UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
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ATLANTA, GEORGIA 30303-1257

June 24, 2013

Mr. Kelvin Henderson
Site Vice President
Duke Energy Carolinas, LLC
Catawba Nuclear Station
4800 Concord Road
York, SC 29745-9635

SUBJECT: CATAWBA NUCLEAR STATION - NRC INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI) INSPECTION REPORT NOS. 05000413/2013009, 05000414/2013009 AND 07200045/2013001

Dear Mr. Henderson:

On May 7, 2013, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Catawba Nuclear Station Units 1 and 2. The enclosed inspection report documents the inspection results which were discussed on May 22, 2013, with you and members of your staff.

This inspection involved a review of the pre-operational demonstration (the dry run) and initial loading activities of spent fuel into the ISFSI facility 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 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 and the initial loading of spent fuel into the ISFSI facility. The inspectors noted that ISFSI activities were implemented in a safe manner.

Based on results of this inspection, the NRC has determined that a traditional enforcement Severity Level IV violation occurred. This traditional enforcement violation was identified with respect to a failure to adequately evaluate a cask drop accident during ISFSI loading activities of the NAC International, Inc. Universal Storage System (NAC-UMS). The NRC is treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2 of the Enforcement Policy.

If you contest the violation or significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator, Region II, the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Catawba Nuclear Station.

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.: 50-413, 50-414, 72-045
License No.: NPF-35, NPF-52

Enclosure: Inspection Reports 05000413/2013009, 05000414/2013009 and 07200045/2013001
w/Attachment: Supplemental Information

cc w/encl.: (See page 3)

U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.:	50-413, 50-414, and 72-045
License Nos.:	NPF-35, NPF-52
Report Nos.:	05000413/2013009, 05000414/2013009 and 07200045/2013001
Licensee:	Duke Energy Carolinas, LLC
Facility:	Catawba Nuclear Station, Units 1 and 2
Location:	York, South Carolina 29745-9635
Dates:	February 18, 2013 through May 7, 2013
Team Leader:	Robert Carrion, Senior Reactor Inspector, Region II
Inspectors:	Cecil Fletcher, Senior Reactor Inspector, Region II Brendan Collins, Reactor Inspector, Region II Abhijit Sengupta, Reactor Inspector, Region II Robert Temps, Senior Safety Inspector, Office of Nuclear Materials Safety and Safeguards (NMSS) Robert Prince, Fuel Facilities Inspector, Region II Matthew Learn, Reactor Engineer, Region III
Approved by:	Steven J. Vias, Chief Engineering Branch 3 Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000413/2013009, 05000414/2013009 and 07200045/2013001, Catawba Nuclear Station, Units 1 and 2, spent fuel pre-loading demonstration and initial loading 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 Modular Advanced Generation Nuclear All-purpose STORage (MAGNASTOR®) System for irradiated fuel at the ISFSI. Upon completion of the dry run demonstrations, the licensee began activities to begin the transfer of Unit 2 spent fuel to the onsite ISFSI on April 28.

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 observed selected portions of the initial spent fuel processing and transfer to the ISFSI to confirm that these activities were performed safely, in accordance with the approved procedures, the Certificate of Compliance (CoC), and Technical Specification (TS) requirements.

One traditional enforcement Severity Level IV violation was identified with respect to a failure to adequately evaluate a cask drop accident during ISFSI loading activities of the NAC UMS System. Corrective actions taken by the licensee have been entered into the licensee's corrective action program. The NRC is treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2 of the Enforcement Policy. This violation and corrective action tracking number are listed in Section 9 of this report.

The finding was determined to have very low safety significance because the calculation assessing criticality or radiological consequences from a MAGNASTOR® transfer cask drop accident prior to confinement being established determined that the consequences of the defined cask drop accident with spent fuel within the cask did not require an amendment to the license or CoC.

REPORT DETAILS

Summary of Facility Activities

Duke Energy Carolinas, LLC selected the NAC International Inc. (NAC) Modular Advanced Generation Nuclear All-purpose STORage System for dry storage of spent nuclear fuel at the Catawba Nuclear Station (CNS), 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 from February 18 to February 21, 2013. During this period, the 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. During the period from April 28 to May 7, NRC inspectors observed activities associated with the initial loading of spent fuel into dry storage to ensure that those activities were performed safely, in accordance with approved procedures and within the TS limits, and to determine if the CNS programs were adequate for continued operation and maintenance of the ISFSI once the ISFSI was loaded.

