

May 8, 2006

MEMORANDUM TO: ACRS Members

FROM: Michael Snodderly, Acting Chief  
Technical Support Branch, ACRS/ACNW

SUBJECT: CERTIFICATION OF THE MINUTES OF THE JOINT MEETING OF  
THE SUBCOMMITTEES ON REGULATORY POLICIES AND  
PRACTICES AND ON THERMAL-HYDRAULIC PHENOMENA,  
JANUARY 25, 2006 - ROCKVILLE, MARYLAND

The minutes of the subject meeting, issued May 5, 2006, 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  
A. Thadani  
S. Duraiswamy

MEMORANDUM TO: M. R. Snodderly, Acting Chief  
Technical Support Branch, ACRS/ACNW

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

SUBJECT: CERTIFICATION OF THE MINUTES OF THE JOINT MEETING OF  
THE SUBCOMMITTEES ON REGULATORY POLICIES AND  
PRACTICES AND ON THERMAL-HYDRAULIC PHENOMENA,  
JANUARY 25, 2006 - ROCKVILLE, MARYLAND

I do hereby certify that, to the best of my knowledge and belief, the minutes of the subject meeting on January 25, 2006, are an accurate record of the proceedings for that meeting.

 5/5/06  
\_\_\_\_\_  
William J. Shack, Date  
Subcommittee Chairman

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
JOINT MEETING OF THE SUBCOMMITTEES ON  
REGULATORY POLICIES AND PRACTICES AND ON  
THERMAL-HYDRAULIC PHENOMENA  
MEETING MINUTES - JANUARY 25, 2006  
ROCKVILLE, MARYLAND

**INTRODUCTION**

The ACRS' Subcommittees on Regulatory Policies and Practices and Thermal-Hydraulic Phenomena held a meeting on January 25, 2006, in Room T-2B3, 11545 Rockville Pike, Rockville, MD. The purpose of this meeting was to review the staff's draft proposed regulatory guide (RG) in support of a voluntary alternative rule that would allow licensees to implement a redefined large-break LOCA and associated risk-informed ECCS requirements. 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. The meeting was convened by Dr. Shack at 1:33 p.m. on January 25, 2006 and adjourned at 4:57 p.m..

**ATTENDEES**

**ACRS Members**

W. Shack, Co-Subcommittee Chairman  
G. Wallis, Co-Subcommittee Chairman  
G. Apostolakis, Member  
M. Bonaca, Member

R. Denning, Member  
T. Kress, Member  
D. Powers, Member  
M. Snodderly, Designated Federal Official

**Principal NRC Speakers**

T. Collins, NRR  
S. Dinsmore, NRR  
R. Landdry, NRR

E. Throm, NRR

There were approximately four 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 CO-CHAIRMAN SHACK**

Bill Shack, Chairman of the ACRS Subcommittee on Regulatory Policies and Practices stated that the purpose of this meeting was to review the staff's draft proposed RG in support of a voluntary alternative rule that would allow licensees to implement a redefined large-break LOCA

and associated risk-informed ECCS requirements. 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 January 10, 2006. Dr. Shack acknowledged that no written comments or requests for time to make oral statements had been received.

## **DISCUSSION OF AGENDA ITEMS**

### **Overview of Proposed 10 CFR 50.46A Regulatory Guide**

Tim Collins, Division of Safety Systems, NRR, discussed the upcoming schedule for the proposed RG. Mr. Collins stated that the draft proposed rule was out for public comment until March 8<sup>th</sup>. He said that if the NRC staff received significant comments that would impact the proposed rule language the change would also have to be incorporated into the RG. Subsequent to the March 8<sup>th</sup>, the staff received significant comments from industry and the staff does not expect the draft final rule and associated RG to be available for ACRS review until the end of July 2006 for review by the full Committee in September 2006. Mr. Collins then gave an overview of the RG using its table of contents. Mr. Collins emphasized that proposed plant changes could invalidate assumptions in radiological consequence analyses and may necessitate the need to assess their impact on LOCA frequency. Ralph Landry and Edward Throm, NRR, provided briefings on possible ECCS and Containment Analyses. Stephen Dinsmore, NRR, briefed the Committee on possible Risk-Informed Integrated Safety Performance (RISP) Assessments to support the proposed 10 CFR 50.46(a).

