BWR OWNERS' GROUP

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August 16, 1990

Dr. Thomas E. Murley
Director, Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Appeal of NRC Staff Decision Regarding Upgraded Neutron Flux Monitoring Systems For BWRs

Dear Dr. Murley:

The BWR Owners' Group hereby appeals the NRC Staff's position directing installation of upgraded neutron flux monitoring systems ("NFMS") for BWRs. Neutron flux is one of a number of variables for which Regulatory Guide 1.97, Rev. 2 recommends post-accident monitoring. NUREG-0737, Supplement 1 requested (but did not require) licensees to provide post-accident monitoring instrumentation consistent with the guidance of Regulatory Guide 1.97, Rev. 2. The currently installed NFMS for BWRs meets certain design and qualification criteria but not all of the qualification criteria recommended by Regulatory Guide 1.97. Following extensive review, the BWR Owners' Group ("BWROG" or "Owners' Group") demonstrated in a 1988 Licensing Topical Report (NEDO-31558) ("LTR") that an upgraded neutron flux monitoring system meeting all design and qualification criteria of Regulatory Guide 1.97 is unnecessary for BWRs.

Without disputing the technical analysis or results reflected in the BWROG LTR, the Staff concluded in a brief Safety Evaluation Report issued January 29, 1990 that an upgraded NFMS is required.[1] The basis for the Staff's position seems to be that an upgraded NFMS (with a range extending down to 10E-6 % power) is necessary to provide operators indication of possible recriticality. The Staff appears to recognize that, for design basis events, recriticality is not a plausible scenario for BWRs once control rods are inserted. However, the Staff indicated that an upgraded neutron flux monitoring capability should be

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1/ Letter from Frank J. Miraglia, Office of NRR, to Stephen D. Floyd, BWROG, dated January 29, 1990 which transmitted the Staff's "Safety Evaluation Report, BWROG Licensing Topical Report, NEDO-31558," at pages 3 and 5.

provided for certain undefined beyond-design-basis events and that the worst-case environmental conditions resulting from design basis events should be the appropriate qualification criteria.

It remains the BWR Owners' Group position that an upgraded NFMS is unnecessary for BWRs. Unlike the situation with PWRs where recriticality following control rod insertion is a credible accident sequence, there is no design basis event for BWRs where recriticality would be a concern once control rods are inserted. With respect to accidents which go beyond the design basis, the BWROG is not aware of any probabilistic analyses showing that reactor recriticality after control rods are inserted is a significant contributor to core melt risk for BWRs. As explained in the BWROG LTR, the event where a NFMS could provide the most useful information is an Anticipated Transient Without Scram ("ATWS") event. An ATWS event, however, does not create a harsh environment for the NFMS,[2] and thus the currently installed wide-range neutron flux monitoring capability consisting of Source Range Monitors, Intermediate Range Monitors and Local Power Range Monitors is adequately qualified for such scenarios.

Given the absence of any demonstrated safety benefit and the substantial cost of installing an upgraded NFMS (which could range between $1 million and $7 million per unit depending on the system chosen and individual plant characteristics), the Owners' Group does not believe an expenditure of resources for this action is justified. Moreover, significant expenditures for this action may have the effect of diverting the affected licensees' available resources from areas which are more important from a public safety and plant reliability standpoint.

The Owners' Group therefore requests that the decision reflected in the Staff's January 29, 1990 SER be reversed and the existing neutron flux monitoring systems for BWRs be found acceptable for purposes of satisfying the recommendations of NUREG-0737, Supp. 1. The Owners' Group also requests that this appeal be acted upon expeditiously by the Staff. Pending final resolution of this appeal, plant-specific actions by individual licensees in response to the January 29, 1990 SER should be deferred.

2/ However, some BWRs are designed with unpiped safety valves which discharge directly to the drywell. For these plants, an ATWS event may create a degraded drywell environment for NFMS equipment. The BWROG LTR fully addresses this issue in sections 4.3.3 and 4.4 (pp. 28-38). The LTR concludes that the operator has alternative means to ensure that appropriate ATWS mitigation actions are taken (p. 38).

