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Subject: River Bend Station - Unit 1
Docket No. 50-458
License No. NPF-47
License Amendment Request (LAR) 98-02; "Stability"

File Nos.: G9.5, G9.42

RBEXEC-98-107
RBF1-98-0199
RBG-44593

Gentlemen:

In accordance with 10 CFR 50.90, Entergy Operations, Inc. (EOI) hereby applies for amendment of Facility Operating License No. NPF-47, Appendix A - Technical Specifications, for River Bend Station (RBS). The proposed changes implement Boiling Water Reactor Owners Group (BWROG) Enhanced Option I-A (EIA) Reactor Stability Long Term Solution as documented in NEDO-32339, Revision 1, "Reactor Stability Long-Term Solution, Enhanced Option I-A." These Technical Specifications, which serve as the basis for the proposed amendment, are provided in NEDO-32339-A, Supplement 4, "Reactor Stability Long Term Solution: Enhanced Option I-A Generic Technical Specifications." The Technical Specifications are provided in the format of the Improved Standard Technical Specifications (ITS).

NEDO-32339, Supplement 4, has been submitted by the BWROG as the basis for the Technical Specifications to implement the EIA long term solution and has been accepted by the NRC in Safety Evaluation Report, "Reactor Stability Long-Term Solution, Enhanced Option I-A Generic Technical Specifications, NEDO-32339, Supplement 4." River Bend Station (RBS) implemented the ITS in 1995.

A001

The initial proposed implementation schedule for the stability issue is documented in the EOI Supplemental Response to Generic Letter 94-02, "Long-Term Solution and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in BWRs," transmitted to the NRC in letter dated September 12, 1996 (RBG-40869). This schedule was based on the assumption that the EIA solution, associated technical issues, and NRC approvals would be completed prior to implementation. In a letter dated January 20, 1998, EOI requested a deferral of the previous implementation schedule to allow completion of the NRC review of the various BWROG documents. EOI proposed the implementation be contingent on the completion of the NRC review and approval of the EIA solution contained in NEDO-32339, Revision 1, including Supplements 1 through 4. This review by the NRC was completed during April 1998 and as a result EOI is now proposing the attached changes to the license be implemented.

Based on the guidelines in 10 CFR 50.92, EOI has concluded that this proposed amendment involves no significant hazards considerations. Enclosure 2 details the basis for this determination. Enclosure 2 provides a detailed description of the proposed changes, justification and the "No Significant Hazards Considerations." The proposed changes to the Technical Specifications, and the Basis are consistent with NEDO-32339-A, Supplement 4. Enclosure 3 is a copy of the marked-up Technical Specification and Bases pages.

This request has been discussed with the NRR project manager for RBS. It has also been reviewed and approved by the RBS Facility Review Committee and the Safety Review Committee. To allow time for completion of procedure revisions and training, EOI requests that the proposed amendments, once approved by the NRC, be issued to RBS allowing implementation during Refueling Outage 8 (RF-8) scheduled to begin April 3, 1999.

The commitments contained in this document are identified on the Commitment Identification Form. If you have any questions regarding this request or require additional information, please contact Mr. B. M. Burmeister at (225) 381-4148.

Sincerely,

Randall K. Edington

RKE/RJK
enclosures

cc: Mr. Robert Fretz
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LA Department of Environmental Quality
Radiation Protection Division
P. O. Box 82135
Baton Rouge, LA 70884-2135
Attn: Administrator

COMMITMENT	ONE-TIME ACTION*	CONTINUING COMPLIANCE*
Administrative controls for manually bypassing APRM flow biased scram and control rod block functions are in place at RBS. Comparable administrative controls will be established for the PBDS channels prior to the full implementation of the EIA solution.		X
In addition to the changes in the TS the corresponding changes in the RBS TRM will be implemented. These changes will include a reference to the COLR for the cycle specific control rod block limits contained in TRM Tables 3.3.1.1-1, Nominal Setpoints, and 3.3.1.2-1, Control Rod Block Instrumentation.		X

*Check one only

ENCLOSURE 1

BEFORE THE

UNITED STATES NUCLEAR REGULATORY COMMISSION

LICENSE NO. NPF-47

DOCKET NO. 50.458

IN THE MATTER OF
ENTERGY GULF STATES, INC. AND
ENTERGY OPERATIONS, INC.

AFFIRMATION

I, Randall K. Edington, state that I am Vice President-Operations of Entergy Operations, Inc., at River Bend Station; that on behalf of Entergy Operations, Inc., I am authorized by Entergy Operations, Inc., to sign and file with the Nuclear Regulatory Commission, this River Bend Station License Amendment Request (LAR) 98-02, Stability Enhanced Option I-A, that I signed as Vice President-Operations at River Bend Station 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.

Randall K. Edington

STATE OF LOUISIANA
PARISH OF WEST FELICIANA

SUBSCRIBED AND SWORN TO before me, a Notary Public, commissioned in the Parish above named, this 8th day of October, 1998.

(SEAL)

Claudia F. Hurst
Notary Public

My Commission expires with life

ENCLOSURE 2

ENTERGY OPERATIONS INCORPORATED
RIVER BEND STATION
DOCKET 50-458/LICENSE NO. NPF-47

STABILITY ENHANCED OPTION I-A
(LAR 98-02)

DOCUMENT INVOLVED: Technical Specifications

The following Technical Specifications are affected by the proposed change.

Specification 3.2.4	**Fraction of Core Boiling Boundary (FCBB)**
Specification 3.3.1.1	**Reactor Protection System (RPS) Instrumentation**
Specification 3.3.1.3	**Period Based Detection System (PBDS)**
Specification 3.4.1	**Recirculation Loops Operating**
Specification 5.6.5	**Core Operating Limits Report (COLR)**

The proposed Technical Specification (TS) and the associated TS Bases changes to be implemented following NRC approval are detailed in Enclosure 3.

