

RULEMAKING ISSUE
(Notation Vote)

May 16, 2007

SECY-07-0082

FOR: The Commissioners

FROM: Luis A. Reyes
Executive Director for Operations /RA/

SUBJECT: RULEMAKING TO MAKE RISK-INFORMED CHANGES TO LOSS-OF-COOLANT ACCIDENT TECHNICAL REQUIREMENTS; 10 CFR 50.46a, "ALTERNATIVE ACCEPTANCE CRITERIA FOR EMERGENCY CORE COOLING SYSTEMS FOR LIGHT-WATER NUCLEAR POWER REACTORS"

PURPOSE:

To inform the Commission of the impacts of the Advisory Committee for Reactor Safeguards (ACRS) recommendations on the draft final rule to make risk-informed changes to the loss-of-coolant accident (LOCA) technical requirements in Title 10, Section 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors," of the *Code of Federal Regulations*, (10 CFR 50.46), to seek Commission clarification on its direction regarding defense-in-depth considerations for beyond transition break size LOCAs, and to seek a Commission decision on the staff's recommended option for proceeding with the rule.

SUMMARY:

This paper provides background information on and status of the preparation of a new Section 50.46a¹, "Alternative Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors" to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." The staff provides its assessment of the significance of the ACRS recommendations on the draft final rule and estimates the resources needed to address the associated issues. The staff provides its reassessment of the scheduling priority for this

CONTACT: Richard Dudley, NRR/DPR
301-415-1116
Timothy Collins, NRR/DSS
301-415-3261

¹ In the proposed rule published on November 7, 2005, (70 FR 67598) the existing Section 50.46a is redesignated as Section 50.46b and a new Section 50.46a is added.

rulemaking, provides options for proceeding with this rulemaking, and seeks Commission guidance on which option to pursue. The staff seeks Commission approval to resume rulemaking activities in Fiscal Year (FY) 2008 in accordance with a schedule that the staff will determine in FY 2008 based upon the relative scheduling priorities of this rule and other existing and emergent rulemaking activities.

During the concurrence process for this paper, an individual from the Office of New Reactors expressed a different view regarding which option the staff should recommend to the Commission. That individual's recommendation was reviewed and addressed in accordance with the current guidance for handling non-concurrences. A copy of the NRC Non-concurrence Form 757 documenting the different opinion and the staff's response is provided in Enclosure 3 as background information for the Commission.

BACKGROUND:

On July 29, 2005, in response to SECY-05-0052, "Proposed Rulemaking for 'Risk-Informed Changes to Loss-of-Coolant Accident Technical Requirements,'" the Commission directed the U.S. Nuclear Regulatory Commission (NRC) staff to publish for public comment a proposed rule adding a new Section 50.46a, "Alternative Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors" to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities" to provide an alternative, risk-informed set of requirements for emergency core cooling systems (ECCSs).

Current light-water reactor licensees could voluntarily adopt these requirements, which are intended to give licensees additional flexibility to change the designs of reactor ECCSs. The proposed rule divides the current spectrum of LOCA break sizes into two regions. The division between the two regions is determined by a "transition" break size (TBS). The first region includes small breaks up to and including the TBS. The second region includes breaks larger than the TBS, up to and including the double-ended guillotine break of the largest reactor coolant system pipe. Pipe breaks in the smaller break size region are considered more likely than pipe breaks in the larger break size region. Consequently, each region is subject to ECCS requirements commensurate with the relative likelihood of breaks in that region. LOCAs in the smaller break size region will continue to be considered "design basis accidents" and will be analyzed by current design basis accident methods, assumptions, and acceptance criteria. LOCAs in the larger break size region must also be mitigated, but they may be analyzed with more realistic analytical methods and initial conditions without postulating the loss of offsite power or the worst case single failure.

The staff published the proposed rule in the *Federal Register* on November 7, 2005 (70 FR 67598). The public comment period ended on March 8, 2006. Of the 13 sets of comments received, 11 were from the nuclear industry. Many of these comments addressed the potential burden to licensees who implement the rule. While the staff was evaluating the comments, it posted revised draft rule language on the NRC Web site to facilitate stakeholder involvement as the issues were being resolved. The staff held two public stakeholder meetings to provide for enhanced public participation on this rulemaking. At each meeting licensees and industry representatives expressed concerns about the burden associated with implementing

the rule. As a result of these interactions, the staff made changes to the draft rule language with the objective of reducing burden on licensees while maintaining adequate protection of public health and safety.

The staff also received public comments stating the rule should apply to new light water reactors that were similar in design to existing plants. As a result, the staff modified the rule to make it apply to new light water reactor designs that are determined by the NRC to be similar to existing light water reactors.

On October 16, 2006, the staff sent draft final rule language for risk-informing 10 CFR 50.46 and the draft *Federal Register* notice for the final rule to the ACRS for review. The staff met to discuss the rule with the ACRS subcommittee on October 31 and with the full committee on November 1, 2006. After these meetings the ACRS issued its letter dated November 16, 2006. The ACRS letter recommends that the final 10 CFR 50.46a rule not be issued in its current form. The letter includes multiple recommendations for performing additional technical reviews and changing the draft final rule. It also contains a recommendation that appears to differ from the staff's interpretation of Commission guidance provided specifically for this risk-informed ECCS rule in the staff requirements memorandum (SRM) on SECY-04-0037, dated July 1, 2004, "Issues Related to Proposed Rulemaking to Risk-Inform Requirements Related to Large Break Loss-of-Coolant Accident (LOCA) Break Size and Plans for Rulemaking on LOCA with Coincident Loss-of-Offsite Power." Addressing the ACRS recommendations would require significant staff resources and could delay completion of the final rule by several years.

