UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001

October 5, 2001

MEMORANDUM TO: ACRS Members

FROM: Michael T. Markley, Senior Staff Engineer
ACRS

SUBJECT: CERTIFICATION OF THE MINUTES OF THE JOINT MEETING OF THE ACRS SUBCOMMITTEES ON MATERIALS AND METALLURGY, THERMAL-HYDRAULIC PHENOMENA, AND RELIABILITY AND PROBABILISTIC RISK ASSESSMENT - JULY 9, 2001 - ROCKVILLE, MARYLAND

The minutes of the subject meeting, issued September 26, 2001, have been certified as the official record of the proceedings of that meeting. A copy of the certified minutes is attached.

Attachment: As stated

cc: via E-mail
J. Larkins
S. Bahadur
H. Larson
S. Duraiswamy
ACRS Staff Engineers
ACRS Fellows

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001

MEMORANDUM TO: Michael T. Markley, Senior Staff Engineer

FROM: William J. Shack, Chairman
Materials and Metallurgy Subcommittee

SUBJECT: CERTIFICATION OF THE SUMMARY/MINUTES OF THE MEETING OF THE JOINT MEETING OF THE ACRS SUBCOMMITTEES ON MATERIALS AND METALLURGY, THERMAL-HYDRAULIC PHENOMENA, AND RELIABILITY AND PROBABILISTIC RISK ASSESSMENT - JULY 9, 2001 - ROCKVILLE, MARYLAND

I do hereby certify that, to the best of my knowledge and belief, the minutes of the subject meeting on July 9, 2001, are an accurate record of the proceedings for that meeting.

10/4/01

William J. Shack, Chairman Date
Materials and Metallurgy Subcommittee

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001

PRE-DECISIONAL

September 26, 2001

MEMORANDUM TO: Dr. William J. Shack, Chairman
Materials and Metallurgy Subcommittee

Dr. Graham B. Wallis, Chairman
Thermal-Hydraulic Phenomena Subcommittee

Dr. George Apostolakis, Chairman
Reliability and Probabilistic Risk Assessment Subcommittee

FROM: Michael T. Markley, Senior Staff Engineer

SUBJECT: WORKING COPY OF THE MINUTES OF THE JOINT MEETING OF THE ACRS SUBCOMMITTEES ON MATERIALS AND METALLURGY, THERMAL-HYDRAULIC PHENOMENA, AND RELIABILITY AND PROBABILISTIC RISK ASSESSMENT - JULY 9, 2001, ROCKVILLE, MARYLAND

A working copy of the minutes for the subject meeting is attached for your review. Please review and comment on them at your soonest convenience. Copies are being sent to each ACRS Member who attended the meeting for information and/or review.

Attachment:
As Stated

cc: ACRS Members
J. Larkins
S. Bahadur
H. Larson
S. Duraiswamy
ACRS Staff and Fellows

CERTIFIED BY: Date:9/26/01
W. Shack - 10/4/01

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
JOINT MEETING OF THE ACRS SUBCOMMITTEES ON
MATERIALS AND METALLURGY, THERMAL-HYDRAULIC PHENOMENA,
AND RELIABILITY AND PROBABILISTIC RISK ASSESSMENT
MEETING MINUTES - JULY 9, 2001
ROCKVILLE, MARYLAND

INTRODUCTION

The ACRS Subcommittees on Materials and Metallurgy, Thermal-Hydraulic Phenomena, and Reliability and Probabilistic Risk Assessment met on July 9, 2001, at 11545 Rockville Pike, Rockville, MD, in Room T-2B3. The purpose of this meeting was to discuss the status of risk-informed revisions to the technical requirements of 10 CFR 50.46 for emergency core cooling systems.

The Subcommittees received no written comments from members of the public regarding the meeting. The entire meeting was open to public attendance. Mr. Michael T. Markley was the cognizant ACRS staff engineer for this meeting. The meeting was convened at 8:30 a.m. and adjourned at 4:45 p.m.

ATTENDEES

ACRS Members

W. Shack, Chairman
G. Wallis, Co-Chairman
G. Apostolakis, Co-Chairman
M. Bonaca, Member
P. Ford, Member
T. Kress, Member
G. Leitch, Member
S. Rosen, Member
J. Sieber, Member
R. Uhrig, Member
M. Markley, ACRS Staff

Principal NRC Speakers

M. Cunningham, RES*
M. Drouin, RES
T. King, RES
A. Kuritsky, RES

Principal Industry Speakers

A. Heymer, NEI*
B. Osterrieder, WOG*
T. Rieck, Exelon

RES	Office of Nuclear Regulatory Research
NEI	Nuclear Energy Institute
WOG	Westinghouse Owners Group

There were approximately 3 members 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 THE SUBCOMMITTEE CHAIRMAN

Dr. William Shack, Chairman of the ACRS Subcommittee Materials and Metallurgy convened the meeting at 8:30 a.m. He introduced Dr. Graham Wallis, Chairman of the Subcommittee on Thermal-Hydraulic Phenomena and Dr. George Apostolakis, Chairman of the Subcommittee on Reliability and Probabilistic Risk Assessment as co-chairmen of the meeting. He introduced the other ACRS Members in attendance and stated that the purpose of this meeting was to discuss the status of risk-informed revisions to the technical requirements (Option 3) of 10 CFR 50.46 for emergency core cooling systems (ECCS).

