SAFETY EVALUATION REPORT

FOR THE GEH MORRIS OPERATION

INDEPENDENT SPENT FUEL STORAGE INSTALLATION

SUBSEQUENT LICENSE RENEWAL

DOCKET NO. 72-01

LICENSE NO. SNM-2500

Office of Nuclear Material Safety and Safeguards
United States Nuclear Regulatory Commission

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CONTENTS

INTRODUCTION

Under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste," the U.S. Nuclear Regulatory Commission (NRC) issued a specific license, Special Nuclear Material (SNM) License No. SNM-2500, for the Morris Operation independent spent fuel storage installation (ISFSI). The license authorizes GE-Hitachi Nuclear Energy Americas, LLC (GEH, licensee, or applicant) to possess, transfer, and store radioactive material at the Morris Operation ISFSI (GEH-MO) located in Grundy County, Illinois, near Morris, Illinois.

GEH-MO was originally constructed as a pilot irradiated fuel reprocessing operation (Docket 50-268 under 10 CFR Part 50). During cold testing of the facility in 1971, the company applied for and was granted Special Nuclear Materials License No. SNM-1265, Docket 70-1308, to receive spent fuel from commercial nuclear power plants. The first fuel was received by the facility in 1972. In 1974, the General Electric Company (GE) suspended its efforts to operate the reprocessing facility and applied for a spent fuel storage license. The NRC staff reissued Special Nuclear Materials License SNM-1265 for the receipt and storage of spent fuel for a period of 5 years in 1974. GE applied for renewal of SNM-1265 in 1979 under 10 CFR Parts 20, 40, and 70. During its review of the application, the NRC staff noted that spent fuel storage at an ISFSI was covered under the new 10 CFR Part 72 regulations that became effective in 1980. Accordingly, the NRC staff requested that GE revise its license renewal request to conform with the requirements of the new 10 CFR Part 72. GE submitted a revised application in 1981 and, after review, the NRC issued Special Nuclear Materials License No. SNM-2500, Docket No. 72-1, on May 4, 1982, for a period of 20 years. In 2007, NRC approved the transfer of the SNM-2500 license from GE to the newly formed entity, GEH, which acquired ownership of GEH-MO and assumed responsibility for the operation and maintenance of the facility. On December 21, 2004, the NRC renewed SNM-2500 for a 20-year term, expiring May 31, 2022 (NRC 2004).

By letter dated June 30, 2020, GEH submitted an application for subsequent renewal of SNM-2500 for GEH-MO for an additional 20 years, as supplemented on February 26, 2021, March 19, 2021, March 24, 2021, January 27, 2022, and May 12, 2022 (GEH 2020b, 2021a, 2021b, 2021c, 2022a, 2022b). The staff generally refers to this application, as supplemented, as the "license renewal application" (LRA) in this safety evaluation report (SER). This license renewal, if approved, would authorize GEH to continue to store radioactive material at GEH-MO until May 31, 2042. No additional radioactive material will be authorized for storage under the license renewal, if approved. The applicant submitted the LRA in accordance with the regulatory requirements of 10 CFR 72.42, "Duration of license; renewal." The submittal of the LRA was timely per the requirement of 10 CFR 72.42(c) and the exemption dated May 13, 2020 (NRC 2020a). This exemption allowed GEH to submit the LRA for GEH-MO less than two years before the expiration of the existing license, while being afforded protection of the timely renewal provision contained in 10 CFR 72.42(c).

This LRA is unique in that it is the first ISFSI to request a subsequent license renewal, and GEH-MO is the only operating commercial water-basin ISFSI not co-located at a nuclear power plant site in the United States. GEH-MO is the only wet storage facility licensed under 10 CFR Part 72.

At GEH-MO, the spent nuclear fuel is stored in two water-filled basins on the west side of the process building. GEH noted the static nature of the facility and that no fuel movements have

occurred since the initial placement of fuel in the storage basins. Water quality and temperature are controlled by basin support systems on the west side of the basins. The above-grade structure enclosing the storage basins is a steel column and girder frame structure with insulated siding to maintain ventilation control. The eastern wall of the basin area is constructed of reinforced concrete and connects to the process building. A concrete shield wall around the basin pumps provides radiological shielding for personnel working in and around the area. Other principal structures include the administration building, various shops and warehouses, a water storage tower, and the sand filter building.

The fuel storage system consists of uniformly spaced baskets that house stainless steel tubes for fuel bundles. Special fuel basket grapples (hooks) are used to lift the basket by engaging lifting rods that protrude above the basket. Baskets are locked in position on a mounting grid of stainless-steel members on the basin floor. The system of mounting grids on the basin floor is braced against basin walls by wedges. Cask handling, cask unloading, and fuel storage areas are constructed of reinforced concrete, steel, and other materials that are either nonflammable or fire-retardant.

In the LRA, the applicant documented the technical bases for renewal of the license and proposed actions for managing potential aging effects on the structures, systems, and components (SSCs) of the ISFSI that are important to safety to ensure that these SSCs will maintain their intended functions during the period of extended operation. The applicant presented general information about the ISFSI design and a scoping evaluation to determine the SSCs within the scope of license renewal (the “in-scope” SSCs) and subject to an aging management review. For each in-scope SSC with an identified aging effect requiring management, the applicant proposed an aging management program (AMP), provided a time-limited aging analysis (TLAA), or identified existing site maintenance activities that essentially function as an AMP and will ensure that the SSC will maintain its intended function(s) during the period of extended operation.

The NRC staff reviewed the applicant’s technical bases for safe operation of GEH-MO for an additional 20 years beyond the term of the current operating license. This SER summarizes the results of the staff’s review for compliance with 10 CFR 72.42. As explained in more detail below, in its review of the LRA and development of the SER, the staff used the guidance in (1) NUREG-1927, Revision 1, “Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel,” issued June 2016 (NRC 2016), (2) NUREG-1801, Revision 2, “Generic Aging Lessons Learned (GALL) Report,” issued December 2010 (NRC 2010), (3) NUREG-2191, “Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report,” issued July 2017 (NRC 2017b), and (4) NUREG-1757, Volume 3, Revision 1, “Consolidated Decommissioning Guidance: Financial Assurance, Recordkeeping, and Timeliness,” issued February 2012 (NRC 2012), to ensure compliance with the NRC’s financial qualification requirements, including those associated with decommissioning the ISFSI, as appropriate.

