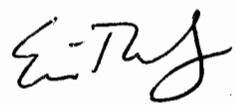




UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

December 12, 2006

MEMORANDUM TO: ACRS Members

FROM: Eric A. Thornsby, ACRS Senior Staff Engineer 

SUBJECT: CERTIFICATION OF THE MINUTES OF THE MEETING OF THE
ACRS SUBCOMMITTEE ON REGULATORY POLICIES AND
PRACTICES, OCTOBER 31, 2006 - ROCKVILLE, MARYLAND

The subcommittee chairman has certified the minutes of the subject meeting, issued December 1, 2006, 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
S. Duraiswamy
M. Snodderly
C. Santos



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

December 1, 2006

MEMORANDUM TO: William J. Shack, Chairman
Regulatory Policies & Practices Subcommittee

FROM: Eric A. Thornsbury, ACRS Senior Staff Engineer *EAT*

SUBJECT: WORKING COPY OF THE MINUTES OF THE MEETING OF THE
ACRS SUBCOMMITTEE ON REGULATORY POLICIES AND
PRACTICES, OCTOBER 31, 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 & Practices Subcommittee Members
J. Larkins
S. Duraiswamy
M. Snodderly
C. Santos



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

MEMORANDUM TO: Eric A. Thornsby, ACRS Senior Staff Engineer

FROM: William J. Shack, Chairman
Regulatory Policies & Practices Subcommittee

SUBJECT: CERTIFICATION OF THE MINUTES OF THE MEETING OF THE
ACRS SUBCOMMITTEE ON REGULATORY POLICIES AND
PRACTICES, OCTOBER 31, 2006 - ROCKVILLE, MARYLAND

I do hereby certify that, to the best of my knowledge and belief, the minutes of the subject meeting on October 31, 2006, are an accurate record of the proceedings for that meeting.

A handwritten signature in black ink, appearing to read "William J. Shack", written over a horizontal line.

William J. Shack
Subcommittee Chairman

12/3/06

Date

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
MEETING OF THE ACRS SUBCOMMITTEE ON
REGULATORY POLICIES AND PRACTICES
MEETING MINUTES - OCTOBER 31, 2006
ROCKVILLE, MARYLAND

INTRODUCTION

The ACRS Subcommittee on Regulatory Policies & Practices held a meeting on October 31, 2006, in Room T-2B3, 11545 Rockville Pike, Rockville, MD. The purpose of this meeting was to review the details of the draft final risk-informed revision to 10 CFR 50.46. Eric Thornsby was the Designated Federal Official for this meeting. The BWR Owners' Group submitted a letter for the Committee's consideration and requested time to make an oral presentation. The Subcommittee received no other written statements or requests for time to make oral statements from the public. The Subcommittee Chairman convened the meeting at 8:30 a.m. on October 31, 2006 and adjourned at 12:55 p.m..

ATTENDEES

ACRS Members

W. Shack, Subcommittee Chairman
G. Apostolakis, Member
J. S. Armijo, Member
S. Banerjee, Member
M. Corradini, Member

T. Kress, Member
O. Maynard, Member
J. Sieber, Member
G. Wallis, Member
E. Thornsby, Designated Federal Official

Principal NRC Speakers

R. Dudley, NRR
R. Landry, NRR

S. Dinsmore, NRR
G. Hammer, NRR

Other Principal Speakers

R. Bunt, BWROG
F. Bolger, GE

T. Browning, BWROG

Other members of the public attended this meeting. A complete list of attendees is in the ACRS Office File and is 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

Dr. William Shack, Chairman of the ACRS Subcommittee on Regulatory Policies & Practices, convened the meeting at 8:30 a.m. Dr. Shack stated that the purpose of this meeting was to review details of the draft final risk-informed revision to 10 CFR 50.46. He said the Subcommittee would 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 October 19, 2006. Dr. Shack acknowledged that Mr. Randy Bunt, Chair of the BWR Owner's Group (BWROG), has submitted written material for consideration, and has requested time to make an oral presentation to the subcommittee.

DISCUSSION OF AGENDA ITEMS

Draft Final Rule Language for 10 CFR 50.46a

Mr. Richard Dudley, Rulemaking Project Manager in the Office of Nuclear Reactor Regulation, led the staff's presentations. He first provided some background on the rulemaking process leading to the current draft final rule, including discussion of areas where the Commission provided direct instructions. He then stated the staff's plan to request a letter from the ACRS on the final rule that addresses all of the rule's technical issues except the selection of the PWR transition break size (TBS). This exception is due to the recent discovery of pipe crack indications at Wolf Creek. Once the staff completes their precautionary review of those discoveries, it plans to return to the Committee to finalize the PWR TBS portion of the rule. Mr. Dudley then described the layout of the agenda for the staff's presentations, which primarily address the public comments received on the proposed rule.

Comments and Observations From the Subcommittee Members

- Dr. Wallis asked about the problem this rule is attempting to solve. Mr. Dudley explained that the existing rule overemphasizes larger breaks that are less likely. The proposed rule change would allow licensees to optimize their emergency core cooling systems to better address the more likely, smaller breaks. Dr. Wallis then asked if this was the only way to address the issue. Mr. Dudley answered that licensees can also perform best-estimate evaluations.
- Dr. Apostolakis asked how the rule change allows licensees to focus on smaller breaks. Mr. Dudley replied that one example is the extension of diesel generator startup times, which create less strain on the diesels and lead to a higher overall reliability. Mr. Sieber and Dr. Shack added some other optimization options from the report provided by the BWROG. Dr. Apostolakis also noted that any changes enabled by this rule would still require individual approval. Mr. Maynard also later reminded the Members that each change will still require approval.
- Dr. Banerjee asked what new information is driving the change. Mr. Dudley replied that the evidence that small LOCAs are more likely, while large LOCAs are very unlikely and have never occurred. Dr. Banerjee asked whether the data accounts for the Davis-

Besse discovery. Mr. Dudley responded that the Davis-Besse discovery would have been a medium LOCA, and would have fit within the data.

- Dr. Kress noted that industry suggested the efforts to develop a risk-informed 50.46 alternative. Dr. Wallis added that the industry had stated that they would have arguments to support such a rule that included risk benefits, but that the Committee has not seen such arguments yet.
- Mr. Sieber suggested that because licensees must still mitigate beyond-TBS breaks, then it should still be considered a design-basis accident, but with less-stringent requirements. Mr. Dudley acknowledged that such events lead to an odd distinction, since equipment solely required for such breaks would still be in the design basis of the plant, though the event would not be a design-basis event. Mr. Sieber suggested cleaning that definition up.
- Dr. Wallis asked if the Appendix K ECCS criteria only apply to design-basis events. Mr. Mark Rubin, PRA branch chief in NRR, confirmed that as true, but noted that licensees must still mitigate beyond-TBS events, though the rule provides alternative criteria for those events.
- Mr. Sieber asked if the crack indications discovered at Wolf Creek were less than the proposed TBS. Mr. Dudley acknowledged that they were.
- Dr. Apostolakis asked if a list of plant changes that licensees may propose is available. Mr. Rubin replied that the staff developed the proposed rule and its guidance to attempt to address any possible plant change. He noted that if a licensee proposes a change that the new rule does not handle well, the staff will address it individually. Dr. Wallis agreed with Dr. Apostolakis that the potential consequences of the rule should be evaluated. Mr. Dinsmore and Mr. Dudley added that many lists of potential plant changes exist, but that the staff does not know what licensees will actually request, but that each request will be evaluated on a plant-specific basis. Mr. Rubin clarified that the rule provides a flexible analysis method to deal with a wide range of changes, yet does not change the risk at any plant by itself.
- Mr. Sieber commented that the PRA does not capture many of the potential safety improvements. Mr. Rubin stated that some are, but some may only be qualitative. Dr. Shack and Dr. Wallis pointed out that the quantified changes in the BWROG report are quite low.
- Dr. Banerjee asked if changes such as power uprates can be achieved using the existing best-estimate analysis option. Mr. Rubin replied that more could be done under the proposed rule.

Public Comments on Thermal-Hydraulic Analysis

Dr. Ralph Landry then took the lead for presenting a discussion of the public comments related to thermal-hydraulic requirements in the rule. He described how the existing requirements will remain unchanged for breaks equal to or less than the TBS. These existing requirements include the option to analyze the events with either a realistic-with-uncertainty approach or the

prescriptive Appendix K analysis requirements. Above the TBS, the analysis may use other approaches with fewer restrictions. Dr. Landry also described the current acceptance criteria and how they would apply under the proposed rule. At or below the TBS, the acceptance criteria consist of specific acceptance values for peak clad temperature of the fuel, maximum local clad oxidation, and combustible gas generation. Above the TBS, the acceptance criteria only require maintaining a coolable core geometry and providing for long-term cooling. The specific definition of these terms would appear in the regulatory guide, and by today's definition, would consist of the same quantitative acceptance criteria as the existing regulation. However, such a definition would allow licensees to propose alternative acceptance criteria for beyond-TBS breaks.

