



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION III
2443 WARRENVILLE RD. SUITE 210
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February 8, 2016

Mr. David A. Heacock
President and Chief Nuclear Officer
Dominion Energy Kewaunee, Inc.
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: NRC INSPECTION REPORT NO. 05000305/2015003(DNMS) AND
07200064/2015001(DNMS) – KEWAUNEE POWER STATION

Dear Mr. Heacock:

On January 21, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed inspections which included decommissioning inspections and independent spent fuel storage installation (ISFSI) pad design and construction inspections at the permanently shut down Kewaunee Power Station (KPS) in Kewaunee, Wisconsin. The purpose of the inspection was to determine whether decommissioning and ISFSI activities were conducted safely and in accordance with NRC requirements. The enclosed report presents the results of this inspection, which were discussed with Mr. S. Yuen and other members of your staff on January 21, 2016.

During the inspection period, the NRC inspectors reviewed the following aspects of onsite activities: safety reviews, design changes, and modifications; self-assessments, audits, and corrective actions; maintenance and surveillance; emergency preparedness scenario review and exercise evaluation; on-site fabrication of components and construction of an ISFSI; and ISFSI design evaluations. The inspection consisted of an examination of activities at the site as they relate to safety and compliance with the Commission's rules and regulations. Areas examined during the inspection are identified in the enclosed report. Within these areas, the inspection consisted of a selective examination of procedures and representative records, observation of work activities, and interviews with personnel.

Based on the results of this inspection, no violations of NRC requirements were identified.

In accordance with Title 10 of the *Code of Federal Regulations* (CFR) 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC's Public Document Room or from the Publicly Available Records System (PARS) component of

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Sincerely,

/RA/

Michael A Kunowski, Chief
Materials Control, ISFSI, and
Decommissioning Branch
Division of Nuclear Materials Safety

Docket Nos. 50-305, 72-064
License No. DPR-43

Enclosure:
IR 05000305/2015003(DNMS);
07200064/2015001(DNMS)

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos: 050-00305; 072-00064

License No: DPR-43

Report Nos: 05000305/2015003(DNMS)
07200064/2015001(DNMS)

Licensee: Dominion Energy Kewaunee, Inc.,

Facility: Kewaunee Power Station (KPS)

Location: Kewaunee, WI

Dates: July 1, 2015, through January 21, 2016

Inspectors: Rhex A. Edwards, Senior Health Physicist
Jennifer Dalzell-Bishop, Health Physicist
Vijay Meghani, Reactor Inspector

Approved by: Michael A. Kunowski, Chief
Materials Control, ISFSI, and
Decommissioning Branch
Division of Nuclear Materials Safety

Enclosure

EXECUTIVE SUMMARY

Kewaunee Power Station NRC Inspection Report 05000305/2015003; 07200064/2015001

Kewaunee Power Station (KPS) operated at full power until May 7, 2013, when it shutdown and permanently ceased power operation. On May 14, 2013, KPS certified the permanent removal of fuel from the reactor vessel (ADAMS Accession No. ML13135A209). On May 31, 2013, the U.S. Nuclear Regulatory Commission (NRC) notified KPS that the Operating Reactor Assessment Program had ceased and that implementation of the Decommissioning Power Reactor Inspection Program would begin on June 1, 2013 (ADAMS Accession No. ML13151A375).

Currently, KPS is a permanently shut-down and defueled power reactor facility that was maintained in a safe storage (SAFSTOR) condition with spent fuel in wet storage and at an Independent Spent Fuel Storage Installation (ISFSI).

Safety Reviews, Design Changes, and Modifications at Permanently Shutdown Reactors

- The licensee implemented design changes and modifications to fuel assemblies susceptible to intergranular stress corrosion cracking in accordance with applicable regulatory requirements, license conditions, and the Technical Specifications (TS). (Section 1.0)

Self-Assessment, Auditing, and Corrective Action

- Issues were identified by the licensee at appropriate thresholds and entered into the corrective action program (CAP). Issues were screened and prioritized commensurate with safety significance. Licensee evaluations determined the significance of issues and included appropriate remedial corrective actions. (Section 2.0)

Onsite Fabrication of Components and Construction of an ISFSI

- Construction activities related to dry cask storage operations at KPS complied with the design specifications contained in the Certificate of Compliance (CoC) and the Safety Analysis Report (SAR). Materials used in construction conformed to procurement specifications and activities related to quality were performed by qualified individuals. Deficiencies and non-conformances were documented in the CAP. KPS provided adequate supervision of contractors performing construction activities. (Section 3.0)

