



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

PDR

December 10, 1996

MEMORANDUM TO: Keith R. Wichman, Acting Chief
Materials & Chemical Engineering Branch
Division of Engineering
Office of Nuclear Reactor Regulation

FROM: C. E. Carpenter, Jr., Lead Project Manager
Materials & Chemical Engineering Branch
Division of Engineering
Office of Nuclear Reactor Regulation

SUBJECT: MEETING SUMMARY FOR OCTOBER 15, AND OCTOBER 28, 1996, MEETINGS
WITH BOILING WATER REACTORS VESSEL AND INTERNALS PROJECT
(BWRVIP) REGARDING INTENTION TO PETITION FOR RULEMAKING, AND
CLARIFICATION OF LICENSE RENEWAL RULE (TAC NOS. M93925 AND
M91898)

Petition for Rulemaking

A meeting was held at the U.S. Nuclear Regulatory Commission's (NRC) One White Flint North offices in Rockville, Maryland, on October 15, 1996, with NRC staff and members of the BWR Vessel and Internals Project (BWRVIP). By letter dated September 20, 1996, the BWRVIP informed the NRC staff of its intent to petition for rulemaking, and requested a meeting with the NRC staff to discuss the proposed Petition. Attachment 1 is a list of attendees. Attachment 2 is the BWRVIP's meeting slides. A proprietary set of slides were provided during the meeting, and were collected by the BWRVIP at the end of the meeting.

By letter dated September 28, 1995, the BWRVIP submitted the proprietary Electric Power Research Institute (EPRI) report TR-105697, "BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations (BWRVIP-05)," dated September 1995, for NRC staff review. This report evaluates the current inspection requirements for reactor pressure vessel (RPV) shell welds in BWRs, proposes alternative inspection requirements for BWR shell welds, and presents results from performing probabilistic fracture mechanics (PFM) analyses based on an enhanced PFM code, VIPER, to justify a proposed alternative scope of inspections. Under the existing augmented vessel inspection requirements in Section 50.55a to Title 10 of the Code of Federal Regulations [10 CFR 50.55a(g)(6)(ii)(A)], all licensees must perform one time examinations of "essentially 100%" of the circumferential and longitudinal reactor vessel shell welds. Among its other recommendations, BWRVIP-05 proposes to revise these requirements in 10 CFR 50.55a(g)(6)(ii)(A) to inspect 50% of RPV shell longitudinal seam welds, and 0% of RPV shell circumferential seam welds.

CONTACT: C. E. Carpenter, Jr.
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of 16 Meetings Gen.
RD-10-1

To aid the NRC staff's review of this document, the NRC staff issued two Requests for Additional Information (RAIs), the first on April 2, 1996, and the second on May 20, 1996. By letter dated June 24, 1996, the BWRVIP responded to the two RAIs with supplemental information. Further, in response to the request from the BWRVIP Executive Oversight Committee (EOC), NRC managerial and technical staff met with the BWRVIP EOC management and technical staff in a public meeting held at the NRC offices in Rockville, Maryland, on July 11, 1996. The meeting summary, dated July 23, 1996, included several requests for additional clarifications from the BWRVIP of issues that the NRC staff identified during this meeting.

The BWRVIP members presented its Petition format, and requested clarification as to what information needs to be provided to expedite review of the proposed Petition. The NRC staff discussed with the BWRVIP members the timing and steps required to be taken for Rulemaking activities. The NRC staff cautioned the BWRVIP members that rulemaking, even if expedited, is still a laborious process that takes two or more years to complete. While it is possible to reduce this by several months, the NRC staff is doubtful that Rulemaking could proceed in a timely enough fashion to address the BWRVIP concerns. The NRC staff agreed to provide the BWRVIP with a description of the Rulemaking process, which is included as Attachment 3 to this meeting summary.

