



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

September 5, 2012

Mr. Michael Perito  
Vice President, Site  
Entergy Operations, Inc.  
P.O. Box 756  
Port Gibson, MS 39150

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE  
GRAND GULF NUCLEAR STATION LICENSE RENEWAL APPLICATION  
(TAC NO. ME7493)

Dear Mr. Perito:

By letter dated October 28, 2011, Entergy Operations, Inc., submitted an application pursuant to Title 10 of the *Code of Federal Regulations* Part 54, to renew the operating license for Grand Gulf Nuclear Station, Unit 1, for review by the U.S. Nuclear Regulatory Commission (NRC or the staff). The staff is reviewing the information contained in the license renewal application and has identified, in the enclosure, areas where additional information is needed to complete the review.

These requests for additional information were discussed with Jeff Seiter, and a mutually agreeable date for the response is within 30 days from the date of this letter. If you have any questions, please contact me at 301-415-1045 or by e-mail at [nathaniel.ferrer@nrc.gov](mailto:nathaniel.ferrer@nrc.gov).

Sincerely,

A handwritten signature in black ink, appearing to read "N. Ferrer", with a long horizontal flourish extending to the right.

Nathaniel Ferrer, Project Manager  
Projects Branch 1  
Division of License Renewal  
Office of Nuclear Reactor Regulation

Docket No. 50-416

Enclosure:  
As stated

cc w/encl: Listserv

GRAND GULF NUCLEAR STATION  
LICENSE RENEWAL APPLICATION  
REQUESTS FOR ADDITIONAL INFORMATION SET 34

**RAI B.1.22-1a**

Background: Based on information from Grand Gulf Nuclear Station (GGNS) calculation MC-Q1111-08011, the staff issued request for additional information (RAI) B.1.22-1 questioning whether the Flow-Accelerated Corrosion (FAC) Program manages wall thinning for components in the low pressure core spray (LPCS) and high pressure core spray (HPCS) systems. The applicant's response, dated May 25, 2012, states that these systems are not susceptible to FAC because they experience two phase flow less than two percent of the time and that the referenced calculation confirmed the conclusion that the FAC Program is not required to manage wall thinning in the LPCS and HPCS systems. The response also stated that no other systems have aging effects being managed by the FAC Program that were not identified in the license renewal application (LRA).

Information obtained during the staff's aging management program audit appears to indicate that several items in the LPCS (i.e., #333, #403, #661, #662) and HPCS (i.e., #253, #285, #301, #307, #402, #605) systems were being monitored through inspections performed by the FAC Program. In addition, the staff identified an excess of 40 items in the residual heat removal (RHR) system that appeared to be monitored through inspections performed by the FAC Program. However these components appear to be in portions of the RHR system that the CSI Technology evaluation No. 0700.104-10, "GGNS FAC System Susceptibility Evaluation," had excluded from susceptibility for FAC for an unspecified reason.

Issue: It is not clear to the staff whether the System Susceptibility Evaluation improperly excluded systems or portions of systems that were susceptible to FAC, or the inspections being performed by the FAC Program are monitoring components that are susceptible to an aging mechanism other than FAC, or components that were previously monitored by the FAC Program have been determined to be acceptable until the end of the period of extended operation and no longer need to be monitored.

Request: Review the components contained in the FAC Program's reinspection list for future outages (specifically, items 333, 403, 661, 662, 253, 285, 301, 307, 402, and 605) and determine whether the inspections conducted on these components were for wall thinning due to FAC or for some other wall thinning mechanism.

If these components are no longer being inspected through the FAC Program, either identify the program that now monitors wall thinning for these components or provide details showing that these components had previously been determined to be acceptable through the end of the period of extended operation.

If these or any other components are being inspected through the FAC Program and were previously excluded through the System Susceptibility Evaluation, explain why the System Susceptibility Evaluation inappropriately excluded these components and revise the LRA to justify the use of the FAC Program to monitor aging mechanisms other than FAC.

ENCLOSURE

**RAI B.1.22-2a**

Background: GGNS Procedure EN-DC-315, "Flow-Accelerated Corrosion Program," Section 5.1.1, "Components Failing to Meet Initial Screening Criteria," states that a condition report shall be generated when "significant wall thinning," is detected in a system or when wall thinning is below  $T_{accpt}$  [acceptable wall thickness]. "Significant wall thinning" is defined in Section 3.0.39 as the largest of a) a thickness less than 60 percent of nominal pipe wall thickness ( $T_{nom}$ ), b) a thickness less than  $\frac{1}{2} (0.875 T_{nom} + T_{accpt})$ , or c)  $T_{accpt} + 0.020$  inches.

