INSPECTION PROCEDURE 62801

MAINTENANCE AND SURVEILLANCE AT PERMANENTLY SHUTDOWN REACTORS

PROGRAM APPLICABILITY: 2561

SALP FUNCTIONAL AREA: N/A

62801-01 INSPECTION OBJECTIVE

01.01 To verify that maintenance and surveillance for structures, systems, and components (SSCs) are being conducted in a manner that results in the safe storage of spent fuel and proper operation of radiation monitoring and effluent control equipment at permanently shutdown reactors. To evaluate the effec-tiveness of the licensee in maintaining adequate material and structural integrity of SSCs important to safe decommissioning.

01.02 To ascertain whether the licensee has an effective maintenance program that implements the maintenance rule (10 CFR 50.65) relative to the safe storage, maintenance, and control of spent fuel.

62801-02 INSPECTION REQUIREMENTS

02.01 Verify by direct observation, conducting reviews, and interviewing licensee personnel that maintenance and surveillance are performed in accordance with regulatory requirements and result in the safe storage of spent fuel and reliable operation of radiation monitoring and effluent control equipment. This includes the proper implementation of technical specifications (TS) maintenance and surveillance requirements.

Perform an examination of planned or completed maintenance and surveillance activities to assess the maintenance and surveillance process from its inception to its completion.

a. Plant Walkthrough Inspections. The inspector should conduct a plant walkthrough inspection and assess the general material condition of SSCs associated with the safe storage of spent fuel, radiological effluent controls, and radiation protection. This inspection should include an assessment of lighting, electrical distribution, fire protection equipment,

housekeeping, and material condition in all areas of the plant with particular focus on SSCs described in the TSs, Post-Shutdown Decommissioning Activities Report (PSDAR), Final Safety Analysis Report (FSAR, or equivalent), and/or license termination plan (LTP).

b. Work Identification Process. Review licensee methods for capturing items which go into their maintenance system. Plant walkthroughs should be used to assess the deficiency-threshold required for an item to enter the work identification process.

c. Machinery History and Operating Logs. Review selected machinery history and operating logs to determine if any patterns exist which may indicate maintenance problems. Assess the effectiveness of preventative maintenance based on maintenance history and vendor documentation.

d. Maintenance Backlog. Review the current backlog and assess the age and prioritization of the items. Determine how often the licensee updates and reviews the backlog. Assess whether goals have been established for the completion of items and whether there is method to bring additional management attention and resources to bear on items which have been on the list for a long time. Determine whether the timeliness of corrective actions is commensurate with safety. Identify whether backlog items create operational work-a-rounds or system line-ups different than described in the PSDAR, FSAR, or LTP.

e. Work Prioritization System. Review the licensee's work prioritization system. Assess whether redundancy and the importance and function of equipment are taken into account. Determine whether other special factors (such as weather, staffing, and status of decommissioning), are considered by management in their work prioritization strategy.

f. Conduct of Maintenance and Surveillance. Select two or more maintenance and surveillance activities and verify that the following considerations were conducted:

   1. That the SSCs were properly released for maintenance or surveillance. This review includes an assessment of planning, scheduling, tagouts, and approvals.

   2. That the licensee adequately assessed the availability and operability of redundant TS systems, or systems credited in accident mitigation or offsite dose projections (as described in licensing basis documentation). The inspector should ascertain whether the licensee has assessed the impact of removing the particular SSC from service on the remaining SSCs and its effect on site-wide activities (such as systems shared between multiple units).

   3. That appropriate personnel safety, fire protection, and radiation safety considerations were established and implemented. This includes as-low-as-reasonably-achievable (ALARA) reviews, pre-job training and/or briefs, mock-up training, security, and housekeeping.

4. That adequate management oversight, quality assurance, or peer reviews were implemented to enhance the quality of maintenance or surveillance.

5. That the maintenance or surveillance was conducted in accordance with instructions appropriate to the circumstances. Elements indicative of adequate work instructions may include, in part: written instructions; references to vendor literature; precautions and prerequisites; quality control checks, such as QC inspection hold points and dual verification requirements; verification of measuring and test equipment (M & TE); and, control of special processes. Other considerations include cleanliness requirements; fire protection; security; housekeeping; lifted leads, jumper, and mechanical block controls; and, verification that replacement parts were equivalent or better than original specifications. This review should include the in-field verification that the maintenance or surveillance is being conducted as described in licensee procedures.