Comments and Observations From the Subcommittee Members

- Dr. Wallis questioned the meaning of "high confidence" in the existing best-estimate approach. Dr. Landry clarified that the rule allows either the selection of break sizes or a sampling of break sizes, but still requires analysis of breaks up to the double-ended guillotine break (though the analysis could use LOCA frequencies from NUREG-1829).
- Dr. Corradini asked for clarification regarding the requirements for above the TBS. Dr. Landry replied that licensees may use any analysis method and make it available for review. Other important requirements would appear in the regulatory guide.
- Dr. Wallis, Dr. Corradini, and Dr. Armijo suggested that the acceptance criteria for above and below the TBS should be the same, since they fall back on the same quantitative criteria. Dr. Corradini stated that he does not know of any data that could supplant those quantitative criteria, and doesn't think the industry would invest in the new data necessary to do so. Dr. Armijo also stated that he does not think any such data exists. Mr. Landry agreed that such was the case today.
- Dr. Apostolakis asked about the need for a frequency criteria on sequences with equipment failures that exceed any of the fuel damage criteria. Mr. Dinsmore explained that such failure sequences would be captured in the risk analysis portion of the rule.
- Dr. Shack asked about the possibility of redefining the design-basis accident to exclude the loss of offsite power and a single failure for breaks above the TBS. Dr. Landry replied that such a change would still require a rule change, but different from the proposed rule.

Public Comments on Risk Analysis and Operational Requirements

Mr. Stephen Dinsmore next provided a discussion of public comments related to the risk analysis and operational requirements portions of the proposed rule. These comments addressed the scope of facility changes requiring a risk evaluation, changes that require prior NRC approval, the tracking of risk changes, updating of the plant PRA, acceptance criteria for risk increases, and operational restrictions related to mitigation equipment. Mr. Dinsmore described the issue of the scope of facility changes requiring a risk evaluation as a "show-stopper" from industry. Industry claimed that the staff did not appropriately credit the existing change control processes and that such a requirement would make the rule too burdensome to use. The draft final rule limits the risk evaluation to changes that are potentially risk-significant.

Mr. Dinsmore discussed a diagram of the decision process for making such determinations, which relies on existing change-control regulations and the maintenance rule to control the changes. This solution also applies to the public comments on the identification of changes requiring prior NRC approval.

Mr. Dinsmore then discussed the comments received on tracking risk increases and acceptance criteria for risk increases, along with the staff's responses. In both cases, the staff decided to retain their proposed language. With regard to updating of plant PRAs, the industry agreed to update the PRA every two refueling outages, but suggested reporting only the results of this assessment to the NRC. The final draft rule requires this update, along with reporting of plans to bring the plant back into compliance if the acceptance criteria have been exceeded and a list of potentially risk-significant changes implemented without NRC review that increased risk.

Mr. Dinsmore also identified the issue of operating restrictions as a "show-stopper" from industry. The proposed rule had prohibited operation in a configuration not demonstrated to meet the acceptance criteria for breaks above the TBS. The final draft rule proposed allowing operation in such configurations up to 14 days per year. He provided some justification for the selection of 14 days, but noted that no guidance directly addresses such an issue.

Comments and Observations From the Subcommittee Members

- Dr. Apostolakis noted that Regulatory Guide 1.174 provides guidance to specifically evaluate risk-informed changes individually, but to also consider the cumulative effects on risk. He stated that the proposed rule appears to directly address the issue of cumulative effects, and that this is a significant change to the intent of the regulatory guide. It should therefore be revised in the guide rather than in this rule. Mr. Michael Tschiltz noted that industry did not object to its use in the rule. Dr. Wallis agreed that risk-informed regulations should not interpret the guidance differently.
- Dr. Kress asked if anything in the rule affects power uprate evaluations. Mr. Dinsmore replied that it does not. Mr. Rubin added that the guidance for power uprate evaluations all exists elsewhere.

Public Comments on Applicability to Future Reactors

Mr. Dudley returned to the table to describe the staff's resolution of public comments related to the applicability of the rule to future reactors. The proposed rule for public comment was only applicable to current light-water reactors, but the industry commenters recommended the rule apply to future light-water reactors as well. Mr. Dudley stated the staff decided to allow the rule to apply to similar reactors, which might potentially include reactors such as the AP1000, US EPR, and ESBWR, but that licensees must justify why a new plant is similar enough to existing reactors to utilize the rule. He also discussed a number of general characteristics the staff would be likely to use to determine such applicability.

Comments and Observations From the Subcommittee Members

- Dr. Apostolakis and Dr. Corradini pointed out that a new reactor would not yet have a baseline risk with which to compare the acceptance criteria. Mr. Dudley agreed that new reactors would probably need different acceptance criteria.

Selection of the BWR TBS and Public Comments on the BWR TBS

Mr. Gary Hammer provided the last staff presentation regarding the development of the TBS for BWR plants and public comments related to the TBS. He first provided the process the staff used to select the TBS, starting with an estimated LOCA frequency of 10^{-5} . The staff then adjusted the break size to account for uncertainties in the elicitation process and other failure modes such as seismic loads. Finally, the staff considered the actual pipe sizes in BWR plants and selected a TBS that would provide regulatory stability. This results in a break size between 13 and 20 inches. Mr. Hammer described how such a size corresponds to the approximate sizes of feedwater and residual heat removal (RHR) piping, which is typically 18-24 inches. Because larger breaks would require the complete failure of the large recirculation piping (which has a much lower frequency), the staff set the BWR TBS at the larger of the attached feedwater or RHR lines inside containment.

Mr. Hammer then reviewed the public comments on the proposed BWR TBS. The first comment suggested that the break frequencies were underestimated, and that leaks should be assumed to be breaks. The staff's review did not confirm the assertion and Mr. Hammer noted that significant additional degradation is necessary before a leak becomes a much larger break. He also described comments from the BWROG, which suggested a BWR TBS of 16 inches in the RHR line for all BWRs. The BWROG also claimed that the staff did not properly credit BWR mitigation programs for piping degradation. The staff disagreed with these comments.

Comments and Observations From the Subcommittee Members

- Dr. Armijo asked what the staff concluded the dominant failure mechanism is for BWRs. Mr. Rob Tregoning replied that all possible mechanisms were considered, and that IGSCC and thermal fatigue were dominant for BWRs. Dr. Armijo stated that the experts should have given more credit for the degradation mitigation measures in place.
- Dr. Banerjee asked if any previous studies of pipe break frequencies had been documented. Mr. Tregoning mentioned that WASH-1400 and NUREG/CR-5750 included estimates based on the available operating data at the time. Dr. Banerjee asked if any significant differences existed between those and the current study. Mr. Tregoning described how the large break frequencies were much lower in the recent study, but that such a comparison was not really fair since NUREG/CR-5750 did not discretize the large breaks as the current study did.

BWROG Perspectives on the 10 CFR 50.46a Rulemaking

Mr. Randy Bunt, chair of the BWR Owners' Group, then began a discussion of comments from his group. He stated the group's pleasure with progress on the rule, but noted that many BWRs would not use it if the TBS remained as currently written. He pointed out that minor changes would significantly improve the rule from their perspective. He then handed the presentation over to Mr. Tony Browning, chair of the BWROG's Option 3 Committee.

Mr. Browning provided a discussion of the purpose of their presentation, some background information, and a summary of their comments. He noted that the staff and BWROG were not far apart on the rule, but felt that the staff could remove unnecessary conservatism from the rule. He then described their understanding of the process the NRC used to develop the BWR

TBS and provided a basis for their alternative definition. The BWROG suggests a fixed size break in a fixed location. That is, a break of a 16-inch pipe (1.177 ft² break) in the RHR shutdown cooling suction piping. They argued that such a TBS would have greater agreement with the results of NUREG-1829, provide for a uniform TBS across the fleet, and enable safety benefits as shown in their report.

Mr. Fran Bolger then provided a discussion of the technical details supporting the BWROG suggestion. He noted that feedwater line breaks are not limiting for BWRs and showed how different delay times for ECCS injection affect the acceptance criteria. Mr. Bolger then showed the effects of different combinations of ECCS delays and reconfigurations on peak clad temperature, a limiting criterion for some plants.

Mr. Browning then concluded the presentation with a brief discussion of several materials issues and the mitigation measures in place to reduce the likelihood of pipe breaks at BWRs.

Comments and Observations From the Subcommittee Members

- Dr. Wallis questioned the BWROG representatives regarding the safety benefits of the changes. Mr. Browning replied that the changes result in no margin loss for peak cladding temperature, and are therefore best characterized as "risk-neutral." Dr. Apostolakis added that a safety benefit is not necessary for this rule, but that the decision should be based on the reduction of unnecessary burden with no undue risk. Mr. Maynard stated his agreement with Dr. Apostolakis. Dr. Shack and Dr. Wallis suggested the decision should be based on the arguments provided, which initially included safety benefits.
- Dr. Armijo repeated his earlier comment that more credit for degradation mitigation measures should be granted for BWRs.

SUBCOMMITTEE DECISIONS AND ACTIONS

The full Committee reviewed the draft final rule on November 1 as part of its 537th meeting and issued a letter at that meeting commenting on the draft final rule. The subcommittee provided input to that discussion and letter.