Dr. Shack noted that the Subcommittee had received no written comments from members of the public regarding the meeting.

DISCUSSION OF AGENDA ITEMS

NRC Staff Presentation

Ms. Mary Drouin, RES, led the discussion for the NRC staff. Mr. Alan Kuritsky, RES, provided supporting discussion. The staff discussed the background and history related to Option 3 effort to revise the 10 CFR 50.46, results of the Phase 1feasibility study, and proposed options and associated implementation issues. Significant points raised during the presentation include:

- SECY-99-264 defined the staff's plan for the Option 3 work scope. The staff used its Option 3 framework document to evaluate revising the technical requirements of 10 CFR 50.46, the 10 CFR Part 50 Appendix K evaluation model, and General Design Criteria of 10 CFR Part 50, Appendix A.

- The staff has completed the Phase 1 feasibility study but has not yet done the technical work to support a proposed rulemaking. The technical work will be completed as part of the Phase 2 effort. The staff expects to develop the proposed rulemaking package approximately one year after the technical work is accomplished.

- Current evaluation models for ECCS performance may be overly conservative. The staff is considering changes to the evaluation model and acceptance criteria. The staff proposes to replace the current prescriptive ECCS acceptance criteria with a performance-based requirement. The staff also proposes to allow use of cladding materials other than zircaloy or ZIRLO without licensees having to submit an exemption request.

- The staff proposes to revise requirements for the ECCS evaluation model based on more realistic analyses. The staff suggested that this may be accomplished by replacing the current 1971 American Nuclear Society (ANS) decay heat curve with a model based on the 1994 ANS Standard. The staff also suggested replacing the 1.2 decay heat multiplier with an NRC-prescribed uncertainty treatment.

- Additional changes to 10 CFR 50.46 may involve evaluating a spectrum of break sizes and locations. However, the technical justification may be increasingly complex and more difficult as smaller break sizes are considered. Other options include modifying the single

failure criterion in General Design Criteria 35 (GDC-35) and conforming changes to other regulatory requirements.

- The staff requested a Committee report/letter during the July 11-13, 2001 ACRS meeting.

Industry Presentation

The Subcommittees heard a presentations by and held discussions Messrs. Adrian Heymer of the Nuclear Energy Institute (NEI), Bob Osterrieder of the Westinghouse Owners Group (WOG), and Terry Rieck of Exelon Generation concerning this matter. Significant points raised during the presentations include:

- The industry proposes to redefine the large-break loss-of-coolant accident (LBLOCA) requirements to improve safety and efficiency. Industry representatives contend that LBLOCA is an extremely low probability event and is, therefore, of low risk significance.

- Benefits of LBLOCA redefinition include: increased emergency diesel generator start times, relaxed ECCS flow requirements, decreased technical specification requirements for accumulators, relaxed ultimate heat sink requirements, and potential for power uprates.

- Industry representatives propose a "simple rule change" to allow the NRC to consider alternative break sizes based classes of NSSS designs and plant-specific features. Alternative break sizes would be approved by the Commission.

- Mr. Osterrieder stated that the NRC staff has previously approved leak-before-break (LBB) applications for PWR piping systems as small as 6 inches in diameter. He stated that the WOG may submit a petition for rulemaking to expedite the technical work to support LBLOCA redefinition. Mr. Rieck stated that changing the decay heat curve would have substantial immediate benefit for BWRs; however, LBLOCA redefinition remains the top priority for the Option 3 initiative.

- Mr. Heimer stated that, if the staff's proposed rule takes 36 months to develop, the industry would prefer to "pick the low-hanging fruit" and move on to other risk-informed initiatives.

SUBCOMMITTEE COMMENTS, CONCERNS, AND RECOMMENDATIONS

Subcommittee members raised the following significant points during its discussion with NRC staff and industry representatives:

- The Subcommittees extensively discussed the technical issues and schedule for LBLOCA redefinition. Dr. Apostolakis noted that the staff is mostly addressing acceptance criteria evaluation model and not LBLOCA redefinition in the short-term plan. Dr. Kress stated that the conservatism built into the current rule was deliberate and suggested that other less limiting break sizes might be considered because we now know more about the actual safety margins. The staff stated that they are focusing mostly on the technical work needed for LOCA/LOOP using core damage frequency (CDF) as a metric.

- Mr. Rosen noted that LOCA and LOOP are not causally linked. Mr. Leitch stated that they relate to single failure criterion in GDC-35. The staff stated that LOCA/LOOP and single failure need to be evaluated both uniquely and as an integrated entity. The staff stated that single failure goes beyond ECCS requirements and suggested that it may be possible to replace single failure with reliability criteria.

- Dr. Apostolakis questioned whether the Option 3 approach would allow risk increases greater than that provided for in Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis." He questioned pushing licensees toward a CDF of 10^{-4}/reactor-year and suggested that the focus should be on the high-tail of the distribution curve which drives the mean. The staff stated that the NRC must address the initiating events and not just LOCA. The staff emphasized that the goal is to be consistent with Regulatory Guide 1.174.

- Dr. Apostolakis noted that the issue of model uncertainty is very important and questioned the staff's approach to handling it. The staff stated that they were funding research on model uncertainty at the University of Maryland related to pressurized thermal shock and suggested that this research is expected to "spill over" into the ECCS analysis.