DISCUSSION:

The issues raised by the ACRS, and the potential conflicts with existing Commission guidance, are identified and discussed in detail in Enclosure 1. Summaries are provided below.

Commission Direction on Defense-in-Depth for Beyond TBS LOCAs

As discussed in Issue 1 of Enclosure 1, the requirements for mitigating pipe breaks larger than the TBS in the draft final rule were based on the staff's interpretation of defense-in-depth direction provided by the Commission. The staff believes that the ACRS recommendation to establish defense-in-depth based on engineering judgement conflicts with previous Commission direction. The Commission directed that defense-in-depth be based upon risk significance. The particular changes recommended by the ACRS are more conservative than the approach in the draft rule since they would result in additional requirements to increase assurance of mitigation capability for breaks larger than the TBS. The staff does not agree with the ACRS recommendations that thermal-hydraulic analysis methods used for beyond TBS breaks should receive prior NRC staff approval and that additional special treatment requirements for equipment credited in beyond TBS analyses be included in the rule. The staff believes that risk significance of beyond TBS breaks is too low to warrant such additional requirements.

Issue 2 in Enclosure 1 is a related issue. In Issue 2, the ACRS suggests that the determination of the transition break size should include consideration of defense-in-depth capability, as well as the potential benefits of a smaller TBS. The staff disagrees with this ACRS recommendation. The staff position is that consideration of additional subjective factors such as "degree of assurance of defense-in-depth," or "potential benefits" in the determination of the TBS would result in a subjective, plant specific process for selecting each plant's TBS. The TBS could vary

widely with different containment designs and between individual sites. The staff believes that regulatory consistency in application of such a process would be difficult.

However, in light of the significant differences between the staff's interpretation of existing Commission direction and the recommendations from the Commission's advisory committee, the staff requests the Commission to confirm that the existing staff position is consistent with the magnitude of defense-in-depth intended by the Commission for this risk-informed ECCS rule.

Other ACRS Issues

The NRC staff has evaluated the remaining ACRS recommendations (Issue 3 through Issue 7) and believes each of these issues should be addressed as described in Enclosure 1. Implementing some of these recommendations could result in an increased regulatory burden on licensees who adopt the rule. As a result, licensees may not choose to implement this voluntary rule. After the final rule has been modified to address the ACRS recommendations, the staff intends to hold an additional public meeting to solicit stakeholder input on regulatory burden to ensure that the final rule will be useful to licensees. Staff estimates of resources needed to address the ACRS concerns and complete the final rule are provided in Enclosure 2.

Rulemaking Schedule

Now that nearly all budgeted resources for this rule have been expended, to continue the staff must either reallocate FY 2007 resources or budget resources in subsequent years via the Planning, Budgeting, and Performance Management (PBPM) process. The method for providing these resources will depend on the new schedule established for completing the rule.

Previously, the NRC had expedited work on this rule based on the schedule established by the Commission. To a large extent, this schedule was based upon potential safety benefits that industry representatives suggested could result from plant changes allowed under the rule. Some of these safety benefits relate to risk-optimized ECCS configurations, improved water management to reduce challenges related to containment sump performance, and improved diesel generator reliability. A study performed by the Westinghouse Owners Group (ML052380422) at the request of the staff estimated that a decrease of about 9% in core damage frequency was achievable at some plants if changes were made to optimize containment spray operation. However, this reduction was noted as highly plant specific and applicable to only small subset of pressurized water reactors (PWRs). For most plants, potential risk reductions were insignificant. Potential safety improvements due to slower diesel generator loading times were also examined in the Owners Group report and found to be small. Likewise, for boiling water reactors (BWRs), representatives of the BWR Owners Group indicated in a presentation to the ACRS on November 1, 2006, that potential enhancements that were assessed for BWRs resulted in only small changes to core damage frequency and could be described as "risk neutral." Also, the NRC staff agrees with public comments and ACRS member comments stating that many of the benefits of the revised ECCS rule may be obtained under current regulations by performing best-estimate (realistic) thermal-hydraulic analyses. Thus, the estimated benefits made possible by the Section 50.46a rule are reduced. Finally, under the draft final rule, plant licensees who implement changes that result in risk decreases, may combine these changes with other changes that increase risk such that the net result is a small (but allowable) increase in risk.

Another factor used by the staff to determine scheduling priority is the impact of an activity on the agency goal to increase effectiveness of licensee and NRC activities by reducing

unnecessary burden. Industry representatives have commented that the burden associated with implementing the proposed § 50.46a rule may be so high that the voluntary rule would not be adopted by licensees. Although the staff worked to reduce unnecessary burden in the draft final rule, implementing some of the ACRS recommendations will result in additional regulatory requirements that further increase licensee burden.

On the other hand, a benefit of proceeding with the rule is the potential for power uprates under Section 50.46a. The staff expects that the ECCS capability in many current plant designs would be sufficient to support operation at higher power levels under the requirements of the new rule. Thus, depending upon plant specific factors, licensees may be able to use the new rule to support increases in licensed power level.

The draft final rule also applies to new light water reactor designs that are determined by the NRC to be similar to existing power reactors. For new reactors, the staff believes that the rule would enhance safety of new reactor designs by focusing NRC and licensee resources in areas commensurate with their importance to risk. Applying the flexibility of the rule, designers would have the opportunity to consider design features including optimization of containment spray systems, optimization of safety system design parameters, such as accumulator cover pressure and other setpoints, and eliminating the need for fast loading of emergency diesel generators without the need to submit exemption requests in certain situations when existing regulations would not be met. Such design and operational options that are more easily considered for new reactor designs, could better mitigate the more likely small-break LOCAs.

