Special Inquiry into the U.S. Nuclear Regulatory Commission Region II's Inspections of Independent Spent Fuel Storage Installations at Operating Reactors

OIG Case No. 20-012
February 21, 2023

MEMORANDUM

DATE: February 21, 2023

TO: Christopher T. Hanson
Chair

FROM: Robert J. Feitel
Inspector General

Robert J. Feitel Digitally signed by Robert J. Feitel Date: 2023.02.21 12:54:53 -05'00'

SUBJECT: SPECIAL INQUIRY INTO THE U.S. NUCLEAR REGULATORY COMMISSION REGION II'S INSPECTIONS OF INDEPENDENT SPENT FUEL STORAGE INSTALLATIONS AT OPERATING REACTORS (OIG Case No. 20-012)

Attached is the report of the Office of the Inspector General (OIG), U.S. Nuclear Regulatory Commission (NRC), titled Special Inquiry into the U.S. Nuclear Regulatory Commission Region II's Inspections of Independent Spent Fuel Storage Installations at Operating Reactors.

This report is furnished for whatever action you deem appropriate. Please notify the OIG by May 30, 2023, of what corrective actions, if any, the NRC will be taking based on the results of this Special Inquiry.

cc: Commissioner Baran
Commissioner Wright
Commissioner Caputo
Commissioner Crowell
Daniel H. Dorman, Executive Director for Operations
David A. Castelveter, Director, Office of Public Affairs

Results in Brief

OIG Case No. 20-012
February 21, 2023

Why the OIG conducted this Special Inquiry

OIG Investigations initiated this Special Inquiry in response to concerns raised by a member of the NRC's Independent Spent Fuel Storage Installation Inspection Program Enhancement Team, which the NRC chartered on June 14, 2019, to evaluate and enhance the agency's Independent Spent Fuel Storage Installation (ISFSI) Inspection Program. The team member's overall concern, which the NRC's Office of Nuclear Material Safety and Safeguards (NMSS) forwarded to us, was that "Region II acted inappropriately and without authority with respect to performing independent spent fuel storage installation inspections." In particular, the team member alleged that Region II failed to adhere to NRC policy by allowing resident inspectors, who were qualified under new and operating reactor programs but *not* under the agency's ISFSI inspection program, to inspect ISFSIs. The team member also alleged that Region II deviated from the requirements in agency procedures for inspecting campaigns during which NRC licensees loaded spent fuel to dry cask storage.

The OIG also received ISFSI concerns from Congressional and other stakeholders. Based on both the internal NRC concerns and these external concerns, the OIG initiated this Special Inquiry, which aligns with the OIG's strategic safety goal to strengthen the NRC's efforts to protect public health and safety and the environment.

Finding

Region II improperly deviated from NRC policies when it authorized resident inspectors who were not qualified to inspect ISFSIs to inspect repeat spent fuel loading campaigns to dry cask storage. Furthermore, data from 2018 and 2019 show that collectively Region II's resident inspectors spent only about 20 percent of the number of hours anticipated for ISFSI inspections stated in the applicable inspection procedure. The limited inspection hours charged appear to show that Region II did not accomplish all inspection requirements identified in the procedure.

Region II's actions potentially resulted in missed opportunities to adequately evaluate whether licensees met the NRC's regulatory requirements. For example, from January 2021 to December 2022, after Region II began using properly qualified inspectors and following all the requirements in the applicable inspection procedure, those qualified inspectors identified numerous violations and other non-compliances during ISFSI inspections that could have been identified earlier.

The OIG did not identify an immediate safety concern related to ISFSIs. The OIG did find, however, that Region II's deviation from NRC policies resulted in licensees loading significant numbers of casks during repeat loading campaigns, from 2012 through 2020, that did not receive—and still have not received—adequate NRC inspections to ensure the licensees met regulatory requirements for long-term storage and retrievability.

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I. ALLEGATION

OIG Investigations initiated this Special Inquiry based on concerns raised by a member of the NRC's Independent Spent Fuel Storage Installation Inspection Program Enhancement Team, as well as concerns from Congressional and other stakeholders, regarding the NRC's oversight of plants performing repeat spent fuel loading campaigns to dry cask storage. The NRC team member alleged that "Region II acted inappropriately and without authority with respect to performing independent spent fuel storage installation inspections." In particular, the team member alleged that Region II failed to follow NRC policies by allowing resident inspectors, who were qualified under new and operating reactor programs but not under the agency's ISFSI inspection program, to inspect ISFSIs. The team member also alleged that Region II deviated from the requirements in agency procedures for inspecting campaigns during which NRC licensees loaded spent fuel to dry cask storage.

Potential violations relevant to this allegation include failure to adhere to policies or procedures stated in Manual Chapter-0124, "Organization and Functions Office of Nuclear Material Safety and Safeguards" (now Management Directive 9.26), and Inspection Manual Chapter (IMC) 2690, "Inspection Program for Storage of Spent Reactor Fuel and Reactor-Related Greater-Than-Class C Waste at Independent Spent Fuel Storage Installations and for 10 CFR Part 71 Transportation Packagings."

II. INTRODUCTION

The NRC inspection program covers ISFSIs in four phases:

- Phase 1: Design, fabrication, and construction;
- Phase 2: Preoperational testing, including dry runs;
- Phase 3: Spent fuel loading and unloading operations; and,
- Phase 4: Storage monitoring of the loaded ISFSI.[1]

Following an audit of the agency's ISFSI oversight program in 2011, the OIG recommended various improvements to that program.[2] In this Special Inquiry, the OIG investigated how the NRC conducted repeat ISFSI loading campaign inspections [Phase 3] in Region II during the time between the OIG's issuance of its 2011 audit report and January 1, 2021, when the NRC implemented a revised ISFSI inspection program.