- Dr. Shack expressed concern that the staff might become bogged-down in the short-term effort and that the big payback from LBLOCA may not be realized. Dr. Wallis noted that LBLOCA appears to have a lot of payback for the industry and questioned the regulatory and safety benefit for the NRC and the public. Dr. Bonaca stated that the issue of public confidence is important. Dr. Kress stated that there is a good degree of confidence that LBLOCA will not occur but questioned how much relaxation of safety margins can be allowed. Dr. Shack suggested that reduction to a 6-inch line break may not be doable. Drs. Wallis and Kress expressed the view that all possible break sizes should be evaluated.

STAFF AND INDUSTRY COMMITMENTS

None.

SUBCOMMITTEE DECISIONS

At the conclusion of the meeting, members of the Subcommittees expressed generally favorable views toward the approach proposed by the staff. Dr. Kress stated that the staff appears to be on the right track but noted that there are still some unanswered questions. Dr. Bonaca stated that there should be some priority for redefining LBLOCA but questioned how it would apply to new generation reactor designs. Dr. Wallis suggested that the Committee prepare a report/letter that recommends approval of the staff's approach with some modification.

FOLLOW-UP ACTIONS

None.

BACKGROUND MATERIALS PROVIDED TO THE SUBCOMMITTEE PRIOR TO THIS MEETING

1. Subcommittee agenda.
2. Subcommittee status report.
3. Presentation handouts from the ACRS briefing on Risk-Informing 10 CFR 50.46, June 6, 2001.
4. 10 CFR 50.46, Acceptance criteria for emergency core cooling systems for light-water power reactors.
5. Letter dated February 8, 2001, from Anthony R. Pietrangelo, Nuclear Energy Institute, to Thomas L. King, RES, Subject: Industry comments on risk-informed revisions to 10 CFR 50.46.
6. Letter dated October 17, 2000, from Robert H. Bryan, Westinghouse Owners Group, to Thomas L. King, Office of Nuclear Regulatory Research, Subject: WOG Large Break Loss of Coolant Accident (LBLOCA) Redefinition Discussion of Benefits.
7. Letter dated January 8, 2001, from Adrian Heymer, Nuclear Energy Institute, to Mary Drouin, Office of Nuclear Regulatory Research, Subject: Large Break LOCA Redefinition Program, Project Summary.
8. Letter dated January 19, 2000, from Joe F. Colvin, Nuclear Energy Institute, to Richard A. Meserve, Chairman, NRC, Subject: SECY-99-264, Proposed Staff Plan for Risk-Informing Technical Requirements in 10 CFR Part 50.
9. Memorandum dated January 19, 2001, from Annette Vietti-Cook, Secretary, NRC, to William D. Travers, Executive Director for Operations, NRC, Subject: Staff Requirements - SECY-00-0198 - 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 50.44.
10. Memorandum dated February 3, 2000, from Annette Vietti-Cook, Secretary, NRC, to William D. Travers, Executive Director for Operations, NRC, Subject: Staff Requirements - SECY-99-264 - Proposed Staff Plan for Risk-Informing Technical Requirements in 10 CFR Part 50.

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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, N.W., Washington, DC 20005 (202) 234-4433.

REVISED 6/28/01

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
JOINT MEETING OF THE ACRS SUBCOMMITTEES ON
MATERIALS AND METALLURGY, THERMAL-HYDRAULIC PHENOMENA, AND RELIABILITY AND PROBABILISTIC RISK ASSESSMENT
ROOM T-2B3, 11545 ROCKVILLE PIKE, ROCKVILLE, MD
JULY 9, 2001

ACRS Contact: Michael T. Markley (301) 415-6885
E-mail: mtm@nrc.gov

- PROPOSED SCHEDULE -

TOPIC	PRESENTER	TIME
1) Introduction		**1:30-1:35 am**
• Review goals and objectives for this meeting; introductions	Bill Shack, ACRS	
• Risk-informing 10 CFR 50.46 for emergency core cooling systems; discussions from March 16, 2001 Joint Subcommittee meeting		
• Technical issues associated with large-break loss-of-coolant accidents (LBLOCA), leak-before-break phenomena (LBB), and probabilistic fracture mechanics (PFM)		
2) NRC Staff Presentation		**1:35-3:30 pm**
• Overview of Phase I activities	Tom King, RES	
• Results of feasibility study for risk-informing 10 CFR 50.46; Options: ECCS reliability, acceptance criteria evaluation model, LBLOCA redefinition	Mark Cunningham, RES Mary Drouin, RES M. Mayfield, RES A. Kuritsky, RES	
****BREAK****		3:45-4:05 ~~**3:30-3:45 pm**~~
3) NRC Staff Presentation - continued		~~**3:45-4:30 pm**~~
• Phase IIA technical work, policy issues, and schedule	M. Cunningham, RES M. Drouin, RES M. Mayfield, RES A. Kuritsky, RES	~~[illegible]~~
4) Industry Comments		4:05-4:45 ~~**4:30-4:45 pm**~~
• Overall industry approach: Why redefine LBLOCA?	Adrian Heymer, NEI	
• Owners Group perspectives	TBD	
5) ACRS General Discussion and Adjournment		4:45 ~~**4:45-5:00 pm**~~
• General discussion and comments by Members of the Subcommittee; items for full ACRS meetings	Bill Shack, ACRS	

Note: Presentation time should not exceed 50% of the total time allocated for a specific item.
Number of copies of presentation materials to be provided to the ACRS/ ACNW - 35.

