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GNRO-2012/00081

July 26, 2012

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Response to Request for Additional Information (RAI) Set 26 dated June 27, 2012
Grand Gulf Nuclear Station, Unit 1
Docket No. 50-416
License No. NPF-29

REFERENCE: NRC Letter, "Requests for Additional Information for the Review of the Grand Gulf Nuclear Station License Renewal Application," dated June 27, 2012 (GNRI-2012/00141)

Dear Sir or Madam:

Entergy Operations, Inc. is providing, in Attachment 1, the response to the referenced Request for Additional Information (RAI). Attachment 2 includes changes to appendices A and B of the License Renewal Application as a result of the responses provided in Attachment 1. Attachment 3 includes an updated listing of regulatory commitments for license renewal that includes revised commitment 27 required in response to RAIs in this letter.

This letter contains no new commitments. If you have any questions or require additional information, please contact Christina L. Perino at 601-437-6299.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 26th day of July, 2012.

Sincerely,

MP/JAS

Attachments:

1. Response to Requests for Additional Information (RAI)
2. License Renewal Application Changes
3. List of Regulatory Commitments

cc: with Attachments

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Attachment 1 to

GNRO-2012/00081

Response to Requests for Additional Information (RAI)

RAI 4.2.3-1

Background. Generic Letter (GL) 92-01, Revision (Rev.) 1 and Regulatory Guide (RG) 1.99, Rev. 2 address the information related to reactor vessel structural integrity required of all licensees for beltline materials. The staff has maintained that the licensees should provide comparable information for all extended beltline materials as part of the license renewal process. With the increase in neutron fluence associated with license renewal, three additional plates are now above the fluence threshold (> 1E+17 n/cm2, E > 1 MeV) and must be considered as extended beltline materials. Note (2) of license renewal application (LRA) Table 4.2-2 indicates that since information is not available for the actual measured copper content for the three plates of Shell Course 1, the maximum allowable copper content was obtained from the vessel design specification (i.e., copper content of 0.12 percent).

Issue. RG 1.99, Rev. 2 specifically considers best estimate values for the material as acceptable, which will normally be the mean of measured values for a given plate. If such values are not available, then upper limiting values given in the material specification are acceptable. The RG does not mention the design specification. Conservative estimates of the chemistry (mean plus one standard deviation) based on generic data may be used if justification is provided.

Request.

a. Provide the part of the design specification for Shell Course 1 that describes the required copper content and the material specification that was in effect when the reactor vessel for Grand Gulf Nuclear Station was built.
b. Describe the documented basis for the copper content of Shell Course 1 plates, such as available certified material test records, quality control documents, and/or other data that might be used to justify the assumed copper content.

RAI 4.2.3-1 RESPONSE

a. As stated in License Renewal Application (LRA) Table 4.2-2, the copper content in Shell Plate #1 was specified as 0.12%. The reference to the design specification in Note 2 of this table was in error, and the correct reference is the purchase specification. As this material was not originally considered to be within the beltline region of the Grand Gulf Nuclear Station (GGNS) reactor vessel, copper content was not determined during fabrication of the vessel materials. To further justify the use of 0.12% Cu, all available BWR/6 fleet vessel Certified Material Test Reports were reviewed. Twenty-eight (28) data points were located, and it was found that mean plus two times the standard deviation results in 0.10% Cu. Based on this data, it is shown that 0.12% Cu is greater than the upper bound for all available BWR/6 copper content.

   Note 2 of Table 4.2-2 in the LRA is revised as shown below to change design specification to purchase specification. Additions are shown with underline and deletions are shown with strikethrough.

TABLE 4.2-2 Notes:

1 USE = initial transverse USE * [1 - (% decrease / 100)]
2 Copper content is not available; therefore, the maximum allowable %Cu was obtained from the vessel ~~design~~ purchase specification.
3 Use of SMAW Heats 422K8511, 627069, 626677, and 627260 was determined to be limited to weld

pick-ups at the ID/OD surfaces or initial root pass or sealing at the backing bars which were ground out or subsequently removed. Certified material test reports indicate that no SMAW weld material is present at either the ¼T or ¾T location. Therefore, these heats do not require evaluation as part of the beltline region.

b. The basis for copper content in Shell Plate #1 materials is provided in response a. above.

RAI B.1.23-2

Background. LRA Section B.1.23, "Inservice Inspection," states that, "ISI Program Summary Reports between 2004 and 2010 reveal compliance and provide evidence that the program is effective for managing aging effects in accordance with the ASME Boiler Pressure Vessel Code Section XI."

Generic Aging Lessons Learned (GALL) aging management program (AMP) XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," "Detection of Aging Effects" program element states that "The extent and schedule of the inspection and test techniques prescribed by the program are designed to maintain structural integrity and ensure that aging effects are discovered and repaired before the loss of intended function of the component." In addition, "monitoring and trending" program element states that, "For Class 1, 2, or 3 components, the inspection schedule of IWB-2400, IWC-2400, or IWD-2400, respectively, and the extent and frequency of IWB-2500-1, IWC-2500-1, or IWD-2500-1, respectively, provides for timely detection of degradation."

Issue. The staff noted that Event Notification Report No. 47880 dated April 30, 2012, indicates that the applicant detected an unacceptable indication in one of the residual heat removal (RHR) system to reactor pressure vessel nozzles (weld area of N06B-KB nozzle) during the current refueling outage. The defect has a size of 0.9 inches in length and 0.5 inches in depth. Nominal wall thickness of the weld is 1.3 inches.

The staff needs clarification regarding how this plant-specific operating experience affects the effectiveness of the applicant's AMP (e.g., detection of aging effects and directing corrective actions in a timely manner).

Request.

a. Clarify whether the defect detected in the RHR nozzle is age-related. If it is, and based on the size of the defect, provide justification that the applicant's proposed Inservice Inspection (ISI) program is still effective in timely detection of aging effects (i.e., whether inspection intervals are adequate to prevent unacceptable flaw propagation).
b. Clarify when the previous UT examination was performed on the subject RHR weld and provide the examination results.
c. Describe any corrective actions and extent of condition performed from previous examinations or as a result of the recent unacceptable indication. Provide justification that the current inspection schedule for all affected components is adequate for timely detection of aging effects.

RAI B.1.23-2 RESPONSE

a. The indication detected in the RHR nozzle on April 30, 2012 (during RF18) was attributed to the aging mechanism of intergranular stress corrosion cracking (IGSCC) and is indicative of the IGSCC cracks found in dissimilar metal welds at other BWRs. The indication was axially-oriented, wholly located within the weld and butter material, and was identified prior to a through-wall leak. Thus no loss of intended function was experienced.

   GGNS has thirty-four (34) dissimilar metal (DM) welds which require inspection under BWRVIP-75-A. Based on industry operating experience with cracking in DM welds, an accelerated inspection program was implemented at GGNS in 2009. This included improvements in surface preparation, testing equipment, inspection procedures, and inspector training specifically developed to identify flaws in DM welds. Twenty (20) DM welds were inspected prior to RF18. The remaining fourteen (14) welds in the program were inspected during RF18. All welds of this type have been inspected at GGNS with no other flaws noted.

b. The previous examination of weld N06B-KB was performed during the fall 2002 refueling outage and no indications were identified.

c. As discussed above, no previous indications were identified.

   The corrective action implemented to correct the indication identified during RF18 (2012) included a weld overlay. The extent of condition review performed with respect to this indication found that all welds of this type have now been inspected at GGNS with no other flaws noted. The improvements in surface preparation, testing equipment, inspection procedures, and inspector training were contributors to the detection of this indication during RF18 (2012). These program improvements remain in effect.

   Therefore, the Inservice Inspection (ISI) program remains effective to assure that the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

RAI B.1.38-1

Background. The "scope of program" program element of GALL AMP XI.M31, "Reactor Vessel Surveillance," states that materials originally monitored within the scope of the licensee's existing Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix H, materials surveillance program will continue to serve as the basis for the reactor vessel surveillance AMP unless safety considerations for the term of the renewed license would require the monitoring of additional or alternative materials.

