ACRS-1726

CERTIFIED
5/16/80

DATE ISSUED: 5/12/80

MEETING MINUTES OF THE
ACRS ATWS SUBCOMMITTEE MEETING
MARCH 26, 1980
WASHINGTON, DC

On March 26, 1980, the ACRS ATWS Subcommittee met in Washington, D.C. to continue discussion of the resolution of ATWS with representatives of the NRC Staff and Industry. The notice of the meeting appeared in the Federal Register on March 11, 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 presentations for 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 (8:30 am - 4:00 pm) INTRODUCTION

Dr. Kerr, Subcommittee Chairman, called the meeting to order at 8:30 a.m. The Chairman explained the purpose of the meeting and the procedures for conducting the meeting, pointing out that Mr. Paul Boehnert was the Designated Federal Employee in attendance. Dr. Kerr called upon Dr. Roger Mattson of the NRC Staff to begin the day's presentations.

NRC STAFF PRESENTATION ON ATWS - R. MATTSON, A. THADANI

Dr. Mattson said he believes that considerable progress has been made on ATWS since last year. Since H. Denton has decided to bring this issue to a resolution, the new approach specified in Volume 4 of 0460 was promulgated. Dr. Mattson said these new requirements are the product of the early verification approach with slight modifications from the activity resulting from the TMI-2 accident.

Dr. Kerr said he felt there were at least two ways of describing the ATWS problem and dealing with it. These are: (1) An ATWS can occur and one needs to protect against it; or (2) the probability of an ATWS can not be

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demonstrated to be acceptably low enough, therefore one needs to assure that steps are taken to assure the probability is acceptably low. Dr. Kerr said he could not determine which of these two view points is being expressed in the Staff's report.

Mr. A. Thadani began discussion of the new ATWS requirements. He noted that with the issuance of Volume 3 of NUREG-0460, NRC attempted an early verification approach to resolution of ATWS for the Alternate fixes for various classes of plants. NRC's review of the Industry submittals resulted in a number of unresolved items for both PWRs and BWRs (Figure D-1).

During discussion of the unresolved items, the Subcommittee raised a number of questions. Dr. Kerr asked if NRC intends to make ATWS a DBA. Mr. Thadani replied they do not, and have recommended that code calculations, for example, be done using best estimate assumptions. Dr. Mark asked what was the effect of the B&W setpoint swap (increased PORV setpoint - decreased high pressure scram setpoint) on peak ATWS pressure. Mr. Thadani replied that there is little effect because the pressure rise is so rapid. Referring to the limit cycle oscillations predicted to occur in GE reactors, Dr. Mark asked if NRC believes it is a real phenomenon. Mr. Thadani replied that conversations with GE indicate that the oscillations are probably real. Mr. Lipinski noted that his work with prototype BWRs showed that there is a limit to the amount of reactivity that can be inserted in a BWR core before chugging commences. Dr. Lipinski also asked how NRC can be assured that compliance with IEEE-279 will assure sufficient system reliability. Mr. Thadani replied that the Staff bases this belief on experience, and information obtained from the WASH-1400 study. Dr. Mattson suggested that NRC should specify that plants should have reliable equipment, state some of the criteria that go into developing reliable equipment, and stay away from a hard and fast numerical reliability.

NRC discussed the differences between the Alternatives in Volume 3 (Alternatives 2, 3, and 4), and Volume 4 (Alternatives 2A, 3A, and 4A) of 0460. The Staff is requiring that eleven early operating reactors implement Alternative 2A

and that all other plants implement Alternative 3A, with a phased-in approach to Alternative 4A. In response to a question from Dr. Kerr, Dr. Mattson said that NRC believes Alternative 3A is clearly needed for safety, and that the need for Alternative 4A is subjective and should be submitted to a Rule-making to determine what should be required. The NRC also noted that an optimization study is allowed for plants that would not find it practicable to implement Alternative 4A modifications. This study would investigate other means to provide the level of safety NRC desires, given the 4A fixes.

There are two changes in the Alternative 2 requirements (Figure D-2). The biggest change is the requirement that Westinghouse upgrade the electrical portion of the scram system. In response to Subcommittee questions on this point, NRC said this has been required because the TMI accident has shown that accident results can be more severe than analyses indicate. The second change is a requirement for analysis to determine if plant mitigation capability exists or is necessary.