I. BACKGROUND

The following provides the general historical background of the neutron flux monitoring system issue.[3] In December 1982 the Staff issued Generic Letter 82-33, "Supplement 1 to NUREG-0737 - Requirements For Emergency Response Capability." The Generic Letter provided, among other things, additional clarification regarding implementation of Regulatory Guide 1.97, Rev. 2. The Generic Letter requested licensees and applicants to provide measurement and indication of Type A, B, C, D and E variables listed in Regulatory Guide 1.97, Rev. 2, in the control room. Licensees developed and submitted to the Staff individual positions and implementation plans for specific instrumentation consistent with their interpretation of the Regulatory Guide. These submittals included any exceptions based on plant-specific design features.

In March 1983 the Staff concluded, based on a number of surveys within the nuclear power industry, that neutron flux monitoring instrumentation conforming to the criteria of Regulatory Guide 1.97, Rev. 2 was not commercially available for BWRs. However, the Staff was informed that instrumentation was under development. Beginning in February 1985, with the issuance of the first Regulatory Guide 1.97 Safety Evaluation Reports (SERs), the Staff again acknowledged that neutron flux monitoring systems meeting Regulatory Guide 1.97 recommendations were not available and generally requested applicants and licensees to follow industry development and consider installation of upgraded neutron flux monitoring systems when they became available. The plant-specific SERs also included acceptance of existing neutron flux monitoring systems for interim use until "fully qualified" systems became available.

In 1986 the BWROG formed a Regulatory Guide 1.97/Neutron Monitoring System Committee to study BWR events, determine the post-accident monitoring function of the neutron flux monitoring system and develop appropriate design and qualification criteria. In response to Staff requests, on January 27, 1988 the BWROG committee met with the Staff and suggested the possibility of

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3/ In December 1980, the Staff issued Regulatory Guide 1.97, Revision 2, "Instrumentation For Light-Water-Cooled Nuclear Power Plants To Assess Plant And Environs During And Following An Accident." Among other things, the Regulatory Guide indicated that neutron flux monitoring should be provided as a Type B, Category 1 variable. Type B, Category 1 variables provide information indicating whether plant safety functions (in this instance reactivity control) are being accomplished. The Regulatory Guide recommends that the instrumentation be qualified in accordance with Regulatory Guide 1.89, NUREG-0588 and Regulatory Guide 1.100.

alternative approaches to the neutron flux monitoring capability described in Regulatory Guide 1.97. At that meeting, the BWROG agreed to address certain beyond-design-basis events in the development of their alternative approaches. On April 1, 1988 the BWROG submitted a Licensing Topical Report (LTR) entitled "Position On NRC Regulatory Guide 1.97, Revision 3, Requirements For Post-Accident Neutron Monitoring System (General Electric Report NEDO-31558)."[4] The BWROG submitted the report as an alternative to the Regulatory Guide 1.97 approach for NFMS and requested the Staff to review and approve the proposed alternatives. In addition, the BWROG requested that all post-accident NFMS implementation requirements be deferred until this report had been evaluated by the Staff.

On January 29, 1990 the Staff issued a five page Safety Evaluation Report (SER) on the BWROG LTR (NEDO-31558). The Staff concluded that the alternatives proposed by the BWROG were unacceptable. Furthermore, the Staff asserted the position that BWR licensees must install neutron flux monitoring instrumentation that fully complies with Category 1 criteria established in Regulatory Guide 1.97, including environmental qualification under 10 C.F.R. § 50.49.

On February 21, 1990 the BWROG requested the Staff to provide additional guidance for the design and implementation of a post-accident NFMS. The BWROG asked for clarification of the Staff SER regarding, among other things, the specific events on which qualification should be based and the need to measure reactivity down to 10^{-6}% power. The BWROG also proposed to develop generic design criteria which could form the basis for further discussion of NFMS issues.

On May 21, 1990 the Staff responded to this request for additional guidance. The Staff stated the position that the NFMS should be qualified for a spectrum of design basis accidents ("DBAs") in accordance with 10 C.F.R. § 50.49. Additionally, the Staff agreed to consider plant specific justifications for not meeting the 10^{-6}% power range. Finally, the Staff agreed that the BWROG should develop generic design criteria for the NFMS.

4/ The BWROG LTR addressed the Staff's latest guidance for post-accident NFMS contained in Regulatory Guide 1.97, Revision 3, while NUREG 0737, Supplement 1 and 10 C.F.R. § 50.49 recommend use of Regulatory Guide 1.97, Revision 2. As far as NFMS is concerned, the recommendations of both revisions are essentially the same.

