

BWR OWNERS' GROUP

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DOCKET NUMBER

PROPOSED RULE 50
(70 FR 67598)

BWROG-06006
March 8, 2006

Secretary, U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
ATTN: Rulemakings and Adjudications Staff

SUBJECT: Comments on Proposed Rule, *Risk-Informed Changes to Loss-of-Coolant Accident Technical Requirements*, 70 FR 67598

ENCLOSURE: Specific Comments on Proposed Changes to 10 CFR 50.46

To the Rulemakings and Adjudications Staff:

We appreciate the opportunity to provide comments on the proposed changes to 10 CFR 50.46 and conforming changes to existing §§ 50.34, 50.46, 50.46a (to be redesignated as § 50.46b), 50.109, 10 CFR Part 50, Appendix A, General Design Criteria 17, 35, 38, 41, 44, and 50. The proposed rule change furnishes a useful opportunity for a risk-informed approach to LOCA design requirements, but also contains a number of impediments to achieving its full potential. We support the comments of the Nuclear Energy Institute on the proposed rule changes, and furnish a number of additional comments to improve its usefulness to BWRs.

Our principal comments relate to the discussion of Transition Break Size (TBS) and the proposed risk-informed integrated safety assessment process (RISP):

- We propose a TBS of equivalent size to an internal diameter of a 16 inch Schedule 80 pipe (i.e., 1.177 ft²), in the Residual Heat Removal System (RHR) shutdown cooling suction piping, for BWRs instead of the BWR TBS proposed in the rule
- We support the NEI proposal for replacing the requirement for a RISP with a program for licensees to assess and manage risk through systematic updates to its plant-specific PRA

We will address these issues further below.

In addition, we provide a number of specific comments in Enclosure 1 and responses to the 16 specific NRC staff questions in Enclosure 2.

Transition Break Size

Consistent with our previously docketed comments on NUREG-1829 regarding the TBS [BWROG-06002 dated January 12, 2006, from Joseph Conen to Dr. Charles Greene], the BWROG proposes a reduced TBS for BWRs, based on recent analysis that supports the safety and operational benefits of this action.

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The proposed rule indicates that the TBS is equal to the cross sectional flow area of the inside diameter of the specified piping for a given reactor. For BWRs, the specified piping is stated as “the larger of the feedwater line inside containment or the residual heat removal line inside containment.” This definition is unclear and not well founded in the Expert Elicitation (NUREG-1829) results. For example, Feedwater piping, which attaches directly to the Reactor Pressure Vessel, is not traditionally thought of as RCS piping for LOCA analysis, nor is it the largest piping in this category. It is more appropriate to define the TBS as being a specific break size in RCS piping, consistent with the results in NUREG-1829 but without the additional conservatisms placed on it. This approach has technical coherence, regulatory stability for implementation, and clarity for inspection and enforcement.

As indicated in Paragraph 3B of the FRN (page 67604), the baseline TBS for BWRs and PWRs was initially based in NUREG-1829 on a mean break frequency of 1 E-5 per reactor-year. For BWRs, this translated to an equivalent break diameter of 6 to 14 inches; for PWRs this translated to an equivalent diameter of 4 to 7 inches. The NRC staff then added conservatism to account for individual variations in the elicitation results by applying a 95th percentile probability to the mean probability (1 E-5 per reactor year). This resulted in a break size of 6 to 10 inches for PWRs and 13 to 20 inches for BWRs. The Staff then applied additional uncertainty issues (not considered by the expert elicitation) and chose the TBS at the upper-most range of the 95th percentile, presumably at a 95% confidence level. This raised the “equivalent diameter” to a pipe size of 20 inches for BWRs. This approach is not consistent with using a “best estimate” philosophy for beyond design basis events. A reduced TBS, as discussed below, would still be within the 95th percentile values of the elicitation (which was already conservative for BWRs, as commented on by the BWROG when the draft NUREG-1829 was issued for public comment), but with a more reasonable confidence level (closer to the midpoint). This “best estimate” TBS would allow for improvements in safety, but should still provide sufficient margin such that future adjustments would only be needed if a significant new phenomena/degradation mechanism were found.

Also, by defining a TBS of a specific break size instead of the “largest attached pipe”, technical coherence is maintained with the Expert Elicitation results for break frequency. Otherwise individual BWR plants would have a different break size for their TBS and thus, a different risk profile for breaks above the TBS.