Alternative 3A (Figure D-3) also contains two new requirements. These are: (1) provisions to assure containment isolation will occur early in the transient to limit radiological releases, and (2) provide instruments necessary for shutdown that can withstand ATWS peak pressure (for PWRs only).

The differences between Alternative 4 and Alternative 4A (Figure D-4) include the requirement for scram system upgrade (BUSS, SPS, MSS-W), along with the containment isolation and instrumentation provisions noted above. In addition, NRC has given B&W, CE, and GE a so called "optimization" provision as noted above.

Describing the perceived values of the new Alternatives, Mr. Thadani said that Alternative 4A provides high reliability in the sense that single failures are considered, plus systems to mitigate an ATWS are also included. In the case of the BWRs, the high capacity boron injection system eliminates the

reliance on the HPCI system, which if not available could result in core melt.

Dr. Kerr raised a question on the NRC position that no credit for operator action is taken in the first 10 minutes of the transient. He noted that an operator can take both good or bad actions; if the NRC assumes actions taken before 10 minutes are bad, he believes that a realistic analysis should take into account operator action that would ameliorate the situation.

Mr. Thadani reviewed the program plans and schedule for implementation of the ATWS alternatives. The NRC schedule for implementation of the requirements are as follows:

- Implement Alternative 2A by July 1981.
- Implement Alternative 3A (electrical), July 1981 - Implement piping changes, July 1982.
- Implement Alternative 4A (following rulemkaing) - by July 1984.

Folloiwng planned receipt of an ACRS letter in April, the NRC intends to present a Commission paper on ATWS in May 1980. The Staff expects Alternative 2A and 3A Orders to be issued by July 1981, and an effective rule for Alternative 4A should be issued in early 1981.

Mr. Thadani responded to the following questions submitted by Dr. Kerr.

- Provide an estimate of the probability of control rod insertion as a function of time after the beginning of "anticipated transient". What are the effects on the hypothesized scenarios if the rods go in 2, 10, or 20 minutes after the initiation of the transient.

  Mr Thadani replied that he could not provide an estimate of the control rod insertion probability as a function of time. However

concerning the consequences of delayed rod insertion, Mr. Thadani provided a char' (Figure D-5) which shows for the four vendor's plants the times, and expected power levels at the times that peak pressure values are exceeded. Also shown were expected primary system pressures if scram occurred 2 or 3 minues after initiation of the transient for PWRs. For the BWRs, Mr. Thadani said that completing scram in 2 to 4 minutes following initiation of the transient would probably allow plant recovery. Beyond this time, plant recovery becomes increasingly uncertain.

°Are the recommendations for ATWS mitigation hardware being made in the context of probable features likely to be required for Class 9 accidents?

Mr. Thadani said the NRC did not have Class 9 accidents in mind when he made ATWS recommendations, particularly since the Staff has not arrived at a definitive position concerning such items as core-catchers or filtered/vented containments. He did point out however that many of the Lessons Learned and Bulletins and Orders recommendations were helpful from the standpoint of ATWS mitigation considerations.

ATOMIC INDUSTRIAL FORUM (AIF) PRESENTATION - J. SORENSEN

Mr. J. Sorensen representing the Atomic Industrial Forum made the following points in his presentation.

°NRC has continually increased the criteria required for resolution of ATWS to the frustration of Industry attempts to resolve the issue (Figure D 6-7).

°AIF believes significant design changes are being required without evaluation of the impact on overall plant system

safety. Implementation of Alternative 4A hardware will necessitate lengthy plant shutdown well beyond normal refueling outages.

- AIF objected to the procedure the NRC is using to resolve this issue. Mr. Sorensen noted that AIF has recommended that the NRC establish an overall plan to define and establish priorities for all outstanding safety issues that are presently before the Industry and the Staff.

- In conclusion, Mr. Sorensen noted that the NRC should place ATWS in proper prospective based on its contribution to overall risk. The AIF believes that one of the Lessons Learned from TMI-2 was that the NRC and Industry concenstrated too much on low probability events.