6. That the post-maintenance testing, calibration, and surveillance are adequate to verify operability of the SSC that was repaired, replaced, or maintained. This includes verification that personnel performing the restoration activities are properly trained and qualified, that procedural, TS, or other acceptance criteria were met prior to the declaration of operability.

7. That preventive maintenance contributes to SSC reliability, and was completed as scheduled by the licensee.

8. That the cause(s) of equipment failures are evaluated, if required, to ensure that the maintenance (whether its repair, replacement, or etc.) will maintain or enhance reliability.

g. Troubleshooting. Observe and evaluate "troubleshooting" activities, including the use of lifted leads and jumpers and/or changes to the configuration of the electrical circuit or mechanical system. Such changes could result in unreviewed or unanalyzed design changes, inoperability, or configurations differently than described in the FSAR. Verify that the system was removed from service for troubleshooting or that on-line troubleshooting was evaluated and approved. Verify that the activity was controlled with appropriate instructions, tagouts, and approvals. Verify that the system was properly returned to service.

02.02 Implementation of the Maintenance Rule (10 CFR 50.65). Review the licensee's program to implement the Maintenance Rule. For licensee's who have submitted the 10 CFR 50.82(a)(1) certifications, the Maintenance Rule applies to those SSC's

associated with the storage, control, and maintenance of spent fuel.

a. Monitoring, 50.65(a)(1). Verify that the licensee has implemented SSC monitoring as required by 10 CFR 50.65(a)(1). This program shall monitor the performance or condition of SSC's monitored under (a)(1) against established goals, in a manner sufficient to provide reasonable assurance that such SSC's are capable of fulfilling their intended functions. These goals (i.e., performance objectives) shall be commensurate with safety and, where practical, take into account industry-wide experience. The program shall require the implementation of appropriate corrective actions when the performance of an SSC does not meet established goals.

b. Preventive Maintenance Alternative, 50.65(a)(2). Paragraph (a)(2) of the maintenance rule allows the licensee to demonstrate that the performance or condition of an SSC can be effectively controlled through the performance of appropriate preventative maintenance, such that the SSC remains capable of performing its intended function. Or, the SSC could be inherently reliable and of low safety significance, therefore, preventive maintenance may not be required. For those SSCs that are within the scope of the rule, but are not monitored under paragraph (a)(1), verify that appropriate preventive maintenance is demonstrated through monitoring of paragraph (a)(2). Verify that the licensee has established appropriate performance criteria and monitoring to demonstrate that the performance or condition of the SSC is effectively controlled through the performance of preventive maintenance.

c. Periodic Evaluation, 50.65(a)(3). Verify that the licensee is periodically evaluating and assessing the performance of their SSCs, as required by 50.65(a)(3).

   1. Ascertain whether the licensee is evaluating performance and condition monitoring, associated goals/performance objectives, and preventive maintenance, taking into account industry-wide experience when practical, on a periodic basis.

   2. Verify that the licensee is adjusting/revising its program to ensure that the objective of preventing failures of SSCs through maintenance is appropriately balanced against the objective of minimizing unavailability due to out-of-service time caused by monitoring or preventive maintenance.

   3. The inspector should assess whether the licensee has assessed the impact of the plant equipment that is out of service and determined the overall effect on site activities or shared SSCs.

d. Scope of the Rule 50.65(b). Verify that the licensee has identified those SSCs associated with the storage, control, and maintenance of spent fuel, and that the licensee has

determined whether they are within scope of the Maintenance Rule.