The question was raised as to whether the revised reactor vessel examination scope, as proposed in the BWRVIP-05 report, could be considered an alternative to 10 CFR 50.55a(g)(6)(ii)(A), pursuant to 10 CFR 50.55a(a)(3). Section 50.55a(a)(3) to 10 CFR Part 50 [10 CFR 50.55a(a)(3)] states that alternatives to the requirements of subparagraph (g) may be used, when authorized by the NRC, if (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulties without a compensating increase in the level of quality and safety. Although the existing augmented examination requirements in 10 CFR 50.55a(g)(6)(ii)(A) also allows the use of alternatives, pursuant to 10 CFR 50.55a(g)(6)(ii)(A)(5), the language in 10 CFR 50.55a(g)(6)(ii)(A)(5) clearly states that the use of these alternatives would only be allowed when licensees are unable to completely satisfy the requirements for the augmented reactor vessel shell weld examination (e.g., as a result of physical interference or obstruction). The NRC staff has previously authorized, for many plants, less than essentially 100% weld coverage when licensees were unable to examine portions of the reactor vessel shell welds due to physical interferences or obstructions. The NRC staff agreed to seek a legal opinion from the Office of the General Counsel (OGC) as to the acceptability of using the approach in BWRVIP-05 as an alternative to the augmented vessel examination requirements.

Clarification of License Renewal Rule

On October 28, 1996, members of the Materials and Chemical Engineering Branch (EMCB) and the License Renewal Project Directorate (PDLR) met with representatives of the BWRVIP and the BWR Owner's Group (BWROG) License Renewal Committee to discuss the applicability of license renewal to the efforts of the BWRVIP. Attachment 4 is a list of attendees.

To date, the BWRVIP has submitted nine documents that deal with the assessment, mitigation and repair of age related degradation of the BWR vessel and its internal components. The BWRVIP requested that the NRC staff provide clarification as to how these, and future, documents could be appropriately submitted so as to be reviewed to both 10 CFR Part 50 and 10 CFR Part 54 (license renewal rule) requirements.

The NRC staff indicated that for the BWRVIP to request review of its submittals under both Part 50 and Part 54 requirements was acceptable. The NRC staff further informed the BWRVIP and BWROG members that the submitted (and future) reports will need to be modified so that they explicitly confirm that they are applicable to license renewal, so that individual licensees can reference these documents in their license renewal applications. The BWRVIP agreed to submit an Appendix to the existing reports that will describe how the reports meet the requirements of 10 CFR Part 54.

The NRC staff encouraged the BWRVIP to work with the NRC staff to expedite the reviews. Further meetings will be scheduled as needed.

- Attachments: 1. October 15, 1996, List of Attendees
2. October 15, 1996, BWRVIP Handout
3. Rulemaking Timeline
4. October 28, 1996, List of Attendees

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Central File	RAHermann	MEMayfield
PUBLIC	CFSheng	GCMillman
NRR/EMCB Reading	SFNewberry	MBMcNeil
FJMiraglia/ACThadani	RKANand	DAJackson
BWSheron/GCLainas		EMHackett

DOCUMENT NAME: G:\BWRVIP\VIP-1015.MTS

* See previous concurrence

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EMCB:LPM	E	EMCB:SC	E	EMCB:(A)C	E	DE:(A)DD	C
CECarpenter		DTerao*		KRWichman*		JRStrosnider*	
12/03/96		12/03/96		12/03/96		12/04/96	

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12/3/96		12/3/96		12/03/96		12/4/96	

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CECarpenter	CC	DTerao		KRWichman		JRStrosnider	
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MEETING WITH BWR VESSEL & INTERNALS PROJECT
TO DISCUSS PETITION FOR RULEMAKING
RELATED TO BWRVIP-05 REPORT
October 15, 1996

NAME	TITLE	ORGANIZATION	TELEPHONE
C. E. Carpenter	Lead PM	NRC/NRR/DE/EMCB	301-415-2169
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Robert HEAMANN	SLS-MATS.	NRC/NRR/DE	301-415-2768
David Terao	Section Chief	NRC/NRR/DE	301-415-3317
ED HACKETT	REGIONAL COORDINATOR	NRC/OCDO	301-415-1733
JACK STROSWIDER	ACTING DEP DIRECTOR FOR ENGINEERING	NRC/NRR/DE	301-415-2796

**BWRVIP Petition for Rulemaking
Regarding Inservice Inspection
Requirements for BWR Reactor
Pressure Vessel Welds**

Petition Format

- **Follow outline of Regulatory Position of Draft Regulatory Guide DG-0010 “Preparation of Petitions for Rulemaking under 10CFR2.802 and Preparation and Submission of Proposals for Regulatory Guidance Documents,” August 1996**