Based upon over 30 years experience with the current LOCA analysis requirements in Appendix K, the “worst” break location in the RCS piping is well established as being in the recirculation suction portion of the piping and need not be re-confirmed. Thus, we propose to locate the TBS at the junction of the RHR shutdown cooling suction line.

To demonstrate the feasibility of this proposal, GE has analyzed a generic BWR/4 and a generic BWR/3, using the NRC-approved LOCA methodology (SAFER/GESTR). The results show that there are safety and operational benefits for performing the LOCA analysis at this “best estimate” TBS. In this case, “safety benefit” is defined consistent with the BWROG topical report on LOOP/LBLOCA separation (NEDO-33148, submitted in April 2004 for NRC staff review):

- a 60-second warm-up period in the EDG start sequence and reduced automatic loading of ECCS trains onto the Diesel Generators, with
- a no more than minor increase in Peak Clad Temperature (PCT) compared with the existing base case double-ended guillotine break (DBA-LOCA).

As noted in NEDO-33148, a risk benefit (improvements in Core Damage Frequency (CDF) and Large Early Release Frequency (LERF)) should result from delayed diesel generator start times/extended warm-up periods and reduced automatic loading.

Based upon the above technical considerations and supporting analysis, we recommend that the TBS for BWRs be specifically defined as:

A single-sided break equivalent to the internal diameter of a 16 inch Schedule 80 pipe in the RHR shutdown cooling suction piping inside primary containment. .

We will be happy to provide details of the supporting analyses in an appropriate forum.

Risk-Informed Integrated Safety Assessment Process (RISP)

The NRC proposes that licensees adopting 10 CFR 50.46a use a RISP to demonstrate the acceptability of all future facility changes, with or without NRC approval, made under 10 CFR 50.90 or 10 CFR 50.59. The RISP would be required to demonstrate that

1. Any increases in plant risk meet risk acceptance criteria,
2. Defense-in-depth is maintained,
3. Adequate safety margins are maintained, and
4. Adequate performance measurement programs are implemented

The Nuclear Energy Institute recommends replacing the requirement for a RISP with a program for assessing and managing risk through systematic updates to its plant-specific PRA. We support this recommendation.

Requiring a RISP analysis for every plant change is unnecessarily burdensome since the vast majority of plant changes are risk-insignificant. An equivalent measure of protection against significant increases in plant risk is afforded by (1) demonstrating that the plant PRA meets established standards and requirements, (2) providing for timely and systematic updates to the plant PRA, and (3) reporting the CDF and LERF changes resulting from PRA updates, as recommended by NEI. For those plant changes requiring prior NRC approval, including a description of the PRA that meets the stated requirements is an appropriate alternative to the RISP analysis that would be required by the proposed rule.

The BWROG recognizes and supports the increasing application of risk information to a wide variety of licensing issues. We accept the fact that appropriate standards for PRA quality to support these applications will be necessary in the future. However, we recommend that any regulatory requirements regarding PRA quality be

- based on accepted PRA standards developed by groups such as ASME or ANS,
- located in one place in 10 CFR 50 rather than dispersed by application, and
- provided with adequate regulatory guidance to assure consistent application

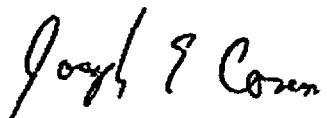
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If you have any questions about these comments, please contact me at 734-586-1960 or Fred Emerson at 910-675-5615.

Sincerely,

A handwritten signature in black ink that reads "Joseph Conen". The signature is written in a cursive style with a large, stylized 'J' at the beginning.

