

THIS DOCUMENT CONTAINS
POOR QUALITY PAGES

ACRS-1713

DATE ISSUED: 4/12/80

MEETING MINUTES OF THE
ACRS SUBCOMMITTEE ON ATWS
JANUARY 25, 1980
WASHINGTON, D. C.

On January 25, 1980 the ACRS Subcommittee on ATWS met in Washington, D.C., to discuss proposed resolution of ATWS with representatives of the NRC Staff and the Nuclear Industry. The notice of the meeting appeared in the Federal Register on December 28, 1979 and January 22, 1980. There were no requests for oral or written statements from members of the public and none were made at the meeting. Attachment A is a copy of the meeting agenda. The attendees list is Attachment B. Attachment C is a tentative schedule of the presentations of the meeting. Selected slides and handouts from the meeting are Attachment D to these minutes. A complete set of slides and handouts is attached to the office copy of these minutes.

OPEN SESSION (8:31 am - 2:00 pm) INTRODUCTION

Dr. Kerr, Subcommittee Chairman, called the meeting to order at 8:31 am. The Chairman explained the purpose of the meeting and the procedures for conducting the meeting, pointing out the Mr. Paul Boehmert was the Designated Federal Employee in attendance. The Chairman introduced Dr. Steve Hanauer (NRC Staff) to begin the day's presentations.

NEW NRC POSITION ON ATWS - S. HANAUER (NRC)

Dr. Hanauer recited a brief review of the history of the ATWS problem beginning with the issuance of Volumes 1 and 2 of NUREG-0460 in 1978. He noted that because of criticisms of the approach taken in the first two volumes of the NUREG, the Staff issued Volume 3 which contains a set of Alternatives for various classes of plants. The majority of plants would be subjected to Alternative 3 fixes. Dr. Hanauer noted that the NRC has been impacted by a number of events over the past year the most important of being the TMI-2 accident. Accordingly the NRC Staff has established a new Position on ATWS.

January 25, 1980

It has been decided by H. Denton that all plants, operating and under construction, will promptly implement most of the hardware fixes specified under Alternative 3 of Volume 3 of NUREG-0460. Dr. Hanauer termed the new requirement as an "Alternative 3A". Further, all plants will, over the long-term, be subjected to most of the requirements under Alternative 4 of 0460. These requirements were specified as "Alternative 4A". Dr. Hanauer noted that prompt implementation of the 3A Alternative will provide immediate improvement in protection against ATWS which will allow the phasing in of Alternative 4A requirements. The NRC will set dates-certain for installation of the ATWS fixes. This will put NRC out of the critical path for design and installation of the necessary components. Dr. Hanauer said that the Nuclear Industry has the responsibility for this task, and the NRC approach is similar to the short-term Lessons Learned effort. Dr. Hanauer also said that he cannot specify the Alternative 3A and 4A fixes at this time pending NRC study of the Industry reports recently submitted in response to the early verification effort initiated by R. Mattson in February 1979. It is not by Dr. Hanauer that NRC wants to move expeditiously on this problem, and the Staff does not feel it is productive to continue the early verification approach noted above.

Dr. Hanauer said that NRC would like ACRS comments on the NRC ATWS Position at the Committee's March 1980 meeting. Dr. Kerr urged that NRC provide written detail of its Position on ATWS to the ACRS well in advance of the March meeting. Dr. Hanauer said he would endeavor to provide this material well in advance of the March meeting.

NRC REVIEW OF ATWS ANALYSES RECEIVED TO DATE - A. THADANI (NRC STAFF)

Mr. Thadani begin by reviewing the Industry submittals sent in response to R. Mattson's Early Verification letter of February 15, 1979 (Figure 1). He noted that as of today, NRC has received very little information from B&W. He also noted that B&W intends to submit a report on ATWS to NRC the week of February 4, 1980. Mr. Thadani summarized the results of the PWR analyses for the Alternative 3 fixes (Figure 2). He noted that the CE plant designs now show the highest

peak pressures (4290 psi for the 3400 MW(t) design). It was noted that CE has taken credit for leakage through the reactor vessel head flange in order to obtain the above pressures. The CE plant pressures would be on the order of 6000 psi if vessel head leakage is not assumed. The B&W peak pressures have decreased due to initial condition assumptions, such as the early availability of auxiliary feedwater and more favorable moderator temperature coefficients.