Petition Outline

- 1. Proposed Regulatory Text**
- 2. Consideration for the Regulation**
- 3. Material to Show Conformance with Legal Requirements**
- 4. Regulatory Analysis**
 - 4.1 Problem Statement**
 - 4.2 Preliminary Analysis of Alternatives**
 - 4.3 Evaluation of Values and Impacts**
 - 4.3.1 BWR Inherent Flaw Tolerance**
 - 4.4.2 Probabilistic Fracture Mechanics**
 - 4.4.3 Cost/Benefit Analysis**
- 5. Response to the Backfit Rule**
- 6. Proposals for Regulatory Guidance Documents**

PROPOSED REGULATORY TEXT - OPTION A

Revise 10CFR50.55a(g)(6)(ii)(A) as follows:

(A) Augmented examination of reactor vessel.

(1) All previously granted reliefs under §50.55a to licensees for the extent of volumetric examination of reactor vessel shell welds specified in Item B1.10 of Examination Category B-A, "Pressure Retaining Welds in Reactor Vessel," in Table IWB-2500-1 of Subsection IWB in applicable edition and addenda of Section XI, Division 1, of the ASME Boiler and Pressure Vessel Code, during the inservice inspection interval in effect on September 8, 1992 are hereby revoked, subject to the specific modification in §50.55a(g)(6)(ii)(A)(3)(iv) for licensees that defer the augmented examination in accordance with §50.55a(g)(6)(ii)(A)(3).

(2) Scope of examinations.

(i) All licensees of a pressurized water-cooled nuclear power facility~~All licensees~~ shall augment their reactor vessel examination by implementing once, as part of the inservice inspection interval in effect on September 8, 1992, the examination requirements for reactor vessel shell welds specified in Item B1.10 of Examination Category B-A, "Pressure Retaining Welds in Reactor Vessel," in Table IWB-2500-1 of Subsection IWB of the 1989 Edition of Section XI, Division 1, of the ASME Boiler and Pressure Vessel Code, subject to the conditions specified in §50.55a(g)(6)(ii)(A)(3) and (4). The augmented examination, when not deferred in accordance with the provisions of §50.55a(g)(6)(ii)(A)(3), shall be performed in accordance with the related procedures specified in the Section XI edition and addenda applicable to the inservice inspection interval in effect on September 8, 1992, and may be used as a substitute for the reactor vessel shell weld examination scheduled for implementation during the inservice inspection interval in effect on September 8, 1992. For the purpose of this augmented examination, "essentially 100% as used in Table IWB-2500-1 means more than 90 percent of the examination volume of each weld, where the reduction in coverage is due to interference by another component, or part geometry.

(ii) All licensees of a boiling water-cooled nuclear power facility shall augment their reactor vessel examination by implementing once, as part of the inservice inspection interval in effect on September 8, 1992, the examination requirements for reactor shell welds specified in Item B1.12 of Examination Category B-A, "Pressure Retaining Welds in Reactor Vessel," in Table IWB-2500-1 of Subsection IWB of the 1989 Edition of Section XI, Division 1, of the ASME Boiler and Pressure Vessel Code, subject to the conditions specified in §50.55a(g)(6)(ii)(A)(3) and (4). The augmented examination, when not deferred in accordance with the provisions of §50.55a(g)(6)(ii)(A)(3), shall be performed in accordance with the related procedures specified in the Section XI edition and addenda applicable to the inservice inspection interval in effect on September 8, 1992, and may be used as a substitute for the reactor vessel shell weld examination scheduled for implementation during the inservice inspection interval in effect on September 8, 1992. For the purpose of this augmented examination, "essentially 100% as used in Table IWB-2500-1 means more than 90 percent of the examination volume of each weld, where the reduction in coverage is due to interference by another component, or part geometry.

(3) Licensees with fewer than 40 months remaining in the inservice inspection interval in effect on September 8, 1992 may defer the augmented reactor vessel examination specified in §50.55a(g)(6)(ii)(A)(2) to the first period of the next inspection interval under the following conditions:

(i) The deferred augmented examination may not be used as a substitute for the reactor vessel shell weld examination scheduled for implementation during the inservice inspection interval in effect on September 8, 1992.

(ii) The deferred augmented examination may be used as a substitute for the reactor vessel shell weld examination normally scheduled for the inspection interval in which the deferred examination is performed.

(iii) If the deferred augmented examination is used as a substitute for the normally scheduled reactor vessel shell weld examination, subsequent reactor vessel shell weld examinations must be performed during the first period of successive inspection intervals.

