GE Hitachi Nuclear Energy

Scott P. Murray
Manager, Facility Licensing

3901 Castle Hayne Road
P.O. Box 780
Wilmington, NC 28402
USA

T (910) 819-5950
scott.murray@ge.com

Proprietary Information Notice
Attachment 4 to this letter contains GEH ~~proprietary information~~ which is to be withheld from public disclosure in accordance with 10 CFR2.390. Upon removal of Attachment 4, the balance of this letter may be made public.

M220015

January 27, 2022

Kristina L. Banovac, Project Manager
Storage and Transportation Licensing Branch
Division of Fuel Management
Office of Nuclear Material Safety and Safeguards
US Nuclear Regulatory Commission

Attn: Document Control Desk

Subject: GEH Morris Operation (MO) Response for Request for Additional Information for the Technical Review of the Application for Renewal of the Morris Operation License NO. SNM-2500

References:

(1) NRC License SNM-2500, Docket 72-01
(2) Letter K. Banovac (NRC) to S.P. Murray (GEH), Request for Additional Information (RAI) for the Technical Review of the Application for Renewal of NRC License No. SNM-2500 dated 8/30/2021 - CAC/EPID NOS. 001028/L-2020-RNW-0024

GE Hitachi Nuclear Energy Americas LLC (GEH) hereby provides responses to the NRC request for additional information (Reference 2) pertaining to the application to renew Special Nuclear Material License SNM-2500 for the GEH Morris Operation (MO) Independent Spent Fuel Storage Installation (ISFSI), in Morris, Illinois.

Attached to this letter are GEH responses to the NRC RAIs.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge. Executed on January 27, 2022.

Please contact me at (910) 819-5950 if there are any additional questions.

Sincerely,

Scott P. Murray, Manager
Facility Licensing

Attachments:

1) GEH Affidavit
2) GEH Responses to RAIs 1 through 6
3) GEH CSAR Rev 15A (Draft), App A.8 Aging Management Program
4) GEH Morris SOP 16-17, Rev 5 (Draft) (Contains Proprietary Information)

Cc: US NRC Region III Administrator
SPM 22-008

Attachment 1
GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, Scott P. Murray, state as follows:

(1) I am the Manager, Licensing & Liabilities of GE-Hitachi Nuclear Energy (GEH), and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is provided in Attachment 4 to GEH's letter, M220015, Scott P. Murray to Kristina Banovac, entitled "GEH Morris Operation (MO) Response for Request for Additional Information for the Technical Review of the Application for Renewal of the Morris Operation License NO. SNM-2500", January 27, 2022. GEH proprietary information contained in Attachment 4 is identified by the statement "GEH Proprietary Information Withhold from Public Disclosure Pursuant to 10 CFR 2.390."

(3) In making this application for withholding of proprietary information of which it is the owner or licensee, GEH relies upon the exemption from disclosure set forth in the Freedom of Information Act (FOIA), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for trade secrets (Exemption 4). The material for which exemption from disclosure is here sought also qualifies under the narrower definition of trade secret, within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, <u>Critical Mass Energy Project v. Nuclear Regulatory Commission,</u> 975 F2d 871 (DC Cir. 1992), and <u>Public Citizen Health Research Group v. FDA</u>, 704 F2d 1280 (DC Cir. 1983).

(4) The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. Some examples of categories of information that fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GEH's competitors without license from GEH constitutes a competitive economic advantage over GEH and/or other companies.

b. Information that, if used by a competitor, would reduce their expenditure of resources or improve their competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product.

c. Information that reveals aspects of past, present, or future GEH customer-funded development plans and programs, that may include potential products of GEH.

d. Information that discloses trade secret and/or potentially patentable subject matter for which it may be desirable to obtain patent protection.

(5) To address 10 CFR 2.390(b)(4), the information sought to be withheld is being submitted to the NRC in confidence. The information is of a sort customarily held in confidence by GEH, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GEH, not been disclosed publicly, and not been made available in public sources. All disclosures to third parties, including any required transmittals to the NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary and/or confidentiality agreements that provide for maintaining the information in confidence. The initial designation of this information as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure are as set forth in the following paragraphs (6) and (7).

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, who is the person most likely to be acquainted with the value and sensitivity of the information in relation to

industry knowledge, or who is the person most likely to be subject to the terms under which it was licensed to GEH.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist, or other equivalent authority for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GEH are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary and/or confidentiality agreements.

(8) The information identified in paragraph (2) above is classified as proprietary because it contains details of GEH's processes, methods, design, or manufacturing facilities.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GEH's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GEH's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GEH. The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial. GEH's competitive advantage will be lost if its competitors are able to use the results of the GEH experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GEH would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GEH of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 27th day of January 2022.

Scott P. Murray
Scott P. Murray
GE-Hitachi Nuclear Energy Americas LLC

STATE OF NORTH CAROLINA)
)
COUNTY OF __NEW HANOVER)

Subscribed and sworn to me, a Notary Public, in and for the State of North Carolina, this 26th day of February 2021.

Morgan Datema
Notary Public in and for the
State of North Carolina

MORGAN DATEMA
NOTARY PUBLIC
NEW HANOVER COUNTY, NC
My Commission Expires 4-30-2022

My Commission Expires: April 30, 2022

Attachment 2

GEH RAI Responses

RAI-1. Justify the exclusion of the fuel basin crane, fuel handling crane, and cask crane from the aging management review. Revise the proposed CSAR supplement, as appropriate, to demonstrate that the effects of aging of the cranes will be adequately managed.

CSAR Section 11.3 includes the fuel basin crane, fuel handling crane, and cask crane that are determined to be structures, systems, and components (SSCs) important to safety within the scope of renewal. However, these SSCs are missing from the aging management review provided in Table 1, Aging Management Program Review, of CSAR Appendix A.8, Aging Management.

The NRC staff notes that CSAR Appendix A.8 designates the cranes and grapples as ancillary equipment important to safety that are on a routine maintenance schedule or inspected prior to use. Table 1 of CSAR Appendix A.8 includes the grapples subject to an aging management 2 review, but not the cranes. NUREG-1927 states that all important-to-safety SSCs should be within the scope of renewal and addressed with an aging management review. Also, 10 CFR 72.42(a) states that renewal applications should include descriptions of aging management programs (AMPs) for the management of aging issues for SSCs important to safety.

The staff notes that existing site processes can be credited for managing the effects of aging; however, the CSAR does not provide any details on the credible aging mechanisms and effects for the cranes or how the maintenance activities adequately manage the effects of aging.