Dr. Kerr questioned Mr. Sorensen on specific aspects of his presentation. He asked Mr. Sorensen what AIF considered a realistic probability for ATWS. Mr. Sorensen replied that numbers stated in the EPRI ATWS reports (about 10^{-6} per year) are in the appropriate range. Dr. Kerr asked what uncertainty AIF would attach to this number. Mr. Sorensen replied that he did not have that figure available but would supply it later. In response to another question from Dr. Kerr, Mr. Sorensen said that he would become concerned about an ATWS if the probability was around 10^{-3} per year. Dr. Kerr also noted that NRC had reevaluated the ATWS contribution to core melt based on the WASH-1400 analysis and found ATWS is a significant contributor to core melt. Further, the Probabilistic Analysis Staff agrees with this conclusion. Dr. Kerr urged the AIF to obtain this information for their perusal. Mr. Ray asked if AIF has an alternative to the NRC requirements to resolve ATWS. Mr. Sorensen replied that they did not. Dr. Kerr asked Mr. Sorensen if AIF could accommodate the Alternative 3A fix. Mr. Sorensen replied in the affirmative.

B&W OWNER'S GROUP PRESENTATION - T. ENOS

Mr. T. Enos gave a presentation on behalf of the B&W Owner's Group. He expressed serious reservations with the Volume 4 requirements, and stated

that B&W believes the probability of ATWS is acceptably small. If an ATWS did occur, B&W plants would achieve a safe shutdown. Mr. Enos said he was dismayed over the rejection of the early verification approach by the NRC in January of this year. He also said that B&W would install the backup scram system (BUSS) in order to resolve ATWS. In response to a question from Dr. Mark, Mr. Enos said that the major components of the BUSS and ATWS mitigating circuitry have been installed in operating plants as a result of the NRC Lessons Learned requirements.

WESTINGHOUSE PRESENTATION - W. GANGLOFF

Mr. Gangloff provided a brief presentation on behalf of Westinghouse. He said that Westinghouse is disappointed with the new ATWS requirements and stated that ATWS will not lead to core melt. He said that W plants will be able to mitigate an ATWS without presenting significant risk to the public health and safety. He also said that NRC should justify the bases for each technical fix required and that a rulemaking hearing should be convened before Volume 4 requirements are implemented.

GENERAL ELECTRIC ATWS PRESENTATION - R. BUCHHOLZ, H. PFEFFERLEN

Mr. Buchholz provided opening remarks for the GE presentation. He noted that GE believed the NRC Position on ATWS as expressed in Volume 3 of 0460 would be the final position, and GE performed their assessments accordingly. Volume 4 of 0460 provides requirements that exceed those in Volume 3, and GE believes the new Staff requirements are arbitrary and open-ended. GE believes the new ATWS requirements are very costly and will provide little safety improvement. In response to a question from Mr. Ray, Mr. Buchholz said that the Kemeny and Rogovin reports do not emphasis the need for a lot of additional equipment in response to the TMI-2 accident implications, rather the emphasis was on obtaining better understanding of plant behavior and providing the operator better information concerning plant behavior.

Mr. Pfefferlen discussed the ATWS mitigation capability of BWRs plants. He noted that GE believes Alternative 2 fixes (ARI and RPT) will provide a factor of one-hundred improvement in scram system reliability. Should an ATWS occur, the Alternative 3 fixes will provide a high degree of confidence that the BWR will mitigate the event (Figure D-8).

Mr. Pfefferlen reviewed the Staff concerns with the BWR early verification submittal (Figure D-9). Mr. Pfefferlen said that it is GE's belief that these concerns can be resolved with further interactions between NRC and GE.

There was detailed discussion of the limit cycle oscillation phenomenon. This phenomenon has been calculated by GE to occur for some ATWS events with turbine trip. GE believes these limit cycle oscillations can be eliminated with such measures as closing the MSIV, increasing the boron injection rate (e.g. increased enrichment of boron-10) plus reducing the injection delay time, or using other poisons. In response to a question from Mr. Ray, Mr. Pfefferlen said that the standby liquid control system would contain an inhibit that would prevent poison injection if the rods are inserted in the core.

Mr. Kay Holling provided a discussion of specific NRC concerns related to the limit cycle phenomenon and GE's proposal for resolving these concerns (Figures D 10-11).

