

July 7, 2004

MEMORANDUM TO: ACRS Members

FROM: Michael Snodderly, Senior ACRS Staff Engineer */RA/*

SUBJECT: CERTIFICATION OF THE MINUTES OF THE MEETING OF THE
 ACRS SUBCOMMITTEE ON REGULATORY POLICIES AND
 PRACTICES, APRIL 1, 2004 - ROCKVILLE, MARYLAND

The minutes of the subject meeting, issued June 24, 2004, have been certified as the official record of the proceedings of that meeting. A copy of the certified minutes is attached.

Attachment: As stated

electronic cc: J. Larkins
 H. Larson
 S. Duraiswamy

June 24, 2004

MEMORANDUM TO: W. J. Shack, Chairman
Regulatory Policies and Practices Subcommittee

FROM: M. R. Snodderly, Senior ACRS Staff Engineer */RA/*

SUBJECT: WORKING COPY OF THE MINUTES OF THE MEETING OF THE
ACRS SUBCOMMITTEE ON REGULATORY POLICIES AND
PRACTICES, APRIL 1, 2004 - ROCKVILLE, MARYLAND

A working copy of the minutes for the subject meeting is attached for your review. Please review and comment on them. If you are satisfied with these minutes please sign, date, and return the attached certification letter.

Attachment: Minutes (DRAFT)

cc: Regulatory Policies and Practices Subcommittee Members
P. Ford
J. Sieber
G. Wallis
S. Bahadur
S. Duraiswamy
J. Larkins
H. Larson

MEMORANDUM TO: M. R. Snodderly, Senior ACRS Staff Engineer

FROM: W. J. Shack, Chairman
Regulatory Policies and Practices Subcommittee

SUBJECT: CERTIFICATION OF THE MINUTES OF THE MEETING OF THE
ACRS SUBCOMMITTEE ON REGULATORY POLICIES AND
PRACTICES, APRIL 1, 2004 - ROCKVILLE, MARYLAND

I do hereby certify that, to the best of my knowledge and belief, the minutes of the subject meeting on April 1, 2004, are an accurate record of the proceedings for that meeting.

/Original Signed by _____ July 7, 2004
William J. Shack, _____
Subcommittee Chairman Date

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
MEETING OF THE ACRS SUBCOMMITTEE ON
REGULATORY POLICES AND PRACTICES
MEETING MINUTES - APRIL 1, 2004
ROCKVILLE, MARYLAND

INTRODUCTION

The ACRS Subcommittee on Regulatory Policies and Practices held a meeting on April 1, 2004, in Room T-2B3, 11545 Rockville Pike, Rockville, MD. The purpose of this meeting was to discuss the staff's proposed approach for responding to the Commission's March 31, 2003 SRM on risk-informing 10 CFR 50.46 and development of near-term LOCA frequencies. The meeting was open to public attendance. Mike Snodderly was the Designated Federal Official for this meeting. There were no written comments or requests for time to make oral statements received from members of the public. The meeting was convened by the Subcommittee Chairman at 8:31 a.m. and adjourned at 5:57 p.m. on April 1, 2004.

ATTENDEES

ACRS Members

W. Shack, Subcommittee Chairman
M. Bonaca, Member
P. Ford, Member
T. Kress, Member
G. Leitch, Member

V. Ransom, Member
J. Sieber, Member
G. Wallis, Member
M. Snodderly, Designated Federal Official

Principal NRC Speakers

L. Abramson, RES
F. Gillespie, NRR
C. Haney, NRR
M. Johnson, NRR
G. Kelly, NRR
S. Magruder, NRR

E. McKenna, NRR
M. Rubin, NRR
D. Skeen, NRR
R. Tregoning, RES
P. Wen, NRR

Other Principal Speakers

There were approximately two other member of the public in attendance at this meeting. A complete list of attendees is in the ACRS Office File and will be made available upon request. The presentation slides and handouts used during the meeting are attached to the office copy of these minutes.