This information is required to demonstrate compliance with 10 CFR 72.42(a)

GEH Response:

The CSAR (Rev 15A), Section A.8, Aging Management is being revised to include the fuel basin crane, fuel handling crane, and cask crane into Table 1, Aging Management Program Review. This table will discuss the Aging Management Program for these cranes. (See Attachment 3). Upon final approval of RAI's, and any potential follow-ups, CSAR (Rev 15A) changes will be formalized.

RAI-2. Justify the exclusion of the Zircaloy cladding from the aging management review. Revise the proposed CSAR supplement, as appropriate, to demonstrate that the effects of aging of the Zircaloy cladding will be adequately managed.

CSAR Section 11.3 includes the spent fuel cladding fabricated from stainless steel or Zircaloy, which is determined to be an SSC important to safety within the scope of renewal. However, the Zircaloy cladding is missing from the aging management review provided in Table 1 of CSAR Appendix A.8. The NRC staff notes that Table 1 of CSAR Appendix A.8 includes the stainless-steel cladding subject to an aging management review, but not the Zircaloy cladding. NUREG-1927 states that all important-to-safety SSCs should be within the scope of renewal and addressed with an aging management review. Also, 10 CFR 72.42(a) states that renewal applications should include descriptions of AMPs for the management of aging issues for SSCs important to safety.

This information is required to demonstrate compliance with 10 CFR 72.42(a).

GEH Response:

The CSAR (Rev 15A), Section A.8, Aging Management is being revised to include the Zircaloy cladding into Table 1, Aging Management Program Review. This table will discuss the Aging Management Program for the Zircalloy cladding. (See Attachment 3). Upon final approval of RAI's, and any potential follow-ups, CSAR (Rev 15A) changes will be formalized.

RAI-3. Clarify whether the coatings applied to the steel building structures are relied on to manage the aging effects for the SSCs within the scope of renewal and, if so, provide details on the type and quality of the coatings and the aging management activities that will ensure that the coatings remain intact. Revise the proposed CSAR supplement, as appropriate.

The "Detection of Aging Effects" program element of the Structures Monitoring AMP states that the 5-year visual inspections are supplemented with annual visual inspections for deterioration of the steel building structures due to corrosion and coating degeneration. Table 2 of CSAR Appendix A.8 provides acceptance criteria for coatings on the steel structures. However, the information for the coating materials is not included in the CSAR. It is unclear whether the coatings are credited with performing an important-to-safety function or protecting an important-to-safety component that meets the scoping criteria in NUREG–1927. An additional AMP may be necessary to manage protective coatings that perform an important-to-safety function.

This information is required to demonstrate compliance with 10 CFR 72.42(a)

GEH Response:

Yes, coatings (paint) applied to the steel building structures are relied on to manage aging effects (i.e., potential corrosion). The CSAR (Rev 15A), Section A.8, Aging Management is being revised to change the word "coating(s)" to "paint" (See Attachment 3). Upon final approval of RAI's, and any potential follow-ups, CSAR (Rev 15A) changes will be formalized. The "paint' is a standard industry use product to minimize corrosion of surfaces and materials under the paint. Painted steel structures are inspected annually by site personnel and every five years by an independent engineering consultant.

RAI-4. Clarify the inspection coverage in the Structures Monitoring AMP that demonstrates that potential aging-related degradation will be identified and appropriately evaluated. Revise the AMP in the proposed CSAR supplement, as appropriate.

The "Detection of Aging Effects" program element of the Structures Monitoring AMP states that the visual inspections will be performed every 5 years by qualified inspectors in accordance with Morris Operation Standard Operating Procedure (SOP) 16-17 and American Concrete Institute (ACI) 349.3R-02. As neither SOP 16-17 nor ACI 349.3R-02 has specific requirements for inspection coverage, the staff requires clarification of whether 100 percent of readily accessible surfaces will be inspected, or whether inspections will involve some justified lower extent of coverage.

This information is required to demonstrate compliance with 10 CFR 72.42(a)

GEH Response:

The CSAR (Rev 15A), Section A.8, Aging Management and SOP 16-17 (Rev 5), Fuel Storage System Inspection are being revised to clarify that the 5-year inspection will cover 100% of readily accessible areas (See Attachments 3 & 4). Upon final approval of RAI's, and any potential follow-ups, CSAR (Rev 15A) changes will be formalized.

RAI-5. Clarify inspection activities in the Structures Monitoring AMP for managing stress corrosion cracking and loss of material due to pitting and crevice corrosion of the fuel basin liner. Revise the AMP in the proposed CSAR supplement, as appropriate, to demonstrate that the effects of aging of the liner will be adequately managed.

The Structures Monitoring AMP in the CSAR states that the AMP elements are consistent with those in AMP XI.S6 (Structures Monitoring) from NUREG-1801, Rev. 2. NUREG-1801, Rev. 2 and NUREG-2191 recommend the Water Chemistry AMP and monitoring of the spent fuel pool water level and leakage from the leak chase channels to manage cracking due to stress corrosion cracking and loss of material due to pitting and crevice corrosion of the fuel pool liner. However, the Structures Monitoring AMP in the CSAR includes various inspection activities at 5-year intervals, the details of which are unclear.

The "Detection of Aging Effects" program element of the Structures Monitoring AMP states that qualified inspectors will examine the stainless-steel basin liner at 5-year intervals. Table 1 of CSAR Appendix A.8 identifies stress corrosion cracking and loss of material due to pitting and crevice corrosion as credible aging effects/mechanisms for the liner. The parameters inspected in the "Parameters Monitored or Inspected" program element and the acceptance criteria for the stainless steel liner in Table 2 of CSAR Appendix A.8 are associated with evidence of bulges or depressions in the liner plate, the measurement of leakage rate via the leak chase channels, and monitoring of the basin water chemistry.

Provide the following clarifying details of the liner inspections in the Detection of Aging Effects AMP element:

1. Clarify which of the five listed basin inspection/monitoring activities includes the periodic, 5-year, inspections of the liner plate. The staff notes that activity "c" cites a 5-year inspection, but it does not specifically mention the liner. Activity "d" appears that it may address the liner, but only in the context of an opportunistic inspection when fuel baskets are moved.

2. Describe the area of coverage of the 5-year inspections of the liner plate (i.e., to what extent the liner is normally accessible and inspected for these periodic inspections).

3. Explain how evidence of bulges or depressions in the liner plate are indicators of cracking and loss of material of the plate.