BASIS FOR CHANGES

Regulatory History

The requirements of 10 CFR 50 Appendix A, General Design Criterion 12, "Suppression of Reactor Power Oscillations." (GDC-12) specify that neutronic/thermal hydraulic instability is to be prevented by design or be readily and reliably detected and suppressed. After neutronic/thermal hydraulic instability events occurred in the early 1980s at Boiling Water Reactors (BWRs) outside the United States, licensees recognized that some BWR designs did not prevent neutronic/thermal hydraulic instability. To improve the ability of the operator to detect and suppress potential neutronic/thermal hydraulic instability, General Electric prepared Service Information Letter (SIL) #380, Revision 1, "BWR Core Thermal Hydraulic Stability" dated February 10, 1984 (Reference 1). The recommendations of SIL #380, Revision 1 were developed based on the limited event and test data available.

Following the neutronic/thermal hydraulic instability event at LaSalle Unit 2 in early 1988, the NRC issued IE Bulletin 88-07, "Power Oscillations in Boiling Water Reactors (BWRs)" (Reference 10). The Boiling Water Reactor Owners Group (BWROG) responded to concerns raised by the NRC pertaining to the neutronic/thermal hydraulic instability issue by performing studies using newer and more detailed models originally developed for the analysis of other BWR neutronic/thermal hydraulic transients. The results of these BWROG studies indicated the

potential for neutronic/thermal hydraulic instability to exceed specified acceptable fuel design limits established for these anticipated operational occurrences routinely evaluated to demonstrate compliance with 10 CFR 50 Appendix A, General Design Criterion 10 "Reactor Design" (GDC-10). Specifically, it was concluded that neutronic/thermal hydraulic instability can result in power oscillations which could result in exceeding the Minimum Critical Power Ratio (MCPR) Safety Limit (SL) prior to automatic actuation of the Reactor Protection System.

Based on these results, the Boiling Water Reactor Owners' Group (BWROG) developed Interim Corrective Actions (ICAs) (i.e., operator actions) based on Neutron Monitoring System (NMS) response, recirculation loop operation, and power and flow conditions within the licensed operating domain. Implementation of the ICAs caused a region of the power and flow operating domain to be excluded from normal operation. This region that is larger than that specified by the power and flow limits of current RBS TS Figure 3.4.1-1.

Concurrent with the development of the ICAs, the BWROG also initiated efforts to develop generic long-term solutions to the neutronic/thermal hydraulic instability issue for the industry. As described in IE Bulletin 88-07, Supplement 1 (Reference 12), the ICAs were accepted by the NRC as adequate compensatory measures pending final development and implementation of the long-term solutions being developed by the BWROG. One of the solutions initially developed by the BWROG was designated Option I-A. The original Option I-A solution is described in NEDO-31960-A and was later enhanced through the efforts of a smaller number of BWROG participants resulting in the Enhanced Option I-A (EIA) solution described in NEDO-32339, Revision 1. (Reference 2) In summary this solution consist of; modifications to the existing neutron monitoring system Average Power Range Meter (APRM) flow biased functions to provide automatic protection in the region of operation most susceptible to neutronic/thermal hydraulic instability and additional controls on the entry in to the region of operation in which neutronic/thermal hydraulic instability may occur. This solution also includes the associated changes to the technical specifications to effectively implement the solution.

Existing RBS Technical Specification Requirements

Existing TS 3.4.1 limits the Reactor Vessel power and flow conditions during operation with two reactor coolant recirculation loops in operation. The immediate actions required, when the power and flow conditions of current TS Figure 3.4.1-1 are not met with any number of recirculation loops operating, are consistent with the recommendations of General Electric (GE) Service Information Letter (SIL) #380, "BWR Core Thermal Hydraulic Stability," Revision 1. With no recirculation loops in operation, power must be reduced within four hours to comply with the power limits (with no recirculation loops operating, increasing flow would not be possible). With one recirculation loop operating, power must be reduced or flow increased to comply with the power and flow limits.

With two recirculation loops operating, the operator may either take immediate action to comply with the power and flow limits or monitor neutron flux noise levels within two hours. When the operator chooses to monitor neutron flux noise levels, the observed levels are compared with baseline noise levels established upon entry into the region. Furthermore, if neutron flux noise

levels exceed three times the established baseline, the operator must take immediate action to reduce the noise levels and meet the power and flow limits of current TS Figure 3.4.1-1.

Operating procedures consistent with the BWROG ICAs, which were instituted in response to Reference 12, are currently in place at RBS and supplement the existing core stability related req. ements specified in TS 3.4.1.

Implementation of the long term solution to the Boiling Water Reactor (BWR) neutronic/thermal hydraulic instability issue has been an industry and regulatory objective since issuance of Supplement 1 of IE Bulletin 88-07. The EIA solution option was identified as the solution proposed to be implemented at RBS in response to Generic Letter 94-02, "Long-Term Solution and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in BWRs." (Reference 13) Upon implementation of the EIA long term stability solution, the administrative controls established to comply with the guidance of the BWROG ICAs will no longer be required at RBS.