Catawba ISFSI Activities

1. Preoperational Test Program

a. Inspection Scope (Inspection Procedure (IP) 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 onsite 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

From CoC Technical Specification Section 5.8, Preoperational Testing and Training Exercises, "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 training exercise shall not be conducted with spent fuel in the Transportable Storage Canister (TSC). The dry run may be performed in an alternate step sequence from the actual procedures, but all steps must be performed."

During the period of February 18 - 21, 2013, the inspectors observed the dry run activities, including moving the Transfer Cask (TC) containing the empty TSC into the spent fuel pool, loading dummy fuel assemblies into the TSC (including independent verification, selection and verification of fuel assemblies to ensure conformance with appropriate loading configuration requirements, installing the closure lid, removal of the TC from the spent fuel pool, TC movement through the designated load path, TC installation on the Concrete Cask (CC), and transfer of the TSC to the CC. The licensee

conducted a pre-job briefing each 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, and Quality Assurance (QA) hold points. Procedure compliance was followed during the performance of the activities. Radiological conditions were simulated and appropriate measures implemented to provide a degree of realism including simulated radiological postings 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 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.

The licensee demonstrated the capability to safely place the TSC into the TC. 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 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 procedural compliance was demonstrated by workers in the field.

c. Conclusions

No findings were identified.

2. Review of Evaluations

a. Inspection Scope (IPs 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 CNS holds a general license for operation of its ISFSI.

Catawba documented the results of the required evaluations in the Independent Spent Fuel Storage Installation 10 CFR 72.212 Evaluation Report MAGNASTOR® Casks, Revision 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

10 CFR 72.212 Evaluation Report

The inspectors reviewed a copy of the Catawba 10 CFR 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 10 CFR 72.212(b)(5) through (13). The 10 CFR 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.

Fire and Explosion Analysis of Hauling and Storage

The inspectors reviewed several supporting documents referenced in the 10 CFR 72.212 evaluation report, including Calculation No. CNC-1435.00-00-0041, Revision 1, which revised the previously performed site-specific fire and explosion hazards analysis for initial use of the NAC-UMS cask system at Catawba. The revised calculation addressed the use of the MAGNASTOR® cask system at Catawba and took into account three changes from the original analysis, including physical changes to the exposures along the transporter haul path, the difference between the MAGNASTOR® concrete cask and the NAC-UMS concrete cask, and the difference between the MAGNASTOR® FSAR hazard analysis and the NAC-UMS FSAR hazard analysis. The results of the revised calculation led CNS to conclude that the physical difference between the NAC-UMS concrete cask and the MAGNASTOR® concrete cask did not affect the original fire hazard analysis. The inspectors reviewed the revised calculation document and did not identify any concerns that would contradict the conclusion made by CNS.

MAGNASTOR® and ISFSI Dose Limits

10 CFR 72.104, Criteria for radioactive materials in effluents and direct radiation from an ISFSI or MRS (Monitored Retrievable Storage Installation), 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 10 CFR 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 to the closest real individual due to the ISFSI, which is comprised of the currently existing 24 NAC-UMS® casks, and up to one 2x12 array of MAGNASTOR® casks, is determined to be less than 14.7 mrem, and the estimated annual dose due to Catawba power generation is less than 5 mrem. Therefore, the total annual dose to the closest real individual (less than 19.7 mrem) is within the 10 CFR 72.104(a) limit.

ISFSI Pad Parameters

The Catawba Nuclear Station is scheduled to begin using the MAGNASTOR® system on an existing storage pad that was originally constructed to store the lighter UMS casks. CNS personnel performed calculations to verify that the storage pad, as built, could support the MAGNASTOR® casks without modifications. The inspectors noted that the

calculations conclude that the existing pad is adequate to support the weight of the new MAGNASTOR® casks.