The NRC staff has not developed specific guidance for renewal of wet storage ISFSIs. However, the storage of spent nuclear fuel in a water basin is held to the same 10 CFR Part 72 regulations as a dry storage ISFSI. Although NUREG-1927 was not developed to specifically address the review of renewal applications for wet storage facilities, the guidance is generally considered appropriate for the review of the GEH-MO LRA in terms of the general information review, scoping evaluation, aging management review, TLAAs, and elements of AMPs. In addition, the design and operation of GEH-MO is similar to those of a spent fuel storage pool at a nuclear power plant. For this reason, the NRC staff has used applicable portions of

NUREG-1801 and NUREG-2191 to support the review of the GEH-MO LRA. While both NUREGs contain guidance that is not specifically applicable to the GEH-MO LRA, the NRC staff believes that the technical information applicable to general processes covering the spent fuel pool and its support systems, and historic information on age-related degradation of nuclear power plant SSCs are appropriate for reviewing the LRA. Because the requested renewal period would result in the facility being operational for a total of approximately 70 years, the staff believes it is appropriate to use the subsequent license renewal guidance in NUREG-2191, which covers 60-80 years of nuclear power plant operation. NUREG-2191 establishes a generic technical basis for the safety review of the LRA, in terms of the evaluation of (1) aging mechanisms and effects that could affect the ability of the SSCs to fulfill their safety functions in the period of extended operation (i.e., credible aging mechanisms and effects) and (2) aging management approaches to address credible aging effects, including examples of AMPs that are considered generically acceptable to address the credible aging effects to ensure that the design bases will be maintained during the period of extended operation. The staff evaluated the applicant's technical basis for its aging management review and proposed AMPs and compared it to the generic technical basis in NUREG-2191. For comparison to the generic technical basis in NUREG-2191, the staff ensured that the design features, environmental conditions, and operating experience for GEH-MO are bounded by those evaluated in NUREG-2191.

This SER is organized into six sections. Section 1 provides the staff's review of the general and financial information in the LRA. Section 2 presents the staff's review of the scoping evaluation for determining which SSCs are within the scope of renewal. Section 3 includes the staff's evaluation of the aging management review for the assessment of aging effects and aging management activities for SSCs within the scope of renewal. Section 4 documents the additions and changes to the license that resulted from the review of the LRA. Section 5 presents the staff's conclusions from its review. Section 6 lists the references supporting the staff's review and technical determinations.

1 GENERAL INFORMATION

1.1 Specific License Holder Information

On June 30, 2020, as supplemented on February 26, 2021, March 19, 2021, March 24, 2021, January 27, 2022, and May 12, 2022 (GEH 2020b, 2021a, 2021b, 2021c, 2022a, 2022b), GE-Hitachi Nuclear Energy Americas, LLC (GEH, licensee, or applicant) submitted an application for subsequent renewal of SNM-2500 for the Morris Operation independent spent fuel storage installation (ISFSI) (GEH-MO) for an additional 20 years. The staff generally refers to this application, as supplemented, as the "license renewal application" (LRA) in this safety evaluation report (SER). The GEH-MO LRA includes general information on the specific license holder, GEH. The LRA includes the names and addresses of the applicants; a description of the business of the applicants and the State in which it is incorporated and does business; and the organization and management of the applicants.

The U.S. Nuclear Regulatory Commission (NRC) staff finds that the applicant provided the information required in paragraphs (a)–(d) of Title 10 of the *Code of Federal Regulations* (10 CFR) 72.22, "Contents of application: General and financial information."

1.2 Financial Qualifications

The LRA includes information on financial qualifications, in accordance with the requirements in 10 CFR 72.22(e), to show that the applicant will have the necessary funds available to cover estimated construction costs, estimated operating costs over the requested period of extended operation, and estimated decommissioning costs.

1.2.1 ISFSI Construction Cost Estimate

The ISFSI water-basin is already constructed, and there are no plans for expansion of the ISFSI at this time. Therefore, there are no construction costs associated with this license renewal and thus the staff's construction cost estimate review is not warranted for this SER.

1.2.2 ISFSI Operating Cost Estimate

According to GEH, the operating costs for GEH-MO are estimated to be $60M (2020 dollars) for the duration of the 20-year license period of extended operation or approximately $3M per year (GEH 2021a). The cost estimate for GEH-MO considers factors such as ISFSI security, project management, maintenance, and equipment surveillance.

In order to evaluate the reasonableness of this estimate, staff reviewed the existing monitoring and maintenance activities for GEH-MO, along with estimated ISFSI operations costs cited by various sources, including costs cited in a 2001 Massachusetts Institute of Technology (MIT) report, "Interim Storage of Spent Fuel in the United States (Macfarlane 2001)," and a U.S. Government Accountability Office (GAO) report that provides estimates of safety and security system and annual operational costs for dry storage at a shutdown reactor site.

The 2001 MIT report references an estimate that ISFSI operating costs could be reduced to $1.4 million per year once the pool has been modified for passive operations (Singh 1997). The applicant states that routine operation of the ISFSI and storage of spent fuel is largely passive and takes place primarily inside buildings. In addition, no new fuel has been added to the basins since 1989, and no additional spent fuel would be added during the requested period of

extended operation. All the spent fuel has been cooling under water for more than 30 years. GEH stated the basin water is maintained in an ultra-pure state to maintain a benign environment and minimize the potential for adverse chemical effects on the fuel cladding, storage baskets, or basin liner. The 2014 GAO publication, entitled "Spent Nuclear Fuel Management; Outreach Needed to Help Gain Public Acceptance for Federal Activities That Address Liability" (GAO 2014), estimates $2.5 to $6.5 million in annual operations and other related costs at a shutdown reactor site (page 52). Inflation from 2014 through 2017 is negligible, at approximately 5% during that time period.

Based on data and estimations from various publications and information reported by licensees, annual costs to operate an ISFSI at a shutdown reactor are estimated from approximately $2.5 million to $10 million. Accordingly, the staff finds the annual operating cost estimate for GEH-MO of $3 million, or $60 million in 2020 dollars over the requested period of extended operation, to be reasonable.

1.2.3 ISFSI Operating Funds Availability

To determine if GEH has reasonable assurance to cover its estimated annual operating costs of approximately $3 million for GEH-MO, the NRC staff reviewed the information in the LRA. The applicant stated that as a subdivision of the GE Power business segment, GEH will remain financially qualified to carry out the activities associated with spent fuel storage at GEH-MO throughout the period of extended operation.

Current and anticipated sources of funding for GEH come from fuel storage fees, sales of reactors, fuel, products, and support services to various nuclear energy customers. GEH has significant assets and can assume total operating costs for GEH-MO for the duration of the requested period of extended operation. In addition, GE Power's profit and earnings (GEH 2020c) ($274 million as of December 2020), was nearly two orders of magnitude greater than the estimated annual operating costs for GEH-MO.

Based on an analysis of the financial information as described in the LRA, the NRC staff finds that GEH has provided sufficient information for financial qualifications to engage in the proposed activities regarding GEH-MO. The staff concludes that the applicant has demonstrated reasonable assurance that funding will remain available to cover the operating costs of GEH-MO for the 20-year period of extended operation.