LRA Table 4.2-2 for the applicant's upper-shelf energy analysis includes "Shell Plate 1," indicating that the 1/4T fluence of this plate is 3.94E+17 n/cm^2 (E > 1 MeV) for 54 effective full power years (EFPY) in consideration of the planned extended power uprate (EPU) as addressed in LRA Section 4.2. LRA Section 4.2 also indicates that 54 EFPY corresponds to the end of the period of extended operation. The projected fluence of Shell Plate 1 exceeds 1.0E+17 n/cm^2, which is a fluence threshold for the consideration in a Reactor Vessel

Surveillance Program in accordance with 10 CFR Part 50, Appendix H. During the audit, the staff also noted that Shell Plate 1 has the highest adjusted reference temperature (ART) among all the plates of the applicant's reactor vessel after 54 EFPY.

Issue. The LRA information does not permit the staff to independently verify the neutron irradiation embrittlement of all relevant beltline and extended beltline materials, including the Shell Plate 1 material, for the period of extended operation. In addition, the LRA does not clearly address how the applicant's program will monitor and use actual test data related to the new limiting material (i.e., Shell Plate 1), including the data of the Integrated Surveillance program (ISP), in order to achieve the program objective specified in the GALL Report (i.e., to provide sufficient material data and dosimetry to monitor irradiation embrittlement, and to determine the need for operating restrictions). The staff also noted that the general description of the program includes references to Nuclear Regulatory Commission (NRC)-approved reports (Boiling Water Reactor Vessel and Internals Project (BWRVIP)-102 and BWRVIP-135) that have never been submitted to the NRC for approval.

Request.

a. Provide a new table that includes the heat numbers, material compositions (Cu and Ni contents), unirradiated reference temperature (RT_{NDT}) data, projected neutron fluences, and calculated ART values of all beltline and extended beltline materials for the period of extended operation (54 EFPY).
b. Clarify how the applicant's program will monitor and use actual test data related to the new limiting material (i.e., Shell Plate 1), including the data of the ISP, in order to achieve the program objective in the GALL Report (i.e., to provide sufficient material data and dosimetry in order to monitor irradiation embrittlement and to determine the need for operating restrictions). As part of the response, clarify whether the ISP includes the embrittlement data of a material that can reasonably represent the embrittlement of Shell Plate 1. In addition, if such data exist, discuss the implications of the currently available test data to the neutron embrittlement of Shell Plate 1. Describe how the applicant's program will communicate with the BWRVIP on the present and future changes in limiting materials in order to adequately address potential safety considerations and to perform necessary actions in response to the identification of new limiting materials.
c. Remove the reference to reports that are not approved by the NRC.

RAI B.1.38-1 RESPONSE

a. A new table providing the requested information is added to LRA Section 4.2.1 as Table 4.2-5, "GGNS Beltline Adjusted Reference Temperature (ART) Values (54 EFPY)". Refer to LRA changes in Attachment 2 of this letter for the new Table 4.2-5.

b. As a member of the Boiling Water Reactor Vessel and Internals Project Integrated Surveillance Program (BWRVIP ISP), monitoring and use of actual test data related to the new limiting material of Shell Plate 1 is in accordance with BWRVIP-86, Revision 1 and BWRVIP-135, Revision 2. As required by BWRVIP-135, Revision 2, Section 3, plants are required to notify the BWRVIP of changes in fluence projections for the reactor pressure vessel (I.D. and 1/4T) and the latest vessel beltline ART tables. Fluence projections and beltline ART values will be submitted to the BWRVIP prior to the period of extended operation. LRA sections A.1.38 and B.1.38 are revised as shown in

Attachment 2 of this letter to include an enhancement to the Reactor Vessel Surveillance Program for submittal of this data to the BWRVIP.

c. LRA sections A.1.38 and B.1.38 are revised as shown in Attachment 2 of this letter to remove references to BWRVIP-102 and BWRVIP-135. The corrected statement is, "The NRC staff has approved an integrated surveillance program for the period of extended operation (ISP(E)) based on BWRVIP-86, Revision 1."

RAI B.1.38-2

Background. LRA Section B.1.38, "Reactor Vessel Surveillance," indicates the applicant's program relies on the BWRVIP ISP based on staff-approved BWRVIP documents to meet the 10 CFR Part 50 Appendix H requirements. The LRA also refers to BWRVIP-86, Rev. 1, "BWR Vessel and Internals Project Updated BWR Integrated Surveillance Program (ISP) Implementation Plan," in the applicant's program enhancement. The ISP is an approved method for the commercial boiling-water reactor (BWR) fleet of reactors to manage the neutron embrittlement of the reactor vessel materials. Table 4-7 of BWRVIP-86, Rev. 1, indicates that the maximum fluence values (E > 1 MeV) of the tested surveillance plate and weld materials are 2.66E+18 n/cm^2 and 2.75E+18 n/cm^2, respectively. BWRVIP-86, Rev. 1 also indicates that only two additional weld materials will be withdrawn additionally in 2013 and 2039, which correspond to estimated fluence values of 1.35E+18 n/cm^2 and 2.67E+18 n/cm^2, respectively.

In comparison, LRA Sections 4.2 and 4.2.1 indicate that 54 EFPY corresponds to the end of the period of extended operation and the peak 1/4T fluence for 54 EFPY with the planned EPU is 3.02E+18 n/cm^2 as projected for the lower-intermediate shell and axial welds. These fluence values (E > 1 MeV) are compared as follows, indicating that the LRA fluence projection for the reactor vessel in consideration of the planned EPU exceeds the fluence values of tested and to-be-tested materials in the applicant's ISP:

- Maximum fluence of the tested surveillance plate materials (ISP): 2.66E+18 n/cm^2
- Maximum fluence of the tested surveillance weld materials (ISP): 2.75E+18 n/cm^2
- Fluence of the surveillance weld to be withdrawn in 2039 (ISP): 2.67E+18 n/cm^2
- Peak inside diameter (ID) fluence of the reactor vessel (LRA with EPU):4.44E+18 n/cm^2

The "detection of aging effects" of GALL AMP XI.M31states that:

> The plant-specific or integrated surveillance program shall have at least one capsule with a projected neutron fluence exceeding the 60-year peak reactor vessel wall neutron fluence prior to the end of the period of extended operation. The program withdraws one capsule at an outage in which the capsule receives a neutron fluence of between one and two times the peak reactor vessel wall neutron fluence at the end of the period of extended operation and tests the capsule in accordance with the requirements of ASTM E 185-82.

In addition, the program description of GALL AMP XI.M31states, "[i]f surveillance capsules are not withdrawn during the period of extended operation, operating restrictions are to be established to ensure that the plant is operated under the conditions to which the surveillance capsules were exposed."

Issue. The LRA does not clearly address whether the peak ID fluence of the reactor vessel for 54 EFPY with the planned EPU is projected to exceed the maximum fluence of the ISP surveillance materials (for either weld or plate). In addition, the LRA states that the Reactor Vessel Surveillance Program is consistent with GALL AMP XI.M31, but does not address how the program will implement relevant operating restrictions if the peak ID fluence of the reactor vessel for 54 EFPY is projected to exceed the maximum fluence of the surveillance materials.

Request.

a. Clarify whether the peak ID fluence of the reactor vessel for 54 EFPY in consideration of the planned EPU is projected to exceed the maximum fluence of the surveillance materials (for either weld or plate).
b. If the peak ID fluence of the reactor vessel for 54 EFPY is projected to exceed the maximum fluence of the ISP surveillance materials (for either weld or plate), modify the LRA to include an exception, or explain how the Reactor Vessel Surveillance Program is consistent with the GALL Report.

RAI B.1.38-2 RESPONSE

a. The peak reactor vessel ID fluence for weld and plate material is expected to exceed the fluence values for GGNS listed in BWRVIP-86, Revision 1, Table 4-7, before reaching 54 EFPY.

b. The projected reactor vessel weld fluence for 54 EFPY considering EPU is expected to exceed the projected fluence for ISP weld surveillance materials. No GGNS target plate fluence projections are included in BWRVIP-86, Revision 1. In addition, no Grand Gulf target plate materials are scheduled for testing prior to the end of the Period of Extended Operation (PEO). This is not consistent with NUREG-1801 and should be considered an exception to GALL AMP XI.M31, Element 4, Detection of Aging Effects. In a letter dated November 4, 2003, GGNS was issued License Amendment No. 160 approving participation in the Boiling Water Reactor Vessel and Internals Project Integrated Surveillance Program (BWRVIP). In a Safety Evaluation Report (SER) (TAC No. ME2190) dated October 20, 2011, the staff approved BWRVIP-86, Revision 1, Boiling Water Reactor (BWR) Vessel and Internals Project, Updated BWR Integrated Surveillance Program (ISP) Implementation Plan. The NRC staff concluded that the ISP and ISP(E) continue to adequately address the requirements of Appendix H to 10 CFR Part 50 for BWR licensees through the end of each facility's proposed 60-year operating license. BWRVIP-86, Revision 1, Section 5, includes provisions to apply the embrittlement evaluation described in Reg. Guide 1.99, Revision 2, for evaluating materials and calculating an adjusted reference temperature. The use of Reg. Guide 1.99 Revision 2 to project the embrittlement evaluation is also described in Element 5 of NUREG-1801 XI.M31.