The proposed changes to the TS will enable the full implementation of the Enhanced Option I-A (EIA) long term solution to the neutronic/thermal hydraulic instability issue. Specifically, the proposed change deletes the limits on power and flow conditions associated with the implementation of the guidance in Reference 1 (current TS 3.4.1, Figure 3.4.1-1 and plant procedures), adds new specifications, to establish limits for Fraction of Core Boiling Boundary (FCBB) and the Period Based Detection System (PBDS), modifies the RPS instrumentation specification and the description of the contents of the Core Operating Limits Report (COLR) in current TS 5.6.5. The two new specifications require maintaining stability control and the availability of a stability detection system during operation in defined regions of the power and flow operating domain. In a general sense, the actions required when the power and flow limits of current TS 3.4.1 are not met are replaced by the requirements to maintain stability control, associated required operator actions, and the required availability of the stability detection system over a specified region of the power and flow operating domain. The additions and modifications of the proposed change are consistent with the description of the EIA solution as described in NEDO-32339, Revision 1, "Reactor Stability Long-Term Solution: Enhanced Option I-A" and Supplements 1-4.

Description of Changes

I EIA Solution Hardware Design

The design of the EIA FCTR card includes both analog and digital components as described in NEDC-32339P-A, Supplement 2, "Reactor Stability Long-Term Solution: Enhanced Option I-A: Solution Design." (Reference 4) The design of the hardware required for implementation of the EIA solution provides the capability for the Average Power Range Monitor (APRM) flow biased control rod block and scram function setpoint values to be "Setup" prior to and during operation in the Restricted Region and to select different trip reference sets. To implement these features, the original design Flow Control Trip Reference (FCTR) card of the RPS is replaced with a card

of a new design specifically developed and manufactured for implementation of the EIA solution. This digital design provides the capability to perform all functions required by the EIA flow mapping methodology including the mapping and calibration of the Exclusion Region and Restricted Region boundaries, in terms of setpoint versus drive flow.

The initial application of the drive flow to core flow mapping methodology described in Reference 5 uses plant specific historical operating data to establish the initial relationship between core flow and drive flow. After an initial flow alignment process that accommodates potential variations in the drive flow to core flow relationship from that assumed in the initial plant specific application of the flow mapping methodology, only periodic adjustment to the digital components of the FCTR is required. The use of digital components in the EIA FCTR card also allows the incorporation of self-test features and more frequent internal checks. Also, digital components, such as those used in the EIA FCTR card, are highly reliable, and therefore in combination with the self-test capability, less frequent external checks are necessary. For these reasons, current TS Surveillance Requirement (SR) 3.3.1.1.3 for the weekly Channel Calibration of Reactor Protection System Function 2.b (APRM flow biased scram) is superseded. The proposed change provides a new SR that is applicable to Reactor Protection System Function 2.b and requires the adjustment of the channel to conform to core flow once within seven after reaching steady state or equilibrium conditions following each refueling outage. As a result, current TS SR 3.3.1.1.3 is replaced with a new SR. In addition, a change is made to add a note (Note 3 to current RBS TS SR 3.3.1.1.11) to the Channel Calibration Surveillance Requirement for Reactor Protection System Function 2.b stating that the digital components of the FCTR card are excluded from the Channel Calibration.

II Exclusion Region

The portion of the reactor power and flow operating domain that must be excluded from the licensed operating domain due to the potential for neutronic/hydraulic instability is designated the Exclusion Region. This exclusion region is implemented through a modification to the existing RPS APRM limits. The limitation on entry into this region is provided through a FCTR SCRAM function on the current system.

The APRM flow biased scram function, as modified by the EIA solution, provides automatic reactor scram protection upon entry into the Exclusion Region as implemented through the FCTR scram function. This feature of the EIA solution can potentially increase the occurrence of automatic reactor scram since the APRM flow biased scram function causes an automatic reactor scram upon entry into this newly defined region of the operating domain. However, the newly defined Exclusion Region and the existing region requiring immediate manual reactor scram upon entry by the recommendations of the BWROG ICAs are similar. Therefore, the overall incidence of reactor scram will not significantly change due to the EIA modification of the APRM flow biased scram function.

Gross violation of the currently licensed operating domain is prevented by the current APRM flow biased scram function specified in TS 3.3.1.1-1 item 2.b. However this APRM flow biased scram function is not credited in the safety analysis and, therefore, does not meet the NRC

criteria in 10 CFR 50.36(c)(2)(ii) for inclusion in TSs. Similarly, the EIA APRM flow biased scram function provides a pre-emptive automatic reactor scram upon entry into the Exclusion Region of the operating domain and again is not used directly to protect the MCPR Safety Limit. However, since the APRM flow biased scram function is a feature of the EIA stability solution necessary to ensure compliance with 10 CFR 50 Appendix A, General Design Criterion 12, it is retained in the TSs. Therefore, compliance with GDC 12 will form the licensing basis for the EIA flow biased scram.

The allowable value for this RPS Function, 2.b, in current TS Table 3.3.1.1-1, is expressed as a fraction of rated recirculation loop flow (W) in percent. The variable "W," defined in the current BASES of Technical Specification 3.3.1.1.2 b as a total drive flow signal, is representative of total core flow. Current TS 5.6.5 lists the specifications for which limits are included in the Core Operating Limits Report (COLR). NEDO-32339-A, Supplement 4 (Reference 6), relocates the Allowable Value of the APRM flow biased scram function to the COLR. This relocation facilitates the revision of these values as it becomes necessary to update them due to changes in core or fuel designs. Accordingly, this proposed change relocates the Function 2.b (APRM flow biased scram) Allowable Value (expressed as a function of reactor recirculation drive flow) from current RBS TS Table 3.3.1.1-1 to the COLR. This change to the Function 2.b Allowable Value is replaced with footnote (b) to Table 3.3.1.1-1, which states that the Allowable Values are specified in the COLR.

A commensurate change is proposed to current TS 5.6.5 to indicate that the COLR contains the Allowable Values of the APRM flow biased scram and provides the methodology for development and revision of these limitations. The methodology for development and revision of these limitations is presented in Licensing Topical Report References 2 through 6.

