ENCLOSURE

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

January 13, 1993

C. L. Tully, Chairperson
BWR Owners' Group
Southern Nuclear Operating Company
P.O. Box 1295, Bin B052
Birmingham, Alabama 35201

Dear Ms. Tully:

SUBJECT: NRC EVALUATION OF BWR OWNERS' GROUP TOPICAL REPORT NEDO-31558, "POSITION ON NRC REGULATORY GUIDE 1.97, REVISION 3, REQUIREMENTS FOR POST-ACCIDENT NEUTRON FLUX MONITORING SYSTEM" (TAC M77660)

Enclosed find our reevaluation of the subject topical report, NEDO-31558, which was submitted to the staff by letter dated April 1, 1988. Our earlier evaluation of NEDO-31558 was appealed to the Director of the Office of Nuclear Reactor Regulation (NRR), by the BWR Owners' Group. NEDO-31558 proposes alternate criteria for neutron flux monitoring instrumentation, in lieu of the Regulatory Guide 1.97 (R.G.) Category 1 criteria.

By letter dated October 14, 1992, the Director of NRR, Dr. Murley, informed the BWR Owners' Group that Category 1 neutron flux monitoring instrumentation is not needed for currently designed BWRs to cope with loss-of-coolant accidents (LOCA), anticipated transients without scram (ATWS), or other accidents that do not result in severe core damage conditions. However, new applications for conventional and advanced BWR designs must meet the R.G. 1.97 criteria. He further concluded that instruments to monitor the progression of core melt accidents are best addressed by the current severe accident management program. Therefore, based on Dr. Murley's decision, the staff finds NEDO-31558 acceptable.

In accordance with procedures established in NUREG-0390, "Topical Reports Review Status," we request that the BWR Owners' Group publish accepted versions of NEDO-31558, within 3 months of receipt of this letter. The accepted versions should (1) incorporate this letter and the enclosed Safety Evaluation Report between the title page and the abstract and (2) include an -A (designating accepted) following the report identification symbol.

Contact: B. Marcus, HICB/DRCH
504-2823

If our acceptance criteria or regulations change so that our conclusions as to the acceptability of the report are no longer valid, the BWR Owners' Group and/or the licensees referencing this topical report will be expected to revise continued applicability of the topical report without revision of its documentation.

Should you have any questions regarding the matters discussed above or the content of the enclosed SER, please contact Barry Marcus, of my staff, on 504-2823.

Sincerely,

Bruce A. Boger, Director
Division of Reactor Controls
and Human Factors
Office of Nuclear Reactor Regulation

Enclosure:
Safety Evaluation Report

cc w/enclosure:
A. Udy (EG&G Idaho)
J. Post (GE)

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ENCLOSURE 1

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

BOILING WATER REACTORS

REGULATORY GUIDE 1.97

POST-ACCIDENT NEUTRON FLUX MONITORING INSTRUMENTATION

1.0 INTRODUCTION

Section 6.2 of Generic Letter 82-33 (Reference 1) requests applicants and licensees to provide a report on their implementation of Regulatory Guide (R.G.) 1.97, Revision 2 (Reference 2), and methods for complying with the Commission's regulations including supporting technical justification of any proposed deviations or alternatives. A review of the applicants' and licensees' submittals was performed and a safety evaluation report (SER) was issued for each plant. These SERs conclude that the applicants and licensees either conformed to, or adequately justified deviations from the guidance of R.G. 1.97 for each post-accident monitoring variable except for the variables identified in the SERs.

A large number of Boiling Water Reactor (BWR) applicants and licensees requested deviations from the regulatory guide position for Category 1 neutron flux monitoring instrumentation. The R.G. 1.97 Category 1 criteria includes environmental qualification, seismic qualification, Class 1E power sources, and redundant channels. Current operating BWRs, with the exception of Susquehanna Steam Electric Station Units 1 and 2 and Washington Public Power Supply Nuclear Project (WNP-2) do not have environmentally qualified neutron

flux monitoring instrumentation. However, none of the submittals requesting neutron flux monitoring instrumentation deviations provide sufficient justification for granting the deviations. These requests were denied to the applicants and licensees, except for Limerick Generating Station Units 1 and 2. Additionally, Big Rock Point was granted an exemption from the provisions of R.G. 1.97.

