May 13, 2011

Mr. Mark Varno, Business Manager
Advanced Programs
GE-Hitachi Global Laser Enrichment, LLC
3901 Castle Hayne Road, Office 5506, Bldg J
Wilmington, NC 28402-2819

SUBJECT: NRC INSPECTION REPORT NO. 072-00001/11-01(DNMS) – GENERAL ELECTRIC-HITACHI MORRIS

Dear Mr. Varno:

On April 29, 2011, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at the General Electric-Hitachi Morris Operation Facility in Morris, Illinois. The purpose of the inspection was to assess the safety of spent fuel storage in the spent fuel basin as followup to the Fukushima Daiichi Nuclear Station event in Japan. NRC Inspection Procedure 60801, “Spent Fuel Pool Safety at Permanently Shutdown Reactors,” and guidance from Temporary Instruction (TI) 2515/183, “Followup to the Fukushima Daiichi Nuclear Station Fuel Damage Event,” were used to conduct the inspection. The enclosed inspection report presents the inspection results which were discussed on April 29, 2011, with Mr. A. McFadden of your staff.

The objective of this inspection was to promptly assess the capabilities of the General Electric-Hitachi Morris Operation Facility to respond to extraordinary consequences similar to those that have recently occurred at the Japanese Fukushima Daiichi Nuclear Station. The results from this inspection, along with the results from other inspections performed at operating commercial nuclear plants in the United States will be used to evaluate the U.S. nuclear industry’s readiness to safely respond to similar events. These results will also be used by the NRC to determine if additional regulatory actions are warranted.

Areas examined during the inspection are identified in the enclosed report. Within these areas, the inspection consisted of an examination of procedures and representative records, walkdowns of systems, structures and components that support spent fuel pool function and interviews of personnel.

All of the potential issues and observations identified by this inspection are contained in this report. The NRC will further evaluate any issues to determine if future regulatory actions are necessary. These actions, if any, will be documented by the NRC in a separate correspondence. You are not required to respond to this letter.

In accordance with Title 10 of the Code of Federal Regulations (CFR) 2.390 of the NRC’s “Rules of Practice,” a copy of this letter and the enclosed report will be available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

If you have any questions, please feel free to contact Mr. Rhex Edwards of my staff. You can reach Mr. Edwards at (630) 829-9722.

Sincerely,

/RA/

Christine A. Lipa, Chief
Materials Control, ISFSI, and
Decommissioning Branch
Division of Nuclear Materials Safety

Docket No. 072-00001
License No. SNM-2500

Enclosure:
Inspection Report 072-00001/11-01(DNMS)

cc w/encl: A. McFadden, Manager, Morris Operation
C. Settles, Head Resident Inspection
Illinois Emergency Management Agency

If you have any questions regarding this inspection, please contact Mr. Rhex Edwards of my staff. You can reach Mr. Edwards at (630) 829-9722.

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U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No.:	072-00001
License No.:	SNM-2500
Report No.:	072-00001/11-01 (DNMS)
Licensee:	GE-Hitachi Nuclear Energy Americas, LLC
Facility:	Morris Operation
Location:	7555 East Collins Road Morris, IL 60450
Dates of Inspection:	On-site April 25-26, and April 28, 2011
Inspectors:	Rhex Edwards, Reactor Inspector Matthew Learn, Reactor Engineer
Approved by:	Christine A. Lipa, Chief Materials Control, ISFSI, and Decommissioning Branch Division of Nuclear Materials Safety

Enclosure

EXECUTIVE SUMMARY

GE-Hitachi Nuclear Energy Americas, LLC
Morris Operation
NRC Inspection Report 072-00001/11-01(DNMS)

This inspection assessed the ability of General Electric-Hitachi Morris Operation Facility in Morris, Illinois (GEH-MO) to cope with design basis and beyond design events in response to the problems that occurred at the Fukushima Daiichi Nuclear Station in March 2011. The inspection focused on GEH-MO's ability to respond to and implement mitigative strategies that result from station blackout conditions, seismic, tornado, flood, and fire events. These inspection results, along with the results from similar inspections at operating commercial nuclear plants in the United States, will be used to evaluate the U.S. nuclear industry's readiness to respond to similar events. The results will also be used by the NRC to determine if additional regulatory actions are warranted.

Overall, the inspectors concluded that there would be minimal consequences to the health and safety of the licensee's onsite staff and members of the public following a design basis event involving the spent fuel basin (SFB) at GEH-MO. This conclusion is based on the availability of several sources of SFB make-up water including those that do not require offsite power. Additionally, GEH-MO staff has more than 50 days to implement compensatory actions before water level in the SFB decreases to a level that potentially complicates recovery. Moreover, in the unlikely event that the SFB is completely drained of water, fuel melt would not occur given the limited fuel decay heat load.