III Restricted Region

The portion of the licensed operating domain immediately adjacent to the Exclusion Region is defined as the Restricted Region. Planned operation in the Restricted Region requires implementation of a stability control prior to entry. The restriction on entry into this region is implemented through a modification to; the existing RPS APRM Flow Biased Upscale Alarm which will implement the Restricted Region Entry Alarm (RREA), a new power distribution limit of Fraction of Core Boiling Boundary (FCBB), and the operation of a Period Based Detection System (PBDS). The APRM Flow Biased Upscale setpoint is adjusted to coincide with the lower boundary of the Restricted Region and thereby provides an operator aid to identify entry into the Restricted Region.

The stability control used in the EIA solution is the Fraction of Core Boiling Boundary (FCBB). The FCBB is the ratio of the power generated in the lower fourth of the active reactor core to the power required to produce bulk saturated boiling of the coolant entering the fuel channels. The value of one fourth above the bottom of the active fuel is set as the boiling boundary limit based on analysis described in Section 9 of Reference 2. The boiling boundary limit is established to ensure that the core remains stable during normal reactor operations in the Restricted Region of the power and flow operating domain, otherwise, the core may be susceptible to

neutronic/thermal hydraulic instability. This core average boiling boundary is manipulated by operator actions that affect power distribution. The associated operating limit, FCBB, is required to be met during operation in the Restricted Region and meets Criterion 2 of 10 CFR 50.36(c)(2)(ii). Therefore, a new specification (RBS TS 3.2.4) is added to the Power Distribution Limits section of the TSs.

To facilitate intentional entry into the Restricted Region once the EIA stability control, discussed above, is in place, the APRM flow biased control rod block setpoint is "Setup." With the "Setup" feature selected, the setpoints associated with stability regions are elevated above the normal or "non-Setup" value. Operation with stability control implemented reduces the susceptibility to neutronic/thermal hydraulic instability while operating in the Restricted Region. The APRM flow biased control rod block function does not meet the NRC criteria in 10 CFR 50.36(c)(2)(ii) for inclusion in the TSs and only serves as an operator aid. Therefore, it is not included in the proposed TSs.

IV Period Based Detection

The Period Based Detection System (PBDS) is a required feature of the EIA solution. The PBDS uses the neutron flux oscillation period confirmation process of the Period Based Algorithm (PBA) described in NEDO-31960-A, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology" and NEDO-31960-A, Supplement 1. (Reference 8) The PBA-EIA, documented in Reference 4, has no safety function and is not credited during any design basis accident or transient analysis. However, during operation in regions of the operating domain potentially susceptible to instability under any operating conditions, the PBDS provides an indication that conditions consistent with a significant degradation in the stability performance of the reactor has occurred and the potential for imminent onset of neutronic/thermal hydraulic instability may exist. Therefore, a new PBDS Specification (RBS TS 3.3.1.3) is appropriately added to the Instrumentation section of the TSs.

The requirements of the EIA solution PBDS Specification include immediate manual reactor scram without delay upon receipt of any valid PBDS channel High-High Decay Ratio (Hi-Hi DR) alarm while operating in regions of the power and flow operating domain potentially susceptible to neutronic/thermal hydraulic instability. Verification that the Hi-Hi DR alarm is valid may be performed in the control room prior to the manual reactor scram. This verification can be completed by using another output from the PBDS card which generated the Hi-Hi decay ratio alarm, which is observable from the reactor controls or confirmation the plant is not operating in regions of the power and flow operating domain potentially susceptible to neutronic/thermal hydraulic instability.

This feature of the EIA solution could result in a potential increase in the incidence of manual reactor scram since there is no specific requirement in current TS 3.4.1 to respond to increased neutron flux noise levels (a characteristic of power oscillations induced by neutronic/thermal hydraulic instability) by initiating a manual reactor scram. Guidance consistent with the BWROG ICAs implemented at RBS, does specify immediate manual reactor scram upon confirmation of power oscillations which could be exhibited by the increased neutron flux noise

levels. With the period based detection region approximately equivalent to the ICAs, it is therefore concluded that implementation of the requirement to initiate a manual reactor scram upon receipt of a Hi-Hi DR alarm which is an indication of by neutronic/thermal hydraulic instability from any Operable PBDS channel will not significantly increase inappropriate reactor scrams.

Summary of Changes and Basis of Acceptability of Proposed TS

The parameters of a reactor system most important in determining stability performance are core power, core flow, core inlet enthalpy, and power distribution. Recirculation system design can impact the calculated stability performance through the coupling of the fluid in the recirculation system piping with the reactor core. For a given set of these parameters the calculated stability performance can be significantly different when large changes in the physical dimensions of the recirculation piping (i.e., jet pump configuration, recirculation pipe length and diameter and pump inertia) are assumed. However, the EIA methodology requires modeling the plant specific characteristics of the recirculation system design important in evaluating the stability performance of the reactor system and determining the EIA regions. Operation with a different number of operating recirculation loops at the same core power, core flow, core inlet enthalpy, and power distribution, has only minor impact on these characteristic values. Furthermore, based on well defined regions in the core power and core flow domain, adherence to the stability control adopted for implementation with the EIA solution has been demonstrated, as described in Section 9 of Reference 2, to greatly reduce the sensitivity of reactor stability performance to all other parameters. Therefore, replacement of the current power and flow limits of the ICAs by the proposed EIA solution is appropriate.

