



UNITED STATES
 NUCLEAR REGULATORY COMMISSION
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December 28, 1993

MEMORANDUM FOR: Ashok C. Thadani, Director, DSSA

THRU: Mark P. Rubin, Acting Chief
 Probabilistic Safety Assessment Branch, DSSA

FROM: Robert L. Palla, Jr.
 Probabilistic Safety Assessment Branch, DSSA

SUBJECT: DECEMBER 8, 1993 MEETING WITH PWR OWNERS GROUPS REGARDING
 SEVERE ACCIDENT MANAGEMENT GUIDELINE DOCUMENTS

On December 8, 1993, the NRC staff met with representatives of the Nuclear Management and Resources Council (NUMARC) and the PWR owners groups. The purpose of the meeting was for NRC staff and contractors to provide comments on the Severe Accident Management Guideline (SAMG) documents submitted by each of the PWR owners groups. A list of attendees is presented in Enclosure 1. A copy of the presentation materials is provided as Enclosure 2.

In introductory remarks, R. Palla (SPSB/DSSA) described the staff and contractor review process, the review and meeting objectives, the classification of review findings, and the anticipated steps for documenting the review. The following points were acknowledged:

- This phase of the staff/contractor review was performed on a very short schedule in order that comments/feedback could be considered by the owners groups as part of the SAMG finalization that is scheduled for early 1994.
- The review was performed principally by contractor staff, however, staff from DSSA (SPSB, SRXB, and SCSB), DRCH (HHFE), and AEOD also reviewed the SAMG documents, and worked closely with the contractors in developing the presentation materials and framing the review findings.
- Potential improvements to the SAMG were classified as being either "needed" or "suggested." Certain of the "needed" improvements are admittedly less important than others, and could be reevaluated using an alternative classification scheme.
- The staff has not yet determined the nature of the final evaluation document; i.e., whether it will be a contractor technical evaluation report (TER) or a safety evaluation report, but is proceeding on the basis that it will be a TER.
- The present staff plan is to complete the review within the next two months, including further review of selected areas/issues, and to forward documentation of the evaluation to NUMARC in the March/April timeframe.

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8818-7 (NUMARC)

1 PDR-10-1 (PWR)
 x MH 9-16-5 (accident & incident presentation)
 x 88-4-6 (not)

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- Representatives of the B&WOG expressed the view that the majority of the comments may be a result of the reviewers not understanding the B&WOG philosophy, which is to provide specific strategies and associated technical bases, but to leave the technical assessment, prioritization, and selection of strategies to the utility as part as an ad hoc response. They also indicated that they are relying on utility staff involved in the SAMG development effort, and the technology transfer workshops being planned by NUMARC and the Owners Groups, to assure that the undocumented technical details and considerations of the working group are reflected in the utility-specific application of the SAMG. The staff questioned whether this is realistic given the long lead time for implementation and personnel turnover and reassignment.

In closing discussions NUMARC indicated that the owners groups will further assess the comments provided during the meeting, and discuss this with NRC at a later date.

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OFFICIAL DOCUMENT NAME: AMDECB.MET

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NUMARC/NRC MEETING
 ACCIDENT MANAGEMENT
 DEC 8, 1993

ENCLOSURE

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**PRELIMINARY
REVIEW OF OWNERS GROUP
SEVERE ACCIDENT MANAGEMENT
GUIDELINES**

INEL * PNL * COMEX

DECEMBER 8, 1993

OVERVIEW OF RESULTS

REVIEW BASIS FOR AMGS

- Initial Findings of CE Only Review (April 22, 1993)
- AMG Submittals from Each PWR Owners Group (June/July, 1993)
- Additional Information from Meeting with Owners Groups (November 16 & 17, 1993)

SCOPE OF PRELIMINARY REVIEW

- Determine Whether Applicable SECY-89-012 Framework Elements are Adequately Addressed
- Identify Possible Conflicts Between Strategies and Guidance in AMGs and the Current EOPs
- Identify Possible Inconsistencies Between Strategies and the Current Severe Accident Knowledge and Understanding
- Identify Potential Shortcomings in Guidance Provided in the AMGs