Joseph Conen
BWR Owners' Group Chairman

cc: Mr. Gary Holahan, NRR
Mrs. Michelle Honcharik, NRR
BWROG Primary Representatives
NRC Document Control Desk

**Comments on Proposed Rule,
*Risk-Informed Changes to Loss-of-Coolant Accident Technical Requirements, 70 FR 67598***

Comments on Rule Language

1. Proposed 10 CFR 50.46a(b)(1): We support applying the requirements of this section to reactors with MOX fuel or alternative cladding materials.
2. Proposed 10 CFR 50.46a(e)(2): The following sentence should be moved from its current location to just in front of the sentence beginning, “These calculations...”: “The evaluation must be performed for a number of postulated LOCAAs of different sizes and locations sufficient to provide assurance that the most severe postulated LOCAAs larger than the TBS up to the double-ended rupture of the largest pipe in the reactor coolant system are analyzed.” This relocated sentence should begin a new paragraph. These changes will properly group the more detailed analysis requirements.
3. Same section as Comment 2: The NRC should clarify the requirements for licensee documentation to be maintained onsite vs. generic documentation in or supporting an LTR.
4. Same section as Comments 2 and 3: NRC states that these calculations [for breaks larger than the TBS] may take credit for the availability of offsite power and do not require the assumption of a single failure. It should also be noted that availability of equipment is not limited to safety-related equipment.
5. Same section as Comment 2: The requirement to revalidate over 30 years of experience with performing large break LOCA analysis to confirm “for a number of postulated LOCAAs of different sizes and locations ...that the most severe postulated LOCAAs ...are analyzed” is unnecessarily burdensome and appears to serve no specific technical need. Current best-estimate large break LOCA models, which are benchmarked to testing data, have yielded no insights that would invalidate the previous analytical experience and knowledge. This provision in the rule language should be removed.
6. The BWROG supports other specific changes to the proposed rule recommended by NEI.

Comments on Information Supporting the Proposed Rule

7. P. 67602 Footnote 4: Change criteria should not apply to all proposed changes. As indicated by comments at the public workshop held on February 16, 2006, it should be feasible to adopt a criterion to screen out insignificant plant changes from detailed risk-informed changed analysis.
8. P. 67608, Column 2: Based upon comments made at the public workshop held on February 16, 2006, we believe that the proposed rule has over-emphasized the intent of the Commission’s desire to maintain “mitigation” for break sizes above the TBS. The proposed rulemaking requires that all operational configurations should either be analyzed and shown to be acceptable, included in Technical Specifications, or precluded when operating. This provision negates the potential benefits of this rulemaking to licensees.

By requiring new, more restrictive Technical Specifications, or not allowing on-line maintenance

of equipment previously allowed by the Maintenance Rule (§50.65(a)(3)), this rulemaking becomes more restrictive than current design basis requirements. We understand that permanent modifications or extended outage times for maintenance or testing can impact equipment credited in the mitigation analysis above the TBS. We believe, however, that the rule should allow for reasonable outage times for maintenance and testing, appropriately managed by the existing Maintenance Rule.

9. P. 67611, Column 3: It is inappropriate to require licensees to retain a level of mitigation for late containment failure and late radiological releases, since these constitute a very small fraction of overall plant risk. Such references should be removed.
10. P. 67612, Paragraph 2a “PRA Requirements”: A requirement for shutdown PRAs is not appropriate because of the low risk associated with shutdown configurations at BWRs. Requirements for seismic PRAs are also inappropriate because these constitute a typically small fraction of the overall risk for most plants.

**Responses to Specific Questions in Proposed Rule,
*Risk-Informed Changes to Loss-of-Coolant Accident Technical Requirements, 70 FR 67598***

1. In proposed § 50.46a(b), the Commission specifically precluded the application of the § 50.46a alternative requirements to future reactors. However, future light water reactors might benefit from § 50.46a. The Commission requests specific public comments regarding whether § 50.46a should be made available to future light water reactors.

Response: Recognizing that the reactor coolant system design of future reactors may be significantly different from current operating reactors, we believe that the concepts of § 50.46a should apply to the new designs.

2. The TBS specified by the NRC in the proposed rule does not include an adjustment to address the effects of seismically-induced LOCAs. NRC is currently performing work to obtain better estimates of the likelihood of seismically-induced LOCAs larger than the TBS. By limiting the extent of degradation of reactor coolant system piping, the likelihood of seismically-induced LOCAs may not affect the basis for selecting the proposed TBS. However, if the results of the ongoing work indicate that seismic events could have a significant effect on overall LOCA frequencies, the NRC may need to develop a new TBS. To facilitate public comment on this issue, a report from this evaluation will be posted on the NRC rulemaking Web site at <http://ruleforum.llnl.gov> before the end of the comment period. In December 2005, stakeholders should periodically check the NRC rulemaking web site for this information. The NRC requests specific public comments on the effects of pipe degradation on seismically-induced LOCA frequencies and the potential for affecting the selection of the TBS. The NRC also requests public comments on the results of the NRC evaluation that will be made available during the comment period. (See Section III.B.3 of this supplementary information.)