62801-03 INSPECTION GUIDANCE

General Guidance

This inspection procedure resulted, in part, from long-term actions taken by the NRC in response to Bulletin 94-01, "Potential Fuel Pool Draindown Caused by Inadequate Maintenance Practices at Dresden Unit 1," and a determination by the NRC staff that NRC inspection of decommissioning power reactors provides additional assurance that licensed activities will not be adverse to public health and safety of the environment. A primary objective of this IP is to ensure that each licensee has implemented an adequate maintenance and surveillance program in accordance with regulatory requirements. Section 01.01 of this IP applies to all phases of decommissioning from the permanent cessation of reactor operations to license termination and site release. Section 02.02, applies as long as the licensee maintains a Part 50 license. Section 02.02 also applies to independent spent fuel storage facilities (ISFSIs) licensed under 10 CFR 72, Subpart K, "General License for Storage of Spent Fuel at Power Reactor Sites."

The inspector is not required to complete all the inspection requirements listed in this IP, nor is the inspector limited to those inspection requirements listed if safety concerns are identified. However, the objectives of this IP shall be met and performance of this inspection shall be commensurate with the NRC staff's assessment of licensee performance. The inspection should also focus on a periodic verification that the quality of maintenance and surveillance does not diminish as the licensee completes decommissioning.

Except where the licensee proposes an acceptable alternative method for complying with specific portions of the Maintenance Rule (10 CFR 50.65), the methods described in Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," should be used to evaluate the effectiveness of the licensee in implementing the requirements as stated in 50.65. This regulatory guide endorses NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," and provides methods acceptable to the NRC for complying with the requirements of the rule.

Specific Guidance

03.01

a. Plant walkthrough inspections will allow the inspector to determine the quality and effectiveness of the licensee at maintaining their power reactor site. The inspector should review the licensee documented housekeeping and material deficiency observations, assess the status of corrective actions, and evaluate trends and whether conditions exist

that are adverse to spent fuel storage or radiological safety. This review will also provide insight into the resources, and level of ownership applied to maintain the power reactor site in a manner commensurate with plant and personnel safety. A deterioration of the effectiveness of the maintenance program could be observed on a plant walkthrough. The inspector should be cognizant of decommissioning projects and be cognizant of propped open fire doors; stationing of fire watches and establishment of fire protection controls; overloading of temporary electrical power supplies and junction boxes; temporary scaffolding or engineered features for the structural support of walls, floors and ceiling; and, personnel access and egress routes for exigent situations. Further, the inspector should be knowledgeable of the descriptions of the site and SSCs as detailed in licensing basis documentation and evaluate whether the configuration of the plant reflects docketed descriptions.

b. The licensee work identification process should include mechanisms to provide confidence that degraded SSC conditions adverse to quality are identified and evaluated. Most licensees may assign a particular plant employee to a plant area or system who would be responsible for the identification of deficiencies and placing the particular item in the work identification process. Poor housekeeping, inoperable lighting, inoperable equipment and instrumentation, or inoperable fire protection equipment are signs of lack of ownership or ineffectiveness in the identification and/or resolution of conditions adverse to quality. Plant and contractor personnel should interviewed to ascertain whether they utilize the licensee's work identification process and have confidence that deficiencies will be corrected.

c. Machinery history and operating logs can indicate recurring problems, ineffective corrective maintenance, and the extent or lack of preventive maintenance. The licensee should be using surveillance data and trends to revise the scope or scheduling of preventive maintenance, spare parts availability, or other considerations that enhance reliability and availability of similar or redundant equipment.

d. The licensee system should incorporate periodic review of the backlog and include mechanism(s) to bring additional management attention and resources to items which remain on the maintenance list beyond their originally established resolution dates. Appropriate management approvals should be required to postpone or cancel scheduled maintenance; these decisions should be justified. If the inspector determines that operational work-a-rounds are long standing, they could potentially represent a de-facto modification, placing the facility outside its licensing basis.

e. The licensee's work prioritization system should incorporate the safety significance of the item and TS limiting

conditions for operation requirements. Time goals should be established for the completion of work activities.

f. The degree of inclusion of the elements described in paragraph 02.01f will vary with the significance and complexity of the maintenance or surveillance task. Not all elements need be included for simple tasks or tasks with low safety significance. The assessment of maintenance effectiveness could be based on the timely identification of deficient or degrading SSCs; successful determination of safety significance and priority; effective planning and scheduling; and, equivalent or increased SSC reliability upon completion of the activity. Surveillance effectiveness could be based on the minimization of out-of-service time, the ability of the instrument to remain operable between surveillances, and the identification of degrading performance prior to instrument inoperability.