EXPERTISE OF REVIEWERS

- Reactor Operations
- Reactor Operator Examiners
- Severe Accident Phenomena
- Instrumentation
- Human Factors
- Emergency Operating Procedure Reviewers
- Emergency Planning
- Emergency Drills

AREAS OF REVIEW

- GENERAL ADEQUACY
- TRANSITION
- PDC DETERMINATION AND CHLA PRIORITIZATION
- STRATEGIES
- EQUIPMENT AND INSTRUMENTATION
- CALCULATION AIDS
- IMPLEMENTATION INSTRUCTIONS

TWO TYPES OF COMMENTS

[N] AREA NEEDS IMPROVEMENT

- Guidance is insufficient to ensure proper implementation by individual utilities
- Strategies for significant actions is lacking
- If guidelines are followed, PDC could be further degraded

[S] AREA WOULD BENEFIT FROM SUGGESTED IMPROVEMENT

- Similar to "Improvement Items" in NRC IRs
- Would improve quality (based on reviewer experience)
- Not perceived to be a critical flaw

SUMMARY OF GENERAL OBSERVATIONS

- **AMGs Are A Major Step Forward in Providing Guidance for Managing Severe Accidents**
- **Owners Groups Obviously Committed Major Resources**
- **Widely Divergent Approaches Used by the Three Owners Groups Was Surprising**

SUMMARY OF GENERAL FINDINGS

- All Approaches Could Be Viable, With Numerous Changes to B&W, Some Changes to CE, and Limited Changes to W
- Review Results Provide Insight as to Possible Benefits of Examining Other Owners Group's Approaches
- Additional Detailed Implementation Guidance is Needed
- Additional Guidance is Needed on Incorporating New Information from IPE Results, Owners Group Studies, and NRC Reports
- Key Assumptions and Limitations on Calculation Aids Need To Be Added
- Guidance on Instrument Behavior and Use Needs Improvement
- AMGs Workable, But Large Size Could Make Use Difficult

NUMBER OF FINDINGS FOR OWNERS GROUPS

Review Area	B&W		CE		W	
	N	S	N	S	N	S
General Adequacy	2	1	2	1	1	0
Procedural Transition	6	1	3	3	0	0
PDC Determination and CHLA Prioritization	3	1	1	3	0	0
Strategies	10	6	5	9	1	2
Equipment and Instrumentation	5	1	3	2	1	3
Calculational Aids	1	0	2	0	1	0
Implementation Instructions	4	1	2	2	1	1
TOTAL	31	11	18	20	5	6

SPECIFIC FINDINGS

GENERAL ADEQUACY

- Are there specific plans for validation and verification of AMGs?

[N] B&W, CE

Validation and verification of AMGs are not adequately addressed. Guidance on AMG validation and verification and guidance on utility validation and verification is needed.

- Are all terms adequately defined (quantitatively)?

[S] B&W, CE

It is recommended that definition of the following terms be provided either in the AMGs or through reference to the EOPs:

- Inadequate Core Cooling
- Primary to Secondary Coupling
- Recent changes
- Rapid changes

GENERAL ADEQUACY

- Is guidance provided on incorporating new information from the IPE, the Owners Groups, and the NRC?

[N] B&W, CE, W

Guidance should be provided to ensure that the utilities will review and consider impacts of additional accident management insights from industry and the NRC.

TRANSITION

- Are there concise AMG entry conditions?

[N] CE - Decision to enter AMGs left to ESD based on tracking a number of plant parameters. There could be entry delays due to ESD indecision. Recommend entry into AMGs be based on a measured parameter(s) such as CET temperature, RVLIS, etc.

[S] B&W - The entry point for the AMGs seems to be well-defined, but there is no indication of the number of CETs that should be used. Additional guidance should be provided.

- Is the transfer of decision making authority clearly defined?

[N] B&W

The AMGs should clearly define how decision making authority is transferred from the control room to the TSC and what the control room's involvement is after the transfer.

TRANSITION

- Is guidance provided for accidents when early severe core damage conditions occur prior to the assembly of the TSC?