OPENING REMARKS BY CHAIRMAN SHACK

William Shack, Chairman of the ACRS Subcommittee on Regulatory Policies and Practices convened the meeting at 8:31 a.m. Dr. Shack stated that the purpose of this meeting was to discuss the staff's proposed approach for responding to the Commission's March 31st, 2003 Staff Requirements Memorandum (SRM) on recommendations for risk-informed changes to 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors," and development of near term LOCA frequencies. He said the Subcommittee will gather information, analyze relevant issues and facts, and formulate proposed positions and actions, as appropriate, for deliberation by the full Committee. The rules for participation in the meeting were announced as part of the notice of the meeting published in the Federal Register on March 23, 2004.

DISCUSSION OF AGENDA ITEMS

Discussion of SECY 04-0037

Michael Johnson, Deputy Director, Division of Systems Safety and Analysis, NRR, said that his staff would be presenting SECY 04-0037 which represents the staff's latest thinking on risk-informing 10 CFR 50.46. He then turned the presentation over to Eileen McKenna, NRR, and Glenn Kelly, NRR. Ms. McKenna confirmed that the purpose of the meeting was to inform the Subcommittee about staff activities to prepare a proposed rule that allows for a risk-informed alternative to the present maximum LOCA break size in response to the Commission's March 31, 2003 SRM. Ms. McKenna added that the staff was interested in obtaining feedback on technical issues and staff activities to resolve these issues relative to the rulemaking.

Ms. McKenna then described the features of the March 31, 2003 SRM. She mentioned that licensees who seek the benefit of redefinition should be required to use best-estimate (ECCS evaluation) codes. This feature has been identified as an area in need of qualification because the staff has not approved best-estimate codes. Ms. McKenna pointed out that the Commission's recent phased approach to PRA quality replaces addresses quality expectations for the proposed rulemaking.

Ms. McKenna then discussed staff activities since issuance of 10 CFR 50.46 which included stake holder input. Stakeholder input revealed varying expectations on scope of redefinition and implementation requirements. For example, NEI proposes a "process rule" for risk-informed deriving from redefinition with few constraints. Some industry proposals for plant changes include removal of equipment, power uprates, and exclusion of breaks from sump blockage consideration. Ms. McKenna said that the staff had identified technical and regulatory issues needing further development. She went on to say that these issues would significantly impact any rulemaking and its implementation. She then discussed the following technical and regulatory issues: (1) what are the appropriate criteria and needed confidence in elicitation results, (2) what is the practical effect of removing specific events and SSCs from the design basis, (3) should the rule be very specific about what can be changed, or should it merely provide a process by which changes could be made, (4) what level of mitigation capability should be retained for LOCAs that formerly were in the design basis, (5) how should adequate defense-in-depth be assured, (6) what limitations should be placed on cumulative increases in plant risk under this rule and how should it be controlled, (7) what is the appropriate scope and

quality for a PRA that is used to provide risk insights, (8) how can or should the rule be written to cover future designs.

Ms. McKenna then outlined activities the staff was conducting in support of the proposed rulemaking: (1) determine criteria to choose maximum break size, (2) identify the level of mitigation required for LOCAs beyond the new maximum break size, (3) develop criteria, including metrics, for acceptable plant changes based on risk, (4) develop criteria to factor total CDF into process, including accounting for less than full-scope PRAs, (5) determine if additional defense-in-depth criteria are needed, (6) provide guidelines on how to meet RG 1.174 defense-in-depth criteria, (7) develop criteria to demonstrate adequate mitigation capability, (8) determine information to track for individual changes and cumulative risk estimates. Ms. McKenna concluded by saying that SECY 04-0037 requests policy direction. Staff activities continue in several areas on technical basis development while awaiting Commission policy direction. Feedback from the Subcommittee will be considered along with Commission direction as the staff proceeds with the proposed rulemaking.