II. DISCUSSION

A. NRC Guidance Relating to Neutron Flux Monitoring Systems

In addressing whether an upgraded NFMS is necessary for BWRs, it is important to recognize that NUREG-0737, Supp. 1 did not establish a binding regulatory requirement for installation of a "fully qualified" NFMS. The Staff's January 29, 1990 SER reflects a misunderstanding on this point in that it appears to be based on the assumption that NUREG-0737, Supp. 1 and 10 C.F.R. § 50.49 effectively require that a "fully qualified" NFMS be provided (see SER at pp. 2 and 4).

NUREG-0737, Supp. 1 established recommendations for plant upgrades based on a number of NRC guidance documents (NUREGs and Regulatory Guides), specifically including Regulatory Guide 1.97, Rev. 2. In doing so, however, the NRC stated:

> It is not intended that these guidance documents (NUREG reports and Regulatory Guides) be implemented as written; rather, they should be regarded as useful sources of guidance for licensees and NRC staff regarding acceptable means for meeting the fundamental requirements contained in this document. It is also not intended that either the guidance documents or the fundamental requirements are to be considered binding legal requirements at this time.[5]

To emphasize the point, NUREG-0737, Supp. 1 further stated:

> The items by virtue of their inclusion in these documents [NUREG reports and Regulatory Guides] shall not be misconstrued as requirements to be levied on licensees or as inflexible criteria to be used by NRC staff reviewers.[6]

Thus, absent a specific commitment by the licensee, the guidance incorporated into NUREG-0737, Supp. 1 is not to be applied as binding regulatory requirements or "inflexible criteria." It was clearly intended that licensees would have flexibility in addressing the Staff's recommendations, proposing alternative approaches and making commitments. With respect to the Regulatory Guide 1.97 provisions in particular, NUREG-0737,

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5/ NUREG-0737, Supp. 1, at p. 1. Under the NUREG-0737 process, a binding legal requirement would arise once a licensee specifically committed to a particular aspect of the guidance and that commitment was confirmed by NRC order.

6/ NUREG-0737, Supp. 1 at p. 3.

Supp. 1 (at § 6) expressly stated that licensees could take exceptions based on plant-specific design features.

In view of the flexibility built into the process, the Staff must not rigidly apply the provisions of Regulatory Guide 1.97, Rev. 2 in addressing the need for an upgraded NFMS for BWR licensees. Contrary to the underlying assumption of the January 29, 1990 SER, the Staff must accept alternatives where adequate justification is provided.

It should also be noted that, contrary to the statements at pages 2 and 4 of the Staff's January 29, 1990 SER, 10 C.F.R. § 50.49 does not convert Regulatory Guide 1.97, Rev. 2 into a binding requirement so that all Category 1 and 2 instrumentation must be environmentally qualified. The Regulatory Guide is simply referenced in a footnote to Section 50.49.[7] To constitute a legally binding requirement, a guidance document such as Regulatory Guide 1.97 must be formally "incorporated by reference" into the regulation, a process which must be accomplished in accordance with specific procedures established by the Office of the Federal Register in 1 C.F.R. Part 51. See Appalachian Power Co. v. Train, 566 F.2d 451, 455-457 (4th Cir. 1977). Regulatory Guide 1.97, Rev. 2 was not formally "incorporated by reference" into Section 50.49. It therefore constitutes guidance only,[8] and the Staff must approve alternative approaches if adequate justification has been provided.

With these principles in mind, we now turn to a discussion of the technical bases for this appeal.

B. An Upgraded NFMS Is Not Needed for Boiling Water Reactors

To ensure that the entire range of reactor power levels are monitored, three basic types of neutron flux monitors are currently used in BWRs. The source range monitors (SRMs) are capable of measuring neutron flux from the fully shutdown condition (well below 10^{-6}% power) to a neutron flux of approximately 5 x 10^{-4}% power. The intermediate range monitors (IRMs) overlap the SRM from about 1 x 10^{-4}% power to approximately 15% power. The power range (i.e., 1% to full

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7/ Additionally, the footnote itself refers to Regulatory Guide 1.97 as "guidance concerning the types of variables to be monitored. . . ."