1.3 Decommissioning Funding Assurance

Pursuant to paragraph (c) of 10 CFR 72.30, "Financial assurance and recordkeeping for decommissioning," each holder of, or applicant for, a license under 10 CFR Part 72 must submit for NRC review and approval a decommissioning funding plan (DFP) containing information on how reasonable assurance will be provided that funds will be available to decommission its ISFSI. At the time of license renewal and at intervals not to exceed 3 years, the DFP must be resubmitted with adjustments as necessary to account for changes in decommissioning costs and the extent of contamination. The DFP must update the information submitted with the original or prior approved plan under 10 CFR 72.30(b). In addition, the DFP must also specifically consider the effect of the following events on decommissioning costs:

- spills of radioactive material producing additional residual radioactivity in onsite subsurface material;
- facility modifications;

- changes in authorized possession limits; and
- actual remediation costs that exceed the previous cost estimate.

The DFP must contain a detailed decommissioning cost estimate (DCE), in an amount reflecting the cost of an independent contractor to perform all decommissioning activities; an adequate contingency factor; and the cost of meeting 10 CFR 20.1402, "Radiological criteria for unrestricted use" (or the cost of meeting 10 CFR 20.1403, "Criteria for license termination under restricted conditions," provided the licensee can demonstrate its ability to meet these criteria). The licensee's DFP must also identify key assumptions contained in the DCE and justify those assumptions. Further, the DFP must describe the method of assuring funds for ISFSI decommissioning, including the means for adjusting cost estimates and associated funding levels periodically over the life of the ISFSI. Finally, the DFP must specify the volume of onsite subsurface material containing residual radioactivity that will require remediation to meet the criteria for license termination and contain a certification that financial assurance for ISFSI decommissioning has been provided in the amount of the DCE.

The LRA references the March 6, 2020, GEH-MO DFP (GEH 2020a), which serves as the DFP for the GEH-MO license renewal submittal per 10 CFR 72.30(c). The NRC staff reviewed and approved the March 6, 2020, DFP, as supplemented, by letter dated January 5, 2022 (NRC 2022a). In the January 5, 2022, letter, the NRC staff concluded that: (1) the updated DCE adequately estimates the cost, at this time, to carry out required ISFSI decommissioning activities prior to license termination, and that the DCE is reasonable; and (2) the aggregate dollar amount of the licensee's financial instrument provides adequate financial assurance to cover its DCE and therefore is acceptable. Based on its financial analyses, the NRC staff found that the March 6, 2020, DFP, as supplemented, contains the information required by 10 CFR 72.30(b) and that GEH has provided reasonable assurance that funds will be available to decommission GEH-MO.

1.4 Environmental Review

Regulations in 10 CFR 72.34, "Environmental report," require that each application for an ISFSI license under this part must be accompanied by an environmental report that meets the requirements of Subpart A, "National Environmental Policy Act—Regulations Implementing Section 102(2)," of 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions." The applicant submitted an environmental report supplement as part of the LRA (GEH 2020b) that contained sufficient information to aid the staff in its independent analysis. In November 2022, the staff issued an environmental assessment (NRC 2022c) for the GEH-MO subsequent license renewal.

1.5 Safety Review

The objective of this safety review is to determine whether there is reasonable assurance that the ISFSI will continue to meet the requirements of 10 CFR Part 72 during the requested period of extended operation. Under 10 CFR 72.42(a), an application for ISFSI license renewal must include the following:

- time-limited aging analyses (TLAAs) that demonstrate structures, systems, and components (SSCs) important to safety will continue to perform their intended functions for the requested period of extended operation

- a description of the aging management program (AMP) for managing issues associated with aging that could adversely affect SSCs important to safety

The applicant provided the results of its scoping evaluation and aging management review (AMR), which identified all SSCs within the scope of the license renewal and pertinent aging mechanisms and effects, respectively. The applicant developed AMPs and evaluated TLAAs to ensure that the SSCs identified to be within the scope of renewal will continue to perform their intended functions during the period of extended operation. This review documents the staff's evaluation of the applicant's scoping analysis, AMR, and supporting AMPs and TLAAs.

1.6 Application Content

The applicant's LRA submittal on June 30, 2020 (GEH 2020b) included a cover letter, a revised final safety analysis report (FSAR), and a supplement to the environmental report. GEH refers to the GEH-MO FSAR as the "Consolidated Safety Analysis Report (CSAR)," and this SER uses the CSAR term. The CSAR version included in the June 30, 2020, LRA submittal was designated as Revision 15. The June 30, 2020, cover letter also included proposed license conditions and a reference to the DFP.

The NRC staff requested supplemental information during its acceptance review of the LRA (NRC 2020b), asking if CSAR Revision 15 is the current operating FSAR for GEH-MO, or if it is GEH's proposed changes to the FSAR (e.g., updates to aging management information) to support the LRA. GEH responded to the request for supplemental information (GEH 2021a), noting that upon submittal of the June 30, 2020, LRA, GEH-MO was operating under CSAR Revision 14a, dated October 19, 2012. CSAR Revision 15 was provided in the June 30, 2020, LRA submittal as information to show proposed changes to aging management information in the CSAR. GEH then formally implemented CSAR Revision 15 on February 23, 2021 (GEH 2021c).

Aging management information was previously provided in CSAR appendix A.8, "Aging Management," in the initial license renewal application approved in 2004. The CSAR Revision 15 in the June 30, 2020, LRA submittal included changes to appendix A.8 to update the aging management information to support this subsequent LRA. The CSAR Revision 15 provided the following updated information:

- general and financial information
- scoping evaluation
- AMR
- AMPs
- TLAAs

Since the June 30, 2020, LRA submittal, GEH submitted additional proposed changes to the CSAR (designated as Draft Revision 15A to the CSAR), in Attachment No. 3 of its January 27, 2022, response to a request for additional information (RAI) (GEH 2022a), as updated in its May 12, 2022, clarification of the RAI response (GEH 2022b). This CSAR Draft Revision 15A reflects the initial proposed CSAR changes to address the aging management information in this LRA, as well as subsequent changes resulting from the staff's review of the LRA.

GEH provided a summary of operating experience to support conclusions made in the CSAR regarding degradation of SSCs within the scope of renewal (GEH 2021a), including reports from implementation of inspection and maintenance procedures.

1.7 Evaluation Findings

The staff reviewed the information in the LRA, following the guidance in NUREG-1927 and NUREG-1757, Volume 3. Based on its review, the staff determined that the applicant has provided sufficient information with adequate details to support the LRA, with the following findings:

F1.1 The information presented in the LRA satisfies the requirements of 10 CFR 72.22, 10 CFR 72.30, 10 CFR 72.34, and 10 CFR 72.42.

F1.2 The applicant has provided a tabulation of all supporting information and docketed material incorporated by reference in accordance with 10 CFR 72.42.

2 SCOPING EVALUATION

As described in NUREG-1927, a scoping evaluation is necessary to identify the SSCs requiring an AMR. The objective of this scoping evaluation is to identify SSCs meeting the following criteria:

(1) SSCs that are classified as important to safety, as they are relied on for one of the following functions:

- maintain the conditions required by the regulations or the specific license to store spent fuel safely;
- prevent damage to the spent fuel during handling and storage; or
- provide reasonable assurance that spent fuel can be received, handled, packaged, stored, and retrieved without undue risk to the health and safety of the public.

