SAFETY EVALUATION REPORT

Docket No. 72-1
License No. SNM-2500
General Electric Company
Morris Operation
Independent Spent Fuel Storage Installation in
Morris, Illinois

SUMMARY

This Safety Evaluation Report (SER) documents the review and evaluation of an application for renewal of the operating license for the General Electric, Morris Operation (GE-MO) Independent Spent Fuel Storage Installation (ISFSI), Special Nuclear Materials License No. SNM-2500. Under Part 72 of Title 10 of the Code of Federal Regulations (10 CFR Part 72), as amended, the U.S. Nuclear Regulatory Commission (NRC) issues operating licenses for ISFSIs to operate for up to 20 years. The regulations also permit the license to be renewed for an additional 20 years if a renewal application is filed at least 2 years prior to the expiration date of the existing license and the information in the renewal application complies with the renewal requirements in the regulations.

The Morris Operation ISFSI 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 as a storage license for a full term 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 specifically 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 SNM-2500, Docket No. 72-1 on May 4, 1982, for a period of 20 years. GE submitted an application to renew Special Materials License SNM-2500 for the Morris Operation ISFSI on May 22, 2000.

The GE application for license renewal of the Morris Operation ISFSI is unique in that it is the first ISFSI to request a license renewal, and it is the only operating commercial water-basin ISFSI not co-located at a nuclear power plant site in the United States. The NRC staff has not developed written guidance for 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-cask ISFSI. The design and operation of the Morris Operation ISFSI 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-1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” and NUREG-1801, “Generic Aging Lessons Learned (GALL) Report,” to support the review of the Morris Operation ISFSI. While both of the NUREGs contain guidance that is not specifically applicable to the Morris Operation ISFSI license renewal application, 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 structures, systems, and components (SSCs) are appropriate for reviewing the license renewal application of the Morris Operation ISFSI.

The NRC Office of Nuclear Material Safety and Safeguards (NMSS), Spent Fuel Project Office (SFPO) has reviewed the GE-MO ISFSI license renewal application for compliance with the requirements of 10 CFR Part 72 and the applicable portions of other NRC guidance documents. The NRC has prepared this Safety Evaluation Report (SER) to document its findings. Based on the statements and representations of the licensee and the independent evaluations made by the NRC, the staff concludes that the Special Nuclear Materials License SNM-2500 meets the requirements of 10 CFR Part 72 for a 20-year renewal.

1.0 GENERAL INFORMATION

1.1 Background

In a letter dated May 22, 2000, GE submitted its initial application to the NRC for renewal of the Morris Operation ISFSI operating license for an additional 20 years. The application included an updated Quality Assurance (QA) Plan, Consolidated Safety Analysis Report (CSAR), and updated Technical Specifications (TS). The NRC approved the QA Plan in a letter dated August 8, 2000. After a May 25, 2001, public meeting with the NRC, GE-MO issued an August 13, 2001, letter transmitting a revised CSAR and Amendment 11 to the TS. The NRC at that time determined it would be appropriate to combine review of any ongoing amendment requests with review of the license renewal request. The NRC staff reviewed the revised CSAR and proposed TS Amendment and issued a Request for Additional Information (RAI) on May 16, 2003. GE issued a partial response to the RAI on August 6, 2003, followed by a complete RAI response on September 27, 2003. Following a request by GE (letter dated March 1, 2004) to withdraw Amendment requests 10 and 11 (Amendment request 10 was submitted to the NRC on April 30, 1998), proposed Amendment 12 to the TS was submitted on July 30, 2004. With submittal of proposed Amendment 12 to the TS the NRC staff deemed it more efficient to review the Amendment request and the license renewal request separately. Another revision to the CSAR was submitted on August 9, 2004, and an updated response to the NRC RAI was submitted on September 24, 2004. GE-MO issued an additional update to the proposed Amendment 12 and corrected pages for the CSAR in a letter dated October 29, 2004. The NRC issued approval of Amendment 12 on __________, 2004.

The applicant has stated that the ISFSI is benign. All of the spent nuclear fuel has been cooling under water for more than 20 years, and the basin water is maintained in an ultra-pure state to minimize the potential for any adverse chemical attack on the fuel cladding, storage baskets, or basin liner. Included in the approved Amendment 12 to the TS was a revision to the Current Licensing Basis (CLB) that removed the site’s authorization to receive additional spent fuel. This limits the site inventory to the spent fuel currently on hand. Because the basins are essentially full and no additional spent fuel will be received during the license renewal period, the sites’ safety envelope will remain unchanged during the period of the license renewal.

The NRC staff has evaluated the information submitted by GE-MO and developed this SER to summarize and document the staff’s findings. This SER describes the technical details considered in evaluating the safety aspects of the proposed continued operation of the Morris Operation ISFSI for an additional 20 years. The staff reviewed the license renewal application in accordance with the requirements of 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste" as well as other NRC regulations and appropriate sections of both NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," updated as of April 2001 and NUREG-1800, "Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants," dated August 2000. The NRC staff also performed independent environmental release calculations and aging analyses to verify the information submitted by the licensee.