The NRC staff has observed that there have been cases where a decommissioning licensee had decided to forego periodic preventive maintenance (such as pump and motor rebuilds) and run equipment to failure. This type of maintenance philosophy would more than likely be applied to SSCs that are not required for the safe storage of spent fuel, TS requirements, SSCs outside of the Maintenance Rule, or SSCs that are not required for accident mitigation or prevention. The inspector should ascertain whether this type of maintenance is utilized by the licensee and assess its effect on safe fuel storage or the conduct of safe decommissioning.

g. Licensees should have procedures for the conduct of troubleshooting. Although detailed step-by-step procedures may not be developed for a particular troubleshooting activity, a general procedure should or could be in-use which provides the appropriate administrative controls, precautions, and prerequisites. In addition, procedures should be appropriate to the circumstances. For example a plant operator or certified fuel handler checking and replacing a fuse would normally be considered trained and qualified to replace fuses, in systems under the operator's control, without a procedure or work order. However, the activity still needs to be properly controlled, in part, through the use of approvals, documentation, and appropriate post-troubleshooting verification. On the other hand, if the troubleshooting is intrusive, in that it: breaks a system pressure boundary; changes the electrical characteristics of a circuit (such as the installation of test equipment, recorders, or multimeters into non-test jack locations); defeats an alarm, indicator, or other system instrument; or, prevents, precludes, or challenges the operability or functionality of an SSC, additional work controls should be applied.

03.02 Implementation of the Maintenance Rule (10 CFR 50.65). The Maintenance Rule (10 CFR 50.65) is required to be implemented by all operating power reactor licensees and power reactor licensees that have submitted 10 CFR 50.82(a)(1) certifications.

Therefore, a primary objective this IP is to ascertain whether decommissioning SSCs, are effectively incorporated into the program and to periodically confirm that the licensee is effectively implementing the rule by evaluating maintenance monitoring during decommissioning. It is not expected that the inspector implementing this IP perform a baseline comprehensive inspection of the decommissioning licensee's Maintenance Rule program. Further, for a number of reactor plants, Maintenance Rule base-line inspections have been performed utilizing IP 62706, "Maintenance Rule." The inspector should brief the appropriate NRR or NMSS Project Manager, if programmatic problems are identified.

The inspector should independently review the licensee accident analysis as described in the FSAR, PSDAR, or licensee procedures to identify the SSCs that could be within scope. The inspector should then evaluate the licensee's determination for placing SSCs within or out of scope, based on the criteria described herein.

Regulatory Guide (RG) 1.160 and NUMARC 93-01 provide guidance on implementation of the Maintenance Rule. Inspection Procedure 62706, "Maintenance Rule," and IP 62707, "Maintenance Observation," for operating reactors can also be used as references. Appendix A of IP 62706 and EGM 96-01 and EGM 96-02 provides enforcement guidance for the assessment violations applicable to Maintenance Rule deficiencies. Any proposed violations shall be reviewed and concurred by the Quality Assurance and Maintenance Branch, NRR.

SSCs Within the Scope of the Maintenance Rule. SSCs include anything that could be called a structure, system, or component including walls, floors, roofs, tanks, sub-systems, sub-components, parts, pumps, valves, motors, pipes, hangers, snubbers, and anything else that meets the definition in 10 CFR 50.65. Other SSCs could include, but are not limited to: the SFP liner and cooling system, spent fuel racks, criticality control design features, radiation monitoring and radiological effluent instrumentation, and spent fuel lifting and handling equipment.

Similarly, SSCs associated with the maintenance of independent spent fuel storage facilities (ISFSIs) are required to be within scope, if the ISFSI is licensed pursuant to 10 CFR 72, Subpart K, "General License for Storage of Spent Fuel at Power Reactor Sites." Whereas maintenance would typically refer to SSCs associated with spent fuel pool water chemistry, biological, or environmental control, SSCs associated with ISFSIs could include, but are not limited to spent fuel: multi-assembly sealed baskets (MSB); MSB transfer casks; ventilated concrete storage containers; transportation casks and lifting equipment; ISFSI pad foundation; lifting equipment; and, MSB air purging and water level control systems.