(2) SSCs that are classified as not important to safety but, according to the design bases, their failure could prevent fulfillment of a function that is important-to-safety.

After the determination of in-scope SSCs, the SSCs are screened to identify and describe the subcomponents that support the SSC intended functions.

In its review of the results of the applicant's scoping evaluation, the staff reviewed the following design-basis documents to verify that the applicant appropriately identified the SSCs with safety functions meeting either scoping criterion 1 or 2:

- GEH-MO CSAR, Draft Revision 15A
- Renewed Materials License No. SNM-2500, dated December 21, 2004 (NRC 2004), and subsequent amendments:
  - Amendment No. 13, dated September 26, 2007 (NRC 2007)
  - Amendment No. 14, dated April 16, 2015 (NRC 2015)
  - Amendment No. 15, dated June 29, 2017 (NRC 2017a)
- Technical Specifications for Safety, Renewed License SNM-2500 (NRC 2015)

2.1 Scoping Results

2.1.1 Structures, Systems, and Components Within the Scope of Renewal Review

CSAR appendix A.8, "Aging Management," provides the results of the applicant's scoping and screening evaluation. Table 2-1 below lists the SSCs and subcomponents determined to be within the scope of license renewal and identifies the scoping criterion met by each SSC.

The staff reviewed the applicant's scoping and screening of the SSCs. The staff's review considered the intended function of each SSC, its safety classification or basis for inclusion in the scope of license renewal, and design-basis information in the GEH-MO CSAR. The staff notes that the list of important-to-safety SSCs in CSAR appendix A.8 is identical to the

important-to-safety SSCs defined in CSAR section 11.3, "Structures, Systems, and Components Important to Safety." The staff also notes that the scoping results are unchanged from the initial renewal of the GEH-MO license in 2004 and that there have not been any license amendments since that renewal that added SSCs, removed SSCs, or altered the safety classification of any existing SSCs. A full description of the technical bases for the scoping results was provided in the applicant's documentation associated with the initial license renewal (GEH 2004).

Based on this review, the staff finds that the applicant identified the in-scope SSCs in a manner consistent with NUREG-1927, and therefore, the staff finds the scoping and screening results for in-scope SSCs to be acceptable.

2.1.2 Structures, Systems, and Components Not Within the Scope of Renewal Review

In its review of SSCs that the applicant did not identify as within the scope of renewal, the staff reviewed the CSAR and the applicant's scoping documentation associated with the initial renewal (GEH 2004). Table 2-2 below lists the SSCs excluded from the scope of license renewal and identifies the scoping criteria not met by each out-of-scope SSC. The staff's review considered the intended function of each SSC, its safety classification or basis for exclusion in the scope of license renewal, and design-basis information.

Regarding the paint present on the steel SSCs, the applicant clarified in a teleconference with the NRC (NRC 2022b) that the paint is not credited in any corrosion calculations and does not provide a safety function. The applicant stated that the paint is a standard industry use product to minimize corrosion, but it is not an important-to-safety SCC that requires aging management. The staff reviewed the design-basis information in the GEH-MO CSAR and verified that the paint is not credited in a safety analysis.

Based on this review, the staff finds that the applicant identified the out-of-scope SSCs in a manner consistent with NUREG-1927, and therefore, the staff finds the scoping and screening results for out-of-scope SSCs to be acceptable.

Table 2-1 SSCs Within the Scope of License Renewal

SSCs	Criterion 1	Criterion 2	In-Scope
Fuel storage basin – concrete walls, floors, and expansion gate	Yes	N/A	Yes
Fuel storage basin – stainless steel liner	Yes	N/A	Yes
Fuel storage system, including baskets and supporting grids	Yes	N/A	Yes
Steel expansion gate	Yes	N/A	Yes
Unloading pit doorway guard	Yes	N/A	Yes
Filter cell structure	Yes	N/A	Yes
Fuel storage basin building – steel structure[1]	Yes	N/A	Yes
Fuel basket grapple	Yes	N/A	Yes
Fuel grapple	Yes	N/A	Yes
Fuel basin crane[2]	Yes	N/A	Yes
Fuel handling crane[2]	Yes	N/A	Yes
Cask crane[2]	Yes	N/A	Yes
Spent fuel cladding	Yes	N/A	Yes

[1]The applicant described the building as a steel structure; however, there are concrete portions of the building, and the staff verified that the periodic inspections of the building include examination of the concrete (GEH 2021a)
[2]The crane SSCs also include the associated bridges and trolleys

Table 2-2 SSCs Not Within the Scope of License Renewal

SSCs	Criterion 1	Criterion 2	In-Scope
Air compressors	No	No	No
Basin leak detection system	No	No	No
Basin water chillers	No	No	No
Basin water level monitor	No	No	No
Basin filter system	No	No	No
Demineralized water system	No	No	No
Ground water monitoring well network	No	No	No
Off-site power	No	No	No
Standby diesel generator	No	No	No
Ventilation system	No	No	No
Water supply well	No	No	No
Water tower	No	No	No
Paint	No	No	No

2.2 Evaluation Findings

The NRC staff reviewed the scoping evaluation provided in the LRA and supplemental documentation. The staff performed its review following the guidance provided in NUREG-1927. Based on its review, the staff finds:

F2.1 The applicant has identified all SSCs important-to-safety and SSCs the failure of which could prevent an SSC from fulfilling its safety function, per the requirements of 10 CFR 72.3, “Definitions”; 10 CFR 72.24, “Contents of application: Technical information”; 10 CFR 72.42; 10 CFR 72.120, “General considerations”; 10 CFR 72.122, “Overall requirements”; 10 CFR 72.124, “Criteria for nuclear criticality safety”; 10 CFR 72.126, “Criteria for radiological protection”; and 10 CFR 72.128, “Criteria for spent fuel, high-level radioactive waste, reactor-related greater than Class C waste, and other radioactive waste storage and handling,” as applicable.

3 AGING MANAGEMENT REVIEW

3.1 Review Objective

The objective of the staff's evaluation of the applicant's AMR is to determine whether the applicant has adequately reviewed applicable materials, environments, and aging mechanisms and effects and proposed adequate aging management activities for in-scope SSCs. The AMR addresses aging mechanisms and effects that could adversely affect the ability of the SSCs and associated subcomponents to perform their intended functions during the period of extended operation.

3.2 Aging Management Review Process

In CSAR appendix A.8, the applicant identified the materials of construction, the environments, and the potential aging effects and the associated aging mechanisms for each SSC and associated subcomponents within the scope of license renewal. For each aging effect requiring management, the applicant determined the required aging management activity, either a TLAA, an AMP, or existing GEH-MO preventive maintenance program activities, which essentially function as an AMP, to ensure that the intended function of the SSC would be maintained during the requested period of extended operation.

