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Grand Gulf Nuclear Station

September 7, 1994

U.S. Nuclear Regulatory Commission  
Mail Station P1-37  
Washington, D.C. 20555

Attention: Document Control Desk

Subject: Grand Gulf Nuclear Station  
Docket No. 50-416  
License No. NPF-29  
Response to Generic Letter 94-02

GNRO-94/00111

Gentlemen:

This submittal provides the Grand Gulf Nuclear Station (GGNS) response to Generic Letter (GL) 94-02 "Long-Term Solutions and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in Boiling Water Reactors".

GL 94-02 was issued by the U. S. Nuclear Regulatory Commission (NRC) on July 11, 1994 requesting that licensees of Boiling Water Reactors (BWRs) take the appropriate actions to augment their respective procedures and training programs for preventing or responding to thermal-hydraulic instabilities in their reactors. This generic letter also requested that BWR licensees submit to the NRC, a plan describing the long-term stability solution option that has been selected and the implementation schedule that is proposed for the modification of plant protection systems to ensure compliance with 10 CFR 50 Appendix A, General Design Criteria 10 and 12. GL 94-02 permitted generic BWR Owners' Group (BWROG) documents or planned submittals to be referenced in this plan.

Prior regulatory documents issued by the NRC to address reactor power oscillations include NRC Bulletin (NRCB) 88-07 dated June 15, 1988, "Power Oscillations in Boiling Water Reactors" and Supplement 1 to NRCB 88-07 "Power Oscillations in Boiling Water Reactors" dated December 30, 1988.

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NRCB 88-07 requested licensees of BWRs to ensure that adequate operating procedures and instrumentation are available and adequate operator training is provided to prevent the occurrence of uncontrolled power oscillations during all modes of BWR operation. Supplement 1 to NRCB 88-07 provided additional information concerning power oscillations in BWRs to clarify the actions specified by the initial bulletin, including initial interim corrective action (ICA) recommendations that were developed by GE and endorsed by the NRC. Supplement 1 also requested licensees to take actions to ensure that the safety limit for the plant minimum critical power ratio (MCPR) is not violated.

Both NRCB 88-07 and NRCB 88-07 Supplement 1 were evaluated for applicability to GGNS and appropriate revisions have been incorporated into station training programs, procedures and the Technical Specifications. The GGNS responses to NRCB 88-07 and NRCB 88-07 Supplement 1 were submitted by letters dated September 15, 1988 (AECM-88-0178) and February 27, 1989 (AECM-89/0030).

GGNS has supported the BWROG initiative to develop and refine interim corrective action guidelines for stability since its inception. The ICAs that were published by the BWROG in March 1992 and June 1994 have been evaluated for applicability to GGNS and the applicable actions have been implemented.

With the administrative provisions specified in NRCB 88-07 Supplement 1 and applicable BWROG ICA recommendations in place, we are confident that power oscillations will be avoided or adequate guidance is available to detect and suppress power oscillations should they occur. These administrative provisions will remain in place until the stability long-term solution is implemented at GGNS.

The reporting requirements of GL 94-02 required BWR licensees to inform the NRC, in writing and under oath or affirmation within 60 days from the date of your letter of the plans and status with respect to the requested actions specified in GL

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94-02. Attachment 1 delineates the response to Reporting Requirement Item 1.a of GL 94-02 for Grand Gulf Nuclear Station. GGNS has elected to proceed with Enhanced Option I-A as the long-term stability option to be implemented.

Enhanced Option I-A is fully described in NEDO-32339 "Reactor Stability Long-Term Solution: Enhanced Option I-A," March 1994. The proposed plans and schedule information is also provided in Attachment 1. Attachment 2 provides the requested affirmation per 10 CFR 50.54(f).

GGNS plans to take the actions requested by GL 94-02 and consequently Reporting Requirement Item 1.b is not applicable.

As requested by Reporting Requirements Item 2, we will inform the NRC, in writing and under oath or affirmation within 30 days after completion of the requested actions of GL 94-02.

Should you have any questions or require additional information regarding this matter, please contact Charles E. Brooks at 601-437-6555.