Elimination of (1) operator actions in current TS 3.4.1 to monitor neutron flux noise levels, (2) requirements to establish baseline neutron flux noise levels, and (3) requirements to monitor individual LPRM signals, also identified in the BWROG ICAs, is justified based on an operable PBDS channel. This system monitors individual LPRM signals for evidence of an approach to development of neutronic/thermal hydraulic instability during operation in a region of the power and flow operating domain that is potentially susceptible to oscillations.

The EIA solution is designed to limit possible neutronic/thermal hydraulic instabilities and to detect and suppress further neutronic/thermal hydraulic through a combination of features. Implementation of some of these features require changes to the TSs. The BWROG EIA Committee prepared NEDO-32339-A, Supplement 4, "Reactor Stability Long-Term Solution: Enhanced Option I-A: Generic Technical Specifications, (Reference 6) to describe the changes to the Improved Standard TSs (ITS) of NUREG-1433. Reference 6 justifies the generic changes in this license amendment request. The features of the EIA solution prevent neutronic/thermal hydraulic instability by limiting reactor operation, including conditions resulting from unexpected transients, to prescribed power and flow conditions. Each of these changes are discussed below under "Proposed Changes."

NRC SER Compliance

In response to Section 5.0 (Plant-Specific Actions) of the NRC SER for NEDC-32339P-A, Supplement 2 (which required that licensees referencing NEDC-32339P for implementation of the EIA long term solution provide certain information in their license amendment submittals), EOI provides the following:

1. The RBS EIA solution equipment design of the FCTR card and the PBDS does not deviate from the design specifications provided in Reference 4 and as a result is applicable to the RBS EIA solution design.

2. The description of the functions of the FCTR card and the PBDS, in Reference 2 and Reference 4, are applicable to RBS. Plant specific analysis performed for RBS has demonstrated stability performance indicating potential susceptibility to neutronic/thermal hydraulic instability in regions of the power and flow operating domain. Therefore, the EIA solution is applicable to RBS. Additional plant specific analysis has been performed to established appropriate setpoints for the FCTR card consistent with the methodology described in Reference 2. Parameter values for optional features of the PBDS have been established during initial installation and testing to optimize the PBDS performance as described in Reference 2.

3. The RBS environmental conditions (temperature, humidity, pressure, seismic, and electromagnetic compatibility) for the areas in which the PBDS and the EIA FCTR card will be installed have been confirmed to be enveloped by the environmental qualification values.

4. Administrative controls for manually bypassing APRM flow biased scram and control rod block functions are in place at RBS. Comparable administrative controls will be established for the PBDS channels prior to the full implementation of the EIA solution.

5. The only changes to the RBS plant operators' control panels associated with the EIA solution will be those associated with the addition of alarms and indications for the PBDS instrumentation. The EIA long term solution modifications associated with changes to the plant operator control panels have received human factors reviews.

Summary of Proposed Changes to Technical Specifications

The EIA solution option was identified as the solution proposed to be implemented at RBS in response to Generic Letter 94-02, "Long-Term Solution and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in BWRs." (Reference 13) Upon implementation of the EIA long term stability solution, the administrative controls established to comply with the guidance of the BWROG ICAs will no longer be required at RBS.

The proposed changes to the TS will enable the full implementation of the EIA long term solution to the neutronic/thermal hydraulic instability issue. Specifically, the proposed change

deletes the limits on power and flow conditions associated with the implementation of the guidance in Reference 1 (current TS 3.4.1, Figure 3.4.1-1 and plant procedures), adds new specifications, to establish limits for Fraction of Core Boiling Boundary (FCBB) and the Period Based Detection System (PBDS), modifies the RPS instrumentation specification and the description of the contents of the Core Operating Limits Report (COLR) in current TS 5.6.5. The two new specifications require maintaining stability control and the availability of a stability detection system during operation in defined regions of the power and flow operating domain. In a general sense, the actions required when the power and flow limits of current TS 3.4.1 are not met are replaced by the requirements to maintain stability control, associated required operator actions, and the required availability of the stability detection system over a specified region of the power and flow operating domain. The additions and modifications of the proposed change are consistent with the EIA solution as described in NEDO-32339, Revision 1, "Reactor Stability Long-Term Solution: Enhanced Option I-A" and Supplements 1 through 4.

Elimination of the limits on power and flow conditions of current TS 3.4.1 and the guidance of the BWROG ICAs is justified based on the following attributes of the EIA long term solution: Operation in the region of the power and flow operating domain most susceptible to neutronic/thermal hydraulic instability is automatically excluded from the licensed operating domain (Exclusion Region) and operation in the region of the power and flow operating domain potentially susceptible to neutronic/thermal hydraulic instability in the absence of stability controls (Restricted Region) requires implementation of stability control prior to entry and verification that at least one PBDS card is operable. These regions are established using the NRC accepted EIA methodology and reflect plant specific design of RBS.

In addition to the changes to the RBS Technical Specifications required by the generic implementation of the EIA solution the following changes to the RBS TS are proposed:

TS 3.3.1.1 SR 3.3.1.1.3; in lieu of deleting SR 3.3.1.1.3, renumbering the remaining SRs and placing the generic SR 3.3.1.1.18 as the last SR RBS proposes to replace the current SR 3.3.1.1.3 with the new generic SR 3.3.1.1.18. This change will reduce the number of required changes to over 100 procedures with more than 300 individual changes to less than 20 procedures for the items addressed by this specification.

TS 3.4.1, Recirculation Loop Operating; this specification included a number of actions corresponding to the previous ICAs as well as limits for single loop operation not included in the generic BWR/6 specification. EOI proposed those limits associated with single loop operation be maintained. The remaining items associated with the ICAs be eliminated and the EIA solution be implemented as approved for the standard BWR/6. The resulting changes are:

- LCO A item b can be eliminated; these limits are included in other TS and plant procedures. The THERMAL POWER limit is currently included in the definition of THERMAL POWER. The core flow limits are currently addressed in plant procedures also this limit is not contained in NUREG-1434 as a two loop

operating limit. As noted below the flow limits is included in the single loop LCO.

