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**INSPECTION PROCEDURE 60854**

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**PREOPERATIONAL TESTING OF AN INDEPENDENT  
SPENT FUEL STORAGE INSTALLATION**

PROGRAM APPLICABILITY: 2515 and 2690

**60854-01 INSPECTION OBJECTIVE**

01.01 Determine by direct observation and independent evaluation whether:

- a. The licensee has developed, implemented, and evaluated preoperational testing activities to safely load spent fuel from the spent fuel pool (SFP) into a dry cask storage system (DCSS) and to transfer the loaded DCSS to the independent spent fuel storage installation (ISFSI).
- b. The licensee has developed, implemented, and evaluated a preoperational test program in order to safely retrieve spent fuel from an ISFSI and transfer it to either the SFP or a separate cask or canister.
- c. The licensee has fulfilled all test acceptance criteria and all identified deficiencies are resolved before receipt of fuel at the ISFSI; and
- d. The licensee has made changes to appropriate plant programs and procedures to support operation of the ISFSI.

01.02 Determine that the activities in Section 01.01 were accomplished in accordance with the commitments and requirements contained in the Safety Analysis Report (SAR), NRC's Safety Evaluation Report (SER), Certificate of Compliance (CoC) for the DCSS design being used under a general license or the license and technical specifications (TS) for an ISFSI operated under a specific license, the licensee's Quality Assurance (QA) program, and 10 CFR Part 72.

01.03 Independently assess, at the completion of the preoperational testing program, the licensee's readiness to load spent fuel into the ISFSI or retrieve spent fuel from the ISFSI.

**60854-02 INSPECTION REQUIREMENTS**

02.01 Before any on-site activity, review the SAR, SER, CoC, and, if applicable, the specific license and TS for the DCSS being used. The review should also include relevant Bulletins, Information Notices, or 10 CFR Part 21 reports issued related to ISFSI activities or the specific cask design. Prior to the on-site visit, ADAMS should be searched for any ISFSI related documents or reports that are relevant to the inspection or that identify issues

that should be added to the inspection. The ADAMS search should go back to the date of the last inspection.

As the following documents are typically available only at the site, at the start of the inspection, review any evaluations required by 10 CFR 72.212(b) for general licensed ISFSIs, and any 10 CFR 50.59 and 10 CFR 72.48 evaluations for both general and specific licensed ISFSIs, as these documents may contain assumptions regarding ISFSI operations. (NOTE: these evaluations may have been previously inspected through the use of Inspection Procedures 60856 and 60857)

02.02 Verify that the preoperational test procedures for DCSS loading, unloading, and transfer activities and their acceptance criteria meet the commitments and requirements specified in the DCSS SAR, 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 ISFSIs.

02.03 Verify that preoperational test procedures, for the activities listed below, have been prepared, reviewed, and initially approved in accordance with the licensee's administrative programs. Determine if the licensee has completed a verification and validation of the procedures. If the licensee has used multiple procedures, then verify that sufficient overlap has been maintained to ensure all required critical activities, such as those listed below, will be performed.

a. For transferring spent fuel from the SFP to the ISFSI:

1. Moving the empty cask or canister into the SFP area.
2. Placing the cask or canister in the SFP.
3. Verification of selected fuel and movement of fuel from SFP into the cask or canister.
4. Documenting the parameters and characteristics of spent fuel placed in the cask or canister per the license or CoC.
5. Lifting the cask or canister from the SFP.
6. Sealing the cask or canister.
7. Evacuating water from the cask or canister and vacuum drying.
8. Gas backfilling the cask or canister and decontaminating.
9. Transferring the loaded cask or canister to the transport vehicle.
10. Transporting the cask or canister to the ISFSI.
11. Placing the cask or canister in the ISFSI.

b. For retrieving spent fuel from a loaded DCSS in the ISFSI and returning it to the SFP:

1. Retrieving of the cask or canister from the ISFSI.
2. Transporting the cask or canister from the ISFSI to the reactor or fuel building.
3. Sampling the cover gas for indications of fuel damage such as radioactivity or air inleakage, and directing operator response if the sample indicates fuel damage.
4. Venting of the cover gas and backfilling of the cask or canister with water.
5. Unsealing the cask or canister for access.
6. Transferring the cask or canister to the SFP.
7. Transporting the fuel from the cask or canister to the SFP.
8. Removing the cask or canister from the SFP and decontaminating.
9. Storing or disposing of the cask or canister.