The OIG interviewed more than 20 witnesses for this report, including NRC principals regarded as knowledgeable in ISFSI-related matters, as well as Senior Executive Service (SES) officials in Region II and at NRC Headquarters. The OIG also reviewed extensive documentation related to the agency's ISFSI oversight program, including NRC inspection reports, staff internal assessments, enforcement actions, NRC policies, and NRC guidance, including guidance set forth in Manual Chapter-0124,[3] IMC 2690,[4] and IMC 1246.[5] In addition, the OIG gathered background information on ISFSIs at NRC-regulated nuclear power plants.

The OIG recognizes that the purpose of the agency's ISFSI inspection program is not to provide a systematic certification for the loading of spent fuel to dry cask storage. The NRC has, however, established programs under which NRC inspectors determine whether licensees are properly conducting operations and maintaining equipment to ensure safe operations. The NRC must, therefore, ensure its offices properly implement these programs.

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[1] Inspection Manual Chapter (IMC) 2690, Appendix A, "Inspection Program Guidance for Reactor Site ISFSIs," revised on March 9, 2012, describes the inspection program for ISFSI activities authorized under the provisions of a general or site-specific license for an ISFSI located at a Part 50 reactor site. This was the version that corresponds to the period of the Special Inquiry.

[2] OIG-11-A-12, "Audit of NRC's Oversight of Independent Spent Fuel Storage Installations Safety" (May 19, 2011).

[3] Manual Chapter-0124, "Organization and Functions Office of Nuclear Material Safety and Safeguards," was the policy in effect during the period covered by this Special Inquiry. On February 21, 2021, Management Directive (MD) 9.26, "Organization and Functions, Office of Nuclear Material Safety and Safeguards (NMSS)," replaced Manual Chapter and Appendix NRC-0124. MD 9.26 reflects the organizational structure, responsibilities, and authorities of the office.

[4] IMC 2690 establishes the NRC's inspection program for ISFSIs, dry storage systems, and transportation packaging to ensure program area staff members have the necessary knowledge and skills to successfully oversee licensee compliance with regulatory requirements.

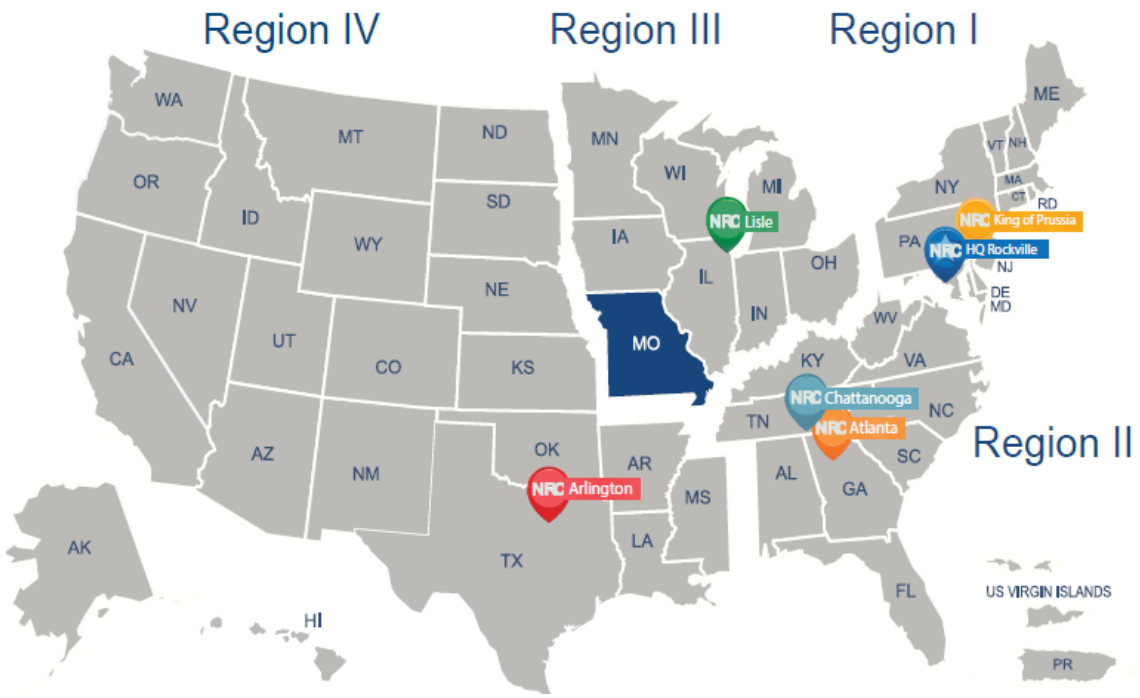
[5] IMC 1246, "Qualification Program for Nuclear Material Safety and Safeguards Programs" (October 26, 2011), establishes the ISFSI inspector qualifications "to ensure that NMSS program area staff has the necessary knowledge and skill to successfully implement the NMSS program."

III. BACKGROUND

A. NRC regions

The NRC has four regional offices that conduct inspections, enforcement, and emergency response programs for most licensees within their geographic areas. Each regional office oversees the nuclear power plants in its region—except for the Callaway plant in Missouri, which Region IV oversees. Figure 1 depicts the geographical separation of the NRC regions.