In support of these requests the BWR Owners' Group submitted NEDO-31558 "Position on NRC Regulatory Guide 1.97, Revision 3, Requirements for Post-Accident Neutron Monitoring System" (Reference 3). The NEDO report proposes criteria for neutron flux monitoring instrumentation, in lieu of the Category 1 criteria included in R.G. 1.97, Revision 3 (Reference 4).

The staff rejected the BWR Owners' Group proposal (Reference 5) because of the judgement that neutron flux is fundamentally a key safety parameter and existing neutron flux monitoring instrumentation is not likely to survive a post-accident harsh environment. The BWR Owners' Group appealed the staff's position to the Director of the Office of Nuclear Reactor Regulation (NRR) (Reference 6).

The Director of NRR upheld the appeal (Reference 7) and concluded that Category 1 neutron flux monitoring instrumentation is not needed for existing BWRs to cope with Loss-of-Coolant Accident (LOCA), Anticipated Transient Without Scram (ATWS), or other accidents that do not result in severe core damage conditions. Instrumentation to monitor the progression of core melt

accidents would be best addressed by the current severe accident management program.

Therefore, for existing BWRs, the staff will accept the criteria of NEDO-31558. However, for new license applications for both conventional and advanced BWR designs there will be no change in the R.G. 1.97 criteria.

2.0 EVALUATION

The Code of Federal Regulations 10 CFR 50.49 requires licensees to establish a program for qualifying certain post-accident monitoring equipment for which specific guidance concerning the types of variables monitored is provided in R.G. 1.97, Revision 2. This regulatory guide identifies neutron flux as a Type B variable that provides information to indicate whether plant safety functions are being accomplished. The guide identifies Category 1 criteria for this instrumentation. The Category 1 criteria includes environmental qualification, seismic qualification, Class 1E power sources, and redundant channels.

Qualification criteria for instrumentation is established based on the safety function of the system whose variables are being monitored. The selection criteria for R.G. 1.97 variable qualification category is based upon whether monitoring of system parameters is needed during and following an accident and whether subsequent operator actions are dependent on the information provided by this instrumentation.

The NEDO-31558 report analyzes event scenarios to determine the consequences of neutron flux monitoring unavailability and concludes that the failure of this instrumentation will not prevent the operator from determining reactor power levels. Alternate parameter status will be available from which reactor power may be inferred. Some alternate indications may require more than one input to determine reactor power. However, based on the multiple inputs available to the operator, sufficient information will be available upon which to base operational decisions and to conclude that reactivity control has been accomplished. Further, NEDO-31558 contains criteria regarding the range, power supplies, and qualifications for neutron flux monitoring instrumentation that provide sufficient confidence that the neutron flux monitoring instrumentation will be available to confirm reactor shutdown for a wide range of events including ATWS. The BWR Owners' Group also stated that for BWR design basis events, recriticality is not a significant contributor to core melt risk for BWR accident scenarios that go beyond the design basis.

Based on the BWR Owners' Group submittals, the Director of NRR has determined that Category 1 neutron flux monitoring instrumentation is not needed for existing BWRs to cope with LOCA, ATWS, or other accidents that do not result in severe core damage conditions. Instrumentation to monitor the progression of core melt accidents are best addressed by the current severe accident management program. Therefore, for existing BWRs, neutron flux monitoring instrumentation does not need to meet the Category 1 criteria of R.G. 1.97. Neutron flux monitoring instrumentation, at existing BWRs, need to meet the new criteria proposed by the BWR Owners' Group in NEDO-31558. However, new

applications for conventional and advanced BWR designs, will be required to meet the R.G. 1.97 criteria.

Licensees should review their neutron flux monitoring instrumentation against the criteria of NEDO-31558 and confirm that they meet this criteria. If the instrumentation does not meet the criteria, licensees should make a commitment to meet the criteria and state when this commitment will be fulfilled. If a commitment to the criteria cannot be made, licensees should explicitly state any deviations from the criteria and provide supporting justification or alternatives.

The criteria in NEDO-31558 includes the use of uniterruptable and reliable power sources. The BWR Owners' Group and the staff agree that each redundant neutron flux monitoring channel should be powered from a different uninterruptable power supply (UPS). Therefore, a loss of a single UPS would not cause the loss of both channels of neutron flux monitoring instrumentation.