- c. For inspection guidance on retrieving spent fuel from a loaded DCSS in the ISFSI and performing a dry transfer to a different DCSS component, contact Spent Fuel Project Office (NMSS/SFPO) for assistance.

02.04 Verify, through interviews and reviews of selected records, that licensee personnel conducting preoperational test activities have a clear understanding of their duties and responsibilities, and that:

- a. Personnel have been trained and certified per the licensee's approved training program.
- b. A pre-job briefing has been performed for all affected staff.
- c. Oversight and command and control responsibilities have been clearly established, including notification requirements.
- d. Specific radiological hazards are identified and controls implemented.

02.05 Verify that equipment used during preoperational test activities has been tested and/or evaluated for its impact on plant structures, systems and components before performance of the preoperational tests.

02.06 Determine by review of selected licensee procedures, that responsibilities for specific activities relating to the ISFSI (i.e., design, component fabrication, construction, preoperational testing, operations, maintenance, and surveillance testing) have been defined and the licensee has integrated responsibilities for these activities into the appropriate plant programs listed below. Verify that these procedures fulfill the commitments and requirements specified in the SAR, 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 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

02.07 Evaluate the effectiveness of the licensee's management oversight and QA assessments of preoperational testing activities.

02.08 Evaluate the effectiveness of the licensee's plans and preparations for controlling radiological activities, by reviewing documents and interviewing individuals. Evaluate the effectiveness of radiological controls and monitoring and the effectiveness of security controls during preoperational testing.

02.09 If the procedures used by the licensee during the dry run have not received final approval yet, then re-perform the reviews described in Section 02.03 after the licensee has issued the procedures for use. Similarly, prior to ISFSI operation, ensure that any plant programs and procedures reviewed in Section 02.06 that were not yet finalized have been, any outstanding issues related to them have been resolved, and the programs and procedures have received the appropriate reviews and approval.

02.10 By direct observation and evaluation of selected activities, such as those listed in Section 02.03.a, independently assess whether the licensee has adequately demonstrated its readiness to safely transfer spent fuel from the SFP to the ISFSI.

02.11 By direct observation and evaluation of selected activities, such as those listed in Section 02.03.b, independently assess whether the licensee has adequately demonstrated its readiness to safely retrieve spent fuel from the ISFSI and transfer it to the SFP or to another DCSS component.

## 60854-03 INSPECTION GUIDANCE

### General Guidance

For the purposes of this procedure, the term "licensee" may refer to a specific license holder (10 CFR 72.16) or a reactor licensee using a general license (10 CFR 72.210).

Requirements and commitments related to preoperational testing may be found in the various licensing basis documents such as the SAR, SER, CoC, and, if applicable, the specific license and TS for the DCSS being used. Additional requirements and commitments may also be located in evaluations required by 10 CFR 72.212(b) for general licensed ISFSIs, and in any 10 CFR 50.59 and 10 CFR 72.48 evaluations for both general and specific licensed ISFSIs. In the event that preoperational test methods and/or acceptance criteria do not coincide with those specified in these documents, the inspectors are encouraged to contact NMSS/SFPO in order to obtain technical assistance. The inspector should directly observe any dry runs required by the specific license or CoC. While it is preferable for the dry run to replicate the actual evolution, the use of mockups and overlapping procedures is acceptable. The dry run should accomplish the following overall goals:

- a. Demonstrate the functionality of all equipment.
- b. Test and refine the procedures used for loading and unloading activities.
- c. Train and rehearse licensee personnel before actual movement of spent fuel.

If the licensee intends to use a different model or type of DCSS, for which a preoperational test program has not been completed, then applicable portions of IP 60855 and this procedure may be revisited.

### Specific Guidance

03.01 SARs and SERs describing commitments regarding preoperational testing, have been written for each type of approved DCSS. DCSS designs vary widely and care must be taken to review the correct documentation. Copies may be obtained from the Division of Reactor Safety or NMSS/SFPO. In some cases, requirements and commitments for preoperational testing may be located in Section 9 of the SAR. While the SER can document or clarify commitments made by the licensee or vendor, it does not serve as an independent basis for enforcement actions.

03.02 If possible, review the licensee's approved preoperational test procedures for DCSS loading, unloading, and transfer activities before conducting the on-site inspection. Although test criteria are discussed in the DCSS SAR, SER, CoC, and, if applicable, the specific license and TS, there may be differences between the licensee's test procedure and the test criteria because of different interpretations of construction Code requirements. Such issues should be brought to the attention of the NRR PM and NMSS/SFPO as soon as they are identified, for timely resolution.