After weighing the above considerations, the staff now believes that the scheduling priority of this rule is medium². This revised priority would not normally support continuing this effort on an expedited schedule. In addition, ACRS' comments suggesting alignment of this rulemaking activity with the revisions to 10 CFR 50.46(b) regarding fuel cladding performance would also delay completing the rule.

RULEMAKING OPTIONS:

The staff proposes the following options for the Commission to consider:

Option 1: Continue to consider the rule to be high priority and delay other work as necessary to expeditiously address ACRS recommendations and issue a final rule.

Pro: This option provides for completing the rule in the shortest period of time.

This option is the most supportive of the Commission's policy to increase the use of probabilistic risk assessment³ in all regulatory matters.

² This priority is primarily based on the agency goal of increasing effectiveness as specified in the Common Prioritization Methodology for NRC Program Offices as described in the August 29, 2005, memorandum from Cynthia A. Carpenter, Office of Nuclear Reactor Regulation, to William M. Dean, Office of the Executive Director for Operations and to Leslie W. Barnett, Office of the Chief Financial Officer (ML052370186).

³ See policy statement entitled "Use of Probabilistic Risk Assessment Methods in Nuclear Regulatory Activities "(60 FR 42622; August 16, 1995)

Con: The schedule in this option is inconsistent with the staff's revised scheduling priority for the rule.

Since no FY 2007 resources are budgeted for this work, existing FY 2007 resources must be reallocated and other NRC activities considered high priority may be delayed.

Accelerated application of staff resources is questionable for existing power reactors since the rule may not be widely adopted by current licensees due to burden considerations and significant net safety benefits are not likely to result.

Option 2: Withdraw the proposed rule and terminate the rulemaking.

Pro: The NRC takes definitive action on the rule.

This option is unlikely to require future resource expenditures beyond currently budgeted activities.

Con: Significant NRC and licensee resources spent on this rule would result in little regulatory benefit.

This option is not supportive of the Commission's policy to increase the use of probabilistic risk assessment in all regulatory matters.

Objections from the nuclear industry representatives are likely.

Option 3: Postpone FY 2007 rulemaking activities other than work by the Office of Nuclear Regulatory Research (RES) to publish final study reports. Resume other activities to address ACRS concerns and continue rulemaking on a schedule that the staff will determine in FY 2008 based upon the relative scheduling priorities of this rule and other existing and emergent activities.

Pro: The staff's revised schedule for this option will be determined by using the NRC Common Prioritization Methodology for rulemaking.

A reduced priority for this rule is consistent with reduced expectations for safety benefits and implementation uncertainties due to potential increases in burden for existing reactors.

This approach is consistent with the current FY 2007 budget.

Con: With this approach it is possible that scheduling priority will result in a lengthy delay in completing the rule.

RECOMMENDATION:

Under Option 1, the rule would be completed in the shortest period of time. However, the staff does not recommend Option 1 because the priority assigned to the rule by this option is inconsistent with the staff's revised scheduling priority (based on the NRC Common Prioritization Methodology) and, after delaying other priority work to expedite Section 50.46a efforts, implementation of the final rule by existing reactor licensees is not assured in light of its potential increased burden.

Terminating the rulemaking under Option 2 would be a decisive action that conserves agency resources. However, significant NRC and licensee resources already spent on this rule would result in little regulatory benefit.

Under Option 3, implementation of the final rule by existing reactor licensees is also not assured in light of potential increased regulatory burden. However, Option 3 will assure that agency resources are assigned consistent with the NRC Common Prioritization Methodology and the rule is not prematurely terminated.

The staff recommends that the Commission:

1. Approve Option 3, in which the scheduling priority of the rule will be reduced and rulemaking activities will be deferred with a schedule that the staff will determine in FY 2008 based upon the relative scheduling priorities of this rule and other existing and emergent activities. The staff will provide the rulemaking schedule to the Commission in FY 2008.

2. Provide the staff with direction on whether the defense-in-depth considerations for this rule should be expanded in accordance with the ACRS recommendations.

RESOURCES:

In FY 2007, RES has allocated 0.7 FTE and intends to complete its ongoing support work on the technical basis for the rule. The staff estimates that approximately 5 additional FTE and \$250K would be required to address the ACRS recommendations and publish the revised final rule. Pending Commission approval of Option 3, NRR and RES will resume work on this rulemaking as early as FY 2008 by allocating resources consistent with the revised scheduling priority of the rule. In FY 2008 and beyond, NRR and RES resource needs will be addressed through the Planning, Budgeting, and Performance Management process.

COORDINATION:

The Office of the General Counsel has no legal objection to this paper. The Office of the Chief Financial Officer has reviewed this Commission paper for resource implications and has no objections.

/RA/

Luis A. Reyes
Executive Director
for Operations

Enclosures:

1. Rule Overview and Summary of ACRS Recommendations
2. Resource Estimate to Address ACRS Issues and Complete Rule
3. Non-concurrence (NRC Form 757)

Enclosure 1

Rule Overview and Summary of ACRS Recommendations

Rule Overview and Summary of ACRS Recommendations

Overview

The draft final rule divides the current spectrum of loss of coolant accident (LOCA) break sizes into two regions. The division between the two regions is determined by a “transition” break size (TBS). The first region includes small breaks up to and including the TBS. The second region includes breaks larger than the TBS, up to and including the double-ended guillotine break (DEGB) of the largest reactor coolant system pipe. Pipe breaks in the smaller break size region are considered more likely than pipe breaks in the larger break size region. Consequently, each region is subject to ECCS requirements commensurate with the relative likelihood of breaks in that region. LOCAs in the smaller break size region will continue to be “design basis accidents” and will continue to be analyzed by current methods, assumptions, and criteria. In this region, licensees must perform analyses under current § 50.46 ECCS requirements to determine the limiting size and location for breaks up to and including the TBS.