### **General Comments and Observations From the Subcommittee Members**

- Dr. Wallis commented that the RG appears to apply only to operating plants. Mr. Collins agreed and said that in order to expedite the rulemaking the staff recommended focusing on operating reactors in the near term.
- Dr. Shack asked how much equipment is dedicated to mitigated the double ended guillotine break. Stephen Dinsmore, NRR, responded that the staff tried to figure out what people might change. The staff was not successful answering that question so they wrote a rule which doesn't require one to know beforehand what is going to be changed. Mr. Dinsmore went on to say that he could not answer Dr. Shack's question.
- Dr. Shack asked if allowed outage times would be significantly affected. Mr. Collins said that was possible, but that the importance of the equipment should be caught in the risk assessment.
- Dr. Kress asked about the impact of the RG on Part 100 dose calculations. Mr. Collins responded that licensees would be responsible for investigating the affects of changes to containment spray actuation time on Part 100 dose calculations.
- Dr. Denning asked if the break size affected the dose calculation. Mr. Collins responded that he didn't think it would have much effect. He thought that licensees what stay with their current analyses and may change a few input assumptions.

- Dr. Wallis asked about demonstrating uncertainty at a higher probability (the proposed 70% instead of the current 95%). Mr. Landry explained that you calculate the peak cladding temperature at an uncertainty level, say 95 percent. Mr. Landry stated that it says nothing about what that other five percent is. He gave the following example, If one calculates a peak clad temperature of 2,190 °F as the 95 percent value then there is a 5 percent probability that you could calculate a temperature higher than 2,190 °F. It could be 2,190.1 °F or 4,000 °F. Dr. Powers summarized that it is a 95 percent probability that the peak clad temperature is less than or equal to what you calculated.
- Dr. Denning made an argument as to why the Commission shouldn't do anything to change the design basis of the containment. He said that the value of the containment is not related to LOCAs or fission product release from the LOCAs. He felt that the value of the containment is to maintain integrity in severe accidents regardless of whether or not large break LOCAs are of high or low probability. Dr. Denning felt that some very specific criteria, such as LERF, the examination of LERF, or the effect of a proposed change on LERF, to address severe accident design of containments will be needed. Mr. Throm suggested a rule that requires that containment integrity be shown for breaks greater than the transition break size.
- Dr. Denning followed up by asking if the staff anticipated licensees asking for relaxation of containment structural integrity. Mr. Collins gave the example where somebody was doing a steam generator replacement and they cut a hole in the side of containment. He asked, "When they patch that hole, can they have a degraded containment as a result because they have adopted 50.46(a)?" Mr. Collins said that the staff has decided that this would not be an acceptable approach. The proposed rule says that one needs to maintain the structural integrity and leak tightness of the containment. Mr. Hans Asher added that the containment would still have to meet the ASME Code for the DEGB.
- Dr. Shack asked why 10 CFR 50.59 and RG 1.174 could not be used as mechanisms for change control in the proposed rule. Mr. Rubin responded that 50.59 applies to design basis, safety-related aspects of the plant. 50.46(a) is a much broader application that touches on both safety-related and non-safety-related aspects. Mr. Rubin added that 50.59 allows changes to be made where there are small impacts on the probability and consequences of "design basis accidents only." Mr. Dinsmore pointed out that anytime you use 50.59 after you adopt 50.46(a) you have to perform a RISP assessment. Mr. Collins added that it goes beyond what used to be covered by 50.59. The Commission came back and said to revise that portion of the rule.
- Dr. Wallis asked how defense-in-depth is being maintained if you change the large break LOCA definition. Mr. Dinsmore responded that defense-in-depth is maintained by providing at least one train of equipment to mitigate the most limiting double ended guillotine break albeit with commercial grade equipment.
- Dr. Denning questioned the importance of qualitative analyses under Element Two, "Engineering Analysis." Mr. Rubin agreed and said that the staff could clarify the language to say they don't generate the traditional PRA metrics of a delta CDF and a delta LERF.

**SUBCOMMITTEE DECISIONS AND ACTIONS**

The Full Committee will review and comment upon the draft proposed RG and the draft final rulemaking package for 10 CFR 50.46(a) at its September 2006 meeting.