Mr. Pfefferlen showed a graph of the GE estimates of the cost of going from the Alternative 3A to the Alternative 4A fix. He indicated that the Alternative 4A fix is not cost effective for the relatively small increase in safety obtained.

In summary, Mr. Pfefferlen said that GE believes installation of RPT and scram system improvements (ARI) are all that is necessary for resolution of ATWS in the near term. For long-term ATWS resolution, Alternative 3 with the 86 gpm SLCS system is sufficient.

During a question and answer session, concern was expressed regarding the reliability numbers shown on Figure D-12. The NRC asked if these numbers were arrived at by using the square-root bounding method that was severely critized in the Lewis Study critique of WASH-1400. The response by GE indicated that these numbers were arrived at by using this method.

The meeting was recessed at 4:00 p.m. to go into open executive session.

OPEN EXECUTIVE SESSION

Dr. Kerr surveyed the Subcommittee members and consultants on their opinions concerning the NRC Staff recommendations for ATWS resolution specified in Volume 4 of 0460. The following comments were noted.

- Mr. Ray felt that Alternative 3A was all that needs to be required.

- Mr. Ditto does not believe the Westinghouse scram system modification will solve the problem. He is not sure that the scram system breakers are the dominant failure mode for that particular system. He disagreed with the GE contention that addition of ARI would result in a factor of 100 improvement in scram system reliability. He feels that Alternative 3A would be sufficient except for additional relieving capacity for the PWRs that need it. (Note: Mr. Ditto provided written comments in order to clarify his remarks - see Attachment D-13).

- Mr. Epler said that the most likely failure mode for a scram system would be due to human error, and that RPT is absolutely essential, he feels that Alternative 3A is a sufficient fix for the BWRs. For the PWRs, he recommends that additional relieving capacity be installed where needed. He also supports the modification suggested for the Westinghouse scram system.

- Dr. Lipinski supports the installation of additional relieving capacity for PWRs in need of it. For the BWRs, Alternative 3A

appears sufficient. The criteria for determining whether or not a high-capacity auto-SLCS system should be installed in BWRs depends on the economic tradeoff of the cost for cleanup given an inadvertant activation versus the core damage experienced during an ATWS.

- Dr. Saunders believes the NRC published Volume 4 to "get the Industry's attention". He would stop at the 3A Alternative based on the incremental increase in costs for going from the 3A to 4A Alternatives.

The meeting was adjourned at 4:20 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.

Advisory Committee on Reactor Safeguards, Subcommittee on Anticipated Transients Without Scram; Notice of Meeting

The ACRS Subcommittee on Anticipated Transients Without Scram (ATWS) will hold a meeting on March 28, 1980, in Room 1046, 1717 H St., N.W., Washington, DC 20555 to continue its discussion with representatives of the NRC Staff on the proposed resolution of ATWS. Notice of this meeting was published February 22, 1980.

In accordance with the procedures outlined in the Federal Register on October 1, 1979, (44 FR 58408), oral or written statements may be presented by members of the public, recordings will be permitted only during those portions of the meeting when a transcript is being kept, and questions may be asked only by members of the Subcommittee, its consultants, and Staff. Persons desiring to make oral statements should notify the Designated Federal Employee as far in advance as practicable so that appropriate arrangements can be made to allow the necessary time during the meeting for such statements.

The agenda for subject meeting shall be as follows:

Wednesday, March 26, 1980; 8:30 a.m. Until the Conclusion of Business

The Subcommittee may meet in Executive Session, with any of its consultants who may be present, to explore and exchange their preliminary opinions regarding matters which should be considered during the meeting.

At the conclusion of the Executive Session the Subcommittee will hear presentations by and hold discussions with representatives of the NRC Staff, their consultants, and other interested persons.

In addition, it may be necessary for the Subcommittee to hold one or more closed sessions for the purpose of exploring matters involving proprietary information. I have determined, in accordance with Subsection 10(d) of the Federal Advisory Committee Act (Public Law 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).

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: March 5, 1980.

John C. Hoyle,

Advisory Committee Management Officer.

