



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001**

October 14, 2016

The Honorable Stephen G. Burns  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

**SUBJECT:     REPORT ON THE SAFETY ASPECTS OF THE LICENSE RENEWAL  
                  APPLICATION OF THE GRAND GULF NUCLEAR STATION, UNIT 1**

Dear Chairman Burns:

During the 637<sup>th</sup> meeting of the Advisory Committee on Reactor Safeguards (ACRS), October 6-7, 2016, we completed our review of the license renewal application for the Grand Gulf Nuclear Station, Unit 1 (GGNS) and the final safety evaluation report (SER) prepared by the NRC staff. Our Subcommittee on Plant License Renewal reviewed this matter during a meeting on May 4, 2016. During these reviews, we had the benefit of discussions with representatives of the staff and Entergy Operations, Inc. (Entergy or the applicant). We also had the benefit of the referenced documents. This report fulfills the requirement of 10 CFR 54.25 that the ACRS review and report on all license renewal applications.

## **CONCLUSION AND RECOMMENDATION**

1. The programs established and committed to by Entergy to manage age-related degradation provide reasonable assurance that Grand Gulf Nuclear Station, Unit 1 can be operated in accordance with its current licensing basis for the period of extended operation without undue risk to the health and safety of the public.
2. Entergy's application for renewal of the operating license for Grand Gulf Nuclear Station, Unit 1, should be approved.

## **BACKGROUND**

GGNS is located about 25 miles southwest of Vicksburg, MS. The NRC issued the GGNS construction permit on September 4, 1974, and operating license on November 1, 1984. GGNS is a boiling water reactor design, a GE BWR 6. General Electric supplied the nuclear steam supply system and Allis-Chalmers Power Systems furnished the turbine generator set. The Mark 3 BWR containment is a steel-lined reinforced concrete structure designed by Bechtel Power Corporation. The GGNS licensed power output is 4,408 megawatts thermal.

In this application, Entergy requests renewal of their operating license for a period of 20 years beyond the current expiration date of midnight, November 1, 2024.

## **DISCUSSION**

In its final SER, dated September 2016, the staff documented its review of the license renewal application and other information submitted by the applicant, and obtained through staff audits and inspections at the plant site. The staff reviewed the completeness of the identification of structures, systems, and components (SSCs) that are within the scope of license renewal. The staff also reviewed the integrated plant assessment process; the identification of plausible aging mechanisms associated with passive, long-lived components; the adequacy of the Aging Management Programs (AMPs); and the identification and assessment of Time-Limited Aging Analyses (TLAAs) requiring review.

The application demonstrates consistency with the Generic Aging Lessons Learned (GALL) Report (NUREG-1801, Revision 2) and documents and justifies deviations to the specified approaches in that report. Entergy will implement 44 AMPs for license renewal, comprised of 34 existing programs and 10 new programs. Sixteen of the 44 AMPs are consistent with the GALL Report without enhancements or exceptions. Twenty AMPs are consistent with enhancements. Three AMPs are consistent with exceptions. Three AMPs are consistent with enhancements and exceptions. Two AMPs, Periodic Surveillance and Preventive Maintenance and 115 kV Inaccessible Transmission Cable, are plant-specific.

The license renewal application includes six programs with exceptions to the GALL Report. We reviewed these exceptions (BWR Stress Corrosion Cracking, Fatigue Monitoring, Flow-Accelerated Corrosion, Reactor Head Closure Studs, Reactor Vessel Surveillance, and Containment Leak Rate). We conclude that the six programs with GALL exceptions are acceptable.

The staff conducted license renewal audits and performed a license renewal inspection at GGNS. The audits verified the appropriateness of the scoping and screening methodology for AMPs, the appropriateness of the aging management review, and the acceptability of the TLAAs. The license renewal inspection verified that the license renewal requirements are implemented appropriately. Both the inspection, and the report of that inspection, are thorough. Based on the audits, the inspection, and reviews related to this license renewal application, the staff concluded in the final SER that the proposed activities will manage the effects of aging of SSCs identified in the application and that the intended functions of these SSCs will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

In January 2013, the staff issued an SER with four open items. The open items were resolved during the intervening three years. Those open items pertained to One-Time Inspection – Small-Bore Piping, Service Water Integrity, Operating Experience for Aging Management Programs, and Reactor Vessel Fluence. A discussion of the resolution of these items follows.

### **One-Time Inspection – Small-Bore Piping**

The GGNS operating experience review of the previous 10 years of condition reports did not fully demonstrate consistency with GALL Report AMP XI.M35, One-Time Inspection of ASME Code Class 1 Small-Bore Piping. After the applicant reviewed plant-specific operating experience covering the full operating history of the plant and identified no instances of age-related cracking of ASME Code Class 1 small-bore piping, the staff determined that the applicant had demonstrated applicability of GALL Report AMP XI.M35 to GGNS.

### **Service Water Integrity**

Recent GGNS plant-specific operating experience condition reports discuss minor erosion to a valve flange connection in the standby service water system. The applicant revised LRA Sections A.1.41 and B.1.41 to state that the Service Water Integrity Program also includes inspections for loss of material due to erosion and included a new enhancement to revise program documents to include inspections for this aging mechanism. The applicant also stated that discrepancies were identified in the GGNS-MS-46 database, and this condition had been entered into its corrective action program

### **Operating Experience for Aging Management Programs**

The staff had determined that the applicant's programmatic activities for the ongoing review of operating experience were consistent with the guidance in SRP-LR Section A.4.2, as established in LR-ISG-2011-05, with the exception of four activities. Based on its review of additional information provided by the applicant, the staff found that three of those activities are consistent with the guidance: (1) identification of age-related operating experience, (2) evaluation of AMP implementation results, and (3) the content of its personnel training.

