

June 26, 2003

MEMORANDUM TO: Brian E. Thomas, Acting Program Director
Policy and Rulemaking Program
Division of Regulatory Improvement Programs, NRR

FROM: Peter C. Wen, Project Manager */RA/*
Policy and Rulemaking Program
Division of Regulatory Improvement Programs, NRR

SUBJECT: SUMMARY OF JUNE 9, 2003, MEETING WITH THE NUCLEAR
ENERGY INSTITUTE REGARDING RISK-INFORMED CHANGES
INVOLVING 10 CFR 50.46

On June 9, 2003, the Nuclear Regulatory Commission (NRC) staff held a public meeting with the Nuclear Energy Institute (NEI) and other interested stakeholders at NRC headquarters to solicit industry's input to identify issues that require resolution for rulemaking on risk-informed changes involving 10 CFR 50.46. The staff called the meeting after receiving the March 31, 2003, staff requirements memorandum (SRM) in response to SECY-02-0057. The meeting attendees are listed in Attachment 1. Handouts used by the staff and NEI during the meeting are included in Attachment 2.

The meeting primarily focused on subjects related to the large-break loss-of-coolant accident (LBLOCA) redefinition and emergency core cooling system (ECCS) reliability. In its March 31, 2003 SRM, the Commission directed the staff to accelerate both the technical basis work and the rulemaking efforts such that a proposed rule to provide a voluntary risk-informed alternative maximum break size would be delivered at the same time as completion of the technical work in March 2004. In the same SRM, the Commission also approved the staff's recommendation for a rulemaking to relax the current requirement of the consideration of an LBLOCA coincident with a loss of offsite power (LOOP), with a date for a proposed rule in July 2004.

The major points offered by various industry groups and the staff on the discussion subjects are as follows:

BWR Owners Group (BWROG) discussed its ideas for making risk-informed changes to ECCS reliability requirements:

- BWROG plans to submit an outline of its topical report, "Separation of LBLOCA from LOOP," for staff review in July this year, and to submit the final report in fall 2003, with a lead plant to request GDC 35 exemption in accordance with 10 CFR 50.12.
- BWROG wishes to continue its activity in parallel with the staff's rulemaking activities, not to wait for the final product of the rulemaking.
- BWROG indicated that its topical report would cover the majority of BWROG member plants. This will simplify individual plant submittals and NRC reviews. However, any plant can request a specific change that is not covered by the topical, provided they supply the necessary justification.

Westinghouse Owners Group (WOG) discussed its ideas regarding the LOCA redefinition:

- WOG plans to use the leak-before-break (LBB) technology to support the selection of an alternative maximum break size to be used in the licensees' design basis evaluation.
- WOG plans to submit its topical report with pilot plant requesting exemption from the current regulation in July 2004.
- WOG will continue to support the staff's rulemaking activities regarding the LOCA redefinition to revise a design basis LBLOCA and Appendices A and K to 10 CFR Part 50.
- WOG believes that the approval and implementation of the proposed changes will have benefits to industry for issues associated with diesel generator and ECCS start times, accumulators, boron concentration, fan coolers, ultimate heat sink temperature limits, fuel peaking factors, power uprates, and PWR sump issues.

NEI provided high-level objective views on the 50.46 rulemaking activities. NEI emphasized the importance of the "deliverable products" and the process to be used to complete the task. At the present, NEI has no plans to develop the implementation guidelines. NEI identified five areas that it believes need further discussion and clarification:

- Rule Attributes: General attributes of the rule need to be determined. The industry and the staff need to determine whether the rule is a general rule or a specific rule (e.g., list of changes allowed or disallowed). The discussion should include advantages and disadvantages of various options along with schedule and implementation impacts.
- PRA Scope: This subject was not discussed in detail during the meeting. However, the industry pointed out that PRA scope should be commensurate with the application, not the "price for admission."
- "Best Estimate": The term "best estimate" needs further definition, including its role in rule development, plant-specific applications of the rule, new design basis analyses, and analysis of new "beyond design basis analysis." The use of "best estimate" is likely to be different for new plants than for current plants.
- Nature of New Design Basis Analysis: The roles of "new design basis" and "new beyond design basis" need to be further discussed.
- Scope of Allowed Changes: Further clarification and definition of allowed changes are needed. Resolution would be helped by a better definition of "continued capability to mitigate accidents."