**BACKGROUND MATERIALS PROVIDED TO THE SUBCOMMITTEE PRIOR TO THIS MEETING**

1. Subcommittee status report, including agenda.
2. Draft Rule Language for § 50.46 ECCS LOCA Redefinition Rule as published in the Federal Register, Volume 70, Number 214, Pages 67597 to 67630, on November 7, 2005.
3. Memorandum dated January 6, 2006, from Eileen McKenna, Chief, Financial, Policy, and Rulemaking Branch, NRR, to John T. Larkins, Executive Director, ACRS, Subject: Review of Regulatory Guide Supporting Risk-Informed 10 CFR 50.46a Proposed Rule (Pre-Decisional For Internal ACRS Use Only).

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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, NW., Washington, DC 20005 (202) 234-4433.

PRE-DECISIONAL

May 5, 2006

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

G. B. Wallis, Chairman  
Thermal Hydraulic Phenomena Subcommittee

FROM: M. R. Snodderly, Acting Chief  
Technical Support Branch, ACRS/ACNW

SUBJECT: WORKING COPY OF THE MINUTES OF THE JOINT MEETING OF  
THE SUBCOMMITTEES ON REGULATORY POLICIES AND  
PRACTICES AND ON THERMAL-HYDRAULIC PHENOMENA,  
JANUARY 25, 2006 - 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  
Thermal Hydraulic Phenomena Subcommittee Members  
G. Apostolakis  
S. Armijo  
O. Maynard  
D. Powers  
S. Duraiswamy  
A. Thadani  
J. Larkins

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
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M. Bonaca, Member

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M Snodderly

public meeting locations are wheelchair-accessible. If you plan to attend a scoping meeting/open house, and need special assistance such as sign language interpretation or other reasonable accommodation, please notify NSF (see **FOR FURTHER INFORMATION CONTACT**) at least 3 business days in advance. Include your contact information as well as information about your specific needs.

We request public comments or other relevant information on environmental issues related to the NSF drilling program. The public meetings are not the only opportunity you have to comment. In addition to or in place of attending a meeting, you can submit comments to Dr. James Allan by March 6, 2006 (see **FOR FURTHER INFORMATION CONTACT**). We will consider all comments received during the comment period. We request that you include in your comments:

- Your name and address (especially if you would like to receive a copy of the Draft Programmatic EIS/OEIS upon completion);
- An explanation for each comment; and
- Include any background materials to support your comments, as you feel necessary.

You may mail, e-mail, or hand deliver your comments to NSF (see **FOR FURTHER INFORMATION CONTACT**). All comment submissions must be unbound, no larger than 8½ by 11 inches, and suitable for copying and electronic scanning. Please note that regardless of the method used for submitting comments or material, all submissions will be publicly available and, therefore, any personal information you provide in your comments will be open for public review. In addition, if you wish to receive a copy of the Draft Programmatic EIS/OEIS, please indicate this in your comment. No decision will be made to implement any alternative until the NEPA process is completed.

Dated: January 5, 2006.

James Allan,

Program Director, Ocean Drilling Program,  
Division of Ocean Sciences, National Science  
Foundation.

[FR Doc. 06-198 Filed 1-9-06; 8:45 am]

BILLING CODE 7555-01-M

## NUCLEAR REGULATORY COMMISSION

### Advisory Committee on Reactor Safeguards; Joint Meeting of the Subcommittees on Regulatory Policies and Practices and on Thermal- Hydraulic Phenomena; Notice of Meeting

The ACRS Subcommittees on Regulatory Policies and Practices and on Thermal-Hydraulic Phenomena will hold a joint meeting on January 25, 2006, 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:

**Wednesday, January 25, 2006—1:30 p.m. until 5:30 p.m.**

The Subcommittees will review the staff's draft proposed Regulatory Guide in support of risk-informed changes to loss-of-coolant accident technical requirements. The Subcommittees will hear presentations by and hold discussions with representatives of the NRC staff, and other interested persons regarding this matter. The Subcommittee will gather information, analyze relevant issues and facts, and formulate proposed positions and actions, as appropriate, for deliberation by the full Committee.

Members of the public desiring to provide oral statements and/or written comments should notify the Designated Federal Official, Mr. Michael R. Snodderly (telephone 301/415-6927), five days prior to the meeting, if possible, so that appropriate arrangements can be made. Electronic recordings will be permitted.

Further information regarding this meeting can be obtained by contacting the Designated Federal Official between 7:30 a.m. and 4:15 p.m. (ET). Persons planning to attend this meeting are urged to contact the above named individual at least two working days prior to the meeting to be advised of any potential changes to the agenda.

