

November 14, 1996

MEMORANDUM TO: David B. Matthews, Chief
Generic Issues and Environmental
Projects Branch
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

FROM: Stewart L. Magruder, Project Manager Original Signed By:
Generic Issues and Environmental
Projects Branch
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF OCTOBER 30, 1996, MEETING WITH ABB COMBUSTION
ENGINEERING REGARDING REVIEW OF CENPD-137, SUPPLEMENT 2-P,
BREAK LOSS-OF-COOLANT ACCIDENT EVALUATION MODEL

On October 30, 1996, representatives of ABB Combustion Engineering (ABB-CE) and Entergy Operations, Incorporated met with representatives of the Nuclear Regulatory Commission (NRC) at the NRC's offices in Rockville, Maryland. Attachment 1 provides a list of meeting attendees.

The purpose of the meeting was to discuss ABB-CE's responses to the staff's request for additional information (RAI) dated October 1, 1996. ABB-CE's proprietary responses to the RAI were submitted in a letter dated October 24, 1996. ABB-CE's non-proprietary meeting presentation material is included as Attachment 2.

The meeting began with a long discussion of the first RAI question. ABB-CE presented some data from analysis performed in response to the question that ABB-CE claimed provided additional confidence in the overall conservatism of their model. The staff questioned ABB-CE about the assumptions used in the analysis. The staff was particularly interested in the values used for steam flow and rod power. ABB-CE committed to run the analysis again with different steam flow and rod power values and to update their response to RAI question 1.b.

The group next reviewed ABB-CE's answers to the remaining RAI questions. The NRC agreed that ABB-CE's responses to questions 2, 4, 5, 7, and 8 were acceptable but that more time was needed to review the responses to questions 3 and 6. With regard to the loop seal refilling issue, question 9, ABB-CE made a detailed presentation on the design of ABB-CE plants and the approach they are considering on taking in their response. The staff found the discussion very helpful and indicated that ABB-CE designed plants may not be subject to the phenomenon provided, among other things, they can show that they are able to use safety grade equipment to perform a steam generator cooldown from the control room.

Attachments: As stated

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UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

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FROM: Stewart L. Magruder, Project Manager
Generic Issues and Environmental
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Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Stewart L. Magruder

SUBJECT: SUMMARY OF OCTOBER 30, 1996, MEETING WITH ABB COMBUSTION
ENGINEERING REGARDING REVIEW OF CENPD-137, SUPPLEMENT 2-P,
SMALL BREAK LOSS-OF-COOLANT ACCIDENT EVALUATION MODEL

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NRC/ABB-CE MEETING ON SBLOCA EM REVISION
LIST OF ATTENDEES
October 30, 1996

<u>NAME</u>	<u>ORGANIZATION</u>
Ernie Jageler	ABB-CE
Joe Cleary	ABB-CE
Ed Lee	ABB-CE
Dick Whipple	ABB-CE
Natalie Mosher	Entergy (ANO)
Frank Orr	NRC/NRR
Stu Magruder	NRC/NRR
Walt Jensen	NRC/NRR
Dan Prelewicz	Sciencetech
Bill Arcieri	Sciencetech
Len Ward	Sciencetech

NRC/ABB MEETING

MEETING DATE: WEDNESDAY, OCTOBER 30, 1996

MEETING TIME: 10:00 AM

LOCATION: NRC OFFICES, WHITE FLINT, MD

THIRD LICENSING REVIEW MEETING FOR ABB CE SBLOCA EM REVISION

COMBUSTION ENGINEERING, INC.

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AGENDA

THIRD NRC/ABB LICENSING REVIEW MEETING FOR ABB SBLOCA EM REVISION

WEDNESDAY, OCTOBER 30, 1996 10:00 AM.
NRC OFFICES, WHITE FLINT, MD

1. Introduction and Meeting Purpose
2. Status of Licensing Review Process and Schedule
3. Overview of the NRC RAI on
CENPD-137, Supplement 2-P
4. ABB Responses to the RAI
5. Discussion of Loop Seal Refilling Issue - Actions
Required for Resolution
6. Open Discussion and Planning / Meeting Wrap-up

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INTRODUCTION AND MEETING PURPOSE

- ◆ CONTINUE THE PLAN FOR REVIEW AND APPROVAL OF ABB'S SBLOCA EM REVISION TOPICAL REPORT, CENPD-137, SUPPLEMENT 2-P, BEGUN AT JANUARY 23, 1996 MEETING
 - Acceptable to NRC
 - Optimizes the Use of NRC Resources
 - Approval for Generic Application Supports the Short Term Needs of Utilities Depending on SBLOCA Improvements for Operation
 - Supports Power Uprate for Waterford 3 Prior to Commitment of Major Capital Funds
- ◆ PRESENT ABB RESPONSES TO THE NRC REQUEST FOR ADDITIONAL INFORMATION
- ◆ IDENTIFY ANY NEW CONCERNS OR ISSUES AND DISCUSS STRATEGIES FOR RESOLUTION
- ◆ FOCUS ON REAL CONCERNS OR ISSUES

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Review Action Items from August 28, 1996 Meeting Related to SBLOCA EM Revision

- Sciencetech completed technical review September 16, 1996; NRC issued RAI on October 1, 1996
- ABB-CE transmitted official response to RAI on October 24, 1996 covering eight of nine questions
- Response to loop seal refilling issue introduced at August meeting in progress

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Project Plan and Status as of 10/30/96