(iv) Licensees that defer the augmented examination, as permitted herein, may retain all previously granted reliefs that otherwise would be revoked by §50.55a(g)(6)(ii)(A)(1) for the inservice inspection interval in effect on September 8, 1992.

(v) Licensees with fewer than 40 months remaining in the inservice inspection interval in effect on September 8, 1992 may extend that interval in accordance with the provisions of Section XI (1989 Edition) IWA-2430(d) for the purpose of implementing the augmented examination during that interval.

(vi) The deferred augmented examination shall be performed in accordance with the related procedures specified in the Section XI edition and addenda applicable to the inspection interval in which the augmented examination is performed.

(4) The requirement for augmented examination of the reactor vessel may be satisfied by an examination of essentially 100 percent of the reactor vessel shell welds specified in §50.55a(g)(6)(ii)(A)(2) that has been completed, or is scheduled for implementation with a written commitment, or is required by §50.55a(g)(4)(i), during the inservice inspection interval in effect on September 8, 1992.

(5) Licensees that make a determination that they are unable to completely satisfy the requirements for the augmented reactor vessel shell weld examination specified in §50.55a(g)(6)(ii)(A) shall submit information to the Commission to support the determination and shall propose an alternative to the examination requirements that would provide an acceptable level of quality and safety. The licensee may use the proposed alternative when authorized by the Director of the Office of Nuclear Reactor Regulation.

PROPOSED REGULATORY TEXT - OPTION B

Add a new paragraph (6) be added to 10CFR50.55a(g)(6)(ii)(A) adding the clarification that:

- (6) For boiling water reactor nuclear power facilities, the augmented reactor vessel examination requirements in §50.55a(g)(6)(ii)(A)(1) through §50.55a(g)(6)(ii)(A)(5) may be satisfied by examination of essentially 100% of the longitudinal shell welds identified in Item B1.12 of Examination Category B-A, "Pressure Retaining Welds in Reactor Vessel," in Table IWB-2500-1 of subsection IWB of the 1989 Edition of section XI, Division 1, of the ASME Boiler and Pressure Vessel Code.