Thomas Smith at 301–415–7204,or toll free 1–800–368–5642 or e-mail aug@nrc.gov. Further instructions will be sent to you by e-mail or telephone.

Dated in Rockville, Maryland, this 19th day of June 2001.

For the Nuclear Regulatory Commission.

Lynn B. Scattolini,

Director, Information, Records and Document Management Division, Office of the Chief Information Officer.

[FR Doc. 01–16098 Filed 6–26–01; 8:45 am]

BILLING CODE7590–01–P

NUCLEAR REGULATORY COMMISSION

Advisory Committee on Reactor Safeguards, Joint Meeting of the ACRS Subcommittees on Materials and Metallurgy, Thermal-Hydraulic Phenomena, and Reliability and Probabilistic Risk Assessment; Notice of Meeting

The ACRS Subcommittees on Materials and Metallurgy, Thermal-Hydraulic Phenomena and Reliability and Probabilistic Risk Assessment will hold a joint meeting on July 9, 2001, Room T–2B3, 11545 Rockville Pike, Rockville, Maryland.

The entire meeting will be open to public attendance.

The agenda for the subject meeting shall be as follows:

Monday, July 9, 2001—1:30 p.m. Until The Conclusion of Business

The Subcommittees will discuss the proposed risk-informed revisions to 10 CFR 50.46 for emergency core cooling systems. The Subcommittee will also discuss revisions to the framework for risk-informing the technical requirements of 10 CFR Part 50. The purpose of this meeting is to gather information, analyze relevant issues and facts, and to formulate proposed positions and actions, as appropriate, for deliberation by the full Committee.

Oral statements may be presented by members of the public with the concurrence of the Subcommittee Chairman; written statements will be accepted and made available to the Committee. Electronic recordings will be permitted only during those portions of the meeting that are open to the public, and questions may be asked only by members of the Subcommittee, its consultants, and staff. Persons desiring to make oral statements should notify the cognizant ACRS staff engineer named below five days prior to the meeting, if possible, so that appropriate arrangements can be made.

During the initial portion of the meeting, the Subcommittees along with any of their consultants who may be present, may exchange preliminary views regarding matters to be considered during the balance of the meeting.

The Subcommittees will then hear presentations by and hold discussions with representatives of the NRC staff and other interested persons regarding this review.

Further information regarding topics to be discussed, whether the meeting has been canceled or rescheduled, and the Chairman's ruling on requests for the opportunity to present oral statements and the time allotted therefor, can be obtained by contacting the cognizant ACRS staff engineer, Mr. Michael T. Markley (telephone 301/415–6885) between 7:30 a.m. and 4:15 p.m. (EDT). Persons planning to attend this meeting are urged to contact the above named individual one or two working days prior to the meeting to be advised of any potential changes to the agenda, etc., that may have occurred.

Dated: June 21, 2001.

James E. Lyons,

Associate Director for Technical Support, ACRS/ACNW.

[FR Doc. 01–16093 Filed 6–26–01; 8:45 am]

BILLING CODE 7590–01–P

NUCLEAR REGULATORY COMMISSION

Advisory Committee on Reactor Safeguards; Meeting of the ACRS Subcommittees on Materials and Metallurgy and Plant Operations July 10, 2001, Notice of Meeting

The ACRS Subcommittees on Materials and Metallurgy and Plant Operations will hold a meeting on July 10, 2001, Room T–2B3, 11545 Rockville Pike, Rockville, Maryland.

The entire meeting will be open to public attendance.

The agenda for the subject meeting shall be as follows:

Tuesday, July 10, 2001—8:30 a.m. until 2:30 p.m.

The Subcommittees will discuss the control rod drive mechanism cracking issues. A portion of this meeting may be closed pursuant to 5 U.S.C. 552b(c)(4) to discuss proprietary information. The purpose of this meeting is to gather information, analyze relevant issues and facts, and to formulate proposed positions and actions, as appropriate, for deliberation by the full Committee.

Oral statements may be presented by members of the public with the concurrence of the Subcommittee Chairman and written statements will be accepted and made available to the Committee. Electronic recordings will be permitted only during those portions of the meeting that are open to the public, and questions may be asked only by members of the Subcommittee, its consultants, and staff. Persons desiring to make oral statements should notify the cognizant ACRS staff engineer named below five days prior to the meeting, if possible, so that appropriate arrangements can be made.

During the initial portion of the meeting, the Subcommittee, along with any of its consultants who may be present, may exchange preliminary views regarding matters to be considered during the balance of the meeting.

The Subcommittee will then hear presentations by and hold discussions with representatives of the NRC staff, and other interested persons regarding this review.

Further information regarding topics to be discussed, whether the meeting has been canceled or rescheduled, and the Chairman's ruling on requests for the opportunity to present oral statements and the time allotted therefore, can be obtained by contacting the cognizant ACRS staff engineer, Ms. Maggalean W. Weston (telephone: 301/415–3151) between 8:00 a.m. and 5:30 p.m. (EDT). Persons planning to attend this meeting are urged to contact the above named individual one or two working days prior to the meeting to be advised of any potential changes to the agenda, etc., that may have occurred.

Dated: June 21, 2001.

James E. Lyons,

Associate Director for Technical Support.