The NRC staff has analyzed the March 31, 2003 SRM to identify the Commission's direction for the rulemaking. The staff distributed a handout (Attachment 2) which contained several SRM topics for consideration and discussion at future meetings. These topics included "risk cutoff" for defining the maximum LOCA size, "reversibility" of a new rule, demonstration of "ECCS functional reliability," the "configuration controls," and PRA scope and standards.

Continued interaction between industry groups and other interested stakeholders and the staff on this program is anticipated. The next meeting is planned for sometime in July 2003. NEI will send in advance the topics it wishes to be discussed.

Representatives of the NRC and the industry agreed that this meeting had been useful for the exchange of information on the discussion topics. Having completed discussion of the agenda items, the meeting was adjourned.

Project No. 689

Attachments: As stated

cc w/att: See next page

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NRC/NEI Meeting on Risked-Informed Changes Involving 10 CFR 50.46
List of Attendees
June 9, 2003

<u>NAME</u>	<u>ORGANIZATION</u>
Steve West	NRR/DRIP/RPRP
Eileen McKenna	NRR/DRIP/RPRP
Peter Wen	NRR/DRIP/RPRP
Glenn Kelly	NRR/DSSA/SPSB
Mark Caruso	NRR/DSSA/SPSB
Frank Orr	NRR/DSSA/SRXB
Mark Kowal	NRR/DSSA/SRXB
Len Ward	NRR/DSSA/SRXB
Simon Sheng	NRR/DE/EMCB
Jim Lazevnick	NRR/DE/EEIB
Paul Rebstoch	NRR/DE/EEIB
Nilesh Chokski	RES/DET/MEB
Rob Tregoning	RES/DET/MEB
Karen Gott	RES/DET/MEB
Mary Drouin	RES/DRAA/PRAB
Hossein Hamzehee	RES/DRAA/PRAB
John Lane	RES/DRAA/PRAB
Arthur Buslik	RES/DRAA/PRAB
Steve Bajorek	RES/DSARE
Dae-Wook Chung	RES
Rick Croteau	OCM/NJD
John Jolicoeur	OEDO
Mike Snodderly	ACRS
Ralph Caruso	ACRS
Tony Pietrangelo	NEI
John Butler	NEI
Adrian Heymer	NEI
Mike Schoppman	NEI
Tim Abney	TVA-Browns Ferry
Tiny Browning	NMC-Duane Arnold
Wayne Harrison	STPNOC
John Gaertner	EPRI
Bob Jaquith	Westinghouse
Nancy Chapman	Serch Bechtel
Deann Raleigh	LIS Scientech
Bert Dunn	FANP
Dave Bajumpsa	Dominion

SRM Direction	Staff Understanding	Implications and Issues
<p>The staff must establish the appropriate risk “cutoff” for defining the maximum LOCA size.</p> <p>(SRM p. 2)</p>	<p>The staff must decide and put in the rule or a supporting document what risk-informed metric and what value(s) of the metric are appropriate for determining the size of LBLOCA that should be in the design bases.</p> <p>The metric should be chosen to account for uncertainties in the PRA analysis. The rule requirements must also satisfy other RG 1.174 principles such as defense-in-depth.</p> <p>The SRM suggests that the risk criteria might be some fraction of baseline risk (either for LOCA or total), rather than being an absolute value for either increase in risk resulting from implementation, or the new baseline risk after redefining LOCA. However, as noted elsewhere, staff has the latitude to propose the metrics and acceptance criteria.</p> <p>The solution suggested by the Commission for a cut-off, based on some fraction of baseline risk, has significant implementation difficulties and limitations and is not favored by the staff.</p> <p>Robust fire, flood, and shutdown PRAs will be needed if the metric is based on the total CDF/LERF. If the metric requires an estimate of the total change in CDF/LERF, robust fire, flood, and shutdown PRAs will also be needed to include the impacts on non LBLOCA accident sequences caused by the changes enabled by moving some LBLOCAs outside the design basis.</p>	<p>Selection of a cut-off value for the metric need not be derived from some first principle. An effective metric and cutoff may be selected based on engineering judgement. Once a risk metric and cut-off value are chosen (e.g., RG 1.174 values, the suggested percentages), the bounding pipe failure frequency metrics will be back-calculated from the risk metric. This would require a plant-specific, level-2 PRA including internal and seismic events. Depending on the metric chosen, it does not appear that fire or flooding risk assessments would be necessary for back calculation of LBLOCA frequencies. Shutdown PRAs are not useful for back calculation because they are highly dependent on plant configuration during outages.</p> <p>An estimate of risk from all contributors, including all modes, is needed.</p> <p>Guidance would be needed on how to meet the acceptance criteria.</p> <p>Use of CDF, LERF (and deltas) as metrics would be consistent with RG 1.174 process, the safety goals, and other guidance documents.</p> <p>This sets precedent for how a licensee goes about removing an SSC from the design bases and perhaps from the regulations. We must understand the implications not only for changes to LBLOCA but for other potential changes in the future.</p>

