



September 9, 1994
JPN-94-046

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Stop P1-137
Washington, DC 20555

SUBJECT: James A. FitzPatrick Nuclear Power Plant
Docket No. 50-333
**Response to Generic Letter 94-02 Regarding
Thermal-Hydraulic Instabilities in Boiling Water Reactors**

Reference: NRC Generic Letter 94-02, R. P. Zimmerman to all holders of BWR operating licenses, "Long-term Solutions and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in Boiling Water Reactors," dated July 11, 1994.

Dear Sir:

This letter responds to the requested actions of NRC Generic Letter 94-02 regarding the issue of Boiling Water Reactor stability. The Generic Letter requests licensees to implement improvements intended to avoid power oscillations, or to detect and suppress oscillations should they occur. The improvements requested entail (1) near-term solutions involving the strengthening of plant procedures and training, and (2) long-term solutions that may include hardware modifications, or additions to facilitate manual or automatic protective actions.

The actions requested by the Generic Letter will be implemented for the FitzPatrick plant as described in the attachments. Attachments 1 and 2 describe the actions and schedule for implementing the near-term solutions and long-term solutions, respectively. Attachment 3 summarizes the Authority's commitments associated with this response.

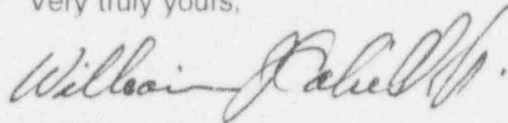
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If you have any questions, please contact Mr. J. A. Gray, Jr.

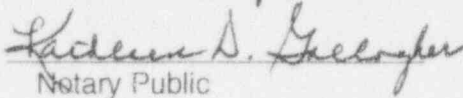
Very truly yours,



William J. Cahill, Jr.
Executive Vice President and
Chief Nuclear Officer

**STATE OF NEW YORK
COUNTY OF WESTCHESTER**

Subscribed and sworn to before me
this 9th day of September 1994.


Notary Public

KATHLEEN D. GALLAGHER
Notary Public, ~~State~~ of New York
No. 5004481
Qualified in ~~Westchester~~ County
Commission Expires Nov. 16, 1994

Attachments: as stated

cc: U. S. Nuclear Regulatory Commission
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Attachment 1 to JPN-94-046

Reactor Stability Near-Term Solution

NRC Requested Actions

1. Review current procedures and training programs and modify them as appropriate to strengthen the administrative provisions intended to avoid power oscillations or to detect and suppress them if they occur prior to implementation of the long-term solutions. The experience gained at WNP-2 should be a primary guide in this review. In doing this, each licensee should:
 - 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); and
 - b. Ensure that factors important to core stability characteristics (e.g., radial and axial peaking, feedwater temperature, and thermal hydraulic compatibility 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 IIIa of Reference 1. Licensees should propose for plant-specific review the administrative controls to be retained in conjunction with other long-term solutions.)

Response to Requested Action 1.a and 1.b

The FitzPatrick plant has implemented the Interim Corrective Actions (ICAs) specified in NRC Bulletin 88-07, Supplement 1, and has supported the BWR Owners Group (BWROG) effort to develop improved guidelines for the ICAs to better address startup and low power maneuvering conditions. A copy of the improved "BWROG Guidelines for Stability Interim Corrective Action" was provided to the NRC in Reference 2. It is the Authority's understanding that, based on a review of an advance copy of these guidelines (Reference 3), the NRC will accept a commitment to implement the improved BWROG guidelines as an adequate response to requested actions 1.a and 1.b of Generic Letter 94-02. These guidelines incorporate the relevant recommendations provided by the BWROG since the NRC

issued Bulletin 88-07, Supplement 1; and accordingly, will be considered by the Authority as superseding all previous BWROG transmittals related to stability interim corrective actions.

The improved BWROG guidelines are consistent with, but more restrictive than, the ICAs which were previously implemented as a result of the NRC Bulletin 88-07, Supplement 1, requirements. The original regions defined in the 1988 BWROG ICAs 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 improved BWROG guidelines incorporate an expanded stability region and power distribution control definition to reduce the potential for oscillations. This, in conjunction with the detection and suppression provisions of the guidelines, provides a higher degree of protection against unacceptable power oscillations.

The FitzPatrick procedures currently implement many of the operating restrictions recommended by the improved BWROG guidelines. These include: (1) the operating restrictions for regions I and II as applied to plants not licensed for operation at the maximum extended load line, (2) power oscillation detection and response, and (3) a manual scram when both recirculation pumps are not operating with the reactor in the RUN mode. In response to Generic Letter 94-02, the Authority will revise, where necessary, its plant procedures and training such that they are consistent with the improved BWROG guidelines.

The improved BWROG guidelines add a Controlled Entry Region that covers the operating region below 40% rated core flow, and between the 70% and 80% rod lines. Entry into this region requires compliance with one of the stability controls outlined in the guidelines. The guidelines also permit the option of treating this region as an Exit Region, i.e., precluding deliberate entry into this region. For FitzPatrick, it is anticipated that the Controlled Entry Region will be treated as an Exit Region subject to the guideline restrictions for exit regions. FitzPatrick is not licensed for operation at the maximum extended load line, and, consequently, will not include the Exit Region between the 45% and 50% rated core flow, and above the 108% rod line, in the Exit Region.

The improved BWROG guidelines and resulting plant procedure and training revisions are intended for use only until the stability long-term solution is implemented, and consequently may be revised or eliminated, as appropriate, in conjunction with the long-term solution. Considering the interim nature of the guidelines, the Authority does not consider changes to the plant Technical Specifications necessary at this time. Revisions to the plant procedures, operator and reactor engineer training, that meet the improved BWROG guidelines (Reference 2) will be completed prior to the start of Cycle 12 following the refueling outage scheduled to start November 30, 1994. The Authority will inform the NRC within thirty days of the completion of these near-term activities.