This information is required to demonstrate compliance with 10 CFR 72.42(a).

GEH Response:

1. The visual inspection of the stainless-steel liner occurs IAW SOP 16-17. On an annual basis, site personnel perform the inspection, looking for abnormalities in the normally accessible surfaces of the liner. The 5-year inspection, as noted in SOP 16-17, Section 4.15, incorporates Table 1 and Table 2 of CSAR A.8. This also includes readily accessible surfaces. The CSAR (Rev 15A), Section A.8, Aging Management is being revised to add stainless-steel liner to "b" and "c" of the scope of Basin

Inspection/Monitoring Activities (See Attachment 3). SOP 16-17 already states the 5-year inspection will include items in Table 2 of CSAR A.8, which includes the stainless-steel liner. Therefore, no change is needed for SOP 16-17. Upon final approval of RAI's, and any potential follow-ups, CSAR (Rev 15A) changes will be formalized.

2. The area of coverage of the 5-year inspections of the liner plate would include a visual inspection of readily accessible areas from the basin walkways, and basin crane. This would include all of the Basin Unloading Pit and Transfer Aisle, basin walls above the fuel bundles (where they are next to the walls), and basin floor and walls where fuel baskets do not immediately impede visual access.

3. Evidence of bulges or depressions in the liner plate will not necessarily be an indicator of cracking and loss of material of the plate. It is a general observation of an abnormality that could indicate degradation. This indicator may lead to further investigation, as necessary. SOP 16-17 (Rev 5), Fuel Storage System Inspection, Section 3.2 is being revised to align closer to monitoring parameters listed in the CSAR, A.8 (See Attachment 4). This will include adding an annual review of historical data for basin water level, and Basin Water quality (i.e., conductivity). It will be clarified that bulges and/or depressions are potential indicators of liner damage not associated with corrosion. Upon final approval of RAI's, and any potential follow-ups, SOP 16-17 (Rev 5) changes will be formalized.

RAI-6. Clarify the role of the acceptance criteria for the basin water radioactivity for the management of the effects of aging in the Water Chemistry AMP, and revise the AMP in the proposed CSAR supplement, as appropriate.

The "Acceptance Criteria" program element of the Water Chemistry AMP states that basin water has the following radioactivity and conductivity limits:

a) Conductivity must be <1.35 µMho/cm.
b) Basin water activity (gross beta) must be less than 0.02 µCi/ml

CSAR Section 10.4.5, Basin Water Chemical Characteristics, states that a conductivity value of 1.35 µMho/cm is equivalent to a pH value of 5.5 to 8.0, which is commensurate with a benign environment for fuel and equipment stored in the basin water. Technical Specification 4.6, Basin Water Radioactive Contaminants, states that the basin water beta activity value of 0.02 µCi/ml is consistent with current decontamination practices, above which additional basin water cleanup measures shall be initiated. The technical specification and the CSAR (Sections 4.3.8.2, 5.5.2.2, 7.3.2, 7.5, 10.4, 10.4.6) further indicate that this activity level assures that concentration of radioactive materials remain as low as is reasonably achievable (ALARA), in terms of radiation protection and keeping exposures ALARA. However, it is not clear how the basin water activity level is an indication of age-related degradation (i.e., how an aging mechanism is linked to this monitored parameter). Also, if this activity level is tied to degradation of an SSC (or fuel), clarify how this value is chosen as an acceptance criterion for timely identification of an aging effects and implementation of corrective actions.

This information is required to demonstrate compliance with 10 CFR 72.42(a).

GEH Response:

In terms of using basin water activity as an age-related degradation indicator for an SSC, it needs to be clear that using this indicator will primarily only apply to the Spent Fuel Cladding, which is listed as one of the SSC's Important-to-Safety, as stated in the CSAR (Section 11.3 & A.8, item "m"). Also, it should also be noted, this parameter is used in conjunction with other day-to-day monitored plant parameters (i.e., Area Radiation Monitors, Criticality Monitors, Air Monitors, etc.) to assist in the determination of potential degradation of this particular SSC, and not solely relied on to provide the degradation indication. Simply put, if the Spent Fuel Cladding were to degrade enough, radioisotopes from the fuel would be released into the basin pool water. Using plant operational experience going back to 1997, we know that average gross beta activity for the fuel basin is ~5.4E-4 uCi/ml, with a maximum of 4.8E-3 uCi/ml noted in 2004 due to an extended basin filter shutdown period for testing. Any sharp rise in gross beta activity could be an early indicator of the cladding degradation.

The actual technical specification value for gross beta in the basin water, up until 2004, was 0.1 uCi/ml. This value was determined in previous technical specifications/licensings due to the facility actually performing shipping campaigns and receiving spent fuel during previous licensing periods. The technical specification stated, however, once gross beta levels reached 0.02 uCi/ml, cleanup measures shall be initiated. The NRC would be notified once gross beta levels reached 0.1 uCi/ml, and all fuel receiving operations would be halted until levels were, once again, below 0.1 uCi/ml. During the re-licensing from 2000-2004, since receiving operations were no longer conducted, it was determined to just drop the gross beta value from 0.1 uCi/ml to the "cleanup" value of 0.02 uCi/ml. There was no specific calculation made for the 2000-2004 re-licensing change made. It was just a more conservative value than previous technical specifications.

M220015
US NRC
1/27/22

Attachment 3

GEH Morris CSAR, Rev 15A (Draft), A.8 Aging Management Program

A.8 AGING MANAGEMENT

This appendix provides a summarized description of the activities for managing the effects of aging at GEH-MO. The evaluations of time-limited aging analyses (TLAAs) for the renewal period are also presented.

An assessment of the GEH-MO inspection activities identified new and existing activities necessary to provide reasonable assurance that Systems, Structures, and Components (SSC) within the scope of license renewal will continue to perform their intended functions consistent with the current licensing basis (CLB) for the renewal period. This section describes these aging management activities.

This section also discusses the evaluation results for each of the applicable SSCs specific time-limited aging analyses (TLAAs) performed for license renewal. The evaluations have demonstrated that the analyses remain valid for the renewal period; the analyses have been projected to the end of the renewal period; or that the effects of aging on the intended function(s) will be adequately managed for the renewal period.

GEH-MO is an away from reactor ISFSI storing spent fuel under 10CFR72 license until such time that the fuel may be shipped off-site for final disposition. The fuel storage basins at GE-MO are designed for below grade storage. Accordingly, the exterior materials can withstand the anticipated effects of "weathering" under normal conditions.