The staff reviewed the applicant's AMR process and finds it acceptable because it is consistent with the methodology recommended in NUREG-1927 and is adequate for identifying credible aging effects for the SSCs within the scope of license renewal.

3.3 Aging Management Review Results

The staff evaluated the applicant's technical basis for its AMR by comparing it to the generic technical basis in NUREG-2191, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report" (NRC 2017b). In this evaluation, the staff ensured that the design features, environmental conditions, and operating experience for GEH-MO are bounded by those evaluated in NUREG-2191.

Table 3-1 provides the results of the applicant's AMR and identifies the disposition of each potential aging effect for SSCs within the scope of license renewal. This table identifies whether the applicant's conclusion on the credibility of each aging effect is consistent with the generic technical bases and conclusions discussed in NUREG-2191. The table also identifies the disposition of the aging effect, in terms of whether: (1) an aging management activity (i.e., AMP or TLAA) is, or is not, needed to address the aging effect (consistent with NUREG-2191), or (2) there is a separate technical basis or supporting analyses that justify either that an aging effect is not credible or that an aging management activity is not needed for the aging effect (for items either not addressed in, or inconsistent with, NUREG-2191).

Table 3-1 Aging Management Review Results

Material	Environment	Aging Mechanism	Aging Effect	Applicant Defined as Credible	Consistent with Conclusion of NUREG-2191	Disposition
Concrete (reinforced)	Any environment	Reaction with aggregates	Cracking	Yes	Yes	Structures Monitoring AMP
	Groundwater/soil	Corrosion of embedded steel	Cracking	Yes	Yes	Structures Monitoring AMP
			Loss of bond	Yes	Yes	Structures Monitoring AMP
			Loss of material (spalling, scaling)	Yes	Yes	Structures Monitoring AMP
		Leaching of calcium hydroxide and carbonation	Increase in porosity and permeability	Yes	Yes	Structures Monitoring AMP
			Loss of strength	Yes	Yes	Structures Monitoring AMP
		Not identified[1]	Cracking	Yes	Yes	Structures Monitoring AMP
			Loss of material (spalling, scaling)	Yes	Yes	Structures Monitoring AMP
			Increase in porosity and permeability	Yes	Yes	Structures Monitoring AMP
		Differential settlement	Cracking	Yes	Yes	Structures Monitoring AMP
			Distortion	Yes	Yes	Structures Monitoring AMP
	Air–outdoor	Freeze and thaw	Cracking	Yes	Yes	Structures Monitoring AMP
			Loss of material (spalling, scaling)	Yes	Yes	Structures Monitoring AMP

Material	Environment	Aging Mechanism	Aging Effect	Applicant Defined as Credible	Consistent with Conclusion of NUREG-2191	Disposition
		Corrosion of embedded steel	Cracking	Yes	Yes	Structures Monitoring AMP
			Loss of bond	Yes	Yes	Structures Monitoring AMP
			Loss of material (spalling, scaling)	Yes	Yes	Structures Monitoring AMP
		Aggressive chemical attack	Cracking	Yes	Yes	Structures Monitoring AMP
			Loss of material (spalling, scaling)	Yes	Yes	Structures Monitoring AMP
			Increase in porosity and permeability	Yes	Yes	Structures Monitoring AMP
	Air–indoor (uncontrolled)	Corrosion of embedded steel	Cracking	Yes	Yes	Structures Monitoring AMP
			Loss of bond	Yes	Yes	Structures Monitoring AMP
			Loss of material (spalling, scaling)	Yes	Yes	Structures Monitoring AMP
		Aggressive chemical attack	Cracking	Yes	Yes	Structures Monitoring AMP
			Loss of material (spalling, scaling)	Yes	Yes	Structures Monitoring AMP
			Increase in porosity and permeability	Yes	Yes	Structures Monitoring AMP
		Elevated temperature exposure	Reduction in strength and modulus	No	Yes[2]	AMP/TLAA not necessary
	Water–flowing	Leaching of calcium hydroxide and carbonation	Increase in porosity and permeability	Yes	Yes	Structures Monitoring AMP

Material	Environment	Aging Mechanism	Aging Effect	Applicant Defined as Credible	Consistent with Conclusion of NUREG-2191	Disposition
			Loss of strength	Yes	Yes	Structures Monitoring AMP
Concrete; porous concrete	Water–flowing under foundation	Differential settlement	Cracking	Yes	Yes	Structures Monitoring AMP
			Reduction of foundation strength	Yes	Yes	Structures Monitoring AMP
		Erosion of porous concrete subfoundation	Cracking	Yes	Yes	Structures Monitoring AMP
			Reduction of foundation strength	Yes	Yes	Structures Monitoring AMP
Steel (including galvanized)	Air–outdoor or Air–indoor (uncontrolled)	General, pitting and crevice corrosion	Loss of material	Yes	Yes	Structures Monitoring AMP
		Stress corrosion cracking (high strength bolting)	Cracking	No	Yes[3]	AMP/TLAA not necessary
Stainless steel	Treated water or treated borated water	Pitting and crevice corrosion	Loss of material	Yes	Yes	Structures Monitoring AMP, Water Chemistry AMP, and Monitoring of pool water level and leakage from leak chase channels Fuel Basin Liner TLAA (see SER section 3.4)
		Stress corrosion cracking	Cracking	Yes	Yes	
Any material (bolting)	Any environment	Self-loosening	Loss of preload	Yes	Yes	Structures Monitoring AMP

Material	Environment	Aging Mechanism	Aging Effect	Applicant Defined as Credible	Consistent with Conclusion of NUREG-2191	Disposition
Zircaloy and stainless steel (Fuel cladding)	Treated water or treated borated water	Pitting and crevice corrosion	Loss of material	Yes	Not evaluated in NUREG-2191	Structures Monitoring AMP and Water Chemistry AMP (See SER section 3.3.1.1)
		Stress corrosion cracking	Cracking	Yes	Not evaluated in NUREG-2191	
Structural Steel (Cranes)	Air–indoor (uncontrolled)	Fatigue	Cumulative fatigue damage	Yes	Yes	GEH-MO Preventive Maintenance Program (per ASME B30.2)
		General corrosion and wear	Loss of material	Yes	Yes	
		n/a	Deformation, cracking	Not evaluated in application	No	(See SER section 3.3.1.2)
		Loss of preload (bolting)	Self-loosening	Not evaluated in application	No	(See SER section 3.3.1.2)

[1] The applicant did not identify the specific aging mechanism associated with this line item. Nevertheless, the conclusion that cracking, loss of material, and increase in porosity and permeability can occur for concrete exposed to groundwater/soil is consistent with NUREG-2191 (in its evaluation of the “aggressive chemical attack” aging mechanism).

[2] For concrete exposed to elevated temperatures (>150°F general; >200°F local), NUREG-2191 identifies reduction in strength and modulus as aging effects; however, the applicant stated that it does not have concrete exposed to these elevated temperatures. The staff reviewed the GEH-MO design-basis information and verified this conclusion.