Report Details

1.0 Spent Fuel Pool Safety

a. Inspection Scope

The objective of this inspection was to perform a broad overview of the licensee's capability and readiness to cope with design basis and beyond design basis events such as those that occurred at the Fukushima Daiichi Nuclear Station in Japan. The inspection assessed the licensee's capability to respond to and mitigate the consequences that result from station blackout conditions as well as design basis and beyond design basis seismic, tornado, flooding and fire events. In particular, the inspectors assessed the licensee's ability to implement mitigative actions upon loss of cooling and/or water inventory in the spent fuel basin (SFB). If necessary, a more specific follow-up inspection will be performed at a later date.

b. Observations and Findings

The following table documents the NRC inspection at GEH-MO performed in accordance with IP 60801 and guidance from TI 2515/183.

c. Conclusions

These inspection results, along with the results from similar inspections at operating commercial nuclear plants in the United States, will be used to evaluate the U.S. nuclear industry's readiness to respond to a similar event. The results will also be used by the NRC to determine if additional regulatory actions are warranted.

2.0 Spent Fuel Pool Safety Inspection Results

2.01 Design Basis Information

Review the facility Defueled Safety Analysis Report (DSAR) or equivalent reports to identify design basis seismic, flood/seiche, tornado and fire events. Identify systems, structures and components (SSCs) that are intended to support fuel safety and radiation safety function (i.e., contain radioactive materials) and are designated as important to the defueled condition. The SSCs important to the defueled condition should be capable of performing their specified function(s) associated with design basis events. Within these reports, identify wind loading design, water level (flood) design, missile protection, fire and seismic qualification to understand their bases and to recognize potential vulnerabilities associated with SSCs.

Describe the licensee's design basis seismic, flood/seiche, tornado and fire events. Specifically, identify wind loading design, water level (flood) design, missile protection, fire and seismic qualification.

The licensee's design basis seismic, flood/seiche, tornado/wind, and fire/explosion events are documented in the GEH-MO Consolidated Safety Analysis Report (CSAR), Revision 12, dated January 25, 2011. The licensee's design basis events are described below.

Tornado/Wind

Structures and components essential for safety are designed to withstand the effects of short-term wind velocities of 300 miles per hour with pressure differentials of up to 3 pounds per square inch without damage to the fuel in storage to an extent that would endanger public health and safety.

The site has two design basis missiles. The first missile is a 12 inch diameter by 20 foot long section of telephone pole weighing 630 pounds. The second design basis missile is a small automobile, 5 foot by 5 foot by 8 foot in dimension and weighing 1,800 pounds.

Flood /Seiche

The highest flood of record in the region occurred in 1957 involving flows of less than 100,000 cubic feet per second through the Illinois River. The 1957 flood created flood elevations far below the 532 foot minimum elevation of the GEH-MO site as referenced to mean sea level. A study was performed by the licensee to develop flood elevation curves for flow of up to 600,000 cubic feet per second through the Illinois River. The calculated water level would rise to less than 520 feet, or more than 10 ft. below the GEH-MO site. There are no other credible flood events affecting GEH-MO.

Seismic
Fuel storage structures and components essential to the integrity of stored fuel, are designed to withstand a seismic event which, based on studies of area seismic history and geology, has a predicted recurrence of once per 1,000 years.

The design earthquake basis for the fuel storage basins were horizontal ground motion of 0.1 G. The design earthquake is defined as seismic event that has a reasonable probability of occurrence during the life of the facility, based on studies of seismic history and geology. A maximum earthquake with ground accelerations of 0.2 G is also considered in the seismic analysis.

Fire/Explosion
Structures, systems and components (SSCs) directly involved in the storage of fuel shall be protected so that performance of their functions is not impaired when exposed to credible fire and explosion conditions.

Identify systems, structures and components (SSCs) that are intended to support fuel safety and radiation safety function (i.e., contain radioactive materials) and are designated as important to the defueled condition (ITDC). understand their bases and to recognize potential vulnerabilities associated with SSCs.

SSCs contributing to prevention of accidents or mitigation of consequences of accidents which could affect public health and safety shall be designed, fabricated, erected, operated, and maintained in compliance with established performance and quality standards. Under these standards, GEH-MO will withstand, without loss of important protection capability, all credible operating and accident stresses, including forces that might be imposed by natural phenomena such as earthquakes, tornadoes, or flooding conditions.

No credible design basis 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.

List of Structures Systems and Components Important to Safety
SSCs important to safety as promulgated in 10 CFR 72.122, "Overall Requirements" specifically relating to the storage of spent nuclear fuel are identified below.

a. Spent fuel basin - concrete walls, floors, and expansion gate are principal elements in protection of stored fuel, and in isolation of basin water from the environment; the fuel storage basin stainless steel liner forms a second element in fuel protection and basin water isolation, facilitating decontamination.
b. Spent fuel system, including baskets and supporting grids is a principal element in protection of stored fuel.
c. Spent fuel basin building – the steel structure that surrounds/protects the fuel basins.
d. Spent fuel cladding –fuel in GEH-MO basins are clad with stainless steel or zircalloy cladding.

Spent Fuel Basin Design
The spent fuel basin (SFB) is a spent fuel pool consisting of several interconnected basin pools: the cask unloading basin, the fuel storage basin 1 and the fuel storage basin 2 (formally the waste storage basin).