In response to a question from Mr. Ebersole, Mr. Thadani said that PORV and safety/relief valve tests being sponsored by EPRI will most likely include ATWS-type tests. In response to a question from Dr. Lee concerning the necessity for CE to require vessel head lift, Mr. Thadani noted that there were two reasons for this: (1) power ratings of the plants assumed in the original analysis were non-conservative (2560 vs. 2700 MW(t)), and (2) the differences in the value of the MTC originally assumed (-6 pcm vs. -2 pcm).

Figure 3 details the major concerns the Staff has with the PWR Alternative 3 information received to date. Among the items noted that have not been described previously include the consideration of primary system voiding and its effect on long-term shutdown, lack of information on plants that have isolated PORVs, lack of information on instrumentation and control system qualification, and lack of significant information on valve operability following peak pressures.

In response to a question from Dr. Kerr, Mr. Thadani noted that the "Alternative 3A" fix will most likely include the requirements specified in the current Alternative 3, plus additional requirements such as instrumentation qualification to assure safe shutdown.

Mr. Thadani summarized the BWR analysis results for the Alternative 3 fix (Figure 4). In the case of all transients analyzed, the peak pool temperatures were less than 200°F. However, Mr. Thadani said that the NRC believes that in some cases the LOCA pool temperatures may exceed 200°F depending on the initial assumptions used in the analysis.

The Staff's major concerns with the information supplied by GE include the effects of power oscillations (limit cycle oscillations due to the introduction of cold cooling water into the core), equipment qualification, lack of information on reactor coolant pressure boundary components (BWR-3) and balance of plant components (BWR-4/5/6), and lack of information on suppression pool temperature and safety/relief valve loads.

Mr. Ebersole asked if liquid leakage is accounted for when considering the boron injection rate. Mr. Thadani said that the system is considered undamaged in respect to liquid leakage.

The advantages of the Alternative 4 fix, as the NRC sees them, were described by Mr. Thadani. Among the items noted were the following: protection from most ATWS events, increased confidence in the integrity of the reactor coolant pressure boundary, reduction in the concern over the limit cycle in BWRs, protection from single failure, and a plant that is more tolerant of operator error given an ATWS.

In regard to the question of potential operator error given an ATWS, Dr. Kerr asked if well trained (post-TMI) operators will still have to wait 10 minutes before taking action. He said it would be unrealistic to assume operators don't do anything (whether it's the right or wrong action) within the first 10 minutes of an ATWS. Mr. Thadani replied that it would be impossible to account for all possible operator actions given an ATWS situation, however it is the NRC's intent to be able to give the operator sufficient time (10-20 minutes) to evaluate the information he has available, and review his procedures so that he is more likely to take proper action.

Referring to the advantages of the Alternative 4 fix noted above, Dr. Kerr suggested that the NRC also list the disadvantages of implementing Alternative 4 fixes and be prepared to discuss them when the NRC comes before the full Committee for review of its position.

Mr. Thadani reviewed the status of the recirculation pump trip (RPT) installation in operating BWRs (Figure 5). He noted that the last operating plant to install RPT will be Dresden 2 which is planned to have installation complete by January 1981. Mr. Thadani also noted that some of the installation dates shown are the results of equipment delays, and NRC management in attempting to expedite equipment deliveries.