SRM Direction	Staff Understanding	Implications and Issues
<p>The staff should prepare a proposed rule change that allows for a risk-informed alternative to the present maximum LOCA break size (redefine the design-basis LOCA).</p> <p>The rule should be very specific, ensuring that pertinent risk parameters are addressed...</p> <p>(SRM p.2)</p>	<p>SRM directs a rule that “allows for” a possible alternative to the maximum break size (double-ended largest pipe). SRM suggests rule language on LOCA “re-definition”, but staff has the latitude to propose language that would accomplish the intent without accepting the specific proposal. Further direction focuses upon “risk parameters” and directs staff to determine a risk cutoff, but rule could be structured many different ways.</p> <p>Break sizes whose risk contribution meets the “cutoff” criteria would no longer be within the design basis, and thus no longer need to show that 50.46 criteria are met for those sizes, under required design basis conditions. Special requirements (e.g., “safety-grade”) placed upon SSCs needed to mitigate what are no longer design basis accidents might be relaxed. Operational flexibility might be provided for plant features that respond to this range of break sizes - TS, diesel start time, etc. Flexibility in special requirements and operational aspects of SSCs may be limited by the continuing needs to prevent and mitigate LOCAs below the new LBLOCA size(s) as well as the requirements placed on the equipment by other initiators such as transients, floods, fires, and seismic events.</p> <p>The staff reads the SRM as directing the rulemaking be primarily limited to 50.46 unless directly required to fulfill the intent of risk-informing the regulation of LBLOCA size.</p>	<p>Key question to determine is the scope of applicability of the alternative break size. Commission intent could be read as being broader than 50.46 in some respects (“throughout Part 50), assuming appropriate acceptance criteria are met. [McGaffigan vote refers specifically to 50.46(c), and to “for use in ECCS accident analysis” but Diaz (and SRM) refers to “throughout Part 50” and containment capabilities].</p> <p>The rule or supporting documents may need to specify what acceptable changes can be made or set limits on what sort of changes can be made through this rule (SRM direction is that redefinition does not extend to every aspect for which LB-LOCA impacts design).</p> <p>There may be significant resource issues in implementation. Licensee submittals may require significant review and each plant could end up with a different LBLOCA size in its design bases.</p> <p>Implementation process may need to be different for applicants.</p>

SRM Direction	Staff Understanding	Implications and Issues
<p>..proceed with rulemaking as an option to... relax the current requirements for consideration of a large-break LOCA coincident with a LOOP.</p> <p>(SRM p.4)</p>	<p>Commission wishes to relax operational requirements that arise from the low-frequency LOCA/LOOP scenarios as required by GDC 35. The LOCA frequency estimations currently being developed by expert elicitation would be used. Decision rationale would be similar to that for “redefinition” (i.e., risk associated with the LOCA, and available mitigation).</p> <p>Staff has latitude to propose rule language that would accomplish the Commission’s intent.</p>	<p>This rulemaking overlaps in some respects with the “redefinition” rulemaking; does it make sense to keep as a separate task (on a longer schedule)?</p> <p>Coincident LOCA/LOOP must be dealt with on a plant-specific basis due to significant differences in grid stability, in agreements between the licensee and the grid operator, and in plant equipment.</p> <p>Need to determine the role of the BWROG exemption request in the rulemaking process as it goes forward.</p>

SRM Direction	Staff Understanding	Implications and Issues
<p>Operational changes should be reversible if the re-estimation results in unacceptable LOCA frequency increases.</p> <p>(SRM p. 1)</p>	<p>If either the 10-year re-estimation or other industry experience provides information that the previous estimates of LOCA frequency are no longer bounding, the staff must evaluate the impact and require appropriate action.</p> <p>The rule must specify that utilities will be responsible for reversing any change implemented as a result of the rule or for reducing the effect of these changes on the metric, without a cost-benefit analysis under 50.109, if the risk of LOCAs (or other metric decided upon) is found to exceed the metric's acceptance criteria. Some or all of the break sizes previously removed (or changes implemented) may have to be restored to the design basis (or other risk reductions must be undertaken) .</p>	<p>"Reversibility" is a new approach to regulation. May pose some legal issues.</p> <p>This approach may reduce licensee interest due to uncertainty about benefits arising if reversibility arises, especially if licensees do not leave themselves enough margin.</p> <p>"Operational" may need to be defined. Changes such as re-sequencing the diesel loading appears to be an operational change but is accomplished by design and hardware changes similar to, but of a different degree, than removing a pump. It will be difficult to develop definitions of reversible and operational that will limit the type of changes the licensee can make. Alternatively, acceptance criteria would need to be included to define what are acceptable changes.</p> <p>Staff would propose that rule would allow licensee to either reverse these changes or define compensating risk-reduction changes.</p>