Site-Specific Parameters

The licensee performed a review, documented in the 10 CFR 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 which enveloped the site-specific characteristics of the CNS were not applicable (snow loading on the cask transfer and loading facility, for example), or that a site-specific analysis, as permitted by FSAR Section 4.3.1, had been performed.

10 CFR 72.48 Screening and Evaluation

The inspectors noted that the CNS 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.

10 CFR 50.59 Screening and Evaluation

The loading, transportation, and storage operations of the MAGNASTOR® System at the CNS 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 CNS FSAR.

The 10 CFR 72.212 report, Section 9.2, “Evaluation,” states, “A 10 CFR 50.59 screen has determined that activities related to the CNS 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 will not adversely affect the design function of the spent fuel pool or its structural integrity. Also, the dry fuel storage activities will have no adverse impact on any other SSC at CNS and concluded that the requirements of 10 CFR 72.212(b)(8) were satisfied. In addition, this evaluation did not identify any concerns that would require a change to the CNS TSs or require a Part 50 license amendment.

c. Conclusions

No findings were identified.

3. Fuel Characterization and Verification

a. Inspection Scope (IP 60854)

The CoC for the MAGNASTOR® dry cask storage 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 documentation.

b. Observations and Findings

The inspectors reviewed the licensee's process for selecting and verifying fuel assemblies for placement in the transportable storage canister (TSC). The inspectors reviewed documents associated with the qualification, characterization, and selection of fuel assemblies for storage at the 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 inspectors discussed the fuel selection process with licensee personnel and determined that individuals were knowledgeable of the technical specification requirements. The inspectors reviewed documentation of visual fuel examinations performed for the 37 fuel assemblies to be loaded into cask number 73.

Examinations were performed in accordance with approved procedures. The inspectors noted that the selected fuel assemblies met all the appropriate technical specification requirements for placement into a TSC for dry storage. Supporting documentation adequately characterized the selected fuel assemblies for loading into a TSC.

The licensee had developed a cask loading plan in accordance with approved procedures. Licensee documentation supported the proper characterization of fuel assemblies to be loaded into a MAGNASTOR® TSC and was in compliance with design parameters specified in the CoC.

c. Conclusions

No findings were identified.

4. Records

a. Inspection Scope (IP 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 10 CFR 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 MP/0/A/7150/027C, Internal Transfer, which tracked the locations at which the fuel assemblies are stored in the spent fuel pool; MP/0/A/7650/281; MAGNASTOR® Fuel Assembly Loading 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. 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 and had established procedural requirements to register each cask with the NRC within 30 days after loading per procedure MP/0/A/7650/281, 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 offsite 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.

c. Conclusions

No findings were identified.

5. Procedures and Technical Specifications

a. Inspection Scope (IP 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. The 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.

c. Conclusions

No findings were identified.

6. Quality Assurance (QA) Program

a. Inspection Scope (IP 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 January 17, 2006, 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. The inspectors also walked down the storage area for the vertical concrete casks to verify that they were being adequately stored prior to use and that there were no apparent structural indications, such as visible cracks, on their walls or damage to screen plates on the vents. The inspectors also verified nameplates and serial numbers of the casks.

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 were 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.

c. Conclusions

No findings were identified.

7. Training and Qualifications

a. Inspection Scope (IP 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. 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.

c. Conclusions

No findings were identified.

8. Radiation Protection

a. Inspection Scope (IP 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 or 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, including 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. The licensee has previously-established programs and measures to address radiation protection aspects of dry cask storage evolutions. The licensee has previous experience in loading and handling dry cask storage systems and had developed programs and procedures to address the radiological aspects associated with these activities. The major difference between the previous dry cask storage system and the new MAGNASTOR® system that influences the radiological aspects of dry cask loading and handling activities, is the increased storage capacity of the TSC from 24 to 37 used fuel assemblies.

The inspectors reviewed the As Low As is Reasonably Achievable (ALARA) work plan and dose estimate for loading the first MAGNASTOR® TSC. Based on discussions with licensee personnel and a review of documentation, the inspector determined that an appropriate dose goal had been established for the first MAGNASTOR® cask loading. The inspector noted that the dose estimate for the initial cask loading was in reasonable agreement with estimated dose values noted in the MAGNASTOR® FSAR. The ALARA work plan adequately addressed the use of temporary shielding at key steps of the evolution and adequate contamination control and dose reduction measures were incorporated into the ALARA work plan. The inspector noted that applicable procedures specified the need to perform radiological surveys at critical steps of the loading sequence and when handling and transporting the loaded canister. Verification steps were incorporated into approved procedures to verify that dose rates and contamination levels were in compliance with applicable limits specified by technical specifications.

c. Conclusions

No findings were identified.