Structures, systems and components at GEH-MO that, while not performing a safety-related function, but do perform a function that demonstrates compliance with NRC regulations on environmental qualification, are identified in the CSAR, section 11, paragraph 11.3, as follows:

11.3 STRUCTURES, SYSTEMS, AND COMPONENTS IMPORTANT TO SAFETY
No credible event, planned discharge, or design basis accident at GEH-MO is identified that would expose a member of the public to radiation in excess of limits specified in 10 CFR 72.104 or 10 CFR 72.106.

It is, therefore, the position of GEH-MO that the term "basic components" in the sense defined by 10 CFR 21.3(a)(2) and 10 CFR 21.3 (m) is not applicable to GEH-MO.

However, "structures systems and components important to safety" as promulgated in 10 CFR 72.122, "Overall Requirements" are identified below.

a. Fuel storage basin (FSB) - concrete walls, floors, and expansion gate are principal elements in protection of stored fuel, and in isolation of basin water from the environment.

b. Fuel storage basin - stainless steel liner forms a second element in fuel protection and basin water isolation, facilitating decontamination.
c. Fuel storage system, including baskets and supporting grids is a principal element in protection of stored fuel.
d. Steel expansion gate – Identified as Gate #4, along the south east corner of fuel basin II. The gate is constructed of reinforced concrete with a thickness of 8" and height and width dimensions of 29'-6" and 5'-0", respectively. The water side of the gate is lined with 16-gauge stainless steel to prevent the reinforced concrete from coming into contact with the water in the basin.
e. Unloading pit doorway guard - is designed to prevent a loaded fuel basket from being tipped so that fuel bundles could fall into the cask-unloading pit. The unloading pit doorway guard is an element in protection of fuel during movement of a loaded basket.
f. Filter cell structure (FCS) - the concrete cell part of the basin pump room area provides radiation shielding to reduce occupational exposure.
g. Fuel Storage Basin building – the steel structure that surrounds/protects the fuel Basins.
h. Fuel Basket Grapple – Used to remove the fuel baskets from their storage location in the fuel basin support grid.
i. Fuel Grapple – Used to remove the fuel bundles from the fuel baskets when they are in the unloading pit.
j. Fuel Basin Crane – Crane utilized to move the full fuel baskets to the unloading pit.
k. Fuel Handling Crane – Crane used to remove the fuel bundles from the fuel storage baskets and place into a cask.
l. Cask Crane – 125 Ton overhead crane used to lift a fully loaded cask from the unloading pit and place cask onto transport vehicle.
m. Spent Fuel Cladding – Fuel in GE-MO basins are clad with SS or zircaloy cladding.

However, since these systems do contain the stored fuel or provide support functions, they have been reviewed for aging management. These SSCs are organized in accordance with NUREG 1801 in Table 1 of this appendix.

STRUCTURES MONITORING AGING MANAGEMENT PROGRAM (AMP)

As identified in Table 1, SSCs involving concrete or structural steel, and necessitating periodic examination, are inspected and monitored according to this Structures Monitoring AMP. AMP elements are consistent with those in XI.S6 from NUREG 1801 Rev. 2 and are as follows:

Scope of Program – Inspection and monitoring of SSCs important to safety ensures there is no loss of function. This is facilitated with periodic examinations and select monitoring in accordance with this AMP. The SSCs identified during the AMR that are covered by this AMP are denoted as "Structures Monitoring" in Table 1.

Preventative Actions – Preventative actions delineated in NUREG-1339 are not applicable to the fuel basin building structure, as bolting used for construction does not form a pressure boundary, is not a reactor internal component, and does not involve high strength >150ksi bolts. Bolted connections used to construct the basin building structure are, however, inspected every 5 years by qualified personnel in accordance with SOP 16-17. Preventative actions for inaccessible portions of concrete and liner structures include maintenance of water chemistry within approved license specifications through continuous filtration and addition of ultra-pure water (typically 0.056 μmho/cm) as needed to maintain basin level (see Water Chemistry AMP).

Parameters Monitored or Inspected – For each structure / aging effect combination designated as "Structures Monitoring" in Table 1, the following parameters are inspected:

Concrete Structures: loss of material, cracking, increase in porosity and permeability, loss of foundation strength, and reduction in concrete anchor capacity due to local concrete degradation.

Steel Structures including Galvanized Steel: loss of material due to corrosion of any kind.

Stainless Steel Basin Liner: evidence of bulging or depressions and leakage rate via leak detection channels.

Structural Bolting: loose bolts, missing or loose nuts, and other conditions indicative of loss of preload. Loss of material due to general, pitting, and crevice corrosion.

Ground Water Quality: Ground water chemistry (pH, chlorides, and sulfates) are monitored periodically to assess its impact, if any, on below grade concrete structures.

Detection of Aging Effects – Aging is detected by periodic visual inspections for each structure / aging effect denoted in Table 1. Parameters are examined every 5 years by qualified inspectors in accordance SOP 16-17. This SOP incorporates relevant sections of ACI 349.3R and suggested parameters from the NUREG 1801, XI.S6 AMP. Additionally, ground water quality is periodically sampled to ensure a non-aggressive environment for inaccessible concrete structures.

The purpose of the GEH-MO Inspection Activities is to:

1. Determine that no significant deterioration of the basin structure has occurred, such that it can still perform its intended function, and

2. Confirm that no significant degradation of the fuel storage components in the basin has occurred.

The scope of the Basin Inspection / Monitoring Activities involves;

a) Triennial monitoring of ground water for chemical species that can deteriorate the basin and filter structure inaccessible concrete.
b) Annual visual broad inspections of exposed concrete, stainless-steel liner, and building structures housing spent fuel. These inspections will typically include 100% of readily accessible surfaces.
c) 5-year visual inspections by qualified inspectors of exposed concrete, stainless-steel liner, and building structures. These inspections will typically include 100% of readily accessible surfaces.
d) Visual inspection of normally inaccessible components of the fuel storage system in the event a basket is lifted in preparation for movement.
e) Continuous monitoring of the leak detection sump level.

Visual inspections identify physical degradation of the exposed surfaces of the concrete structures, and stainless-steel liner. These inspections will typically include 100% of readily accessible surfaces. Qualified inspectors examine the fuel storage basin concrete, building structure and liner at 5-year intervals relative to the requirements of ACI 349.3R. These examinations are supplemented with annual inspections by operations staff for deterioration of the concrete due to loss of material, cracking or spalling, and steel building structures due to corrosion and paint degeneration. A visual inspection of normally inaccessible components in the basin, baskets, grid, basin liner, if/when they are moved will identify degradation of the material resulting from corrosion. Inspections provide reasonable assurance that any degradation of the fuel storage system is identified.