Pipe breaks larger than the TBS, because of their lower likelihood, can be analyzed by the more realistic and less stringent analysis methods established in the new § 50.46a. Although LOCAs for break sizes larger than the transition break will become “beyond-design-basis accidents,” the NRC will include requirements ensuring that licensees maintain the ability to mitigate¹ all LOCAs up to and including the double-ended guillotine break of the largest reactor coolant system pipe. Although these breaks would be mitigated, the analysis methods and initial and boundary conditions used may be more realistic. Licensees would be allowed to take credit for sufficiently reliable non-safety-related systems without assuming a loss of offsite power and/or other independent failures and must show that the core remains in a coolable geometry. The specific metrics for demonstrating “coolable core geometry” are not necessarily limited to a peak cladding temperature of 2200 degrees F and less than 17% local cladding oxidation, as required for breaks smaller than the TBS. Licensees could propose other criteria for assuring coolable core geometry if an adequate technical basis was provided to support the proposed criteria.

Licensees who perform LOCA analyses using the risk-informed alternative requirements may find that their plant designs are no longer limited by certain parameters from previous large-break analyses. The new analyses could enable licensees to propose a wide range of design or operational changes. However, the risk-informed § 50.46a option would establish risk acceptance criteria for evaluating all design changes that would be similar to the criteria for risk-informed license amendments in Regulatory Guide 1.174, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis.” Licensees could use the revised § 50.46a to optimize safety system design and setpoints in ways that could result in a net reduction in risk to public health and safety. However, the proposed rule would also allow licensees to make changes that result in small increases in risk. To control any risk increases, the proposed rule requires that the total increases in core damage frequency (CDF) and large early release frequency (LERF) are small and that plant baseline risk remains small.

¹ The proposed rule requires that licensees maintain the capability to mitigate these large breaks. However, in response to industry comments, the staff is considering if, and for how long, plants may operate in a configuration for which mitigation cannot be shown to be available for all LOCAs.

Summary of ACRS Issues and Recommendations

The recommendations in the November 16, 2006, ACRS letter on the § 50.46a rule raise the following issues:

Issue 1. What should be the basis for determining the adequacy of defense-in-depth and safety margins in reactor designs?

The ACRS letter recommends that adequate defense-in-depth and safety margins to account for unanticipated issues and other phenomena not addressed by risk analysis be based on engineering judgement and not on calculated risk significance (See ACRS letter, p. 2, ¶'s 3 & 4). The Committee said that it is acceptable to allow mitigation analyses for breaks larger than the TBS to exclude assuming the loss-of-offsite power and a single failure, but the staff's rule provides otherwise inadequate mitigation requirements for breaks larger than the TBS (See ACRS letter, p. 1, Rec. 1 & p. 3, ¶ 1). The ACRS also said that the staff's rule provides restrictions on the unavailability of the non-safety-related equipment needed to mitigate breaks beyond the TBS, but this equipment should be subject to requirements for special treatment and control (See ACRS letter, p. 3, ¶ 4). Further, the ACRS recommended that the staff's rule should increase confidence in the ability to mitigate breaks greater than the TBS by requiring licensees to submit the codes used for the analyses of breaks beyond the TBS to the NRC for review and approval (See ACRS letter, p. 3, ¶ 3).

Previously, the Commission directed the staff to determine defense-in-depth and safety margins for mitigating these breaks based on the frequency (i.e. risk significance) of LOCAs larger than the TBS. The Commission stated "The requirements of § 50.46a should be edited to remove the overly prescriptive regulatory treatment of beyond design basis LOCAs to be consistent with the low frequency of these events." (General Comment 1 on p. 1 of July 29, 2005 SRM on SECY-05-0052; ML052100416). The Commission also said, "The mitigation capabilities for beyond design basis events, and any changes to these capabilities, should be controlled by NRC requirements commensurate with the safety significance of these capabilities..." (See last ¶ on p. 1 of July 1, 2004 SRM on SECY-04-0037; ML041830412).

Staff Position:

The requirements for mitigating pipe breaks larger than the TBS reviewed by the ACRS in the draft final rule were based on the staff's interpretation of defense-in-depth direction provided by the Commission. The staff believes that the ACRS recommendation to establish defense-in-depth based on engineering judgement conflicts with previous Commission direction in that the Commission directed that defense-in-depth be based upon risk significance. The particular changes recommended by the ACRS are more conservative than the approach in the draft rule since they would result in additional requirements to increase assurance of mitigation capability for breaks larger than the TBS. The staff does not agree with the ACRS recommendations that thermal-hydraulic analysis methods used for beyond-TBS breaks should receive prior NRC staff approval and that additional special treatment requirements for equipment credited in beyond TBS analyses be included in the rule. The staff believes that risk significance of beyond TBS breaks is too low to warrant such additional requirements.

Issue 2. In determining the transition break size, should the staff also consider the following two factors: 1) the degree of assurance that breaks larger than the TBS can be mitigated, and 2) the potential benefits of a smaller TBS?