Dated: January 4, 2006.

Michael L. Scott,

Branch Chief, ACRS/ACNW.

[FR Doc. E6-122 Filed 1-9-06; 8:45 am]

BILLING CODE 7590-01-P

## NUCLEAR REGULATORY COMMISSION

### Sunshine Federal Register Notice

**DATES:** Weeks of January 9, 16, 23, 30, February 6, 13, 2006.

**PLACE:** Commissioners' Conference Room, 11555 Rockville Pike, Rockville, Maryland.

**STATUS:** Public and closed.

**MATTERS TO BE CONSIDERED:**

**Week of January 9, 2006**

*Tuesday, January 10, 2006*

9:30 a.m.: Briefing on International Research and Bilateral Agreements (Public Meeting). (Contact: Roman Shaffer, 301-415-7606). This meeting will be webcast live at the Web address—<http://www.nrc.gov>

*Wednesday, January 11, 2006*

1:55 p.m.: Affirmation Session (Public Meeting) (Tentative) a. Hydro Resources, Inc. (Crownpoint, New Mexico) Petition for Review of LBP-05-17 (Groundwater Issues) (Tentative)

2 p.m.: Meeting with Advisory Committee on Nuclear Waste (ACNW) (Public Meeting) (Contact: John Larkins, 301-415-7360) This meeting will be webcast live at the Web address—<http://www.nrc.gov>

*Thursday, January 12, 2006*

9:30 a.m.: Discussion of Security Issues (Closed—Ex. 2 & 3).

**Week of January 16, 2006—Tentative**

*Tuesday, January 17, 2006*

1:30 p.m.: Discussion of Security Issues (Closed—Ex. 1 & 3).

**Week of January 23, 2006—Tentative**

There are no meetings scheduled for the Week of January 23, 2006.

**Week of January 30, 2006—Tentative**

*Tuesday, January 31, 2006*

9:30 a.m.: Briefing on Strategic Workforce Planning and Human Capital Initiatives (Closed—Ex. 2).

*Wednesday, February 1, 2006*

9:30 a.m.: Discussion of Security Issues (Closed—Ex. 1 & 3)

**Week of February 6, 2006—Tentative**

*Monday, February 6, 2006*

9:30 a.m.: Briefing on Materials Degradation Issues and Fuel Reliability (Public Meeting). (Contact: Jennifer Uhle, 301-415-6200). This meeting will be webcast live at the Web address—<http://www.nrc.gov>

2 p.m.: Discussion of Security Issues (Closed—Ex. 1 & 3).

*Wednesday, February 8, 2006*

9:30 a.m.: Briefing on Office of Nuclear Materials Safety and Safeguards (NMSS). Programs, Performance, and

**ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
 JOINT MEETING OF THE SUBCOMMITTEES ON  
 REGULATORY POLICIES AND PRACTICES AND  
 THERMAL HYDRAULIC PHENOMENA  
 ROOM T-2B3, 11545 ROCKVILLE PIKE, ROCKVILLE MD  
 JANUARY 25, 2006**

Contact: Michael Snodderly (301-415-6927, mrs1@nrc.gov )

**-PROPOSED SCHEDULE-**

	<b>TOPICS</b>	<b>PRESENTERS</b>	<b>TIME</b>
I.	<b>Opening Remarks</b>	W. Shack, ACRS G. Wallis, ACRS	1:30-1:35 p.m.
II.	<b>Introduction</b>	T. Collins, NRR	1:35-1:50 p.m.
III.	<b>ECCS Analyses</b>	R. Landry, NRR	1:50-2:25 p.m.
IV.	<b>Containment Analyses</b>	E. Throm, NRR	2:25-3:00 p.m.
	<b>BREAK</b>		<b>3:00-3:15 p.m.</b>
V.	<b>Risk-Informed Integrated Safety Assessment</b>	S. Dinsmore, NRR	3:15-4:45 p.m.
VI.	<b>General Discussion-Including Future Interactions</b>	W. Shack, ACRS G. Wallis, ACRS T. Collins, NRR	4:45-5:00 p.m.
VII.	<b>Adjourn</b>	W. Shack, ACRS G. Wallis, ACRS	5:00 p.m.