[3] For high strength structural bolting (yield strength > 150 ksi), NUREG-2191 identifies stress corrosion cracking as an aging effect; however, the applicant stated that it does not have high strength bolting. The staff reviewed the GEH-MO design-basis information and verified this conclusion.

The staff reviewed the applicant's AMR results for consistency with the technical bases for aging mechanisms and effects in NUREG-2191. If the staff determined that the applicant's conclusions were consistent with expected aging management activities in accordance with NUREG-2191, the staff considered the results acceptable and provides no additional discussion in this SER. The following sections address the applicant's conclusions on aging mechanisms and effects for which the staff was not able to verify consistency with NUREG-2191.

3.3.1 Supplemental Analyses

The following assessments document the staff's review for those AMR conclusions that were either inconsistent with NUREG-2191 or warranted additional explanation.

3.3.1.1 Cracking and Loss of Material of Zircaloy and Stainless Steel Fuel Cladding

The applicant stated that the zircaloy and stainless steel fuel cladding is subject to loss of material due to corrosion and cracking due to stress corrosion cracking in the spent fuel pool environment. NUREG-2191 does not evaluate the aging of fuel cladding.

The staff reviewed the applicant's conclusion that cracking and loss of material are the only credible aging effects for zircaloy and stainless steel fuel cladding. The staff verified that these aging effects are consistent with those identified in NUREG-2191 for other stainless steel spent fuel pool components (e.g., pool liner, pool cooling piping components). The staff notes that, although NUREG-2191 identifies these potential aging effects for other stainless steel spent fuel pool components, the recommended inspections in that guidance are limited, as aging is either not expected to occur or to occur very slowly. NUREG-2191 does not evaluate the aging of zirconium-based alloys; however, the staff notes that zirconium alloys are highly resistant to corrosion, as evidenced by their use as cladding materials in the reactor water environment, and thus the conclusions in NUREG-2191 for stainless steel in a pool environment are generally considered to be appropriate for zirconium alloys as well.

In addition, the staff reviewed the technical literature on the performance of stainless steel and zircaloy cladding in wet storage. International Atomic Energy Agency (IAEA) TECDOC No. 1012, "Durability of Spent Nuclear Fuels and Facility Components in Wet Storage," (IAEA 1998) provides an evaluation of potential long-term degradation of light water reactor (LWR) fuels, considering corrosion, cracking, and hydrogen embrittlement mechanisms. Based on a review of operating experience from routine handling, post-irradiation cladding examinations, coupon studies, and analytical assessments, the IAEA study concluded that stainless steel and zircaloy LWR cladding are expected to perform without degradation in long-term wet storage.

Based on the staff's review of the historical performance of fuel cladding in a pool environment, and the verification that the identified aging effects in the proposed AMPs are consistent with those identified by NUREG-2191 for stainless steel SSCs, the staff finds the applicant's conclusion that zircaloy and stainless steel cladding are subject to cracking and loss of materials to be acceptable. The staff's review of the aging management approach for the cladding is documented below in SER tables 3-2 and 3-3.

3.3.1.2 Deformation, Cracking, and Loss of Preload of Crane SSCs

The applicant identified loss of material and cumulative fatigue damage as credible aging effects for steel crane components; however, NUREG-2191 also identifies deformation, cracking, and

loss of preload (bolting) as additional aging effects. These additional effects were not specifically cited by the applicant in its AMR results.

The staff notes that, despite not including an AMR line item for deformation, cracking, and loss of preload, these aging effects are nevertheless addressed in the applicant's activities to manage the aging of cranes. Consistent with the guidance in NUREG-2191, the cranes are inspected in accordance with ASME B30.2, "Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)." ANSI B30.2, section 2-2.1.5, "Periodic Inspection," includes inspection for deformed and cracked members and loose or missing fasteners. Therefore, the staff finds that, though the AMR line items are not fully consistent with NUREG-2191, the applicant has adequate activities in place to manage all applicable aging effects.

3.3.2 Evaluation Findings

The staff reviewed the AMR in the renewal application to verify it adequately identified the materials, environments, and aging effects of the in-scope SSCs. The staff performed its review following the guidance provided in NUREG-1927 and NUREG-2191. Based on its review of the renewal application, the staff finds the following:

F3.1 The applicant's AMR process is comprehensive in identifying the materials of construction and associated operating environmental conditions for those SSCs within the scope of renewal and has provided an acceptable summary of the information in the renewal application.

F3.2 The applicant's AMR process is comprehensive in identifying all pertinent aging mechanisms and effects applicable to the SSCs within the scope of renewal, and the applicant has provided an acceptable summary of the information in the renewal application.

3.4 Time-Limited Aging Analyses

As discussed in CSAR appendix A.8, the applicant identified one TLAA for the fuel basin liner. The staff notes that this TLAA is consistent with that identified in the initial renewal of the GEH-MO license.

Based on its review of the design-basis documents, the staff confirmed that the applicant identified all calculations and analyses meeting all six criteria in 10 CFR 72.3 and therefore concludes that the applicant adequately identified all TLAAs. The following documents the staff's evaluation of the TLAA.

3.4.1 Corrosion Analysis of the Fuel Basin Liner

CSAR appendix A.8 summarizes the results of the applicant's TLAA on corrosion of the stainless steel fuel basin liner due to chemical or microbial attack. The applicant inspected the fuel basin liner at GEH-MO in 1994 and conducted a metallurgical evaluation of a coupon cut from the stainless steel liner in the cask unloading pit that had been exposed to the basin water for more than 20 years (GEH 2021a). The evaluation found that the maximum surface penetration was 0.01 mm (0.4 mils). Given that the liner thickness is 3.2 mm (125 mils), the applicant concluded that the stainless steel fuel basin liner would not be penetrated over the period of extended operation.

The staff reviewed the applicant's corrosion analysis of the fuel basin liner and verified that the observed degree of liner corrosion over 20 years, extrapolated out through the period of extended operation, would not result in significant penetration of the liner (wall thickness loss of approximately 1 percent). Therefore, the staff finds the applicant's analysis of corrosion of the fuel basin liner to be acceptable.

The staff also notes that, notwithstanding this finding, the applicant proposes aging management activities to manage potential liner corrosion, including maintaining pool water chemistry in the Water Chemistry AMP, inspecting the liner in the Structures Monitoring AMP, and monitoring for liner leakage. These activities are consistent with the recommendations in NUREG-2191 for managing the aging of the pool liner, and therefore the staff finds them to be acceptable.

3.4.2 Evaluation Findings

The staff reviewed the TLAA provided in the renewal application. The staff performed its review following the guidance provided in NUREG-1927. The staff verified that the TLAA assumptions, calculations, and analyses were adequate and bound the environment and aging mechanisms or aging effects for the pertinent SSC. Based on its review of the renewal application, the staff finds the following:

F3.3 The applicant identified all pertinent aging mechanisms and effects pertinent to SSCs within the scope of renewal that involve TLAAs. The methods and values of the input parameters for the applicant's TLAA are adequate. Therefore, the applicant's TLAA meets the requirements in 10 CFR 72.42(a)(1) and provides reasonable assurance that the SSC will maintain its intended functions for the period of extended operation.