General Comments and Observations From the Subcommittee Members

- Dr. Wallis asked if the staff was going to take something which used to be design basis and put it into risk space. Mr. Kelly responded in the affirmative. He said, at a minimum, it would be in risk space. But it might also be in another kind of space, which has yet to be determined. It might have some additional regulatory controls on it, but exactly how that's going to play out has yet to be determined.
- Dr. Kress cautioned that one should be aware that risk differs from site-to-site when discussing the cumulative risk of all plants. By changing a rule, you're going to affect some plants more than others. Dr. Wallis added that the question is, how does one deal with that type of effect in terms of being sure an individual plant doesn't pose an undue risk as opposed to the whole fleet of plants causing an undue risk. Mr. Kelly replied that the staff doesn't have a proposal of exactly how it would be done. He thought the actual process of tracking cumulative changes of risk at a plant are challenging, but it's being done for some risk-informed activities, such as ISI. He expected that the staff would track the cumulative risk for individual plants, rather than looking at the cumulative risk for all the plants.
- Dr. Kress then followed up by questioning whether the framework in RG 1.174 would be used to track risk. Mr. Kelly did not expect so. He said RG 1.174 provided an excellent framework for plant specific changes while meeting the current regulations. But now the staff is talking about changing the regulations.
- Dr. Shack challenged the staff by asking why was it acceptable to increase risk by a discrete amount for a plant specific change but not acceptable for changing a regulation. Dr. Shack did not see the difference. Mr. Kelly conceded that was a good question. He said that staff was concerned about unintended consequences. Mr. Rubin then added that the staff was considering a lower metric. He gave the example of a plant with a lower starting baseline risk such as 10-6. If one uses a delta CDF limit of 10-5, you're going to allow some of the BWR 5s and 6s to change their limiting DBA and bump their baseline risk up by a factor of eight. Mr. Rubin said the staff was concerned about such an increase.

- Dr. Kress suggested that the staff may want to rethink their approach to defense-in-depth. Dr. Kress said BWRs have relatively low CDFs but high conditional containment failure probabilities. Dr. Kress said that from a defense-in-depth standpoint you may not let BWRs make large changes in CDF.
- Dr. Bonaca added that one is constrained to a small increase no matter how much margin you have. Yet you can only take advantage of a very small amount of margin no matter how much you have. If you make a rule change then one may reduce their margin by a relatively large amount and have a smaller margin. Dr. Bonaca saw this as a disparity.
- Dr. Wallis believed that the LB LOCA initiated by an act of sabotage was greater than 10^{-8} . He asked why these types of initiating events were not considered. Mr. Rubin said the frequency estimates from RES don't include sabotage events. Mr. Rubin suggested that the Committee bring this issue up with them during their briefing in the afternoon. Mr. Rubin went on to say that the approach being taken is to retain a mitigative capability for the design basis LOCA. Therefore, it would not be a very attractive location or size for a saboteur or even an insider.
- With regard to reversibility, Dr. Kress expected to see something like a risk level or maybe a balance between CDF and LERF that's unacceptable to us, including uncertainties. If at some point one updates and changes their PRA or plant configuration that puts you outside those boundaries then you must do something to get back in. Mr. Kelly said that approach was consistent with how the staff interprets reversibility.
- Dr. Kress estimated that if the new DBA was a six inch break then plants could increase their power by as much as 40 percent.
- Dr. Kress suggested that instead of tracking delta changes in CDF and LERF one should track a speed limit, say 10^{-4} , with a certain confidence level, say 95% confidence in the mean.
- Dr. Shack commented that going from 10^{-6} to 10^{-4} is an unacceptable jump unless you have a conditional containment failure probability.
- Mr. Leitch asked about the requirement for consideration of coincident loss of offsite power. Ms. McKenna said that the BWR Owners Group had an initiative to look at some specific plant changes that were of interest to them, that were in large part derived from this coincident LOOP and the resulting impacts, for instance, on diesel start times. The BWROG generated a set of six or seven plant changes that as an owner's group they wanted to pursue. Ms. McKenna said the staff expects this topical soon.
- Dr. Ransom said the conservatism in Appendix K accounts for the uncertainties involved in this kind of analysis. Dr. Ransom went on to say that it appears that the staff is attempting to evaluate small changes in risk with a tool that has large uncertainties. Dr. Ransom saw that as a limitation. Mr. Kelly responded by referring to his first technical issue which discusses what are the appropriate criteria needed for confidence in the elicitation results. Because these uncertainties are additive with those uncertainties associated with the PRA.