Yours truly,

*CRH/CEB*  
*for CRH*

CRH/CEB/amb

attachment: 1) Grand Gulf Nuclear Station Response to Generic Letter 94-02

2) Affirmation per 10CFR50.54(f)

cc: (See Next Page)

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cc:

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Mr. R. B. McGehee (w/a)  
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Attachment 1

to

GNRO-94/00111

Response to Generic Letter 94-02

"Long-Term Solutions and Upgrade of  
Interim Operating Recommendations for Thermal Hydraulic  
Instabilities in Boiling Water Reactors"

Requested Actions Applicable to Reporting Requirements Item 1.a

Grand Gulf Nuclear Station  
Response to Generic Letter 94-02

Reporting requirements applicable to holders of  
operating licenses for Boiling Water Reactors

Requested Action 1.a:

Ensure that procedural requirements exist for initiation of a manual scram under all operating conditions when all recirculation pumps trip (or there are no pumps operating) with the reactor in the RUN mode, and ensure that operators are aware of the potential for very large power oscillations and the potential for exceeding core thermal safety limits before automatic protection systems function following the trip of all recirculation pumps (the procedural manual scram is not necessary after long-term solutions are approved and implemented for individual plants).

GGNS Response to Action Item 1.a:

Off-Normal Emergency Procedure (ONEP) 05-1-02-III-3, "Decrease in Recirculation System Flow Rate", was revised as part of the actions taken at GGNS in response to NRCB 88-07 Supplement 1. This procedure requires a manual scram under all operating conditions when both recirculation pumps trip and the reactor is in the RUN mode. GGNS Technical Specifications as well as ONEP 05-1-02-III-3 requires the mode switch to be placed in shutdown immediately, if no reactor coolant system recirculation loops are in operation and the mode switch is in the RUN position or operating using Maximum Extended Operating Domain (MEOD) above the 100% Load Line and recirculation pumps trip to slow speed. Operators are trained to be aware of the potential for very large power oscillations and the potential for exceeding core thermal safety limits before automatic safety systems function following the trip of all recirculation pumps.



Requested Action 1.b:

Ensure that factors important to core stability characteristics (e.g., radial and axial peaking, feedwater temperature, and thermal hydraulic comparability of mixed fuel types) are controlled within appropriate limits consistent with the core design, power/flow exclusion boundaries, and core monitoring capabilities of the reactor in question, and that these factors are controlled through procedures governing changes in reactor power, including startup and shutdown, particularly at low flow operating conditions. Each licensee should review its procedures and determine if instability can be avoided by these procedures and if the procedures can be carried out using existing instrument information. If it is concluded that a near-term upgrade of core monitoring capability is called for to ease the burden on operators, determine the need to incorporate on-line stability monitoring or monitors for stability sensitive parameters and inform the NRC of the schedule and technical evaluation for such upgrades found to be necessary. (These procedural operation controls will no longer be necessary for licensees which implement fully automatic long-term solutions, such as Options III or III-A of Reference 2. Licensees should propose for plant-specific review the administrative controls to be retained in conjunction with other long-term solutions).

GGNS Response to Action Item 1.b:

Grand Gulf Nuclear Station has implemented the interim corrective actions (ICAs) specified in NRC Bulletin 88-07 Supplement 1 and, in addition, has supported the BWROG effort to develop improved guidelines for the ICAs to better address startup and low power maneuvering conditions. A copy of the improved BWR Owners' Group Guidelines for Stability Interim Corrective Actions was provided to the NRC in Reference 5. It is our understanding that, based on a review of an advance copy of these guidelines (Reference 6), the NRC will accept the improved BWR Owners' Group guidelines as an adequate response to requested actions 1.a and 1.b of Generic Letter 94-02.

It should be noted that the BWR Owners' Group Guidelines (Reference 5) are consistent with, but more restrictive than, the ICAs which were previously implemented and incorporated into GGNS Technical Specifications as a result of the NRC Bulletin 88-07 Supplement 1 requirements. The original regions defined in the 1988 BWROG ICAs and included in NRC Bulletin 88-07 Supplement 1, were based on stability tests and events known at the time. Subsequent work identified a sensitivity to reactor power shape and/or feedwater temperature conditions.

Because of this, the Reference 5 guidelines incorporated an expanded stability region and power distribution control definition to strengthen the oscillation prevention feature. This, in conjunction with the detection and suppression provision of the guidelines, provides a higher degree of protection against unacceptable power oscillations.

GGNS has modified, where necessary, its operating procedures and operator training such that they are consistent with, or more conservative than, the BWROG guidelines in Reference 5. GGNS has incorporated into procedures the operating regions and the applicable actions that are currently recommended in Reference 5.

Additionally, GGNS maintains further conservatism to the BWROG recommended stability regions by the incorporation of an Increased Operator Awareness Region and by increasing the size of the Exit and Controlled Entry Regions.