BACKGROUND MATERIALS PROVIDED TO THE SUBCOMMITTEE PRIOR TO THIS MEETING

Documents	
1.	Draft Final Rule Language, Risk-Informed Changes to Loss-of-Coolant Accident Technical Requirements, October 3, 2006, http://ruleforum.llnl.gov/cgi-bin/downloader/ECCS_risk_lib/1433-0035.pdf .
2.	Report from Graham B. Wallis, Chairman, Advisory Committee on Reactor Safeguards, to Nils. J. Diaz, Chairman, US Nuclear Regulatory Commission, "Proposed Rulemaking to Modify 10 CFR 50.46, 'Risk-Informed Changes to Loss-of-Coolant Accident Technical Requirements'," March 14, 2005.
3.	Draft Federal Register Notice, "Risk-Informed Changes to Loss-of-Coolant Accident Technical Requirements," Transmitted by email from Michael Marshall to Eric Thornsbury, October 16, 2006.
4.	Letter from Randy C. Bunt, Chair, BWR Owners' Group, to Graham B. Wallis, Chairman, Advisory Committee on Reactor Safeguards, "Draft Final Rule Language, <i>Risk-Informed Changes to Loss-of-Coolant Accident Technical Requirements</i> , ADAMS Accession NO. ML062760146, dated October 3, 2006," October 13, 2006.

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/what-we-do/regulatory/advisory/acrs.html> or purchase from Neal R. Gross and Co., Inc., (Court Reporters and Transcribers) 1323 Rhode Island Avenue, NW, Washington, DC 20005 (202) 234-4433.

**Advisory Committee on Reactor Safeguards
Regulatory Policies & Practices Subcommittee Meeting
Rockville, MD
31 October 2006**

- Proposed Agenda -
Revised 10/30/06

Cognizant Staff Engineer: Eric Thornsby (301-415-8716, eat2@nrc.gov)

	Topic	Presenter(s)	Time
	Opening Remarks and Objectives	W. Shack, ACRS	8:30 - 8:40 am
I	Draft Final Rule Language for 10 CFR 50.46a - Comments on T/H analysis - Comments on risk analysis - Comments on new reactors - Selection of the BWR TBS	M. Tschiltz, NRR D. Dudley, NRR R. Landry, NRR S. Dinsmore, NRR G. Hammer, NRR	8:40 - 10:30 am
	Break		10:30 - 10:45 am
II	Comments on the BWR Transition Break Size	R. Bunt, BWROG	10:45 - 11:30 am
III	Additional Public Comments (if requested)	TBD	11:30 - 11:45 am
	Concluding Discussions	W. Shack, ACRS	11:45 am - 12:00 noon
	Adjourn		12:00 noon

Notes:

- 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 - 35.

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
SUBCOMMITTEE MEETING ON REGULATORY POLICES
AND PRACTICES

October 31, 2006
Date

NRC STAFF SIGN IN FOR ACRS MEETING

PLEASE PRINT

	<u>NAME</u>	<u>NRC ORGANIZATION</u>
1	STEVEN A. LAUR	NRR/DRA
2	JOSHUA S. KAIZER	NRR/DNRL
3	RALPH R. LANDRY	NRR/DSS
4	TED QUAY	NRR/DPR
5	Rob Tringony	RES/DFBR
6	Mike / Sch. 1/2	NRR/BKA
7	Andrew Hone	NRC/DRA
8	Michael Marshall	NRC/NRR/DPR
9	Gary Hammer	NRC/NRR
10	John J. McHale	NRR/DCI/CPTB
11	Edwan J. Thom	NRR/DSS
12	TOM ALEXION	NRR/DPR
13	SAMSON LEE	NRR/DCI
14	Mark Rubin	NRR/DRA
15	JOHN G. LAMB	UETO
16	Tim Collins	NRR/DSS
17	Bill Bateman	NRR/DCI
18	Jim Clifford	NRR/DPR
19	Cornelius Hobbs	NRR/DRA
20	Richard Deally	NRR/DPR
	STEPHEN DINSMORE	NRR/DRA/APLB

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
SUBCOMMITTEE MEETING ON REGULATORY POLICIES
AND PRACTICES

October 31, 2006
Date

PLEASE PRINT

	<u>NAME</u>	<u>AFFILIATION</u>
1	FRED EMERSON	GE
2	Ray Browning	BWR Owners Group
3	Fran Bolger	GE
4	Randy Bunt	BWR Owners Group
5	John Butler	NEI
6	Andrew	
7	Julie Keys	NEI
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

October 11, 2006

MEMORANDUM TO: Michael R. Snodderly, Branch Chief, ACRS/ACNW

FROM: Eric A. Thornsby, Senior Staff Engineer 

SUBJECT: FEDERAL REGISTER NOTICE REGARDING THE ACRS
SUBCOMMITTEE ON REGULATORY POLICIES AND
PRACTICES, OCTOBER 31, 2006, ROCKVILLE,
MARYLAND

Attached is a *Federal Register Notice* regarding the subject meeting. Please have this Notice transmitted for publication as soon as possible.

Attachment:
FR Notice

cc with Attachment:

W. Shack, ACRS
J. Larkins, ACRS
J. Szabo, OGC
A. Bates, SECY
B. Sosa, OEDO
S. Burnell, OPA
J. Dyer, NRR
G. Holahan, NRR
J. Grobe, NRR
T. Collins, NRR
R. Dudley, NRR

PMNS

Public Document Room

NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
SUBCOMMITTEE MEETING ON REGULATORY POLICIES
AND PRACTICES

Notice of Meeting

The ACRS Subcommittee on Regulatory Policies and Practices will hold a meeting on October 31, 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:

Tuesday, October 31, 2006 - 8:30 a.m. until 12:30 p.m.

The Subcommittee will review the details of the draft final rule 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Plants." The Subcommittee 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. Eric A. Thornsbury (telephone 301/415-8716), 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.

10-12-2006
Date



Michael R. Snodderly, Branch Chief, ACRS/ACNW

Recommendations (Open)—The Committee will discuss the responses from the NRC Executive Director for Operations to comments and recommendations included in recent ACRS reports and letters.

12:30 p.m.–6:30 p.m.: Preparation of ACRS Reports (Open)—The Committee will discuss proposed ACRS reports.

Friday, November 3, 2006, Conference Room T-2B3, Two White Flint North, Rockville, Maryland

8:30 a.m.–12:30 p.m.: Preparation of ACRS Reports (Open)—The Committee will continue discussion of proposed ACRS reports.

12:30 p.m.–1 p.m.: Miscellaneous (Open)—The Committee will discuss matters related to the conduct of Committee activities and matters and specific issues that were not completed during previous meetings, as time and availability of information permit.

Procedures for the conduct of and participation in ACRS meetings were published in the **Federal Register** on October 2, 2006 (71 FR 58015). In accordance with those procedures, oral or written views may be presented by members of the public, including representatives of the nuclear industry. Electronic recordings will be permitted only during the open portions of the meeting. Persons desiring to make oral statements should notify the Cognizant ACRS staff named below five days before the meeting, if possible, so that appropriate arrangements can be made to allow necessary time during the meeting for such statements. Use of still, motion picture, and television cameras during the meeting may be limited to selected portions of the meeting as determined by the Chairman. Information regarding the time to be set aside for this purpose may be obtained by contacting the Cognizant ACRS staff prior to the meeting. In view of the possibility that the schedule for ACRS meetings may be adjusted by the Chairman as necessary to facilitate the conduct of the meeting, persons planning to attend should check with the Cognizant ACRS staff if such rescheduling would result in major inconvenience.

Further information regarding topics to be discussed, whether the meeting has been canceled or rescheduled, as well as the Chairman's ruling on requests for the opportunity to present oral statements and the time allotted therefor can be obtained by contacting Mr. Sam Duraiswamy, Cognizant ACRS staff (301-415-7364), between 7:30 a.m. and 4 p.m., (ET). ACRS meeting agenda, meeting transcripts, and letter reports are available through the NRC Public

Document Room at pdr@nrc.gov, or by calling the PDR at 1-800-397-4209, or from the Publicly Available Records System (PARS) component of NRC's document system (ADAMS) which is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> or <http://www.nrc.gov/reading-rm/doc-collections/> (ACRS & ACNW Mtg schedules/agendas).

Videoteleconferencing service is available for observing open sessions of ACRS meetings. Those wishing to use this service for observing ACRS meetings should contact Mr. Theron Brown, ACRS Audio Visual Technician (301-415-8066), between 7:30 a.m. and 3:45 p.m., (ET), at least 10 days before the meeting to ensure the availability of this service. Individuals or organizations requesting this service will be responsible for telephone line charges and for providing the equipment and facilities that they use to establish the videoteleconferencing link. The availability of videoteleconferencing services is not guaranteed.

Dated: October 13, 2006.

Andrew L. Bates,

Advisory Committee Management Officer.