Figure 1: The NRC regions

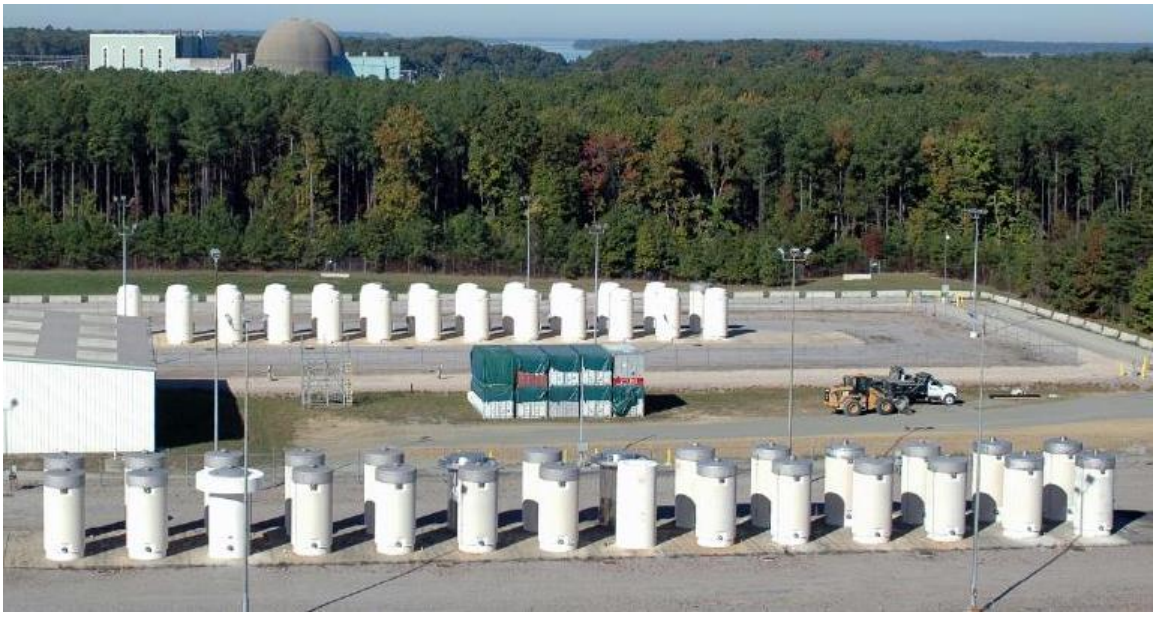


Source: NRC

There are 16 Region II plants with ISFSIs. Those plants are in Alabama, Florida, Georgia, North Carolina, South Carolina, Tennessee, and Virginia. All Region II ISFSIs are co-located with operating reactors, such as shown in Figure 2.

There are normally two NRC resident inspectors assigned to each nuclear power plant. Resident inspectors are reactor operations experts who work at a plant and live in the neighboring community. As part of their routine duties, these NRC employees inspect plant facilities and operations, and they provide the plant status and safety information to their respective NRC regional office. The resident inspectors act as the agency's on-the-ground eyes and ears.

Figure 2: Dry cask storage on an ISFSI pad at a nuclear power plant



Source: NRC

B. Role of independent spent fuel storage installations

After uranium fuel is used in a reactor for a period of time, the fuel becomes less efficient in splitting its atoms and producing heat to make electricity. When the fuel is removed from the reactor, it is referred to as spent nuclear fuel. Nuclear plant operators, called "licensees" because they operate plants under NRC-issued licenses, are required to manage the heat and radioactivity that remain in the spent fuel after being removed from the reactor.

Currently, most spent nuclear fuel is stored in specially designed pools at individual reactor sites around the country (see Figure 3). Spent fuel rods are stored under at least 20 feet of water, which provides adequate shielding from the radiation for anyone near the pool. These spent fuel pools, however, are reaching design storage capacity. Because there are no permanent disposal facilities in the United States for high-level nuclear waste, licensees have built dry cask

Figure 3: Fuel assembly removal from spent fuel pool

Source: NRC

storage facilities, called ISFSIs, that are designed and constructed for the interim storage of spent nuclear fuel. An ISFSI comprises a storage pad, storage containers, transfer equipment, and storage casks. Structures, systems, and components involved in ISFSIs are not safety-related but are classified as important to safety.[6]

During the initial spent fuel loading "campaign"—when a licensee loads the very first cask with spent fuel—the NRC inspects the risk-significant aspects of the campaign, including the implementation of the licensee's procedures, during a rehearsal before loading.[7] Thereafter, the licensee will conduct *repeat* spent fuel loading campaigns, which include activities such as removing the spent fuel from the spent fuel pool, preparing the cask for storage, moving the cask to the ISFSI, and performing any change analyses that are required by 10 C.F.R. 72.48.[8] NRC inspectors observe these repeat campaigns, but their activities are not typically as involved as during initial loading campaigns.

C. The NRC's oversight of ISFSIs

Regulatory framework

One of the main components of the NRC's regulatory process is overseeing licensee operations and facilities through inspections. The NRC conducts inspections to verify that licensees meet the requirements in NRC regulations and NRC-issued licenses. Inspectors follow guidance in the NRC's inspection manuals, which contain objectives, requirements, estimated inspection hours, and procedures for each type of inspection. If an inspection shows that a licensee is not complying with NRC requirements, the agency notifies the licensee of the non-compliance and may take other appropriate action to ensure any deficiencies are addressed. Conversely, when proper inspections determine that a licensee meets regulatory requirements, the NRC and the public are reasonably assured that the licensee is conducting operations in a manner that protects the public and the environment from undue nuclear risk.