Response: The BWROG supports the NEI position on this question.

3. Depending on the outcome of an ongoing NRC study (see Section III.B.3 of this supplementary information), the final rule could include requirements for licensees to perform plant-specific assessments of seismically-induced pipe breaks. These assessments would need to consider piping degradation that would not be prejudiced by implementation of the licensee's inspection and repair programs. The assessments would have to demonstrate that reactor coolant system piping will withstand earthquakes such that the seismic contribution to the overall frequency of pipe breaks larger than the TBS is insignificant. The NRC requests specific public comments on this and any other potential options and approaches to address this issue.

Response: The BWROG supports the NEI position on this question. The TBS proposed for BWRs has adequate margin that reflects seismically induced pipe breaks; additional plant-specific assessments are not necessary.

4. The ACRS noted that "a better quantitative understanding of the possible benefits of a smaller break size is needed before finalizing the selection of the transition break size." The TBS to be included in the final rule should be selected to maximize the potential safety improvements. Thus, the NRC is soliciting comments on the relationship between the size of the TBS and potential safety improvements that might be made possible by reducing the maximum design-basis accident break size.

Response: The BWROG supports a reduced TBS for BWRs as supported by recent analysis. This is consistent with the 95% percentile TBS noted from the expert elicitation (i.e., without additional conservatisms).

5. The proposed § 50.46a includes an integrated, risk-informed change process to allow for changes to the facility following reanalysis of beyond design basis LOCAs larger than the TBS. However, the current regulations in 10 CFR Part 50 already have requirements addressing changes to the facility (§ 50.59 and § 50.90). It might be more efficient to include the integrated, risk-informed change (RISP) requirements, for plants that use § 50.46a, under these existing change processes. The Commission solicits specific public comments on whether to revise existing §§ 50.59 and 50.90 to accommodate the requirements for making plant changes under § 50.46a.

Response: The NRC should reflect change requirements in 50.59 and 50.90 consistent with NEI comments on alternatives to the proposed RISP program.

6. The proposed § 50.46a rule would rely on risk information. The NRC has included specifically applicable PRA quality and scope requirements in the proposed rule. However, there are other NRC regulations that also rely on risk information (e.g. § 50.65 maintenance rule and § 50.69 alternative special treatment requirements). Consistent with the Commission policy on a phased approach to PRA quality, it might be more efficient and effective to describe PRA requirements (e.g., contents, scope, reporting, changes, etc.), in one location in the regulations so that the PRA requirements would be consistent among all regulations. The NRC is seeking specific public comments on whether it would be better to consolidate all PRA requirements into a single location in the regulations so that they were consistent for all applications or to locate them separately with the specific regulatory applications that they support.

Response: In general, the BWROG agrees with consolidation of all PRA requirements in one place. However, not all PRA applications require the same level of technical adequacy, so we recommend that the capability levels for PRA application be developed along with the types of applications that each level applies to.

7. The proposed § 50.46a rule would include the requirement that all allowable at-power operating configurations be included in the analysis of LOCAs larger than the TBS and demonstrated to meet the ECCS acceptance criteria. Historically, operational restrictions have not been contained in § 50.46 but were controlled through other requirements (e.g., technical specifications and maintenance rule requirements). It might be more practical to control the availability of equipment credited in the beyond design-basis LOCA analyses in a manner more consistent with other operational restrictions. As a result, the NRC is soliciting public comments on the most effective means for implementing appropriate operational restrictions and controlling equipment availability to ensure that ECCS acceptance criteria are continually met for beyond design-basis LOCAs.

Response: Beyond design basis operational requirements should be placed in a licensee-controlled program, such as a Technical Requirements Manual (TRM).