8/ The post-accident monitoring instruments to be environmentally qualified under Section 50.49(b)(3) will be those agreed to between the licensee and the Staff in the Regulatory Guide 1.97 resolution process.

power) is monitored by the local power range monitors (LPRMs). The SRMs and IRMs are retractable detectors. While the current SRM subsystem was not designed by General Electric to be Class 1E, it has proven to be a reliable system.[9] The current IRM subsystem is designed to be a Class 1E system (except for the drive mechanism).[10] It too has been a reliable system. The LPRMs are fixed-position fission chambers uniformly spaced throughout the core in an axial direction lying in four horizontal planes. Most LPRM subsystems were designed to be Class 1E and, if power is lost, would cause an automatic scram of the reactor to be initiated.

The LTR submitted by the BWROG provided, among other things, functional design criteria for the NFMS based on standard BWR event analysis methodology. This methodology was chosen because it assesses the importance of the neutron flux information for BWRs provided by the NFMS by examining the consequences of post-accident NFMS failures covering a broad spectrum of events including certain events which go beyond the design basis. By evaluating the potential adverse consequences associated with an NFMS failure, this methodology identified postulated events for which the monitoring capability of the NFMS would be desirable. Having identified this subset of events, the potential consequences of NFMS failure for these events were used to establish appropriate functional-based design criteria. The analysis revealed that while information provided by the NFMS could be useful to the operator in the event of an accident (especially the scram failure event), this information is not necessary for any event to assure that post-accident plant safety is achieved and maintained.[11] Therefore, an upgraded NFMS for post-accident monitoring was found to be unnecessary.

The Staff reviewed the BWROG LTR and rejected its proposed alternative in the January 29, 1990 SER. Significantly, the SER did not dispute the technical analysis or results reflected in

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9/ The reliability of this subsystem, measured in terms of "percent unavailability" is .05 percent over the period of 1975 through 1985. See the BWROG LTR at p. 10 for details.

10/ The reliability of this subsystem, measured in terms of "percent unavailability" is .07 percent over the period of 1975 through 1985. See the BWROG LTR at p. 10 for details.

11/ LTR at p. 51. However, it was found that for a group of events, referred to in the LTR as "lesser ATWS events," the NFMS does enhance operator actions (although, it is not required). The "lesser ATWS events" were, therefore, used to establish the bounding functional design requirements for the NFMS.

the BWROG LTR (see SER at p. 4). Rather, the Staff appeared to base its rejection of the methodology and corresponding conclusions on the Staff's interpretation that the provisions of Regulatory Guide 1.97 are mandatory. In rejecting the LTR, the Staff focused on two issues: (1) the range recommendations for NFMS and (2) the environmental qualification recommendations for Category 1 variables.

With regard to the first issue, the SER states that:

> [A]t least some of the instrumentation recommendations of R.G. 1.97 were intended to cover a wider range of possibilities, including conditions not necessarily to be anticipated by following the usually clearly defined paths of standard event analyses. In particular, the proposed elimination of the 10^{-6}% to 1% power portion of the range would delete a primary purpose of the post-accident neutron flux monitoring instrumentation. This purpose was intended to provide, with maximum forewarning time, operator information (via indications of deviations from normal post shutdown flux levels) warning of possible post event approaches or return to a critical state. This might be under circumstances which would involve reactor states and evolving events and conditions not anticipated from analyses following normally considered event scenarios. It would thus be virtually impossible to either predict or demonstrate the implausibility of such event paths and resulting conditions with assurance.
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> Therefore, <u>while not disputing the analyses or results presented in the LTR</u>, it must be concluded that they do not address the above conceptual basis that set the low power range recommendations of R.G. 1.97.

SER at pp. 3-4, emphasis added.

In later correspondence concerning this issue, the Staff again acknowledged that it had not defined the beyond-design-basis events where recriticality could be a concern for BWRs. The Staff stated that "the scenarios for which the recommended low end of the range (10^{-6} percent full power) <u>might</u> be needed to provide an early warning of abnormal reactivity conditions and

possible return to criticality following shutdown have not been specifically defined."[12]

These Staff positions apparently disregard the technical analysis provided by the BWROG LTR. That analysis indicates that "full control rod insertion results in reactor shutdown with margin for all reactor conditions."[13] Furthermore, criticality, control rod withdrawal errors, and control rod drop accidents are only postulated to occur when there is a deliberate operator action to select and withdraw control rods. Such operator action, of course, would not occur in a post-accident situation until the emergency was terminated and the NFMS was determined to be available.