**NOTE:**

- Presentation time should not exceed 50 percent of the total time allocated for specific item. The remaining 50 percent of the time is reserved for discussion.
- 35 copies of the presentation materials to be provided to the Subcommittee



ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
 JOINT SUBCOMMITTEE MEETING ON REGULATORY POLICIES & PRACTICES  
 AND THERMAL-HYDRAULIC PHENOMENA

January 25, 2006  
 Date

**NRC STAFF SIGN IN FOR ACRS MEETING**

PLEASE PRINT

	<u>NAME</u>	<u>NRC ORGANIZATION</u>
1	EDWARD THORN	NRR / ADEL / DSS / SNPB
2	RALPH LANDRY	JNPB
3	Mark Rubin	NRR / AP6A
4	STEPHEN DOWSMORE	NRR / DPA
5	John Fair	NRR / DE
6	Gary Hammer	NRR / DCI
7	Richard Dudley	NRR / DAR
8	Hani Ashur	NRR / DE
9	Ted Sullivan	NRR / DCI
10	Veronica Klein	NRR / ADEL / DSS / SNPB
11	SAM LEE	NRR / DCI / CPTB
12	DAVID FISHER	↓
13	FRANCIS AKSINTSEV	NRR / DSS / SNPB
14	JOHN E. WISE	NRR / PLAB
15	Georgina Tsafaye	NRR / DRA / ACTN
16		
17		
18		
19		
20		

DATA SHEET - RETURN TO BJWHITE AFTER MEETING

SUBCOMMITTEE MEETING DATA SHEET

1. Subcommittee (Name) - **REGULATORY POLICIES AND PRACTICES & THERMAL-HYDRAULIC PHENOMENA**
- a. Date 1a. January 25, 2006, 1:30 p.m. - 5:30 p.m.
- b. Cognizant Staff Engineer 1b. Mike Snodderly
2. Amount of Time Spent in Open Sessions 2. 3 hours and 24 minutes  
(hours and minutes)
3. Amount of Time Spent in Closed Session 3. None
- (1) Exemption 1 - Natl. Security Info. \_\_\_\_\_)
- (2) Exemption 4 - Proprietary Material\* \_\_\_\_\_)
- (3) Exemption 6 - Undue Invasion of Personal Privacy \_\_\_\_\_)
- (4) Exemption 9 - Premature Disclosure (e.g., Budget and Financial Info) \_\_\_\_\_)
- (5) Exemption 10 - Adjudicatory Matters \_\_\_\_\_)
4. Number of Written Comments from the Public (submitted for consideration) 4. None  
(Names)
5. Number of Oral Statements (Name) 5. None
6. Number of Public Attendees 6. 4

\*Currently includes Plant Security Information



# PROPOSED 10CFR 50.46A REGULATORY GUIDE

Briefing for ACRS

Timothy Collins, NRR-DSS

January 25, 2006

# Schedule for ACRS Meetings

Date	Rule	Reg Guide	Notes
Jan 25		Sub	Non seismic
March 8th	Comment period ends		
Apr or May		Sub	Rule comments and seismic
May or June		Full	Ltr: Send RG out for comment
July-Sept		Out for comment	
Sept	Full		Ltr on Final Rule
Nov		Sub	Comment resolution
Dec		Full	Ltr on RG for trial use

*Take off NUPEG  
Put on rule and R/G*

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# Radiological Consequences

- Existing Guidance Valid under 50.46a
  - More realistic source term for LOCA already developed in Alternate Source Term Rule
  - Leak rate used in dose calculation is independent of calculated containment pressure
- Proposed plant changes could invalidate assumptions in current guidance,
  - analysis must be made consistent with actual plant as well as intent of regulatory guidance

# Changes in Break Frequency

- LOCA frequency estimates used to support 50.46a assumed historical operating conditions
- Significant changes to operating conditions could invalidate applicability
- Significant changes need to be assessed for impact on LOCA frequency



# **Risk-Informed Integrated Safety Performance (RISP) Assessment for Proposed 50.46(a) Rule**

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**PRA Licensing Branch  
Division of Safety Systems, NRR  
US Nuclear Regulatory Commission**

**ACRS Subcommittee Presentation  
January 25, 2006**



# Topics

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- Overview of the RISP Process
- Application to Adopt 50.46a
- Description of Risk Assessment Methods
- Risk Metrics for Changes Under 50.59
- Risk Metrics for Changes Under 50.90
- Change in Risk Calculation
- Defense-in-Depth
- Safety Margins
- RISP Requirements During Operation
- Risk Assessment Reporting Requirements