Staff Position:

The selection of the TBS was based primarily on the staff's interpretation of Commission direction that the frequency of pipe breaks should be the basis for the TBS. In addition, the staff believes that consideration of additional subjective factors such as "degree of assurance of defense-in-depth," or "potential benefits" in the determination of the TBS would result in a subjective, plant specific process for selecting each plant's TBS. The staff believes that consistency in application of such a process is unlikely and does not recommend implementation of this ACRS recommendation.

Issue 3. What should be the process and the acceptance criteria for determining the acceptability of changes in risk?

The ACRS letter states, "The interpretation that the Rule limits the total increase in core damage frequency (CDF) resulting from all changes in a plant that adopts the Rule to be "small" (i.e., $<1 \times 10^{-5}/\text{yr}$) represents a significant departure from the current guidance for risk-informed regulation and should be reviewed for its implications." (See ACRS letter, p. 1, Recommendation 3). The ACRS also observed that the change control process would allow changes that increases risk up to $1 \times 10^{-5}/\text{year}$ that would not require prior staff review and approval. The ACRS recommended that licensees should submit changes that are expected to increase risk by more than $1 \times 10^{-6}/\text{year}$ for prior staff review and approval (See ACRS letter, p. 3, ¶ 5).

The draft final rule relied on Commission direction to the staff to include a risk-informed change control process and specifying the scope of changes that should be included in that process. The Commission stated, "A change process for proposed plant changes using the rule should follow existing regulations and guidance, (e.g., 50.59 and 50.90, and RG 1.174) and should ensure that the review mechanisms for such changes provide for adequate NRC oversight." (See 3rd ¶ on p. 2 of July 1, 2004 SRM on SECY-04-0037). The Commission also said, "for licensees that use § 50.46a, the integrated, risk informed change process should be used for *all* [emphasis in the original] changes made under 50.59 or 50.90." (See General Comment 2 on p. 1 of July 29, 2005 SRM on SECY-05-0052.)

In addition to the above general guidance, the July 29, 2005, SRM on SECY-05-0052 included an attachment that provided a number of edits that should be made to the rule language. Several edits affected the change control process. Section (f)(2)(i) included the language, "[f]or changes reviewed and approved by the NRC under § 50.90, the total increases in core damage frequency and large early release frequency are small and the overall risk remains small. For changes that do not require prior NRC approval under 10 CFR 50.59, any increases in the estimated risk are minimal compared to the overall plant risk profile." Sections (f)(1) and (f)(6) included language that required that all changes to a facility, technical specifications or procedures be made by requesting a license amendment under §50.90 unless otherwise permitted under §50.59. The proposed rule included requirements consistent with the SRM direction. Instead of requiring all changes to the facility to be made under §50.59 or §50.90, the draft final rule continued to rely on the existing regulations to specify how changes must be

made but required that all changes to the facility must be risk-informed. As stated by the ACRS, the draft final rule limits the total increase in core damage frequency resulting from all changes at a facility that adopts the rule to a “small” increase. Regulatory Guide 1.174, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis” recommends that the total increase from all related changes not exceed a “small” increase. The departure from RG 1.174 guidance was proposed by the staff as the best alternative that combined the Commission direction that the change process follow existing regulations and guidance, that all changes need be risk informed, and that the “total” increases in CDF and LERF are small and the overall risk remains small.

The ACRS recognized that the draft final rule would allow some changes that increase risk up to 1×10^{-5} /year without prior staff review and approval as long as the total increase did not exceed 1×10^{-5} /year. Regulatory Guide 1.174 provides guidance on the use of probabilistic risk assessment (PRA) findings and risk insights in support of licensee requests for changes to a plant’s licensing basis. It does not address licensee-initiated changes that do not require NRC review and approval and provides limited guidance on use of risk-insights when a licensee does not make a risk-informed submittal. The draft final rule proposed by the staff required a risk-informed evaluation of all potentially risk significant changes before the change is implemented, but continued to rely on existing regulations (e.g., § 50.59 and § 50.55a) to identify what changes should be submitted for prior staff review and approval. The staff did not propose an additional risk-informed criterion because the staff believed that the controls established by the draft rule in combination with existing regulations make it unlikely that licensees could make risk-significant changes without prior staff review and approval.

Staff Position:

The staff concurs with ACRS conclusion that the rule would be strengthened by addressing the issues raised in the ACRS letter. The two issues discussed above relate to the use of risk in the change control process. The Committee’s concern that the rule departs significantly from RG 1.174 guidance can be resolved without conflicting with Commission direction by identifying the population of related changes as is done in other risk-informed applications. The ACRS proposal to apply existing guidelines in RG 1.174 to identify what changes must be submitted for staff review will not conflict with Commission direction if the scope of changes that must be evaluated against this criterion is consistent with existing regulations.

Issue 4. Should promulgation of the rule be delayed until updated cladding oxidation acceptance criteria for higher burnup fuel can be included?

In its letter the ACRS said, “It is likely that with this rule, the NRC will find requests for additional power uprates at pressurized water reactors (PWRs) acceptable. However, the uprates will clearly decrease safety margins, even for breaks below the TBS. The rule currently contains acceptance criteria for fuel cladding performance under LOCA conditions based on the current 10 CFR 50.46. The Office of Nuclear Regulatory Research is now completing an examination of the adequacy of these criteria for high-burnup fuel. The adequacy of the acceptance criteria for cladding performance is important to maintain adequate safety margins. The rule should not be finalized until the fuel cladding acceptance criteria for LOCAs involving breaks at or below the TBS are reviewed and/or revised to assure their adequacy for the higher burnup fuel and more demanding conditions of current reactor operating conditions. Alternatively, the acceptance criteria in the rule could be expressed in terms of general requirements, such as a

high degree of confidence in maintaining a coolable geometry and retaining some ductility in the cladding. Specific cladding and core criteria could be placed in the associated regulatory guide."