9. Control of Heavy Loads

a. Inspection Scope (IP 60854)

The inspectors reviewed the licensee's implementation of the control of heavy loads program for ISFSI operations including inspection, testing, and maintenance documentation associated with the Fuel Handling Building crane, cask lift yoke, cask lift beam, and cask trunnions.

The inspectors reviewed the Duke Energy Nuclear Lifting Program, Revision 18. The program document contains the Lifting Program responsibilities for all employees, vendors, and contractors who participate in the lifting process, planning of lifts and the purchase, training, inspection, testing, maintenance, and operation of rigging hardware, lifting equipment, and cranes.

The inspectors reviewed procedure MP/0/B/1300/026, Inspection and Servicing of Overhead and Gantry Cranes, Revision 006. The procedure provides guidance for testing of the Whiting 125-ton Fuel Handling Building Cranes, in accordance with industry standards.

The inspectors reviewed work orders associated with the load and functional testing of special lifting devices used for ISFSI activities. Specifically, the inspectors reviewed testing for the lift yoke, lift yoke extension, chain fall, and cask lifting trunnions.

The inspectors reviewed procedure MP/0/A/7150/027A, Operation of Overhead Fuel Handling Building Crane, Revision 001. The procedure prescribes operation of the Whiting 125-ton Fuel Handling Building Cranes, and prescribes daily inspection criteria, in accordance with applicable industry standards.

b. Observation and Findings

The inspectors observed the licensee perform heavy loads movements inside the fuel handling building. The inspectors reviewed problem investigation program (PIP) documentation associated with the control of heavy loads program.

The inspectors identified a Severity Level IV NCV of 10 CFR 72.212(b)(8) and 10 CFR 72.212(b)(6), Condition of the general license issued under 10 CFR 72.210. Specifically, the inspectors identified that the licensee failed to address the effects a cask drop containing spent fuel pursuant to 10 CFR 50.59(c) and to ensure that the reactor site parameters are bounding of the cask design basis.

The licensee utilizes two non-single failure proof cranes in the Units 1 and 2 Fuel Handling Building to perform ISFSI cask loading activities. Rather than upgrading the cranes to single-failure proof, the licensee performed load drop analyses to fulfill the recommendations of NUREG-0612, Section 5.1.2, as described in the NRC's safety evaluation report, NUREG-0954.

Because the licensee's cranes are non-single failure proof, the Catawba FSAR contains a "Spent Fuel Cask Drop Accident." Catawba FSAR, Section 15.7.5, Spent Fuel Cask Drop Accident, states:

> "Based on an analysis discussed in Section 9.1.2.3 it is concluded that the cask cannot enter the spent fuel pool due to a postulated dropping or tipping of the cask. Based on this conclusion, the radiological consequences of a spent fuel cask drop accident need not be evaluated."

Therefore, the inspectors concluded that there is no resultant radiological consequence from a cask drop accident. In addition, Catawba FSAR, Section 9.1.2.3.1.5, Cask Drop Accident, states:

> "Cask drop accidents are not analyzed for criticality consequences [for fuel in the spent fuel pool] since the dropping of a cask into the fuel storage areas at Catawba is precluded by design features and cask handling procedures."

Therefore, the inspectors concluded that there is no resultant criticality consequence from a cask drop accident. However, the inspectors determined that the radiological and criticality effects of having spent fuel inside of the cask during a cask drop accident had not been assessed in the licensee's design basis.