[FR Doc. 80-7273 Filed 3-10-80; 8:45 am]

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POOR ORIGINAL

ATTACHMENT A

ACRS ATWS SUBCOMMITTEE MEETING
MARCH 26, 1980
WASHINGTON, DC

- Attendees List -

ACRS

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

*Designated Federal Employee

COMBUSTION ENG. INC.

C. R. Musick
D. Kreps

WPPSS

G. C. Sorensen

ARK. PWR. & LIGHT CO

J. T. Enos

STONE & WEBSTER

R. A. Haladyna
D. R. Jaquette

PSE&G

C. W. Veprek

CIN. GAS & ELEC.

F. J. Suetkovich

PASNY

G. Rangarao

TEXAS UTILITIES

B. Dacko

EG&G IDAHO INC.

V. Berta

AMERICAN ELECTRIC POWER

V. Manno

MPIL

M. R. Knight

FLA POWER & LIGHT

G. E. Liebler

NUTECH

T. Martin

BALT. G&E

R. Olson

LHSMO

T. Lenberg

IVRI

N. Di Paolo
S. Corsanicu
E. Arnow

GNS

J. Rollins

PHIL ELEC. CO.

G. A. Hunger, Jr.

SOUTHERN CO. SERVICES

A. Farrak
D. Crowe

BECHTEL POWER CORP.

M. David

GENERAL ELECTRIC CO.

W. L. Fiock
A. L. Armitage
E. C. Eckert
L. K. Holland
R. H. Buchholz
H. C. Pfefferlen

CLEVELAND ELECTRIC ILLUMINATING

H. A. Putre

TENN. VALLEY AUTHORITY

C. S. Walker

ATOMIC INDUSTRIAL FORUM

F. T. Stetson

B&W

R. Borsum
C. S. Banwarth

AEPSC

V. P. Manno

TUSI

B. S. Dacko

DUKE POWER CO.

T. P. Harrall

KMC, INC.

R. E. Schaffatall

TEPCO

H. Hamader

CP&L

C. S. Bohanan

NRC

H. Vander-Molen
K. Parczewski
M. Tokar
F. Cherny
C. Moon
K. Kniel
A. Thadani
R. Mattson
F. Akstulewicz
F. Odar
M. Srinivasan
D. Nash
C. L. Pittiglio
P. M. Wood

WISCONSIN PUBLIC SERVICE CORP.

C. Schrock

WESTINGHOUSE

S. T. Maher
W. C. Gangloff
B. Steitler
G. Augustine
W. D. Tauche
C. W. Rowland

SNUPPS

F. Schwoerer

DETROIT EDISON

E. Page

NIAGARA MOHAWK

D. Pike

EBASCO SERVICES, INC

W. Malec
M. Horrell

PECO

R. H. Logue

ATTACHMENT B

ACRS ATWS SUBCOMMITTEE MEETING
MARCH 26, 1980
WASHINGTON, DC

- TENTATIVE SCHEDULE OF PRESENTATIONS -

I. CONVENE - INTRODUCTION (8:30 am)

W. KERR, CHAIRMAN

II. NRC PRESENTATION OF NUREG-0460 VOLUME 4 ATWS REQUIREMENTS

S. HANAUER

Topics to be discussed will include:

- New NRC ATWS Requirements
- Bases for the Requirement
- Implementation of Requirements
- Response to W. Kerr's Questions on NUREG-0460 Volume 4

- LUNCH -

III. INDUSTRY/VENDOR PRESENTATIONS

A. Atomic Industrial Forum (20 min)

B. B&W ATWS Owner's Group (10 min)

T. Enos

C. Westinghouse (10 min)

R. Steitler

D. General Electric Company (60 min)

G. Sherwood
H. Pfefferlen - J. Weiss

IV. DISCUSSION AND CAUCUS

V. ADJOURN

ATTACHMENT C

II. INDUSTRY SUBMITTALS

UNRESOLVED CONSIDERATIONS

PWR

CODE VERIFICATION
EQUIPMENT CAPABILITY
VESSEL HEAD LIFT (CE)
ANALYSES (ESPECIALLY B&W)
INSULATED PORVs

BWR

OSCILLATIONS - COOLABLE GEOMETRY, CONTROLS
SUPPRESSION POOL INTEGRITY,
SYSTEM RELIABILITY
CONTAINMENT LOADS
EQUIPMENT CAPABILITY