Monitoring and Trending – All SSCs covered by the Structures Monitoring AMP are non-safety related as defined in 10CFR50.65. These structures have been ranked based on risk significance and are monitored based on condition. Results from condition monitoring activities are analyzed against predetermined goals annually in accordance with SOP 16-17. Deficiencies are corrected commensurate with the associated safety significance and may necessitate adjustments to monitoring frequency and/or implementation of trending for structures with high risk significance.

The basin leak detection system continuously monitors the sump level via the Site Instrumentation Monitoring System (SIMS) and constantly displays the level on a monitoring screen. Alarms are triggered if the level exceeds pre-set values.

The eight NRC reviewed and approved ground water sampling wells at MO are used to monitor for any potential leakage of basin water to the surrounding soil. The wells are sampled routinely per SOP 16-102, Sample Well Analysis Compliance Test. In addition, at least 1 of 3 of the wells positioned around the basin are used to monitor ground water for potential effects on below grade concrete.

Acceptance Criteria - Table 2 summarizes acceptance criteria based on the type of inspection and the associated structure.

Corrective Actions - Visual inspection acceptance criteria are based on the absence of indications that are signs of degradation. Engineering evaluations determine whether observed deterioration of material condition is significant enough to compromise the ability of the SSC to perform its intended function. Occurrence of degradation that is adverse to quality will be entered into the Corrective Action System. Alarm panel response procedures identify the various criteria for the different fuel storage system monitoring devices at GEH-MO and specify any required corrective actions and responses.

Confirmation Process - The process of confirmation is controlled by the Morris quality program and is consistent with the requirements of 10CFR72, Subpart G.

Administrative Controls – Administrative controls are governed by the Morris quality program. This program implements controls that are consistent with the requirements of 10CFR72, Subpart G.

Operating / Industry Experience - A review of the results of SOP 16-17, Fuel Storage System Inspection, indicates that although there is some degradation visible in some of the painted structures, there is no visible evidence that the concrete or stainless steel structures that are accessible for inspection are degrading/degraded to any extent that would indicate their functionality has in any way changed over the review period. The inspections have been conducted by veteran operators, one of which has been employed at MO for over 40 years. Minor paint issues are addressed as they are observed and due to the humid conditions in the area of the fuel pools, these minor issues are to be expected.

Regulatory information presented in NUREG-1522 and NUREG/CR-6927 was also reviewed to ensure degradation parameters selected for the identified structures were consistent with the published findings. This review concluded that the aging mechanisms described in NUREG-1801 for fuel storage facilities do indeed cover the concrete and steel deteriorations noted in NUREG-1522 and NUREG/CR-6927. It should also be noted that the concrete structures at GEH-MO were designed and constructed in accordance with the applicable national standards, specifically ACI 318-63, and meet conditions consistent with longevity as described by the Gall Report.

WATER CHEMISTRY AMP

As identified in Table 1, SSCs constructed from stainless steel, and necessitating maintenance of water chemistry, are maintained according to this Water Chemistry AMP. AMP elements are consistent with those in XI.M2 from NUREG 1801 Rev. 2 and are as follows:

Scope –Maintenance of water chemistry in contact with stainless steel SSCs ensures there is no material loss that would affect the functionality of structures important to safety. This is facilitated by water replenishing / filtering systems in combination with periodic monitoring in accordance with this AMP. The stainless steel SSCs identified during the AMR that are managed with this AMP are denoted as "Water Chemistry" in Table 1.

Preventative Actions – This AMP involves SOPs that specify limits for the total amount of radioactivity and conductivity in the fuel basin water, sampling and analysis frequencies, and corrective actions for control of water chemistry. Fuel Basin water chemistry is controlled to minimize contaminant concentration thereby mitigating loss of material due to general, crevice, and pitting corrosion and cracking caused by SCC. Water chemistry is maintained within approved license specifications through continuous filtration and addition of ultra-pure water (typically 0.056 μmho/cm) as needed to maintain basin level.

Parameters Monitored / Inspected – Gross Beta and Conductivity

Detection of Aging Effects – Aging is mitigated by maintenance of basin water for structures in Table 1 involving stainless steel by:

a) Continued analysis of fuel storage basin water quality in accordance with a Compliance Test insuring conformity to license specifications.
b) Monthly sample analysis of water from the Basins using an independent lab.

Monitoring and Trending – Basin water radioactivity and conductivity is periodically recorded, evaluated and trended in accordance with SOP 16-10.

Acceptance Criteria – Basin water has the following radioactivity and conductivity limits:

a) Conductivity must be <1.35 μMho/cm.
b) Basin water activity (gross beta) must be less than 0.02 μCi/ml

Corrective Actions – Non-compliant samples indicating conditions adverse to quality will be entered into the Corrective Action System. Alarm panel response procedures identify the various criteria for the different fuel storage system monitoring devices at GEH-MO and specify any required corrective actions and responses.

Confirmation Process – The process of confirmation is controlled by the Morris quality program and is consistent with the requirements of 10 CFR 72 Part G.

Administrative Controls – Administrative controls are governed by the Morris quality program. This program implements controls that are consistent with the requirements of 10 CFR 72 Part G.

Operating Experience - All SSC's in the basin are 304 Stainless Steel. Per IAEA-TECDOC-1012, "Durability of Spent Nuclear Fuels and Facility Components in Wet Storage", SS wet storage facility components have excellent histories of durability in periods approaching 40 years provided that good water chemistry control is maintained. The GE-MO basin water chemistry provides an excellent media for SS materials. Combining the basin liner coupon examination, and the guidance from the IAEA Report, corrosion is minimal and should have little or no impact on the basin liner or other stainless-steel components of the fuel storage (baskets and supporting grid) system for the term of the license renewal. In addition, all of these components have been in a static mode since the last fuel receipt in January 1989, so there also hasn't been any mechanical wear.