   LRA Section B.1.38 is revised as shown in Attachment 2 of this letter to include an exception.

RAI B.1.38-3

Background. GALL AMP XI.M31 states that the objective of the reactor vessel material surveillance program is to provide sufficient material data and dosimetry. LRA Section B.1.38

indicates that the Reactor Vessel Surveillance Program manages reduction of fracture toughness for reactor vessel beltline materials using material data and dosimetry. LRA Sections 4.2 and 4.2.1 and Table 4.2-1 indicate that 54 EFPY corresponds to the end of the period of extended operation and the peak 1/4T fluence value for 54 EFPY is 3.02E+18 n/cm^2 (E > 1 MeV) as projected for lower-intermediate shell and axial welds in consideration of the EPU. In comparison, the applicant's previous fluence projections without the consideration of EPU are described below.

The applicant's program credits ISP specified in BWRVIP-86, Rev. 1. Tables 7-2 and 7-3 and Section 7.2 in BWRVIP-86, Rev. 1 indicate that the applicant's 1/4T fluence of the target materials estimated for 48 EFPY is 1.8E+18 n/cm^2 (E > 1 MeV). This 1/4T fluence for 48 EFPY is equivalent to 2.03E+18 n/cm^2 for 54 EFPY based on linear extrapolation from 48 to 54 EFPY. This 54-EFPY neutron fluence value of the target materials in BWRVIP-86, Rev. 1 is in agreement with the fluence value in update Final Safety Analysis Report (UFSAR) Section 5.3.1.6.2, "Neutron Fluence" because the UFSAR section indicates that the 1/4T fluence of the reactor vessel beltline region for 32 EFPY is 1.21E+18 n/cm^2 and this fluence value for 32 EFPY is converted to 2.04E+18 n/cm^2 for 54 EFPY using linear extrapolation. In addition, UFSAR Sections 5.3.1.6.1, 5.3.1.6.2 and 4.3.2.8 indicate that the updated lead factor for this fluence projection for 32 EFPY is based on 3-degree surveillance capsule dosimetry data.

In contrast, the applicant's letter dated May 5, 1994, in response to Generic Letter GL 92-01 indicates that the 1/4T fluence at the end of original 40-year license (32 EFPY) is 2.11E+18 n/cm^2 as determined from flux wire dosimetry measurements at the applicant's reactor vessel. This fluence value is converted to 3.56E+18 n/cm^2 for 54 EFPY using linear extrapolation.

With the aforementioned assumption that linear extrapolation of the fluence is applicable, these 1/4T fluence values (E > 1 MeV) projected for 54 EFPY are compared as follows:

- Projection based on the data in the 1994 letter: 3.56E+18 n/cm^2 (without EPU)
- Projection based on the data in BWRVIP-86, Rev. 1: 2.03E+18 n/cm^2 (without EPU)
- Projection based on the data in UFSAR Section 5.3.1.6.2: 2.04E+18 n/cm^2 (without EPU)
- LRA Section 4.2.1: 3.02E+18 n/cm^2 (with EPU)

Issue. The "operating experience" program element of the LRA AMP does not provide sufficient information to demonstrate the adequacy of the applicant's dosimetry monitoring activities which are part of the Reactor Vessel Surveillance Program. For example, the LRA does not clearly address why the 1/4T fluence projected for 54 EFPY based on the fluence information in the applicant's 1994 letter is greater than the other fluence values described above.

Request.

a. Provide the following information regarding the neutron dosimetry data obtained and to be obtained in the program: (1) the withdrawal schedule of the dosimetry capsules/wires (including the dosimetry data addressed in UFSAR Section 5.3.1.6.1 and applicant's letter dated May 5, 1994) and (2) the results of the benchmark of the flux calculations with the dosimetry data.

b. Clarify why the 1/4T fluence for 54 EFPY projected from the fluence information in the 1994 response significantly exceeds the other fluence values addressed in the background of this request for additional information. As part of the response, justify why the 54-EFPY fluence in the LRA that considers EPU is less than the 54-EFPY

fluence projected using the dosimetry-based 32-EFPY fluence in the 1994 letter with no consideration of EPU.

c. Using the responses to the aforementioned requests and the relevant operating experience, justify why the dosimetry monitoring activities are adequate to provide sufficient dosimetry for the Reactor Vessel Surveillance Program, consistent with the GALL Report.

RAI B.1.38-3 RESPONSE

a. (1) There are no dosimetry capsule withdrawals scheduled for GGNS. Refer to UFSAR Section 5.3.1.6.1. The dosimetry data identified in UFSAR Section 5.3.1.6.1 is that obtained at end-of-cycle 1, addressed in the letter dated May 5, 1994, and used in the fluence evaluation at the end of cycle 13.

   (2) GGNS is a member of the BWRVIP Integrated Surveillance Program (ISP) as a non-host plant. Consequently, there is no on-going dosimetry data from Grand Gulf. The flux wire dosimetry obtained at the end-of-cycle 1 is not reliable for end-of-license benchmarking, therefore no benchmarking of the flux calculations with the dosimetry data was performed.

b. Projected fluence discussed in the 1994 letter was based on first cycle flux wire dosimetry. Later fluence calculations have the advantage of updated dosimetry evaluations from the BWRVIP and improved methods. The difference in fluence projections is attributed to input from the BWRVIP and over-conservative fluence projections from first cycle dosimetry which is unreliable for reasonable end-of-license fluence projections.

c. Dosimetry capsules are not tested at GGNS. However, in a letter dated November 4, 2003, GGNS was issued License Amendment No. 160 approving participation in the Boiling Water Reactor Vessel and Internals Project Integrated Surveillance Program (BWRVIP). In a Safety Evaluation Report (SER) (TAC No. ME2190) dated October 20, 2011, the staff approved BWRVIP-86, Revision 1, BWR Vessel and Internals Project, Updated BWR Integrated Surveillance Program Implementation Plan. The NRC staff concluded that the ISP and ISP(E) continue to adequately address the requirements of Appendix H to 10 CFR Part 50 for BWR licensees through the end of each facility's proposed 60 year operating license. BWRVIP-86, Revision 1, Section 5, includes provisions for ongoing vessel dosimetry for plants that do not have dosimetry capsules tested. Thus, the ISP dosimetry monitoring activities are adequate to provide sufficient dosimetry for the Reactor Vessel Surveillance Program, consistent with NUREG-1801 XI.M31.

RAI B.1.38-4

Background. LRA Section B.1.38 addresses the applicant's Reactor Vessel Surveillance Program and indicates that an enhancement to the "monitoring and trending" program element will be implemented prior to the period of extended operation. The LRA indicates that the enhancement will ensure that any additional requirements specified in the final NRC safety evaluation (SE) for BWRVIP-86, Rev. 1 will be addressed before the period of extended operation.

The "monitoring and trending" program element of GALL AMP XI.M31 states that the program provides reactor vessel material fracture toughness data for the time-limited aging analyses on neutron irradiation embrittlement (e.g., upper-shelf energy, pressurized thermal shock and pressure-temperature limits evaluations, etc.) for 60 years.

The conclusion section of the staff's SE for BWRVIP-86, Revision 1, dated October 20, 2011, states that BWRVIP-86, Rev. 1, is acceptable subject to the conditions discussed in previous staff's SEs where such conditions have not been superseded by this SE. The staff's SE also states that the ISP and the ISP for the extended operation (ISP(E)) continue to adequately address the requirements of Appendix H to 10 CFR Part 50 for BWR licensees through the end of facility's proposed 60 year operating licenses.

Issue. There are no "additional requirements" of the staff's SE for BWRVIP-86, Revision 1, which need to be applied to the applicant's program. In addition, the LRA does not address the staff's SE for BWRVIP-116, "BWR Vessel and Internals Project, ISP Implementation for License Renewal" which is dated February 24, 2006 and includes the conditions of the approval for the ISP(E).