There are no design basis means of accidentally draining the SFB, nor can any SFB water systems inadvertently drain the SFB. The SFB water systems are designed with nonreversible pumps and no drainage penetration system is present. The SFB is constructed of reinforced concrete poured on bedrock with a welded stainless steel liner. The SFB is filled with demineralized water to a nominal depth of 28.5 ft. A leak detection system and pump-out facilities are provided for the space between concrete walls and floor and the stainless steel liner. The SFB is enclosed above by a steel structure consisting of steel walls and roofing.

An expansion gate is located in the SFB. The expansion gate was designed to allow an additional basin section (an additional waste storage basin 2 or fuel storage basin 3, for example) to be added to GEH-MO and connected to the existing SFB. The expansion gate consists of two large concrete walls partially surrounded by a stainless steel liner that are set against the inside and outside SFB concrete walls. The gates are joined together by tie rods pulling the walls together.

Tornado/Wind
Plant structures and components were designed to withstand sustained wind velocities of 110 mph without loss of functions. At higher velocities, enclosures (steel above grade walls) may fail or blow away; however, loss of these enclosures does not impact the safety of spent fuel basin which is below grade. Due to a large portion of the SFB being located below grade, wind loading does not affect the SFB structure.

The licensee analyzed the effects of tornado missiles and concluded that missiles will not penetrate the wall liners based on the strength and ductility of the liner, the possible angle of impact, and on the relative crushing strengths of the postulated missiles on the concrete.

The licensee completed an analysis to determine the consequences of a tornado missile damaging several fuel assemblies. The licensee determined that the maximum exposure an individual would receive from a tornado missile damaging fuel assemblies was a fraction of a mrem, which is below the Part 72 guideline values of 5 Rem total effective dose equivalent to the whole body.

Flood /Seiche
The calculated water level due to a design basis flood would rise to less than 520 ft. or more than 10 ft. below the GEH-MO site. There are no other credible flood situations affecting GEH-MO.

Seismic
The main building, including all portions of the structure now used for irradiated fuel storage, was originally constructed to seismic criteria based on a design earthquake and a maximum earthquake. The design earthquake was defined as a seismic event that has

a reasonable probability of occurrence during the life of the facility, based on historical seismic studies and structural geology. The design earthquake has a horizontal ground acceleration of 0.1 G. The maximum earthquake is rated at twice the acceleration of the design earthquake, or 0.2 G. The SFB was designed to ensure the DBE would be sustained without exceeding allowable stresses of the structure. The SFB was designed to ensure the maximum earthquake would be sustained without exceeding yield stress limits of the structure.

The inspectors verified that the SFB expansion gate was delineated in the CSAR as a seismically qualified important to safety component as an integral structure of the SFB. The inspectors requested design documents demonstrating that the expansion gate was qualified for the design earthquake and maximum earthquake as well as tornado missiles hazards as described in the CSAR. At the time of the closure of the inspection, the licensee was unable to locate original design documentation for the SFB expansion gate. The inspectors will verify design documentation during future inspections pending the licensee's location of the original design documentation or re-analysis of the SFB expansion gate. This item will be characterized as unresolved item (URI) 0720001/2011-001-01. The licensee documented this issue in its corrective action program as corrective action request (CAR) MO-11-0007.

Fire/Explosion
Structures, systems and components directly involved in storage of fuel shall be protected so that performance of their functions is not impaired when exposed to credible fire and explosion conditions.

The SFB areas are constructed of concrete, steel, and other materials which are either nonflammable or fire-retardant. No significant amount of flammable materials is used in these areas, and other potential fire dangers (bottled gases, etc.) are introduced only under stringent administrative control. Fire extinguishers are strategically located and plant personnel are trained for fire surveillance. Further protection is provided by surveillance patrols. Fire training is furnished to all personnel.

Discuss general results including corrective actions by licensee.

The inspectors determined that SSCs important to safety are capable of performing their specified function associated with design basis events. At the conclusion of the inspection, the licensee was unable to locate original design documentation for SFB expansion gate. The inspectors will verify design documentation during future inspections pending the licensee's location of the original design documentation or re-analysis of the SFB expansion gate. This item will be characterized as URI 0720001/2011-001-01. The licensee documented this issue in its corrective action program as CAR MO-11-0007.