NMSS is the NRC office responsible for coordinating the agency's oversight of ISFSIs. Under Manual Chapter-0124, which was in effect for most of the period covered by this Special Inquiry, the NMSS Director was authorized and directed to "take such actions as may be required to ensure technical efficiency and program consistency nationwide in the conduct of licensing, inspection, and regulatory activities for programs under NMSS cognizance that have been regionalized."[9]

The NRC's general policy for the inspection of repeat spent fuel loading campaigns is described in IMC 2690, which states that ISFSI inspections "shall be performed by qualified ISFSI inspectors."[10] The qualification requirements for ISFSI inspectors are

[6] See 10 C.F.R. 72.3 and IP 60855 (January 16, 2008) at page 3.
[7] "Campaign" is a term used to describe the process for loading spent fuel to dry cask storage in batches.
[8] Section 72.48, "Changes, test, and experiments," sets forth a process for licensees to use in determining whether they can make certain changes relevant to their ISFSIs without seeking specific NRC approval.
[9] Manual Chapter-0124 at Section 034.
[10] IMC 2690, Section 05.14.

stated in IMC 1246, Appendix B3, "Training Requirements and Qualification Journal for Independent Spent Fuel Storage Installation Inspectors." These requirements, managed by NMSS, establish the minimum training for a staff member to become fully qualified as an ISFSI inspector. IMC section 1246-03.05 does, however, allow for interim qualification of ISFSI inspectors, which it defines as "qualification of an NMSS staff member to independently conduct activities in specified areas before completion of all qualification journal requirements."

According to IMC section 1246-05, "Requirements," staff implementing programs under the authority of the NMSS, such as the IFSFI inspection program, must understand the facilities, equipment, processes, and activities of this program, as well as the criteria, techniques, and mechanics of implementing the program. The qualification process is intended to ensure inspectors possess sufficient knowledge and skill to perform oversight activities that are technically correct and in accordance with NRC regulations, policies, and procedures.

In addition, IMC section 1246-05.01, "Training and Qualification Requirements," states that staff assigned to perform inspections, technical reviews, or project management in the NMSS program area must successfully complete the applicable requirements of the relevant qualification program and the appropriate qualification journal. This IMC further states:

- 1246-04.04—A regional division director approves the use of and accepts the justification for using alternate methods of meeting qualification program requirements; and,
- 1246-05.05—Staff who have not completed all requirements for final certification may obtain interim qualification to independently conduct activities in specified areas for which prescribed training has been completed.

Prior to January 1, 2021, the NRC had two similar inspection procedures (IPs) for operating ISFSIs: IP 60855, "Operation of an Independent Spent Fuel Storage Installation" (January 16, 2008), and IP 60855.1, "Operation of an Independent Spent Fuel Storage Installation at Operating Plants" (September 5, 2006). Regions I, III, and IV used IP 60855 and IP 60855.1, and Region II primarily used IP 60855.1.

Both IPs were similar, with only minor differences in content.[11] For example, both required direct observation and independent evaluation—ranging from 100 to 136 hours (IP 60855) or 100 to 134 hours (IP 60855.1), as identified in the inspection procedure's Inspection Resources section—to determine whether a licensee was operating an ISFSI

[11] IP 60855.1 was initially developed in 2002 in connection with IMC 2515, Appendix C, "Special and Infrequently Performed Inspections." As of January 1, 2021, the NRC had combined IPs 60855 and 60855.1 in a revised IP 60855, dated November 25, 2020.

safely and according to approved procedures.[12] Examples of required actions listed in IP 60855 included:

- Verifying, by direct observation of selected activities and independent evaluation, that the licensee had performed either loading or unloading safely and according to approved procedures; and,
- Verifying, by direct observations or review of selected records, that the licensee had identified each fuel assembly placed in the ISFSI, recorded the parameters and characteristics of each fuel assembly, and maintained a record of each fuel assembly as a controlled document.

The regions may also issue their own instructions. For example, prior to 2021, Region II had Regional Office Instruction No. 2294 (Revision 3), "Independent Spent Fuel Storage Installation Inspection Program" (ROI No. 2294), which directed ISFSI-qualified Region II resident inspectors to use IP 60855.1 rather than IP 60855 when conducting ISFSI inspections. An NRC Headquarters SES official told the OIG that the "regions have a suite of regional office instructions or office procedures that they've developed to further implement [NRC] program requirements." The official further stated that these instructions lay out specific procedures for implementing various provisions in the Inspection Manual Chapters.

ISFSI program enhancement

The NRC chartered an ISFSI Inspection Program Enhancement Initiative Team in June 2019.[13] This team consisted of representatives from all four regions, NMSS, and the Office of Nuclear Reactor Regulation (NRR). The team's primary objective was to evaluate and enhance the NRC's existing ISFSI inspection program by developing a clearer, risk-informed, comprehensive, and consistent approach to ISFSI inspections across the NRC's regions. The team was to incorporate best practices learned from implementing the current program and evaluate stakeholder recommendations to enhance and improve the NRC's oversight of ISFSIs.

The team used probabilistic risk analyses, byproduct material radiation exposure studies, subject matter expertise, operating experience, and lessons learned from 30 years of inspection history to inform recommended revisions to the ISFSI inspection program.