IV. COMPARISON OF ALT. 2 AND 2A

	ALT. 2	ALT. 2A
B&W	BUSS AMSAC	BUSS AMSAC ANALYSIS
CE	SPS AMSAC	SPS AMSAC ANALYSIS
W	AMSAC	AMSAC MSS ANALYSIS
GE	ARI SD RPT LOGIC	ARI RSD RPT LOGIC ANALYSIS

V. COMPARISON OF ALT. 3 AND 3A

	ALT. 3	ALT. 3A
B&W	BUSS AMSAC ANALYSIS	BUSS AMSAC CONT. ISOL. INSTRUMENTATION
CE	SPS AMSAC ANALYSIS	SPS AMSAC CONT. ISOL. INSTRUMENTATION
W	AMSAC	AMSAC MSS CONT. ISOL. INSTRUMENTATION
GE	ARI SD RPT LOGIC 86 GPM AUTO SLCS ANALYSIS	ARI SD RPT LOGIC 86GPM AUTO SLCS CONT. ISOL.

VI. COMPARISON OF ALT. 4 AND 4A

	ALT. 4	ALT. 4A
B&W, CE	AMSAC SAFETY VALVES ANALYSIS	BUSS, SPS AMSAC SAFETY VALVES ANALYSIS OPT. CONT. ISOL. INST.
W	AMSAC ANALYSIS	AMSAC MSS ANALYSIS CONT. ISOL. INST.
GE	RPT AUTO, HIGH CAPACITY POISON INJECTION ANALYSIS	ARI SD RPT LOGIC AUTO., HI-CAP. POISON CONT. ISOL. ANALYSIS OPT.

KERR QUESTIONS

I. PROB. (CONTROL ROD INSERTION) ~F (TIME)

DON'T KNOW

II. CONSEQUENCES ~F (DELAYED ROD INSERTION)

DESIGN	TIME MIN.	POWER PERCENT	CONCERN PARAMETER
W	< 2	~ 50	PEAK PRESSURE
	~ 3	< 10	2500 PSI
CE	< 2	~ 50	PEAK PRESSURE
	~ 4	~ 5	2500 PSI
B&W	~ 1	~ 30	PEAK PRESSURE
	~ 1.5	~ 10	2500 PSI
BWRS	~ 0.1	< 100	PEAK PRESSURE
(86 GPM SLCS)	~ 1	~ 25	INVENTORY, CONTAINMENT
	~ 3	~ 20	LOWEST LEVEL
	~10	~ 10	
	~20	~ 5	PEAK CONT. P T

EVOLUTION OF ATWS REQUIREMENTS

PART 1

REG 0460 ISSUE	ATWS-I PRE WASH - 1270 PHASE	ATWS-II WASH-1270 PHASE	ATWS-III STATUS REPORT PHASE
ME PERIOD	1968-9/73	9/73-12/75	12/75-4/78
VOLVEMENT	VENDORS	VENDORS UTILITIES EPRI	VENDORS MIN. UTILITY EPRI
WS SOLUTION	STUDY ONLY	MITIGATE ONLY	DETERMINISTIC MITIGATION
PE OF EVENT	SPECIAL STUDY	SPECIAL STUDY	SPECIAL STUDY
OBABILITY GOAL	NONE	NONE	10-7/YEAR
DELS	BEST ESTIMATE	CONSERVATIVE ESTIMATE	CONSERVATIVE
TICIPATED TRANSIENTS	NONE	0.1-1.0	1.0
RAMETERS	NONE	NOMINAL	99% MTC
EE 279	NO	N.	NO
FETY GRADE	NO	N.	NO
RESS LIMIT	NONE-FAULTED	EMERGENCY	EMERGENCY
SE MODEL	NONE		NOMINAL PARAMETERS