03.03 A licensee may use the preoperational test program to validate through trial use the proposed operating procedures. Consequently, the procedures may not have received a final approval before the inspector's review. In that case, the inspector should ensure that the licensee has performed an initial review, which may include the plant operations review committee (or similar entity), and that performance of these "draft" procedures is subsumed under the overall ISFSI preoperational testing process. However, this overall process and associated documents should have been reviewed and approved by the licensee's administrative processes. The list of activities contained in Section 02.03 should be viewed as typical, but not all inclusive. Further, not all tasks are equally significant; for example, activities that affect containment boundaries, seal integrity, or long-term heat removal capabilities have greater potential safety impact and warrant a higher level of attention by the inspector.

Responsibilities should be clearly defined. Instructions should be provided if licensee personnel cannot perform the steps as written and stop-work criteria and contingency plans should be established to place the DCSS in a safe configuration. Determine if the licensee has established guidelines for how long a cask or canister may remain suspended in mid-air from a crane and has identified any required compensatory measures. Dry runs of cask or canister movements should simulate the maximum expected weight, including water, as closely as possible. Hold and inspection points should be clearly identified. Procedures should also state whom to notify if an abnormal or emergency condition arises and what criteria must be met to resume activity. Alternatively, the licensee's problem identification and corrective action systems may be referenced for those actions. Particular attention should be paid to procedures for venting and sampling loaded DCSSs, recognizing and responding to damaged fuel, and refilling the loaded cask or canister with water, as problems have been observed in these areas. Problem areas can include radiation exposure when sampling the container or steam flashing and pressure control difficulties while backfilling the cask or canister with water. Guidance for operator actions and radiological controls in response to damaged fuel should be included. As a minimum, the unloading procedure should contain steps to identify the presence of fuel damage in excess of that assumed by the procedure and direct initial operator response to this event. Supplemental guidance on inspecting licensee procedures can be found in IP 42700.

When performing Section 02.01, make note of any operational commitments contained in documents (e.g., the SAR, SER, CoC, and, if applicable, the specific license and TS for the DCSS being used and any 10 CFR 50.59, 10 CFR 72.48 and 10 CFR 72.212(b) evaluations) that should be captured in the ISFSI operating procedures and verify that they have been incorporated in the applicable procedures.

03.04 Inspectors may choose to review training records, training curricula, and available training aids to support staff interviews. Workers should be able to readily discuss their responsibilities and demonstrate an understanding of the critical knowledge and skills required to perform their assigned tasks. Supplemental guidance on inspecting training can be found in IP 41500. For a specific license, additional requirements are contained in 10 CFR 72.192 and the cask CoC.

Pre-job briefings should be thorough and discuss hold and inspection points, expected radiological hazards and controls, and worker actions if an unexpected response is encountered during preoperational testing. Continuance of testing during shift turnovers should be addressed. Delineation of responsibilities should be clear to all licensee staff performing preoperational test activities.

03.05 Operation of an ISFSI, whether under a specific or general license, requires a licensee to assess the ISFSI's effects on all aspects of plant operations. This evaluation is performed under 10 CFR 50.59. Inspection of these safety evaluations may be done through a review of selected 10 CFR 50.59 and 72.48 evaluations. Inspection guidance

for inspecting 10 CFR 50.59 evaluations may be found in IP 71111.02 and in IP 60857 for 10 CFR 72.48 evaluations.

Special attention should be paid to testing and inspecting cranes and rigging and lifting equipment, to verify that they can support the anticipated loads, without compromising the licensing basis margins of safety and are compatible with the DCSS components. This should also include reviews of heavy load paths, crane single failure issues, and maximum DCSS weight versus crane capacity limits. Any impact on transient radiation sources (such as high integrity containers in the load path) should be evaluated by the licensee. See the references for supplemental information.

The inspectors should directly observe that sufficient space in the SFP and in laydown areas has been prepared and set aside to conduct both preoperational testing and the operational transfer and transport of DCSS components. Reinforcement of the roadway from the fuel or reactor buildings to the ISFSI site should also be considered.

03.06 Additional guidance for the review of licensee procedures may be found in IP 42700. Procedures should have been formally reviewed and approved consistent with the licensee's administrative programs, including any reviews required by the plant operations review committee (or similar entity). When performing Section 02.01, make note of any operational commitments contained in documents (e.g., the SAR, SER, CoC, and, if applicable, the specific license and TS for the DCSS being used and any 10 CFR 72.48 and 10 CFR 72.212(b) evaluations) that should be captured in the ISFSI operating procedures and verify that they have been incorporated in the applicable procedures.