There were a number of questions from the Subcommittee. In response to question from Dr. Lee on the major differences between Alternatives 3 and 4 as they apply to GE plants, Mr. Thadani said the major difference is the capacity of the liquid poison injection system (about 86 gpm for Alternative 3, approximately 400 gpm for Alternative 4). Mr. Ebersole raised the concern that given an ATWS in a BWR, when the liquid poison injection solution is exhausted how will the plant be maintained sub-critical if fresh water is added for energy removal? Mr. Thadani said this point needs to be examined by the Staff, and this will be done. Dr. Kerr asked how much of a reduction in risk from core melt caused by ATWS would be achieved, given implementation of the Alternative 4A fix. Mr. Thadani replied that he believed this risk would be reduced by about a factor of 100. Mr. Epler stated that he did not believe the risk could be reduced any more than a factor of 10. Mr. Ebersole asked if given the infrequent ATWS challenge, is it necessary to put in a safety-grade RPT system. Mr. Thadani replied that the Alternative 4 RPT system is not safety grade in the strict sense and that there is a basic lack of redundancy in the system. That is, the system is single-failure proof only up to the pump breakers.

ATOMIC INDUSTRIAL FORUM PRESENTATION - J. SORENSEN (AIF)

Mr. Sorensen provided a brief presentation to the Subcommittee. Mr. Sorensen made the following points:

- AIF is concerned over the "new approach" to regulation being applied by the Staff. AIF questions the propriety, and perhaps the legality, of the new approach.

January 25, 1980

- AIF questions whether the ATWS fix proposed by the Staff is technically defensible. He noted that the fix will be costly. He said the Staff should be made to demonstrate a commensurate level of increase in safety.
- AIF urges the ACRS not endorse the approach being used by the Staff in this case without the Committee's careful scrutiny, and Industry comment.

GENERAL ELECTRIC PRESENTATION - G. SHERWOOD, H. PFEFFERLEN

Mr. Glen Sherwood provided opening remarks for the GE presentation. He noted that the Alternative 3 modifications would cost between \$1-3M/plant and would result in a factor of 50-100 improvement in protection against ATWS. Alternative 4 modifications, on the other hand, would cost \$8-15M/plant while providing only a factor of 2 improvement in ATWS protection over Alternative 3 modifications. Dr. Sherwood questioned the lack of increased safety benefit for the expense incurred for Alternative 4 modifications. He noted that it is GE's position that Alternative 3 modifications are sufficient to protect against ATWS for BWRs.

GE ANALYSIS SUPPORTING ALTERNATIVE 3 MODIFICATIONS - H. PFEFFERLEN

Mr. Pfefferlen begin by noting that the Alternative 3 assessment was performed in response to the NRC Staff's early verification request. GE devoted approximately 25 man-years to this effort and a final version of this report was recently submitted to the NRC Staff.

GE's approach to the analysis embraces the following parameters: the analysis was based on a representative plant for each product line, sensitivity studies were provided, and all ATWS-initiating transients were considered. GE assumed no control rod motion and also assumed automatic (timed) initiation of a 2 pump standby liquid control system.

Mr. Pfefferlen described an ATWS mitigation system under conceptual design by GE (Figure 6). This system would be activated on a high pressure or low level signal to initiate an ATWS protection logic. This logic would activate recirculation

pump trip, ARI (alternate rod insertion) and, by using the APRM system to monitor neutron flux, would conduct a "failure to scram test" before the liquid poison injection system is activated. Dr. Lipinski expressed concern over the reliability of the above "failure to scram test" subsystem in relation to the overall system reliability, noting that if this system does not work the liquid poison may not be injected. GE said they would take these comments under advisement.

The expected results for such critical parameters as peak RCS pressure, suppression pool bulk temperature, and containment pressure were shown for the BWR plants (Figure 7). All results were within safety limits. In response to a question from Mr. Ebersole concerning possible seal leakage and loss of reactivity due to boron dilution, GE replied that the boron injection system has a capacity that is 25% in excess of requirements. The equipment is qualified to withstand high pressures. In addition, the system has a make-up capability.

GE described the sensitivity studies conducted in conjunction with the ATWS analysis (Figure 8). In response to a question from Dr. Saunders, Mr. Pfefferlen replied that the analysis showed a relative insensitivity to a variation in the parameters. Mr. Ray asked how far the analysis took the assumption of the delay in liquid poison injection. Mr. Pfefferlen replied that injection was delayed as long as 300 seconds (180 seconds was the base-case assumption).