2.02 Siphon and Drain Protection

Review the configuration of the spent fuel pool (SFP), SFP piping and any interconnected piping systems to determine whether the configurations represent a siphon or drain path. If anti-siphon devices are credited by the licensee in their spent fuel pool operational

occurrences and/or design basis events, verify that the devices exist and are functional. Review maintenance and surveillance procedures to determine whether drain and anti-siphon systems are maintained and that temporary hoses are controlled to preclude unauthorized use. The licensee should be knowledgeable of any potential siphon or drain paths and have procedures that can identify, resolve and minimize the probability of occurrence of an undetected drain or siphon. These considerations should have been documented by the licensee in their response to NRC Bulletin 94-01. Information Notice No. 93-83 also provides pertinent information.
Describe the licensee's spent fuel pool configuration that represent a siphon or drain path. If anti-siphon devices are credited by the licensee in their spent fuel pool operational occurrences and/or design basis events, document if the devices exist and are functional.
The SFB structure is below grade elevation with the exception of the top 3.5 feet which are above grade elevation. The SFB cooling system is at grade elevation. The only penetrations in the SFB liner are for the SFB cooling system suction inlets. If the SFB water level falls more than two feet from normal elevation, the SFB cooling pump suction inlets are exposed, leaving more than the minimum required water level on top of stored fuel and additionally eliminating any further suction path to drain the SFB. Suction motors are non-reversible. The SFB cooling discharge piping discharges to the bottom of the SFB through piping within the pool, rather than through additional liner penetrations. The piping enters the pool near the top of the pool. There are no other piping penetrations that could drain the SFB. The lack of a drainage system, location of cooling system suction locations, coupled with non-reversible pumps in the cooling system prohibits unintended drainage by operator error or design basis events.
Describe the licensee's anti-siphon devices that are credited (and not credited) by the licensee in their spent fuel pool operational occurrences and/or design basis events, verify and document that the devices exist and are functional.
The SFB structure is below grade and the SFB cooling system is at grade elevation. The lack of a drainage system, coupled with non-reversible pumps in the cooling system prohibits unintended drainage by operator error or design basis event
Describe the licensee's procedures that can identify, resolve and minimize the probability of occurrence of an undetected drain or siphon.

The licensee utilizes both manual and automatic means to monitor SFB level and temperature. Operators manually record SFB water level by entering the SFB building once per shift. In addition operators monitor SFB temperature and level remotely from the control room once per shift utilizing the Site Instrument Monitoring System (SIMS). SIMS also displays SFB level and temperature in manned security stations. In the event of SFB low level, high temperature, or elevated SFB building dose rates SIMS will automatically alarm to notify staff.
Discuss general results including corrective actions by licensee.
The inspectors concluded that the licensee was within their design basis requirements for SFB siphon and drain protection requirements. The inspectors reviewed the licensee's methods for monitoring SFB level.
2.03 Loss of Spent Fuel Pool Cooling Review the Defueled Safety Analysis Report (DSAR) or equivalent reports to identify the time available to initiate compensatory measures in the event that forced cooling to the SFP is lost. Also, identify the resultant radiological impact in areas of the plant that need to be occupied to implement compensatory actions for the loss of cooling event. Identify the SFP heat load used to calculate the times available before the volume of water in the pool reaches (1) saturation; (2) the time available for uncovering the assemblies due to boil-off; and (3) the required rate of make-up water necessary to match pool boil-off.
Describe the SFP heat load used to calculate the times available before the volume of water in the pool reaches saturation. Discuss the time available for uncovering the assemblies due to boil-off; and the required rate of make-up water necessary to match pool boil-off.
The SFB contains spent fuel bundles from both boiling and pressurized water reactors. The licensee completed an analysis in 2001 that determined that it will take approximately 24 to 30 days for the SFB to reach an equilibrium temperature of 140 to 160 degrees F should the spent fuel cooling system fail to function. Based on evaporation rates the licensee concluded, it will take approximately 141 days for the water level to expose the top of the stored fuel bundles. To maintain the same SFB water level at the top of fuel, the licensee would need to add 2,300 gallons of make-up water per day (1.6 gallons per minute). In addition, a physical test was performed in the GEH-MO SFB in 2004 to determine how long the SFB water could perform its safety function without the aid of any support systems operating, including the SFB cooling system. The licensee concluded that the GEH-MO SFB can fulfill their intended function of maintaining water conductivity and level for a minimum of 50 days without any support system in operation.

Describe the radiological impact in areas of the plant that need to be occupied to implement compensatory actions for the loss of cooling event.
The licensee will have at least 50 days during a loss of cooling event to implement compensatory actions in order to restore cooling or add water inventory to the SFB before radiological conditions may impact access into the basin area.
Discuss general results including corrective actions by licensee.
The inspectors concluded that the licensee was within their design basis requirements for SFB cooling requirements. The inspectors reviewed additional safety analyses that demonstrate safety for beyond design basis events.
2.04 Loss of Spent Fuel Pool Inventory Review the DSAR or equivalent reports to identify the time available to initiate compensatory measures in the event that the worst case postulated fuel pool inventory event occurs. This may include rupture of cooling and/or drain lines that could cause the pool to gravity drain to the lowest elevation postulated. Identify the resultant radiological impact in areas of the plant that need to be occupied to implement compensatory actions for the rupture event. Identify the times available before the volume of water in the pool reaches saturation; the time to uncover the fuel assemblies due to the combined effects of drain-down and boil-off; and the required rate of make-up water necessary to match losses. Additionally, identify the radiological impact of the worst case (beyond postulated) condition such as a catastrophic failure (crack or hole) in the SFP that lowers cooling water to the bottom of the active fuel. Determine the predicted heat-up time to fuel melt, if applicable, should drain-down occur. If applicable, the inspector should review the licensee's action plan in response to a zirconium fire resulting from a drain-down event.
Describe the time available to initiate compensatory measures in the event that the worst case postulated fuel pool inventory event occurs.
During a beyond design basis worst case postulated loss of SFB inventory event, the licensee would be able to initiate actions to place water into the spent fuel pool by normal plant sources within minutes. The licensee would be able to contact the fire department to arrange for fire department tankers to arrive and provide additional water sources within an hour. In addition, the licensee has several contacts with local water suppliers to supply additional sources if needed within several hours.