- Dr. Shack asked if we really needed 95/95 confidence for an event we never expect to happen couldn't we live with 90/50. Dr. Kress said that the trouble with trying to decide on confidence levels is related to the consequences associated with the low frequency event. Dr. Kress went on to say it is not a technical issue it is a policy issue of acceptable risk. He said this same challenge was confronted by the Commission in defining the safety goals.

Development of Passive System LOCA Frequencies for Risk-Informed Revision of 10 CFR 50.46

Rob Tregoning, RES, introduced Mr. Abramson, RES, and said they would be discussing RES's development of passive system LOCA frequencies for risk-informed revision of 10 CFR 50.46. Mr. Tregoning began by going over major milestones since September 2003 which included completing the individual elicitations, conducting a feedback meeting with the panel, and completing the preliminary analysis. Mr. Tregoning said that the objective of the elicitation was to develop generic BWR and PWR piping and non-piping passive system LOCA frequency distributions as a function of break size and operating time. Mr. Tregoning described the rationale and insights gained for BWR plants. He said thermal fatigue, intergranular stress corrosion cracking, mechanical fatigue, and flow accelerated corrosion have been identified as the important degradation mechanisms. BWR plants have increased operating transients (e.g., water hammer) compared to PWR plants. With regard to intergranular stress corrosion cracking, the BWR industry has more experience identifying and mitigating this type of degradation but service experience must be carefully evaluated due to preponderance of pre-mitigation IGSCC precursor events. For PWR plants, important degradation mechanisms included: primary water stress corrosion cracking, thermal fatigue, mechanical fatigue. The expert panel expects near-term frequency increases due to PWSCC before effective mitigation is developed. Most panelists believe that PWSCC will be successfully resolved within the next 15 years.

Mr. Tregoning then presented a series of frequency versus LOCA category curves. Mr. Tregoning provided estimates for total LOCA frequency and broke out contributions from piping and non-piping contributors. He then showed the medians for each panelist and how they were combined into a distribution. Mr. Tregoning said that there was good agreement on contributors for the smaller Category 1 and 2 LOCAs because the panelist were calibrated similarly by service experience. Variability increases for larger Category 3-6 LOCAs because there was not as good agreement on the contributors and the contributors were more difficult to quantify. Mr. Tregoning then discussed uncertainty and panel variability. He said that 50% of the panel's responses were contained in the first three quartiles. He added that statistical confidence bounds would also be calculated. Mr. Tregoning provided a comparison with WASH-1400 and NUREG/CR-5750. He said that he had gained confidence in the results because using a very different approach he was able to confirm and refine the results in the other studies and he could explain the differences based on improved understanding of known degradation mechanisms.

Mr. Tregoning ended by saying that the NRC has used formal elicitation process to estimate generic BWR and PWR LOCA frequencies as a function of flow rate and operating time considering both piping and non-piping contributions. The process developed quantitative

estimates for piping and non-piping base cases which were used to anchor subsequent elicitation responses. There was relatively good agreement between the panelists about important factors contributing to LOCAs. Although there was large uncertainty and variability in quantifying the frequencies associated with these contributing factors. The elicitation results were generally comparable to NUREG/CR-5750.