In response to questions from Dr. Lee, there was discussion of the capability of the GE computer code used to predict the results of the ATWS analyses. Concern centered in particular on the accuracy of the modeling of the limit cycle phenomenon.

Mr. Pfefferlen described the conservative radiological assessment used in the ATWS analysis (Figure 9).

In conclusion Mr. Pfefferlen stated that RCP trip combined with 2 pump standby liquid control and the high pressure cooling systems now in place will adequately protect against ATWS. It is GE's position that the Alternative 3

modification specified in NUREG-0460, Volume 3 is adequate for protection against ATWS in a BWR. Mr. Pfefferlen also observed that GE believes the proposed Staff "new approach" is a major setback to a meaningful and orderly resolution of the ATWS issue.

BOSTON EDISON PRESENTATION - W. LARSON

Mr. Larson noted that Boston Edison is concerned over the form, structure, and process of the ATWS resolution as being proposed by the NRC Staff. He said that generic issues such as ATWS should be resolved on a timely basis, but must be done in an consistent, logical manner. He also noted that issues such as ATWS should be given proper priority based on risk assessment and engineering judgement. He expressed concern with the uncertainty in plant construction, licensing, and management introduced by the new Staff approach to ATWS. Mr. Larson said that the ATWS issue should be folded into the risk study associated with IREP. Finally, Mr. Larson noted that resolution of ATWS should focus as much on operational safety as on design fixes.

Dr. Kerr asked Mr. Larson how he would decide whether or not ATWS is a problem. Mr. Larson agreed with Dr. Kerr's suggestion that if the plant can tolerate ATWS, it is not a problem. Dr. Kerr also asked Mr. Larson if he had a cut off point for the probability of a core melt, below which the contribution from a potential ATWS does not need to be addressed. Mr. Larson replied that preliminary discussion with company representatives suggested a goal on the order of 1×10^{-5} from all contributions. In response to further questions from Dr. Kerr, Mr. Larson replied that he believes the Staff should assure itself that the proposed ATWS fixes will have a positive safety increment.

Dr. Kerr recessed the transcribed portion of the meeting at 1:40 p.m. to go into open executive session.

OPEN EXECUTIVE SESSION

Dr. Kerr surveyed the Subcommittee members and consultants to determine if they had any requests for information from the NRC Staff. The following requests were noted:

Dr. Lee

- Requested the NRC Staff provide information on whether or not the moderator temperature coefficient (MTC) is being calculated on the same basis for all vendors. He said that it appeared to him that different parameters were being applied for the different vendors.
- Requested that the NRC provide an estimate of the reliability of various components stressed beyond Service Level C, and what inelastic analysis (if any) can be used.

Dr. Lipinski

- Requested the NRC provide a tabulation of the differences between Alternatives 3A and 4A and what would be required for the different reactor types. Dr. Hanauer stated that this would be done.

Mr. Ebersole urged the NRC to take a close look at the CE evaluation of the results of vessel head lift.

Dr. Kerr requested that the consultants provide comments on comparisons of Alternative 3A versus Alternative 4A fixes being proposed by the NRC. The Chairman also asked for comments on the possibility of varying the MTC (90% versus 95% versus 99%) or perhaps an alternative approach to this. Dr. Kerr requested consultant responses within one week.

The meeting was adjourned at 2:10 p.m.

NOTE: Additional meeting details can be obtained from a transcript located in the NRC Public Document Room, at 1717 H Street, N.W., Washington, D.C., or can be obtained from International Verbatim Reporters, Inc., 499 South Capitol Street, S. W., Suite 107, Washington, D.C. 20002.

Material Provided for ACRS ATWS Meeting January 25, 1980

1. Vu-graphs used by NRC (6).
2. Vu-graphs used by GE (15).
3. Handout from AIF .

**NUCLEAR REGULATORY
COMMISSION**

**Advisory Committee on Reactor
Safeguards Subcommittee on
Anticipated Transients Without Scram;
Meeting**

The ACRS Subcommittee on Anticipated Transients Without Scram (ATWS) will hold an open meeting on January 25, 1980, in Room 1046, 1717 H St., NW., Washington, DC 20555. Notice of this meeting was published December 20, 1979.