3.5 Aging Management Programs

Under 10 CFR 72.42(a)(2) requirements, the applicant must provide a description of AMPs for management of issues associated with aging that could adversely affect SSCs important to safety. In CSAR appendix A.8, the applicant proposed the following AMPs:

1. Structures Monitoring AMP
2. Water Chemistry AMP

In addition, for the fuel basin crane, fuel handling crane, and cask crane (including the bridges and trolleys), the applicant stated that the maintenance of those SSCs has been, and will continue to be, addressed by the following site preventive maintenance program:

3. GEH-MO Preventive Maintenance Program

The staff notes that, while the site preventive maintenance program was not identified by the applicant as an AMP, the staff nevertheless evaluated the adequacy of that program to continue to ensure that the cranes will fulfill their intended functions in the period of extended operation. The staff's review of that program was approached in a manner consistent with the staff's evaluation of AMPs.

The staff conducted the safety review of the proposed AMPs and the existing GEH-MO preventive maintenance program per the guidance in NUREG-1927. The staff also evaluated the proposed activities and compared them to the AMPs in NUREG-2191. Tables 3-2 through

3-4 provide the staff's conclusions regarding consistency of the proposed AMPs and GEH-MO maintenance program with the applicable AMPs in the NUREG-2191. If the staff identified inconsistencies, a discussion is provided on the staff's review of the applicant's justification.

- The Structures Monitoring AMP was compared to NUREG-2191 AMP XI.S6, "Structures Monitoring" (see table 3-2).

- The Water Chemistry AMP was compared to NUREG-2191 AMP XI.M2, "Water Chemistry" (see table 3-3).

- The GEH-MO Preventive Maintenance Program activities for cranes were compared to NUREG-2191 AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems" (see table 3-4).

Table 3-2 AMP Review Results—Structures Monitoring AMP

AMP Element	Staff's Assessment on Consistency with NUREG-2191 AMP, "Structures Monitoring"
1. Scope of Program	Consistent, except as noted here. NUREG-2191 does not include aging management activities for fuel cladding (as cladding is not within the scope of reactor renewals). The applicant proposes to visually inspect readily accessible surfaces of the fuel cladding under its Structures Monitoring AMP, as visible from the basin crane and basin walkways. The staff considers the Water Chemistry AMP to provide the primary assurance that aging of the cladding will be adequately managed (as discussed in SER table 3-3 below) and that the cladding inspections will be very limited, given the general inaccessibility of the fuel assemblies. Nevertheless, the applicant's proposed inspections can provide additional information to verify the effectiveness of the water chemistry controls. The staff notes that this approach is consistent with the NUREG-2191 guidance to manage fuel pool piping components, where a combination of the Water Chemistry Program and a one-time visual inspection is recommended to manage the aging of the piping. Therefore, the staff finds the applicant's proposal to use the Structures Monitoring AMP to perform visual inspections of the cladding to be acceptable.
2. Preventive Actions	Consistent The AMP relies on condition-monitoring, rather than preventive actions.
3. Parameters Monitored or Inspected	Consistent

4. Detection of Aging Effects	Consistent The staff notes that the applicant's AMP provides a greater level of detail on the inspections of the various SSCs than the NUREG-2191 AMP. The staff verified that all described activities are consistent with the general recommendations in NUREG-2191 that all structures are inspected at least once every 5 years by a qualified inspector.
5. Monitoring and Trending	Consistent
6. Acceptance Criteria	Consistent
7. Corrective Actions	Consistent
8. Confirmation Process	Consistent
9. Administrative Controls	Consistent
10. Operating Experience	Consistent The applicant stated that a review of inspection results found no degradation that would indicate the functionality of the SSCs would be affected in any way. Minor degradation of some painted surfaces was considered by the applicant to be expected for such surfaces in a humid environment, and the applicant stated that these issues are addressed as they are observed. The staff also reviewed proprietary inspection reports from 1983 through 2020 (GEH 2021a) and verified the applicant's conclusion regarding the minor nature of the observed degradation. Therefore, the staff finds that the operating experience supports the capability of the proposed AMP activities to manage potential aging.

Table 3-3 AMP Review Results—Water Chemistry AMP

AMP Element	Staff's Assessment on Consistency with NUREG-2191 AMP, "Water Chemistry"
1. Scope of Program	Consistent, except as noted here. As discussed in table 3-2, NUREG-2191 does not include aging management activities for fuel cladding (as cladding is not within the scope of reactor renewals), though the applicant proposes to use the Water Chemistry AMP to manage the aging of the cladding. The staff notes that this approach is consistent with the NUREG-2191 guidance to manage cracking and corrosion of fuel pool piping components, as water chemistry controls are considered to effectively manage these aging effects. Therefore, the staff finds the applicant's proposal to include fuel cladding as an SSC managed by the Water Chemistry AMP to be acceptable.
2. Preventive Actions	Consistent

AMP Element	Staff's Assessment on Consistency with NUREG-2191 AMP, "Water Chemistry"
3. Parameters Monitored or Inspected	Consistent NUREG-2191 cites Electric Power Research Institute (EPRI) water chemistry guidelines for PWR and BWR reactor facilities, and the staff recognizes that some aspects of that guidance may not be fully applicable to the stand-alone pool at GEH-MO (e.g., the need to consider impurities that could exchange with the water in the reactor pressure vessel). However, the applicant's monitoring of (1) electrical conductivity to characterize water corrosivity and (2) beta activity to verify fuel cladding performance are generally consistent with the approach recommended in the industry guidelines.
4. Detection of Aging Effects	Consistent
5. Monitoring and Trending	Consistent
6. Acceptance Criteria	Not consistent (Use of Site-Specific Criteria) The applicant did not cite acceptance criteria from the EPRI water chemistry guidelines recommended in NUREG-2191, but rather established site-specific acceptance criteria, which are consistent with the levels used in the current operation and the levels the staff approved in the 2004 GEH-MO initial license renewal review. The staff notes that the applicant's conductivity threshold is more conservative than the recommendations in IAEA Report No. NP-T-5.2, "Good Practices for Water Quality management in Research Reactors and Spent Fuel Storage Facilities." (2011). The IAEA guidelines also recommend monitoring radiation levels in the water, but do not recommend a specific limit. The applicant's beta activity limit threshold is consistent with its technical specifications, and the applicant stated that the value was established in consideration of historical averages, such that any sharp rise would be identified as an early indicator of cladding degradation. The staff finds the applicant's acceptance criteria to be acceptable because they are either more conservative than the criteria in IAEA guidance or are otherwise established at thresholds that will support timely identification of chemistry deviation associated with a cladding breach.
7. Corrective Actions	Consistent
8. Confirmation Process	Consistent
9. Administrative Controls	Consistent

AMP Element	Staff's Assessment on Consistency with NUREG-2191 AMP, "Water Chemistry"
10. Operating Experience	The applicant cited IAEA-TECDOC-1012, "Durability of Spent Nuclear Fuels and Facility Components in Wet Storage," as evidence that proper water chemistry controls are capable of ensuring the durability of fuel pool components. The staff also reviewed proprietary GEH-MO inspection reports from 1983 through 2020 (GEH 2021a) and noted that those components that primarily credit the use of water chemistry controls to manage aging (e.g., pool liner, fuel cladding) were confirmed to be free of significant degradation. Therefore, the staff finds that the operating experience supports the capability of the proposed AMP activities to manage potential aging.