Because the guidance issued by NRCB 88-07 Supplement 1 and the BWROG is intended for use until replaced by a stability long-term solution, modification of the GGNS Technical Specifications are not appropriate. The Reference 5 guidelines and the resulting plant operating procedures and operator training modifications are intended for use only until the stability long-term solution is implemented. Beyond this, appropriate Technical Specification changes, procedure revisions and training program changes are to be evaluated and determined by the long-term solution implemented at GGNS.

GGNS has incorporated into plant operating procedures, the Fraction of Core Boiling Boundary (FCBB) limit to ensure parameters important to stability are controlled in the Controlled Entry Region. In addition to the procedure changes, the calculation to demonstrate conformance to the FCBB limit has been incorporated into the core monitoring software and is available each time a core monitor calculation is performed. GGNS currently has no mixed fuel types in the core. The thermal hydraulic compatibility of reload fuel is addressed on a cycle specific basis.

GGNS meets the applicable operator training recommendations of Reference 5. Reactor operators are trained to recognize thermal-hydraulic oscillations and to realize that stability region boundaries are not absolute indicators of the potential for instability under all conditions. As such, operator training emphasizes that time spent operating near the stability region should be minimized.



Reactor operator training emphasizes that a scram is required upon recognition of power oscillations, even if the magnitude of the oscillations is below 10% or the APRMs and LPRM upscale or downscale alarms have not occurred. The intent of this training is to minimize the potential for a safety limit violation should a regional oscillation occur, and is consistent with a proactive reactivity management philosophy.

#### Requested Action 2:

All licensees of BWRs, except for Big Rock Point, are requested to develop and submit to the NRC, a plan for long-term stability corrective actions, including design specifications for any hardware modifications or additions to facilitate manual or automatic protective response needed to ensure that the plant is in compliance with General Design Criteria 10 and 12. An acceptable plan could provide for implementing one of the long-term stability solution options described in Reference 3 or in subsequent documentation. The plan should include a description of the action proposed and a schedule of any submittal requiring plant-specific design review and approval by the NRC and an installation schedule (if applicable). The plan should also address the need for near-term and long-term Technical Specification modifications. Generic BWROG documents or planned submittal may be referenced in the plan.

#### GGNS Response to Action Item 2:

The NRC requirements for stability long-term solutions to ensure compliance with General Design Criteria 10 and 12 of Appendix A to 10 CFR Part 50 was presented in NRC Bulletin 88-07 Supplement 1 (December 30, 1988). The bulletin acknowledged that the NRC was working with the BWR Owners Group (BWROG) to develop generic approaches to resolve the reactor stability issue. The resulting BWROG efforts have led to the solution concepts and methodology described in NEDO-31960 "BWR Owners Group Long-Term Stability Solutions Licensing Topical Methodology" (Reference 1), NEDO-31960, Supplement 1 (Reference 2) and NEDO-32339 "Reactor Stability Long-Term Solution: Enhanced Option I-A" (Reference 4). GGNS has elected to proceed with a solution which introduces new plant hardware/software to mitigate the consequences of reactor coupled neutronic/thermal-hydraulic instabilities should they occur considering reasonably limiting anticipated operating conditions. This long-term solution is Enhanced Option I-A and is fully described in NEDO-32339 (Reference 4). GGNS is participating with other utilities under a BWROG program to conduct initial application activities, and has contracted with GE to develop the hardware/software design and deliver the final product. Recommendations for conceptual Technical Specification changes are provided as part of this BWROG program.

Plant specific Technical Specification changes for stability will be evaluated against the selection criteria in the NRC Final Policy Statement on Technical Specification Improvements of July 16, 1993. Implementation of the Enhanced Option I-A stability long-term solution plan is contingent upon NRC acceptance of the BWROG methodology submittal (Reference 4) and the GGNS/GE hardware and software submittals.

The schedule for completion of the joint design and licensing activities is delineated in Table 1. Plans for GGNS plant specific activities are delineated Table 2. The implementation schedule is based on an NRC review cycle of six months for plant specific submittals. Assuming the joint development activities and NRC acceptance are completed as scheduled, it is GGNS' objective to have the Enhanced Option I-A stability solution Technical Specifications evaluated against the NRC Final Policy Statement on Technical Specification Improvements of July 16, 1993 and any identified changes submitted for NRC approval by the last quarter of 1996. The long-term stability hardware solution will be installed and operational at GGNS 6 months following startup from the 8th Refueling Outage (Expected installation 2nd Quarter 1997).