1.2 Site Description

The Morris Operation ISFSI site was originally designed as a fuel-reprocessing center and, as such, much of the structure is unused or not necessary for its current use as an ISFSI. Most of the process building holds the unused fuel-reprocessing equipment that was contaminated with natural uranium during start-up testing of the reprocessing facility. The spent nuclear fuel is stored in two water-filled basins on the east side of the process building. Other than the control room and access walkways, the rest of the process building remains unused. Water quality and temperature are controlled by basin support systems on the west side of the basins. Other principal structures include the administration building, various shops and warehouses, a water storage tower, and the sand filter building.

The above-grade structure enclosing the decontamination area and storage basins is a steel column and girder frame structure with insulated siding to maintain ventilation control. The roof is approximately 15.2 meters (50 feet) above grade and is of steel decking with rigid insulation and built-up roofing. Cask access doors measuring about 9 meters (30 feet) high by 3.4 meters (11 feet) wide on the north side of the structure allow for the movement of shipping casks between the receiving area and decontamination and storage basin area. The basin water cooling and filtration system is housed on the west side of the storage basin. A concrete shield wall around the basin pumps provides radiological shielding for personnel working in and around the area.

The GE-MO fuel storage system consists of uniformly spaced baskets that house stainless steel tubes for fuel bundles. Pressurized water reactor (PWR) baskets contain bundles of four round tubes while the boiling water reactor (BWR) baskets contain nine square or round tubes. The bottom of each basket containing round tubes is closed while holes in the wall of the basket allow cool water to enter near the bottom and warm water to exit the top. This heat transfer is known as convection. The closed bottom traps material that may fall from a fuel bundle such as corroded material from the fuel bundle's surface. Baskets containing square tubes have flow holes in both the wall and the bottom to permit cooling water flow through the basket. The stainless steel baskets reduce neutron interaction between adjacent fuel bundles, thereby permitting more efficient use of space. Tubes are attached firmly together and are supported by a substructure to form an independently movable basket. 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. A three-basket mount is installed in the cask unloading pit. A similar mount may be installed in the transfer corridor so baskets can be temporarily placed in the cask unloading pit or in the corridor in a safe manner. The GE-MO CSAR does not specify if similar mounts are, in fact, installed in the transfer corridor. It simply implies that mounts similar to the ones in the unloading pit may be installed in the corridor to ensure the same level of safety while baskets are temporarily placed in the corridor. The mounts are referred to as basket retainer frames and are equivalent to the mounting grid used in the fuel basins.

The system of mounting grids on the basin floor is braced against basin walls by wedges. An analysis of load effects on basin walls and liners indicates that the walls will withstand seismic and thermal loads transmitted by the grid support. A solid film lubricant is used on wedges to reduce the friction between the grids and the walls to accommodate thermal and seismic movement.

The support grids are made from Type 304L stainless steel. The weight of the basket is supported by the stainless steel angle structure of the grid. A locking block at each intersection of cross members is attached to the top of the grid structure to secure the baskets in place.

Cask handling, cask unloading, and fuel storage areas are constructed of reinforced concrete, steel, and other materials that are either nonflammable or fire-retardant. No significant amount of flammable materials is present in these areas, and other potential fire dangers are introduced only under strict administrative control.

2.0 SCOPING EVALUATION

The first step in the license renewal process involved the identification of the Systems, Structures, and Components (SSCs) that are important to safety of the ISFSI and are subject to an Aging Management Review (AMR). The applicant did this by evaluating the SSCs that comprise the Morris Operation ISFSI against the scoping criteria and guidance provided in 10 CFR §72.42; the Part 54 Final Rule Statements of Consideration published in the Federal Register on May 8, 1995, (60 FR 22464); preliminary NRC staff guidance for 10 CFR Part 72 license renewal issued as an attachment to a letter to Virginia Electric and Power Company by E. William Brach on March 29, 2001; and the principle that the plant-specific current licensing basis (CLB) must be maintained during the renewal term in the same manner and to the same extent as during the original licensing term. This guidance requirement results in the need to verify and demonstrate that the SSCs of the ISFSI can, with reasonable assurance, continue to function in a safe manner and meet applicable regulatory requirements for the license renewal period.

Pursuant to 10 CFR §72.24, each application must include an updated Safety Analysis Report (SAR). This report must contain a summary description of the programs and activities for managing the effects of aging on all SSCs important to safety. An important factor to be addressed in the SAR is the design life of the ISFSI. During the design phase, certain assumptions are made about the length of time the ISFSI will be operated, and these assumptions are incorporated into design calculations for several of the facility's SSCs. These calculations must be reviewed and shown to be valid for the period of extended operation or must be projected to the end of the period of extended operation, or the applicant must demonstrate that the effects of aging on these SSCs will be adequately managed for the period of extended operation.

The SSCs subject to an AMR were determined to be any SSC that meets either of the following criteria:

1. SSCs that are important to safety (i.e., the SSCs are relied on to perform any of the following functions):

   a) Maintain the conditions required to store spent fuel safely.

   b) Prevent damage to the spent fuel during handling and storage.

   c) Provide reasonable assurance that spent fuel can be handled, packaged, stored, and retrieved without undue risk to the health and safety of the public as identified in the CLB.

2. SSCs that are classified as not important to safety but, according to the CLB, their failure could prevent an important-to-safety function from being fulfilled.