[FR Doc. 01–16094 Filed 6–26–01; 8:45 am]

BILLING CODE 7590–01–P

NUCLEAR REGULATORY COMMISSION

Advisory Committee on Reactor Safeguards; Subcommittee Meeting on Planning and Procedures; Notice of Meeting

The ACRS Subcommittee on Planning and Procedures will hold a meeting on July 10, 2001, Room T–2B1, 11545 Rockville Pike, Rockville, Maryland.

The entire meeting will be open to public attendance, with the exception of a portion that may be closed pursuant to 5 U.S.C. 552b(c) (2) and (6) to discuss organizational and personnel matters that relate solely to internal personnel rules and practices of ACRS, and information the release of which would

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
SUBCOMMITTEE MEETING ON MATERIALS METALLURGY/THERMAL-HYDRAULIC PHENOMENA AND PROBABILISTIC RISK ASSESSMENT

JULY 9, 2001
TODAY'S DATE

NRC STAFF SIGN IN FOR ACRS MEETING

PLEASE PRINT

NAME	NRC ORGANIZATION
F. Aksztulewicz	NRR/DSSA/SPSB
Undine Shoop	NRR/DSSA/SPSB
Alan Kuritzky	RES/DRAA/PRAB
Mary Drouin	NRC/RES
Stephen Dinsmore	NRC/NRR
Norm Lauben	NRC/RES
@Fairbanks	NRC/RES
STU MAGRUDER	NRC/NRR

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
SUBCOMMITTEE MEETING ON MATERIALS METALLURGY/THERMAL-HYDRAULIC PHENOMENA AND PROBABILISTIC RISK ASSESSMENT

JULY 9, 2001
TODAY'S DATE

ATTENDEES - PLEASE SIGN BELOW

PLEASE PRINT

NAME	AFFILIATION
Bob Osterrieder	Westinghouse / WOG
TERRY RIECK	EXELON
ADRIAN HEYMER	NEI

Markley
(1)

RISK-INFORMING 10 CFR 50.46

Presented to
Advisory Committee on Reactor Safeguards
(Subcommittee)

Presented by
Mary Drouin and Alan Kuritzky
RES/DRAA/PRAB
U.S. Nuclear Regulatory Commission
(301) 415-6189

July 9, 2001

OUTLINE

- Purpose/goal of meeting
- Background - Option 3
- Activities
  - Feasibility assessment of changing 10 CFR 50.46
  - Feasibility assessment of additional changes to 10 CFR 50.46
  - Other Option 3 activities
- Tentative Recommendations and schedule

PURPOSE/GOAL OF MEETING

- Provide status report on staff's efforts to risk-inform 10 CFR 50.46
- Solicit feedback and comments from ACRS:
  - Options
  - Implementation issues
  - Feasibility
- Letter requested

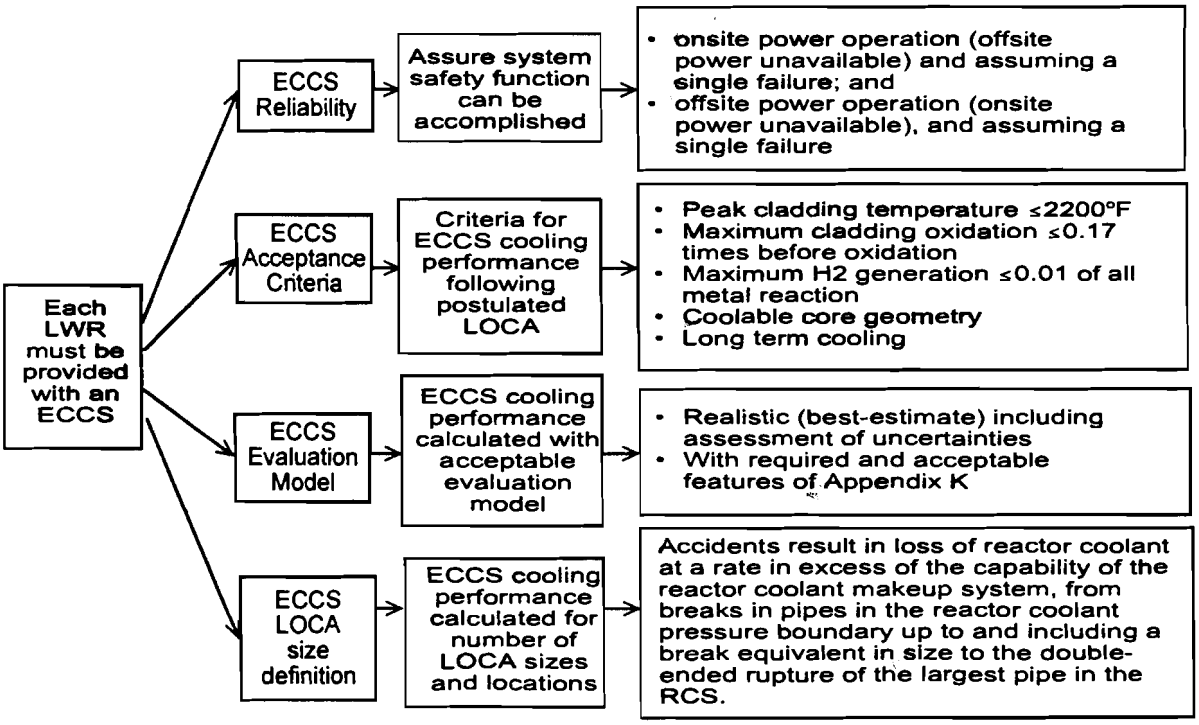
BACKGROUND

SECY-99-264 (Nov 9, 1999) defined plan for Option 3 work

OPTION 3 FRAMEWORK:

- Phase I:
  - Part A: Identify candidate requirement
  - Part B: Prioritize
  - Part C: Evaluate feasibility and provide recommendations to Commission
    - ★ Develop technical content and basis for alternative
    - ★ Identify policy issues
    - ★ Identify required technical work
    - ★ Identify required resources
- Phase II:
  - Part A: Perform technical work
  - Part B: Develop and implement rulemaking

OVERVIEW OF 50.46 (including Appendix K and GDC 35)



FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46

- Changes to reliability, acceptance criteria and evaluation model may be justified
- ECCS reliability resulting from technical requirements not commensurate with risk significance of the various LOCA sizes
- Unnecessary conservatisms exist in the requirements

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

- Current evaluation models of ECCS performance may be overly conservative for large-break LOCAs
- Current estimates of the frequency of large-break LOCAs are uncertain and are not low enough to allow elimination of all large-break LOCA sizes from the design bases
- Reliability of the ECCS is generally sufficient to assure that large-break LOCAs (> 6 inches in diameter) are not significant contributors to risk
- Plant equipment that is designed, at least in part, to the requirements of design-basis LOCAs also provides defense against a spectrum of beyond-design-basis accidents

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

- Staff Considering:
  - A. Changes to the technical requirements of the ***current*** 50.46 related to acceptance criteria and evaluation model
  - B. Development of a voluntary risk-informed ***alternative*** to the reliability requirements in 50.46
- Follows the guidelines in Option 3 framework
- Framework is designed to ensure that changes are risk-informed, and include consideration of defense-in-depth principles

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

A. Possible changes to the current 50.46

- Replace the current prescriptive ECCS acceptance criteria in 50.46 with a performance-based requirement
- This requirement would:
  - demonstrate adequate post-quench cladding ductility and adequate core-coolant flow area to ensure that the core remains amenable to cooling, and,
  - for the duration of the accident, maintain the calculated core temperature at an acceptably low value and remove decay heat.
- Allows use of cladding materials other than zircaloy or ZIRLO without licensees having to submit an exemption request

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

A. Possible changes to the current 50.46 (cont'd)

- Revise the requirements for the ECCS evaluation model to be based on more realistic analyses
- Specifically this update could involve:
  - replacing the current 1971 American Nuclear Society (ANS) decay heat curve with a model based on the 1994 ANS standard.
  - replacing the current decay heat multiplier of 1.2 with an NRC-prescribed uncertainty treatment.
  - deleting the limitation on PWR reflood steam cooling for small reflood rates.
  - replacing the Baker-Just zirconium steam model with the Cathcart-Pawel zirconium steam oxidation model for heat generation.
  - deleting the prohibition on return to nucleate boiling during blowdown.
- Rule requirements would include a provision that would account for recognized nonconservatisms and model limitations

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

Additional technical work would be required to support the actual rule changes

- Support removal of unnecessary conservatisms from Appendix K
- Develop guidelines for demonstrating adequate post-quench ductility as a replacement for the current prescriptive acceptance criteria
- Support development of the regulatory guides needed for implementing the modifications to the existing rule

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

B. Develop a voluntary risk-informed alternative 50.46

- Include technical requirements to ensure an ECCS reliability that is commensurate with the frequency of challenge to systems

- Two options to accomplish ECCS system reliability (in place of the simultaneous loss of offsite power requirement and single failure criterion)

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

B. Develop a voluntary risk-informed alternative 50.46 (cont'd)

Option 1

1. A deterministic system reliability requirement based on risk information
   - e.g., an ECCS design requirement that only one train of ECCS is required for LOCAs larger than a specified size

<- NRC prescribed

Option 2

2. An ECCS functional reliability requirement that is commensurate with the LOCA frequency
   - e.g., a requirement that ECCS design must be such that the core damage frequency [CDF] associated with a specified set of LOCAs is less than an NRC-specified CDF threshold

plant-specific

<- Licensee and plant-specific

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

Phase II

Additional technical work would be required to support the actual rule changes

- Determine acceptable methods and assumptions for performing LOCA CDF and ECCS reliability analyses for those alternatives requiring such analyses
- Determine appropriate reliability and CDF threshold values
- Identify features that tend to decrease the likelihood of loss of offsite power following a LOCA
- Determine acceptable methods and assumptions for estimating plant-specific probability of loss of offsite power given a LOCA.
- Support development of the regulatory guides needed for implementing the recommended risk-informed alternative rule

FEASIBILITY ASSESSMENT OF ADDITIONAL CHANGES TO 10 CFR 50.46

Phase II - cont.