General Comments and Observations From the Subcommittee Members

- Dr. Wallis asked what passive system meant in this context. Mr. Tregoning responded piping and structures versus things that are active, such as pumps and seals. Mr. Tregoning said they tried to exclude things that were already covered by the maintenance rule.
- Dr. Shack asked if the 95th and 5th percentiles are estimates of uncertainty on the median. Mr. Tregoning answered in the affirmative.
- Mr. Snodderly asked if the elicitation could be used to account for external initiating events. Mr. Tregoning replied that the focus of the elicitation was on normal operating loads and expected transients. They realized that the rarer transients, such as seismic or large water hammer events, could be contributors but they were plant specific questions. They did not believe that there was a way to develop generic frequencies for challenges associated with those types of events. They did ask the expert panel members given the large load what's your conditional failure probability.
- Mr. Sieber asked about the crack in the RCS piping at Summer. Mr. Sieber was aware that this crack was axial and it arrested before it became a large leak. Therefore, it is not necessarily a precursor to a large LOCA and this concerned him. Mr. Sieber asked how this event was considered by the panel. Mr. Tregoning agreed that the cracks that were found in Summer don't tend to be LOCA challenges because they were axially oriented instead of circumferentially oriented. Mr. Tregoning said the panelists understood that distinction and when they looked at service history they were concerned with estimating the challenges of those types of degradation and flaws which can lead to LOCAs or mechanisms where you have a more global erosion of the material, something flow assisted corrosion or something like Davis-Besse.
- Dr. Ransom asked if the expert elicitation had been used by the staff before. Dr. Abramson said it was used as part of NUREG-1150 and has been used to address pressurized thermal shock.
- Dr. Ransom recalled that the philosophy of license renewal was that the plants were held to their initial licensing base and through aging management programs there would be no increase in likelihood of accidents. Dr. Ransom said there seems to be a contradiction between that philosophy and the impact of these degradation mechanisms on LOCA frequency. Mr. Tregoning responded that there is no trend. He added that estimating is more uncertain into the future because you're trying to project further out. He said there were not huge differences when they projected the results over three different time periods.

- Dr. Abramson mentioned the over confidence adjust. He said it has been well established in the elicitation community that people tend to be over confident about their knowledge. When one is asked to give a 95 percent and 5 percent bound, it tends to envelope 50 percent of the data instead of 90 percent. This is based on the almanac type questions that Mr. Abramson had used to introduce the expert elicitation process to the Subcommittee in July 2003.
- Mr. Sieber said he did not have any issues with what has been presented today but he did have some concerns. But he would hold off on those comments until a more thorough examination of the issues. He thought that what had been done to this point in the expert elicitation had been done very well. He thought the results are reasonable, and he looked forward to reading the NUREG and any comments coming out of the peer review. Mr. Sieber said he would prefer that the hardware part of the plant stay the same and meet the same criteria as the original Appendix K which had the assumption of the double ended guillotine break. He felt the changing of things like diesel start times or allowed outage times is reasonable. But if you carve out a class of accidents that you can't mitigate because you decide that your high head safety injection pumps really don't pump very well anymore and so you can't really deal with a double ended break, he would prefer the licensee fixed the pump. He also felt that the DEGB should be used to address debris generation.
- Dr. Ford said the LOCA frequency distribution work was great. Dr. Ford said that he had questions concerning the following four areas: physical aspects of the uncertainties, calibration of the predictions against historical evidence, methodology used to model water chemistry for BWRs and temperature phenomenon for PWRs, and use of the bounding 95 percentile instead of the mean.
- Mr. Leitch said he had a problem with the concept of narrow versus broad application. He was concerned that the broad application was too much of a relaxation and the narrow may not give sufficient benefit for the utility to want to invest the time and money in the PRA that would be required. Mr. Leitch was concerned about what the systems for breaks greater than the maximum break size would look like and how they would be maintained. He also had a concern about terrorism and security as it relates to public confidence. He felt that a terrorist attack could be a major contributor to LB LOCA.
- Dr. Bonaca shared Mr. Leitch's concern that some considerations like human factors, sabotage or terrorism have not been taken into consideration. Dr. Bonaca was leaning more towards a narrow scope rule until these uncertainties are better addressed. He believed that whichever way we go, narrow versus broad scope rule, there has to be a mitigative capability for beyond design basis LOCAs. On reversibility, He thought that the reversibility issue should not be subjected to analysis and it should be viewed as an agreement whereby if the estimations used to justify the changes change then there shouldn't be a burden on the staff to demonstrate that the reversal be done. On defense-in-depth, Dr. Bonaca thought that if you contain the risk increases through criteria such as the ones in Reg. Guide 1.174 and you say that they're going to be very small, that should resolve some of the concern about defense-in-depth.
- Dr. Kress felt there was an issue with how the results of the expert elicitation are conglomerated into a final distribution. He encouraged the staff to see how this was done