The staff issued RAI B.1.22-2 requesting GGNS to confirm that significant wall thinning, as defined in EN-DC-315, had not been detected in recent outages and condition reports were not required to be generated. The response to RAI B.1.22-2, dated May 25, 2012, stated:

A review of program documentation and data from the Fall 2008 and Spring 2010 refueling outages determined that no significant wall thinning has been detected other than the wall thinning documented in the condition reports referenced in the background of this request for information, which had resulted in wall thickness below the minimum acceptable wall thickness. Thus no additional condition reports on significant wall thinning as defined in EN-DC-315 were required to be generated.

Information obtained during the staff's aging management program audit appears to indicate several instances where the measured wall thickness ( $T_{meas}$ ) was less than 60 percent of  $T_{nom}$ , which meets the criteria for "significant wall thinning" in EN-DC-315. Specifically, in calculation MC-Q111-08011, "Evaluation of RF16 Flow Accelerated Corrosion Wall Thickness Data," for the refueling outage in fall 2008:

Item 314A, 4-inch pipe to downstream tee:  $T_{nom} = 0.237$ ,  $T_{meas} = 0.122$  [51%]

Item 353, 3x6 expander:  $T_{nom} = 0.280$ ,  $T_{meas} = 0.163$  [58%]

Item 795, 2-inch elbow and pipe:  $T_{nom} = 0.218$ ,  $T_{meas} = 0.095$  [44%]

Issue: Inspections apparently identified significant wall thinning, but GGNS did not issue condition reports as required by the controlling procedure. Since the current program is not being implemented in accordance with the controlling procedure, the staff cannot reasonably conclude that the program will be implemented in accordance with the controlling procedure during the period of extended operation.

Request: Re-review the program documentation and data from recent outages to confirm that no significant wall thinning, as defined in EN-DC-315, "Flow-Accelerated Corrosion Program" had been identified and condition reports were not required to be generated. Specifically discuss items 314, 353, and 795 to explain why these are not examples of "significant wall thinning."

If significant wall thinning was identified, but condition reports were not generated, then provide information to demonstrate that there is reasonable assurance the program will be implemented in accordance with the controlling procedures during the period of extended operation.

**RAI B.1.24-1a**

Background: In its response to RAI B.1.24-1, and the updated list of commitments, the applicant stated that it will enhance the Inservice Inspection-IWF Program to identify the component supports that contain high-strength bolting in sizes greater than 1 inch nominal diameter, and that the extent of examination will be as specified in ASME Code Section XI, Subsection IWF (Table IWF-2500-1).

Issue: It is not clear whether the applicant plans to assess the plant for all component supports applicable to the Inservice Inspection-IWF Program that contain high strength structural bolting and then establish a sample based upon the criteria specified in ASME Code Section XI, Table IWF-2500-1, or if the applicant plans to identify the high strength bolts among the component supports already identified as part of the IWF examination sample.

Request: Clarify whether the applicant will identify all of the high strength bolts that are eligible to be part of the IWF inspection population and establish a new sample for high strength bolts based on the ASME Table IWF-2500-1 or if it is going to identify high strength bolts from the already-established set of IWF supports. If the latter, explain how that approach will ensure that the ASME Code criteria for sample size will be met.

**RAI B.1.24-2a**

Background: In RAI B.1.24-2, the staff requested that the applicant provide information regarding degraded components in the standby service water basins and any corrective actions that were taken in accordance with the ASME code. The staff reviewed the response and noted that the applicant expanded the scope and frequency of inspections in accordance with the ASME Section XI, Subsection IWF requirements; however, the staff noted that the expanded scope and frequency of inspections was limited to the standby service water system.

Issue: The staff is concerned that there may be similar aging of IWF components in systems other than the standby service water system with the same material and environment combination.

Request: Provide information on whether there are IWF supports in other areas of the plant that may be subject to similar age-related degradation. If so, provide information as to whether the applicant performed additional examinations extending to other systems in the plant, if any, or provide justification for not determining the potential extent of the degraded condition to other areas.

**RAI B.1.24-3a**

Background: The ASME Code, Section XI, Subsection IWF Program requires the inspection of the same sample of the total population of component supports each inspection interval. The staff noted in the applicant's program operating experience, the applicant discovered degraded conditions that were significant enough that the applicant chose to repair or re-work the component to as-new condition. However, the degradation was not enough to exceed the IWF-3000 acceptance criteria for expansion in scope or additional inspections.

Issue: The staff's concern, as stated in RAI B.1.24-3, is that if IWF supports and components are re-worked to as-new condition, they are no longer representative of the age-related degradation to the remaining components in the population of the IWF scope but that are not in the inspection sample.

Request: Explain how the applicant plans to ensure that the IWF inspection sample components represent the age-related degradation of the rest of the population. If applicable, state whether the program will include an evaluation for the need to substitute components that are re-worked with another that may be more representative of the general population, or to include additional components in the inspection sample.