SSCs That Are Credited for Accident Mitigation or Transients. Paragraph (b)(2)(i) of the Maintenance Rule states that SSCs used to mitigate accidents or transients or are used in emergency operating procedures (EOPs) are required to be included within the scope of the rule. For a plant undergoing decommissioning, EOPs may not be applicable or be significantly scaled back from that of an operating power reactor. Nonetheless, SSCs that mitigate the

consequences of a decommissioning accident (such as fuel drop, inadvertent criticality, zirconium fuel fire, etc.) or transient (such as high radiation levels caused by a loss of shielding) could include SSCs such as: walls credited for radiation attenuation, seismic qualification, or structural support; SFP water supplies and control systems credited for spent fuel temperature control and/or radiation protection; and, ventilation systems required to minimize radiation exposures on or off site. A decommissioning licensee may have implemented procedures that require operator response to spent fuel or SFP accidents or transients utilizing various plant SSCs to mitigate or preclude the situation; these SSCs would be considered within scope.

Other SSCs. There are other SSCs that may also be included in the licensee maintenance rule program because they may prevent other equipment from being damaged or contaminated in the event of an emergency, not because they are relied upon to mitigate an accident. An example of an SSC that might be included is a fire protection system capable of supplying a significant fraction of what is required to mitigate an accident. In this case, if the decommissioning licensee takes significant credit for a fire protection system water supply in their response to SFP accidents or transients, that systems would be within the scope of the rule. Additional guidance can be found in NUMARC 93-01.

SSCs Outside the Scope of the Maintenance Rule. Unless they meet the criteria described above, the following categories of SSCs are generally outside the scope of the maintenance rule: fire protection systems, seismic class II SSCs installed in proximity to seismic class I SSCs, security systems, and emergency facilities described in the licensee's emergency plan. Further guidance is provided in section 8.2.1.6 of NUMARC 93-01.

Safety Determination. The rule requires that goals be established commensurate with safety. Implementation of the rule in accordance with NUMARC 93-01 requires that a safety determination be performed for all SSCs within the scope of the rule. The safety determination would then be taken into account when setting goals and monitoring under (a)(1) and establishing performance criteria under (a)(2). The safety determination method would utilize the expert panel methodology and possibly the Delphi method as discussed in NUREG/CR-5424. Also, a licensee undergoing decommissioning may utilize probablistic risk assessment (PRA) information or Individual Plant Examination (IPE) insights in the determination of safety significance; however, the use of PRA information by decommissioning licensees for safety determinations is not be required. Refer to NUMARC 93-01 and Regulatory Guide 1.160 for additional details on the use of PRA information.

Determination of (a)(1) or (a)(2) Status. NUMARC 93-01 provides guidance that initially places all SSCs under paragraph (a)(2) and are only moved under paragraph (a)(1) if experience indicates that the performance or condition is not adequately controlled through preventive maintenance as evidence by the failure to meet a performance criterion or by experiencing repetitive maintenance preventible functional failures (see NUMARC 93-01, Appendix B, for a definition of maintenance preventible functional failure). A

decommissioning licensee may initially place any SSC under either paragraph, if appropriately justified; however, it is expected that the majority of decommissioning SSCs will be under (a)(1).

Monitoring of SSCs. The rule requires that decommissioning licensees monitor the performance of condition of SSCs in a manner sufficient to provide reasonable assurance the SSCs are capable of fulfilling their intended functions. It is intended that licensees be allowed considerable flexibility in the methods used to monitor SSC performance or condition. It is expected that most monitoring will be done at the plant, system, or train level rather than at the component level. In cases where a specific component has been identified as the cause of multiple system maintenance preventible failures, the licensee may elect to monitor at the component level. Parameters monitored at the system or train level could include temperature, pressure, flow velocity, voltage, current, or vibration, as well as, availability and/or reliability. Train level monitoring provides a method of addressing degraded performance of a single train even though the system function is still available. For low safety significant SSCs, monitoring at the availability/reliability level may be sufficient.