Review of 10CFR72.212(b) Evaluations

- The licensee performed written evaluations that demonstrated the cask storage pad and areas were designed to support the static and dynamic loads of the storage casks. Appropriate assumptions were made by the licensee regarding the seismic and liquefaction analyses. (Section 4.0)

Decommissioning Emergency Preparedness Scenario Review and Exercise Evaluation

- The inspectors determined that the licensee's exercise scenario provided sufficient opportunities to demonstrate the capability to protect public health and safety. Additionally, the licensee demonstrated the ability to identify weaknesses during the conduct of a critique following an emergency exercise. Identified weaknesses were entered into the CAP as appropriate. (Section 5.0)

Report Details

Summary of Plant Activities

During the inspection period, the licensee maintained the unit in a SAFSTOR condition. No major onsite decommissioning activities occurred during the inspection period. However, a new ISFSI storage pad and Vertical Concrete Casks (VCC) were constructed onsite in preparation for a future ISFSI campaign.

1.0 Safety Reviews, Design Changes, and Modifications at Permanently Shutdown Reactors (IP 37801)

1.1 Inspection Scope

The inspectors conducted document reviews and interviews with plant personnel to assess the licensee's performance as it related to the following areas:

- Determination that licensee procedures and processes conform to the regulation and guidance associated with 10 CFR 50.59;
- Procedures that control and implement design changes and modifications to assess that the procedures provided adequate guidance for implementation, review and approval;
- Implementation of a sampling of design change modifications to verify procedures and controls were followed and confirm that the applicable changes were effectively implemented in the field and in plant procedures, drawings and training programs if applicable;
- Verification that changes made under 10 CFR 50.59 did not require prior NRC approval.

The inspectors verified that when issues were identified licensee personnel appropriately documented the issues in the CAP.

1.2 Observations and Findings

The inspectors reviewed the licensee's plans for, and observed the repair of, fuel assemblies located in the spent fuel pool that were considered susceptible to intergranular stress corrosion cracking. The plans involved inserting fuel anchors designed to preclude the top nozzle from separating from the fuel assembly during handling. The repairs allowed the licensee to handle the susceptible fuel assembly by normal means. These modifications were reviewed by the inspectors to ensure quality, structural adequacy, and compliance with regulatory requirements. The inspectors observed the work and verified that the licensee followed installation procedures, maintained quality assurance records, and controlled the evolution effectively. When issues were identified, the issues were documented by the licensee in the CAP at an appropriate threshold.

No findings were identified.

1.3 Conclusions

The licensee implemented design changes and modifications to fuel assemblies susceptible to intergranular stress corrosion cracking in accordance with applicable regulatory requirements, license conditions, and the TSs.

2.0 **Self-Assessments, Audits, and Corrective Actions (IP 40801)**

2.1 Inspection Scope

The inspectors conducted document reviews and interviews with plant personnel to assess the licensee's performance as it related to the following areas:

- Administrative procedures prescribed actions for the identification, evaluation and resolution of problems;
- License procedures prescribed thresholds for the performance of self-assessments, audits, and surveillances;
- Licensee management reviewed self-assessments, audits, and corrective actions to remain knowledgeable of plant performance;
- Issues or problems were identified and corrected in accordance with the licensee's CAP;
- Licensee management observed maintenance and surveillance activities, operations evolutions, and training.

The inspectors reviewed CAP documents to determine: if a sufficiently low threshold for problem identification existed; the quality of follow-up evaluations, including extent-of-condition; and if the licensee assigned timely and appropriate prioritization for issue resolution commensurate with the significance of the issue. Issues that were repetitive and those with the potential for safety or regulatory consequence were evaluated further by the inspectors to assess apparent and/or common cause and significance.

2.2 Observations and Findings

The inspectors determined that issues were identified by the licensee at an appropriate threshold within various functional areas of the site and entered into the CAP. Issues were effectively screened, prioritized, and evaluated commensurate with safety significance. The scope and depth of evaluations were adequate in that the evaluations reviewed addressed the significance of issues and assigned an appropriate course of remedial action.

No findings were identified.

2.3 Conclusions

Issues were identified by the licensee at appropriate thresholds and entered into the CAP. Issues were screened and prioritized commensurate with safety significance. Licensee evaluations determined the significance of issues and included appropriate remedial corrective actions.