SRM Direction	Staff Understanding	Implications and Issues
<p>..proceed with rulemaking to risk-inform the ECCS functional reliability requirements in GDC 35 ... (SRM p.4)</p> <p>...changes in hardware and operation would require that it be demonstrated that the ECCS functional reliability is commensurate with the frequency of accidents in which ECCS success would prevent core damage or a large early release. (SRM p.3)</p>	<p>For any changes made to the plant through this rule, the licensee must demonstrate to the NRC that the ECCS functional reliability (i.e., the ability of the ECCS, as modified, to “mitigate” the event, including consideration of the reliability of the equipment) is commensurate with the frequency of accidents that the ECCS prevents or mitigates (includes LOCA and non-LOCA events). If the event frequency were expected to be very low, the reliability (including availability) of the equipment need not be as high as it would if the event were to occur more frequently. Similarly, if the event frequency were expected to be very low, the meaning of “mitigation” may be relaxed for example by allowing some core damage, but not significant damage or vessel breach.</p>	<p>Details of what is meant by functional reliability could go in a RG.</p> <p>Is there a need for additional requirements either for enhanced maintenance rule monitoring or for PRA updating, or for an ongoing process (in addition to the 10 year frequency update) to keep the decisions valid.</p> <p>Is “demonstration” provided by the results of an acceptable PRA that shows that the operational changes meet the acceptance criteria?</p> <p>If reliability criteria for ECCS systems were applied in addition to the risk criteria, it might result in appropriately limiting functional changes to ECCS equipment.</p>

SRM Direction	Staff Understanding	Implications and Issues
Staff should consider the full range of contributors to LOCAs, even if not actual pipe breaks (SRM p.2)	The staff is required to consider both pipe break and non-pipe break LB LOCAs when assessing possible design basis changes.	Since risk-informed regulation is a two-edged sword, does this mean that SG manway failure or other non-pipe breaks may need to be added to the design bases if their frequency is higher than some criterion?
The redefinition of the LBLOCA would also require strict configuration controls... (SRM p.3)	<p>As noted above, configuration controls play an important role in managing risk during shutdown and low power operations.</p> <p>See also discussion about “functional reliability”</p>	

SRM Direction	Staff Understanding	Implications and Issues
<p>The redefinition would require a high quality PRA, including low power and shutdown operations.</p> <p>Once the appropriate standards are in place, the PRA should be a level 2 internal- and external-initiating event all mode PRA, which has been subjected to a peer review process and submitted to and endorsed by the NRC. (SRM p. 3)</p>	<p>Licensees using the redefinition of LBLOCA must have a level 1 and 2, full PRA including internal and external events as well as low power and shutdown operations. The PRAs, when complete, are to be peer reviewed and then submitted to NRC for its approval. The NRC should provide guidance on how complete PRAs will be used under this rule if a complete set of PRA standards (e.g., for shutdown and all external events) does not exist at the time of promulgation.</p>	<p>Required: Standards and staff review guidance for a complete PRA.</p> <p>Typically, the staff reviews and determines the acceptability of PRAs to support specific licensing requests, but does not “endorse” PRAs.</p> <p>Standards for Internal event PRA released but not yet endorsed by staff. Other standards are under development, but will not be available when rule is complete, and thus staff reviews may be extensive.</p> <p>Staff has insufficient resources at this time to perform reviews that will determine if the PRAs are capable of providing insights as the basis for changing fundamental parts of 10CFR50. Potentially very large resources would be required. It is not clear what is the minimum level of review that will be required by the NRC to assure the PRAs are adequate for the application specific to 10CFR50.46 or to future changes to other parts of 10CFR50.</p>

Meeting Handout by NEI

- Option 3 Rulemaking Goal
- Top 5 “Areas Needing Further Discussion/Definition”
 1. Rule Attributes
 2. PRA Scope
 3. “Best Estimate”
 4. Nature of New DB Analysis
 5. Scope of Allowed Changes