Since BWR design bases include a requirement to be capable of achieving shutdown for all conditions with the highest worth control rod stuck out of the reactor core, chemical reactivity control (e.g., boron injection)[14] is not required when a successful scram has occurred. For low-probability transients where an automatic scram (i.e., control rod insertion) does not successfully occur the operator may achieve safe shutdown by injecting boron into the reactor and can continue to monitor reactivity through the primary means of boron sampling and analysis, as well as through the existing neutron flux monitoring capability (which is expected to survive an ATWS event).[15] Regardless of the method used for achieving safe shutdown, the important point established in the BWROG LTR is that the operator does not need to rely on information provided by the NFMS for post-accident mitigation actions. In every instance, the operator has means for achieving and maintaining safe shutdown without relying upon the NFMS.

The Emergency Procedure Guidelines (EPG), developed by the BWROG as the bases for plant-specific Emergency Operating Procedures, do not require that the neutron flux instrumentation be available for providing the operator with reactivity

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12/ Letter from William T. Russell, Office of NRR, to Stephen D. Floyd, BWROG, dated May 21, 1990, emphasis added. As noted above, the currently installed neutron flux monitoring capability has a range well below 10^{-6} percent full power.

13/ BWROG LTR at p. 8.

14/ Id.

15/ The BWROG LTR acknowledges that NFMS information would be beneficial to the operator for monitoring ATWS events. However, the LTR demonstrates that the currently installed NFMS is adequately qualified for ATWS events, with the possible exception of BWR's having unpiped safety valves.

information. The EPGs demonstrate that BWRs can achieve safe shutdown without the operators' knowledge of reactivity levels. Notwithstanding the fact that information regarding reactivity might be useful in some scenarios (i.e., ATWS events), the EPGs demonstrate that an alternate means can be used to achieve safe shutdown when the currently installed NFMS is not available.[16]

In sum, when successful control rod insertion occurs, post-accident neutron monitoring is not necessary because shutdown is maintained with adequate margin by the control rods. If control rod insertion does not occur, the alternative functionally-based design requirements for the NFMS proposed by the BWROG LTR are intended to ensure that the post-accident neutron flux monitoring system provides adequate information to the operator for appropriate action. Furthermore, in the unlikely event that plant shutdown is achieved with boron injection, the primary means for monitoring reactivity is boron sampling and analysis. In short, the range requirements proposed by Regulatory Guide 1.97 are not needed for BWR reactivity monitoring and maintaining the plant in a safe shutdown condition.

With regard to the second issue raised by the Staff (environmental qualification), the January 29, 1990 SER asserts that 10 C.F.R. § 50.49 "requires that certain post-accident monitoring equipment (Category 1 and 2) be environmentally qualified. Therefore . . . the Staff continues to conclude that the Category 1 designation is appropriate and neutron flux monitoring equipment must be environmentally qualified . . . ."[17] With this assertion, the Staff concluded that "as an alternative to the Category 1 criteria of Regulatory Guide 1.97, the proposed LTR NEDO-31558 functional criteria . . . is [sic] unacceptable."[18]

16/ While the BWROG LTR acknowledges that the NFMS offers the most direct method for determining whether the reactor remains shutdown by measuring reactor power (at p. 50), the LTR also discusses alternate or supporting methods for determining whether the reactor is shutdown in Section 6 of the LTR (i.e., Rod Position Information System, Transversing Incore Probe System, and other plant parameter indications of reactor power).

17/ SER at p. 4. As previously discussed above, contrary to this statement, 10 C.F.R. § 50.49 does not require that equipment designated as Category 1 by Regulatory Guide 1.97, Rev. 2, be environmentally qualified.

18/ SER at p. 5.