Request. Revise LRA B.1.38 to remove the mention of the "additional requirements" of the staff's SE for BWRVIP-86, Revision 1, and address how the Reactor Vessel Surveillance Program addresses the requirements of the staff's SE for BWRVIP-116, dated February 24, 2006, which includes the conditions of the approval for the ISP(E).

RAI B.1.38-4 RESPONSE

BWRVIP-86, Revision 1, combined BWRVIP-86-A, *Updated BWR Integrated Surveillance Program (ISP) Implementation Plan*, and BWRVIP-116, *Integrated Surveillance Program (ISP) Implementation for License Renewal*, into a single implementation plan covering plant operation to 60 years. BWRVIP-86, Revision 1 incorporated the final NRC safety evaluation for BWRVIP-116. With one exception, all the conditions included in the final NRC safety evaluation for BWRVIP-116 were addressed by program requirements included in BWRVIP-86, Revision 1 and BWRVIP-135, Revision 1.

The single exception pertains to the incorporation of the requirements of the ISP for the extended period of operation (ISP(E)) into the plant licensing basis. The BWRVIP-116 safety evaluation Section 4.0, c states:

> "BWR licensees that will submit a license renewal application shall implement the ISP(E) by revising their licensing basis to include the approved version of BWRVIP-116 in its application and the proposed licensing basis for the extended period of operation."

Since BWRVIP-86, Revision 1 superseded BWRVIP-116 and incorporated its safety evaluation, this condition will be satisfied by the inclusion of BWRVIP-86, Revision 1 into the plant's licensing basis. The program description and program enhancement in LRA Section A.1.38 and Section B.1.38 are revised as shown in Attachment 2 of this letter.

RAI B.1.38-5

Background. LRA Section A.1.38 addresses the UFSAR supplement for the Reactor Vessel Surveillance Program that is described in LRA Section B.1.38. In comparison, Standard Review Plan for License Renewal (SRP-LR), Table 3.0-1 describes a recommended summary description of the UFSAR Supplement for GALL AMP XI.M31, "Reactor Vessel Surveillance." The recommended summary describes the important program attributes of GALL AMP XI.M31.

Issue. LRA Section A.1.38 does not address all of the important program attributes included in the UFSAR Supplement described in SRP-LR, Table 3.0-1. The staff is concerned about the omission of the important program attributes from the applicant's UFSAR Supplement.

Request. Justify the absence of the following portions of the program description from the UFSAR supplement or modify LRA Section A.1.38 to include them:

a. If surveillance capsules are not withdrawn during the period of extended operation, operating restrictions are to be established to ensure that the plant is operated under the conditions to which the surveillance capsules were exposed;
b. All capsules in the reactor vessel that are removed and tested must meet the test procedures and reporting requirements of American Society for Testing and Materials (ASTM) E185-82 to the extent practicable for the configuration of the specimens in the capsule;
c. Any changes to the capsule withdrawal schedule, including spare capsules, must be approved by the NRC prior to implementation; and
d. Untested capsules placed in storage must be maintained for future insertion.

RAI B.1.38-5 RESPONSE

Each of the program attributes listed in the Request for Information (RAI) Request are addressed as features or requirements of the BWR Integrated Surveillance Program (ISP). The ISP surveillance capsule withdrawal and testing program for the period of extended operation is documented in the NRC-approved BWRVIP-86, Revision 1. The withdrawal schedule of the ISP identifies surveillance capsules that have been or will be withdrawn and tested to support operation of GGNS during the period of extended operation. Testing of capsules in accordance with ASTM E 185-82 is controlled by the BWRVIP ISP. Consequently, program attributes a and b of the request are governed by the ISP, and are incorporated into LRA Section A.1.38 by reference to BWRVIP-86, Revision 1.

Program attributes c and d of the request are similarly addressed by the ISP. However, GGNS has surveillance capsules that are not scheduled to be tested as part of the ISP. Since control of these capsules is not explicitly addressed in BWRVIP-86, Revision 1, the following paragraph will be added to the end of LRA Section A.1.38, to include these program attributes.

"Although not scheduled for removal and testing for the integrated surveillance program as delineated in BWRVIP-86, Revision 1, the surveillance capsules at GGNS may be required for contingencies of the program. Consequently, any changes to the capsule withdrawal schedule, including spare capsules, must be approved by the NRC prior to implementation; and untested capsules placed in storage must be maintained for future insertion."

Refer to Attachment 2 of this letter for the markup to Appendix B.1.38.

Attachment 2 to

GNRO-2012/00081

License Renewal Application Changes

1. LRA Section 4.2.1 is revised to include an ART Table, associated notes, and an introductory statement as shown below with additions underlined and deletions shown with strikethrough.

The Adjusted Reference Temperature (ART) table for GGNS reactor vessel beltline materials is included as Table 4.2-5

Table 4.2-5
GGNS Beltline ART Values (54 EFPY)

COMPONENT	HEAT	%Cu	%Ni	CF	Fitted or Adjusted CF °F	Initial RT_{NDT} °F	1/4 T Fluence n/cm²	54 EFPY Δ RT_{NDT} °F	m	σ_Δ	Margin °F	54 EFPY Shift °F	54 EFPY ART °F
PLANT-SPECIFIC CHEMISTRIES PLATES:													
Shell Ring 2	C2593-2	0.04	0.59	26		-30	3.02E+18	17.5	0	8.7	17.5	34.9	4.9
	C2594-1	0.04	0.63	26		-10	3.02E+18	17.5	0	8.7	17.5	34.9	24.9
	C2594-2	0.04	0.63	26		0	3.02E+18	17.5	0	8.7	17.5	34.9	34.9
	A1224-1	0.04	0.65	26		0	3.02E+18	17.5	0	8.7	17.5	34.9	34.9
Shell Ring 1 [6]	A1113-1	0.12 [7]	0.65	84		10	3.94E+17	21.5	0	10.7	21.5	43.0	53.0
	C2557-2	0.12 [7]	0.64	84		10	3.94E+17	21.4	0	10.7	21.4	42.9	52.9
	C2506-1	0.12 [7]	0.66	84		-20	3.94E+17	21.5	0	10.8	21.5	43.1	23.1
AXIAL WELDS [1]:													
Shell Ring 2	5P6214B/0331 Single	0.02	0.82	27		-50	3.02E+18	18.1	0	9.1	18.1	36.3	-13.7
	5P6214B/0331 Tandem	0.02	0.82	27		-40	3.02E+18	18.1	0	9.1	18.1	36.3	-3.7
Shell Ring 1 [6]	5P6214B/0331 Single	0.02	0.82	27		-50	3.94E+17	6.9	0	3.5	6.9	13.9	-36.1
	5P6214B/0331 Tandem	0.02	0.82	27		-40	3.94E+17	6.9	0	3.5	6.9	13.9	-26.1
CIRCUMFERENTIAL WELDS:													
AB [2]	4P7216/0156 Single	0.03	0.79	41		-40	4.07E+17	10.7	0	5.4	10.7	21.4	-18.6
AB [2]	4P7216/0156 Tandem	0.03	0.81	41		-60	4.07E+17	10.7	0	5.4	10.7	21.4	-38.6
NOZZLES:													
N12 [3]	C2593-2	0.04	0.59	26		-30	3.67E+17	6.4	0	3.2	6.4	12.8	-17.2
N12 [3]	C2594-2	0.04	0.63	26		0	3.67E+17	6.4	0	3.2	6.4	12.8	12.8
N12 Welds [3]	SB166												
BEST ESTIMATE CHEMISTRIES from BWRVIP-135 R2													
Plate	A1224-1	0.035	0.65	23		0	3.02E+18	15.5	0	7.7	15.5	30.9	30.9
Weld	5P6214B/0331 Single	0.019	0.828	26.3		-50	3.02E+18	17.7	0	8.8	17.7	35.3	-14.7
Weld	5P6214B/0331 Tandem	0.019	0.828	26.3		-40	3.02E+18	17.7	0	8.8	17.7	35.3	-4.7
Weld AB [2]	4P7216/0156 Single	0.038	0.82	51.4		-40	4.07E+17	13.4	0	6.7	13.4	26.9	-13.1
Weld AB [2]	4P7216/0156 Tandem	0.038	0.82	51.4		-60	4.07E+17	13.4	0	6.7	13.4	26.9	-33.1
INTEGRATED SURVEILLANCE PROGRAM (BWRVIP-135 R2):													
Plate	A1224-1	0.035	0.65		47.87 [4]	0	3.02E+18	32.2	0	8.5	17.0	49.2	49.2
Weld	5P6214B Single	0.019	0.828		38.72 [4.5]	-50	3.02E+18	26.0	0	13.0	26.0	52.0	2.0
Weld	5P6214B Tandem	0.019	0.828		38.72 [4.5]	-40	3.02E+18	26.0	0	13.0	26.0	52.0	12.0

Notes:

[1] Use of SMAW Heats 422K8511, 627069, 626677, and 627260 was determined to be limited to weld pick-ups at the ID/OD surfaces or initial root pass or sealing at the backing bars which were ground out or subsequently removed. Certified Material Test Reports indicate that no SMAW weld material is present at either the 1/4T or 3/4T location. Therefore, these heats are not required to be evaluated as part of the beltline region.