As stated in Section 5.2.8 of NEDO-31558, each licensee should perform a plant specific evaluation to review power distribution to the neutron flux monitoring instrumentation, including recorders. The intent of this review is to verify that neutron flux monitoring instrumentation power would not be lost during events by load shedding logics or similar schemes or that a single power supply failure would not cause the loss of redundant channels of neutron flux monitoring instrumentation.

The licenses for Grand Gulf Nuclear Station Unit 1 and River Bend Station contain license conditions that require the installation of Category 1 neutron flux monitoring instrumentation. Since neutron flux is no longer considered to be a Category 1 variable, the staff will entertain licensee requests for removal of these license conditions.

The licensees for Nine Mile Point Unit 2, Perry Nuclear Power Plant Unit 1, and WNP-2 have designated neutron flux as a Type A variable because this information is required to permit the operator to take specific manually controlled actions. These licensees will not be required to upgrade the qualification of the neutron flux monitoring instrumentation to meet the Category 1 criteria. These licensees should review their Emergency Operating Procedures (EOPs) to assure that there is no plant specific role for neutron flux monitoring that differs from the evaluation in NEDO-31558. If the role of neutron flux monitoring does not differ from the evaluation in the NEDO report, the staff will entertain licensee requests for removal of neutron flux from their Type A instrument lists.

Neutron flux monitoring will no longer appear in the post-accident monitoring section of the new BWR Standard Technical Specifications, since it is no longer Category 1 instrumentation. Licensees wishing to maintain a post-accident monitoring technical specification on neutron flux monitoring instrumentation will be allowed to do so. Licensees may request the removal of neutron flux monitoring instrumentation from their post-accident monitoring technical specifications if they so desire.

Big Rock Point was granted an exemption from the provisions of R.G. 1.97 and Limerick Generating Station Units 1 and 2 were granted deviations from the Category 1 criteria for neutron flux monitoring instrumentation. Therefore, these plants do not need to meet the criteria of NEDO-31558. The neutron flux monitoring instrumentation installed at Susquehanna Steam Electric Station Units 1 and 2 and WNP-2 exceed the criteria of NEDO-31558, and therefore, these plants may take advantage of any relaxation that the new criteria might provide.

3.0 CONCLUSION

Based on our review, we conclude that the post-accident neutron flux monitoring instrumentation at existing BWRs should meet the criteria in NEDO-31558. Licensees should provide a commitment to these criteria and perform a plant specific power distribution review for neutron flux monitoring instrumentation. However, new applications for conventional and advanced BWR designs, will be required to meet the R.G. 1.97 criteria.

Principal Contributor:

B. Marcus

References:

1. Letter from D. G. Eisenhut (NRC) to All Licensees of Operating Reactors, Applicants for Operating Licenses, and Holders of Construction Permits, "Supplement No. 1 to NUREG-0737--Requirements for Emergency Response Capability, (Generic Letter No. 82-33)", dated December 17, 1982.

2. Regulatory Guide 1.97, Revision 2, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident", NRC Office of Standards Development, dated December 1980.

3. Letter from R. F. Janecek (BWROG) to T. E. Murley (NRC) "BWR Owners' Group Licensing Topical Report Position on NRC Regulatory Guide 1.97, Revision 3 Requirements for Post-Accident Neutron Monitoring System" (General Electric Report NEDO-31558), dated April 1, 1988.

4. Regulatory Guide 1.97, Revision 3, "Instrumentation for Light-Water-Cooled nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident", NRC Office of Nuclear Regulatory Research, dated May 1983.

5. Letter from F. J. Miraglia (NRC) to S. D. Floyd (BWROG), "BWR Owners' Group Licensing Topical Report Position on NRC Regulatory Guide 1.97, Revision 3 Requirements for Post-Accident Neutron Monitoring System" (General Electric Report NEDO-31558), dated January 29, 1990.

6. Letter from G. J. Beck (BWROG) to T. E. Murley (NRC), "Appeal of NRC Staff Decision Regarding Upgraded Neutron Flux Monitoring Systems for BWRs", dated August 16, 1990.

7. Letter from T. E. Murley (NRC) to C. L. Tully (BWROG), "Appeal of NRC Staff Decision Regarding Upgraded Neutron Flux Monitoring Systems for BWRs", dated October 14, 1992.