The agenda for subject meeting shall be as follows:

**Friday, January 25, 1980; 8:30 a.m. Until
Conclusion of Business**

The Subcommittee will discuss proposed resolution of ATWS with representatives of the NRC Staff.

Further information regarding topics to be discussed, whether the meeting has been cancelled or rescheduled, the Chairman's ruling on requests for the opportunity to present oral statements and the time allotted therefor can be obtained by a prepaid telephone call to the cognizant Designated Federal Employee, Mr. Paul A. Boehnert (telephone 202/634-3267) between 8:15 a.m. and 5:00 p.m., EST.

Dated: December 20, 1979.

John C. Hoyle,
Advisory Committee Management Officer.

[FR Doc. 79-30662 Filed 12-27-79; 8:45 am]
BILLING CODE 7590-01-M

**NUCLEAR REGULATORY
COMMISSION**

**Advisory Committee on Reactor
Safeguards, Subcommittee on
Anticipated Transients Without Scram;
Change in Agenda**

The agenda for the January 25, 1980 meeting of the ACRS Subcommittee on Anticipated Transients Without Scram (ATWS) has been amended to include one or more closed sessions, if necessary, for the purpose of exploring matters involving proprietary information.

I have determined, in accordance with Subsection 10(d) of the Federal Advisory Committee Act (Pub. L. 92-463), that, should such sessions be required, it is necessary to close these sessions to protect proprietary information. See 5 U.S.C. 552b(c)(4).

Notice of this meeting was published December 28, 1979 (44 FR 76889) and all other items regarding this meeting remain the same as published at that time.

Dated: January 16, 1980.

John C. Hoyle
Advisory Committee Management Officer.

[FR Doc. 80-1930 Filed 1-21-80; 8:45 am]
BILLING CODE 7590-01-M

ACRS SUBCOMMITTEE ON ATWS
JANUARY 25, 1980
WASHINGTON, D.C.

ATTENDEES LIST

ACRS

W. Kerr, Chairman
D. Ebersole, Member
C. Mark, Member
J. Ray, Member
S. Ditto, Consultant
E. Epler, Consultant
J. Lee, Consultant
W. Lipinski, Consultant
S. Saunders, Consultant
P. Boehnert, Staff*

*Designated Federal Employee

ATOMIC INDUSTRIAL FORUM

F. Stetson

KMC, INC

D. F. Knuth

CINN GAS & ELEC

F. Suetkovich

CAROLINA POWER & LIGHT CO

C. S. Bohanan

LNRD&T

K. C. Fortino

IVRI

A. J. Gasdor

GPU SERVICE

E. Wallace

BABCOCK & WILCOX CO

I. L. Baldwin
C. S. Banwarth

NRC

M. D. Stolzenberg
G. D. McPherson
R. Van Houten
M. El-Zeftawy
M. Srinivasan
C. Z. Serpan
A. Thadani
S. Hanauer
NORTHERN STATES POWER