[2] Weld AB occurs within the extended beltline region, defined as experiencing a fluence >1.0e17 n/cm^2.

[3] The N12 Water Level Instrumentation Nozzle occurs in the beltline region. Because the forging is fabricated from stainless steel, the ART is calculated using the plate heats where the nozzles occur. For GGNS, these nozzles occur in only two (2) of the Shell 2 plates. The welds connecting the forging to the vessel shell are SB166 material.

[4] The fitted CF (plate material) and adjusted CF (weld material) are determined using the methods defined in RG1.99 R2, Position 2. Best estimate chemistry is considered.

[5] Weld Heat 5P6214B is represented by materials in BWRVIP-135 R2 with two (2) different chemistries. Recommendations provided in BWRVIP-135 R2 have been employed to determine the surveillance chemistry used for calculating the adjusted CF. The adjusted CF is calculated using the best estimate chemistry to represent the vessel CF = (26.3 / 27) * 39.75 = 38.72°F.

[6] Shell #1 is evaluated based on the extended beltline region.

[7] Copper content is not available; therefore, the maximum allowable %Cu was obtained from the vessel purchase specification.

[8] The plate and axial weld materials are evaluated using the minimum thickness for Shell #1. Circumferential weld AB is evaluated using the smaller thickness between Shell #1 and Shell #2.

[9] Regulatory Guide 1.99, revision 2, Position 1.1 applies to all materials except those for the Integrated Surveillance Program, for which Position 2.1 is applied.

2. Changes to Appendix A.1.38 and B.1.38 with additions underlined and deletions shown with strikethrough.

A.1.38 Reactor Vessel Surveillance Program

The Reactor Vessel Surveillance Program manages reduction of fracture toughness for reactor vessel beltline materials using material data and dosimetry. The program includes all reactor vessel beltline materials as defined by 10 CFR 50 Appendix G, Section II.F, and complies with 10CFR50, Appendix H for vessel material surveillance. The NRC staff has approved aAn integrated surveillance program for the period of extended operation (ISP(E)), based on ~~staff-approved BWRVIP documents (including~~ BWRVIP-86-A, Revision 1 ~~BWRVIP-102, BWRVIP-135) has been approved for use by NRC~~.

The Reactor Vessel Surveillance ~~Maintenance~~ Program will be enhanced as follows.

- Ensure that the additional requirements of the ISP(E) specified in ~~the final NRC safety evaluation for~~ BWRVIP-86, Revision 1, including the conditions of the final NRC safety evaluation for BWRVIP-116 incorporated in BWRVIP-86, Revision 1 will be addressed before the period of extended operation.

- Ensure that new fluence projections through the period of extended operation and the latest vessel beltline ART Tables are provided to the BWRVIP prior to the period of extended operation.

These~~is~~ enhancements will be implemented prior to the period of extended operation.

Although not scheduled for removal and testing for the integrated surveillance program as delineated in BWRVIP-86, Revision 1, the surveillance capsules at GGNS may be required for contingencies of the program. Consequently, any changes to the capsule withdrawal schedule, including spare capsules, must be approved by the NRC prior to implementation; and untested capsules placed in storage must be maintained for future insertion.

B.1.38 REACTOR VESSEL SURVEILLANCE

Program Description

The Reactor Vessel Surveillance Program is an existing program that manages reduction of fracture toughness for reactor vessel beltline materials using material data and dosimetry. The program includes all reactor vessel beltline materials as defined by 10 CFR 50 Appendix G, Section II.F, and complies with 10CFR50, Appendix H for vessel material surveillance. The NRC staff has approved a~~A~~n integrated surveillance program for the period of extended operation (ISP(E)), based on ~~staff-approved BWRVIP documents (including~~ BWRVIP-86-~~A~~, Revision 1 ~~BWRVIP-102, BWRVIP-135) has been approved for use by NRC~~.

NUREG-1801 Consistency

The Reactor Vessel Surveillance Program, with enhancements, is consistent with the program described in NUREG-1801, Section XI.M31, Reactor Vessel Surveillance with one exception.

Exceptions to NUREG-1801

~~None~~

The Reactor Vessel Surveillance Program is consistent with the program described in NUREG-1801, Section XI.M31, Reactor Vessel Surveillance, with the following exception.

Elements Affected	Exceptions
4. Detection of Aging Effects	NUREG-1801 recommends that the reactor vessel surveillance program shall have at least one capsule with a projected neutron fluence equal to or exceeding the 60-year peak reactor vessel wall neutron fluence prior to the end of the period of extended operation. A capsule meeting this qualification is not expected to be obtained prior to the end of the period of extended operation.[1]

Exception Note

1. In a letter dated November 4, 2003, GGNS was issued License Amendment No. 160 approving participation in the Boiling Water Reactor Vessel and Internals Project Integrated Surveillance Program (BWRVIP). In a Safety Evaluation Report (SER) (TAC No. ME2190) dated October 20, 2011, the staff approved BWRVIP-86, Revision 1, BWR Vessel and Internals Project, Updated BWR Integrated Surveillance Program (ISP) Implementation Plan. The NRC staff concluded that the ISP and ISP(E) continue to adequately address the requirements of Appendix H to 10 CFR Part 50 for BWR licensees through the end of each facility's proposed 60-year operating license. BWRVIP-86, Revision 1, Section 5, includes provisions to apply the embrittlement evaluation described in Reg. Guide 1.99, Revision 2, for evaluating materials and calculating an adjusted reference temperature. The use of Reg. Guide 1.99 Revision 2 to project the embrittlement evaluation is also described in Element 5 of NUREG-1801 XI.M31. This exception is justified because the provisions set forth in Reg. Guide 1.99, Revision 2, are acceptable for embrittlement evaluation.

Enhancements

The following enhancement will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
5. Monitoring and Trending	The GGNS Reactor Vessel Surveillance Program will be enhanced to ensure that the additional requirements of the ISP(E) specified in ~~the final NRC safety evaluation for~~ BWRVIP-86, Revision 1, including the conditions of the final NRC safety evaluation for BWRVIP-116 incorporated in BWRVIP-86, Revision 1 will be addressed before the period of extended operation. The GGNS Reactor Vessel Surveillance Program will be enhanced to ensure that new fluence projections through the period of extended operation and the latest vessel beltline ART Tables are provided to the BWRVIP prior to the period of extended operation.

Attachment 3 to

GNRO-2012/00081

List of Regulatory Commitments

List of Regulatory Commitments

The following table identifies those actions committed to by Entergy in this document. Additions are shown with underline and deletions with strikethrough.