# Overview of the RISP process

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- A licensee who wishes to make changes to the facility or procedures or to the technical specifications shall perform a RISP assessment.
- The RISP assessment must demonstrate that all plant changes satisfy the acceptance criteria in the rule:
  - acceptable changes in risk,
  - Defense-in-Depth is maintained,
  - Adequate safety margins are maintained, and
  - Adequate performance measurement programs are implemented.
- The RISP assessment process includes:
  - Quantitative and qualitative risk analysis tools,
  - A framework for evaluating defense-in-depth,
  - A framework for evaluating safety margins, and
  - Performance-measurement programs that monitor the facility and provide feedback during operation.





# Application to Adopt 50.46a

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- The Commission must approve an application made under 50.90 to adopt 50.46a
- The application under 50.90 must contain a description of the RISP assessment process including:
  - Description of the licensee's PRA and non-PRA risk assessment methods and
  - Description of the methods and decisionmaking process for evaluating compliance with
    - the risk criteria,
    - defense-in-depth criteria,
    - safety margin criteria, and
    - performance measurement criteria.
- Approval will authorize licensee to use the RISP to satisfy 50.46a requirements when making future changes under 50.59 and its internal change process.
- The RISP will also be used to satisfy 50.46a requirements when proposing future change under 50.90.

# Description of Risk Assessment Methods - Scope

- The application to adopt 50.46 should include a description of the licensee's PRA and non-PRA risk assessment methods and should:
  - Identify the PRA scope (initiators and operating modes) that will be used and provide the estimated CDF and LERF.
  - Identify the non-PRA methods that will be used for out-of-scope initiators and modes. For each facility change that is evaluated, the non-PRA methods should be capable of;
    - realistically estimating the change in risk if risk will be estimated,
    - demonstrating that any risk increase caused by the modification would not affect the regulatory decision in a substantial manner (for example, by not affecting the results of screening analyses), or
    - demonstrating that it can not be reasonably concluded that risk has actually changed (for example, the qualitative review of potential safety related functions used for 50.69 implementation).

# Description of Risk Assessment Methods – Technical Adequacy

- A description of the measures taken to assure the technical adequacy of the risk assessments. An acceptable approach for assessing technical adequacy of PRA risk assessment is discussed in RG 1.200 including
  - Resolving all peer reviewer comments and
  - Identifying key sources of uncertainty.
- NRC approval to adopt 50.46a will limit the changes permitted under 50.59 to those for which the available risk assessments are adequate to demonstrate that any increase in risk will be minimal.
- Any change may always be requested under 50.90, and technical adequacy of supporting RISP analyses will be required to be submitted and will be reviewed by the staff.

# Risk Metrics – Changes Under 50.59

- The proposed rule authorizes licensees to make facility changes without prior NRC approval when the increase in the estimated risk is minimal compared to the overall plant risk profile.
- The NRC staff decided that quantitative guidelines defining minimal are needed because:
  - The proposed rule introduces the consideration of the change in risk into every decision,
  - The proposed rule provides quantitative guidelines for (non-minimal) acceptable risk increases, and
  - Although changes in risk from many facility changes may not be quantifiable, some will be quantifiable although very small.
- RG 1.174 does not provide any guidance about when a proposed risk-informed change not need be approved by NRC so a new guideline was needed.
- The staff is proposing the following guidelines to define when a quantifiable risk increases is minimal:
  - Increase in CDF less than  $10E-7$  per year,
  - Increase in LERF less than  $10E-8$  per year,
  - And
  - Increases in CDF and LERF are less than 1 % of overall plant risk profile.

# Risk Metrics – Changes Under 50.90

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- Licensee may submit a request for a licensing amendment when the RISP assessment demonstrates that
  - the total increases in core damage frequency and large early release frequency are small and the overall risk remains small.
- Every change to the facility that increases or decreases risk should be included in the total change in risk estimate.
- Small increase is defined by RG 1.174.
- Overall risk will remain small due to RG 1.174's guidelines that reduce acceptable increases when the overall CDF or LERF is greater than  $10^{-4}/\text{yr}$  and  $10^{-5}/\text{yr}$  respectively.