Discuss the resultant radiological impact in areas of the plant that need to be occupied to implement compensatory actions for the rupture event. Identify the times available before the volume of water in the pool reaches saturation; the time to uncover the fuel assemblies due to the combined effects of drain-down and boil-off; and the required rate of make-up water necessary to match losses.
The design basis of the SFB is such that a design basis rupture event is non-credible. Localized damage may occur due to tornado missiles near the top of the SFB, however it is not expected that these ruptures would significantly lower water level in the SFB creating elevated dose rates.
Discuss the radiological impact of the worst case (beyond postulated) condition such as a catastrophic failure (crack or hole) in the SFP that lowers cooling water to the bottom of the active fuel.
The licensee had not evaluated the radiological consequences of the beyond design basis catastrophic failure in the SFB that lowers cooling water to the bottom of the active fuel.
Discuss the predicted heat-up time to fuel melt, if applicable, should drain-down occur. If applicable, discuss the licensee's action plan in response to a zirconium fire resulting from a drain-down event.
The licensee completed evaluations in 2002 for a hypothetical beyond design basis event which assumes all the water coolant in the SFB is lost. For such an event the concern is whether the fuel will heat up sufficiently to cause the fuel or cladding to fail as a result of a zirconium fire, oxidation, creep out, embrittlement, or other chemical reaction. The licensee's analysis results, including some extreme sensitivity studies, determined that even for this hypothetical beyond design basis event, the spent fuel cladding temperatures are sufficiently low to conclude that no fuel failure will occur.
Discuss general results including corrective actions by licensee.
The inspectors concluded that the licensee was within their design basis requirements for SFB level requirements. The inspectors reviewed additional safety analyses that demonstrate safety for beyond design basis events.
2.05 Station Black Out (SBO) Mitigating Strategies Review the DSAR or equivalent reports to identify the primary alternating current (AC) and backup AC and/or Direct Current (DC) power supplies. Walk down the primary and backup power supplies to identify potentially adverse conditions, material condition problems and/or system line-ups that could be outside system design or detrimental to long-term system operability.

Identify backup power supplies intended to ensure SFP cooling, make-up water, instrumentation, alarms, and leakage detection are maintained upon SBO conditions. Verify through walk downs that backup power supplies are available and functional. Review surveillance protocols and test results which demonstrate functionality of the backup power supplies. Determine that materials necessary to support backup power supplies are adequate, including fuel oil supply in day tanks and other onsite storage tanks. Determine whether these materials are adequate, properly staged and maintained in a state of readiness. If battery powered supplies are intended for use, determine if the battery system is rated for a capacity equivalent to that credited by the licensee in the DSAR or as provided in station auxiliary or emergency operating procedures (AOPs/EOPs), as applicable. Verify through walk downs that procedures (AOPs/EOPs) for response to SBO conditions are developed and executable including the availability of necessary support equipment and supplies. Review training and qualification information to determine whether personnel are sufficiently knowledgeable to execute the procedures.
Describe the primary alternating current (AC) and backup AC and/or DC power supplies, and identify backup power supplies intended to ensure SFP cooling, make-up water, instrumentation, alarms, and leakage detection are maintained upon SBO conditions.
Primary Power Supply of offsite power is from separate lines from the Dresden Nuclear Power Station switchyard to GEH-MO power terminal facilities. All electrical loads which contribute directly to plant capability under abnormal conditions are supplied from an essential services distribution system. DC power is supplied from two rectifiers; one rectifier can handle all demand and maintain batteries charged. Within the main building, the bulk of power supply cabling and wiring for instrumentation and control functions are carried in separate wiring trays. *Secondary Power* If power is lost from both offsite sources, the diesel generator is designed to start and restore power to some lighting systems, SFB cooling water pumps, and other important loads. The diesel generator is capable of starting from either battery or air. A fuel oil tank is located onsite and both electrically driven and