J. A. Gonyeau

PENNA POWER & LIGHT

J. Zola
E. Bragger

S.C. ELEC & GAS CO

O. Dixon

COMMONWEALTH EDISON CO

L. O. DeGeorge

BURNS & ROW, INC

R. Buldwin

WESTINGHOUSE

R. W. Steither

SCIENCE APPLICATIONS, INC

W. Miller

BALTIMORE GAS & ELEC CO

R. C. L. Olson

NORTHEAST UTILITIES

R. L. McGuinness

COMBUSTION ENGINEERING

D. A. Kreps

STONE & WEBSTER

D. R. Jaquette
C. Grouchmal

PASNY

G. Rawgarao

MIDDLE SOUTH SERVICES, INC

K. R. Iyengar

EPRI

W. E. Lotz

TEPCO

H. Hamada

VEPCO

W. B. Rodill

PG&E

S. E. Traisman

NIAGARA MOHAWK POWER CORP

D. K. Greene

BOSTON EDISON CO

S. Malony
W. Larson

MISSISSIPPI P&L

M. R. Knight

BECHTEL

M. T. David

GENERAL ELECTRIC

A. L. Armitage
W. L. Fiock
J. M. Weiss
L. B. Claassen
H. C. Pfefferlen
G. G. Sherwood
L. S. Gifford

EBASCO SERVICES, INC

M. P. Horrell

WASHINGTON PUBLIC POWER
SUPPLY SYSTEM

G. C. Sorensen

ACRS ATWS SUBCOMMITTEE MEETING
WASHINGTON, D.C.
JANUARY 25, 1980

- TENTATIVE SCHEDULE OF PRESENTATIONS -

- I. Introduction
 - W. Kerr, Chairman
- II. NRC Presentation
 - A. Overview and Status of ATWS Review Effort Since TMI-2 Accident
 - B. Status of NRC Review of Vendor Analyses Received to Date
 - C. Staff Concerns with Analyses
 - 1. Generic
 - 2. Plant-Specific
 - 3. TMI-2 Related Concerns for PWRs
 - D. Status of ATWS Recirculation Pump Trip Installation in BWRs
 - E. NRC Requests for Further Analyses
 - F. NRC Staff Comments on Proposed ATWS Rule
- III. Industry/Vendor Presentations
 - AIF - J. Sorensen (10 min)
 - General Electric - H. Pfefferlen, J. Weiss (30 min)
 - Boston Edison - W. Larson (20 min)
- IV. Discussion
- V. Adjourn

ATTACHMENT C

REPORTS SUBMITTALS SINCE 2/15/69 LETTER

GE	ALT. 3	BWR 4/5/6	MAY 79
	ALT. 2	BWR 3	JUNE 79
	ALT. 3	BWR 4/5/6	JAN. 80
	ALT. 3	BWR 3	JAN. 80
CE	ALT. 3	2710/3400/3800	NOV. 79
B&W	VERY LITTLE INFO.		
	ALT. 3 (LETTER REPORT) 177/205		JULY 79
	FEW SUMMARY SHEETS		JAN. 23 '80
V	ALT. 3 + SOME ALT. 4		JUNE 79
	RADIOLOGICAL		NOV. 79
	IMPROVED JUNE REPORT		DEC. 79

FIGURE 1

SUMMARY OF PWR RESULTS

ALTERNATE 3

WESTINGHOUSE DESIGNS

TRANSIENT	PEAK REF.	CALCULATED PRESSURE		
		1 F.O PORV	60 SEC. AFW DELAY	1100 PSI SG DESIGN
LOSS OF LOAD	2974	+166	+134	+151

COMBUSTION ENGINEERING DESIGNS

	2710 MWT	3400 MWT	3800 MWT
LOFW	4220	4290	3800

BABCOCK & WILCOX DESIGNS

	177 FA	145 FA	205 FA
LOFW	3464	N/A	3762

FIGURE 2

PRELIMINARY

MAJOR CONCERNS WITH PWR ALT. 3 INFORMATION

1. VERY LITTLE INFORMATION FROM B&W
2. INCOMPLETE ANALYSES - IMPROPER ANALYSIS OF SORV CASE
3. VOIDS IN PRIMARY - LONG-TERM SHUTDOWN
4. RELIANCE ON VESSEL HEAD LIFT (C-E)
5. NO INFORMATION ON PORV'S ISOLATED
6. LOSS OF INST. CAPABILITY (C-E)
7. NO INFORMATION ON INST. AND CONTROL SYSTEM QUALIFICATION
8. FUNCTIONABILITY OF S/V, R/V, PIPING
9. MANY COMP. OVER 'C' (C-E)
10. NO INFORMATION ON RCPB (BOP) COMPONENTS
11. INSUFFICIENT INFORMATION ON VALVES OPERABILITY