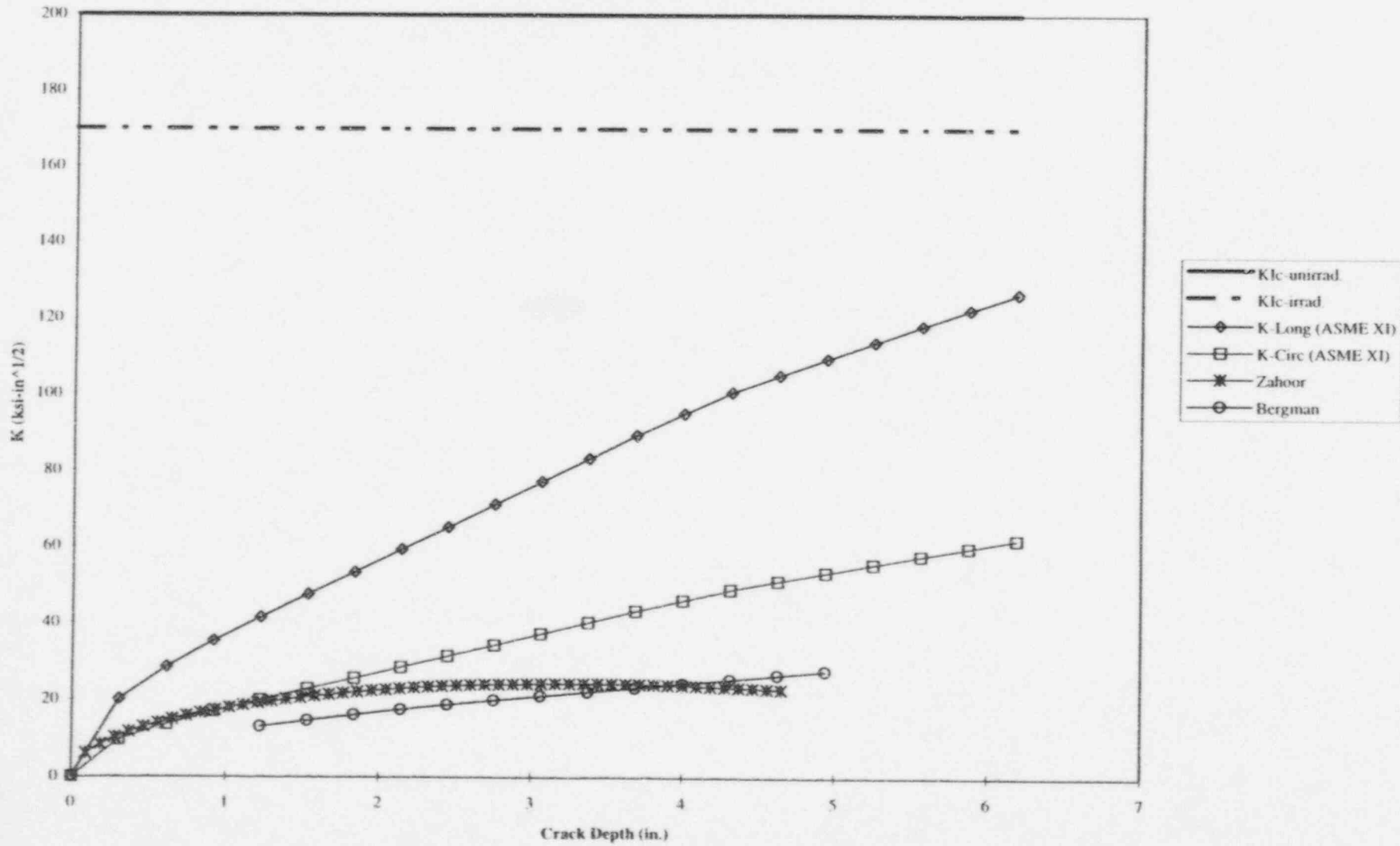
2. Considerations for the Regulation

- **Current ISI requirements per ASME Section XI and 10CFR50.55a**
 - **Essentially 100% of longitudinal and circumferential shell welds**
 - **Same for BWRs and PWRs**
- **But, BWR vessels possess significantly greater inherent flaw tolerance**
 - **Lower irradiation embrittlement**
 - **No pressurized thermal shock event**
 - **Pressure test limiting condition**

Considerations for the Regulation

- **Findings of BWR vessel analysis**
 - **Reduction to zero circumferential and 50% longitudinal shell weld inspections results in small but finite increase in risk of vessel failure**
 - **Circumferential shell welds make zero contribution to vessel failure probability**
 - **Cost savings of \$1.3M to \$1.6M per plant by eliminating circumferential weld inspections (\$46M to \$58M for BWR fleet)**

Stress Intensity Factors vs. Fracture Toughness
Longitudinal vs. Circumferential Welds



3. Material to Show Conformance with Legal Requirements

3.1 Environmental Impact Under NEPA

- No significant change in environmental impact compared to existing rule

3.2 Information Collection Requirements Under the Paperwork Reduction Act

- No measurable change in amount of paper provided to the Federal Government

3.3 Economic Impact on Small Entities Under the Regulatory Flexibility Act

- No “significant economic impact on a substantial number of small entities” (from Draft Reg. Guide DG-0010)

4. Regulatory Analysis

Preliminary Evaluation of Alternatives

Three Inspection Scenarios Considered:

- A. Current Inspection Requirements**
- B. Elimination of Circumferential Welds from Inspection Program**
- C. Elimination of Circumferential Welds and 50% of Longitudinal Seam Welds from Inspection**

CASE B SELECTED FOR PETITION FOR RULEMAKING

Comparative Analysis of Alternatives

CASE	RISK OF VESSEL FAILURE	COST OF INSPECTION	
		per Plant	BWR Fleet
A	5.69×10^8	\$3.3M	\$119M
B	5.69×10^8	\$1.85M	\$67M
C	1.151×10^7	\$1.45M	\$52M