manual pumps are provided for transferring fuel from the storage tank to the day tank located in the generator room. With full load on the generator, there is enough fuel onsite to run the diesel generator for approximately 30 hours. *Supplied Loads* Emergency lighting has been installed in corridors and routinely used areas of the process building as well as other site buildings. Equipment such as area radiation monitors, off-gas stack monitors, criticality monitors and alarm system, evacuation alarm system, and control panel instruments are supplied via the emergency distribution systems so that reliability is very high for continuous power. Normal water is provided to the site from an onsite well. A motor driven pump fills the water tower which then serves as a supply of potable water for the sites fire fighting, potable, and spent fuel make up needs. The motor driven pump is not operational upon a loss of offsite power; however, the emergency diesel generator is capable of providing power to the pump.
Describe results from the walk down of the primary and backup power supplies to identify potentially adverse conditions, material condition problems and/or system line-ups that could be outside system design or detrimental to long-term system operability. Describe if materials necessary to support backup power supplies are adequate, including fuel oil supply in day tanks and other onsite storage tanks. Describe whether these materials are adequate, properly staged and maintained in a state of readiness.
Inspectors performed a partial walk down of the electrical distribution system and observed the operation of the emergency diesel generator. SFB temperature and level indications are fed to a network computer which provides indication to licensee operators. In addition, alarms are annunciated in security locations and the system is backed up by an uninterruptable power supply. The licensee has a contract for the delivery of diesel fuel oil. The diesel generator, fuel oil and day tank are all located in a concrete building. The intake and radiator on the diesel generator is provided with missile protection from a tornado.
Discuss procedures (AOPs/EOPs) for response to SBO conditions that are developed and executable including the availability of necessary support equipment and supplies.
The diesel generator is designed to auto start on a loss of power. The diesel generator has the capability of being started by air and by battery. Procedures exist for switchboard manipulations such that one bus can be cross tied to the other and the diesel can be placed on either bus. The operation of the diesel generator was demonstrated by the licensee.
Discuss general results including corrective actions by licensee.

The inspectors concluded that the licensee was within their design basis requirements for electrical systems and station blackout mitigation strategies. The inspectors reviewed additional mitigation strategies that the licensee has in place for beyond design basis events.

2.06 Make-up Water and Mitigating Strategies

Identify all the SFP make-up water supplies as provided in the DSAR or other equivalent reports. Also, identify any other make-up sources that the licensee may use if conditions warrant.

Walk down selected pumps, valves and piping associated with make-up water supplies. Review SFP system configurations to determine if they correspond with the Piping and Instrumentation Diagrams (P& IDs) and licensing basis documents.

For make-up water supplies, ensure that appropriate capacities exist and that the make-up rate is sufficient to overcome loss rate. Verify through walk downs that equipment for delivery of make-up water is available and functional. Review equipment surveillance and test records, as applicable. If hoses, portable pumps, and other temporary equipment is intended for use, verify that equipment is staged and in a state of readiness.

Verify procedures are developed to ensure make-up water is provided in a timely manner to mitigate consequences. Also, determine if make-up water can be provided uninterrupted for a duration consistent with anticipated recovery needs. Determine what make-up sources and strategies are developed (or planned) to ensure make-up supplies are available for prolonged periods in the event of a beyond design basis event.

Verify training and qualifications of operators and support staff needed to implement procedures are adequate. Determine if a sufficient number of qualified staff is available for procedure implementation.

Discuss all the SFP make-up water supplies as provided in the DSAR or other equivalent report and identify any other make-up sources that the licensee may use if conditions warrant. In addition, discuss capacities for make-up rate vs. loss rate.

Normal Water Sources

Potable, utility, and fire fighting water supplies are drawn from a deep well located on the licensee's site. A submersible pump is used to pump water to an onsite storage tank. Potable and utility usage is limited by location of outlet piping to the top most 8,000 gallons of water in the storage tank. The remaining 42,000 gallons is used for fire protection.

Piping is provided to distribute utility water from the storage tank to the utility building for supplying the demineralized water supply system.

Demineralized water is used for SFB supply. The demineralizer is capable of treating the utility water supply system. A pressurized header distributes the demineralized water to the point of use. A line to the SFB is in place for SFB water level makeup. SFB water level is made up manually when water level drops 2 inches. A backup low level alarm activates if water level drops 6 inches below normal. *Contingency Water Sources* The remaining volume of the water storage tank, normally dedicated to fire fighting supplies, can be piped into the SFB through manual valve manipulations if needed. In addition, water can be pumped directly from the well into the SFB under both normal power and backup power sources. The Coal City Fire Department has the capability to transport water and connect to the GEH-MO fire main which is piped to the SFB. The department could respond in approximately 15 minutes. Backup water supplies are available from both local river sources and the Dresden Nuclear Power Station cooling lake; however, there are no specific formalized agreements in place to withdraw water from these sources. The most probable source of makeup water is to draw water from the river using a portable tanker truck, drive the tanker to the site and connect the tanker to the fire main. The fire main is capable of providing a flow path to add water to the pool. If additional water resources are needed, local bulk water suppliers could respond to the site within 3 hours. No contract exists for conducting this evolution; however, the site contacted the suppliers while onsite and confirmed that the companies still have the capability to deliver water to the site.
Discuss the results of the walked down of selected pumps, valves and piping associated with makeup water supplies. Describe the availability and condition of hoses, portable pumps and other temporary equipment intended for use specifically if the equipment is staged and in a state of readiness.
Minimal valve operations are needed to provide an alternative source of water to the spent fuel pool. The location and connection points to the system are in a place that would provide additional shielding if a high radiation environment existed in the SFB area. If the fire main were disabled, the site could potentially run fire hoses from a truck at or near the site boundary to the spent fuel pool. The site has several hoses onsite if needed to perform this operation.
Describe procedures that are developed to ensure make-up water is provided in a timely manner to mitigate consequences. Also, determine if make-up water can be provided uninterrupted for a duration consistent with anticipated recovery needs. Describe what make-up sources and strategies are developed (or planned) to ensure make-up supplies are available for prolonged periods in the event of a beyond design basis event.