#### **RAI B.1.24-5a**

Background: In its response to RAIs B.1.24-1 and B.1.24-5, the applicant references the Generic Aging Lesson's Learned (GALL) Report statement that ASTM A-325, F-1852, and ASTM A-490 bolts used in civil structural applications have not shown to be prone to stress corrosion cracking (SCC). In its response to RAI B.1.24-5, the applicant also states that "cracking due to SCC is an applicable aging effect on high-strength bolting greater than one inch and having a yield strength greater than 150 ksi exposed to sustained high tensile stress in a corrosive environment" and that "high-strength bolting is not exposed to a corrosive environment at Grand Gulf Nuclear Station."

Issue: The statement in the GALL Report that ASTM A-325, F-1852, and ASTM A-490 bolts have not been shown to be prone to SCC does not apply to high strength structural bolting for ASME Class 1, 2 and 3 piping and component supports. The GALL Report also does not define or specify criteria for a "corrosive environment" that must be met for age-management of high strength structural bolting, rather it defines the applicable environment as air-indoor, uncontrolled, to manage high strength structural bolting for cracking due to SCC. The GALL Report recommends that the ASME Section XI, Subsection IWF Program is augmented to include consideration of the guidance applicable in EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339 for selection of bolting material installation torque or tension and the use of lubricants and sealants to prevent or mitigate degradation and failure of structural bolting. In addition, the GALL Report recommends that for high strength structural bolting, the preventive actions for storage, lubricants, and SCC potential discussed in Section 2 of Research Council for Structural Connections (RCSC) publication "Specification for Structural Joints using ASTM A325 or A490 Bolts" need to be used. The applicant's response to RAI B.1.24-1 does not indicate whether the applicant's procedures implement the recommended guidance or consider the preventive actions for storage, lubricants, and SCC potential discussed in Section 2 of the RCSC publication "Specification for Structural Joints using ASTM A325 or A490 Bolts."

Request: Specify whether the Inservice Inspection-IWF Program will be enhanced in accordance with the GALL Report such that:

- a. The guidance applicable in EPRI NP-5769, EPRI TR-104213, and NUREG-1339 for selection of bolting material and the use of lubricants and sealants will be used to prevent or mitigate degradation and failure of safety-related bolting

- b. The preventive actions addressed in Section 2 of RCSC publication "Specification for Structural Joints using ASTM A325 or A490 Bolts" will be followed for structural bolting consisting of ASTM A325, ASTM F1852, and/or ASTM A490 bolts

If this guidance will not be used, provide technical justification for not following the guidelines recommended in the GALL Report.

#### **RAI B.1.41-1a**

Background: The operating experience discussion for the Service Water Integrity Program states that degraded areas of coatings were identified on the submerged piping in the standby service water (SSW) basins. Based on the degree of degradation noted after 12 months, the staff issued RAI B.1.41-1 questioning the adequacy of the 36-month inspection frequency specified in the coatings procedure 07-S-07-211, "Service Level I Coatings Conditions Assessment."

The response to RAI B.1.41-1, states that procedure 07-S-07-211 applies to the underwater coatings in the SSW basin, including the coatings on concrete structures, and that the 36-month inspection frequency is appropriate for these concrete structures. The response also stated: "In addition to the SSW basin inspections specified in Procedure 07-S-07-211, GGNS performs SSW basin pipe coating inspections annually."

The Service Water Integrity Program descriptions in LRA Section B.1.41 and the updated final safety analysis report (UFSAR) supplement in LRA Section A.1.41 state that the Service Water Integrity Program manages loss of material and fouling as described in the GGNS response to GL 89-13. However, the GGNS generic letter (GL) response, dated January 29, 1990, states that for protective coatings, "accessible external piping surface coatings are maintained by routine plant painting efforts." The GGNS response to GL 89-13 did not address submerged piping in the SSW basins, and GGNS Commitment Change Evaluations (CCEs) 2004-0002, 2006-0002, 2006-0004, and 2007-0001, for GL 89-13 commitments did not discuss protective coatings.

Issue: Based on the response to the RAI, it is not clear whether the SSW basin pipe coating inspections are controlled through procedure 07-S-07-211, through some other procedure, or through a combination of procedures. Since the SSW basin pipe coatings are currently inspected annually due to past piping degradation, it is not clear where the inspection frequency is specified and how the inspection frequency is controlled.

In addition, since the GGNS response to GL 89-13 stated that external surfaces are maintained by routine plant painting efforts, but the current inspection and maintenance of submerged piping do not appear to be routine painting activities, the LRA's program description and UFSAR supplement for the Service Water Integrity program do not reflect current GGNS aging management activities for the Service Water Integrity program.