In summary, the function performed by an SSC that causes it to be within the scope of license renewal and potentially subject to an AMR is its intended function and not an ancillary function. Additionally, any SSC that performs a support function is generally not within the scope of license renewal unless it satisfies criterion 2 above.

Any ISFSI SSC that met either criterion 1 or 2 above was determined to be within the scope of license renewal. The basic premise of the license renewal scoping process is that the CLB determines which SSCs perform intended functions that meet either of the two principal scoping criteria. The CLB comprises three documents for the ISFSI: the Consolidated Safety Analysis Report (CSAR), the TS, and the docketed licensing correspondence.

GE-MO’s License Renewal Application (LRA) and CLB provide details of the scoping study. The scoping study identified the following equipment as being within the scope of license renewal and subject to an AMR:

- Fuel Storage Basin and Cask Unloading Pit – concrete walls, floors, and expansion gate.
- Fuel Storage Basin and Cask Unloading Pit – stainless steel liner.
- Fuel Storage System – baskets and supporting grid.
- Spent fuel cladding.
- Unloading pit doorway guard.
- Filter cell concrete structure.
- Fuel Storage Basin Building – above-grade building structure.

Additionally, the scoping study identified the following equipment as being within the scope of license renewal but covered by an existing inspection program, surveillance assessment, or preventive maintenance program and thus, not requiring a separate AMR:

- Fuel-handling crane.
- Fuel-basin crane.
- Cask-handling crane.
- Fuel basket grapple.
- Fuel grapple.

The staff has reviewed the details of the licensee's scoping evaluation with respect to the NRC's Staff Guidance and regulatory requirements and finds the licensee's evaluations to be appropriate.

3.0 AGING MANAGEMENT REVIEW

The second step in the license renewal process involved the analysis of material aging and their effects on the SSCs determined to be within the scope of license renewal also called the Aging Management Review (AMR). The AMR process involved the following major steps:

1. Identification of materials and environments.
2. Identification of aging effects requiring management.
3. Determination of the activities required to manage the effects of aging.

Section 3 discusses the first two steps of this process. Section 4 provides details on the aging management surveillance and maintenance programs for managing the effects of aging.

3.1. SSCs Subject to an AMR

10 CFR §72.24 "Contents of Application: Technical Information," requires, in part, that each application for license renewal contain an analysis and evaluation of SSCs to determine the adequacy of the SSCs to prevent accidents and mitigate the consequences of accidents including natural phenomena and manmade events for the duration of the term of the license. The NRC staff considers aging to be as much a naturally occurring phenomena as earthquakes, tornadoes, or floods and, as such, requires the applicant to analyze and evaluate the SSCs defined as within the scope of license renewal and determine the adequacy of the SSCs to continue to perform their intended functions for the licensed period of extended operation.

As defined in Section 2.0 of this report, SSCs that require an AMR are defined as SSCs that are important to safety or, if not important to safety, SSCs whose failure could prevent an important safety function from being fulfilled. For the purposes of 10 Part 72 license renewal this includes both operating and static SSCs. Operating SSCs are those that perform an action such as starting or stopping a pump or opening or closing an electrical circuit. Static SSCs are those that perform a function with no moving parts. Examples of static SSCs requiring an AMR include a concrete wall or building that provides shielding, security, or protection for the spent fuel.

It is the responsibility of the applicant to demonstrate that both operating and static SSCs subject to an AMR will be managed in such a way that the intended function or functions of those SSCs, that caused them to be considered within the scope of license renewal, i.e., satisfying Criterion 1 or 2, will be maintained for the licensed period of extended operation.

All SSCs satisfying the scoping criteria described in Section 2 are subject to an AMR. However, operating SSCs, when monitored and maintained under an existing program such as In-Service Inspection or Testing (ISI or IST), preventive maintenance (PM), routine surveillance, or performance indicator monitoring, may be considered adequately monitored and maintained if it can be demonstrated that the detrimental effects of aging can be detected and corrected through the existing program. This assumes that the surveillance and maintenance programs currently in place for active equipment as well as other aspects of maintaining the ISFSI's design and licensing basis continue throughout the licensed period of extended operation. Operating SSCs that the NRC staff believe are covered by an existing ISI, IST, PM, or inspection program are:

- Fuel basket grapples.
- Fuel grapples.
- Fuel basin crane.
- Fuel-handling crane.
- Cask-handling crane.

Static SSCs are not normally part of an active surveillance, monitoring, or preventive maintenance program and, as such, the effects of aging may not be easily identified. The static SSCs that are not part of a periodic inspection program require an AMR to verify that they will continue to perform their intended functions for the licensed period of extended operation. Static SSCs that the NRC staff believe requires an AMR are those SSCs required to maintain the water level in the storage basin, provide radiation shielding around the basin water filters, and protect the basin water from foreign objects. These items consist of:

- The concrete walls, floor, and expansion gate that form the fuel storage basin and cask unloading pit.

- The stainless-steel liner inside the concrete fuel storage basin and cask unloading pit.

- The stainless-steel baskets and support grids that form the fuel-storage system,

- The zircaloy and stainless-steel fuel cladding,

- The unloading pit doorway guard.

- The concrete structure around the basin pump and filter room that provides radiation shielding for operators.