In a report dated October 2, 2019, the team concluded that the existing policies for the ISFSI inspection program were effective.[14] At the same time, the team made five

[12] IMC 0040, "Preparing, Revising, and Issuing Documents for the NRC Inspection Manual," Section 08.02.e explains that the Resource Estimate section of each inspection procedure provides "an estimate of the average time needed to complete the inspection for broad resource planning and is not intended as a measure for judging the inspector's or the region's performance." This section further states that "[a]ctual inspections may require substantially more or less time, depending on the individual circumstances."
[13] Project Working Guidance—Independent Spent Fuel Storage Installation Inspection Program Enhancement (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19155A273). The team concluded its work in March 2020.
[14] Result of the Assessment of the Independent Spent Fuel Storage Installation Inspection Program (ADAMS Accession No. ML19277G875).

recommendations to enhance the program through additional risk-informed inspection activities and revised qualification and training requirements for ISFSI inspectors. Under the team's recommendations, most ISFSI inspection standards would be retained with minimal adjustment in the level of effort or resource estimate. The team also recommended revising IP 60855 and deleting IP 60855.1, with the revised IP 60855 establishing the standard requirements for repeat spent fuel loading campaign inspections.

Among its recommendations, the team concluded that ISFSI inspectors should be qualified using the formal qualification process in IMC 1246, and it recommended that the qualification program be supplemented with the new cross-qualification program for IMC 1245, "Qualification Program for Reactor Inspectors" (January 13, 2016). Specifically, the team stated, "Inspections of any ISFSIs would be required to be performed by staff that have completed the ISFSI qualification program, which includes those partial qualified inspectors qualified under the cross-qualification program…." The NRC accepted the recommendation on March 19, 2020, and implemented the revised ISFSI inspection program on January 1, 2021.[15]

[15] Final Decision on Independent Spent Fuel Storage Installation Inspection Program Enhancement Team (ADAMS Accession No. ML20079E064).

IV. DETAILS

Finding: Region II's past inspection practice resulted in missed opportunities to identify ISFSI violations

Through this Special Inquiry, the OIG determined that Region II's inspections of repeat loading campaigns from 2012 through 2020 deviated from NRC policies in that (1) resident inspectors did not obtain ISFSI qualifications before inspecting ISFSIs, and (2) Region II likely did not fully meet ISFSI inspection requirements based on the actual number of inspection hours charged. Fully qualified ISFSI inspectors began inspecting Region II ISFSIs in 2021, and since then, those inspectors have found multiple ISFSI violations that might have been detected earlier; however, there are still a significant number of loaded casks that have not been properly inspected.

A. Inspectors did not obtain ISFSI qualifications before inspecting ISFSIs

Based on the evidence gathered during this Special Inquiry, the OIG identified the following areas of concern related to Region II's practice of using resident inspectors who were not ISFSI-qualified to inspect repeat loading campaigns from 2012 through 2020.

1. Deviation from policy

Soon after the OIG issued its 2011 audit report, Region II began taking two actions to align its inspections with agencywide ISFSI inspection policies:

- On January 16, 2013, Region II revised its Regional Office Instruction 2294, "Independent Spent Fuel Storage Installation Inspection Program," to add that, "The resident inspectors, qualified in the ISFSI area to be inspected, perform ISFSI operational inspections to verify licensee activities, processes, and programs during repeat spent fuel loading campaigns using IP 60855.1."
- In 2013, Region II developed a draft template letter, "Recommendation for interim/partial qualification of an inspector as an operational ISFSI inspector," that justified accepting previous experience and training to meet program requirements. This letter was to be approved by the Division Director and recorded in the individual's training record.

During this Special Inquiry, the OIG determined that Region II failed to fully implement either of these actions. Specifically, Region II did not ensure its managers and staff complied with the language added to Regional Office Instruction 2294 pertaining to resident inspector qualification. Regarding the draft template letter, the OIG

determined that Region II neither finalized the letter nor used the draft version of the letter to document inspector qualifications.

Region II's failure to fully implement these actions appears to have contributed to its deviations from NRC policy regarding the qualifications of ISFSI inspectors. For example, an NRC principal acknowledged that while Region II used an ISFSI-qualified inspector for the region's initial spent fuel loading campaigns,[16] the resident inspectors who performed inspections for repeat campaigns were *not* ISFSI qualified. Further, a Region II SES official who has overseen both the resident inspectors and the ISFSI qualification processes since 2015 stated that he did not recall signing any resident inspectors' interim ISFSI qualification documents during his tenure. All the Region II resident inspectors the OIG interviewed who conducted ISFSI inspections from 2012 through 2020 stated they were not ISFSI qualified.

2. Region II's approach was not approved

Neither the NMSS nor the Office of the Executive Director for Operations (OEDO) approved Region II's use of non-qualified ISFSI inspectors on repeat spent fuel loading campaigns. In addition, the OIG interviewed several NRC Headquarters SES officials who stated they were unaware of any exemption request from Region II to deviate from policy or that the resident inspectors were not ISFSI qualified.

One NRC Headquarters SES official believed Region II resident inspectors were "interim qualified" in the ISFSI areas they had inspected. The official further stated that the expectation was that a resident inspector performing inspections had a branch chief or higher-level official first approving the inspector's interim qualifications.

Another NRC Headquarters SES official stated that it is not acceptable to have "unqualified [ISFSI] inspectors" performing inspections, and Region II should have "vetted" an alternate form of qualification with the program office or the OEDO. The EDO also confirmed that documented approval from executive management and the program office is necessary to deviate from NRC policy. Furthermore, the EDO stated, "we know that every good policy is not going to cover every eventuality, so it needs to have the process for exception, but then the exception has to have guardrails."