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
1	Implement the 115 kilovolt (KV) Inaccessible Transmission Cable Program for Grand Gulf Nuclear Station (GGNS) as described in License Renewal Application (LRA) Section B.1.1	Prior to November 1, 2024	GNRO-2011/00093	B.1.1
2	Implement the Aboveground Metallic Tanks Program for GGNS as described in LRA Section B.1.2	Prior to November 1, 2024	GNRO-2011/00093	B.1.2
3	Enhance the Bolting Integrity Program for GGNS to clarify the prohibition on use of lubricants containing MoS_2 for bolting, and to specify that proper gasket compression will be visually verified following assembly. Enhance the Bolting Integrity Program to include consideration of the guidance applicable for pressure boundary bolting in Regulatory Guide (NUREG) 1339, Electric Power Research Institute (EPRI) NP-5769, and EPRI TR-104213. Enhance the Bolting Integrity Program to include volumetric examination per American Society of Mechanical Engineers (ASME) Code Section IX, Table IWB-2500-1, Examination Category B-G-1, for high-strength closure bolting regardless of code classification.	Prior to November 1, 2024	GNRO-2011/00093	B.1.3

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
4	Enhance the Boraflex Monitoring Program for GGNS to perform periodic surveillances of the boraflex neutron absorbing material in the spent fuel pool and upper containment pool at least once every 5 years using Boron-10 Areal Density Gage for Evaluating Racks (BADGER) testing. RACKLIFE analysis will continue to be performed each cycle. This analysis will include a comparison of the RACKLIFE predicted silica to the plant measured silica. This comparison will determine if adjustments to the RACKLIFE loss coefficient are merited. The analysis will include projections to the next planned RACKLIFE analysis date to ensure current Region I storage locations will not need to be reclassified as Region II storage locations in the analysis interval.	Prior to November 1, 2024	GNRO-2011/00093 GNRO-2012-00077	B.1.4 / RAI B.1.4-1
5	Implement the Buried Piping and Tanks Inspection Program for GGNS as described in LRA Section B.1.5.	Prior to November 1, 2024	GNRO-2011/00093	B.1.5

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
6	Enhance the Boiling Water Reactor (BWR) Vessel Internals Program for GGNS as follows. (a) Evaluate the susceptibility to neutron or thermal embrittlement for reactor vessel internal components composed of CASS, X-750 alloy, precipitation-hardened (PH) martensitic stainless steel(e.g., 15-5 and 17-4 PH steel), and martensitic stainless steel (e.g., 403, 410 and 431 steel). (b) Inspect portions of the susceptible components determined to be limiting from the standpoint of thermal aging susceptibility, neutron fluence, and cracking susceptibility (i.e., applied stress, operating temperature, and environmental conditions). The inspections will use an inspection technique capable of detecting the critical flaw size with adequate margin. The critical flaw size will be determined based on the service loading condition and service-degraded material properties. The initial inspection will be performed either prior to or within 5 years after entering the period of extended operation. If cracking is detected after the initial inspection, the frequency of re-inspection will be justified based on fracture toughness properties appropriate for the condition of the component. The sample size will be 100% of the accessible component population, excluding components that may be in compression during normal operations.	Prior to November 1, 2024	GNRO-2011/00093	B.1.11

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
7	Enhance the Compressed Air Monitoring Program for GGNS to apply a consideration of the guidance of ASME OM-S/G-1998, Part 17; ANSI/ISA-S7.0.01-1996; EPRI NP-7079; and EPRI TR-108147 to the limits specified for air system contaminants. Enhance the Compressed Air Monitoring Program to include periodic and opportunistic inspections of accessible internal surfaces of piping, compressors, dryers, aftercoolers, and filters to apply consideration of the guidance of ASME OM-S/G-1998, Part 17 for inspection frequency and inspection methods of these components in the following compressed air systems. • Automatic Depressurization System (ADS) air • Division 1 Diesel Generator Starting Air (D1DGSA) • Division 2 Diesel Generator Starting Air (D2DGSA) • Division 3 Diesel Generator Starting Air (D3DGSA), also known as the HPCS Diesel Generator • Instrument Air (IA)	Prior to November 1, 2024	GNRO-2011/00093	B.1.12/RAI B.1.12-1

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
8	Enhance the Diesel Fuel Monitoring Program to include a ten-year periodic cleaning and internal inspection of the fire water pump diesel fuel oil tanks, the diesel fuel oil day tanks for Divisions I, II, III, and the diesel fuel oil drip tanks for Divisions I, II. These cleanings and internal inspections will be performed at least once during the 10-year period prior to the period of extended operation and at succeeding 10-year intervals. If visual inspection is not possible, a volumetric inspection will be performed. Enhance the Diesel Fuel Monitoring Program to include a volumetric examination of affected areas of the diesel fuel tanks if evidence of degradation is observed during visual inspection. The scope of this enhancement includes the diesel fuel oil day tanks (Divisions I, II, III), the diesel fuel oil storage tanks (Divisions I, II, III), the diesel fuel oil drip tanks (Divisions I, II), and the diesel fire pump fuel oil storage tanks, and is applicable to the inspections performed during the 10-year period prior to the period of extended operation and at succeeding 10-year intervals.	Prior to November 1, 2024	GNRO-2011/00093	B.1.16
9	Enhance the External Surfaces Monitoring Program to include instructions for monitoring of the aging effects for flexible polymeric components through manual or physical manipulation of the material, including a sample size for manipulation of at least 10 percent of available surface area. Enhance the External Surfaces Monitoring Program as follows. 1. Underground components within the scope of this program will be clearly identified in program documents. 2. Instructions will be provided for inspecting all underground components within the scope of this program during each 10-year period, beginning 10 years prior to entering the period of extended operation.	Prior to November 1, 2024	GNRO-2011/00093	B.1.18

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
10	Enhance the Fatigue Monitoring Program to monitor and track all critical thermal and pressure transients for all components that have been identified to have a fatigue Time Limited Aging Analysis (TLAA). Enhance the Fatigue Monitoring Program to perform a review of the GGNS high energy line break analyses and the corresponding tracking of associated cumulative usage factors to ensure the GGNS program adequately manages fatigue usage for these locations. Fatigue usage calculations that consider the effects of the reactor water environment will be developed for a set of sample reactor coolant system components. This sample set will include the locations identified in NUREG/CR-6260 and additional plant-specific component locations in the reactor coolant pressure boundary if they are found to be more limiting than those considered in NUREG/CR-6260. F_{en} factors will be determined using the formulae sets listed in Section 4.3.3. If necessary following this analysis, revised cycle limits will be incorporated into the Fatigue Monitoring Program documentation. Enhance the Fatigue Monitoring Program to provide updates of the fatigue usage calculations on an as-needed basis if an allowable cycle limit is approached, or in a case where a transient definition has been changed, unanticipated new thermal events are discovered, or the geometry of components have been modified. The program revision will include providing for the consideration of the recirculation pump fatigue analysis exemption validity if cycles that were input into the exemption evaluation exceed their limits.	Two years prior to November 1, 2024	GNRO-2011/00093 GNRO-2012/00063	B.1.19/ RAI B.1.19-1, RAI 4.3-11

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
11	Enhance the Fire Protection Program to require visual inspections of the Halon/CO2 fire suppression system at least once every fuel cycle to examine for signs of corrosion. Enhance the Fire Protection Program to require visual inspections of fire damper framing at least once every fuel cycle to check for signs of degradation. Enhance the Fire Protection Program to require visual inspection of concrete curbs, manways, hatches, manhole covers, hatch covers, and roof slabs at least once every fuel cycle to confirm that aging effects are not occurring. Enhance the Fire Protection Program to require an external visual inspection of the CO2 tank at least once every fuel cycle to examine for signs of corrosion.	Prior to November 1, 2024	GNRO-2011/00093 GNRO-2012/00042	B.1.20/ RAI B.1.20-2

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
12	Enhance the Fire Water Program to include inspection of hose reels for degradation. Acceptance criteria will be enhanced to verify no unacceptable degradation. Enhance the Fire Water Program to include one of the following options. (1) Wall thickness evaluations of fire protection piping using non-intrusive techniques (e.g., volumetric testing) to identify evidence of loss of material will be performed prior to the period of extended operation and at periodic intervals thereafter. Results of the initial evaluations will be used to determine the appropriate inspection interval to ensure aging effects are identified prior to loss of intended function. OR (2) A visual inspection of the internal surface of fire protection piping will be performed upon each entry to the system for routine or corrective maintenance. These inspections will be capable of evaluating (a) wall thickness to ensure against catastrophic failure and (b) the inner diameter of the piping as it applies to the design flow of the fire protection system. Maintenance history shall be used to demonstrate that such inspections have been performed on a representative number of locations prior to the period of extended operation. A representative number is 20% of the population (defined as locations having the same material, environment, and aging effect combination) with a maximum of 25 locations. Additional inspections will performed as needed to obtain this representative sample prior to the period of extended operation.	Prior to November 1, 2024	GNRO-2011/00093	B.1.21/RAI B.1.21-5