- The building that surrounds and protects the fuel storage basin

3.2. Materials and Environment

Identification of the materials and the environment to which SSCs within the scope of license renewal will be exposed is the first phase of the AMR process. The materials of construction of the SSCs requiring an AMR are reinforced concrete, stainless steel, and zircaloy. All of these materials have been shown to perform for extensive periods of time when properly inspected and maintained.

The Environment

The Morris Operation ISFSI is located near the confluence of the Kankakee and Des Plaines rivers in Goose Lake Township, Grundy County, about 11 kilometers (7 miles) east of the city of Morris, Illinois. The 330-hectare (815-acre) site is south of, and contiguous to, the Dresden Nuclear Power Station site.

The GE-MO site is in an area of rocky outcropping and thin top soil. All of the main building foundations and below-grade basin structures are excavated into the bedrock to ensure high structural integrity of the facility. The basins were designed to facilitate future expansion and mitigate the unlikely event of basin leaks.

The climate in the vicinity of the Morris Operation ISFSI is typically continental with cold winters and warm, humid summers. Winds are primarily controlled by storm systems and weather fronts that move eastward and northeastward through the area. Southeasterly and easterly winds usually bring mild and wet weather. The southerly winds are warm and showery, while westerly winds are dry with moderate temperatures. Winds from the northwest and north are usually cool and dry.

The Materials

Each of the SSCs identified as being subject to an AMR are described below.

Fuel Storage Basin and Cask Unloading Pit. The fuel storage basins and cask unloading pit are constructed of reinforced concrete poured against bedrock with a welded stainless-steel liner. The basin floors are 76- to 137-millimeter (30- to 54-inch) -thick reinforced concrete. The walls are of reinforced concrete that extends 1 meter (3.5 feet) above grade. The basin wall structure is designed to resist accelerations from a Design-Basis Earthquake (DBE) based on the north-south components of the 1940 El Centro earthquake normalized to 0.1G and 0.2G.

The floor and walls of the basins and pit are lined with Type 304L stainless steel welded to stainless-steel beams embedded in the concrete walls and floor.

The bedrock that was excavated to form the basins and pit is shale bedrock with an ultimate compressive strength of 422 to 773 kilograms-force per square centimeter (6,000 to 11,000 pounds-force per square inch [psi]). All loose and disturbed rock was removed prior to concrete construction.

The two storage basins are filled with ultra-pure demineralized water to a nominal depth of 8.7 meters (28.5 feet). At a depth of 15.24 meters (50 feet), the cask unloading pit is the deepest part of the storage basins. It is designed to allow spent fuel assemblies to be lifted out of or into a shipping cask while remaining under at least 2.7 meters (9 feet) of water.

Fuel-Storage System. The fuel-storage baskets are bundles of stainless-steel tubes designed to hold four pressurized water reactor (PWR) or nine boiling water reactor (BWR) spent fuel assemblies. Openings in the top, sides, and bottom of the tubes allow water to circulate around each spent fuel assembly. The fuel-storage baskets are supported by a stainless-steel grid on the floor of the basins and unloading pit. Each fuel-storage basket has four cam-activated latches that engage the mounting grid and hold the fuel basket in place. Pulling up on the basket lifting arm with the fuel-basket grapple will release the locking cams and allow the basket to be lifted free of the mounting grid.

Spent Fuel Cladding. The light-water reactor fuel stored at GE-MO was received by the ISFSI between 1972 and 1989. It has remained in storage, undisturbed, since its receipt. Eleven percent (352 bundles) have stainless-steel cladding, and the remaining 2,865 bundles (89 percent) have zircaloy cladding. The normal water level is 3.9 meters (12.75 feet) above the top of the fuel-storage baskets. The minimum water level required for safe storage is 2.1 meters (7 feet) above the top of the fuel.

The water environment provides cooling and shielding for the spent fuel and spent fuel cladding. The ultra-pure water in the storage basin and cask unloading pit is generated by a computer controlled demineralization system that is capable of producing water with a dissolved solids content of less than 0.1 parts per million (ppm). This is far below normal dissolved solids level of 100 ppm found in distilled or deionized water. A study by the International Atomic Energy Agency (IAEA) showed that both zircaloy and stainless-steel cladding will remain serviceable for 50 to 100 years in wet storage.

Unloading Pit Doorway Guard. The opening between the cask-unloading pit and the fuel-storage basins is the only area in the facility where the contents of a fuel storage basket could be discharged as the result of a postulated basket drop. The doorway guard is a stainless-steel pipe-frame assembly that is used to prevent tipping of the fuel-storage basket while it is being lifted from the cask unloading pit floor (elevation 0) to the storage basin floor (elevation 6.6 meters [21.5 feet]). The doorway guard is designed to act as an energy absorbing device. In the event of a fuel basket drop, the doorway guard will prevent the fuel-storage basket from tipping and spilling the spent fuel rods into the cask unloading pit. The doorway guard is fabricated from stainless-steel pipe and stainless-steel cable. It is fully immersed in the ultra-pure basin water and should remain serviceable for 50 to 100 years.

Filter Cell Concrete Structure. The filter system maintains water clarity and removes dissolved materials. The filter system is housed in a heavily shielded, restricted access room to minimize worker exposure to the radiation field around the filter system. The concrete structure that provides shielding for the filter system was designed and constructed in accordance with American Concrete Institute (ACI), “Building Code Requirements for Structural Concrete,” with Commentary, 1963 Edition, Document No: ACI 318-63.