If the technical basis report does not indicate an immediate safety concern, this rulemaking would be implemented via the normal process which would provide the Commission with a final rule in 2009.

Staff Position:

The staff agrees with the ACRS view that it is preferable to complete the review and revision of the fuel cladding acceptance criteria for LOCAs involving breaks at or below the TBS before finalizing the § 50.46a rulemaking. Such an approach would assure that the issue of adequate safety margin with regard to cladding oxidation is addressed in a generic, structured rulemaking prior to any potential implementation under § 50.46a. This is a logical sequence because changes proposed by licensees adopting § 50.46a will likely result in more demanding reactor operating conditions that may further stress the fuel, or result in small break LOCAs becoming limiting. In addition, the trend toward higher fuel burnups where oxidation effects are most pronounced is expected to continue. Thus cladding safety margin considerations are likely to be important issues in § 50.46a applications.

Although proceeding with the § 50.46a rulemaking by incorporating general cladding acceptance criteria could also be considered, resolution of safety margin questions would then be on a plant specific basis. Plant specific resolution is likely to complicate consistency in the regulatory process. In addition, incorporating general criteria in the near term would also result in the need for a subsequent rule change to § 50.46a when the cladding rulemaking is completed.

Accordingly, the staff agrees with the ACRS that assuring the adequacy of the cladding oxidation criteria before implementing the § 50.46a rulemaking is a more appropriate approach for assuring that adequate safety margins are maintained and for assuring consistency in rule implementation. The current rulemaking schedule for the revised cladding acceptance criteria could result in a delay of several years in issuing of the revised § 50.46a.

Issue 5. Should the rule include a requirement that licensees demonstrate that the results in NUREG-1829 are applicable to their plants?

The ACRS stated, "Although the Rule defines TBSs for BWRs and PWRs, licensees should not presume that these automatically apply to all plants. As part of the adoption of the rule, licensees should have to demonstrate that the results in draft NUREG-1829 are applicable to their plants. The staff should provide guidance for this demonstration in the associated regulatory guide. As part of this demonstration, licensees should demonstrate that the reactor coolant system piping of diameter corresponding to the TBS or larger meets the deterministic requirements currently used to credit leak-before-break for dynamic analysis of reactor coolant piping." (See ACRS letter, p. 4, ¶ 4 & p. 5, ¶ 1).

The staff notes that NUREG-1829 does not provide explicit guidance as to what plant-specific attributes would be considered "key" to ensuring that the NUREG's findings were applicable to

an individual plant thus, implementing this ACRS recommendation would require the staff to develop explicit implementation guidance.

Staff Position:

The staff agrees that the rule should require licensees to justify that the generic NUREG-1829 results are applicable to their plants. The justification could require that licensees verify that plant construction, operation, inspection, and maintenance practices meet the explicit and implicit assumptions which are the foundation of the NUREG-1829 results. The staff plans to develop regulatory guidance which will provide one acceptable method for licensees to provide this justification. However, counter to the ACRS recommendation, the staff does not believe that licensees should be required to demonstrate that deterministic requirements currently used to credit leak-before-break are met for reactor coolant piping having a diameter corresponding to or larger than the TBS. The leak-before-break (LBB) tolerance of large diameter reactor coolant piping was explicitly considered during the expert elicitation summarized in NUREG-1829. Specifically, the experts recognized that large diameter piping that is fabricated, inspected, maintained, and operated under existing regulations demonstrates increased LBB tolerance. The licensee justification described above will provide assurance that each specific plant retains this tolerance without requiring specific LBB calculations for piping equivalent to or larger than the TBS.

Issue 6. Should promulgation of the rule be delayed until after the ACRS has reviewed the staff's resolution of public comments on draft NUREG-1829?

The ACRS letter noted that the staff is revising draft NUREG-1829 to incorporate, as appropriate, the changes resulting from the resolution of public comments. The Committee recommended that the revision should be completed prior to issuing the revised rule (See ACRS letter, p. 5, ¶ 2).

Staff Position:

The current staff schedules for NUREG-1829 and for the § 50.46a rule are consistent with this ACRS recommendation. The schedule for incorporating changes, as appropriate, resulting from the resolution of public comments, and finalizing NUREG-1829 is August 2007. The staff plans to schedule both subcommittee and main committee ACRS meetings in the fall of 2007 to discuss the resolution of public comments and summarize the contents and findings of NUREG-1829. Additional ACRS meetings may be held in the spring of 2007 to provide the Committee with an overview of NUREG-1829. The current schedule should allow the ACRS ample time to review NUREG-1829 to evaluate this component of the technical basis, and understand how the results have been utilized in developing the revised rule. Under the currently proposed schedule for completing the § 50.46a rulemaking, the ACRS would review the final rule in 2008 or 2009, depending upon whether the rule is repropounded for additional public comments.

Issue 7. Should the final rule be delayed until after the ACRS has reviewed the staff's seismic study and should the rule require licensees to demonstrate that the results developed by the staff bound the likelihood of seismically induced failure in their plants?