3. Missed opportunities to restore policy adherence

From 2012 through 2020, five NRC SES officials (two now retired) were in management positions with the authority to align Region II's approach to ISFSI inspections with agency policy, but they did not do so. None of the current officials could explain why Region II did not implement its interim/partial ISFSI qualification process.

Region II SES officials acknowledged they knew Region II's approach did not align with NRC policies. However, they believed Region II met the intent of those policies. An NRC SES official who previously worked in Region II acknowledged knowing Region II's

[16] This inspector was Region II's only ISFSI-qualified inspector at the time.

approach differed from the other regions but thought the region was nonetheless aligned with agencywide policy. The official stated, "Had I known [residents were not ISFSI qualified]…I certainly would have pushed further and gotten us [Region II] back in line with policy because I think it's very important that we follow policy and procedures."

4. Appearance of inadequate oversight due to deviations from NRC policy

Region II's approach to ISFSI inspections gave the appearance of inadequate ISFSI oversight. Consistent with IMC Section 1246-05, NRC staff responsible for implementing the ISFSI oversight program must understand ISFSI facilities, equipment, processes, and activities, as well as how to implement the agency's program. This section states, "the ISFSI inspector qualification process is intended to provide staff with sufficient information to perform program activities that are technically correct and in accordance with NRC regulations, policies, and procedures."

Several NRC principals stated that there is a difference in technical knowledge and experience required to inspect operating reactors for compliance under 10 C.F.R. Part 50 and ISFSIs co-located at those reactors under 10 C.F.R. Part 72; being qualified for one part does not necessarily ensure an inspector is ready to conduct inspections under the other. For example, qualified ISFSI inspectors require knowledge of the relationship among the plant license, the Certificate of Compliance (CoC), the final safety evaluation report (FSAR), the CoC technical specifications, and changes under 10 C.F.R. Part 72, Subpart G and 10 C.F.R. Part 72.48.

Furthermore, some of Region II's resident inspectors expressed reservations about performing their first few ISFSI inspections, primarily due to lack of knowledge. One resident inspector stated that the inspection procedure (IP 60855.1) was "high level" and not detailed enough to guide inspectors without supplementary training and further research to ensure thorough inspections. Another resident inspector described the ISFSI inspection experience as "a steep learning curve." Two resident inspectors felt proficient enough to perform ISFSI inspections after having completed a few ISFSI inspections.

Some NRC principals stated that NRC procedures allot a high number of hours to ISFSI inspections because the inspections must be "done right from the start." These principals explained that the spent fuel could be on the pad for 20 to 60 years, and the NRC must ensure future "retrievability" of casks for transportation to long-term storage.

NRC Headquarters SES officials interviewed for this Special Inquiry stated that consistency and following policy is important. One official stated, "It's very important that we follow policy and procedures." Another official stated, "the regional administrators are responsible for ensuring that the inspections programs are carried out in the regions, so that's where I believe the accountability starts." This official added, "Every year, [the regions] have to certify that the inspection program has been completed, and they do that by memo to the program office…which gives the public the

confidence that the NRC is performing its intended safety functions and security functions."

The EDO stated that "inspectors being sent into the field without the appropriate training and qualifications does not meet my expectations, and [an] implementing office deciding not to implement the program is not consistent with my expectations." The EDO further stated that:

- Proper inspector qualifications are important for the NRC to produce a quality product and for external stakeholders to continue to have confidence in the NRC;
- Region II should have been consistent with the other regions because the NRC regulates licensees that may have plants in multiple regions, and licensees would expect consistency in how each plant is inspected;
- The inspector qualifications are "fundamental" and "not a new topic at the NRC"; and,
- A region not following the IMC "is disconcerting" because there is a process to change the IMCs by engaging with the program office.

B. Region II likely did not fully meet ISFSI inspection requirements based on the inspection hours expended

During this Special Inquiry, the OIG identified additional evidence that appears to show Region II did not fully meet inspection requirements for repeat ISFSI loading campaigns from 2012 through 2020.

To support the extensive inspection requirements, IP 60855.1 included an inspection resource estimate for repeat loading of 100 hours (see Figure 4).

Figure 4: Hours resourced

60855.1-04 INSPECTION RESOURCES

Starting in FY 2004 (to account for NRR funding), this IP should be used in time reporting IP 60855 inspections at operating plants. Estimated hours for the above prioritized sections are:

Initial Inspection New ISFSI, General Licensee	Initial Inspection New ISFSI, Site Specific Licensee	Repeat Loadings
134	134	100

Source: Excerpt from IP 60855.1, dated September 5, 2006 (the IP was subsequently revised, most recently on May 16, 2019, but with no change to these estimates)

Examples of inspection requirements to be performed at operating plants include (also see Figure 5):

- The inspector must review changes made to the programs and procedures in 13 program areas;
- The inspector must verify by direct observation selected activities and independent evaluations; and,
- The inspector must verify by "direct observation or review of select records that the licensee has identified each fuel assembly placed in the ISFSI, has recorded the parameters and the characteristics of each fuel assembly and has maintained a record of each fuel assembly as a control document."

In 2021, Region II management directed its staff to assess internal inspection resources expended for repeat loading campaigns to determine if requirements of the inspection procedure and the Regional Office Instructions were met. The results of this assessment were reported in an internal document that included the actual inspection hours charged per plant for 2018, 2019, and 2020. This assessment's key findings included that actual inspection hours charged for cask loading campaigns were far fewer than those identified in the procedures, and that cask design changes [10 C.F.R. 72.48] is an inspection area that appeared to "need more attention." Furthermore, the assessment confirmed that, prior to 2021, inspections covered only one or "possibly" multiple focus areas, whereas inspections since 2021 have covered all five focus areas: welding, cranes, radiation protection, quality assurance/quality control, and fuel selection.