The reinforced concrete shield walls around the filter cell are inside the steel beam and sandwich panel building that covers the spent fuel storage basins. As such, the concrete walls are protected from the cold winters and heavy rains of summer and are available for easy inspection and monitoring for signs of aging.

Fuel-Storage Basin Building. The fuel-storage basins and support equipment are enclosed in a structural steel building with sandwich panel siding and a built-up roof on a steel deck. The building is a freestanding structure that is subject to normal wind loads and weather phenomena of the Morris Operation ISFSI location.

3.3 Aging Effects Requiring Management

The major aging effects on the Morris Operation ISFSI will be wear and equipment degradation and loss of integrity or material. Operating equipment will be subject to normal wear and degradation of moving parts, deterioration of lubricants, and similar aging effects. Concrete may lose its integrity through cracking or it may lose material through spalling and chemical attack. The stainless-steel liner, zircaloy and stainless-steel cladding may undergo corrosion, weld deterioration, or physical damage. The building structure can lose integrity through roof leaks, siding failure, or corrosion of the structural steel support members.

Some of the structural components have external coatings designed to inhibit corrosion of the base material. The inspection and maintenance of these coatings are part of the aging management program, however, it is not assumed to eliminate all of the aging effects that require management.

An additional aging effect, Time-Limited Aging Analysis (TLAA) (e.g., thermal fatigue) has also been identified as an issue requiring analysis. Discussion of the TLAAs and their disposition follows in Section 5 of this safety evaluation.

3.4 Activities Required to Manage the Effects of Aging

The Morris Operation ISFSI has operated as a licensed storage facility since 1974. An underwater visual inspection of the stainless-steel liner in the fuel-storage basins and cask unloading pit in 1993 showed continued structural integrity and an absence of microbe-induced corrosion. In 1994, a 3.8 x 8.9 centimeter (1.5 x 3.5-inch) coupon was cut from the basin liner and subjected to optical metallography and scanning electron microscopy (SEM) examination. The maximum surface penetration was 1×10^{-5} meter (0.4 mils). SEM examination of the surface found oxide deposits that were determined to be mostly iron oxide. No detrimental chemical species or microbial corrosion were found.

The minimal amount of corrosion identified on the stainless steel liner indicates the innocuous nature of the basin water and provides reasonable assurance that all immersed stainless steel components will be able to perform their safety-related functions for the duration of the license renewal period.

The grapples and other stainless-steel items that are not fully immersed in the basin water have been decontaminated and placed in long-term dry storage. Each tool will undergo thorough inspection and testing before use to ensure that all tooling is in compliance with the CLB and original manufacturer's specifications. Tooling that does not pass the inspection will be repaired or replaced.

The below-grade portions of reinforced concrete in the fuel-storage basins, cask unloading pit, and filter cell structure are poured against bedrock and cannot be visually inspected. Sample wells have been positioned around the basins and are used to monitor ground water for signs of basin leakage or aggressive environmental conditions. Historically, neither aggressive ground water nor basin leaks have been identified at the site. Continued monitoring of the ground water will provide a monitoring program for the below-grade concrete.

Above-grade reinforced concrete is accessible for visual inspection. The applicant has stated that they performed a one-time visual inspection of the exposed concrete between July 15 and 29, 2004. The concrete was inspected for visual signs of deterioration, cracks, spalling, scaling, weathering or porosity. The inspection showed no through wall cracks or signs of deterioration. Some hairline cracks were found but they showed no recent growth and appear to have occurred during construction.

The fuel-basin crane, fuel-handling crane, and cask-handling crane are the only operating SSCs subject to an AMR and covered by a periodic inspection and operational inspection program. Each of the cranes undergoes a quarterly inspection by plant personnel and a yearly surveillance by an independent inspector. The yearly inspection follows the guidelines of 10 CFR 1910.179 and ANSI B30-2 and inspect the crane for items such as:

- Deformed, cracked or corroded members
- Loose bolts or rivets
- Cracked or worn sheaves and drums
- Worn, cracked or distorted parts such as bearings, gears, rollers, etc.
- Excessive wear on brake system parts
- Excessive wear of chain drive sprockets and chain
- Deteriorated electrical components such as pushbuttons, limit switches or contacts
- Proper fluid and lubrication type and level in gear boxes and bearings.

This preventive maintenance program will help ensure that the cranes remain operable and within the CLB for the duration of the license renewal.

4.0 AGING MANAGEMENT SURVEILLANCE AND MAINTENANCE PROGRAMS

Wet storage fuel storage basin inspection activities are conducted for the fuel storage basins, cask unloading pit, and the zircaloy- and stainless-steel- clad spent fuel.

The purpose of the fuel storage basin inspection activities is to:

- Determine that no significant deterioration (corrosion) of the fuel storage SSCs has occurred.

- Determine that no significant degradation of the basin structure has occurred.

The scope of the fuel storage basin inspection activities involves:

- The continuous monitoring of water chemistry and air emissions, including water being added to the basin and the water already in the basin.

- The visual inspection of exposed concrete and building structures housing spent fuel and shielding radiation areas.

- The inspection of components of the fuel storage system related to the storage and movement of a fuel storage basket.