The licensee has various procedures to provide makeup water in a timely manner from a variety of sources. The demand of water from the SFB is well within the capability of GEH-MO to provide.
Discuss general results including corrective actions by licensee.
The inspectors concluded that the licensee was within their design basis requirements for makeup water and mitigation strategies. The inspectors reviewed additional mitigation strategies that the licensee has in place for beyond design basis events.
2.07 Flood and Fire Protection Mitigating Strategies Identify internal and external flooding events (including a seiche if applicable) and fire events as provided in the station DSAR. Identify SFP equipment and system vulnerabilities from these postulated events. Walk down potential flood impacted areas to determine if required barriers, curbing, walls, and door penetration seals are in-place and intact. Assess the thoroughness of the licensee's walk downs and inspections of equipment needed to mitigate fire and flood events to identify equipment vulnerabilities. Determine that procedures or plans have been developed to address those vulnerabilities. Verify that applicable agreements are in place to mitigate the consequences of a fire such as agreements with offsite fire departments and other emergency responders.
Describe any SFP equipment and system vulnerabilities from natural phenomenon.
The calculated water level would rise to less than 520 feet, or more than 10 feet below the GEH-MO site. There are no credible flood situations affecting GEH-MO. In the case of a beyond design basis flood, systems important to safety are passive and below grade. Thus flooding would not affect important to safety structures, systems, and components.
Describe the results of walk downs of potential flood impacted areas.
The calculated water level would rise to less than 520 ft. or more than 10 ft. below the GEH-MO site. There are no credible flood situations affecting GEH-MO. In the case of a beyond design basis flood, systems important to safety are passive, and below grade and thus flooding would not affect important to safety structures, systems, and components.
Discuss agreements in place to mitigate the consequences of a fire such as agreements with offsite fire departments and other emergency responders.

GEH-MO has an agreement, dated October 21, 2010, with the Coal City Fire Department which includes both responding to a fire, and treating and transporting any person who is potentially contaminated. GEH-MO has agreed to provide site familiarization and training to the Coal City Fire Department.
Discuss general results including corrective actions by licensee.
The inspectors concluded that the licensee was within their design basis requirements for flood and fire protection mitigation strategies. The inspectors reviewed additional mitigation strategies that the licensee has in place for beyond design basis events.
Discuss newly developed or planned mitigating strategies for identified vulnerabilities.
The site performed an assessment of the potential effects of beyond design basis events on the safety aspects of the SFB, based on lessons learned to date from the Fukushima Daiichi Nuclear Power Station. The review included: SFB siphon and drain protection, SFB cleanliness and criticality controls, effects of natural phenomena on criticality controls, beyond design basis of high winds, tornados, and earthquakes, SFB instrumentation, SFB alarms and leakage detection, and loss of utilities and effect of total station blackout. The inspectors reviewed the licensee's assessment and recommendations. A Corrective Action Request (CAR MO-11-003) was generated based on recommendations from the assessment.
Discuss general results including corrective actions by licensee.
The inspectors observed that the site had initiated actions for internal reviews in the wake of events at Fukushima Daiichi. The inspectors reviewed the licensee's assessment and recommendations.
2.09 Environmental/Radiological Conditions and Special Tools Evaluate radiological conditions that operators may encounter while traveling to the area where manual actions will be performed and within the areas those actions will take place. Conditions to be verified include: • Capability to assess radiological conditions including provisions for planned special exposures • Availability and functionality of respiratory protection equipment (including self-contained breathing apparatus) • Availability and functionality of fixed and portable emergency lighting along access routes and manual operating stations • Availability and functionality of communications equipment • Availability and functionality of fire protection equipment • Availability of special tools necessary to implement mitigating actions
Discuss general results including corrective actions by licensee.
An offsite release is not considered credible; therefore, no formal commitments were made with offsite support organizations. The site would rely on assistance from the Illinois Emergency Management Agency (IEMA) or the Exelon Generation Company to

assess/assist with offsite radiological conditions. There are no formal agreements in place between GEH-MO and IEMA. A letter of agreement exists with Exelon; however, the letter does not detail a commitment for Exelon to provide assistance to GEH-MO in the event of an unplanned radiological release.

The site relies on outside assistance for conditions that would require the use of respirators. The site does not maintain, nor are they required to maintain, individuals qualified in self contained breathing apparatuses. In the event of a fire, the Coal City Fire Department would be deployed to combat the fire. GEH-MO would assist with providing radiological oversight.