As shown in GE-MO 72.48 prepared February 16, 1996, conductivity is a more accurate way to measure ultra-pure water quality than pH and a conductivity value of 2.5 μmho/cm was established, corresponding to a pH of 4.5 to 9.0 in keeping with the reference license specification. The 2004 GE-MO 72.48 lowers that value to 1.35 μmho/cm for the basin water, equivalent to a pH value of 5.5 to 8.0. This change is in keeping with the requirements in NUREG 1801, Chapter III establishing a lower limit of 5.5 pH for water as non-aggressive to concrete or stainless steel. This value is also representative of the typical GE-MO basin water quality. Since March 1976 the average basin water conductivity has been 1.07 μmho/cm. There are no sources for NaNo3 and Cl in the basin environment and values for these materials repeatedly are below detectable limit. During a recent test, basin water makeup, cooling and filtration were discontinued for a period of 50 days resulting in an actual conductivity increase to 1.22 μmho/cm. A conductivity value of 1.35 μmho/cm also provides a much lower tolerance for ionic impurities allowing the elimination of NaNo3 and Cl measurements since values well below 5 ppm of either cause conductivity to significantly increase beyond 1.35 μmho/cm.

ANCILLARY EQUIPMENT IMPORTANT TO SAFETY

All cranes are maintained in compliance with the requirements specified in 10 CFR 1910.179 (OSHA) and tracked by our Preventive Maintenance (PM) program described in MOI 401. The cranes are inspected, and routine maintenance items performed quarterly by on-site Maintenance personnel per the manufacturers recommended schedule. Annually, an independent inspection company performs a complete inspection, including non-destructive testing, of all cranes and hoists on site.

All grapples and miscellaneous tooling used for moving fuel bundles or fuel baskets are laid away. Each tool will undergo thorough inspection and testing to insure it complies with the original manufacturers specifications prior to utilizing it for lifting any fuel bundle or basket. When in use, these tools are only exposed to treated water described in the Water Chemistry AMP.

FUEL BASIN LINER TLAAs

In June 1993, the fuel storage basin was inspected to confirm expectations of continued structural integrity, as well as confirm the absence of microbe-induced corrosion (MIC). To confirm and document the integrity of the liner, a routine inspection plan was developed in accordance with ASME Boiler and Pressure Vessel Code and other industry approved IVVI procedures. The inspection plan included use of underwater TV cameras to inspect the basin welds.

The results of this inspection showed, that based on high-resolution visual inspection and surface examination, the basin liner is judged to have continued integrity, with no environmental degradation associated with 20+ years of fuel storage. Also, considering the continuous maintenance of high purity water flow in the fuel storage basins continued long-term service is indicated.

The above is detailed in report GENE 689-013-0893, "Morris Fuel Recovery Center Fuel Storage Basin Liner Visual Examination Summary Report", dated September 1993.

Additionally, in 1994 an approximately 1.5" x 3.5" coupon was cut from the basin liner in the cask unloading pit. This area then had a patch welded over it. The sample was sectioned for optical metallography and scanning electron microscopy (SEM). Cross sectional views did not find evidence of significant surface attack, and the maximum surface penetration was 0.4 mils. SEM examination of the surface found oxide deposits, which is expected for a stainless steel that has been exposed to a water environment for 20+ years. Chemical analysis of the deposits determined the composition to be mostly iron oxide. No detrimental chemical species were found. No evidence of MIC phenomena was observed.

The nominal liner wall thickness in the unloading pit is 0.125 inches. Assuming the degradation occurred over 20 years and the corrosion rate remained constant, the liner would not be penetrated for the foreseeable future.

See report number GENE-689-003-0494, "Morris Fuel Recovery Center Fuel Storage Basin Liner Metallurgical Evaluation"; dated May 1994.

FUEL BUNDLE STORAGE

In broad, generic terms, the design and operation of the GEH-MO spent fuel pool is similar to a spent fuel storage pool at a nuclear power plant and some aspects of the reference NUREGs may be applicable, however, significant differences between GEH-MO basins and support systems and a nuclear power plants fuel storage basins and the fuel stored in both must also be taken into account. The GE-MO basins are below ground, in native bedrock, water level is maintained at or below grade level. All stored fuel is held in GEH-MO unique stainless-steel baskets (CSAR Section 5.0, ¶ 5.4.4.2) that are a "can" style container minus a lid, providing individual support and additional containment and shielding for each fuel bundle. Fuel is not routinely shuffled nor is new fuel added unlike the spent fuel pool in a nuclear power plant, (last fuel moved was January 1989) and there are no plans to do so. The static state of the GEH-MO fuel assures there are no mechanical or dynamic stresses placed on the fuel. The large basin water volume and low decay heat input from the stored fuel provide an extended period of time to take corrective action in case of a malfunction of any of the basin support systems. In the event of an earthquake or other extreme natural phenomena, sufficient makeup water is available through either on-site or off-site means to maintain safe storage conditions.

Fuel stored at GEH-MO has reactor discharge dates that range from April 1970 through October 1986. The last fuel was received at GEH-MO in January 1989. Burnup rates range from a high of 36.71 GWD/MTU to a low of 0.18 GWD/MTU, and an average burnup of 17.74 GWD/MTU. Due to the robust design of the pool (CSAR Section 5.0, ¶ 5.5) and the time interval from reactor discharge, there are no postulated events that would result in exposure to a member of the public in excess of the limits of 10CFR72.104, as stated in the CSAR, Section 8.0, ¶ 8.1.1. The condition of the fuel is monitored as part of routine activities conducted at GEH-MO through basin water analysis and air quality monitoring. The design of the pool, and operational requirements for the basin area assure a depth of water over the stored fuel, which provides for extended passive heat dissipation capability. In May of 2004, a test was performed in to demonstrate the water quality would be minimally affected if there were a total loss of the Basin cooling and filtration systems. Results of the test revealed the conductivity approached 1.24μmho/cm, well below the license specification. Also demonstrated in the test was that heat dissipation from the basin was adequate as the basin water temperature reached a mere 123°F. Basin water level decreased to the 46' 9" el., 9' 6" above the upper most portion of the fuel bundle, leaving an additional 6" before reaching the license limit of 9' above the upper most part of the fuel bundle.

In general, safe storage of the spent fuel is achieved by maintaining the integrity of the fuel cladding through maintaining a high quality of basin water (CSAR Section 10.0, ¶ 10.4.5) and substantiated by IAEA-TECDOC-1012, "Durability of Spent Nuclear Fuels and Facility Components in Wet Storage". Fuel cladding is designed to withstand a far more severe environment in a reactor than in static storage at GEH-MO. The low temperature conditions, removal of both particulate and ionized impurities from the basin water, and absence of chemical materials provides high water clarity, limits corrosion and maintains radiation exposure rates in the vicinity of the basin as low as reasonably achievable. The cladding provides an effective primary barrier to the escape of fission or activation products from stored fuel. The basin water is an effective secondary barrier for the confinement of the small amounts of radioactive materials that may be released from the spent fuel.