The spent fuel pool inspection activities are designated as a condition monitoring activity. No preventive actions are performed during an inspection activity. Preventive and corrective actions are performed under other programs as discussed later. Inspection activities are described below.

Water Chemistry and Air Emissions Monitoring

Water chemistry and air monitoring provide an indication of the integrity of the spent fuel cladding, fuel storage system, reinforced concrete, and structural steel components. Cladding degradation or corrosion would be detected by changes in water chemistry or radioactive gas concentrations in air effluents and minimized through monitoring water chemistry or installation of special ventilation hoods. Degradation of fuel storage and structural components would be minimized by monitoring water chemistry. Fuel storage and structural components include:

- Fuel storage basin concrete foundation; walls and floor.
- Basin filter structure concrete foundation; walls and floor.
- Stainless-steel expansion gate.
- Fuel storage basin steel liner.
- Fuel storage system, including baskets and supporting grid.
- Unloading pit doorway guard.

Cladding degradation or corrosion and structural component degradation can be controlled by ensuring the quality of makeup water being added to the basin. Makeup water is typically provided from the on-site well. Monitoring well-water quality and water purity after the well water is treated with a demineralized water system maintains the purity of the basin water. Well-water quality will be monitored on a quarterly basis. By monitoring well water, the introduction of chemicals to the basin that could promote aging degradation of the spent fuel cladding and the above-listed structural components can be prevented. The acceptance criterion for well-water quality is defined by the well-water permit. The well-water permit delineates specific water-quality characteristics and monitoring specifications.

The demineralized water system is designed to maintain water conductivity to less than 135 µS/m (1.35 µmho/cm). By maintaining water purity, aging effects related to the spent fuel cladding (degradation or corrosion) and structural components can be minimized. The system provides an automatic notification of the demineralized water system vendor and sounding of a local alarm. The vendor will arrive normally within 24 hours to inspect the system and replace the system resin beds if needed. In addition to automatic notification of out-of-specification operation of the demineralized water system, a duty operator will verify the system is functioning once per day and record total flow, capacity flow, and water quality.

The basin filter system will be inspected twice each shift by operations personnel to verify operation. There is no failure alarm on the basin filter system. The purpose of the basin filter system is to maintain basin water quality such that spent fuel cladding degradation or corrosion effects and structural component degradation effects are minimized.

The basin water will be sampled and tested on a routine basis per a GE-MO Standard Operating Procedure. Sampling and testing of the basin water will indicate loss of cladding material and fuel components, a sign of cladding degradation or corrosion. The acceptance criterion for basin water quality is that water-quality conductivity be maintained less than 135 µS/m (1.35

μmho/cm) (equivalent to pH of 5.5 to 8.0 in demineralized water). Water-quality parameters are specified in the TS and GE-MO Standard Operation Procedures.

Air emissions will be sampled continuously in the ventilation system and analyzed weekly through GE-MO Standard Operating Procedures. Monitoring air emissions will detect changes in radioactive gases that could indicate the spent fuel cladding is undergoing degradation or corrosion. The acceptance criterion for air emissions is gross beta (β) activity of less than 4×10^{-8} μCi/ml.

Visual Inspection of Exposed Concrete and Building Structures

The condition of the basin structure interior and above-grade exterior, and the basin filter structure interior and above-grade exterior underwent a visual inspection between July 15 and 29, 2004. The inspection found no signs of deterioration, cracks, spalling, scaling, weathering or porosity. Minor hairline cracks were identified but they present no hazard to the continued safe and continued operation of the ISFSI.

The protective coating for all structural steel of the fuel-storage basin building will be inspected periodically. These inspections will be conducted to determine that the coatings remain intact and there are no signs of degradation. Upon visual observation of any such defect, the degraded coating will be removed and new coating reapplied to protect the building structural members. The acceptance criterion for this visual inspection is the absence of coating defects that are signs of degradation. Maintaining a functional protective coating precludes corrosion of the underlying material. Engineering evaluations will determine whether observed deterioration of material condition is significant enough to compromise the ability of these structures to perform their intended functions for the duration of the license renewal period.

Inspection of Fuel-Handling Components

Inspection of components related to the movement of fuel and fuel-storage baskets includes the stainless-steel fuel basket grapple and stainless-steel fuel grapple, the fuel basin crane, the fuel-handling crane, and the cask-handling crane. Inspections of these components are required to ensure the safe movement of spent fuel.

Visual inspection of the grapples will occur prior to the movement of spent fuel. Inspection of the grapples is necessary because the grapples are currently in long term dry storage. The grapples are therefore subject to possible degradation due to environmental exposure. The inspection of the grapples prior to use will determine whether the grapples will be able to perform their intended functions or if the aging effects will prevent the use of the grapples. The grapples will be repaired or replaced if they fail the inspection criteria.

All three cranes, including their bridges and trolleys, fall under the GE-MO preventive maintenance program and undergo inspections in accordance with the requirements specified in 10 CFR §1910.179 and ANSI B30-2 (See Section 3.4 for details of the types of inspections conducted). Inspections, tests, and certifications are annually conducted by personnel accredited under 29 CFR Part 1919.

Quality Assurance

Corrective actions for conditions that are adverse to quality are performed in accordance with the requirements of the existing GE-MO site Quality Assurance Program (QAP). Any resultant maintenance or repair activities are performed in accordance with approved procedures.