[FR Doc. E6-17433 Filed 10-18-06; 8:45 am]

BILLING CODE 7590-01-P

NUCLEAR REGULATORY COMMISSION

* Advisory Committee on Reactor Safeguards Subcommittee Meeting on Regulatory Policies and Practices; Notice of Meeting

The ACRS Subcommittee on Regulatory Policies and Practices will hold a meeting on October 31, 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:

Tuesday, October 31, 2006—8:30 a.m. until 12:30 p.m.

The Subcommittee will review the details of the draft final rule 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Plants." The Subcommittee 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. Eric A. Thornsbury (telephone 301/415-8716), 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: October 12, 2006.

Michael R. Snodderly,

Branch Chief, ACRS/ACNW.

[FR Doc. E6-17436 Filed 10-18-06; 8:45 am]

BILLING CODE 7590-01-P

NUCLEAR REGULATORY COMMISSION

Advisory Committee on Reactor Safeguards; Subcommittee Meeting on Fire Protection; Notice of Meeting

The ACRS Subcommittee on Fire Protection will hold a meeting on October 31, 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:

Tuesday, October 31, 2006—1:30 p.m. Until the Conclusion of Business

The purpose of this meeting is to review Regulatory Guide 1.189, "Fire Protection for Operating Nuclear Power Plants," and associated SRP Section 9.5.1, "Fire Protection Program." The Subcommittee will hear presentations by and hold discussions with 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 A. Junge (Telephone: 301-415-6855) 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 6:45 a.m. and 3:30 p.m. (ET). Persons planning to attend this meeting are



10 CFR 50.46a Rulemaking Risk-Informed ECCS Requirements

Advisory Committee on Reactor Safeguards

October 31, 2006

Richard Dudley

Rulemaking Project Manager

Division of Policy and Rulemaking

Office of Nuclear Reactor Regulation



10 CFR 50.46a Rulemaking

Background and Status

- ACRS letter on proposed rule March 14, 2005
- SECY-05-0052; March 29, 2005
- Commission approval July 29, 2005
- Proposed rule published November 7, 2005
- Comment period ended March 8, 2006



10 CFR 50.46a Rulemaking

Background and Status (Cont.)

- Public meetings (February, June, August 2006)
- Draft final rule language posted October 3, 2006
- Draft *Federal Register* notice October 16, 2006
- Final rule to Commission by February 2007
- Staff to meet with ACRS in spring 2007 on Regulatory Guide



10 CFR 50.46a Rulemaking

Request for ACRS Letter on Final Rule

- Potential impact of pipe crack indications at Wolf Creek plant has caused staff to review its position on seismic analysis supporting the PWR TBS
- Staff seeks ACRS review of all other technical issues related to the §50.46a final rule
- Staff will meet again with ACRS to discuss PWR TBS



10 CFR 50.46a Rulemaking

Agenda

- Discuss comments on thermal-hydraulic analysis (R. Landry)
- Discuss comments related to risk analysis and operational requirements (S. Dinsmore)
- Discuss comments on applicability to future reactors (R. Dudley)
- Discuss method for selecting BWR TBS (G. Hammer)
- Discuss comments on the BWR TBS (G. Hammer)



10 CFR 50.46a Rulemaking

Public Comments

- Six licensees, two reactor vendors
- Four industry groups (NEI, BWROG, WOG, STARS), NRC employee
- Comments on expert elicitation (NUREG-1829)



10 CFR 50.46a Rulemaking Thermal-Hydraulic Req'ts

At and below the TBS requirements are the same as current
Analysis with uncertainty evaluation

Analysis that complies with 10 CFR 50, Appendix K

Above the TBS, analysis methods can be as current or another
approach. The Regulatory Guide will identify items the
staff believes to be important to consider in the analysis.



10 CFR 50.46a Rulemaking T/H Acceptance Criteria

At or below the TBS the acceptance criteria are the same as in 10 CFR 50.46

$PCT \leq 2200 \text{ }^\circ\text{F}$

$MLO \leq 17\%$

$CWO \leq 10\%$

Coolable core geometry

Must provide long-term cooling

Above the TBS the acceptance criteria are:

Coolable core geometry

Must provide long-term cooling



10 CFR 50.46a Rulemaking

Applicability to Future Reactors

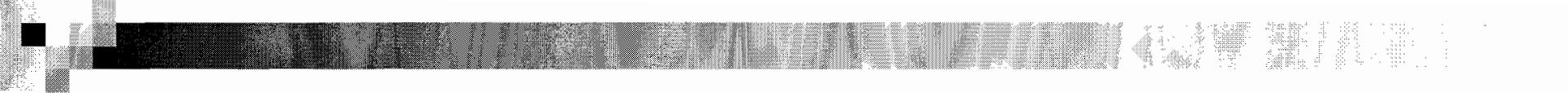
- Proposed rule only applicable to current LWRs
- Industry commenters recommended applicability to future LWRs similar to current LWRs
- Staff considers AP 1000, US EPR, ESBWR as potentially similar re: §50.46a
- Final rule allows future LWR applicant to justify why design is similar; propose TBS
- NRC staff design-specific review
- NRC must approve both applicability and TBS
- General similarity characteristics developed



10 CFR 50.46a Rulemaking

General similarity characteristics

- LOCA frequency vs. pipe size
- Overall piping configuration
- Core/containment capabilities and severe accident margins
- Guidance will be included in Regulatory Guide

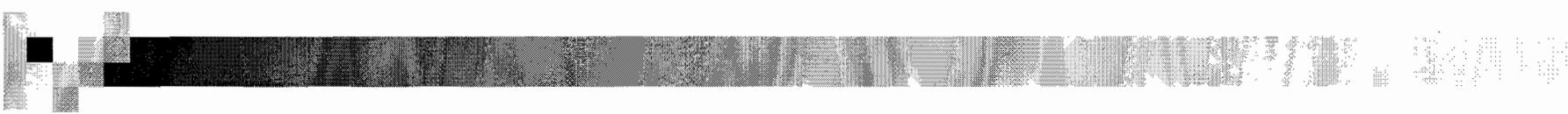


BWR TBS Selection

- BWR TBS in the proposed rule uses expert elicitation estimates of LOCAs at $1E-5/R-Y$ frequency as a starting point.
- Adjustments made to account for uncertainties and sensitivities with respect to elicitation.
- Other considerations to accommodate failure mechanisms not explicitly considered in elicitation such as seismic loads.
- Consideration of actual pipe sizes.
- Consideration of regulatory stability.

BWR TBS Selection

- From the expert elicitation estimates, also considering uncertainties and sensitivities, BWR break sizes at a $1E-5$ frequency are approximately 13 inches to 20 inches in diameter.
 - Considers 95th percentile estimates.
 - Considers geometric and arithmetic mean aggregations of estimates.



BWR TBS Selection

- These sizes are approximately the sizes of the largest attached feedwater and residual heat removal lines inside containment, typically 18 to 24 inches nominal diameter (or 16.12 to 21.56 inches ID).
- Breaks larger than these in size would require complete failure of large recirculation piping, which has a significantly lower frequency of occurrence.

BWR TBS Selection

Survey of BWR Pipe Sizes

GE	Plant	Nominal Diameter, inches			
		Feedwater	RHR	MS	Recirc
BWR-2	Nine Mile Pt 1	18	14	24	28
	Oyster Creek	18	14	24	26
BWR-3	Dresden 2/3	18	16	20	28
	Monticello	14	18	18	28
	Pilgrim	18	18	20	28
BWR-4	Browns Ferry 1/2/3	24	24	24	28
	Cooper	18	24	24	
	Duane Arnold	16	18	20	22
	Fermi 2	20	24	26	28
	FitzPatrick	18	24	24	28
	Hatch 1/2	18	20	24	28
	Vermont Yankee	16	24	18	28
BWR-5	Columbia	24	20	26	
	LaSalle 1/2	24	20	26	24
	Nine Mile Pt 2	24	20	26	24
BWR-6	Grand Gulf	24	20	28	24
	Perry	20	20	26	
	River Bend	20	18	24	

BWR TBS comments

- Staff received public comments on proposed BWR TBS:
 - PSU comment: Break frequencies appear to be larger than expert elicitation estimates, and leaks should be assumed to be breaks.
 - Staff response: Staff review of break data does not indicate break frequency is significantly greater. Significant additional degradation is required before a leak becomes a much larger break.

BWR TBS comments

- BWROG comment: TBS should not be based on the size of any feedwater (FW) piping, and should be a 16 inch break in the residual heat removal (RHR) line for all BWRs.
- Staff response: A likely way for a break as large as the TBS to occur is with a complete break of that size pipe. Consideration was given to all attached pipes inside containment having diameters corresponding to the 1E-5 break frequency, which are typically the FW or RHR pipes. Also, this would bound a complete break of a smaller 12 inch recirculation pipe, which would result in a double-ended discharge.

BWR TBS comments

- BWROG comment: Proper credit was not given by the expert elicitation for mitigation programs for various degradation mechanisms (i.e., thermal fatigue and IGSCC).
- Staff response: Mitigation programs were considered in the estimates in the expert elicitation. These measures are generally effective in lowering break frequencies from what they were prior to mitigation.



