

**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 50.46a<sup>1</sup>, "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

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<sup>1</sup> 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 medium<sup>2</sup>. 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.

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<sup>2</sup> 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).

This option is the most supportive of the Commission's policy to increase the use of probabilistic risk assessment<sup>3</sup> in all regulatory matters.

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.

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

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.

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Luis A. Reyes  
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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)



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\*SEE PREVIOUS CONCURRENCE

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<b>OFC</b>	DPR	TechEd	D/DPR	DPR/PFPB	D/DE	D/DSS	D/DCI	D/DRA
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<b>DATE</b>	05/03/07	01/23/07	05/02/07	05/03/07	05/02/07	05/02/07	05/02/07	05/02/07
<b>OFC</b>	OGC	OCFO	RES	D/NRO	D/NRO	D/NRR	EDO	
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