- LCO B items 1 and 2 are maintained as well as associated RBS actions A and B. RBS SLO analysis has specific limits on maximum thermal power and core flow which will be included in LCO

- LCO B items 2 and 3 are replaced by NUREG-1434 items a, b and c. This change in administrative only as there are no changes in the actual operating limits.

- RBS Actions C through G are replaced by NUREG-1434 Actions A and B. Current Actions C, D, E and F will be deleted, they support requirements in place prior to the development of the ICAs in references 12 and 13 and therefore, are no longer applicable. Action F will be replaced by new Action D.

- NUREG-1434 Actions A and B will be added as new Actions C & D. These address the time required to restore the LCO to within limits. RBS has additional limits on the loop flow and THERMAL POWER, addressed in Actions A and B, which are required to be restored to within limits before the 24 hour completion time in the NUREG-1434 standard. Also Actions F.2 and F.3 are equivalent to NUREG-1434 Action B and can be replaced by the proposed Action D. The current instrumentation Action, item G, and the associated note contained in the LCO can be deleted and the limits of the proposed Action D be used to limit the total time with the associated instrumentation limits not met. The proposed change is in accordance with NUREG-1434. In addition the limits for flow mismatch, THERMAL POWER, FCBB and PBDS are required to be in place within 12 hours per this TS and others thus maintaining reactor stability limits to be met. Also APLHGR and MCPR should be within at least 2-loop spec within 2 hours per 3.2 TS's thereby ensuring these limits are within requirements. Therefore the proposed delay in verifying setpoints for SLO from 12 to 24 hours, as in the NUREG-1434 Actions, are acceptable.

- SR 3.4.1.2 will be deleted, this surveillance is supporting requirements in place prior to the development of the ICAs in references 12 and 13 and therefore are no longer applicable.

- With the implementation of the EIA solution the previous ICAs, currently in place, will be eliminated.

TS 5.6.5, Administrative Controls, Core Operating Limits Report; a reference to NEDO-32339 including supplements 1 through 4 (as approved by the NRC) is added to identify those analytical methods used in developing the COLR.

In addition to the changes in the TS the corresponding changes in the RBS TRM will be implemented. These changes will include a reference to the COLR for the cycle specific control rod block limits contained in TRM Tables 3.3.1.1-1, Nominal Setpoints, and 3.3.1.2-1, Control Rod Block Instrumentation.

IMPLEMENTATION SCHEDULE

As identified in the cover letter, RBS proposes that an adequate time for procedure revisions and training based on the final BWROG approved version of the EIA licensing documents is necessary. RBS proposes an implementation no later than startup from refueling outage 8, currently scheduled to end during May 1999. This time is necessary for the approved BWROG documents to be included in the RBS training, installation of the solution hardware, and subsequent revisions to the COLR, and other plant-specific documents.

ENVIRONMENTAL IMPACT CONSIDERATION

EOI has reviewed this request against the criteria of 10 CFR 51.22 for environmental considerations. The request does not affect any system discharging radwaste to the environment or monitoring any such discharge. Also, the request does not adversely affect any system designed to monitor or isolate gaseous radioactive effluents to the environment. Therefore, the request does not involve a significant hazards consideration, does not significantly increase the types or quantity of effluent that may be released offsite, and does not significantly increase individual or cumulative occupational radiation exposures. Based on the foregoing, EOI concludes that the proposed change meets the criteria given in 10 CFR 51.22 (c)(9) for a categorical exclusion from the requirement for an Environmental Impact Statement.

References:

1. GE Service Information Letter # 380, Revision 1, "BWR Core Thermal Hydraulic Stability."

2. NEDO-32339, Revision 1 "Reactor Stability Long-Term Solution: Enhanced Option I-A," dated April, 1998.

3. NEDC-32339P-A, Supplement 1, "Reactor Stability Long-Term Solution: Enhanced Option I-A," dated December, 1996.

4. NEDC-32339P-A, Supplement 2 revision 1, "Reactor Stability Long-Term Solution: Enhanced Option I-A: Solution Design," dated April, 1998.

5. NEDO-32339-A, Supplement 3, Revision 1, "Reactor Long Term Stability Solution EIA: Flow Mapping Methodology," dated April, 1998.

6. NEDO-32339-A, Supplement 4 revision 1, "Reactor Stability Long Term Solution: Enhanced Option I-A Generic TSs," dated April 1998.

7. NEDO- 31960-A, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," dated November 1995.

8. NEDO-31960-A, Supplement 1, "BWR Owners' Group Long Term Stability Solutions Licensing Methodology," dated November 1995.

9. 10 CFR 50, Appendix A, General Design Criterion (GDC) 12, "Suppression of Reactor Power Oscillations."

10. IE Bulletin 88-07, "Power Oscillations in Boiling Water Reactors (BWRs)."

11. 10 CFR 50, Appendix A, GDC 10, "Reactor Design."

12. IE Bulletin 88-07, Supplement 1, "Power Oscillations in Boiling Water Reactors (BWRs)."

13. Generic Letter 94-02, "Long-Term Solution and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in BWRs."

14. 10 CFR 50.36(c)(2)(ii).