The NAC MAGNASTOR® FSAR, Revision 2, Section 12.2.4, 24-inch Drop of the Concrete Cask, contains a 24-inch concrete cask end drop analysis; however, this analysis pertains to the vertical concrete cask (VCC) rather than the transfer cask used within the fuel handling building. Therefore, the 24-inch lift height does not bound lift

heights for the licensee's transfer cask drop accident. In addition, the NAC MAGNASTOR® FSAR, Revision 2, Section 2.4.6, Nuclear Criticality Safety, states:

> "MAGNASTOR design includes features to ensure that nuclear criticality safety is maintained (i.e., the cask remains subcritical under normal conditions and off-normal and accident events). The design of the TSC and fuel basket is such that, under all conditions, the highest neutron multiplication factor (k_{eff}) is less than 0.95."

Prior to loading the NAC MAGNASTOR® system at Catawba, the licensee loaded 24 NAC UMS casks.

Similarly, the NAC UMS FSAR, Revision 4, Section 11.2.4, 24-Inch Drop of Vertical Concrete Cask contains a 24-inch concrete cask end drop analysis; however, this analysis pertains to the vertical concrete cask (VCC) rather than the transfer cask used within the fuel handling building. Therefore, the 24-inch lift height does not bound lift heights for the licensee's transfer cask drop accident. In addition, the NAC UMS FSAR, Revision 4, Section 2.3.4, Nuclear Criticality Safety, states:

> "The Universal Storage System design includes features to ensure that nuclear criticality safety is maintained (i.e., the cask remains subcritical) under normal, off-normal, and accident conditions. The design of the canister and fuel basket is such that, under all conditions, the highest neutron multiplication factor (k_{eff}) is less than 0.95."

In preparation for loading the NAC MAGNASTOR® system at Catawba, the licensee completed calculation CNC-1139.09-01-001, Design of Spent Fuel Building, Revision 40, to assess the drop of the cask on the Part 50 structures, systems, and components (SSCs). The analysis evaluated the effects of a dropped cask in the spent fuel pool area. The calculation concluded that the drop of a canister would not affect the spent fuel located within the spent fuel pool. In addition, the licensee completed calculation CNC-1140.04-04-003, Catawba MAGNASTOR Transfer Cask and Canister Drop Analysis, Revision 0. The analysis evaluated various drops of the cask in the Fuel Handling Building. The calculation concluded that once a canister was sealed, a confinement boundary would be maintained during a cask drop accident. However, the inspectors observed that neither of the analyses assessed criticality of spent fuel inside of the cask or dose from a cask drop accident prior to confinement being established.

The inspectors noted that during a heavy load lift of the cask from the loading pit to the processing shelf, confinement was not yet established. The inspectors determined that the licensee had not performed a calculation assessing criticality or radiological consequences from a MAGNASTOR® transfer cask drop accident prior to confinement being established and, therefore, had not addressed criticality or radiological consequences in either a 10 CFR 50.59 or 10 CFR 72.48 evaluation, which would provide a basis for the determination that this change did not require a license or CoC amendment.

In addition, the inspectors identified that the 24 previously loaded NAC-UMS casks were loaded without these evaluations and, therefore, the licensee failed to assess the criticality and radiological consequences of a NAC UMS transfer cask drop as described above for the previously loaded NAC UMS casks.

The licensee entered this issue into its PIP process as PIP C-13-01464. The licensee performed calculation 12418-6001, Duke TSC Drop Reactivity Evaluation, Revision 0, to evaluate the effects of a MAGNASTOR® transfer cask load drop on spent fuel within the cask. The licensee performed CNC-1227.00-00-0160, Radiological Consequences of a Fuel Storage Cask Drop into a Fuel Cask Pit at CNS, Revision 0. The licensee determined that the radiological and criticality consequences of a MAGNASTOR® cask drop accident with spent fuel within the cask did not require a license or CoC amendment. The licensee did not pursue an evaluation of a cask drop of the NAC UMS system as the licensee plans to only load the NAC MAGNASTOR® system during future loading campaigns.