TABLE 1

ENHANCED OPTION 1-A STABILITY PROGRAM  
DESIGN & LICENSING ACTIVITIES  
NRC/BWROG MILESTONES

<u>Activity</u>	<u>Date</u>	<u>Organization</u>
Licensing Topical Report on Enhanced Option I-A (NEDO-32339) Submitted	4/94	BWROG
Licensing Topical Report on Enhanced Option I-A (NEDO-32339) Safety Evaluation Report	3rd Quarter 1994*	NRC
Enhanced Option I-A Hardware Licensing Topical Report Submitted	1st Quarter 1995*	BWROG
Enhanced Option I-A Hardware Licensing Topical Report Safety Evaluation Report	3rd Quarter 1995*	NRC

\* Planned Dates

TABLE 2

## ENHANCED OPTION 1-A STABILITY PROGRAM

## GRAND GULF NUCLEAR STATION PLANT SPECIFIC ACTIVITIES

## NRC/GRAND GULF NUCLEAR STATION MILESTONES

Activity	Date	Organization
GGNS Stability Region Boundaries Submittal	3rd Quarter 1995*	GGNS
GGNS Stability Region Boundaries Safety Evaluation Report	1st Quarter 1996*	NRC
GGNS Stability Technical Specification Submittal, if required based on evaluation	4th Quarter 1996* Note 1	GGNS
GGNS Stability Technical Specification Safety Evaluation Report, if required	2nd Quarter 1997* Note 1	NRC
Stability Solution Final Installation	6 months following startup from the 8th Refueling Outage **	GGNS

\* Planned Dates

\*\* Final installation is expected during the 2nd Quarter of 1997

Note 1: Plant Specific Technical Specification changes to address stability will be evaluated against the selection criteria in the NRC Final Policy Statement on Technical Specification Improvements of July 16, 1993.

## References

1. NEDO-31960, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," June 1991.
2. NEDO-31960, Supplement 1, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," March 1992.
3. Letter from A. Thadani, NRC to L. A. England, Chairman, BWR Owners' Group, Acceptance for Referencing of Topical Reports NEDO-31960 and NEDO-31960, Supplement 1, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," dated July 1993.
4. NEDO-32339, "Reactor Stability Long-Term Solution: Enhanced Option I-A," March 1994.
5. Letter, L. A. England to M. J. Virgilio, "BWR Owners' Group Guidelines for Stability Interim Corrective Actions," June 6, 1994
6. Letter, L. A. England to M. J. Virgilio, "BWR Owners' Group Improved Guidelines for Stability Interim Corrective Actions," April 4, 1994



Attachment 2

to

GNFO-94/00111

Response to Generic Letter 94-02

"Long-Term Solutions and Upgrade of  
Interim Operating Recommendations for Thermal Hydraulic  
Instabilities in Boiling Water Reactors"

Affirmation per 10 CFR 50.54(f)

BEFORE THE

UNITED STATES NUCLEAR REGULATORY COMMISSION

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LICENSE NO. NPF-29

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DOCKET NO. 50-416

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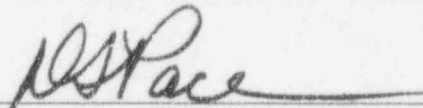
IN THE MATTER OF

MISSISSIPPI POWER & LIGHT COMPANY  
and  
SYSTEM ENERGY RESOURCES, INC.  
and  
SOUTH MISSISSIPPI ELECTRIC POWER ASSOCIATION  
and  
ENTERGY OPERATIONS, INC.

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AFFIRMATION

I, D. L. Pace, state that I am General Manager, Plant Operations GGNS of Entergy Operations, Inc.; that on behalf of Entergy Operations, Inc., System Energy Resources, Inc., and South Mississippi Electric Power Association I am authorized by Entergy Operations, Inc. to sign and file with the Nuclear Regulatory Commission, this response to Generic Letter 94-02 for the Grand Gulf Nuclear Station; that I signed this generic letter response as General Manager, Plant Operations GGNS of Entergy Operations, Inc., and that the statements made and the matters set forth therein are true and correct to the best of my knowledge, information and belief.



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D. L. Pace

STATE OF MISSISSIPPI  
COUNTY OF CLAIBORNE

SUBSCRIBED AND SWORN TO before me, a Notary Public, in and  
for the County and State above named, this 8<sup>th</sup> day of  
September, 1994.  
(SEAL)

Richard R. Mor-TII

Notary Public

My commission expires:  
MISSISSIPPI STATEWIDE NOTARY PUBLIC  
MY COMMISSION EXPIRES JUNE 5, 1998  
BONDED THRU STEGALL NOTARY SERVICE