Both fixed and portable lighting are available in the SFB building. Fixed lighting in the spent fuel pool area is capable of receiving power from the emergency diesel generator and battery backup DC lighting is available for egress in the event of an emergency. Fire extinguishers are provided at the site, there are no fire hoses connected to the fire water piping.

2.10 Staffing and Training

Review license shift staffing to determine whether enough qualified personnel are available to perform the required compensatory actions for prolonged periods.

Determine if response staff is knowledgeable and trained on compensatory actions and associated procedures.

Discuss general results including corrective actions by licensee.

The inspectors observed that sufficient staffing exists to operate the plant and respond to design basis events. A significant accident is not considered credible and therefore the site retains sufficient staffing for the conduct of their operations. If a significant event were to occur, the site relies on outside help for assistance. IEMA is relied upon for radiological support and the Coal City Fire Department is relied upon for fire and emergency management support. There are no formal agreements in place between GEH-MO and IEMA. Additionally, there is an agreement between GEH-MO and Exelon Generation Company; however, the agreement does not specify what assistance Exelon would provide to GEH-MO. The licensee documented the lack of formal agreements for offsite assistance in its corrective action program under CAR MO-11-005.

The inspectors questioned staff on compensatory procedures, and the staff appeared knowledgeable of actions need to carry out the procedures.

Discuss general results including corrective actions by licensee.

The inspectors reviewed documents related to historical leaks and repairs of the SFP basins. The NRC inspectors did not find any changes made to the facility that were inconsistent with the CSAR.

3.0 Exit Meeting

The inspectors presented the inspection results to Mr. A. McFadden at the conclusion of the inspection on April 29, 2011. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

A. McFadden, Plant Manager
F. Partney, Operations and Maintenance Coordinator
J. Legner, Administrator, EHS and Procurement

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened	Type	Summary
07200001/2011-001-01	URI	Design Verification of Basin Expansion Gate

Closed	Type	Summary
None		

LIST OF DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety but rather that selected sections of portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

Basin Water Heat-Up Rate Maximum Temperature and Time Required to Evaporate Down to Top of Fuel, J. Kesman; November 27, 2001

Corrective Action Request MO-11-003: Off-Site Document Storage

Corrective Action Request MO-11-004; LOA Fire Department

Corrective Action Request MO-11-005; LOA Exelon

Corrective Action Request MO-11-006; MOI-226 Contingency Plan for Make-Up Water to Basin

Corrective Action Request MO-11-007; Design Basin Analysis Expansion Gate

Evaluation of Fuel Storage Basin Water Temperature During a Combined Loss of Water Cooling and Ventilation Air Flow Capacity, February 25, 2004

Final Report for Basin Thermal Output Test Operation Test Number 75; March 5, 1997

Fuel Basin Water Evaluation: Conductivity Change and Evaporation Rate,

GEH-MO Consolidated Safety Analysis Report; Revision 12

Heat Load in Morris Pool, April 23, 1979

In-Plant Test Measurements for spent Fuel Storage at Morris Operations, Volume 3; February 1982

Letter, L.L. to K.J. Eger entitled "Decay Heat and Other Questions" of 11/14/95; November 28, 1995

MOI-226; Contingency Plan for Providing Makeup Water to the Basin; Revision 5

Renewal of Letter of Agreement Between GE-Hitachi Morris Operation and Coal City Fire Department; October 21, 2010

Renewal of Letter of Agreement Between GE-Hitachi Morris Operation and Morris Hospital; October 31, 2008

SOP 14-1; Loss of One Incoming Power Line – Initial Action and Return to Normal; Revision 15

SOP 14-2; Total Power Loss – Initial Action and Return to Normal; Revision 13

SOP 14-3; Cross-Tie of Incoming Power Busses; Revision 9

SOP 14-4; Emergency Diesel Generator Operation; Revision 8

SOP 14-7; Restoration of Commercial Power to MO; Revision 1

SOP 16-90; Emergency Generator – Operability Test; Revision 15

SOP 16-91; Back-up Diesel Generator – Operability Test; Revision 15

Spent Fuel Heat Up Evaluation, G.L. Sozzi; March 2002

Spent Fuel Information Letter, January 3, 1979

SPOP-249; Fuel Basin Conductivity Test; Revision 0

Update to Existing Letter of Agreement [between Exelon Nuclear and GE-Hitachi Morris Operations]; June 23, 2010

LIST OF ACRONYMS USED

AC	Alternating Current
ADAMS	Agencywide Documents Access and Management System
CSAR	Consolidated Safety Analysis Report
CAR	Corrective Action Request
CFR	Code of Federal Regulations
DC	Direct Current
DSAR	Defueled Safety Analysis Report
GEHMO	General Electric-Hitachi Morris Operation
IEMA	Illinois Emergency Management Agency
NRC	U.S. States Nuclear Regulatory Commission

SBO	Station Black Out
SFB	Spent Fuel Basin
SFP	Spent Fuel Pool
SIMS	Site Instrument Monitoring System
SOP	Standard Operating Procedure
SSCs	Structures, Systems and Components
URI	Unresolved Item