The Staff has provided guidance regarding an acceptable methodology for environmental qualification[19] which is described in Regulatory Guide 1.89, "Environmental Qualification of Certain Electric Equipment Important To Safety For Nuclear Power Plants," Rev. 1, dated June 1984. Among other things, Regulatory Guide 1.89 provides the following information to be used in determining the qualification parameters to be demonstrated for equipment within the scope of the guide:[20]

> Equipment that will experience environmental conditions of design basis accidents through which it need not function for mitigation of such accidents and whose failure (in any mode) is deemed not detrimental to plant safety or accident mitigation . . . need not be qualified for any accident environment.[21]

The BWROG LTR consistently follows the guidance of Regulatory Guide 1.89. The LTR evaluates the functional requirements and associated environmental conditions of the NFMS by evaluating the broad spectrum of design basis accidents to which it may be subjected. The LTR demonstrates that there is no design basis accident through which the NFMS must provide post accident indication. Furthermore, the LTR takes the additional step of evaluating the NFMS for ATWS events for which the NFMS does not need to function but for which the NFMS can provide useful information. In this regard, the LTR addresses the environmental conditions associated with these ATWS events which were determined to be essentially the normal operating conditions for the system (i.e., the ATWS events do not create a harsh environment for the NFMS) except for those plants with unpiped safety valves as discussed previously. In either case, the alternative design criteria proposed by the LTR fully address the environmental conditions resulting from an ATWS event.

The Staff's insistence on qualifying the NFMS to the worst-case design basis accident conditions, when it has been shown that the NFMS need not function for any design basis accident creating a harsh environment for BWRs, is clearly contrary to the Staff's own guidance regarding environmental qualification.

19/ The Statement of Considerations for the final EQ rule (10 C.F.R. § 50.49) states, in part, that "[p]roposed Revision 1 to Regulatory Guide 1.89 . . . describes methods acceptable to the NRC for meeting the provisions of this rule. . . ." 48 Fed. Reg. 2729, 2731.

20/ This would include the NFMS described in Regulatory Guide 1.97.

21/ Regulatory Guide 1.89, Appendix E, Section 3.c at p. 1.89-17.

By letter dated February 21, 1990, the BWROG asked the Staff to clarify its position with regard to this issue. The Staff responded to this request by indicating that "[t]he conditions within and surrounding the reactor to be considered for environmental qualification of the NFMS should be those associated with the typical spectrum of design basis events. Conditions beyond that scope are not required . . . . Since the NFMS needs to be qualified to DBA environments there is no conflict with 10 CFR 50.49."[22] The Staff appears to be contradicting itself as to which qualification standard truly applies to the NFMS. On the one hand, the Staff says that the "typical spectrum of design basis events" should be used to establish the appropriate qualification requirements. On the other hand, when the BWROG LTR does exactly this (and demonstrates that the NFMS need not function through any of these events), the Staff indicates, in their SER, that the BWROG should consider events that cannot be anticipated by standard event analyses.

Recognizing the need to clarify this obvious contradiction, the Staff response to the BWROG request for clarification stated:

> Because NFMS are not required in deterministic DBA analyses [i.e., standard event analyses], does not cause us to conclude that a discrepancy exists between the staff SER and 10 C.F.R. 50.49. It is our view that a NFMS qualified for a DBA environment in accordance with 10 C.F.R. 50.49 would be very likely to survive for a spectrum of accidents 'beyond' the DBA . . . . It is not the Staff's intent to require qualification beyond the environment associated with design basis events."[23]

Again, the Staff is alternately asserting that 10 C.F.R. § 50.49 establishes the qualification requirements yet, when the BWROG actually applies these requirements, the Staff asserts that NFMS qualification should consider accidents which go "beyond" the design basis.[24] Neutron flux is a Type B variable, which are

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22/ Letter from William T. Russell, Office of NRR, to Stephen D. Floyd, BWROG, dated May 21, 1990 at p. 2.

23/ Id.

24/ 10 C.F.R. § 50.49 and the Statement of Considerations for the final EQ rule provide a definition of design basis events which clearly excludes the need to consider accidents which go "beyond" the design basis in establishing the qualification of equipment. 48 Fed. Reg. 2729, 2731.

defined as "those variables that provide information to indicate whether plant safety functions are being accomplished." Implicit within this definition is the concept that plant safety functions are those functions defined for design basis events. Therefore, Type B instrumentation must be qualified for applicable design basis events only.

In sum, the BWROG LTR provided a technical justification for the adequacy of existing neutron flux monitoring instrumentation. The Staff rejected this approach without offering any explanation other than the position that standard event analyses are not adequate for the NFMS. The BWROG LTR has provided appropriate technical justification for not requiring that the NFMS be qualified to worst-case DBA environments. The Staff has not provided a technical or legal basis for rejecting this technical justification. The Staff position seems to reflect an inflexible interpretation of Regulatory Guide 1.97 and a desire that the NFMS be qualified for potential accidents which go "beyond" the design basis.