The inspectors determined that the licensee's failure to perform a calculation to evaluate the effects of a cask drop accident with spent fuel present inside of the cask was a violation that warranted a significance evaluation. Consistent with the guidance in Section 2.2 of the NRC Enforcement Policy, ISFSIs are not subject to the SDP and, thus, traditional enforcement is used for these facilities. Also, consistent with the guidance in Section 2.6.D of the NRC Enforcement Manual, if a violation does not fit an example in the Enforcement Policy Violation Examples, it should be assigned a severity level: (1) Commensurate with its safety significance; and (2) informed by similar violations addressed in the Violation Examples. ISFSI reports are generally documented using NRC Inspection Manual Chapter (IMC) 0610, Nuclear Material Safety and Safeguards Inspection Reports. A note in Section 6 of IMC 0610, Significance of Observations, refers to Appendix E, "Examples of Minor Issues", in IMC 0612, Power Reactor Inspection Reports, to determine thresholds for documenting findings and violations. The violation of this case was determined to be of more than minor significance using IMC 0612, Appendix E, Example 3i, in that the licensee's lack of evaluation did not assure radiological and criticality safety during a design basis cask drop accident and an additional calculation was required to evaluate the effects of the design basis cask drop accident during canister loading operations in the Fuel Handling Building.

The violation screened as having very low safety significance (Severity Level IV). Specifically, Calculations 12418-6001 and CNC-1227.00-00-0160 determined that radiological and criticality safety were maintained during the design basis cask drop accident.

No cross-cutting aspects were identified with this violation.

Title 10 CFR 72.212(b)(8) states, in part, "Before use of the general license, determine whether activities related to the storage of spent fuel under this general license require a license amendment for the facility pursuant to §50.59(c) of this chapter. Results of this determination must be documented in the evaluations made in paragraph (b)(5)."
10 CFR 72.212(b)(6) states, in part, "…prior to use of the general license, to determine whether or not the reactor site parameters…are enveloped by the cask design bases…"
Contrary to the above, as of February 19, 2013, the licensee failed to determine whether activities related to storage of spent fuel under this general license required a license amendment to the facility pursuant to 50.59(c) and failed to determine whether or not the reactor site parameters are enveloped by the cask design bases. Specifically, the licensee failed to address the effects of a cask drop containing spent fuel pursuant to

10 CFR 50.59(c) to the facility as described in the UFSAR and had not performed a written evaluation which provided the bases for determining that the changes did not require a license amendment. In addition the licensee failed to address that the effects of a NAC UMS transfer cask drop containing spent fuel were within their respective cask design bases. Because this violation was of very low safety significance, was not repetitive, was not willful, and was entered into the licensee's corrective action program as PIP C-13-01464, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy; NCV 07200045/2013001-01, Licensee Failure to Adequately Evaluate a Cask Drop Accident during ISFSI Loading Activities of the NAC UMS System.

c. Conclusions

The inspectors identified one Severity Level IV NCV of very low safety significance of 10 CFR 72.212(b)(6) and 72.212(b)(8), Condition of the General License Issued Under 72.210, in that the licensee failed to adequately evaluate a cask drop accident during ISFSI loading activities.

Exit Meeting

The preliminary results of the inspection were discussed at an exit meeting conducted via teleconference on May 22, 2013, with Mr. Kelvin Henderson, Catawba Site Vice President, and other members of the staff.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel
T. Arlow – Emergency Preparedness Manager
C. Bigham – Reactor Group Supervisor
S. Gibby - Nuclear Engineering Manager
J. Glenn – Manager Spent Fuel Management
R. Hart – Regulatory Affairs Manager
K. Henderson – Site Vice President
W. Murphy – Dry Fuel Storage Engineer
D. O'Brien, FRS
P. Simbrat – Regulatory Affairs Staff
T. Simril – Plant Manager

NRC
A. Hutto – Catawba Senior Resident Inspector

LIST OF REPORT ITEMS

Opened and Closed

07200045/2013001-01	NCV	Licensee Failure to Adequately Evaluate a Cask Drop Accident during ISFSI Loading Activities of the NAC UMS System

DOCUMENTS REVIEWED

Specifications

CNS-1140.04-00-0001, Design Basis Specification for the Licensing Basis Requirements for Selecting Spent Fuel for Use of NAC-MAGNASTOR System at Catawba General License Independent Spent Fuel Storage Installation, Revision 0