3.0 **On-Site Fabrication of Components and Construction of an ISFSI (IP 60853)**

3.1 Inspection Scope

The inspectors conducted document reviews, observed licensee performance, and conducted interviews with plant personnel to determine whether:

- Materials and services received by the fabricator met dry cask storage system (DCSS) procurement specifications and the specifications conformed to the design requirements contained in the DCSS SAR and the CoC;
- Licensee, vendor, and fabricator personnel had established an effective method for tracking, evaluating, and dispositioning changes or modifications to the DCSS component design;
- Individuals performing quality-related activities were trained and certified where required and the on-site fabricator's personnel were familiar with the design, testing requirements, and quality controls associated with the construction of the DCSS;
- The licensee performed appropriate oversight during fabrication activities;
- Nonconformance reports documenting deficiencies were initiated and resolved, and the associated corrective actions were implemented, in a timely manner commensurate with their significance;
- The pad's subsoil was treated to meet the specifications defined in the SAR, CoC, and construction specifications;
- The correct size, grade, and spacing of reinforcing steel are installed per the pad's specifications; and
- The concrete was batched correctly, delivered within specification, tested appropriately, and placed in accordance with construction specifications.

3.2 Observations and Findings

KPS constructed 24 VCCs and a reinforced concrete pad designed to accommodate the VCCs in a 3 by 8 array. The new pad was constructed adjacent to the approach slab for the existing ISFSI and is approximately 53 feet wide and 164 feet long.

Pad Subgrade Preparation

During installation of the first ISFSI pad, additional subgrade preparation was performed in the vicinity of the new pad with the expectation to eventually build an ISFSI pad in this location. As such, the licensee prepared the new pad location by excavating the crushed rock down to the previously placed granular fill. After performing density tests on the subgrade, a thin concrete mat, or mud mat, was placed on top to support the pad formwork and reinforcing steel. The subgrade material was prepared adequately and conformed to design specifications and SAR requirements.

Placement of Reinforcing Steel

The formwork and reinforcing steel (rebar) placed on top of the mud mat met design specifications. The inspectors reviewed certified material test reports for the rebar used and found procurement specifications were being met and the steel met specified quality requirements. Following placement, the inspectors concluded that the licensee adequately placed the correct number and size of bars according to design specifications.

Concrete Mix Design

The concrete mix design met applicable codes and standards listed in the licensee's design specification. Specifically, the inspectors found that the mix design satisfied specified strength requirements and American Concrete Institute code specifications for durability. The inspectors also concluded that the compressive strength design requirements considered the FSAR cask tip-over strength requirements.

Placement of Concrete

The concrete for the ISFSI pad was placed in one continuous pour and adequate supervision was provided by the licensee over the contractors. The concrete was appropriately tested, consolidated, finished, and cured as specified by the design specifications.

Concrete Field Tests

Batch tickets for each truck were checked by the licensee to verify conformance with the mix design and to ensure delivery time and drum rotations met construction specifications. The batch tickets reviewed by the inspectors met design specifications. The licensee's contractor performed additional onsite testing for concrete temperature, slump, and air content. All testing was performed by qualified inspectors and in accordance with industry standards. Concrete samples were taken and placed in test cylinders, stored appropriately for curing, and later tested in a laboratory to determine the compressive strength of the concrete. The inspectors reviewed the 28-day break test results and found all the cylinders tested were within the KPS specific cask tip over analysis requirements for concrete compressive strength.

VCC Construction

VCC fabrication activities were performed by NAC International under contract with KPS. The inspectors concluded that the licensee adequately supervised its contractor and

documented deficiencies and non-conformances in accordance with its CAP. Materials provided met design and procurement specifications and construction activities and materials testing were performed by qualified individuals.

No findings were identified.

3.3 Conclusions

Construction activities related to dry cask storage operations at KPS complied with the design specifications contained in the SAR. Materials used in construction conformed to procurement specifications and activities related to quality were performed by qualified individuals. Deficiencies and non-conformances were documented in the CAP and KPS provided adequate supervision of its contractors performing construction activities.

4.0 **Review of 10 CFR 72.212(b) Evaluations (IP 60856)**

4.1 Inspection Scope

The inspectors conducted document reviews, performed walk downs, observed licensee performance, and conducted interviews with plant personnel to determine whether:

- The licensee performed written evaluations which establish that the conditions of the CoC have been met;
- Cask storage pads and areas have been designed to support the static and dynamic load of the storage casks; and
- Appropriate assumptions were made regarding the seismic and liquefaction analyses.