Corrective actions provide reasonable assurance that deficiencies adverse to quality are either promptly corrected or are evaluated to be acceptable. For evaluations performed without repair or replacement, engineering analysis must provide reasonable assurance that the intended function is maintained consistent with the CLB. If the deficiency is assessed to be significantly adverse to quality, the cause of the condition is determined, and a corrective action request and action plan are developed to correct the deficiency and prevent reoccurrence. Corrective actions identify recurring discrepancies and initiate additional corrective action to preclude recurrence.

Evaluation of post-maintenance conditions provides reasonable assurance that the corrective actions have been satisfactorily implemented. The repeated inspections described above will confirm that corrective actions have been completed and are effective.

The staff has reviewed the licensee's surveillance and maintenance programs with respect to the regulatory requirements for license renewal. The staff finds the licensee's programs to be effective for identifying age and service related non-conforming conditions that may be adverse to quality or safety. An appropriate corrective actions program was shown to be in place. The staff therefore finds that the licensee's surveillance and maintenance programs satisfy the requirements for license renewal.

5.0 IDENTIFICATION OF TIME-LIMITED AGING ANALYSES (TLAAs)

Time-Limited Aging Analyses (TLAAs) are defined in the staff's Preliminary NRC Staff Guidance for 10 CFR Part 72 license renewal (NRC, 2001). TLAAs encompass those components that have a limited life that is based upon some measured or calculated parameter. That parameter could be years of operation, number of cycles used, or similar temporal limits.

The following TLAAs have been identified by reviewing necessary design-basis documents:

- Corrosion analysis of immersed stainless-steel components.

  The original analyses were found to remain valid. The analyses showed that no degradation due to corrosion would affect the functionality or safety of the stainless steel or zircaloy for the duration of the proposed 20-year license renewal period.

  The evaluation of this TLAA for the Morris Operation ISFSI revealed that none of the identified degradation mechanisms were limiting to the proposed license extension period of 20 years. Consequently, no further action is required for this mechanism. However, for completeness of discussion, the disposition of the TLAA follows:

- Corrosion analysis of immersed stainless-steel components

The only TLAA identified for the immersed stainless-steel components is corrosion due to chemical or microbial attack. The 1994 examination of a coupon cut from the basin liner showed no evidence of microbe-induced corrosion, and the maximum surface penetration was 1 x 10^{-5} m (0.4 mils). Therefore, extrapolating linearly, the immersed stainless steel will remain operational for the license renewal period given water purity is maintained in accordance with established acceptance criteria.

6.0 OTHER RENEWAL ISSUES

The applicant addressed other renewal issues that were not specifically addressed in the preliminary staff guidance.

6.1 Calculation of Public Offsite Dose Rates

The applicant revised the calculated offsite dose due to normal annual releases in the Consolidated Safety Analysis Report (CSAR) using the COMPLY computer program. The staff evaluated the modified offsite dose calculations independently to verify their accuracy and compliance with 10 CFR §20.1101(d). The staff determined that the applicant's COMPLY analysis properly demonstrates that members of the public will receive significantly less than the 0.1 mSv (10 mrem) per year limit of 10 CFR §20.1101(d).

COMPLY is a computer program developed for the U.S. Environmental Protection Agency (EPA) to gauge compliance with the Clean Air Act limits for radionuclide emissions. COMPLY is acceptable to the NRC staff for demonstrating compliance with 10 CFR 20.1101(d) such that the individual member of the public likely to receive the highest dose will not be expected to receive a total effective dose equivalent in excess of 0.1 millisievert (10 millirem) per year from these emissions. The COMPLY computer program has 4 levels of complexity increasing from Level 1 to Level 4. While Level 1 of COMPLY can indicate existence or absence of compliance, Level 4 of the computer model can report an estimate of the dose rate as well. The dose rates reported in the CSAR by GE-MO were based on the Level 4 of COMPLY.

The basis for the applicant's design basis accident analysis has not changed since the previous license approval. The previous analysis demonstrates that any person located at or beyond the nearest boundary of the Owner Controlled Area (OCA) will not receive a dose greater than the limits of 10 CFR §72.106(b) as the result of a design basis accident (i.e., 0.05 sievert [5 rem] to the whole body or 0.5 sievert [50 rem] to any individual organ or tissue [other than the lens of the eye]).

7.0 CONSOLIDATED SAFETY ANALYSIS REPORT

The Consolidated Safety Analysis Report (CSAR) must contain a summary description of the programs and activities relied upon to manage the effects of aging and the evaluation of TLAAs for the renewal period. GE–MO provided a proposed new CSAR Appendix A.8, Aging Management, which includes a summarized description of the activities for managing the effects of aging.

The NRC staff has verified that the updates and additions to the CSAR are consistent with aging management and TLAA programs with respect to the Preliminary Staff Guidance and regulatory requirements. Thus, the staff finds that the licensee's CSAR supplement is adequate and meets the requirements for license renewal.

8.0 ADDITIONAL INFORMATION

The applicant provided additional information that addressed the other requirements of 10 CFR Part 72, Subpart B, including training and qualifications, financial assurance and decommissioning, and emergency planning.

The staff reviewed these sections and verified that they do not affect previous staff findings and are consistent with respect to the preliminary staff guidance and regulatory requirements for license renewal.