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
12 (cont.)	Enhance the Fire Water Program to include a visual inspection of a representative number of locations on the interior surface of below grade fire protection piping in at least one location at a frequency of at least once every 10 years during the period of extended operation. A representative number is 20% of the population (defined as locations having the same material, environment, and aging effect combination) with a maximum of 25 locations. Acceptance criteria will be revised to verify no unacceptable degradation. Enhance the Fire Water Program to test or replace sprinkler heads. If testing is chosen a representative sample of sprinkler heads will be tested before the end of the 50-year sprinkler head service life and at 10-year intervals thereafter during the period of extended operation. Acceptance criteria will be no unacceptable degradation. NFPA-25 defines a representative sample of sprinklers to consist of a minimum of not less than 4 sprinklers or 1 percent of the number of sprinklers per individual sprinkler sample, whichever is greater. If replacement of the sprinkler heads is chosen, all sprinklers that have been in service for 50 years will be replaced. Enhance the Fire Water Program to include visual inspection of spray and sprinkler system internals for evidence of degradation. Acceptance criteria will be enhanced to verify no unacceptable degradation.		GNRO-2012-00064	
13	Enhance the Flow-Accelerated Corrosion Program to revise program documentation to specify that downstream components are monitored closely to mitigate any increased wear when susceptible upstream components are replaced with resistant materials, such as high Cr material.	Prior to November 1, 2024	GNRO-2011/00093	B.1.22
14	Enhance the Inservice Inspection - IWF Program to address inspections of accessible sliding surfaces.	Prior to November 1, 2024	GNRO-2011/00093	B.1.24/ RAI B.1.24-1

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
14 (cont.)	Enhance the Inservice Inspection - IWF Program to; clarify that parameters monitored or inspected will include corrosion; deformation; misalignment of supports; missing, detached, or loosened support items; improper clearances of guides and stops; and improper hot or cold settings of spring supports and constant load supports. Accessible areas of sliding surfaces will be monitored for debris, dirt, or indications of excessive loss of material due to wear that could prevent or restrict sliding as intended in the design basis of the support. Elastomeric vibration isolation elements will be monitored for cracking, loss of material, and hardening. Structural bolts will be monitored for corrosion and loss of integrity of bolted connections due to self-loosening and material conditions that can affect structural integrity.High-strength structural bolting (actual measured yield strength greater than or equal to 150 ksi or 1,034 MPa in sizes greater than 1 inch nominal diameter) susceptible to stress corrosion cracking (SCC) will be monitored for SCC. Enhance the Inservice Inspection - IWF Program to clarify that detection of aging will include: a) Monitoring structural bolting (American Society for Testing Materials (ASTM) A-325, ASTM F1852, and ASTM A490 bolts) and anchor bolts will be monitored for loss of material, loose or missing nuts, loss of pre-load and cracking of concrete around the anchor bolts. b) Volumetric examination comparable to that of ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1 should be performed for high strength structural bolting to detect cracking in addition to the VT-3 examination. This volumetric examination may be waived with adequate plant-specific justification.			

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
14 (cont.)	c) Identification of component supports that contain high strength bolting (actual measured yield greater than or equal to 150 ksi) in sizes greater than 1 inch nominal diameter. The extent of examination for support types that contain high-strength bolting will be as specified in ASME Code Section XI, Table IWF-2500-1. GGNS will examine high-strength structural bolting on the frequency specified in ASME Code Section XI, Table IWF-2500-1. Enhance the Inservice Inspection - IWF Program acceptance criteria to include the following as unacceptable conditions. a) Loss of material due to corrosion or wear, which reduces the load bearing capacity of the component support; b) Debris, dirt, or excessive wear that could prevent or restrict sliding of the sliding surfaces as intended in the design basis of the support; and c) Cracked or sheared bolts, including high strength bolts, and anchors.		GNRO-2012/00055 GNRO-2011/00093	
15	Enhance the Inspection of Overhead Heavy Load and Light Load Handling Systems Program to include monitoring of rails in the rail system for the aging effect "wear", and structural connections/bolting for loose or missing bolts, nuts, pins or rivets. Additionally, the program will be clarified to include visual inspection of structural components and structural bolts for loss of material due to various mechanisms and structural bolting for loss of preload due to self-loosening. Enhance the Inspection of Overhead Heavy Load and Light Load Handling Systems Program acceptance criteria to state that any significant loss of material for structural components and structural bolts, and significant wear of rails in the rail system, is evaluated according to ASME B30.2 or other applicable industry standard in the ASME B30 series.	Prior to November 1, 2024	GNRO-2011/00093	B.1.25

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
16	Implement the Internal Surfaces in Miscellaneous Piping and Ducting Components Program as described in LRA Section B.1.26.	Prior to November 1, 2024	GNRO-2011/00093	B.1.26
17	Enhance the Masonry Wall Program to clarify that parameters monitored or inspected will include monitoring gaps between the supports and masonry walls that could potentially affect wall qualification. Enhance the Masonry Wall Program to clarify that detection of aging effects require masonry walls to be inspected every 5 years.	Prior to November 1, 2024	GNRO-2011/00093	B.1.27/ RAI B.1.27-1
18	Implement the Non-EQ Cable Connections Program as described in LRA Section B.1.28	Prior to November 1, 2024	GNRO-2011/00093	B.1.28
19	Enhance the Non environmentally Qualified (Non-EQ) Inaccessible Power Cables (400V to 35kV) Program to include low-voltage (400V to 2kV) power cables. Enhance the Non-EQ Inaccessible Power Cables (400V to 35kV) Program to include condition-based inspections of manholes not automatically dewatered by a sump pump being performed following periods of heavy rain or potentially high water table conditions, as indicated by river level. Enhance the Non-EQ Inaccessible Power Cables (400V to 35kV) Program to clarify that the inspections will include direct observation that cables are not wetted or submerged, that cables/splices and cable support structures are intact, and that dewatering/drainage systems (i.e., sump pumps) and associated alarms if applicable operate properly.	Prior to November 1, 2024	GNRO-2011/00093	B.1.29
20	Implement the Non-EQ Instrumentation Circuits Test Review Program as described in LRA Section B.1.30.	Prior to November 1, 2024	GNRO-2011/00093	B.1.30
21	Implement the Non-EQ Insulated Cables and Connections Program as described in LRA Section B.1.31.	Prior to November 1, 2024	GNRO-2011/00093	B.1.31

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
22	Enhance the Oil Analysis Program to provide a formalized analysis technique for particulate counting. Enhance the Oil Analysis Program to include piping and components within the main generator system (N41) with an internal environment of lube oil.	Prior to November 1, 2024	GNRO-2011/00093	B.1.32
23	Implement the One-Time Inspection Program as described in LRA Section B.1.33.	Within the 10 years prior to November 1, 2024	GNRO-2011/00093	B.1.33
24	Implement the One-Time Inspection – Small Bore Piping Program as described in LRA Section B.1.34.	Within the 6 years prior to November 1, 2024	GNRO-2011/00093	B.1.34
25	Enhance the Periodic Surveillance and Preventive Maintenance Program to include all activities described in the table provided in LRA Section B.1.35 program description.	Prior to November 1, 2024	GNRO-2011/00093	B.1.35
26	Enhance the Protective Coating Program to include parameters monitored or inspected by the program per the guidance provided in ASTM D5163-08. Enhance the Protective Coating Monitoring and Maintenance Program to provide for inspection of coatings near sumps or screens associated with the Emergency Core Cooling System. Enhance the Protective Coating Program to include acceptance criteria per ASTM D 5163-08.	Prior to November 1, 2024	GNRO-2011/00093	B.1.36
27	Ensure that the additional requirements of the ISP(E) specified in ~~the final NRC safety evaluation for~~ BWRVIP-86, Revision 1, including the conditions of the final NRC safety evaluation for BWRVIP-116 incorporated in BWRVIP-86, Revision 1 will be addressed before the period of extended operation. Ensure that new fluence projections through the period of extended operation and the latest vessel beltline ART Tables are provided to the BWRVIP prior to the period of extended operation.	Prior to November 1, 2024	GNRO-2011/00093 GNRO-2012/00081 GNRO-2012/00081	B.1.38 / RAI B.1.38-1, B.1.38-4