4.2 Observations and Findings

Soil Analysis and Soil Liquefaction Analysis

The inspector's reviewed soil investigation reports and calculations documenting the engineering properties and design soil profile of the ISFSI site based on geotechnical investigations of the ISFSI areas combined with the data in the plant updated SAR. The pad design addressed geological and hydrological considerations using the information from the previously performed soil investigation when the first pad was built and newly performed soil investigations. Items reviewed included depth of soil borings, test records, groundwater table, effects of long-term settlements, and effects of potential flooding and soil erosion. The licensee's liquefaction analysis was verified to be in compliance with the seismic input and safety factors within Regulatory Guidance 1.198.

Seismic Soil Structure Analysis and ISFSI Pad Structural Analysis

The inspector's reviewed documents used in generation of new seismic acceleration time histories from the seismic ground motion spectra at the reactor site used as inputs for the ISFSI analyses. The inspectors verified the adequacy of the soil structure interaction analysis methodology and associated calculations including: the

soil, pad, and cask analytical model; the soil profile; the modeling for interfaces; boundary conditions; and consideration of uncertainties in the soil investigation data. The inspectors found that the pad structural design methodology utilized acceptable load factors and acceptance criteria. Additionally, the methodology considered long-term total and differential settlements; the adequacy of safety factors under static and dynamic loading; and sequential and partial loading. Finally, the evaluations determined the static and ultimate soil bearing capacities and the safety factors under worst case static and dynamic loads.

No findings were identified.

4.3 Conclusions

The licensee performed written evaluations that demonstrated the cask storage pad and areas were designed to support the static and dynamic loads of the storage casks. Appropriate assumptions were made by the licensee regarding the seismic and liquefaction analyses.

5.0 **Decommissioning Emergency Preparedness Scenario Review and Exercise Evaluation (IP 82401)**

5.1 Inspection Scope

The inspectors conducted document reviews, performed interviews, and observed an emergency exercise to assess:

- Whether the exercise scenario provided sufficient opportunities to demonstrate the licensee's capability to perform key skills in principal functional areas to protect public health and safety; and
- The adequacy of the licensee's conduct of an exercise and ability to assess performance via a formal critique to identify and correct weaknesses.

5.2 Observations and Findings

The inspectors determined that the exercise scenario provided sufficient opportunities to demonstrate key skills in principle functional areas to protect public health and safety. Additionally, through direct observation of the emergency response organization during an emergency exercise, the inspectors confirmed the scenario provided sufficient opportunities to demonstrate the licensee's capability during an emergency. Following the exercise, the inspectors observed portions of the licensee's critique and concluded that the licensee adequately assessed performance and entered identified weaknesses into the CAP as appropriate.

No findings were identified.

5.3 Conclusions

The inspectors determined that the licensee's exercise scenario provided sufficient opportunities to demonstrate the capability to protect public health and safety. Additionally, the licensee demonstrated the ability to identify weaknesses during the

conduct of a critique following an emergency exercise. Identified weaknesses were entered into the CAP as appropriate.

6.0 Exit Meeting

The inspectors presented the results of the inspection to Mr. S. Yuen and other members of the KPS staff at an onsite exit meeting on January 21, 2016. The licensee acknowledged the results presented and did not identify any of the information discussed as proprietary.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

S. Yuen, Plant Manager
T. Olson, Technical Support Manager
B. McMahon, Operations Manager
M. Hale, Radiation Protection Manager
J. Helbing, Maintenance Manager
R. Repshas, Licensing Manager
J. Gadzala, Licensing Engineer

INSPECTION PROCEDURES (IPs) USED

IP 37801 Safety Reviews, Design Changes, and Modifications at Permanently Shutdown Reactors
IP 40801 Self-Assessment, Auditing, and Corrective Action at Permanently Shutdown Reactors
IP 60853 On Site Fabrication of Components and Construction of an ISFSI
IP 60856 Review of 10 CFR 72.212(b) Evaluations
IP 82401 Decommissioning Emergency Preparedness Scenario Review and Exercise Evaluation