NO SIGNIFICANT HAZARDS CONSIDERATION

The Commission has provided standards in 10 CFR 50.92 for determining whether a significant hazards consideration exists. A proposed amendment to an operating license for a facility involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated, (2) create the possibility of a new or different kind of accident from any accident previously evaluated, or (3) involve a significant reduction in a margin of safety. EOI has reviewed these proposed license amendment requests and believes that their adoption would not involve a significant hazards consideration. The basis for this determination follows.

1. **The proposed amendments do not involve a significant increase in the probability or consequences of an accident previously evaluated.**

   The proposed amendments allow the implementation of the Enhanced Option I-A (EIA) long term solution to the neutronic/thermal hydraulic instability issue. Current TS restrictions on power and flow conditions, number of operating recirculation loops, and operator actions implemented to reduce the probability of neutronic/thermal hydraulic instability are eliminated and new stability requirements consistent with NEDO-32339-A, Supplement 4, Revision 1, are imposed.

   While the proposed amendments permit operation in regions of the power and flow operating domain postulated to be susceptible to neutronic/thermal hydraulic instability, the implementation of the EIA solution ensures there is not a significant increase in the probability or consequences of an accident previously evaluated. Operation in these regions does not increase the probability of occurrence of initiators and precursors of other previously analyzed accidents. The proposed amendments permit the implementation of the features of the EIA solution which prevent neutronic/thermal hydraulic instability. The features include pre-emptive reactor scram upon entry into the regions of the power and flow operating domain most susceptible to neutronic/thermal hydraulic instability - the Exclusion Region. The EIA solution prevents neutronic/thermal hydraulic instability during operation in regions of the power and flow operating domain previously excluded from operation and therefore does not significantly increase the probability of a previously analyzed accident.

   The EIA solution also requires implementation of stability control prior to entry into a region of the power and flow operating domain which is potentially susceptible, in the absence of stability control, to neutronic/thermal hydraulic instability. The modified rod block functions providing the restricted region entry alarm (RREA), boiling boundary limits, and PBDS functions are required on entry into the Restricted Region of the power to flow map. The boiling boundary limits, and Period Based Detection System (PBDS) functions are required on entry into the Monitored Region of the power to flow map. The EIA

solution prevents or allows for detection and suppression of neutronic/thermal hydraulic instability during operation in these regions of the power and flow operating domain.

The EIA solution includes restrictions on power and flow conditions and actions associated with the modified APRM flow biased scram and RREA functions. Required actions include adherence to the boiling boundary limit stability control prior to entry and during operation in the region of the power and flow operating domain which is potentially susceptible to neutronic/thermal hydraulic instability - in the absence of stability control. In addition, the proposed amendments require operator actions based upon control room indications generated by a new PBDS. The PBDS is designed to provide alarm indication that conditions consistent with a significant degradation in the stability performance of the reactor have occurred and the potential for imminent onset of neutronic/thermal hydraulic instability may exist. The PBDS also provides analog indication of the highest and second highest successive period confirmation count for all of the LPRMs monitored. This provides the plant operators with continuous indication of reactor stability operating conditions. The PBDS system provides indication only and does not affect plant structures, systems, or components in any way that could increase the probability or consequences of an accident. Rather, the improved control room indications provide the operator with more accurate and timely information.

The EIA solution allows for the "Setup" of APRM flow biased scram and control rod block function. The EIA solution requires adherence to certain boiling boundary limit stability controls prior to selection by the operator of APRM flow biased scram and control rod block function "Setup" setpoints. This "Setup" function allows operation in a region of the power and flow operating domain potentially susceptible to neutronic/thermal hydraulic instability provided the additional limits of the flow control boiling boundary (FCBB) and PBDS are met. After exiting the region requiring the stability control to be met, the setpoints can be manually reset to their normal values. Stability controls are required to be in place when setpoints are "Setup". As a backup EIA feature, the APRM flow biased setpoints automatically reset to their normal values above a pre-determined flow condition. This automatic reset to the more conservative setpoints ensures that the pre-emptive reactor scram will prevent operation as a result of an anticipated operational occurrence in the region most susceptible to neutronic/thermal hydraulic instability should the operator not select the more conservative setpoints appropriate for operation following exit from the region requiring stability control. The FCBB, PBDS, and automatic reset of the APRM flow biased scram and control rod block function "setup" setpoints allow for the use of the "setup" feature and help ensure that there is not an increase the probability or consequences of an accident.

Operation in the regions of the power and flow operating domain excluded by current TS 3.4.1 and Figure 3.4.1-1 can occur as a result of anticipated operational occurrences. In the absence of operator actions the severity of these anticipated operational occurrences may increase due to the potential occurrence of neutronic/thermal hydraulic instability as a result of operation in these regions. Upon entry, as a result of an anticipated operational occurrence, into the region most susceptible to neutronic/thermal hydraulic instability the

pre-emptive reactor scram prevents neutronic/thermal hydraulic instability. Therefore, the consequences of an accident do not significantly increase while operating with stability control in place.

The required EIA features is designed to limit possible neutronic/thermal hydraulic instabilities and to detect and suppress further neutronic/thermal hydraulic instabilities. These features include; a pre-emptive automatic scram, the control rod block and alarms associated with entry into the region susceptible to neutronic/thermal hydraulic instabilities, automatic reset of APRM flow biased setpoints, PBDS, FCBB, and the required operator actions, including manual reactor scram. Therefore, the proposed amendments prevent the occurrence of neutronic/thermal hydraulic instability during operation or as a consequence of an anticipated operational occurrence and do not significantly increase the consequences of any previously analyzed accident.