8. Given the Commission's intent (See SRM for SECY-04-0037) that plant changes made possible by this rule should be constrained in areas where the current design requirements "contribute significantly to the 'built-in capability' of the plant to resist security threats," the Commission seeks examples on either side of this threshold (plant changes allowed vs. changes prohibited), and additionally any examples of changes made possible by § 50.46a that could enhance plant security and defense against radiological sabotage or attack. (See Section III.G.2 of this

supplementary information.) The Commission also solicits comments on whether the § 50.46a rule should explicitly include a requirement to maintain plant security when making changes under § 50.46a or otherwise rely on a separate rulemaking now being considered by the NRC to more globally address safety and security requirements when making plant changes under §§ 50.59 and 50.90. Any examples of plant changes that involve Safeguards Information should be marked and submitted using the appropriate procedures.

Response: The BWROG supports the NEI position on this question.

9. Given the potential impact to the licensee (since the backfit rule would not apply) of the NRC's periodic re-evaluation of estimated LOCA frequencies which could cause the NRC to increase the TBS, should the rule require licensees to maintain the capability to bring the plant into compliance with an increased transition break size (TBS), within a reasonable period of time?

Response: The BWROG supports the NEI position on this question.

10. Is the proposed rule sufficiently clear as to be "inspectable?" That is, does the rule language lend itself to timely and objective NRC conclusions regarding whether or not a licensee is in compliance with the rule, given all the facts? In particular, are the proposed requirements for PRA quality sufficient in this regard?

Response: The BWROG supports the NEI position on this question.

11. The proposed § 50.46a rule would impose no limitations on "bundling" of different facility changes together in a single application. Changes which would increase plant risk substantially or create risk outliers could be grouped with other plant changes which would reduce risk so that the net change would meet the risk acceptance criteria. Are the net change in risk acceptance criteria in the proposed rule adequate or should some additional limitations be imposed to avoid allowing facility changes which are known to increase plant risk?

Response: The BWROG supports the NEI position on this question. No restrictions on bundling should be imposed by this rule, consistent with Regulatory Guide 1.174.

12. Is there an alternative to tracking the cumulative risk increases associated with plant changes made after implementing § 50.46a that is sufficient to provide reasonable assurance of protection to public health and safety and common defense and security? (See Section III.D.1 of this supplementary information.)

Response: The BWROG supports the NEI position on this question. Tracking cumulative risk increases is not necessary. The threshold for risk increases is low enough so that the cumulative effect is not significant.

13. The Commission requests specific public comments on the acceptability of applying the change in risk acceptance guidelines in RG 1.174 to the total cumulative change in risk from all changes in the plant after adoption of § 50.46a. Should other risk guidelines be used and, if so, what guidelines should be used? (See Section III.D.1.c of this supplementary information.)

Response: See the response to Question 12. Reg Guide 1.174 provides a built-in limitation and scrutiny for risk increases and is therefore adequate without additional regulation.

14. After approval to implement § 50.46a, the proposed rule would require tracking risk associated with all proposed plant changes but would not require a licensee to include increases caused by previous risk-informed changes that were implemented before § 50.46a was adopted. Licensees who adopt § 50.46a before implementing other risk-informed applications will have a smaller risk increase “available” compared to licensees who have already incorporated some risk-informed changes into their overall plant risk before adopting § 50.46a. The Commission does not consider this a safety issue but requests specific public comments on whether this potential inconsistency should be addressed and, if so, how? (See Section III.D.1 of this supplementary information.)

Response: Licensees should not have to consider risk changes prior to the adoption of the revised 10 CFR 50.46 differently from those after its adoption. Reg Guide 1.174 provides for adequate control over this concern.

15. The proposed § 50.46a would require licensees to report every 24 months all “minimal” risk facility changes made under § 50.46a(f)(1) without NRC review. Are there less burdensome or more effective ways of ensuring that the cumulative impact of an unbounded number of “minimal” changes remains inconsequential? (See Section III.E.3 of this supplementary information.)

Response: The reporting mechanism proposed in the NEI comments is adequate.

16. Should the § 50.46a rule itself include high-level criteria and requirements for the risk evaluation process and acceptance criteria described in Reg Guide 1.174, as is currently proposed? If these criteria were included in the regulatory guide only, and not in the rule, how could the NRC take enforcement action for licensees who failed to meet the acceptance criteria?

Response: It is not appropriate to place implementation guidance and acceptance criteria in any rule. These details are more appropriately placed in a regulatory guide. If the guidance in a rule is too detailed, any change to this guidance requires rulemaking. Adequate guidance for inspection and enforcement can be placed in regulatory guides and inspection procedures, as they are now.

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