PART 2

NUREG 0460 ISSUE	ATWS-IV NUREG - 0460 VOL. 1 &2	ATWS-V NUREG - 0460 VOL. 3	ATWS-VI NUREG - 0460 VOL. 4
TIME PERIOD	4/78-PRESENT	12/78-3/80	3/80-PRESENT
INVOLVEMENT		VENDORS A/E'S UTILITIES	VENDORS, A/E'S, UTILITIES, EPRI
ATWS SOLUTION	MITIGATION & RELIABILITY	PREVENTION AND/OR MITIGATION	PREVENTION AND MITIGATION FOR ALL
TYPE OF EVENT	DBA	GENERIC ANALYSES	GENERIC AND PLANT-SPECIFIC ANALYSES
PROBABILITY GOAL	10-6/YEAR	NONE	NONE
MODELS	LIKE LOCA	CONSERVATIVE	CONSERVATIVE
ANTICIPATED TRANSIENTS	6	6	6
PARAMETERS	99% MTC	95% MTC AND 99% MTC	95% AND 99% MTC
IEEE 279	YES	YES AND NO	YES
SAFETY GRADE	YES	YES AND NO	YES
STRESS LIMIT	EMERGENCY	SERVICE LEVEL C AND FUNCTIONABILITY	SERVICE LEVEL C
DOSE MODEL	MODIFIED ACCIDENT PARAMETERS	NONE	NONE

ALTERNATE 3 MITIGATION

RESULTS

	MAX VESSEL BOTTOM PRESSURE (PSIG)		PEAK SUPPRESSION POOL BULK TEMPERATURE (°F)		MAX CONTAINMENT PRESSURE (PSIG)	
WR/3	1370	(1500)	189	(210)	11.0	(56)
WR/4	1296		189		11.0	
WR/5	1247		187		10.6	-(45)
WR/6	1299		170		7.3	-(15)

ATWS RADIOLOGICAL CONSEQUENCES ARE LESS SEVERE THAN THOSE CURRENTLY EVALUATED IN LICENSING SUBMITTALS

NO PRESSURE, TEMPERATURE OR RADIOLOGICAL LIMITS EXCEEDED

CP:MM/1592
/21/80

STAFF CONCERNS WITH BWR SUBMITTAL

- o LIMIT CYCLE OSCILLATIONS
  (DISCUSSED LATER)

- o EQUIPMENT QUALIFICATION NOT ADEQUATELY ADDRESSED
  (RESPONSE - ATWS ENVIRONMENT NOT SEVERE/BOUNDED BY LOCA)

- o INSUFFICIENT INFORMATION ON RCPB COMPONENT INTEGRITY/ OPERABILITY
  (RESPONSE - ATWS PRESSURE IS LOW/NO PROBLEMS IDENTIFIED)

- o ATWS CONTAINMENT LOADS NOT SHOWN TO BE BOUNDED BY DESIGN BASIS LOADS
  (RESPONSE - POSITION SUPPORTED BY TESTS/ METHODOLOGY ALREADY SUBMITTED)

- o QUESTIONS ON RADIOLOGICAL EVALUATION IF CONTAINMENT NOT ISOLATED EARLY
  (RESPOND - (CURRENT INSTRUMENTATION SATISFIES REQUIREMENTS)

- o INSUFFICIENT DESIGN INFORMATION ON ATWS SYSTEMS
  (RESPONSE - CONCEPTUAL INFORMATION PROVIDED/ DETAILS MUST CONSIDER OVERALL SAFETY)

CONCERNS DO NOT JUSTIFY NUREG 0460 VOLUME 4

VOLUME 4 BWR CONCERNS

CONTENTION	RESPONSE
SEVERE POWER OSCILLATIONS	LARGE NEUTRON FLUX SMALL HEAT FLUX ~20% PTOP BWR-TURBINE TRIP ONLY
SEVERE FLOW OSCILLATIONS	VERY MINOR FLOW OSCILLATIONS < 10% PTOP
OSCILLATIONS HAVE BEEN OBSERVED IN OPERATING BWR	NOT IN A GE BWR EXCEPT UNDER PREDEFINED AND EXPECTED TEST CONDITIONS. THEN ONLY LOCALLY IN CORE
CONCERN WITH PREDICTIVE CAPABILITY OF CODES	REDY - GOOD HISTORY OF CONSERVATIVE PREDICTIONS COMPARED TO PERFORMANCE REDY - NEAR EQUIVALENT TO ODYN NO EXPECTATION OF GROSS DEVIATION FROM ACTUAL PERFORMANCE
IMPACT ON CONTROL SYSTEMS	CONTROL SYSTEMS ARE VERY ACCURATELY SIMULATED. ONLY PRESSURE CONTROLLER IS ACTIVE. FW OFF (LEVEL CONTROL). FLOW CONTROL OFF (RPT).