Procedures

Calibration Procedure (CP)-036.05, Electrical/ Electronic Thermometer, M&TE Calibration Procedure, Revision 5
CP-002.07, Direct Reading Pressure, M&TE Calibration Procedure, Revision 7
CP-064.08, Torque Devices, M&TE Calibration Procedure, Revision 8
EPA AGREE3, CNC Emergency Plan Agreement Letter #3 – Bethel Volunteer Fire Department, Revision 14
EPA AGREE4, CNC Emergency Plan Agreement Letter #4 – York County Emergency Management, Revision 11-1
Maintenance Procedure (MP)/0/A/7650/184, Spent Fuel Dry Storage Cask Troubleshooting, Revision 2
MP/0/A/7150/027A; Operation of Overhead Fuel Handling Building Crane; Revision 001
MP/0/A/7650/182, Operation of Dry Cask Transporter, Revision 0
MP/0/A/7650/186, Upending/Loading TSC into VCC, Revision 4
MP/0/A/7650/281, Loading Spent Fuel Assemblies into MAGNASTOR Casks, Revision 0
MP/0/A/7650/281D, Helium Leak Detector Operation, Revision 0
MP/0/A/7650/282A, MAGNASTOR Contingencies, Revision 0
MP/0/A/7650/282F, E 1000 LT VDS Set-up, Pre-Check, and Operation, Revision 0
MP/0/B/1300/026; Inspection and Servicing of Overhead and Gantry Cranes; Revision 006
PT/0/A/4150/038, Controlling Procedure for Fuel/Component Work, Revision 009
TT/0/A/9100/299, MAGNASTOR Dry Run, Revision 006

Calculations

12418-6001; Duke TSC Drop Reactivity Evaluation; Revision 0
CNC-1139.09-01-001; Design of Spent Fuel Building; Revision 40
CNC-1140.04-00-0001, Seismic Qualification of NAC Casks on CNS ISFSI Pads Using NUREG/CR-6865, Revisions 1 through 4
CNC-1140.04-04-003; Catawba MAGNASTOR Transfer Cask and Canister Drop Analysis; Revision 0
CNC-1227.00-00-0160; Radiological Consequences of a Fuel Storage Cask Drop into a Fuel Cask Pit at CNS; Revision 0
CNC-1229.00-00-0061, (NAC International Calculation 1241 8-5004. Revision 1)
CNC-1229.00-00-0062, (NAC International Calculation 1241 8-5005, Revision 0), Catawba Source Term Analysis & Fuel Assembly Model Development (NAC International Calculation 1241 8-5005)
CNC-1435.00-00-0041, Fire/Explosion Hazards Analysis for the Dry Cask Transfer Route, Revision 0
CNC-1553.12-00-0026, 10CFR72.48 Requirements for Selecting Spent Fuel for NAC-MAGNASTOR Storage System at Catawba General License Independent Spent Fuel Storage Installation, Revision 0
CNC-1553.12-00-0029, (ISFSI) Selection of Spent Fuel Assemblies and Non-Fuel Hardware for Storage in NAC-MAGNASTOR Transportable Storage Canister CNZ-074, Revision 0.
DPC-1201.30-00-0013 (CNC-1201.30-0058, MCC-1201.30-00-0033), Catawba and McGuire ISFSI Candidate Fuel Decay Heat Calculation, Revision 1

DPC-1229.00-00-0011 (MCC-1229.00-00-0059, CNC-1229.00-00-0066, OSC-1 0713), Distance Measurements from ISFSI to Nearest Residents

Corrective Action Documents

Problem Investigation Program (PIP) C-10-03142, Procedure Use and Adherence for Dry Cask Loading
PIP C-10-03882, NAC UMS Storage System cask lifting lugs
PIP C-11-01897, ISFSI procedure changes did not receive 10CFR72.48 screens
PIP C-11-01919, Audit Recommendations for Performance Improvement
PIP C-12-01234, Vendor Calculations for the Structural Analysis of ISFSI Pad #2
PIP C-12-01807, Identify Trend with Concrete Rejection from the Supplier
PIP C-12-04480, Review of Cause Analysis
PIP C-12-04522, Initiate actions to process a vendor drawing
PIP C-12-06665, Documentation of Assessment of CNS MAGNASTOR Internal Dry Run Readiness Gap Analysis
PIP C-12-06937, ISFSI paperwork reviewing Visual Inspection
PIP C-12-08961, Document Results of Catawba MAGNASTOR Cask Loading Operational Readiness Assessment
PIP C-13-00410, Controlling Drawing CNM-1206.00-0889.001 is not stamped with the applicable QA condition.
PIP C-13-00788, Cathodic Protection System for ISFSI
PIP C-13-01464; As part of ISFSI MAGNASTOR Dry Run Inspection, NRC Inspector Raised Questions Concerning Analysis Related to Dropped Casks for the ISFSI Process; dated February 19, 2013
PIP C-13-01526, NRC Inspector identified Supply Chain Procedure enhancements during ISFSI MAGNASTOR Dry Run inspection
PIP C-13-01530, NRC Inspector identified M&TE Calibration Procedure enhancements during ISFSI MAGNASTOR Dry Run inspection