The ACRS observed that as part of its effort to establish the TBS, the staff performed a study of the likelihood of seismically induced failures in unflawed piping, flawed piping, and indirect failures of other components and component supports that could lead to piping failure. The study focused on piping systems in PWRs east of the Rocky Mountains. The ACRS recommended that the Committee should complete its review of the staff's study in this area before the final rule is issued. Specifically, because seismic hazards are very plant specific, the ACRS recommended that licensees adopting the rule be required to demonstrate that the results developed by the staff bound the likelihood of seismically induced failure in their plants. For unflawed piping, the results of the individual plant examination of external events (IPEEE) program may provide the needed information. Licensees may have to perform additional calculations to demonstrate a comparable robustness of flawed piping. (See ACRS letter, p. 5, ¶ 3).

Staff Position:

The staff agrees that the final § 50.46a rule should not be issued before the ACRS reviews the staff's seismic study. The need for the plant-specific analyses suggested by the ACRS will be addressed as a part of that review. The staff currently plans to discuss the study with the ACRS in the summer of 2007. This schedule is consistent with the ACRS recommendation.

Resource Estimate to Address ACRS Issues and Complete Rule

Issue No. or Activity	Issue Summary/Description	FTE
1.a	What should be the basis for determining the adequacy of defense-in-depth and safety margins in reactor designs?	0.1
1.b	Non safety equipment needed for beyond TBS needs special treatment and controls.	0.3
1.c	Require staff review of codes used for beyond TBS breaks	0.1
2.	More defense-in-depth would allow smaller TBS - (Included in Issue 1)	-
3.	What should be the change process and acceptance criteria for determining the acceptability of changes in risk?	0.9
4.	Wait for revised cladding acceptance criteria before issuing final rule (assumes cladding acceptance criteria rule budgeted separately)	0.1
5.	Licensee must demonstrate applicability of NUREG 1829 to each plant (See Note 3)	0.5
6.	Don't issue rule until NUREG 1829 is finalized.	0.3
7.a	ACRS should complete its review of seismic report before the final rule is issued.	0.2
7.b	Licensees must demonstrate applicability of seismic report to each plant.	0.4
7.c	Licensees must demonstrate robustness of flawed piping	0.4
	Rulemaking project management activities	2.1
	Regulatory guide coordination	0.5
	Total :	5.9

Notes:

1. Estimates assume that no complex regulatory guides will be needed for seismic analyses, special treatment requirements or plant specific applicability of NUREG-1829.
2. The FY 2007 budget includes 0.7 FTE to address aspects of issues 6 and 7. No additional resources are currently budgeted for this rulemaking activity.
3. Contractor support costing \$250K is also needed to develop regulatory guidance for this issue.

NON-CONCURRENCE PROCESS

SECTION A - TO BE COMPLETED BY NON-CONCURRING INDIVIDUAL

TITLE OF DOCUMENT Rulemaking Commission Paper on 50.46a, ECCS Requirements	ADAMS ACCESSION NO. ML070180692
DOCUMENT SPONSOR NRR	SPONSOR PHONE NO. 415 1116
NAME OF NON-CONCURRING INDIVIDUAL Gary M Holahan	PHONE NO. 415 1897

DOCUMENT AUTHOR
 DOCUMENT CONTRIBUTOR
 DOCUMENT REVIEWER
 ON CONCURRENCE

TITLE Deputy Director	ORGANIZATION Office of New Reactors
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REASONS FOR NON-CONCURRENCE

Summary:

I can not support the proposed approach in the Commission paper since I conclude that it recommends delaying in a safety-beneficial, risk-informed, burden-reducing, safety-focused activity which is consistent with Commission direction and policy. In addition, by presenting only options to delay or terminate the rulemaking, the paper does not present the full range of the Commission's options. For example, the paper does not address the obvious option of proceeding to a final rule consistent with the Commission's proposed rule, ACRS views notwithstanding.

In my view, what needs to be done is very simple and it does not require a Commission options paper. I believe that the staff should proceed with a final rule package informing the Commission that none of the ACRS recommendations are sufficiently important to delay the rulemaking. The staff should also inform the Commission of how it would proceed to resolve the ACRS recommendations in a expeditious manner, if that is what the Commission desires.

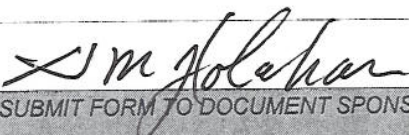
Discussion:

The proposed Commission paper on 50.46(a) states that its purpose is "to inform the Commission of the impact of the Advisor Committee for Reactor Safeguards (ACRS) recommendations on the draft final rule ...". This statement is misleading at best. The proposed paper includes options for delaying or terminating the rulemaking bases in large part on a change in the staff's perception of the safety benefits of the rule. Let us be clear and straightforward. The ACRS letter contains not one single word on reduced expectations for safety benefits and nowhere does it even suggests terminating the rulemaking. Those ideas stem from staff members opposed to risk-informing ECCS requirements. They were opposed before the Commission directed the rulemaking to be done and they remain opposed to it now. Attributing those issue to ACRS is incorrect.

Continued on Page 2 and 3

CONTINUED IN SECTION D

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SECTION D: CONTINUATION PAGE

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I support expedited resolution of the ACRS recommendations as part of the rulemaking comment resolution process and I continue to support expedited staff action to provide the Commission with a draft final rule as soon as possible. I support these actions for two simple reasons. First, the Commission directed the staff to do so, more than once, and I take those directions seriously. The paper repeatedly refers to Commission directions in SRMs as "Commission guidance". I do not consider "Commission direction" and "Commission guidance" to be interchangeable concepts.

Second, I continue to believe that this rulemaking will result in: safety enhancements, some large and some small; reductions in unnecessary and undesirable regulatory burdens; re-focused staff and licensee attention to more risk significant issues. In addition, I believe that the rule change would enable safe and secure power uprates. I see all of these as fully consistent with the Commission's mission, strategic plans, policies and directions.