The staff found that the applicant's activities associated with the fourth activity, operating experience reporting, are not consistent with the guidance. However, the staff determined that this inconsistency is an acceptable departure from the guidance because the programs provide for: (a) the systematic review of plant-specific and industry operating experience to ensure that the license renewal AMPs are and will continue to be effective in managing the aging effects for which they are credited, and (b) the enhancement of AMPs or development of new AMPs when it is determined through the evaluation of operating experience that the effects of aging may not be adequately managed.

### **Reactor Vessel Fluence**

SRP-LR Section 4.2 indicates that the applicant's fluence analysis should identify (a) the neutron fluence for the reactor vessel at the expiration of the license renewal period; (b) the staff-approved methodology used to determine the neutron fluence; and (c) whether the

method follows the guidance in RG 1.190. In its review, the staff identified discrepancies, noted incomplete documentation of technical bases, and found that the methods used were inconsistent with RG 1.190. The issues were complex. In 2012 and 2013, the staff issued an initial series of RAIs and received responses from the applicant. In August 2013, the staff issued a comprehensive RAI that suggested alternative paths to resolve the issues. In a series of responses between September 2013 and July 2015, the applicant successfully explained differences in results for the two methods originally used; revised the fluence projections for its neutron embrittlement TLAs using a single, improved, NRC-approved method that showed good agreement with GGNS dosimetry measurements.

During the time between our subcommittee meeting and our review, the applicant submitted additional clarification of the GGNS containment leak rate program, detailing two exceptions to the program described in NUREG-1801, Section XI, S4. The staff found that, with these exceptions, the revised AMP is adequate to manage the effects of aging for SSCs within the scope of the containment leak rate program.

We agree with the staff that there are no issues related to the matters described in 10 CFR 54.29(a)(1) and (a)(2) that preclude renewal of the operating license for GGNS. The programs established and committed to by Entergy provide reasonable assurance that GGNS can be operated in accordance with its current licensing basis for the period of extended operation without undue risk to the health and safety of the public. The Entergy application for renewal of the operating license for Grand Gulf Nuclear Station, Unit 1 should be approved.

Sincerely,

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Dennis C. Bley  
Chairman

## REFERENCES

1. Entergy Operations, Inc., "Grand Gulf Nuclear Station, Unit 1, License Renewal Application," dated October 28, 2011(ML11308A101).
2. U.S. Nuclear Regulatory Commission, "Safety Evaluation Report Related to the License Renewal of Grand Gulf Nuclear Station, Unit 1," dated September 2016 (ML16250A838).
3. U.S. Nuclear Regulatory Commission, "Safety Evaluation Report with Open items Related to the License Renewal of Grand Gulf Nuclear Station, Unit 1," dated April 2016 (ML16090A252).
4. U.S. Nuclear Regulatory Commission, "Scoping and Screening Methodology Audit Report Regarding the Grand Gulf Nuclear Station, Unit 1 License Renewal Application," dated June 20, 2012 (ML12165A387).
5. U.S. Nuclear Regulatory Commission, "NRC Aging Management Programs Audit Report Regarding the Grand Gulf Nuclear Station, Unit 1, dated June 8, 2012 (ML12137A290).

6. U.S. Nuclear Regulatory Commission, "Grand Gulf Nuclear Station - NRC License Renewal Inspection Report 05000416/2012007," dated September 24, 2012 (ML ML12268A365).
7. U.S. Nuclear Regulatory Commission, NRC NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR), dated December 2010 (ML103409036).
8. U.S. Nuclear Regulatory Commission, NRC NUREG-1801, Revision 2, "Generic Aging Lessons Learned (GALL) Report," dated December 2010 (ML103409041).
9. U.S. Nuclear Regulatory Commission, NRC Regulatory Guide-1.188, Revision 1, "Standard Format and Content for Application to Renew Nuclear Power Plant Operating Licenses," dated September 2005 (ML082950585).
10. Entergy Operations, Inc., "Grand Gulf Nuclear Station, Unit 1, License Renewal Application 2012 Annual Update," dated August 15, 2012 (ML12229A582).
11. Entergy Operations, Inc., "Grand Gulf Nuclear Station, Unit 1, License Renewal Application 2013 Annual Update," dated October 25, 2013 (ML13302A598).
12. Entergy Operations, Inc., "Grand Gulf Nuclear Station, Unit 1, License Renewal Application 2014 Annual Update," dated October 27, 2014 (ML14301A102).
13. Entergy Operations, Inc., "Grand Gulf Nuclear Station, Unit 1, License Renewal Application 2015 Annual Update," dated December 10, 2015 (ML15344A283).
14. Entergy Operations, Inc., "Clarification of Grand Gulf Nuclear Station Containment Leak Rate Program Description Grand Gulf Nuclear Station, Unit 1 Docket No. 50-416," dated September 23, 2016 (ML16267A400).
15. Entergy Operations, Inc., "Additional Clarification of the Grand Gulf Nuclear Station Containment Leak Rate Program Description Grand Gulf Nuclear Station, Unit 1 Docket No. 50-416," dated October 3, 2016 (ML16277A573).
16. U.S. Nuclear Regulatory Commission, "Staff SER Update to Section 3.0.3.1.14 Containment Leak Rate," dated October 5, 2016 (ML16279A517).
17. U.S. Nuclear Regulatory Commission, RG 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence," dated March 2001 (ML010890301).