The GEH-MO radiation protection program is previously established in the current approved revision of the GEH-MO Consolidated Safety Analysis Report (CSAR) Section 7.0, Radiation Protection. Subsection 7.7, Estimated Man-Rem Off Site Dose Assessment, specifies the current approved environmental monitoring program. Under normal operating conditions, Kr-85 provides essentially all the exposure from the GEH-MO ventilation exhaust stack. The sum of the values for annual whole-body exposure due to inhalation and skin dose out to a radius of 50 miles gives a total of less than 2×10^{-6} man-Rem/yr whole body and less than 0.12 man-Rem skin dose. Routine air samples continue to show that exhaust emissions are below detectable limit, as follows:

	Vent Supply	Stack Inlet
Alpha (µCi/ml)	3.0×10^{-13}	MDA ($\sim 3 \times 10^{-15}$)
Beta (µCi/ml)	6.0×10^{-13}	MDA ($\sim 3 \times 10^{-15}$)

The vent supply is air intake to the facility and stack inlet is air being released to the exhaust stack.

There are no planned or unplanned releases of liquid wastes from the site boundaries.

Analysis of postulated accidents including the causes of such events, consequences, and the ability of GEH-MO to cope with each are previously established in the CSAR, Section 8.0, Accident Safety Analysis. The Structures, Systems, and Components (SSCs) Important to Safety are described in Section 11.0, Quality Assurance. Both have been in the CSAR since the original Part 50 license, SNM-1265 was issued for GEH-MO and were included during the 1979 license renewal application and subsequent issue of the current Part 72 license SNM-2500 in 1982. As such, both are considered part of the original licensing basis for Morris Operation. Given the robust design of the Morris pool and the passive nature of the SSCs Important to Safety, no scenario involving a support system would result in an exposure to the public in excess of the criteria established in 10CRF72.104.

The current approved safety basis for the Morris facility as defined in the CSAR, designated items important to safety (CSAR Section 11.0, sub-section 11.3) demonstrates that no accident postulated (CSAR Section 8.0) will result in exceeding the limits of 10 CFR 72.104 and 10 CFR 100.20 to demonstrate protection of the public.

As shown in CSAR Sections 7.0 and 8.0, the low value of credible doses which could be received from normal operating and credible accident releases are many orders of magnitude below regulatory limits.

Unlike similar support systems at a nuclear power plant, the combination of the GEH-MO radiation safety program, accident analysis and functional classification of equipment demonstrates that failure of a SSC supporting fuel storage basin operation will not cause an immediately reportable event. Ample time has been demonstrated for repair, temporary substitution, or permanent replacement of any SSC to prevent any Technical Specification violation and without exceeding any regulatory limits for radiation exposure is postulated.

Summary

Based on the reference information supplied in IAEA-TECDOC-1012, "Durability of Spent

Nuclear Fuels and Facility Components in Wet Storage", and NUREG 1801, "Generic Aging Lessons Learned (GALL) Report", the effects of aging are minimal and will be adequately managed for the duration of the license period through the GE-MO Aging Management Program.

Aging Management Program Review
Table 1

Item	Link	Structure and/or Component	Material	Environment	Aging Effect / Mechanism	Aging Management Program (AMP)	Further Evaluation
III STRUCTURES AND COMPONENT SUPPORTS A5 Group 5 Structures (Fuel Storage Facility, Refueling Canal)							
III.A5.TP-25	III.A5-2 (T-03)	FSB/FCS Concrete (accessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	"Structures Monitoring"	No
III.A5.TP-27	III.A5-4(T-05)	FSB/FCS Concrete (accessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	"Structures Monitoring"	No
III.A5.TP-23	III.A5-6(T-01)	FSB/FCS Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	"Structures Monitoring"	No
III.A5.TP-24	III.A5-7(T-02)	FSB/FCS Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	"Structures Monitoring"	No
III.A5.TP-26	III.A5-9(T-04)	FSB/FCS Concrete (accessible areas): interior	Concrete	Air – indoor, uncontrolled or Air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling)	"Structures Monitoring"	No

		and above-grade exterior			due to corrosion of embedded steel		

Item	Link	Structure and/or Component	Material	Environment	Aging Effect / Mechanism	Aging Management Program (AMP)	Further Evaluation
III.A5.TP-204	III.A5-2(T-03)	FSB/FCS Concrete (inaccessible areas): all	Concrete	Any environment	Cracking due to expansion from reaction with aggregates	The concrete structures at GEH-MO were designed and constructed in accordance with ACI 318-63 and meet conditions for longevity as described by the Gall Report. Aggregates per ACI 318-63 conform with ASTM C33 "Specifications for Concrete Aggregates" as referenced by ASTM C295.	No
III.A5.TP-212	III.A5-4(T-05)	FSB/FCS Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	"Structures Monitoring"	No
III.A5.TP-29	III.A5-5(T-07)	FSB/FCS Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Ground water/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	"Structures Monitoring"	No
III.A5.TP-67	III.A5-7(T-02)	FSB/FCS Concrete (inaccessible areas): exterior	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength	N/A - There are no exterior GEH-MO concrete structures in contact with untreated flowing water.	N/A

		above- and below-grade; foundation			due to leaching of calcium hydroxide and carbonation		

Item	Link	Structure and/or Component	Material	Environment	Aging Effect / Mechanism	Aging Management Program (AMP)	Further Evaluation
III.A5.TP-108	III.A5-6(T-01)	FSB/FCS Concrete (inaccessible areas): foundation	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	N/A. There are no GEH-MO inaccessible areas are subject to outdoor air.	N/A
III.A5.TP-114	III.A5-1(T-10)	FSB/FCS Concrete: all	Concrete	Air – indoor, uncontrolled	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	N/A. There are no GEH-MO concrete structures subject to temperatures above 150°F	N/A
III.A5.TP-30	III.A5-3(T-08)	FSB/FCS Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	"Structures Monitoring" GEH-MO does not have a de-watering system.	No
III.A5.TP-31	III.A5-8(T-09)	FSB/FCS Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing under foundation	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	"Structures Monitoring" GEH-MO does not have a de-watering system.	No

III.A5.TP-28	III.A5-10(T-06)	FSB/FCS Concrete: interior; above-grade exterior	Concrete	Air – indoor, uncontrolled or Air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	"Structures Monitoring"	No