References

1. NEDO-31960, Supplement 1, "BWR Owners Group Long-Term Stability Solutions Licensing Methodology," March 1992.
2. BWROG letter, L. A. England to M. J. Virgilio, NRC, "BWR Owners Group Guidelines for Stability Interim Corrective Action," June 6, 1994.
3. BWROG letter, L. A. England to M. J. Virgilio, NRC, "BWR Owners Group Improved Guidelines for Stability Interim Corrective Actions," April 4, 1994.

Attachment 2 to JPN-94-046

Reactor Stability Long-Term Solution

NRC Requested Actions

2. 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 proposed by the BWROG and approved by the NRC in Reference 1 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. 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.

Response to Requested Action 2

The Authority plans to implement the following long-term stability corrective actions:

- (1) Demonstrate the application of the "Regional Exclusion with Flow-Biased APRM Neutron Flux Scram" stability solution (Option I-D) presented in Reference 2 to the James A. FitzPatrick Nuclear Power Plant.
- (2) Install an on-line stability monitor with the capability of computing reactor stability characteristics and the exclusion region.

Option I-D provides for a plant-specific exclusion region in the power/flow operating map utilizing the methodology presented in Reference 2. This is a region where conservative decay ratio calculations indicate that power oscillations are possible. Administrative controls will preclude deliberate entry into this region, and require immediate exit from the region if the plant should enter the region due to an operational transient. However, should oscillations occur, they will be automatically detected and suppressed by the Flow-Biased APRM Neutron Flux scram. This scram function will be modified to remove the simulated thermal power monitoring feature from the flow-biased APRM neutron flux signals. Consequently, the Flow-Biased APRM Neutron Flux trip units will respond directly to instantaneous neutron flux.

A preliminary analysis demonstrates the good stability characteristics of the FitzPatrick reactor. The analysis shows that core-wide mode oscillation is the most likely mode for FitzPatrick due primarily to the small size of the fuel inlet orifice. The analysis also concluded the following: The Final MCPR (FMCP) calculations show that there is a large margin to the Safety Limit MCPR (SLMCPR) due primarily to the relatively low Flow-Biased APRM Neutron Flux Scram Line (54% power at natural circulation). For core-wide oscillations there is a large margin to the SLMCPR at the rated flow-control line (FCL) with high statistical confidence.

For regional mode oscillations, there is a large margin to the SLMCPR at the rated FCL with nominal statistical confidence, even though this mode of oscillation is predicted to not occur for FitzPatrick. The final analysis supporting these conclusions is being prepared by General Electric Co. as a plant-specific Licensing Topical Report (LTR), and will be submitted by the Authority to the NRC after the NRC has issued the SER for the lead Option I-D plant, Vermont Yankee.

The Option I-D solution will be augmented with the installation of an on-line stability monitor. The monitor will compute the real time exclusion region, and core and channel decay ratios. The stability monitor will be used during controlled startups, shutdowns, and lower power/flow operations within the buffer zone of the exclusion region. A description of the monitor and its application will be provided in the previously referenced Licensing Topical Report (LTR). The same monitoring software will also be utilized off-line (predictor mode) for reload core review.

Near-term Technical Specification changes are not necessary considering the interim corrective actions discussed in Attachment 1. The schedule for long-term Technical Specification changes will be addressed in the submittal transmitting the LTR.

Implementation Schedule

Submit the plant-specific Licensing Topical Report for FitzPatrick: 3 months after NRC issues SER for Vermont Yankee LTR.

Complete procedures/training for Option I-D: Prior to start of Cycle 13 (estimated to be early 1997).

Modification to the Simulated Thermal Power Monitor (STPM) trip system: Prior to start of Cycle 13 (estimated to be early 1997)

Operability of Stability Monitor in Control Room: Prior to start of Cycle 13 (estimated to be early 1997).

The NRC will be informed within thirty days after all long-term activities have been completed.

References:

1. NRC letter, A. Thadani to L. A. England, 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.
2. "BWR Owners Group Long-Term Stability Solutions Licensing Methodology." NEDO-31960, June 1991, and NEDO-31960, Supplement 1, March 1992.

Attachment 3 to JPN-94-046

Summary of Commitments

Commitment Number	Commitment	Due Date
JPN-94-046-01	Revise plant procedures/conduct operator training to conform to "BWROG Guidelines for Stability Interim Corrective Actions," dated June 6, 1994.	Prior to start of Cycle 12 (early 1995)
JPN-94-046-02	Conduct reactor engineers training to conform to "BWROG Guidelines for Stability Interim Corrective Actions," dated June 6, 1994.	Prior to start of Cycle 12 (early 1995)
JPN-94-046-03	Notify NRC under oath or affirmation within 30 days of completing commitment JPN-94-046-01 & 02.	As stated
JPN-94-046-04	Submit Licensing Topical Report for long-term solution on reactor stability.	3 months after NRC SER on Vt. Yankee LTR
JPN-94-046-05	Complete procedures/training for Option I-D (Reactor Stability).	Prior to start of Cycle 13 (early 1997)
JPN-94-046-06	Modification to the Simulated Thermal Power Monitor trip system.	Prior to start of Cycle 13 (early 1997)
JPN-94-046-07	Place stability monitor in-service in control room.	Prior to start of Cycle 13 (early 1997)
JPN-94-046-08	Notify NRC under oath or affirmation within 30 days of completion of all long-term commitments: JPN-94-046-04, 05, 06, & 07.	As stated