10 CFR 50.46a Rulemaking Major Public Comments

Advisory Committee on Reactor Safeguards

October 31, 2006

Stephen Dinsmore

Senior Reliability and Risk Analyst

Office of Nuclear Reactor Regulation



10 CFR 50.46a Rulemaking Major Public Comments

Summary of Major Public Comments on Risk informed Change process

- Scope of facility changes requiring a risk evaluation
- Identification of changes that require prior staff review and approval
- Tracking risk increases
- Periodic PRA update and reporting
- Acceptance criteria on amount by which risk increases
- Operational restrictions / maintaining mitigation

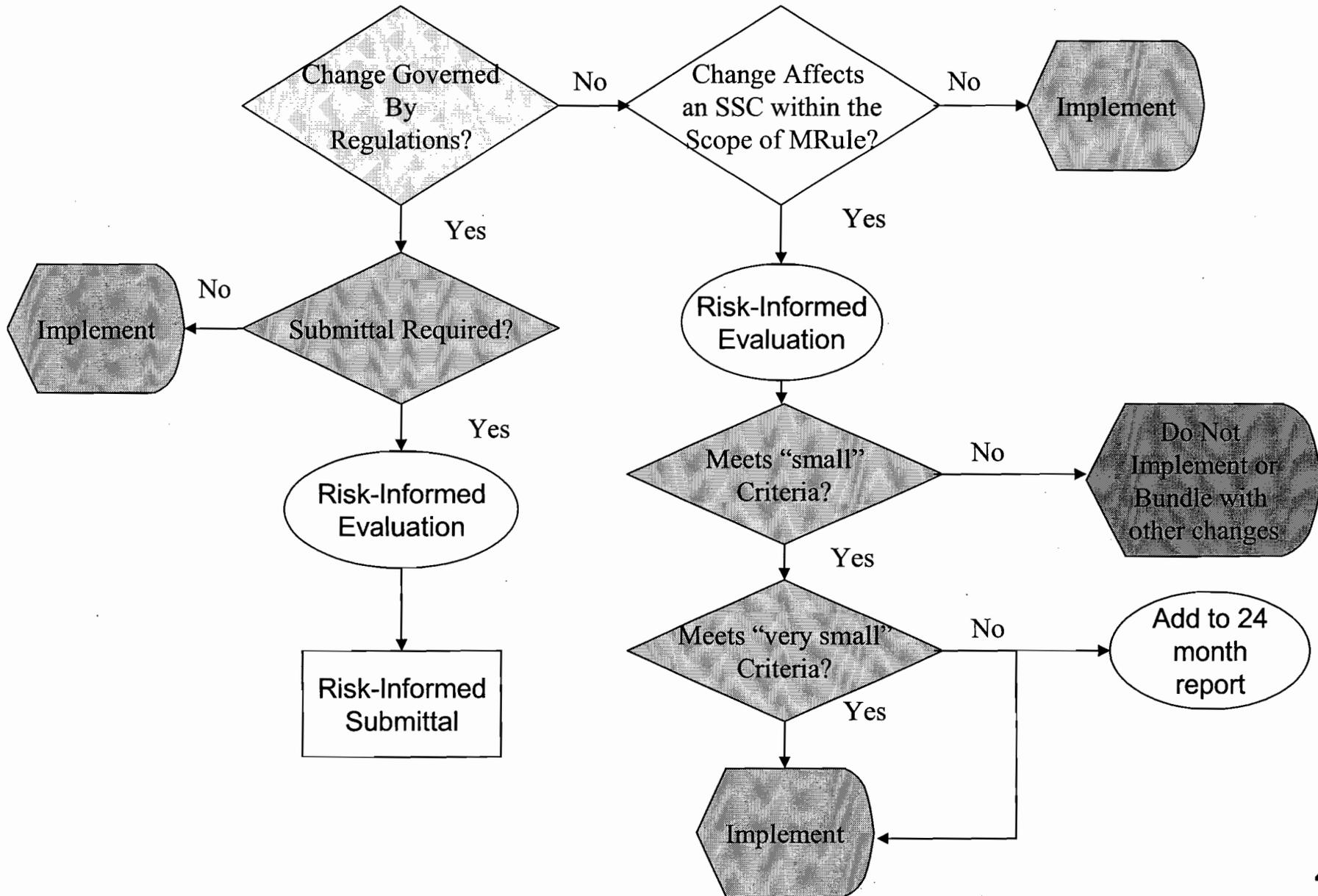


10 CFR 50.46a Rulemaking Major Public Comments

Issue: Scope of facility changes requiring a risk evaluation

- Proposed rule: A risk evaluation of all changes is required prior to implementing the change
- Comment: Does not credit current change control processes and is unnecessarily burdensome
- Final Rule: A risk evaluation is required prior to implementing potentially risk-significant changes. A periodic risk evaluation is required to assess the cumulative effect of all changes

50.46a Change Control process





10 CFR 50.46a Rulemaking Major Public Comments

Issue: Identification of changes that require prior staff review and approval

- Proposed rule: Current regulatory requirements and any change that increases risk by more than a “very small” amount govern what must be submitted for prior staff review and approval.
- Comment: Does not credit current change control processes and is unnecessarily burdensome.
- Final Rule: Current regulatory requirements govern which changes must be submitted for prior staff review and approval.



10 CFR 50.46a Rulemaking Major Public Comments

Issue: Tracking risk increases

- Proposed rule: The amount by which CDF and LERF increase over time must be estimated and tracked.
- Comment: It should be sufficient to estimate and track the overall CDF and LERF over time.
- Final Rule: Unchanged



10 CFR 50.46a Rulemaking Major Public Comments

Issue: Acceptance criteria on amount by which risk increases

- Proposed rule: The amount by which CDF and LERF increase is compared to the acceptance criteria that the “total increases in CDF and LERF are small and the overall risk remains small.” Small is defined using RG 1.174 guidelines.
- Comment: Do not put acceptance criteria in the rule and rely on RG 1.174 guidelines for controlling risk increases over time.
- Final Rule: Unchanged



10 CFR 50.46a Rulemaking Major Public Comments

Issue: Periodic PRA update and reporting

- Proposed rule: PRA update every two refueling outages and reporting of
 - Changes that result in a “significant reduction in the capability to meet the acceptance criteria” and
 - Short description of all changes involving minimal increases in risk

- Comment: Industry proposed PRA update every two refueling outages to assess the cumulative effect of changes and reporting of the results (i.e., overall CDF and LERF) of this assessment to the NRC.

- Final Rule: PRA update every two refueling outages and reporting of
 - Steps and a schedule to bring the facility back into compliance if the acceptance criteria have been exceeded and
 - Potentially risk-significant changes implemented without NRC review that increased risk greater than very small



10 CFR 50.46a Rulemaking Major Public Comments

- Issue: Operating restriction when in a configuration not demonstrated to meet the ECCS acceptance criteria for breaks>TBS
 - Proposed rule: Prohibited operation in this configuration.
 - Public Comment: Restriction not commensurate with safety significance of configuration and could increase risk by reducing permitted on-line maintenance.
 - Final Rule: Operation in this configuration not to exceed 14 days per year. Fourteen days was chosen as
 - Consistent with related guidelines on initiating event mitigation
 - Sufficiently long to allow most maintenance activities
 - A longer period of time would not be consistent with maintaining the capability to successfully mitigate the full spectrum of LOCAs



10 CFR 50.46a Rulemaking Major Public Comments

Issue: Operational Restrictions (Cont.)

- No guidance directly addressing this issue exists but some related guidance does exist
- RG 1.177, “An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications “
 - Acceptance guideline for integrated conditional core damage probability $\leq 5E-7$
 - $1E-5$ /year frequency with no LOCA mitigation yields an allowed AOT of 18 days
- SRP Chapter 2.2.1 and 2.2.2 identifying design basis events (that need to be mitigated) as those with a frequency $>1E-7$ /year
 - $1E-5$ /year frequency could exist for 3.6 days in a one year period before exceeding an annual frequency of $1E-7$



10 CFR 50.46a Rulemaking Major Public Comments

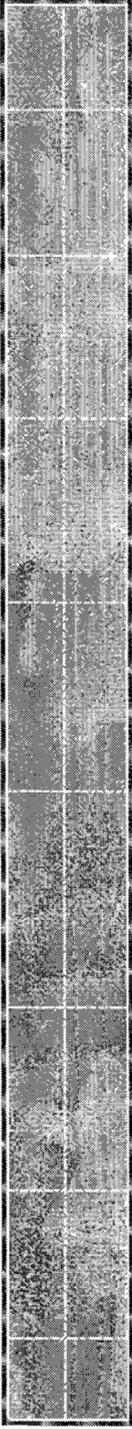
Miscellaneous

Risk-Informed change process description should not be required with submittal to adopt 50.46a

The acceptability of many changes, including some without prior staff review and approval, will be based, in part, on the results of the risk-informed evaluation. Without opportunity to review a description of the proposed process, the staff would have no basis for concluding the process is capable of demonstrating the acceptance criteria are satisfied

Deletion of requirement for LOOP and single failure for > TBS could result in all EDGs being required to mitigate a LBLOCA/LOOP.