VOLUME 4 BWR CONCERNS (CONTINUED)

CONTENTION	RESPONSE
FUEL INTEGRITY UNDER OSCILLATION	EXPECTED: FEW RODS MAY ENTER BOILING TRANSITION. NO FAILURES LIKELY. CONSERVATIVE: ASSUME NO REWET. AVERAGE TEMP~1150°F WITH OSCILLATIONS 130°F PTOP. ~10% RODS IN TRANS. BOILING FEW FATIGUE FAILURES MIGHT OCCUR - NO FLOW BLOCKAGE
SAFE SHUTDOWN EQUIPMENT ATWS TRANSIENT OSCILLATION	TRANSIENT IS WITHIN SERVICE LEVEL C. EXPECTED RESULT NOT SIGNIFICANTLY DIFFERENT FROM CONVENTIONAL ANTICIPATED TRANSIENTS (SERV. LEVEL B) OSCILLATION - EVEN AT UNEXPECTED MAXIMUM, AMPLITUDES WILL IMPOSE ALMOST UNDISCERNABLE PERTURBATIONS ON SHUTDOWN EQUIPMENT (PRESSURE-FLOW-TEMP)
10-20% PCI FAILURE .	LHGR OSCILLATIONS ARE 1 KW/FT 4 KW/FT AVERAGE. DAMAGE THRESHOLD 9 KW/FT

MODIFICATION COST IMPACT

	NRC	GE	COSTS * IN MILLIONS DIRECT & INDIRECT
PRESENT	2×10^{-4}/RY	ASSUME NRC VALUE	
ALT 2	9×10^{-5}/RY	2×10^{-6}/RY	$1-2
ALT 3/3A	1×10^{-5}/RY	$< 10^{-6}$/RY	$12-15
ALT 4/4A	1×10^{-6}/RY	$< 10^{-6}$/RY	$50-60**

- o ALTERNATES 4/4A ARE NOT COST EFFECTIVE

* DOES NOT INCLUDE DOWN TIME.

** COSTS COULD GO TO $100 MILLION DEPENDING ON SITE LIMITATIONS

OAK RIDGE NATIONAL LABORATORY
OPERATED BY
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NUCLEAR DIVISION

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U.S. NUCLEAR REG. COMM.
ADVISORY COMMITTEE ON
REACTOR SAFEGUARDS

March 27, 1980

Mr. Paul Boehnert
Advisory Committee on Reactor Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Paul:

Because of the short time available to discuss our positions after the meeting of March 26 and the perhaps garbled way in which I presented my views, I am sending you this statement to help in unraveling things.

1. I believe that properly designed and implemented BUSS, SPS, MSS and ARI could perhaps reduce the likelihood of failure to scram by a factor of perhaps 3 to 10, but not 100 as suggested by GE. This is based in part upon the assumption that anticipated transients involve a relatively small number of scenarios and therefore specific contingencies could be addressed.

2. My comments about breakers did not reflect what I had in my notes. My specific concern is that simply using breakers made by different manufacturers does not really provide much diversity - only a very limited potential for improvement and could be counterproductive. Westinghouse now uses two breakers - and if MSS would provide those with redundant and independent inputs in key areas some improvement would be expected.

3. Calculations as to the amount of improvement to be achieved are hampered by our inability to focus upon where the PPS is deficient. We believe it is not in the simple random component failure area, but other systemic failure mechanisms are hard to pin down.

4. With regard to the choice between 3A and 4A, I believe that 3A plus the added relief capacity of 4A should be sufficient for PWR's, although implicit in that is the presumption that some sort of analysis would appear to justify capability of the modifications. I agree that in any case the improvements to the shutdown systems (BUSS, etc)

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should be included, whether 3A or 4A is opted. I can't decide about the need to increase the capacity of the SLCS for BWR's as suggested in 4A. ARI is, I believe, useful.

Sincerely,

Steve

S. J. Ditto

SJD:alm

cc: W. Kerr
File - NoRC