9.0 REQUIREMENTS FOR NOTICING PROPOSED ACTION

The staff considered the amendment's potential impact on the health and safety of the public in a separate Environmental Assessment.

10.0 ENVIRONMENTAL REVIEW

Pursuant to Part 51 of the Code of Federal Regulations, an Environmental Assessment (EA) has been prepared for this action, and a Finding of No Significant Impact (FONSI) was issued. The EA and FONSI were published in the Federal Register on ______,__, 2004 (FR   ).

11.0 CONCLUSION

The license renewal review involved the following four major steps:

1. Identification of in-scope SSCs requiring AMR.
2. Identification of materials and environments.
3. Identification of aging effects requiring management.
4. Determination of the activities required to manage the effects of aging.

The staff has reviewed the GE-MO license renewal review and results and finds that the overall license renewal program is well constructed and executed and meets the intent of the NRC staff for the purpose of extending the period of operation for an additional 20 years.

The staff reviewed the application for renewal of the Morris Operation ISFSI, Special Nuclear Materials License SNM-2500, as supplemented, including applicable general, technical, and environmental supporting information and proposed CSAR supplement. Based on the information provided in the application, as supplemented, the staff concludes that the Morris Operation ISFSI Special Nuclear Materials License SNM-2500 satisfies the requirements of 10-CFR Part 72 for license renewal.

Issued with Materials License No. SNM-2500
on   2004

12.0 REFERENCES

1. Dresden Nuclear Power Station, Units 2 and 3. "Individual Plant Examination of External Events for Sever Accidents Vulnerabilities." Commonwealth Edison, Morris, Illinois. December 30, 1997.

2. International Atomic Energy Agency. "Durability of Spent Nuclear Fuels and Facility Components in Wet Storage." Technical Document IAEA-TECDOC-1012. Vienna, Austria. 1998.

3. *Corrosion of Containment Materials for Radioactive-Waste Isolation*. Metals Handbook, Ninth Edition, Volume 13.

4. *Corrosion of Stainless Steels.* Metals Handbook, Ninth Edition, Volume 13.

5. General Electric Morris Operation. *Consolidated Safety Analysis Report*. NEDO-21326D8. Updated to August 20, 2001.

6. *Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste*, Title 10, Code of Federal Regulations, Part 72 (10 CFR 72). Updated to January 1, 2002.

7. Baggett, S. Project Manager, U.S. Nuclear Regulatory Commission, letter to E. Secko, Regulatory Compliance Manager, General Electric, Morris Operation. September 14, 2000.

8. Baggett, S. Senior Project Manager, U.S. Nuclear Regulatory Commission, letter to J. Moyer, Vice-President-Nuclear Operations, Virginia Electric and Power Company. May 17, 2001.

9. Matthews, Vice-President-Nuclear Operations, Virginia Electric and Power Company. March 29, 2001.

10. General Electric - Morris Operation. *Consolidated Safety Analysis Report* (CSAR). NEDO-21326D10. Revised August 10, 2001.

11. General Electric - Morris Operation, *Environmental Report* (ER), NEDO-32966. Revised May 22, 2000.

12. General Electric - Morris Operation, *Morris Operation Emergency Plan.* NEDO-31955. Revised February 1997

13. U.S. Nuclear Regulatory Commission. "Preliminary Guidance for License Renewal for Site-Specific Independent Spent Fuel Storage Installations (ISFSIs)," March 2001.

14. U.S. Nuclear Regulatory Commission. "Environmental Impact Appraisal Related to the Renewal of Materials License SNM-1265 for the Receipt, Storage, and Transfer of Spent Fuel." NUREG-0695. General Electric Co., Morris Operation, Docket 70-1308. June 1980.

15. U.S. Nuclear Regulatory Commission. "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants." NUREG-1800. July 2001.

16. U.S. Nuclear Regulatory Commission. "Generic Aging Lessons Learned (GALL) Report." NUREG-1801, Vol. 1 and 2. July 2001.

17. Secko, E.W., Regulatory Compliance Manager, General Electric - Morris Operation, letter to T.J. McGinty, Program Manager, U.S. Nuclear Regulatory Commission. April 30, 1998.

18. Secko, E.W., Regulatory Compliance Manager, General Electric - Morris Operation, letter to T.J. McGinty, Program Manager, U.S. Nuclear Regulatory Commission. June 17, 1998.

19. Secko, E.W., Regulatory Compliance Manager, General Electric - Morris Operation, letter to U.S. Nuclear Regulatory Commission. August 13, 2001.

20. U.S. Environmental Protection Agency. User's Guide for the COMPLY Code (Revision 2). U.S. EPA, Office of Radiation and Indoor Air, 401 M Street, S.W., Washington, DC 20460. EPA 520/1-89-003. October 1989.

21. U.S. Nuclear Regulatory Commission. *Environmental Assessment for the License Renewal of the General Electric Morris Operation Independent Spent Fuel Storage Installation In Morris, Illinois*. Office of Nuclear Materials Safety and Safeguards, Spent Fuel Project Office, Washington, DC 20555-0001. October 2004.

22. U.S. Environmental Protection Agency (EPA) "COMPLY." <http://www.epa.gov/radiation/assessment/comply.html>, September 16th, 2004 (Accessed 11/11/2004).