Other Documents Reviewed

10CFR 72.212 Evaluation Report, Independent Spent Fuel Storage Installation, MAGNASTOR Casks, Revision 0
Catawba Correspondence File # CN-514.31, Radiological Evaluation of the Vertical Concrete Cask (VCC) and MAGNASTOR Transfer Cask (MTC) for Use at Catawba Nuclear Station for Dry Storage of Spent Fuel
Certificate of Compliance 1031, Amendment 2, Appendix B
CO-MECH-BT-MAG-DRY-CASK-R00, Common NAC MAGNASTOR Dry Cask Qualification Report, dated 2/8/2013
CO-MECH-OT-2175-R00, Operate the Overhead Fuel Building Cranes Qualification Report, dated 2/8/2013
CO-MECH-OT-2176-R00, Operate All Fuel Component Handling Tools Qualification Report, dated 2/8/2013
Duke Energy Nuclear Lifting Program; Revision 18
Instrument Calibration Certification for Fuel Cask RTD CNMNT20428
Instrument Calibration Certification for Digital Thermometer CNMNT20260
Instrument Calibration Certification for Pressure Transducer CNMNT20554
Instrument Calibration Certification for Pressure Transducer CNMNT20553
Instrument Calibration Certification for Torque Wrench CNMNT19475
Instrument Calibration Certification for Helium Leak Tester CNMNT20577
MAGNASTOR ALARA Planning Package, RWP 2052, MAGNASTOR Dry Cask Storage
MAGNASTOR Training Program Modules 1-5, 12/7/2011

NAC MAGNASTOR Final Safety Analysis Report; Revision 2
Nuclear Procurement Issues Committee (NUPIC) #2053, Supplier Audit Evaluation Report of NAC International, Inc.
Nuclear Supply Directive (NSD) 208, Problem Investigation Program (PIP), Revision 13
NSD 220, Evaluation and Reporting of Deviations and Noncompliance Per 10CFR Part 21, Revision 5
NSD 406, Control of Measuring and Test Equipment, Revision 6
Nuclear System Directive 313, Control of Transient Fire Loads, Revision 12
Supply Chain Directive (SCD) 311, QA Inspection and Testing, Revision 10
SCD410, Receiving, Revision 15
SCD420, Shipping, Revision 5
SCD 450, Putaway, Storage, and Inspection, Revision 12
Surveillance # VS11017, Supplier Surveillance Report for Boral Sheets
Surveillance # VS11047, Supplier Surveillance Report for MAGNASTOR Transfer Cask Assembly
Surveillance # VS11059, Supplier Surveillance Report for MAGNASTOR Transfer Cask Assembly
Surveillance # VS11098, Supplier Surveillance Report for MAGNASTOR Transfer Assembly
Surveillance # VS11202, Supplier Surveillance Report for Vertical Concrete Cask Weldments/Liners
Surveillance # VS12116, Supplier Surveillance Report for NAC and HZ
TTC819-N, Duke MNT MAGNASTOR Procedure Dry Cask Lesson Plan and Presentation, 12/22/11
Unique Trace Code (UTC)#1980352, Receiving Inspection Report for Welding Rod
UTC#1992583, Receiving Inspection Report for Dry Storage MAGNASTOR Cask Transfer
UTC#1997279, Receiving Inspection Report for Dry Storage MAGNASTOR Transportable Cask
UTC#2002520-2002543, Receiving Inspection Report for Dry Storage MAGNASTOR Vertical Concerete Cask
Work Order (WO)# 02004537 08, Canister Storage