The CoC or site-specific license and TS typically include requirements that the Zircaloy cladding of spent fuel loaded into the DCSS contain no known or suspected gross cladding failures. A licensee should establish written procedures to address this issue. These procedures should define the inspection process and specific acceptance criteria.

Supplemental guidance may also be found in the inspection procedures used for evaluating these program areas in the MC 2515 program. Supplemental guidance on the quality classification of DCSS components may be found in the references. Further questions should be referred to NMSS/SFPO for assistance.

- a. Procedures should include normal, abnormal, and emergency conditions. They may include guidance on contingency plans for placing the DCSS in a safe configuration during an emergency or abnormal condition.
- b. No specific guidance.
- c. For control of heavy loads, the program should be examined closely to determine whether the licensee has properly evaluated, through the use of 10 CFR 50.59, the impact of lifting loaded DCSSs against the operating reactor facility. Areas where problems have arisen include heavy load pathways, single-failure-proof cranes, and loaded casks or canisters exceeding crane capacity limits. Supplemental guidance may be found in the references.
- d. Requirements for radiation protection program activities may be found in 10 CFR 72.104, 72.106, 72.126, and 72.212, in addition to 10 CFR Part 20.
- e. Security and safeguards inspections are conducted under IP 81001
- f. No specific guidance.
- g. No specific guidance.
- h. Surveillance requirements may be found in the CoC or site-specific license and TS.
- i. The fire protection program should consider the impact of transient combustible loading on the ISFSI (e.g., fuel oil for multiple cranes).
- j. For training programs, a systems-based approach should be used that identifies required knowledge and skills, provides the training, and examines the individual to ensure he/she understands the training. For a site-specific license, additional

requirements are specified in 10 CFR 72.192. Supplemental guidance may also be found in IP 41500.

- k. No specific guidance.
- l. Supplemental guidance may be found in applicable MC 2515 IPs.
- m. No specific guidance.

03.07 Inspectors should review QA audit and surveillance plans and interview auditors to assess the QA department's plans for evaluating the preoperational testing. Hold points should be clearly marked in preoperational test procedures. Completed audits and surveillances should be reviewed after the testing to assess their depth and thoroughness. Inspectors may supplement these activities with reviews of completed audits of ISFSI construction and fabrication activities.

Corrective actions for identified deficiencies should be completed in a timely manner and dispositioned in accordance with the licensee's programs. Corrective actions should be resolved before the preoperational testing program is completed.

03.08 Verify that the licensee has implemented the site radiological protection program for activities related to dry cask storage. Special consideration should include contamination controls, minimizing workers time near the cask, use of temporary shielding, such as during welding, pre-job briefings, continuous coverage by RP personnel, and special considerations for neutron surveys and dosimetry. Verify that the licensee has adequately addressed the change in the neutron energy spectrum that will be encountered around the cask after the water has been drained and has provided workers with personnel dosimeters and alarming dosimeters that compensate for the higher neutron energy. During preoperational testing and dry runs the inspector should observe the implementation of RP activities and the licensee's readiness to deal with actual radiation hazards.

03.09 The intent of this section is not to re-perform procedure reviews accomplished by Sections 02.03 and 02.06, unless the licensee used the preoperational testing program as a means of validating "draft" operating procedures during performance of the dry run. In that case, the inspector should review the operating procedures after the licensee has incorporated any comments and improvements and approved the procedures for use. See also the guidance for Sections 03.03 and 03.06.

03.10 No specific guidance.

03.11 No specific guidance.

#### 60854-04 INSPECTION RESOURCES

Generally, to prepare for these inspections each inspector should spend approximately 16 hours for in-office review. Inspection activities will require approximately 40 hours, each, by three inspectors. Documentation is estimated to require 16 hours per inspector. It is expected that regional inspection personnel will perform this procedure, with assistance from NMSS and NRR staff, as requested. Actual budgeted resources for each inspection will vary as defined in the IIP developed for each site.

60854-05 REFERENCES

ANSI/N14.6-1993, "For Radioactive Materials - Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More."

NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," July 1980. Licensee implementation of this NUREG may vary and specific commitments to this guidance are covered by responses to NRC Generic Letters 80-113 and 85-11.

END