The risk increases arising from such changes must be evaluated and, if acceptance criteria are exceeded, the change would not be permitted or must be otherwise compensated.



BWROG Perspectives on the 10 CFR 50.46a Rulemaking



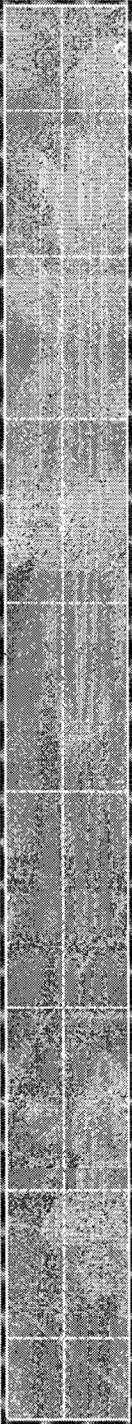
Randy Bunt, BWROG Chair

Tony Browning, BWROG Option 3 Committee Chair

Francis Bolger, GE

October 31, 2006



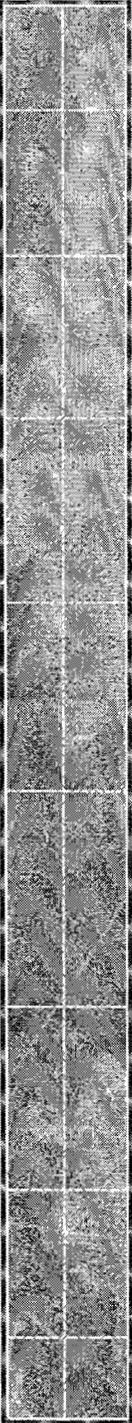


Introduction

- * BWROG pleased that this initiative has proceeded to a draft rule
- * Rule as written would not be used by a significant number of BWRs
 - Little benefit to offset cost of implementation
- * Minor changes would significantly improve this

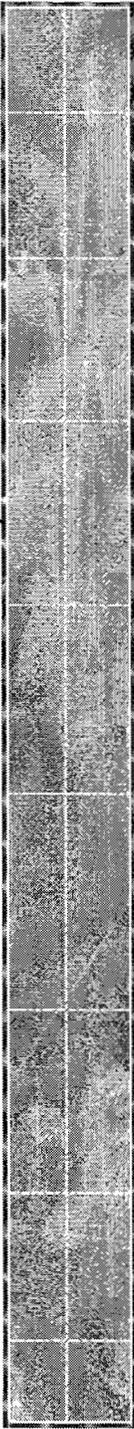
Outline

-
- * Purpose
 - * Background
 - * Technical discussion of BWROG T/H analysis
 - * Technical discussion of BWR materials issues



Purpose

- ✳ Provide recommendations for achieving a rule that is useful to BWRs
 - Present technical information supporting a revision to the BWR TBS definition in the proposed rule
 - Remove unnecessary conservatism
 - Demonstration of safety benefits
 - Conform to “plain language” standard



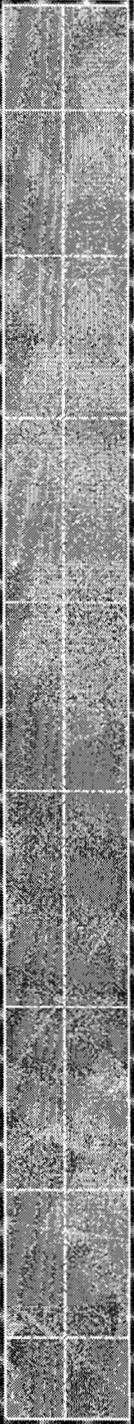
Background

* NUREG-1829, Estimating LOCA Frequencies Through the Elicitation Process

- ◆ Published for comment in June 2005
 - BWROG comments provided January 12, 2006

* Proposed 10 CFR 50.46a

- ◆ Noticed November 7, 2005
 - BWROG comments submitted March 8, 2006



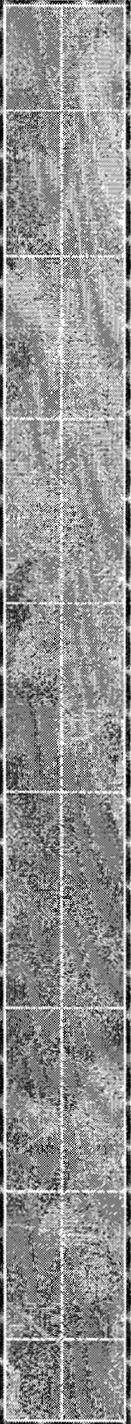
BWROG Comment Summary

* Principal BWROG comment on NUREG-1829

- Apparent lack of credit for mitigation of failure mechanisms (IGSCC, FAC, and Thermal Fatigue) attributed to the BWR piping designs
 - BWR Vessel Internals Program (BWRVIP) created in 1994 to deal with such material issues
 - Operating experience indicates mitigation efforts have been successful

Evolution of NRC TBS

TBS Determination Steps	BWR TBS
<u>Starting Point</u> - NUREG-1829: Break Sizes with <u>mean</u> frequency of 1 E-5	6-14 inches
<u>Next:</u> Apply uncertainty to mean Break Sizes - 95th percentile	13-20 inches
<u>Next:</u> Apply biases for failure mechanisms not considered in NUREG-1829 elicitation	20 inches
<u>Last:</u> Modify definition based upon initial comments on rule package	Larger of FW or RHR piping inside containment: (Typical BWR/4 TBS = 24 inches)



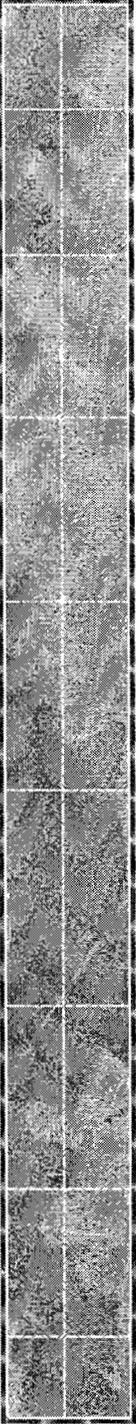
Principal BWROG comment on Draft 10 CFR 50.46a Rule Package

✱ Proposed Alternative BWR TBS definition:

TBS = Equivalent in size to internal diameter of a
16 inch Schedule 80 pipe (1.177 ft²), in the
Residual Heat Removal System (RHR)
shutdown cooling suction piping

● BWROG considerations

- Fixed size
- Fixed location

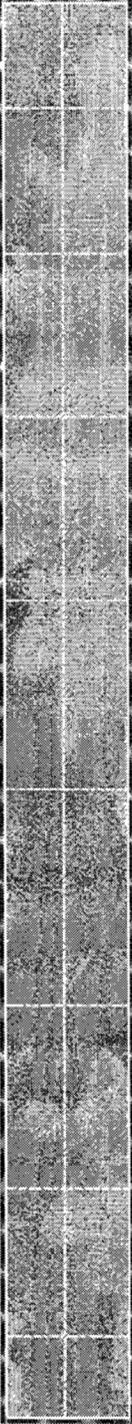


10 CFR 50.46 Rulemaking

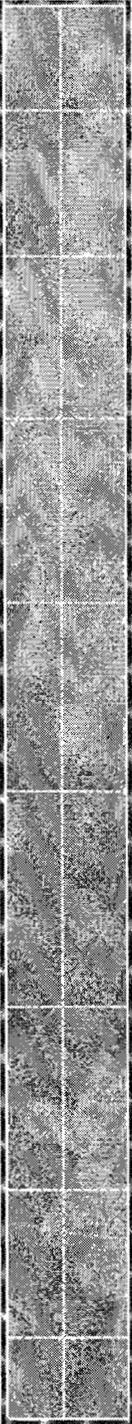
✦ Merits of the BWROG alternative:

- ◆ Fidelity to NUREG-1829 results (w/o application of unnecessary conservatism)
- ◆ Uniformity of TBS across BWR Fleet (FW and RHR pipe sizes vary)
- ◆ Safety benefit as shown by SAFER/GESTR-LOCA analysis
 - No significant increase in current PCT (DBA) with:
 - ◆ Delayed ECCS injection (relaxed DG starts, valve stroke times)
 - ◆ Reduced requirement for auto-start of ECCS trains (reduced DG loading)

Technical Discussion



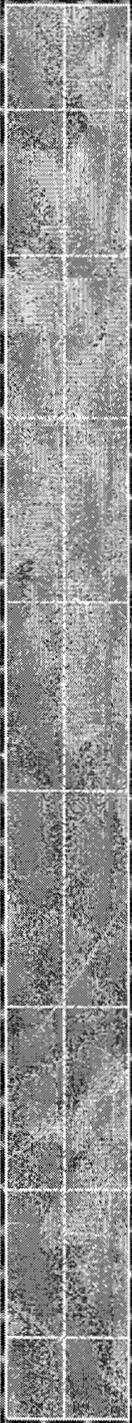
- ✦ Demonstration of Safety Benefits (T/H analysis)
- ✦ Successful mitigation of identified BWR material issues