# Change-in-Risk Calculation

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- The total increases in CDF and LERF can be estimated by tracking the change to overall CDF and LERF caused by all changes to the facility since the adoption of 50.46a.
- Some change to the PRA that change the overall CDF and LERF are not made to reflect changes to the facility but, instead, to improve the fidelity of the model or the methods used in the model.
- Changes to overall CDF and LERF caused by PRA improvements should be tracked separately.
- Quantitative guidelines in RG 1.174 should not be interpreted as being overly prescriptive. Therefore, a reasonable estimate of the overall change to CDF and LERF should be acceptable.



# Defense-in-Depth

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- The RISIP must also demonstrate that defense in depth is maintained for all changes, in part, by assuring that:
  - Reasonable balance is provided among prevention of core damage, containment failure (early and late), and consequence mitigation;
  - System redundancy, independence, and diversity are provided commensurate with the expected frequency of postulated accidents, the consequences of those accidents, and uncertainties; and
  - Independence of barriers is not degraded.
- Licensees should retain a level of containment reliability for the full spectrum of accident sequences following all facility changes, even if there is no change in CDF or LERF.



# Safety-Margins

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- The RISP must also demonstrate that adequate safety margins are retained for all changes to account for uncertainties. With sufficient safety margins:
  - Codes and standards or their alternatives approved for use by the NRC are met
  - Either safety analysis acceptance criteria in the plant licensing basis are met, or proposed revisions provide sufficient margin to account for analysis and data uncertainty.
- The licensee is expected to choose the method of engineering analysis appropriate for evaluating whether sufficient safety margins would be maintained if the proposed modification were implemented.



# RISP Requirements During Operation

- Performance measuring programs should be integrated with existing programs where practicable such as;
  - Maintenance Rule (§ 50.65) and
  - Monitoring and feedback programs implemented as part of previous risk-informed regulatory actions.
  
- Licensees must periodically reevaluate and update the risk assessments (both PRA and non-PRA assessments)
  - Address modifications to the plant, operational practices, equipment performance, and plant operational experience
  - Determine impact on RISP assessments when errors, non-conformances, degraded conditions, or conditions adverse to quality are discovered
  
- Licensees must take appropriate action to ensure that all modifications continue to meet all applicable acceptance criteria, or modify the facility, technical specifications or procedures so that the acceptance criteria are met.

# Risk Assessment Reporting Requirements

- The rule requires periodic PRA reevaluation and, if necessary to address facility changes that have not been incorporated into the PRA, a PRA update.
- As part of the PRA update, the licensee shall report the change to the NRC if the change results in a significant reduction in the capability to meet the acceptance requirements.
- RG 1.174 does not provide guidance on a significant reduction in capability.
- The staff has proposed the following guidance to define a significant reduction in capability
  - The overall CDF or LERF estimate increase by 20% or more
  - The increase in CDF increases by  $1 \times 10^{-6}$ /year or more
  - The increase in LERF increases by  $1 \times 10^{-7}$ /year or more

**Proposed 10 CFR 50.46a  
ECCS Analysis  
Containment Analysis**



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**ACRS Subcommittees  
Regulatory Policies and Practices  
Thermal-Hydraulic Phenomena  
January 25, 2006**



## 50.46a Regulatory Guide

- ACRS Presentation History
- Objectives and Scope
- Approach
  - ECCS Analysis
  - Containment Analysis



## **Previous ACRS Briefings Regarding 10 CFR 50.46a**

- Previous ACRS briefings
  - November 2004
  - March 2005



## Objectives and Scope — ECCS Analysis

- Define acceptable analysis approaches
  - For break sizes less than or equal to the TBS
  - For break sizes greater than the TBS
- Define acceptance criteria
  - For break sizes less than or equal to the TBS
  - For break sizes greater than the TBS



## Acceptable Analysis Methods — ECCS Analysis

- Breaks  $\leq$  TBS
  - 10 CFR Part 50, Appendix K
  - Realistic with uncertainty determination, Regulatory Guide 1.157
  - Uncertainty demonstrated at high probability level
- Breaks  $>$  TBS
  - 10 CFR Part 50, Appendix K
  - Realistic with uncertainty determination, Regulatory Guide 1.157
  - Another analytical approach
  - Uncertainty can be demonstrated at lower probability level



## Acceptance Criteria — ECCS Analysis

- Breaks  $\leq$  TBS
  - Current criteria
- Breaks  $>$  TBS
  - Coolable geometry
  - Long-term cooling
  - Coolable geometry understood by the staff to be:
    - PCT  $\leq$  2200°F
    - MLO  $\leq$  17%
    - Hydrogen equivalent to CWO  $\leq$  1%