2. **The proposed amendments do not create the possibility of a new or different kind of accident from any accident previously evaluated.**

The proposed amendments eliminate existing restrictions on power and flow conditions and impose alternative restrictions which permit the implementation of the EIA long term stability solution. The current restrictions on the power and flow conditions do not prevent entry into regions of the power and flow operating domain most susceptible to neutronic/thermal hydraulic instability and therefore the possibility of neutronic/thermal hydraulic instability exists in the absence of operator action. The required features of the EIA solution implement a pre-emptive scram upon entry into the region most susceptible to neutronic/thermal hydraulic instability, without operator action. The accessible operating domain allowed by the proposed amendments is essentially a subset of the power and flow operating domain currently allowed. Initial conditions are bounded by the current initiators and precursors of accidents and anticipated operational occurrences. Accordingly, no new accident of initiator is present. Therefore, the proposed amendments do not create the possibility of a new or different kind of accident from that previously evaluated.

Concurrent with the implementation of the proposed amendments, a modified Flow Control Trip Reference (FCTR) card, EIA FCTR card, and a new Period Based Detection System (PBDS) will be installed as required by the EIA solution. The function of the EIA FCTR card is to aid the operator in the identification of entry into regions of the power and flow operating domain potentially susceptible to neutronic/thermal hydraulic instability in the absence of stability controls and to initiate a pre-emptive scram upon entry into the regions most susceptible to neutronic/thermal hydraulic instability. This is accomplished by altering the existing values of setpoints of the APRM flow biased scram and the control rod block functions generated by the EIA FCTR card.

The design of the EIA digital FCTR card is a functional equivalent of the original analog FCTR card. The Failure Modes and Effects Analysis (FMEA) for the card detailed in NEDC-32339P-A Supplement 2 found no single failure that would increase the

consequences of an accident. The EIA FCTR card maintains the original basis for the NMS interface functions of the analog FCTR card it replaces. The plant specific environmental conditions (temperature, humidity, pressure, seismic, and electromagnetic compatibility) have been confirmed to be enveloped by the environmental qualification values for the EIA FCTR cards. Therefore, the potential for spurious scrams or common mode failures induced by environmental effects (e.g., electromagnetic interference) is considered negligible. The installation of the EIA FCTR card will therefore not create the possibility of a new or different kind of accident from any accident previously evaluated.

The function of the PBDS is to provide the operator with an indication that conditions consistent with a significant degradation in the stability performance of the reactor has occurred and the potential for imminent onset of neutronic/thermal hydraulic instability may exist. This is accomplished by the installation of a new PBDS card in the Neutron Monitoring System in accordance with NRC approved BWROG and GE design. The PBDS card takes inputs from individual local power range monitors and provides analog indication of the highest and second highest successive period confirmation count, provides a Hi DR and Hi-Hi DR alarm, and INOP status indication to the operator in the control room. These displays can not create the possibility of a new or different kind of accident from any accident previously evaluated. The plant specific environmental conditions (temperature, humidity, pressure, seismic, and electromagnetic compatibility) have been confirmed to be enveloped by the PBDS environmental qualification values. Therefore, the installation of the PBDS card will not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. The proposed amendments do not involve a significant reduction in a margin of safety.

The proposed amendments permit the implementation of the EIA long term solution to the stability issue. Under certain conditions, existing BWR designs are susceptible to neutronic/thermal hydraulic instability. GDC 10 of 10 CFR 50, Appendix A, requires that specified acceptable fuel design limits not be exceeded during anticipated operational occurrences. General Design Criterion (GDC) 12 of 10 CFR 50, Appendix A, requires thermal hydraulic instability to be prevented by design or be readily and reliably detected and suppressed. When the design of the reactor system does not prevent the occurrence of neutronic/thermal hydraulic instability, instability is considered an anticipated operational occurrence. The proposed amendments and the associated design modifications provide automatic features and operational information to the Control Room that replace the existing BWROG Interim Corrective Actions (ICAs). Thus the EIA solution assures compliance with GDC- 10 and GDC 12 by providing for reliable detection and suppression and by the prevention of neutronic/thermal hydraulic instability. This therefore precludes neutronic/thermal hydraulic instability from becoming a credible consequence of an anticipated operational occurrence. As a result the margins of safety are maintained.

Analyses performed by the BWROG indicate that neutronic/thermal hydraulic instability induced power oscillations could result in conditions exceeding the MCPR SL prior to

detection and suppression by the current design of the Neutron Monitoring System and Reactor Protection System. To ensure compliance with GDC 12 the BWROG developed Interim Corrective Actions (ICAs) to enhance the capability of the operator to readily and reliably detect and suppress neutronic/thermal hydraulic instability. The BWROG ICAs also provided additional guidance for monitoring local power range monitors beyond the requirements of current TS 3.4.1 to ensure adequate margin to the onset of neutronic/thermal hydraulic instability. Reliance on operator actions to comply with GDC 12 was accepted on an interim basis by the NRC pending final implementation of a long term solution to the stability issue. The modified design of the Reactor Protection System (APRM flow biased scram) and stability control prior to entry into a region of the power and flow operating domain which is potentially susceptible, in the absence of stability control, to neutronic/thermal hydraulic instability implemented with the EIA solution prevents neutronic/thermal hydraulic instability. In addition, significant backup protection features, including the PBDS and specified operator actions, are required to be implemented. As a result, the margin to the onset of neutronic/thermal hydraulic instability provided by the existing TS requirements and BWROG ICAs recommendations is not reduced by the implementation of the EIA solution. The EIA solution assures compliance with GDC 12 by the prevention of neutronic/thermal hydraulic instability and therefore precludes neutronic/thermal hydraulic instability from becoming a credible consequence of an anticipated operational occurrence. The consequences of anticipated operational occurrences will not increase and the margin to the MCPR SL will not decrease upon implementation of the EIA solution. Therefore, the proposed amendments do not involve a reduction in a margin of safety.