FIGURE 3

SUMMARY OF BWR RESULTS

ALTERNATE 3

TRANSIENTS	BWR 3		BWR 4		BWR 5		BWR 6	
	VES.PR.	BULK	VES.PR.	BULK	VES.PR.	BULK	VES.PR.	BULK
MSIV CLOSURE	1370	179	1230	185	1247	179	1299	167
LOCV	1253	178	1195	188	1193	176	1235	163
PRES. REG. FAILURE	1346	179	1280	189	1238	175	1296	167
TTWOBP	1346	179	1267	191	1230	178	1285	168
IORV		189		183 (13)		187		170

COMMENT: EXCELLENT ANALYSIS INFORMATION ON BWR'S 4/5/6

PRELIMINARY

MAJOR CONCERNS WITH BWR INFORMATION

1. LIMIT CYCLE
2. EQUIPMENT QUALIFICATION
3. NO INFORMATION ON RCPB COMP. (BWR 3) - BOP (BWR 4/5/6)
4. INSUFFICIENT INFORMATION - POOL ΔT , S/RV LOADS

FIGURE 4

RPT STATUS

PLANTS W/O RPT

<u>PLANT</u>	<u>PLANNED IMPLEMENTATION</u>
DRESDEN 2	1/81
QUAD CITIES 2	12/80
NINE MILE POINT	12/80
BIG ROCK PT.	10/80
QUAD CITIES 1	9/80
VERMONT YANKEE	9/80
MILLSTONE 1	8/80
DRESDEN 3	3/80

FIGURE 5

MITIGATION SYSTEM

CONCEPTUAL APPROACH:

- o HIGH PRESSURE/LOW LEVEL INITIATES ATWS LOGIC
- o RECIRCULATION PUMPS TRIP
- o ALTERNATE ROD INSERTION
- o FAILURE TO SCRAM TEST
 - LIMIT FEED WATER (HIGH PRESSURE)
 - START STANDBY LIQUID CONTROL PUMPS
- o RCIC AND HPCI/S START ON LOW WATER LEVEL.

HCP:vk/809
1/21/80

FIGURE 6

ALTERNATE 3 RESULTS

	<u>MAX VESSEL BOTTOM PRESSURE (PSIG)</u>	<u>PEAK SUPPRESSION POOL BULK TEMPERATURE (°F)</u>	<u>MAX CONTAINMENT PRESSURE (PSIG)</u>
BWR/3	1370	189	11.0
BWR/4	1296	189	11.0
BWR/5	1247	187	10.6
BWR/6	1299	170	7.3

JMW:mm/1502
1/21/80

FIGURE 7

SENSITIVITY STUDIES

TYPICAL SENSITIVITY STUDIES PERFORMED:

- o VOID COEFFICIENT
 - o DOPPLER COEFFICIENT
 - o BORON DELAY (INJECTION TIME)
 - o BORON FLOW RATE
 - o BORON MIXING EFFICIENCY
 - o HPCI/S AND RCIC CAPACITY
 - o RHR CAPACITY
 - o RHR DELAY
 - o POOL/SERVICE WATER TEMPERATURE
 - o POOL SIZE
 - o S/RV CAPACITY
 - o RECIRCULATION PUMP TRIP DELAY
 - o RECIRCULATION PUMP INERTIA
 - o TWO PARAMETER SENSITIVITIES
-
- o VOID AND DOPPLER COEFFICIENT
 - o RHR CAPACITY AND POOL/SERVICE WATER TEMPERATURES

HCP:vk/mm/817
1/21/80

FIGURE 8

CONSERVATIVE RADIOLOGICAL ASSESSMENT

- o 100% CLAD PERFORATIONS ASSUMED - NONE EXPECTED
- o METEOROLOGY BOUNDS ALL BWR SITES
- o MAXIMUM RELEASE TRANSIENT UTILIZED

	<u>SITE BOUNDARY RESULTS</u>	<u>LPZ RESULTS</u>	<u>10CFR100 LIMIT</u>
WHOLE BODY	0.7 REM	0.1 REM	25 REM
INHALATION	0.8 REM	0.4 REM	300 REM

CONCLUSION

CONSEQUENCES ARE WELL BELOW 10CFR100 LIMITS
EVEN USING VERY CONSERVATIVE ASSUMPTIONS

HCP:vk/mm/835
1/21/80

FIGURE 9