For the reasons given above, it remains the BWROG's position that the current neutron flux monitoring capability is adequate, and that the installation of a qualified NFMS meeting all the guidance of Regulatory Guide 1.97, Rev. 2 is unnecessary for BWRs.

C. An Upgraded NFMS Cannot Be Justified From A Cost-Benefit Perspective

As explained above, NUREG-0737, Supp. 1 did not establish a requirement to install an upgraded NFMS. Rather, it allowed the flexibility for licensees to propose alternatives. Thus, absent a specific licensee commitment or plant-specific requirement, there is currently no generic requirement for BWRs to install an upgraded NFMS. If the Staff now imposes the position that all BWRs must install an upgraded NFMS, the Staff must address this matter in accordance with the requirements of the backfitting rule, 10 C.F.R. § 50.109. Among other things, the backfitting rule requires that the overall cost of the proposed backfit be weighed against the potential safety benefits expected.[25]

The cover letter which transmitted the BWROG LTR to the NRC indicates that the total estimated installation cost for an upgraded or new post-accident NFMS ranges from $1 million to $5 million depending upon options selected (i.e., the addition of instrumentation for post-accident monitoring supplementing existing instrumentation or replacement of existing instrumentation with a new NFMS).[26] In addition, one BWROG

25/ 10 C.F.R. § 50.109(c).

26/ Letter from Robert F. Janecek, BWROG, to T.E. Murley, Office of NRR, dated April 1, 1988. Please note that this estimate is in terms of 1988 dollars.

member utility conducted a very detailed cost estimate and concluded that installation of a new incore NFMS for one unit would cost over $7 million.[27] These estimates do not reflect the additional concern that installation of a new NFMS would result in a high radiation dose to personnel.

Regardless of which estimate is used, the fact is that the BWROG LTR established clear technical justification for not upgrading to a "fully qualified" NFMS. Existing systems are capable of providing the operator with the information needed to achieve and maintain safe shutdown. The BWROG has thus concluded that there is no quantifiable safety benefit that would result from installation of an upgraded NFMS.

The Staff has stated that the primary benefit an upgraded NFMS provides is advance information to the operator for events "beyond" the design basis which might lead to reactor recriticality following initial shutdown. However, the Staff offers no technical explanation concerning which events could lead to recriticality. Moreover, the Staff offers no technical explanation as to how a BWR will become critical again after control rods are inserted. The BWROG is not aware of any probabilistic-based risk analyses which indicate that recriticality scenarios make a significant contribution to core melt risk.[28] The Staff's benefits are thus too speculative and unsubstantiated to justify the expenditure of millions of dollars for each unit and the significant radiation exposure which will result from installation. Such actions could potentially have an overall negative impact on public health and safety and plant reliability by causing licensees to expend limited resources on an issue that does not promise any appreciable benefit in safety.

In short, the high cost of installation compared with the speculative safety benefit indicates that installation of an upgraded NFMS is not justified at this time.

III. CONCLUSION

For the foregoing reasons, the BWROG requests that the Staff position directing the installation of an upgraded NFMS be reversed. The BWROG has demonstrated by a technical analysis that an upgraded NFMS is not necessary for achieving and maintaining safe shutdown for BWRs. The Staff has not provided a technical and legal basis for rejecting the Owners' Group

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27/ This estimate was also in terms of 1988 dollars.

28/ The additional risk associated with BWR recriticality once control rods are inserted is negligible. Therefore, the risk significance has not been quantified.

technical analysis. In these circumstances, the BWROG does not believe that installation of an upgraded NFMS is justified. Furthermore, plant-specific actions by licensees in response to the January 29, 1990 SER should be deferred pending resolution of this appeal.

As with similar generic appeals in the past, we urge the Staff to provide independent review of this appeal by referring the matter to the Committee to Review Generic Requirements ("CRGR"). The BWROG also requests the opportunity to brief Staff management and the CRGR on this appeal. Should you have any questions please feel free to contact us.

Sincerely,

George J. Beck, Chairman
BWR Owners' Group

cc: James M. Taylor
Edward L. Jordan