Impact of TBS Size for BWRs SAFER/GESTR methodology

✱ SAFER/GESTR methodology is the current NRC approved GE LOCA methodology for BWRs

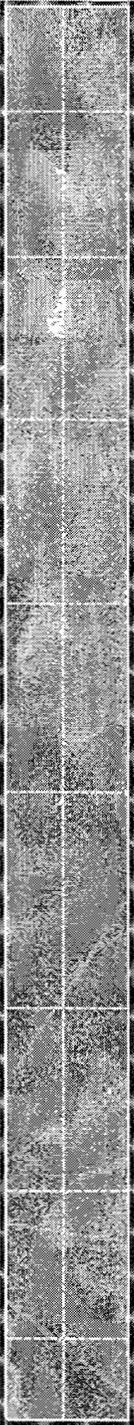
- Consists of dual Appendix K bounding analysis and nominal upper bound analysis (licensing PCTs typically about 1600°F but can be near 2200°F for BWR 2/3)
- Generally limiting for DBA large breaks, but some plants limiting for small breaks ($< 0.1 \text{ ft}^2$)
 - Recirc discharge break area set by jet pump nozzles and recirc pump eye (can be smaller equivalent break area than largest attached pipe)
- Intermediate breaks less limiting but methodology would need to be reviewed with implementation of TBS



Impact of TBS Size for BWRs

Non-limiting Breaks

- * Main Steam Line and Feedwater Line Breaks are not limiting for BWRs
 - Break location above core
 - Core uncovered briefly with little heatup
 - Level quickly restored following initiation of ECC systems
 - Will not become limiting with any TBS since bounded by recirc line small breaks

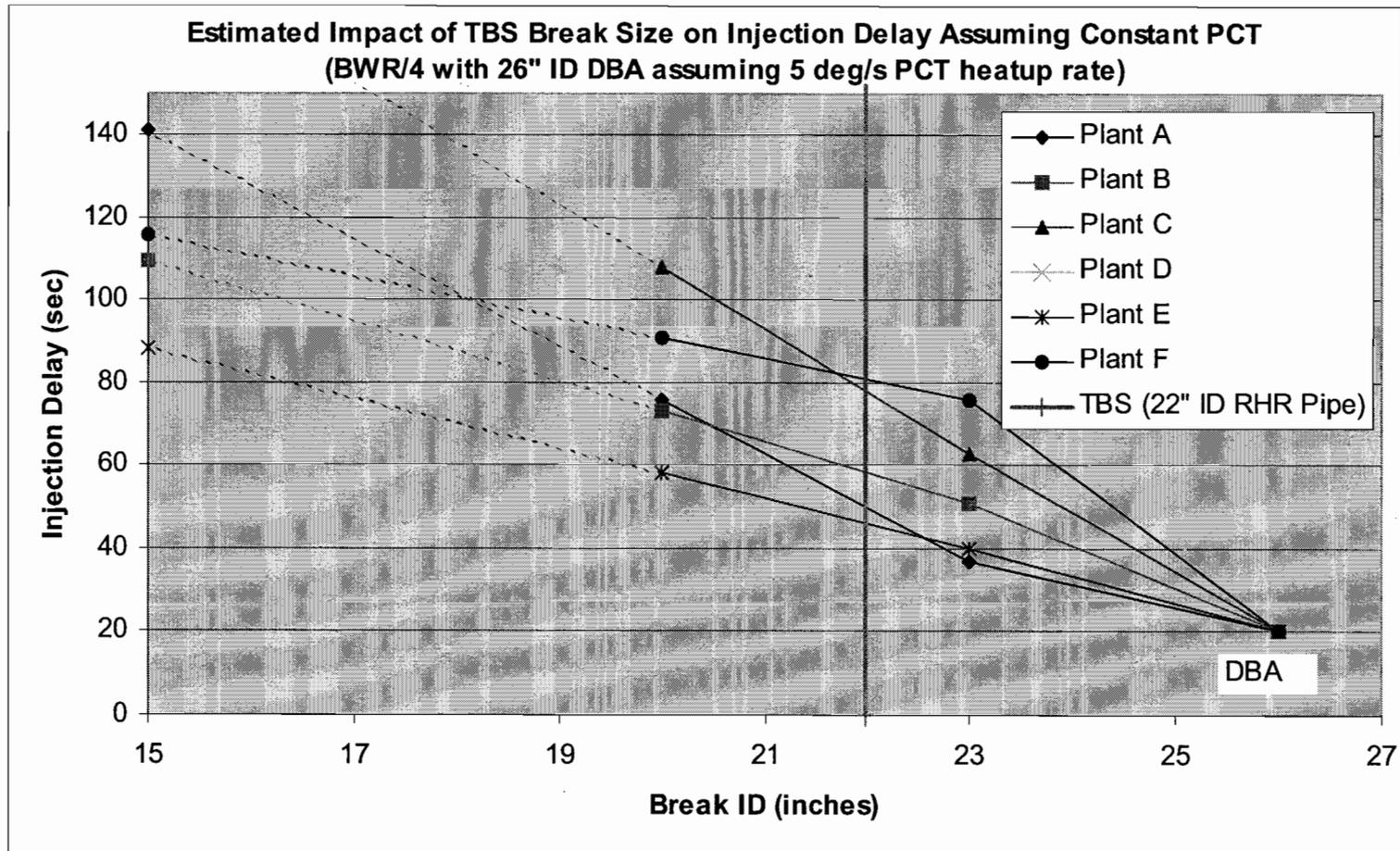


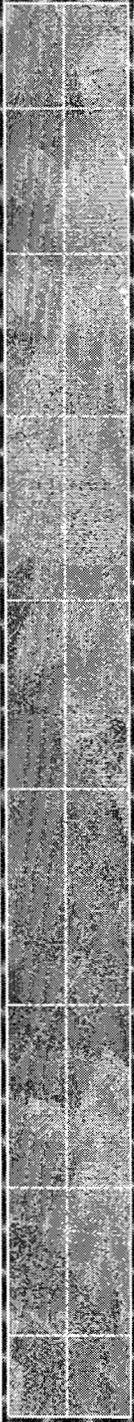
Impact of TBS Size for BWRs ECC Injection Delay

- ✱ Small breaks not impacted by ECC injection delays > 2 minutes since high pressure system is typically a limiting failure and injection waiting for depressurization
- ✱ Large breaks typically begin injecting in < 1 min and PCT increases as delay increases
- ✱ DBA limited plants see PCT reductions as TBS size is reduced
- ✱ Most plants will not be able to maintain their PCT with a 120 sec ECC injection delay if the TBS set to the RHR size

Impact of TBS Size for BWRs

ECC Delay (BWR/4 impact of TBS)

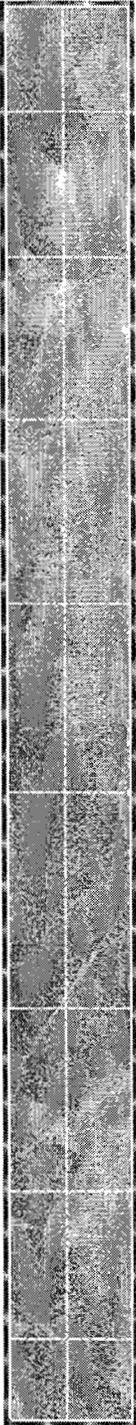




Impact of TBS Size for BWRs

System Relaxation

-
- * Small breaks less impacted by ECC system relaxation since level recovers very quickly
 - * DBA limited plants show a greater ability to relax ECC systems as TBS size is reduced



Impact of TBS Size for BWRs

SAFER Analysis for System Relaxation

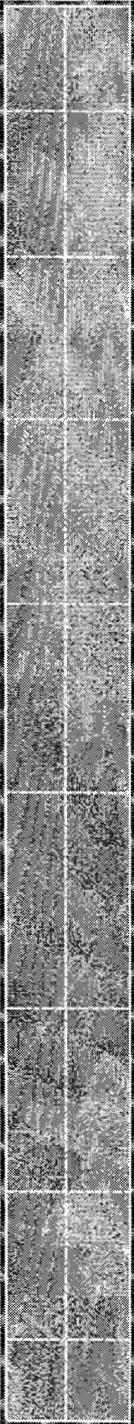
✳ SAFER/GESTR analysis was performed for a BWR/4 and a BWR/3 to assess the impact of analyzing at TBS, increasing the ECC injection delay time, and relaxing ECC systems

- Plants analyzed: BWR/4 and BWR/3
- Analysis performed for limiting failure and varying break sizes