## Acceptance Criteria – Alternative

- Statement of proposed criteria
- Basis for criteria
  - Experimental data base
  - Applicability of the metric
  - Derivation of success criteria
  - Key assumptions
  - Uncertainty analysis
  - Limits of applicability
- Validation and assessment of the analysis methodology



## ECCS Analysis > TBS

- Assumptions and input
  - Locked RCP rotor need not be assumed, but appropriate pump coast down resistance must be used
  - Offsite power available
  - Worst single failure is not assumed
  - Non-safety grade equipment may be credited, but must be maintained available and be capable of performing credited function under the associated accident conditions



## **Analysis Methodology (>TBS) Documentation**

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- Analytical model requirements
- Analytical model methodology
- Code description manuals
- User manuals and guidance
- Scaling reports
- Assessment reports
- Uncertainty analysis reports



## Quality Assurance

- Good QA practices consistent with 10 CFR Part 50, Appendix B
- Applies to analytical model
  - Development
  - Assessment
  - Application



## ECCS Analysis Summary

- Breaks up to and including the TBS follow all the rules currently in place
- Breaks beyond the TBS may use the current analytical methods or an alternative
- The documentation relevant to the analytical methodology used must be maintained for staff inspection
- Considerable relaxations are acceptable for breaks beyond the TBS
- Good quality assurance practices must be followed



# 50.46a Containment Analysis

Edward D. Throm



## Containment Response Analyses

- Performed for DBAs – LOCAs, MSLBs and FWLBs
- Demonstrate pressure and temperature within design limits
  - Evaluate safeguards equipment performance
    - Sprays, coolers, ice weight, suppression pool temperature
    - Diesel-loading sequence time requirements
  - Evaluate auxiliary systems performance
    - Heat exchangers, service/component cooling water, UHS
- Equipment Qualification temperature and pressure profiles
- PWR – Minimum containment pressure for ECCS performance



## Containment Criteria and Guidance

- General Design Criteria
  - GDC 16 - Containment Design
  - GDC 38 - Containment Heat Removal
  - GDC 44 - Cooling Water
  - GDC 50 - Containment Design Basis
  
- Standard Review Plan
  - 6.2.1.1.A,-.B,-.C - Containment Functional Design
  - 6.2.1.3 - Mass and Energy Releases for LOCAs
  - 6.2.1.5 – Min Pressure for ECCS Performance (PWRs)
    - Possible issue related to use of Tagami for heat transfer coefficient
    - $H_{\text{Tagami}}$  at end-of-blowdown  $\sim 1/\text{time to end-of blowdown}$





## Containment - Breaks Up to the TBS

- Use current approved computer models and guidance
  - Models based on lumped parameter approach
  - Breaks result in a "well-mixed" containment atmosphere
  - Conservative initial conditions (p,T and relative humidity)
  - Conservative treatment of break flow and heat structures
  - Single failure/Loss of Offsite power for engineered safety systems
- Possible need to reconsider models for "small" breaks
- Acceptance Criteria
  - Containment and containment structures withstand peak pressure without loss of integrity
  - Containment remains a low-leakage barrier against the release of fission products as long as accident conditions require



## Containment - Breaks Beyond the TBS

- Use current approved computer models
  - Realistic initial conditions ( $p, T$  and relative humidity)
  - Realistic treatment of break flow and heat structures
  - No single failure/Offsite power for engineered safety systems
  - Non-safety grade equipment may be credited, but must be maintained available and be capable of performing credited function under the associated accident conditions
- Acceptance Criteria
  - Containment and containment structures withstand peak pressure without loss of integrity – based on ASME code limits
  - SRP 3.8.1 – Concrete Containment
  - SRP 3.8.2 – Steel Containment



## Containment Analysis Summary

- For breaks up to the TBS use current codes and practices
  - May need to revisit codes if TBS is a "small" break
  - May need to revisit guidance for PWR ECCS performance
  
  - Containment pressure and temperature within design limits
  - Leak tight for accident duration
  
- For breaks beyond the TBS use current code
  - Without single failure or loss of offsite power
  - With realistic inputs and modeling, may include non-safety systems
  
  - Containment integrity maintained for breaks beyond the TBS