Similar to systems and components, the monitoring of structures should provide sufficient assurance that performance and condition will not degrade below established standards. Licensees may take credit for or build upon existing monitoring activities already in place for structures. These activities could include: leak detection surveillance; visual inspections; crack propagation monitoring; or, operator or engineering staff structural integrity assessments. For structures that are not amenable to monitoring, engineering evaluations should be performed to establish condition monitoring criteria. These evaluations could assess, for example, design safety margins, corrosion susceptibility, or environmental conditions. All monitoring activities should have specific quantitative and/or qualitative criteria for monitoring.

For decommissioning licensees, licensees shall monitor the performance or condition of all SSCs associated with the storage, control, and maintenance of spent fuel in a safe condition. For example, a licensee could establish SFP leakage monitoring; measure and trend concrete crack or spalling propagation; SFP heat exchanger performance; SFP pump capacity, vibration, or differential pressure testing; ventilation capacity and differential pressure testing; and radiation monitoring surveillance testing. For fuel handling equipment, a licensee monitoring program could include visual and capacity testing, freedom of motion, or limit switch testing. A licensee should assess whether their fuel handling equipment, grapple, jib crane, polar crane, and spent fuel maintenance inspection stand are required to be monitored under (a)(1). For criticality control monitoring, a licensee could survey SFP boron concentration, SFP temperature, or spent fuel rack or boraflex integrity. For monitoring of the SFP liner integrity, a licensee could analytically assess the SFP evaporation rate, survey chemistry control limits, or perform ground water monitoring. For monitoring of ISFSI SSCs, monitoring could include, but is not limited to: monitoring of radiation levels; visual inspections of material

condition; surveillance testing of lifting and handling equipment capacity, limit switches, and freedom of motion; pump fill and evacuation rates; and, ventilation flow testing.

Goal Setting. Licensees have a great deal of flexibility in determining goals (i.e., performance objectives). Licensees may elect to choose system, train, or component level goals; performance-related goals (reliability and availability); or, goals based on system parameters such as flow, pressure, differential pressure, or electric current and voltage. Goals need to be based on licensee experience, SSC safety significance, and where practicable industry-wide experience. Performance objectives (or goals) could be as simple as extrapolations of surveillance or calibration criteria.

Demonstrated Effective Maintenance. The monitoring of an SSC as specified in paragraph (a)(1) is not required if the licensee demonstrates that the performance or condition of the SSC is being effectively controlled through the performance of appropriate preventive maintenance so that the SSC can perform its intended function. Under paragraph (a)(2), preventive maintenance must be demonstrated to be effective in controlling the performance or condition of the SSC so that the SSC remains capable of performing its intended function. Therefore, in order to show that preventive maintenance is effective, the licensee must conduct some evaluation or monitoring under (a)(2). As described in the Statements of Consideration for 10 CFR 50.65, the purpose of (a)(2) is to provide an alternative approach for those SSCs where it is not necessary to establish the monitoring program required by paragraph (a)(1).

62801-04 RESOURCE ESTIMATE

Inspection resources for this inspection procedure will vary from site to site based on NRC management's assessment of licensee performance. In addition, inspection resources will be dependent on the phase of decommissioning being implemented. For planning purposes, however, it is estimated that approximately 28 onsite inspection hours will be needed to adequately assess licensee maintenance and surveillance semi-annually.

62801-05 REFERENCES

1. 10 CFR 50.65 "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants" (the Maintenance Rule)

2. Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," June 1993

3. NUREG 1526, "Lessons Learned From Early Implementation of the Maintenance Rule at Nine Nuclear Power Plants," June 1995

4. Nuclear Management and Resources and Research Council, NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of

Maintenance at Nuclear Power Plants," May 1993 (NUDOCS accession number 9308180091)

5. U.S. Nuclear Regulator Commission, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Federal Register, Vol. 56, No. 132, Wednesday July 10, 1991, pages 31306 to 31324

6. U.S. Nuclear Regulator Commission, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Federal Register, Vol. 58, No. 53, Monday March 22, 1993, Pages 15303 to 15305

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