- Additional changes to 50.46 may also have merit:
  - evaluation of the definition of the spectrum of breaks and locations
- The extent of potential change to the definition of pipe break size is dependent on the state-of-knowledge of the frequency of LOCAs of various break sizes
- For example, if a set of LOCAs can be demonstrated to have a collective mean frequency of occurrence of below —
  - 10^{-4}/yr, some regulatory relief may be appropriate
  - 10^{-5}/yr, may be appropriate to remove these LOCAs from the plant design basis, with some mitigative capability
  - 10^{-6}/yr, may be appropriate to remove these LOCAs from the plant design basis
- Staff to continue to perform the technical work to determine its feasibility

FEASIBILITY ASSESSMENT OF ADDITIONAL CHANGES TO 10 CFR 50.46 (cont'd)

Phase II - ca

- The staff will continue to meet with representatives of the nuclear industry in public meetings to address and resolve the technical issues
- These issues include, for example,
  - initial flaw distributions, degradation mechanisms, material response and uncertainty analysis
- If found feasible, the staff would recommend additional changes, potentially including rulemaking to change the wording in 50.46 and Appendices A and K of Part 50 which would allow the licensee to use an alternate pipe size, subject to some level of NRC approval

OTHER OPTION 3 ACTIVITIES

- GDC 35 requires that the ECCS safety function be accomplished assuming a single failure
- Considering replacing this single failure criterion in the alternative rule, but only as it affects ECCS
- The single failure criterion is applied to more than just the ECCS. GDCs 17, 34, 38, 41 and 44 also contain the single failure criterion.
- A generic change to the Part 50 Appendix A single failure criterion definition may be warranted
  - Staff intends to assess the feasibility of a single generic change under Option 3.

OTHER OPTION 3 ACTIVITIES (cont'd)

- Such a risk-informed definition would also address the Commission's guidance in the SRM of February 3, 2000
- The staff has also begun to investigate changes to the special treatment technical requirements of Part 50 — deferred
- The staff has deferred further work on this to better focus its resources on assessments of 50.44 and 50.46, but would reassess its priority late this year

TENTATIVE RECOMMENDATIONS AND SCHEDULE

- Modification of the existing 10 CFR 50.46 and Appendix K:
  - Develop proposed rule — 12 months from date of SRM or 2 months after completion of technical work (whichever is later)
  - Perform technical work — On or before July 2002
- Development of a risk-informed alternative to 10 CFR 50.46, Appendix K and GDC 35:
  - Develop proposed rule — 12 months from date of SRM or 2 months after completion of technical work (whichever is later)
  - Perform technical work — On or before April 2002
- Continue longer-term feasibility assessment on additional changes to 50.46, including rigorous analysis of LOCA frequencies
  - Up to 3 years

Markley
(1)

RISK-INFORMING 10 CFR 50.46

Presented to
Advisory Committee on Reactor Safeguards
(Subcommittee)

Presented by
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RES/DRAA/PRAB
U.S. Nuclear Regulatory Commission
(301) 415-6189

July 9, 2001

OUTLINE

- Purpose/goal of meeting
- Background - Option 3
- Activities
  - Feasibility assessment of changing 10 CFR 50.46
  - Feasibility assessment of additional changes to 10 CFR 50.46
  - Other Option 3 activities
- Tentative Recommendations and schedule

PURPOSE/GOAL OF MEETING

- Provide status report on staff's efforts to risk-inform 10 CFR 50.46
- Solicit feedback and comments from ACRS:
  - Options
  - Implementation issues
  - Feasibility
- Letter requested

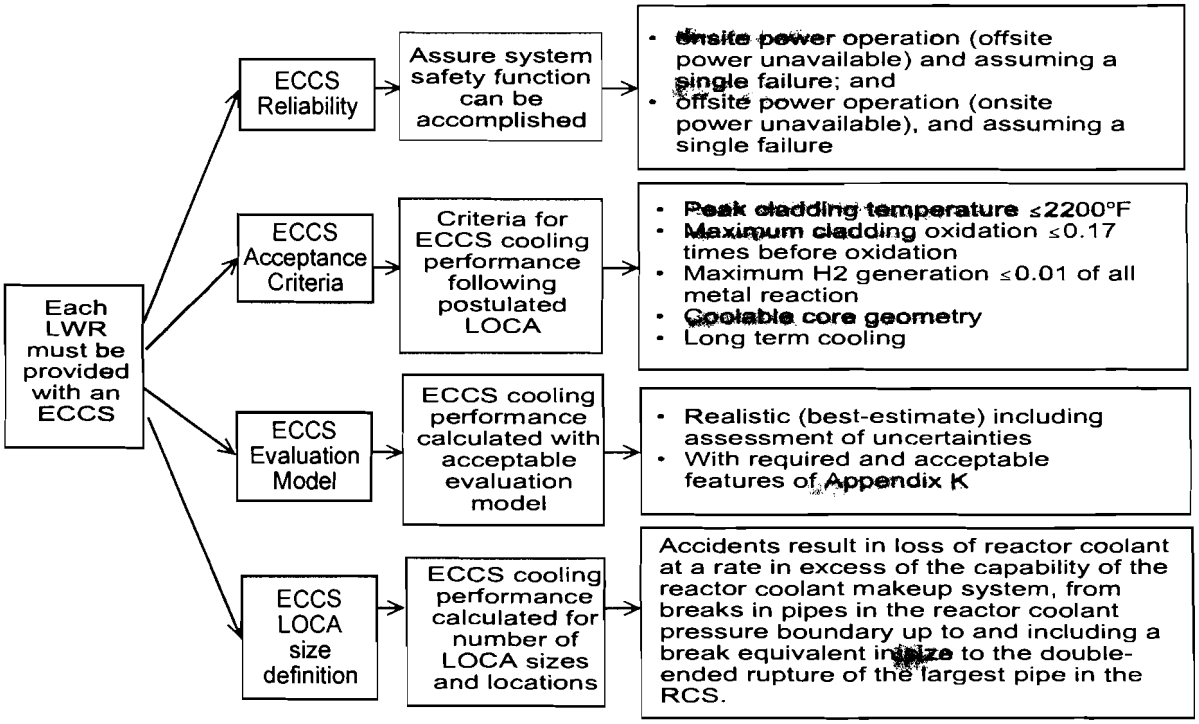
BACKGROUND

SECY-99-264 (Nov 9, 1999) defined plan for Option 3 work

OPTION 3 FRAMEWORK:

- Phase I:
  - Part A: Identify candidate requirement
  - Part B: Prioritize
  - Part C: Evaluate feasibility and provide recommendations to Commission
    - ★ Develop technical content and basis for alternative
    - ★ Identify policy issues
    - ★ Identify required technical work
    - ★ Identify required resources
- Phase II:
  - Part A: Perform technical work
  - Part B: Develop and implement rulemaking

OVERVIEW OF 50.46 (including Appendix K and GDC 35)



FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46

- Changes to reliability, acceptance criteria and evaluation model may be justified
- ECCS reliability resulting from technical requirements not commensurate with risk significance of the various LOCA sizes
- Unnecessary conservatisms exist in the requirements

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

- Current evaluation models of ECCS performance may be overly conservative for large-break LOCAs
- Current estimates of the frequency of large-break LOCAs are uncertain and are not low enough to allow elimination of all large-break LOCA sizes from the design bases
- Reliability of the ECCS is generally sufficient to assure that large-break LOCAs (> 6 inches in diameter) are not significant contributors to risk
- Plant equipment that is designed, at least in part, to the requirements of design-basis LOCAs also provides defense against a spectrum of beyond-design-basis accidents

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

- Staff Considering:
  - A. Changes to the technical requirements of the ***current*** 50.46 related to ~~acceptance~~ criteria and evaluation model
  - B. Development of a voluntary risk-informed ***alternative*** to the reliability requirements in 50.46
- Follows the guidelines in Option 3 framework
- Framework is designed to ensure that changes are risk-informed, and include consideration of defense-in-depth principles

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

A. Possible changes to the current 50.46

- Replace the current prescriptive ECCS acceptance criteria in 50.46 with a performance-based requirement
- This requirement would:
  - demonstrate adequate post-quench cladding ductility and adequate core-coolant flow area to ensure that the core remains amenable to cooling, and,
  - for the duration of the accident, maintain the calculated core temperature at an acceptably low value and remove decay heat.
- Allows use of cladding materials other than zircaloy or ZIRLO without licensees having to submit an exemption request

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

A. Possible changes to the current 50.46 (cont'd)

- Revise the requirements for the ECCS evaluation model to be based on more realistic analyses
- Specifically this update could involve:
  - replacing the current 1971 American Nuclear Society (ANS) decay heat curve with a model based on the 1994 ANS standard.
  - replacing the current decay heat multiplier of 1.2 with an NRC-prescribed uncertainty treatment.
  - deleting the limitation on PWR reflood steam cooling for small reflood rates.
  - replacing the Baker-Just zirconium steam model with the Cathcart-Pawel zirconium steam oxidation model for heat generation.
  - deleting the prohibition on return to nucleate boiling during blowdown.
- Rule requirements would include a provision that would account for recognized nonconservatisms and model limitations

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

Additional technical work would be required to support the actual rule changes

- Support removal of unnecessary conservatisms from Appendix K
- Develop guidelines for demonstrating adequate post-quench ductility as a replacement for the current prescriptive acceptance criteria
- Support development of the regulatory guides needed for implementing the modifications to the existing rule

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

B. Develop a voluntary risk-informed alternative 50.46

- Include technical requirements to ensure an ECCS reliability that is commensurate with the frequency of challenge to systems

- Two options to accomplish ECCS system reliability (in place of the simultaneous loss of offsite power requirement and single failure criterion)

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

B. Develop a voluntary risk-informed alternative 50.46 (cont'd)

Option 1

1. A deterministic system reliability requirement based on risk information
   - e.g., an ECCS design requirement that only one train of ECCS is required for LOCAs larger than a specified size

<- NRC prescribed

Option 2

2. An ECCS functional reliability requirement that is commensurate with the LOCA frequency
   - e.g., a requirement that ECCS design must be such that the core damage frequency [CDF] associated with a specified set of LOCAs is less than an NRC-specified CDF threshold

plant-specific

<- Licensee and plant-specific

FEASIBILITY ASSESSMENT OF CHANGING 10 CFR 50.46 (cont'd)

Phase II

Additional technical work would be required to support the actual rule changes

- Determine acceptable methods and assumptions for performing LOCA CDF and ECCS reliability analyses for those alternatives requiring such analyses
- Determine appropriate reliability and CDF threshold values
- Identify features that tend to decrease the likelihood of loss of offsite power following a LOCA
- Determine acceptable methods and assumptions for estimating plant-specific probability of loss of offsite power given a LOCA.
- Support development of the regulatory guides needed for implementing the recommended risk-informed alternative rule

FEASIBILITY ASSESSMENT OF ADDITIONAL CHANGES TO 10 CFR 50.46

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