Item	Link	Structure and/or Component	Material	Environment	Aging Effect / Mechanism	Aging Management Program (AMP)	Further Evaluation
III.A5.TP-300		High-strength structural bolting	Low-alloy steel, actual measured yield strength ≥ 150 ksi	Air – indoor, uncontrolled or Air – outdoor	Cracking due to stress corrosion cracking	N/A. There are no GEH-MO structures secured with High-strength (≥ 150 ksi) bolts.	N/A
III.A5.T-12	III.A5-11(T-12)	Masonry walls: all	Concrete block	Air – indoor, uncontrolled or Air – outdoor	Cracking due to restraint shrinkage, creep, and aggressive environment	N/A. There are no masonry structures at GEH-MO.	N/A
III.A5.TP-34		Masonry walls: all	Concrete block	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	N/A. There are no masonry structures at GEH-MO.	N/A
III.A5.TP-302	III.A5-12(T-11)	FSB Building Steel components: all structural steel	Steel	Air – indoor, uncontrolled or Air – outdoor	Loss of material due to corrosion	"Structures Monitoring"	No
III.A5.T-14	III.A5-13(T-14)	FSB S-Steel components: fuel pool liner, Grapples, Doorway Guard, Expansion Gate, Fuel Cladding	Stainless steel	Treated water or Treated borated water	Cracking due to stress corrosion cracking; Loss of material due to pitting and crevice corrosion	"Water Chemistry" and "Structures Monitoring" Additionally, spent fuel pool water level is maintained in accordance with SOP 1-10 technical specifications and leakage from the leak chase channels is monitored in accordance with SOP 1-27. TLAAs involving IVVI inspections and liner coupon extractions provide additional	No, unless leakages have been detected through the SFP liner that cannot be accounted for from the leak chase channels

						support that water chemistry control is effective at managing aging effects.	
N/A	N/A	FSB Zircaloy components: Fuel Cladding	Zircaloy	Treated water or Treated borated water	Cracking due to stress corrosion cracking; Loss of material due to pitting and crevice corrosion	"Water Chemistry" and "Structures Monitoring" Additionally, spent fuel pool water level is maintained in accordance with SOP 1-10 technical specifications and leakage from the leak chase channels is monitored in accordance with SOP 1-27. TLAAs involving IVVI inspections and liner coupon extractions provide additional support that water chemistry control is effective at managing aging effects.	No, unless leakages have been detected through the SFP liner that cannot be accounted for from the leak chase channels

Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect / Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
III.A5.TP-261		FSB Building Structural bolting	Any	Any environment	Loss of preload due to self-loosening	"Structures Monitoring"	No
III.A5.TP-248		FSB Building Structural bolting	Steel	Air – indoor, uncontrolled	Loss of material due to general, pitting and crevice corrosion	"Structures Monitoring"	No
III.A5.TP-274		FSB Building Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, and crevice corrosion	"Structures Monitoring"	No

Item	Link	Structure and/or Component	Material	Environment	Aging Effect / Mechanism	Aging Management Program (AMP)	Further Evaluation
XI.M23		Fuel Basin Crane, including bridge and trolley	Structural steel	Air – indoor, uncontrolled	Cumulative fatigue damage / fatigue. Loss of material / General corrosion & wear.	Maintained under the GEH-MO preventive maintenance program and inspected in accordance with the requirements specified in 10 CFR 1910.179 and ANSI B30-2. Yearly inspections are performed by an independent contractor whose crane inspection services are accredited by the U.S. Department of Labor under 29 CFR 1919; to inspect, test and certify cranes.	No
XI.M23		Fuel Handling Crane, including bridge and trolley	Structural steel	Air – indoor, uncontrolled	Cumulative fatigue damage / fatigue. Loss of material / General corrosion & wear.	Maintained under the GEH-MO preventive maintenance program and inspected in accordance with the requirements specified in 10 CFR 1910.179 and ANSI B30-2. Yearly inspections are performed by an independent contractor whose crane inspection services are accredited by the U.S. Department of Labor under 29 CFR 1919; to inspect, test and certify cranes.	No
XI.M23		Cask Crane, including bridge and trolley	Structural steel	Air – indoor, uncontrolled	Cumulative fatigue damage / fatigue. Loss of material / General corrosion & wear.	Maintained under the GEH-MO preventive maintenance program and inspected in accordance with the requirements specified in 10	No

						CFR 1910.179 and ANSI B30-2. Yearly inspections are performed by an independent contractor whose crane inspection services are accredited by the U.S. Department of Labor under 29 CFR 1919; to inspect, test and certify cranes.	

Structures Monitoring
Table 2 – Acceptance Criteria

Concrete Surfaces	Concrete Embedments	Steel Structures	Stainless Steel Liner (with Leak Detection)
Absence of leaching and chemical attack	Concrete surface condition attributes are met	Loss or degraded areas of paint less than or equal to 4,000 mm^2 (6 $in.^2$) at one area	No increase in leakage rate observed in leak-detection system
Absence of abrasion, erosion, and cavitation	Absence of corrosion of the exposed embedded metal surfaces and corrosion stains around the embedded metal	Loss or degraded areas of paint less than or equal to 10,000 mm^2 (16 $in.^2$) over the gross surface of the structure	Absence of bulges or depressions in liner plate – related to aging not construction
Popouts and voids less than 20 mm (3/4 in.) in diameter or equivalent surface area	Absence of detached embedments or loose bolts		Basin Water Analysis: - Gross beta < 0.02 µCi/ml - Conductivity <1.35 µMho/cm.
Scaling less than 5 mm (3/16 in.) in depth	Absence of indications of degradation due to vibratory loads from piping and equipment		
Spalling less than 10 mm (3/8 in.) in depth and 100 mm (4 in.) in any dimension			
Absence of any signs of corrosion in the steel reinforcement or anchorage components			
Passive cracks less than 0.4 mm (0.015 in.) in maximum width (note 1)			
Absence of excessive deflections, settlements, or other physical movements that can affect structural performance			
Monitoring Well Analysis (at least 1 of 3): - Verification of non-aggressive ground water or soil			

(pH > 5.5, chlorides < 500 ppm, or sulfates <1500 ppm)			
Notes: 1. passive cracks are defined as those having and absence of recent growth and an absence of other degradation mechanisms at the crack			

M220015
US NRC
1/27/22

Attachment 4

GEH Morris SOP 16-17, Rev 5 (Draft)

(Contains Proprietary Information)