Figure 5: Inspection requirements

02.02: Review changes made to the programs and procedures listed below since the last inspection (they may have been reviewed last in Section 02.06 of IP 60854.1) to verify that changes made were consistent with the license or Certificate of Compliance (CoC) and did not reduce the effectiveness of the program. Verify that these procedures still fulfill the commitments and requirements specified in the Safety Analysis Report (SAR), Safety Evaluation Report (SER), CoC, 10 CFR Part 72, the site-specific license and TS as applicable, any related 10 CFR 50.59 and 72.48 evaluations, and 10 CFR 72.212(b) evaluations for general licensed independent spent fuel storage installations (ISFSIs).

a. Plant Operations
b. Radwaste Storage and Handling
c. Control of Heavy Loads
d. Radiation Protection
e. Security and Safeguards
f. Emergency Preparedness
g. Maintenance
h. Surveillance
i. Fire Protection
j. Training
k. Environmental Monitoring
l. QA Activities
m. Administrative Procedures

02.04: Verify by direct observation of selected activities and independent evaluations, that the licensee has performed either loading or unloading, as applicable, in a safe manner and in compliance with approved procedures.

02.05: Verify by direct observation or review of select records that the licensee has identified each fuel assembly placed in the ISFSI, as recorded the parameters and the characteristics of each fuel assembly and has maintained a record of each fuel assembly as a control document.

Source: Excerpt from IP 60855.1, dated September 5, 2006

In addition, NRC internal data reviewed by the OIG appear to show that Region II did not fully meet ISFSI inspection requirements in 2018 and 2019 due to the limited inspection hours per repeat loading campaign. As shown in Figure 6, Region II resident inspectors charged an average of 15 and 20 percent, respectively, of the standard resourced 100-hour estimate for 2018 and 2019.[17]

Figure 6: Region II ISFSI inspection hours for repeat loading campaigns

	2018	2019
Region II inspection hours charged to IP 60855.1	231	273
Spent Fuel Loading Campaigns at Region II plants	14	12
Percentage of inspection hours compared to estimated 100 hours per campaign resourced in IP 60855.1	15%	20%

Source: OIG generated from Region II assessment

Region II inspectors confirmed that the hours they spent inspecting repeat loading campaigns were far fewer than those estimated in IP 60855.1, and some stated that, in their view, inspection requirements were not fully met. A Region II principal stated that prior to January 2021, ISFSI inspections did not meet the inspection procedure requirements and inspections "were purely a walkdown of the pad" during the spent fuel loading campaigns. Another NRC principal involved in two repeat loading campaign inspections stated that he spent far fewer than the 100 hours referenced in the inspection procedure and "did not feel [he] had enough time to adequately conduct the quality of inspection required by the IP" due to his additional oversight responsibilities. This principal explained further that, during one of the ISFSI inspections, he was the single resident inspector at the plant and could not dedicate the time required to adequately perform the ISFSI inspection because he also had operating reactor inspection duties in the plant.

Furthermore, a principal in another NRC region stated that although ISFSI inspections are planned for 100 hours at each site, actual inspections usually take longer than that, with 80 hours typically spent on direct inspection (observing licensee activities). For example, the principal stated that "the major steps [of a loading campaign] include: removing the fuel bundle from the spent fuel pool, loading it in the canister or cask, welding/sealing the cap, placing the canister in the 'overpack,' transporting the overpack to the ISFSI pad, and installing it on the pad." The principal added, "All of these steps require direct inspection as well as review of calculations and documents for crane loads, quality of welding, criticality, radiation, etc."

When presented with a detailed breakdown of the hours charged for Region II's repeat loading inspections in 2018 and 2019, NRC Headquarters SES officials stated that those hours were not consistent with inspection procedure estimates, even though some variation in the inspection hours and some discrepancies would be expected (depending on factors such as the experience of the inspectors, credit for other inspections performed, and the nature of the activity). One official stated that if an inspector spent hours in the "single digits" on required inspection elements, that would be a significant

[17] The OIG did not include 2020 results because COVID-19 restrictions may have limited inspection activities.

variation.[18] Furthermore, the EDO stated that it did not seem like all the inspection requirements could have been accomplished when the NRC's inspection hours were "68 to 94 percent off—all on the low side" of the inspection procedure standard.

C. Qualified ISFSI inspectors found multiple ISFSI violations that might have been detected earlier

The OIG identified evidence showing that, since 2021, qualified ISFSI inspectors have found multiple ISFSI violations that might have been detected earlier.

On January 1, 2021, Region II corrected its ISFSI policy deviations and began implementing agencywide ISFSI policies. Between 2021 and 2022, there were 16 repeat spent fuel loading campaign inspections at Region II plants. Because Region II did not have an inspector in the ISFSI qualification process until 2022, four NRC qualified ISFSI inspectors from NMSS and one Region I qualified ISFSI inspector supported most of the Region II repeat spent fuel loading inspections during 2021 and 2022.

During that time, the ISFSI-qualified inspectors issued 6 non-escalated violations and identified at least 12 minor violations or observations.[19] An NRC principal stated that most of these violations existed prior to 2021, and that classifying these violations as pre-existing conditions was appropriate. See Figure 7 for examples of these minor violations or observations and Figure 8 for a summary of the six violations reported in NRC inspection reports.