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
28	Enhance the Regulatory Guide (RG) 1.127, Inspection of Water-Control Structures Associated With Nuclear Power Plant Program to clarify that detection of aging effects will monitor accessible structures on a frequency not to exceed 5 years consistent with the frequency for implementing the requirements of RG 1.127. Enhance the RG 1.127, Inspection of Water-Control Structures Associated With Nuclear Power Plant Program to perform periodic sampling, testing, and analysis of ground water chemistry for pH, chlorides, and sulfates on a frequency of at least every 5 years. Enhance the RG 1.127, Inspection of Water-Control Structures Associated With Nuclear Power Plant Program acceptance criteria to include quantitative acceptance criteria for evaluation and acceptance based on the guidance provided in ACI 349.3R.	Prior to November 1, 2024	GNRO-2011/00093	B.1.39
29	Implement the Selective Leaching Program as described in LRA Section B.1.40.	Prior to November 1, 2024	GNRO-2011/00093	B.1.40
30	Enhance the Structures Monitoring Program to clarify that the scope includes the following: a) In-scope structures and structural components. • Containment Building (GGN 2) • Control House – Switchyard • Culvert No. 1 and drainage channel • Manholes and Ductbanks • Radioactive Waste Building Pipe Tunnel • Auxiliary Building (GGN2) • Turbine Building (GGN2) b) In-scope structural components • Anchor bolts • Anchorage / embedments • Base plates • Basin debris screen and grating • Battery racks • Beams, columns, floor slabs and interior walls • Cable tray and cable tray supports • Component and piping supports • Conduit and conduit supports • Containment sump liner and penetrations	Prior to November 1, 2024	GNRO-2011/00093 GNRO-2012/00074	B.1.42/ RAI B.1.42-3, B.1.42-5, 2.1-4, 3.5.1.33-2

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
30 (cont)	• Containment sump structures • Control room ceiling support system • Cooling tower drift eliminators • Cooling tower fill • CST/RWST retaining basin (wall) • Diesel fuel tank access tunnel slab • Drainage channel • Drywell floor slab (concrete) • Drywell wall (concrete) • Ductbanks • Electrical and instrument panels and enclosures • Equipment pads/foundations • Exterior walls • Fan stack grating • Fire proofing • Flood curbs • Flood retention materials (spare parts) • Flood, pressure and specialty doors • Floor slab • Foundations • HVAC duct supports • Instrument line supports • Instrument racks, frames and tubing trays • Interior walls • Main steam pipe tunnel • Manholes • Manways, hatches, manhole covers, and hatch covers • Metal siding • Missile shields • Monorails • Penetration sealant (flood, radiation) • Penetration sleeves (mechanical/ electrical not penetrating primary containment boundary) • Pipe whip restraints • Pressure relief panels • Reactor pedestal • Reactor shield wall (steel portion) • Roof decking • Roof hatches • Roof membrane • Roof slabs • RPV pedestal sump liner and penetrations • Seals and gaskets (doors, manways and hatches)			

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
30 (cont)	• Seismic isolation joint • Stairway, handrail, platform, grating, decking, and ladders • Structural bolting • Structural steel, beams columns, and plates • Sumps and Sump liners • Support members: welds; bolted connections; support anchorages to building structure • Support pedestals • Transmission towers (see Note 1) • Upper containment pool floor and walls • Vents and louvers Note 1: The inspections of these structures may be performed by the transmission personnel. However, the results of the inspections will be provided to the GGNS Structures Monitoring Program owner for review. c) Clarify the term "significant degradation" to include "that could lead to loss of structural integrity". d) Include guidance to perform periodic sampling, testing, and analysis of ground water chemistry for pH, chlorides, and sulfates on a frequency of at least every 5 years. Enhance the Structures Monitoring Program to clarify that parameters monitored or inspected include: a) inspection for missing nuts for structural connections. b) monitoring sliding/bearing surfaces such as Lubrite plates for loss of material due to wear or corrosion, debris, or dirt. The program will be enhanced to include monitoring elastomeric vibration isolators and structural sealants for cracking, loss of material, and hardening. c) Include periodically inspecting the leak chase system associated with the upper containment pool and spent fuel pool to ensure the tell-tales are free of significant blockage. The inspection will also inspect concrete surfaces for degradation where leakage has been observed, in accordance with this Program. Enhance the Structures Monitoring Program to			

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
30 (cont.)	clarify that detection of aging effects will: a) include augmented inspections of vibration isolators by feel or touch to detect hardening if the vibration isolation function is suspect. b) Require inspections every 5 years for structures and structural components within the scope of license renewal unless technical justification is provided to extend the inspection to a period not to exceed 10 years. c) Require direct visual examinations when access is sufficient for the eye to be within 24-inches of the surface to be examined and at an angle of not less than 30° to the surface. Mirrors may be used to improve the angle of vision and accessibility in constricted areas. d) Specify that remote visual examination may be substituted for direct examination. For all remote visual examinations, optical aids such as telescopes, borescopes, fiber optics, cameras, or other suitable instruments may be used provided such systems have a resolution capability at least equivalent to that attainable by direct visual examination. e) Include instructions to augment the visual examinations of roof membranes, and seals and gaskets (doors, manways, and hatches) with physical manipulation of at least 10 percent of available surface area. Enhance the Structures Monitoring Program acceptance criteria by prescribing acceptance criteria based on information provided in industry codes, standards, and guidelines including NEI 96-03, ACI 201.1R-92, ANSI/ASCE 11-99 and ACI 349.3R-96. Industry and plant-specific operating experience will also be considered in the development of the acceptance criteria.		GNRO-2012/00054 GNRO-2011/00093 GNRO-2012/00054 GNRO-2012/00054 GNRO-2012/00076 GNRO-2011/00093	

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
31 .	Enhance the Water Chemistry Control – Closed Treated Water Program to provide a corrosion inhibitor for the engine jacket water on the engine-driven fire water pump diesel in accordance with industry guidelines and vendor recommendations. Enhance the Water Chemistry Control – Closed Treated Water Program to provide periodic flushing of the engine jacket water and cleaning of heat exchanger tubes for the engine-driven fire water pump diesel in accordance with industry guidelines and vendor recommendations. Enhance the Water Chemistry Control – Closed Treated Water Program to provide testing of the engine jacket water for the engine-driven fire water pump diesels at least annually. Enhance the Water Chemistry Control – Closed Treated Water Program to revise the water chemistry procedure for closed treated water systems to align the water chemistry control parameter limits with those of EPRI 1007820.	Prior to November 1, 2024	GNRO-2011/00093 GNRO-2012/00049	B.1.44/ RAI B.1.44-1, B.1.44-2

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
31 (cont.)	Enhance the Water Chemistry Control – Closed Treated Water Program to conduct inspections whenever a boundary is opened for the following systems. • Drywell chilled water (DCW – system P72) • Plant chilled water (PCW – system P71) • Diesel generator cooling water subsystem for Division I and II standby diesel generators • Diesel engine jacket water for engine-driven fire water pump • Diesel generator cooling water subsystem for Division III (HPCS) diesel generator • Turbine building cooling water (TBCW– system P43) • Component cooling water (CCW – system P42) These inspections will be conducted in accordance with applicable ASME Code requirements, industry standards, and other plant-specific inspection and personnel qualification procedures that are capable of detecting corrosion or cracking.			

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
31 (cont.)	Enhance the Water Chemistry Control – Closed Treated Water Program to inspect a representative sample of piping and components at a frequency of once every ten years for the following systems. • Drywell chilled water (DCW – P72) • Plant chilled water (PCW – P71) • Diesel generator cooling water subsystem for Division I and II standby diesel generators • Diesel engine jacket water for engine-driven fire water pump • Diesel generator cooling water subsystem for Division III (HPCS) diesel generator • Turbine building cooling water (TBCW – P43) • Component cooling water (CCW – P42) Components inspected will be those with the highest likelihood of corrosion or cracking. A representative sample is 20% of the population (defined as components having the same material, environment, and aging effect combination) with a maximum of 25 components. The inspection methods will be in accordance with applicable ASME Code requirements, industry standards, or other plant specific inspection and personnel qualification procedures that ensure the capability of detecting corrosion or cracking.			
32	Enhance the BWR CRD Return Line Nozzle Program to include inspection of the CRD return line nozzle inconel end cap to carbon steel safe end dissimilar metal weld once prior to the period of extended operation and every 10 years thereafter.	Prior to November 1, 2024	GNRO-2012/00029	B.1.6 / RAI B.1.6-1
33	Enhance the BWR Penetrations Program to include that site procedures which implement the guidelines of BWRVIP-47-A will be clarified to indicate that the guidelines of BWRVIP-47-A apply without exceptions.	Prior to November 1, 2024	GNRO-2012/00029	B.1.8 / RAI B.1.8-1