in NUREG 1150. He had some doubts about the value of peer review in this case but he acknowledged that it is one of the things you do. He said he would not redo the elicitation but would try to figure out how to adjust the results of the elicitation based on the peer review comments. Dr. Kress felt there was a need to articulate the connection between design basis base and risk base. He felt the question was how do you choose design basis base and why. The philosophy is that you look at all the types of accidents you have and you address your design basis case in a conservative way with things like the single failure. This renders the plant in a state of acceptable risk, acceptable uncertainty, acceptable balance. He said that the staff has never articulated that and he felt that what the staff was really after is controlling the risk, controlling the uncertainty, controlling the balance to acceptable levels. He concluded that those acceptable levels have never been articulated. With respect to terrorism, Dr. Kress felt that should be kept separate. He felt that cumulative risk should be addressed by Regulatory Guide 1.174 and reversibility should be addressed by the backfit rule 10 CFR 50.109.

- Dr. Ransom said that the benefits associated with risk-informing 50.46 were not clear. Dr. Ransom thought one of the biggest uncertainties with this effort were the consequences predicted by system simulation. Dr. Ransom was concerned that best estimate methods are quoted without really quantifying what that is. He felt more effort was needed for defining what is an acceptable best-estimate analysis, how the staff reviews it, and how the licensee assures the applicability of the results to the current plant configuration. He thought that a better approach was to treat to the break size as a statistical variable, like was done with S-RELAP5 by Framatome, where the probability of a particular break is simply incorporated into the other sources of uncertainty that exist in predicting the consequences of the event.
- Dr. Wallis thought the staff had done a good job of describing the issues. He didn't understand how you take something out of the design basis and yet require mitigation of what you have removed. Dr. Wallis agreed with Dr. Kress that a more explicit definition of defense-in-depth is needed. He thought deliberate or accident human actions could well have far more influence than those events being discussed. 1

SUBCOMMITTEE DECISIONS AND ACTIONS

The Full Committee will review and comment upon the NUREG documenting the LOCA frequencies developed by the expert elicitation after it has been peer reviewed.

BACKGROUND MATERIALS PROVIDED TO THE SUBCOMMITTEE PRIOR TO THIS MEETING

1. Subcommittee status report, including agenda.
2. Staff Requirements Memorandum dated March 31, 2003, from Annette L. Vietti-Cook, Secretary, to William D. Travers, EDO, Subject: Staff Requirements - SECY-02-057 - Update to SECY-01-0133, "Fourth Status Report on Study of Risk-Informed Changes to the Technical Requirements of 10 CFR Part 50 (Option 3) and Recommendations on Risk-Informed Changes to 10 CFR 50.46 (ECCS Acceptance Criteria)".
3. SECY-04-0037, Memorandum for the Commissioners, from William D. Travers, Executive Director for Operations, NRC, dated March 3, 2004, Subject: Issues Related to Proposed

Rulemaking to Risk-Inform Requirements Related to LBLOCA Break Size and Plans for Rulemaking on LOCA With Coincident Loss-of-Offsite Power.

4. Memorandum dated March 25, 2004, from , RES, to John Larkins, Executive Director, ACRS, Subject: (Pre-Decisional For Internal ACRS Use Only).

Note: Additional details of this meeting can be obtained from a transcript of this meeting available for downloading or viewing on the Internet at "<http://www.nrc.gov/ACRSACNW>" or can be purchased from Neal R. Gross and Co., Inc., (Court Reporters and Transcribers) 1323 Rhode Island Avenue, NW., Washington, DC 20005 (202) 234-4433.