Regarding the 12 minor violations or observations, an NRC principal stated the licensee created the "CR" (corrective action program report) to correct these deficiencies.[20] The principal added that, "a couple" were dispositioned as minors "because they are worth the effort of verifying that they were, indeed, violations versus suspect items that needed to be addressed." For example, a concrete pad at a Region II plant did not have "controls in place to validate that the compressive strength" met regulatory requirements.

While these recent NRC-identified violations do not reveal any immediate safety concern related to ISFSIs, they help demonstrate the value of the NRC using qualified inspectors who conduct their inspections consistent with approved NRC policies.

[18] Although Figure 6 shows only the total number of hours expended on repeat loading inspections in 2018 and 2019, Region II records showed that some inspections took fewer than 10 hours.
[19] Under section 2.3.1 of the NRC's Enforcement Policy,"[v]iolations of minor safety or security concern generally do not warrant enforcement action or documentation in inspection reports but must be corrected."
[20] A corrective action program is the system by which a utility finds and fixes problems at a nuclear plant. It includes a process for evaluating the safety significance of the problems, setting priorities in correcting the problems, and tracking them until they have been corrected. Ref: https://www.nrc.gov/reading-rm/basic-ref/glossary/corrective-action-program.html

Figure 7: Examples of Region II's minor violations or observations since 2021

Plants 1 and 2:

- Emergency actions for doses on ISFSI pads were not cask-specific
- Revision to emergency action levels

Plant 3:

- Staging/storage of cask components
- Two independent samples of boric acid
- Fuel debris in cask
- Inspection of steel structures
- Calibration of monitors

Source: OIG generated from an NRC internal document

Figure 8: Region II issued ISFSI violations in 2021 and 2022

	Violation	Description
1	Severity Level IV, NCV of 10 C.F.R. Part 72.162, "Test Control." (ADAMS Accession No. ML22308A179)	Failure to incorporate the design basis flow rates for the Forced Air Cooling units into ongoing testing procedures or other instructions to ensure the criteria in FSAR Section 4.2 for the fuel cladding and the various components of the transfer casks were satisfied.
2	Severity Level IV NCV of 10 C.F.R. 72.48(d)(1),6, "Changes, Tests, and Experiments." (ADAMS Accession No. ML22308A179)	Failure to provide the basis for the determination that the presence of boiling water in the dry shielded canister and transfer cask annulus does not require a CoC amendment.
3	Green finding and associated NCV of Title 10, C.F.R. Part 50, Appendix B, Criterion III, "Design Control." (ADAMS Accession No. ML22130A795)	Failure to develop appropriate acceptance criteria associated with the ISFSI haul path and the railway access hatch hoisting system and failed to verify the adequacy of the Auxiliary Building Crane testing program.
4	Green finding and associated NCV of Title 10, C.F.R. Part 50, Appendix B, Criterion III, "Design Control." (ADAMS Accession No. ML22132A308)	Failure to translate the maximum cask lift elevation and the locking of the trunnion axis into site procedures.
5	Green finding and associated NCV of 10 C.F.R. Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings." (ADAMS Accession No. ML21314A186)	When procedure 0-TI-561, "Underground Piping and Tanks Integrity Program," (a procedure described in the UFSAR) was changed, the licensee failed to perform the 10 C.F.R. 50.59 evaluation to determine whether the calculation "Evaluation of Cask Transporter Haul Route ([ ]Report [ ]-2022947 for the Dry Cask Storage Project)" continued to demonstrate that ISFSI operations will not compromise plant underground safe shutdown equipment.
6	Green finding and associated NCV of 10 C.F.R. Part 50, Appendix B, Criterion III, "Design Control." (ADAMS Accession No. ML21314A530)	Failure to translate applicable acceptance criteria for the spent fuel bridge crane into its plant maintenance procedure.

Source: Publicly available NRC inspection reports

D. A significant number of casks have not been properly inspected

The issues identified above show that a significant number of casks from repeat loading campaigns in Region II were not properly inspected between 2011 and 2020 either because:

- Inspectors were not IFSFI qualified, or,
- The hours spent on these inspections were significantly below what the inspection procedures estimated, at least for 2018 and 2019.

Information on the ISFSI casks loaded between 2011 and 2020 is readily available because licensees must register all ISFSI casks with the NRC in accordance with 10 C.F.R. 72.212(b)(2), and the registration information includes the applicable regions, plants, vendors, and model numbers. For example, the Region II internal assessment discussed in Section B of this report used this cask registry to determine the number of repeat loading campaigns completed by Region II licensees for 2018 and 2019 and the total number of casks loading during these campaigns (see Figure 9).

Figure 9: Licensee casks registered

	2018	2019	Total
Spent fuel loading campaigns at Region II plants	14	12	26
Casks Region II licensees moved to ISFSIs	59	64	123

Source: OIG generated from Region II assessment and NRC Cask Register Database

These 123 casks registered for 2018 and 2019 represent only a portion of the total casks loaded during repeat campaigns between 2011 and 2022. The total number of casks that were loaded in Region II without proper inspections—due to either inadequate qualifications on the part of the NRC inspectors, inadequate time spent on the inspections, or both—may therefore be significantly higher.

V. CONCLUSION

As noted previously, the OIG did not identify an immediate safety concern related to ISFSIs. The OIG did find, however, that Region II's deviation from NRC policies led to a significant number of casks being loaded during repeat loading campaigns, from 2012 through 2020, that did not receive—and still have not received—proper inspections to ensure that licensees met regulatory requirements for long-term storage and retrievability.

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