Request:

- a. Clarify which GGNS procedure controls the coating inspections for submerged piping in the SSW basin, the frequency of these inspections, and how inspection frequencies are adjusted based on plant-specific operating experience.
- b. Update the program description in LRA Sections A.1.41 and B.1.41 for the Service Water Integrity program to reflect current aging management activities or provide justification that the program described in GGNS response to GL 89-13, as modified through the commitment change process, adequately describes current GGNS aging management activities.

**RAI B.1.41-3a**

Background: Based on information in GGNS condition report CR-GGN-2010-01344, the staff issued RAI B.1.41-3 requesting information regarding whether components that are being managed for loss of material by the Service Water Integrity program are also being managed for loss of material by GGNS MS-46, "Program Plan for Monitoring Internal Erosion/Corrosion in Moderated Energy Piping Components (Safety Related)." In addition, based on the similarity in definitions between "flow-accelerated corrosion," and "erosion/corrosion," the staff issued RAI B.1.22-3 requesting information regarding the aging effects being managed by GGNS MS-46.

The response to RAI B.1.41-3, dated May 25, 2012, states:

"The GGNS MS-46 procedure for moderate energy piping **is not** an aging management program that is necessary or **credited** to manage the effects of aging for components that are included in the Service Water Integrity program." [emphasis added]

By contrast, the response to RAI B.1.22-3, dated May 25, 2012, states:

"These inspections [described in GGNS MS-46] are not credited as part of the aging management program described in LRA B.1.22, Flow-Accelerated Corrosion Program. However, inspections specified in GGNS MS-46 **are credited** as part of the aging management program for managing loss of material described in LRA B.1.21 Fire Water System Program and LRA B.1.41 Service Water Integrity. Furthermore, the inspections described in GGNS MS-46 may be used, where applicable, as opportunistic or periodic inspections defined in other aging management programs at GGNS." [emphasis added]

GALL Report AMP XI.M20, Open-Cycle Cooling Water System, states that this program manages aging effects caused by mechanisms including erosion. Although the GGNS response to GL 89-13, Action III, Item 7, stated that the SSW system did not meet the selection criteria of the erosion/corrosion monitoring program, the GGNS review for GL 89-13 appears to have used the criteria for NRC Bulletin 87-01, which is for FAC (as clarified in NSAC-202L, "Recommendations for an Effective Flow-Accelerated Corrosion Program"). Erosion as described in GL 89-13 relates to solid particle erosion, but as discussed in DRAFT Interim Staff Guidance 2012-001, "Wall Thinning Due to Erosion Mechanisms," erosion can be caused by other mechanisms, such as cavitation, flashing and droplet impingement.

Issue: Statements that were provided in response to RAI B.1.41-3 and RAI B.1.22-3 appear to be in conflict with each other. In addition, since the condition report and the response to RAI B.1.22-3 discuss MS-46, wall thickness inspections of pipe components are being performed at GGNS for erosion/corrosion. However, it is not clear whether these are one-time inspections that confirm the components are acceptable until the end of the period of extended operation, or whether these are ongoing monitoring activities that verify the acceptability of components for a time period less than the period of extended operation. In that regard, any one-time inspections performed early in plant life may have only considered a 40-year operating license.

Request:

- a. Reconcile the apparent disparity between the responses to RAI B.1.41-3 and RAI B.1.22-2 regarding whether the inspections specified in GGNS MS-46, "Program Plan for Monitoring Internal Erosion/Corrosion in Moderated Energy Piping Components (Safety Related)," are or are not credited in the Service Water Integrity Program. In addition, if inspections performed through MS-46 are credited by any aging management program, include appropriate changes to the related sections of the LRA.
- b. Provide information regarding all components that are being monitored for erosion/corrosion through GGNS MS-46 to demonstrate that these components are not within the scope of license renewal; or if components are within the scope of license renewal, that the monitoring activities are limited to one-time inspections which have verified the components are acceptable until the end of the period of extended operation or are credited by an aging management program in the LRA.



September 5, 2012

Mr. Michael Perito  
Vice President, Site  
Entergy Operations, Inc.  
P.O. Box 756  
Port Gibson, MS 39150

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE  
GRAND GULF NUCLEAR STATION LICENSE RENEWAL APPLICATION  
(TAC NO. ME7493)

Dear Mr. Perito:

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Sincerely,

/RA/

Nathaniel Ferrer, Project Manager  
Projects Branch 1  
Division of License Renewal  
Office of Nuclear Reactor Regulation

Docket No. 50-416

Enclosure:  
As stated

cc w/encl: Listserv

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Letter to M. Perito from N. Ferrer dated September 5, 2012

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE  
GRAND GULF NUCLEAR STATION, LICENSE RENEWAL APPLICATION

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