Table 3-4 Review of GEH-MO Preventive Maintenance Program

Program Activity	Staff's Assessment on Consistency with NUREG-2191 AMP, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems"
Quarterly inspection and maintenance of crane SSCs by on-site personnel, per the manufacturers recommended schedule and ASME B30.2, "Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)"	Consistent. NUREG-2191 recommends the use of ASME B30.2. ASME B30.2, section 2-2-1, "Inspection," specifies • periodic inspections for degradation associated with fatigue (cracking), corrosion, and wear. For normal and heavy service, periodic inspections are to be performed annually. • for items not in regular use, inspections are to be performed prior to being placed into service. ASME B30.2, section 2-4.2.2, "Preventive Maintenance," specifies: • a preventive maintenance program shall be based on the recommendations outlined in the crane manufacturer's manual.
Annually, an independent inspection company performs a complete inspection, including non-destructive testing, of all cranes and hoists on site, per ASME B30.2	
Prior to use, each grapple and miscellaneous tooling used to move fuel bundles or baskets is inspected and tested to insure it complies with the original manufacturer specifications, per ASME B30.2	

3.5.2 Evaluation Findings

The staff reviewed the AMPs and the GEH-MO Preventive Maintenance Program provided in the GEH-MO CSAR. The staff performed its review following the guidance in NUREG-1927 and NUREG-2191. For aspects of the applicant's programs, the staff either confirmed consistency with the AMPs in NUREG-2191 or confirmed that the applicant's alternative approach was adequate to manage all credible aging effects. The staff finds the following:

F3.4 The applicant has identified programs that provide reasonable assurance that aging mechanisms and effects will be managed effectively during the period of extended operation, in accordance with 10 CFR 72.42(a)(2).

4 LICENSE CONDITIONS TO ADDRESS RENEWAL

This section provides a consolidated list of, and the basis for, the changes to the license conditions resulting from the staff's review of the LRA.

4.1 Consolidated Safety Analysis Report Update

The NRC added the following condition to the license:

> Within 90 days after issuance of the subsequent renewed license, the licensee shall submit an updated CSAR to the NRC, in accordance with 10 CFR 72.4, and continue to update the CSAR pursuant to the requirements in 10 CFR 72.70(b) and (c). The updated CSAR shall reflect the Draft Revision 15A to the CSAR, as documented in Attachment No. 3 of the May 12, 2022, submittal (Agencywide Documents Access and Management System (ADAMS) Accession No. ML22132A072). The licensee may make changes to the updated CSAR, consistent with 10 CFR 72.48(c).

GEH submitted the proposed changes to the CSAR (as Draft Revision 15A to the CSAR) in Attachment No. 3 to its January 27, 2022, RAI response (GEH 2022a), as updated in its May 12, 2022, clarification to the RAI response (GEH 2022b). This reflects the proposed CSAR changes to address the aging management information in the LRA and the changes resulting from the staff's review of the LRA. This license condition requires the applicant to submit an updated CSAR that includes the information in the Draft Revision 15A to the CSAR within 90 days after issuance of the license renewal. This condition ensures that the changes to the CSAR are made in a timely fashion to enable the licensee to develop and implement necessary procedures related to renewal and aging management activities during the period of extended operation.

4.2 Aging Management Program Implementation

The NRC added the following condition to the license:

> Within one year after issuance of the subsequent renewed license, the licensee shall create, update, or revise procedure(s) for implementing the activities in the aging management programs described in the updated CSAR. The licensee shall maintain the procedure(s) throughout the term of this license.

GEH submitted proposed changes to Standard Operating Procedure (SOP) 16-17, "Fuel Storage System Inspection," in Attachment No. 4 to its January 27, 2022, RAI response (GEH 2022a), as updated in its May 12, 2022, clarification to the RAI response (GEH 2022b). This reflects the proposed procedure changes to reflect the aging management information in the Draft Revision 15A to the CSAR. This license condition requires the applicant to create, update, or revise its procedure(s) for implementing the AMPs described in the LRA and in the Draft Revision 15A to the CSAR. This condition ensures that the procedures address AMP activities required for extended storage operations. The timeframe (1 year) in the condition is to ensure that the applicant develops the procedures in a timely manner. This timeframe is consistent with the guidance in NUREG-1927.

4.3 License Condition on Physical Security Plan

In its June 30, 2020, LRA submittal (GEH 2020b), GEH requested that license condition 14 be revised to reference the current Physical Security Plan (PSP) (Revision 9, dated February 16, 2017 (GEH 2017)). The staff determined that this change is unnecessary, as the license condition already includes language noting that the PSP may be further amended under the provisions of paragraph (e) of 10 CFR 72.44, “License conditions,” and 10 CFR 72.180, “Physical protection plan.” GEH made the Revision 9 changes to the PSP under these regulatory provisions, noting that the changes do not decrease the effectiveness of the PSP, and therefore, NRC approval of PSP Revision 9 was not necessary. Therefore, the staff is making no changes to license condition 14 on the PSP.

5 CONCLUSION

Under 10 CFR 72.42(a), the Commission may issue a renewed license if it finds that actions have been identified and have been or will be taken such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the design bases. In 10 CFR 72.42(a), the NRC requires the application for license renewal to include TLAAs and AMPs demonstrating that the SSCs important to safety will continue to perform their intended functions for the requested period of extended operation.

The NRC staff reviewed the LRA for GEH-MO, in accordance with NRC regulations in 10 CFR Part 72. The staff followed the guidance in NUREG-1927, NUREG-1801, NUREG-2191, and NUREG-1757, Volume 3. Based on its review of the LRA and the license conditions, the staff determines that the requirements of 10 CFR 72.42(a) have been met.

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DATE	Sep 2, 2022	Sep 19, 2022	Sep 8, 2022	Sep 15, 2022
OFFICE	NMSS/DFM/STLB	OGC/GCRPS /HLWFCNS/NLO	NMSS/DFM/STLB	
NAME	WWheatley *WW*	ACoggins *AC*	YDiaz-Sanabria *YD*	
DATE	Sep 20, 2022	Nov 8, 2022	Nov 22, 2022	

OFFICIAL RECORD COPY