Impact of TBS Size for BWRs

SAFER PCT Impact

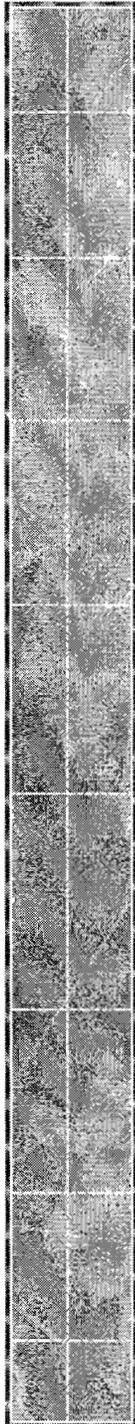
Case Description - Break Size (ID) / Location	ECC Delay	Available Systems	PCT Impact
BWR/4			
DBA Recirculation Suction Break, 25" guillotine	Base	1 LPCS + 2 LPCI	N/A
21" Discharge Break (single sided)	Base	1 LPCS + 1 LPCI	Reduction
21" Discharge Break (single sided)	+50 sec	1 LPCS + 1 LPCI	Same (< ± 50 deg F)
21" Discharge Break (single sided)	+50 sec	1 LPCS	Large Increase (>200)
18" Suction Break (single sided)	Base	1 LPCS + 2 LPCI	Large Reduction (>200)
18" Suction Break (single sided)	+50 sec	1 LPCS	Reduction
18" Suction Break (single sided)	+80 sec	1 LPCS	Increase
18" Suction Break (single sided)	+80 sec	1 LPCS + 1 LPCI	Same
16" Suction Break (single sided)	+80 sec	1 LPCS	Same
BWR/3			
DBA Recirculation Suction Break, 25" guillotine	Base	2 LPCS	N/A
18" Suction Break (single sided)	Base	2 LPCS	Large Reduction (>200)
18" Suction Break (single sided)	+40 sec	2 LPCS	Large Reduction (>200)
18" Suction Break (single sided)	+40 sec	1 LPCS	Large Reduction (>200)



BWR Materials Issues

* Overview

- The BWROG requests appropriate consideration of acknowledged IGSCC, thermal fatigue, and FAC mitigation in BWRs in removing unnecessary conservatism applied to TBS definition in the proposed rule
- The BWROG is not recommending revision of NUREG-1829

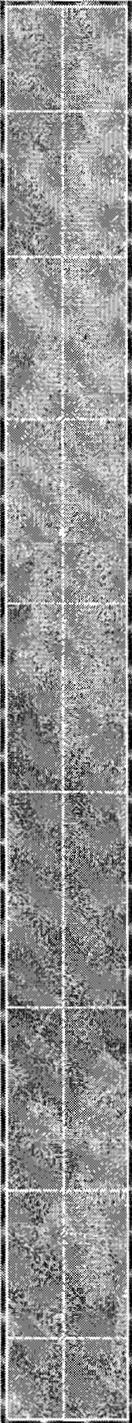


BWR Materials Issues

* IGSCC Concerns

- NUREG-1829 page xvii states, in part:

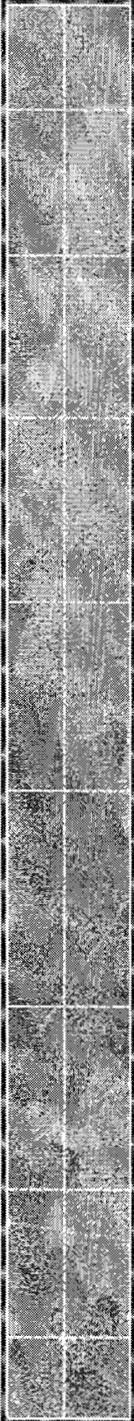
- “...the biggest frequency contributors for each LOCA size tend to be systems having the smallest pipes, or component, which can lead to that size LOCA. The exception to this general rule is the BWR recirculation system, which is important at all LOCA sizes due to lingering IGSCC concerns.” {emphasis added}



Materials Discussion

* BWR mitigation measures for IGSCC in piping

- Water chemistry
- Better material and/or repair measures
- Stress improvement



Materials Discussion

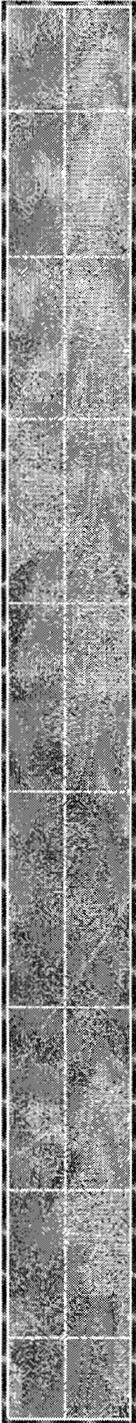
✦ References supporting IGSCC mitigation in piping

◆ ***BWRVIP-75-A: BWR Vessel and Internals Project, Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules***

- An industry survey was conducted by the ASME Task Group on ISI Optimization (1995)
 - ◆ Approximately 10,000 Class 1 welds under the current ASME Section XI sampling requirement, in 50 responding plants,
 - ◆ Only a small number (5) innocuous indications.
 - ◆ The only significant service-induced flaws that have been observed in Class 1 piping have been due to unmitigated occurrences of IGSCC.

◆ ***GE-NE-A41-00110-00-1, Rev. 0, A Review Of NUREG/CR-5750 IGSCC Improvement Factor and Probability of Rupture Given a Through-Wall Crack***

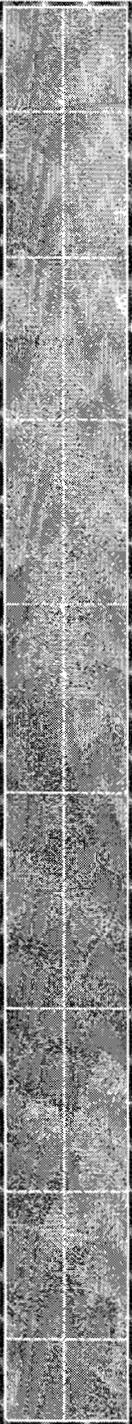
- Provided to NRC by BWROG letter on April 25, 2002
- Address Staff concerns with Factor of Improvement (FOI) for HWC



BWR Materials Issues

* Thermal fatigue in BWR Feedwater Nozzles

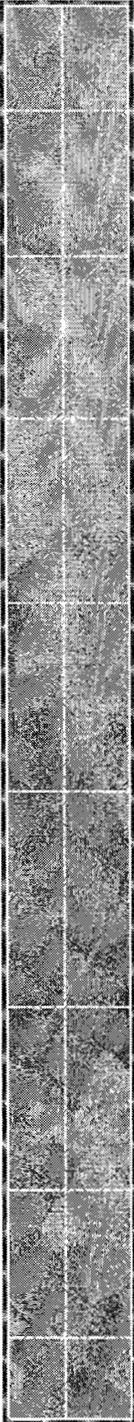
- ◆ Design Modifications and rigorous inspection program per NUREG-0619 have been in place since 1981
- ◆ **GENE-523-A71-0594, *Alternate BWR Feedwater Nozzle Inspection Requirements***, May 2000.
 - *It should be emphasized no new cracking has been identified in the last fifteen years.*
- ◆ NRC has approved a relaxed inspection schedule for FW Nozzles based upon GENE-523-A71-0594:
 - *The staff has completed its review and determined that the proposed inspection program and schedule in GE-NE-523-A71 - 0594. Revision 1 is justified and provides an acceptable level of quality and safety. Therefore, GE-NE-523-A71 -0594, Revision 1, is an acceptable alternative to the inspection guidelines in NUREG-0619.*



BWR Materials Issues

* Flow-Assisted Corrosion (FAC)

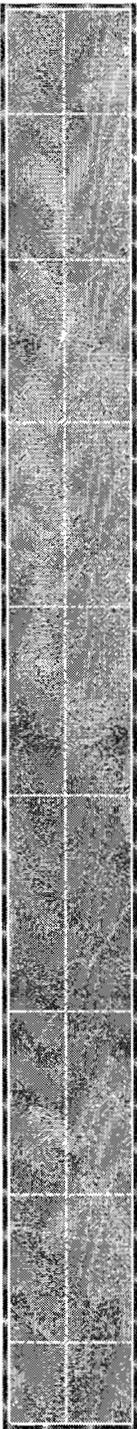
- NUREG-1829 - Tables 3.7 and B.1.9 mention flow-assisted corrosion (FAC) as a long-term aging mechanism
 - Main Recirculation System is Stainless Steel – not susceptible
 - FW Piping Inside Containment (TBS) not overly susceptible to FAC
 - ♦ Temperature is high ($> 200^{\circ}\text{C}/400^{\circ}\text{F}$)
 - ♦ HWC plants inject O_2 into FW to increase concentration above FAC range (> 30 ppb)
 - RHR Piping Inside Containment (TBS) not susceptible to FAC
 - ♦ Material is Stainless Steel at connection to Recirculation System piping (carbon steel outboard of isolation valves)
 - ♦ Minimum flow duty (standby system)



BWR Materials Issues

* Summary

- Credit for mitigation of IGSCC, thermal fatigue, and FAC should be considered in removing the excess conservatism added by NRC Staff to the TBS results from the Expert Elicitation
 - BWROG Proposal (16" pipe break) represents mid-range of 95th percentile values from Expert Elicitation



10 CFR 50.46 Rulemaking

* Summary:

- ◆ For the proposed rule to be useful to BWRs, a reduced TBS should be allowed based on
 - T/H analysis results demonstrating Safety Benefits from a reduced TBS
 - Significant Operating Experience with successful mitigation of IGSCC, Thermal Fatigue, and FAC