Activity	Due Date	% Complete
Meeting with NRC	1/23	100%
Letter of Intent to NRC	2/9	100%
Proposal to EOI	2/28	100%
Submittal Analysis	5/10	100%
Draft Submittal Preparation	5/15	100%
Submittal Review and Revision	5/17	100%
Technical Review of Submittal	5/22	100%
Submit EM Revision to NRC	5/23	100%
Kickoff Meeting with NRC	6/10	100%
Analysis Documentation	7/15	100%
NRC Issue Acceptance Review	7/19	100%
Analysis Documentation QA	7/31	100%
Submit Response to NRC Acceptance Review	8/9	100%
Second Licensing Review Meeting with NRC	8/28	100%
NRC Issue RAI	10/1	100%
Response to RAI	10/24	90%
Third Licensing Review Meeting with NRC	10/30	
Complete Response to LSR Issue		
Final Documentation & QA	12/31	65%
NRC Issue SER	(4/1/97)	
Issue Final EM Revision	(4/16/97)	

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Overview of the NRC RAI Regarding the Supplement 2 SBLOCA Evaluation Model Topical Report

- Sciencetech identified 8 subjects where additional information is required
 - 4 questions related to the S2M changes
 - 2 questions related to the S1M
 - 2 questions requested text revisions to the report
- NRC requested resolution of 1 subject on generic SBLOCA behavior related to loop seal refilling

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SUMMARY OF 9 RAI QUESTIONS

1. Application of ABB methodology to regulatory limit
 - 1.a Margin analysis at higher temperatures
 - 1.b Benchmark against 336-Rod Bundle Tests
2. Radiation geometric path length - future implementation
3. Steam emissivity at low temperatures - justification & sensitivity
4. Typographical error in equation 2-9
5. Text revisions to show units on all equations
6. Basis for weighting factor in equation 2-17 - clarification
7. Flag value for return to transition boiling - explanation
8. STRIKIN-II interface - explanation
9. Loop seal refilling - adequacy of SBLOCA EM

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ABB RESPONSES TO THE RAI

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List of Temporary Code Changes

Response to Acceptance Review

- THTF FRS Physical Properties (Heat Capacity)
- Option for closed form calculations of steam heat transfer model
- Edit axial distributions at the time of PCT
- Per time step edit of steam flow rate and minimum heat transfer logic
- Optional multiplier on geometric path length

Response to RAI

- G2 FRS Physical Properties (Heat Capacity)

1. Application of ABB methodology to regulatory limit

1.a Margin analysis at higher temperatures

Response:

- Additional sensitivity studies performed with both S1M & S2M
- Metal-water reaction option turned off
- Increased decay heat multiplier to elevate PCT near 2200°F
- Margin between S1M and S2M at higher power level and higher temperatures is the same as reported in the topical report
- Margin between decay heat multiplier of 1.2 and 1.0 is several hundreds of degrees greater at the higher power level than reported in the topical report
- Results show that the S2M maintains an appropriate amount of overall conservatism

1.b Benchmark against 336-Rod Bundle Tests

Response:

- Integral comparisons made to the 336-Rod Bundle G2 Tests
- Two G2 tests were selected: Test 721 and 722
- Comparisons justify the adequacy of the S2M by conservatively simulating observed behavior
 - Integral comparisons show adequacy of PARCH/REM representation of interrelationship between convection and radiation at different temperature levels and different steam heating lengths
 - PARCH/REM predictions match bundle average data well
- These results establish the adequacy of the S2M by benchmarking against the best available data closest to the temperature range of interest

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ABB**2. Radiation geometric path length - justification**

Response:

- A temporary code change was made in order to perform a sensitivity study
- The limiting NSSS case PCT increased by only 2°F
- Further review of the reference materials indicate that no strong justification exists for the use of 0.85 times the hydraulic diameter for a square lattice of fuel rods
- Prefer to stay with the methodology documented

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3. Steam emissivity at low temperatures - justification & sensitivity

Response:

- Hottel data base covers the SBLOCA condition of pure steam
- High pressure adjustment to Hottel data compares favorably to Ferriso data at low temperatures
- Sensitivity studies indicate that the effect of emissivity differences between Hottel and Ferriso are insignificant to PCT
- The results indicate that the S2M method for pressure dependent emissivity at low temperature is adequate for SBLOCA applications

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4. Typographical error in equation 2-9

Response:

- This correction will be incorporated in the final version of the S2M topical report

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5. Text revisions to show units on all equations

Response:

- Text revisions will be incorporated in the final version of the S2M topical report including units for all of the equations
- The heat generation rates in equation 2-12 are on a per unit length basis

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6. Basis for weighting factor in equation 2-17 - clarification

Response:

- The formulation is a continuous approximation for spatial variations using a discrete noding scheme
- Method is justified by the transient G2 test comparisons
- Method has negligible impact on NSSS PCT evaluations

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7. Flag value for return to transition boiling - explanation

Response:

- Vectors 101-121 preserve the nodal heat transfer history calculated by the STRIKIN-II code - as required by Appendix K
- This question is not related to the changes implemented for the S2M

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ABB**8. STRIKIN-II interface - explanation**

Response:

- Initial temperatures for PARCH/REM were taken from the STRIKIN-II licensing basis calculations of record documented in Reference 3-1.
- This question is not related to the changes implemented for the S2M

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9. Loop seal refilling - adequacy of SBLOCA EM

Response:

- Response to this question is being developed
- Issue not directly related to S2M model changes
- The S2M adequately addresses 10CFR50.46(b) requirements for ABB CE designed (or fueled) plants through inherent and required conservative methodologies

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ABB**SUMMARY**

- All 8 questions regarding the SBLOCA EM Revision have been addressed
- Proposed model changes contain conservatism relative to other models and test data over the full range of applicability
- Clarifications and text revisions for the S2M topical report will be implemented after receipt of the SER
- Loop seal refilling issue response is on-going

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CE OWNERS GROUP

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