In its November 16, 2006 letter to the Commission, the ACRS presented its three recommendations on the proposed ECCS rule. That letter also discussed several other topics and included two additional ACRS member comments. Although I do not agree with many of the ACRS recommendations, I do respect the fact that the Committee evaluated the technical issues objectively and presented thoughtful bases for their recommendations, and that they did so in a timely manner. Five months later and the staff appears to have made little progress in addressing those technical recommendations. In addition, the staff appears to have lost sight of the remaining steps in the rulemaking process. Rather than focusing on the resolution of the ACRS recommendations, as part of the comment resolution stage of rulemaking, the staff began a reassessment of the purpose of the rule, its potential benefits, its priority and its schedule. In my view those are all settled issues, having been covered in one or more of the Commission's Staff Requirements Memoranda. So why are they being raised now?

It is clear that some in the staff do not support risk-informing the ECCS or other regulatory requirements. I understand those views and I support the staff's right to hold and express them; but I can not support those staff member who are substituting their views for the Commission's directions. I see the staff efforts to revisit the safety benefits of the rulemaking and to establish a "staff's revised scheduling priority" in place of the Commission's schedule, as diversions from simply resolving comments during the comment resolution stage. In addition, the discussion of a lack of resources is simply unconvincing. The staff regularly find resources for activities it values. That is what the PBPM process is for. The staff doesn't appear to value completing the 50.46(a) rulemaking.

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Although, it is not really relevant to completing the comment resolution process, I must react to the discussion in the Commission paper on safety benefits . That discussion is, at best, an incomplete presentation of the facts. It is true that the industry did a particularly poor job of identifying safety benefits. And it is true that most of the safety benefits are probably intangible or unquantifiable. The value of having regulatory requirements which are consistent with the risk-informed elements of the Reactor Oversight Process is one such example. Focusing staff and licensee attention on more safety significant issues is another. Unquantifiable does not mean valueless. In addition, the quantitative example that is presented in the Commission paper (showing a 9% reduction in core damage frequency for some PWR designs) addresses only one issue, that is, relaxed requirements for containment sprays, and the 9% is presented as relatively small improvement for only a few plants. In fact, the same report that presents the 9% reduction in core damage frequency shows that the total core damage frequency for all LOCAs is less than 14%. The "9% reduction" really means that the 14% contribution would be reduced to less than 5% ... a 60% reduction in all LOCA-related risk, and that from just one change. In other areas the benefit is generally small because the risks are already so low. In my view, these are hardly a basis for reduced priority.

I would be glad to meet and further discuss these views and recommendations with any interested parties.

Gary Holahan

NON-CONCURRENCE PROCESS

TITLE OF DOCUMENT *Rulemaking Commission Paper on 50.46 a* ADAMS ACCESSION NO. *ML070180692*

SECTION B - TO BE COMPLETED BY NON-CONCURRING INDIVIDUAL'S SUPERVISOR

NAME *Richard W Borchardt*

TITLE *Director* PHONE NO. *415 1897*

ORGANIZATION *Office of New Reactors*

COMMENTS FOR THE DOCUMENT SPONSOR TO CONSIDER

- I HAVE NO COMMENTS *
- I HAVE THE FOLLOWING COMMENTS

** Based on earlier discussion of issues with Mr. Borchardt.*

R.W. Borchardt 5.7.07

CONTINUED IN SECTION D

SIGNATURE *[Signature] for RWS* DATE *5/24/07*

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TITLE OF DOCUMENT

Rulemaking Commission Paper on 50.46a

ADAMS ACCESSION NO.

ML070180692

SECTION C - TO BE COMPLETED BY DOCUMENT SPONSOR

NAME

John Grobe

TITLE

Assoc. Dir. for Engin. and Safety Systems

PHONE NO.

301-415-1274

ORGANIZATION

NRR

ACTIONS TAKEN TO ADDRESS NON-CONCURRENCE

Response to non-concurrence by document sponsor

As previously discussed, the consensus view of the staff is that several of the ACRS recommendations warrant technical evaluation and resolution prior to finalizing the rule. With regard to potential safety benefits, the staff believes that additional information has been developed through the rulemaking process that was not available when the Commission previously provided direction regarding this rule. Industry estimates have shown only limited potential for safety benefits.

The staff consensus is aligned with Mr. Holahan that the draft final rule would allow licensees to pursue NRC review and approval of safe and secure power uprates. The staff also agrees with Mr. Holahan that "Commission guidance" and "Commission direction" are not interchangeable concepts. In response to this comment, the staff has modified the SECY paper to utilize the more accurate term "direction" in several instances.

To determine the priority for additional staff effort necessary to appropriately address the ACRS concerns, the staff utilized the Common Prioritization Methodology for NRC Program Offices¹. This process was established to ensure that the relative merit of various staff activities was judged on a common basis and has been used for several years to ensure that funding for rulemaking activities is properly prioritized. The staff determined under the prioritization process that this rulemaking activity is "medium" priority.

The Commission has the opportunity to evaluate the staff's recommendation and provide appropriate direction.

¹ See August 29, 2005, memorandum from Cynthia A. Carpenter, Office of Nuclear Reactor Regulation, to William M. Dean, Office of the Executive Director for Operations and to Leslie W. Barnett, Office of the Chief Financial Officer (ML052370186).

NON-CONCURRING INDIVIDUAL (To be completed by document sponsor):

- CONCURS
- NON-CONCURS
- WITHDRAWS NON-CONCURRENCE