**OPTION B SELECTED FOR PETITION FOR
RULEMAKING BECAUSE NO IMPACT ON PLANT
SAFETY WITH SIGNIFICANT COST SAVINGS**

Evaluation of Values and Impacts

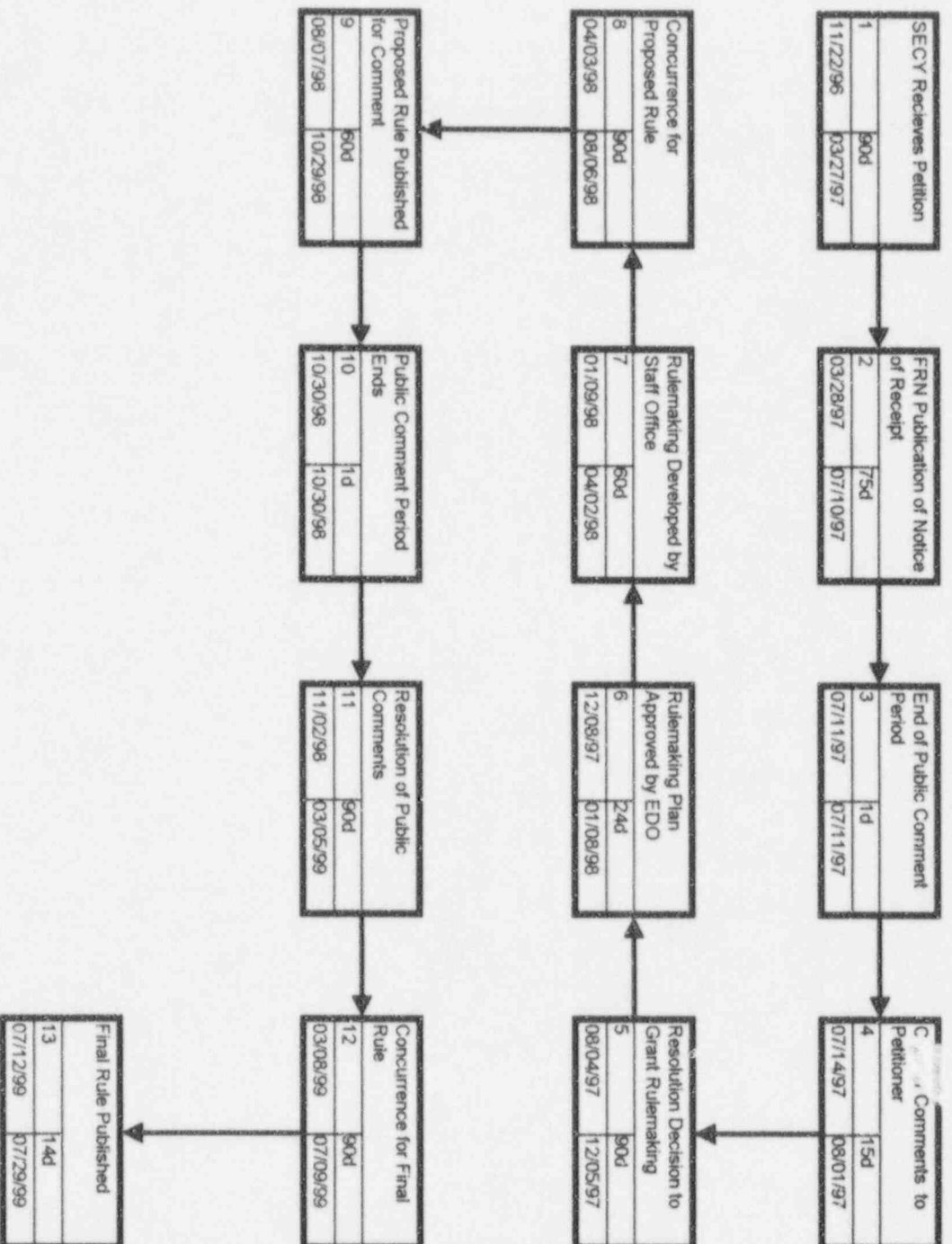
- **BWR Inherent flaw tolerance**
- **Circumferential vs. longitudinal welds**
- **Probabilistic fracture mechanics**
- **Cost/Benefit analysis**

5. Response to Backfit Rule

- **Proposed rule change does not impose new or additional requirements, therefore, not a backfit as defined in 10CFR50.109 and a backfit analysis is not required**

6. Proposals for Regulatory Guidance Documents

- **Not applicable to this petition**



Meeting with BWRVIP Regarding License Extension
October 28, 1996

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Scott Newberry	NRC/NRR/PDR	Project Director	301-415-1183
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David Terao	NRR/DE/EMCB	Section Chief	301-415-3317
Jim Davis	NRR/DE/EMCB	Materials Engr	301-415-2713
Lee Banic	NRC/DE/EMCB	Mtts. Engr	301 415 2771