ITEMS OPENED, CLOSED, AND DISCUSSED

<u>Opened</u>	<u>Type</u>	<u>Summary</u>
None		

<u>Closed</u>	<u>Type</u>	<u>Summary</u>
None		

<u>Discussed</u>	<u>Type</u>	<u>Summary</u>
None		

PARTIAL LIST OF DOCUMENTS REVIEWED

The following is a partial list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety, but rather that selected sections of portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

- ETE-KW-2015-0005; Evaluation of Fuel Anchors for Fuel Assembly Repair; Revision 0
- 50.59/72.48 Screen: ETE- KW-2015-0005, Revision 0; June 17, 2015
- Westinghouse Letter; 14x14 Fuel Anchor Design Report; May 8, 2015
- MRS-GEN-2842; Fuel Anchor Installation in 14x14 Fuel Assemblies; Revision 0
- WO KW100992451; Fuel Assembly Insert Relocation and Bulge Joint Repair by Westinghouse; Revision 0
- MAGNASTOR System FSAR, Docket No. 72-1031; Revision 6
- Certificate No. 1031; Certificate of Compliance for Spent Fuel Storage Casks, Issued to NAC International Inc.; Amendment 5
- Kewaunee Power Station Updated Safety Analysis Report; Revision 24
- STS Consultants Project No. 4-30075; Subsurface Exploration and Geotechnical Engineering Evaluation; March 17, 2006, June 6, 2006, and June 23, 2006
- Calculation GD061606; Shallow Foundation Design Parameters; Revision 2
- Calculation 30026-2001; Kewaunee MAGNASTOR Storage and Transport Weights and C. G. Calculation; Revision 1
- Calculation 11862-010-ST-04; Soil Liquefaction Evaluation; Revision 0, Addenda A, B
- Drawing XK-70155348-1; ISFSI Facility, General Notes; Revision 0
- Drawing XK-70155348-5; ISFSI Facility, Final Grading and Surfacing Plan; Revision 0
- Drawing XK-70155348-7; ISFSI Facility Storage Pad and Approach Slabs; Revision 0
- Drawing XK-70155348-9; ISFSI Facility, Heavy Haul Route Road Upgrade Plan; Revision 0
- Calculation 11862-010-ST-02; ISFSI Pad and Approach Slab Design; Addendum B
- 30026-R-01; Design and Operational Interface Requirements for the MAGNASTOR System and the Kewaunee Nuclear Power Station ISFSI; Revision 1
- Calculation 13200-001-ST-02; ISFSI Pad 2 Slab Design; Revision 0, Addenda A, B
- Calculation 13200-001-ST-03; Seismic Soil Structure Interaction Analysis of ISFSI Pad 2; Revisions 0 and Addendum A
- 30026-WP-003; Disposition of NRC Information Notice 2003-16 and Evaluation of Potential Cask Sliding of the MAGNASTOR System at the Kewaunee Site due to Icing Conditions; Revisions 0, 2
- Calculation 30026-2010; Kewaunee MAGNASTOR VCC Tip-Over Analysis; Revision 0
- Calculation 11862-010-ST-06; Underground Utilities Evaluation; Revisions 1, Addenda A, B, C
- Design Change No.: KW-14-02009; ISFSI Pad #2; November 6, 2014
- 50.59/72.48 Screen; KW-14-02009; October 16, 2014
- Specification No.: K-4893; Technical Specification for the Earthwork Construction of the ISFSI Cask Storage Pad #2, Roadwork, Grading, and Electrical Work; Revision 5
- 30026-P-05; ISFSI Storage Pad Expansion Work Record and Inspection Forms at Kewaunee Storage Pad Project; Revision 0
- 30026-P-07; NAC Project Oversight of the Concrete Batching and Site Testing for the Kewaunee ISFSI Storage Pad; Revision 0

- Calculation 71160-2016; Concrete Cask Impact During Seismic; Revision 1
- KOCT15E; KPS Emergency Preparedness Exercise Report; December 14, 2015
- Permanently Defueled Emergency Plan; November 3, 2014

LIST OF ACRONYMS USED

ADAMS	Agencywide Documents Access and Management System
CAP	Corrective Action Program
CFR	Code of Federal Regulations
CoC	Certificate of Compliance
DNMS	Division of Nuclear Materials Safety
DCSS	Dry Cask Storage System
ISFSI	Independent Spent Fuel Storage Installation
KPS	Kewaunee Power Station
NRC	U.S. Nuclear Regulatory Commission
SAFSTOR	Safe Storage
SAR	Safety Analysis Report
TS	Technical Specification
VCC	Vertical Concrete Cask