[N] B&W - Guidance should be provided to the control room for the time period between identification of need to enter AMGs and manning of TSC.

[S] CE - Additional guidance should be provided to the control room for the time period between identification of need to enter AMGs and manning of TSC.

- Is the transition from EOPs to AMGs well integrated?

[N] B&W, CE

Exact step in EOPs where severe accident conditions may be entered should be identified for modification to alert control room operators that entrance into AMGs may be imminent.

TRANSITION

- Is there adequate guidance to foster control room operator trust, cooperation, and response?

[N] B&W - Operators must be an integral part of implementing AMGs. Guidance to operators needs to be provided once EOPs are dropped.

[S] CE - Specific control room guidance during the transition and throughout AMG implementation is recommended to enhance coordination. Even with guidance, unilateral use of EOPs may cause friction.

TRANSITION

- Is the method for communicating CHLAs to control room adequate?

[N] B&W, CE

No specific method of communicating details for implementing CHLA actions is discussed. Either verbal or written instructions should be specified regarding what specific actions will be implemented to accomplish CHLAs.

TRANSITION

- Is the interface between the AMGs and emergency plans well defined?

[N] B&W - No interface tie with emergency plans is currently made. The interface between the AMGs and the emergency plans should be discussed.

[S] CE - It is stated consideration of "current EAL" is one of two factors likely to be used by ESD to determine severe accident in progress and initiate the AMGs. However, no specific guidance is provided for the decision making process. Specific guidance should be provided.

PDC DETERMINATION AND CHLA PRIORITIZATION

- Is quantitative information used in PDC determination?

[N] B&W - No criteria given for PDC determination in PDC flow chart. Determination criteria embedded in PDC sections. Have to know what PDC you are in to determine if you should be in that PDC. Criteria need to be added to flow chart.

[S] CE - Quantitative information is used. However, the time taken to determine RCS and RB conditions may delay implementation of necessary actions. Should improve guidance.

- Is quantitative information used in CHLA prioritization?

[N] B&W, CE

Unless concurrent actions are explicitly stated, must work through CHLAs in sequence before proceeding to next. May delay implementation of necessary actions. Criteria should be provided to determine if CHLA needs to be entered.

PDC DETERMINATION AND CHLA PRIORITIZATION

- Is it necessary to determine whether the core is in the "EX" PDC?

[S] B&W, CE

May be difficult to distinguish between BD and EX PDCs and time spent doing so may delay implementation of necessary actions. Initial action should be same for either PDC - Inject Water Into RCS. Creative means of injecting water would be needed in either PDC. Should consider eliminating EX.

- Are measurable or quantitative success criteria used for completion of the CHLAs?

[N] B&W - No definitive endpoints are identified.

[S] CE - Use of vague success criteria should be eliminated (e.g., "until desired results are achieved").

STRATEGIES

- Are the CHLA sets judged to be adequate?

[N] B&W - Need to incorporate strategies for containment hydrogen control, auxiliary building spray, and containment vacuum mitigation or provide justification for their absence.

[N] CE - Need to incorporate strategies for containment vacuum mitigation or provide justification for its absence.

- Are actions prioritized to save final fission product barrier?

[S] B&W, CE

The prevention of fission product release should be given a high priority, it is not a "LESS IMMEDIATE" concern. Containment pressure should be constantly monitored to prevent containment challenge and provide adequate time for implementing mitigation strategies.

STRATEGIES

- Are CHLAs cross-referenced and concurrent actions adequate?

[N] B&W, CE, W

More specific CHLA cross references and guidance for performing concurrent actions should be made.

- How do the CHLAs compliment or conflict with EOPs?

[S] B&W, W

It is recommended that discussions be included on how each CHLA compliments or conflicts with current EOPs. This could facilitate better understanding by the control room operators as to why actions are being taken.

STRATEGIES

- Is place keeping within CHLAs adequately covered?

[S] B&W, CE

Multiple CHLAs could be in use at the same time. Need guidance on how accident management personnel maintain their place within each CHLA.

- Is there adequate documentation on how plant specific IPE results were used in developing strategies?

[N] B&W - It is not clear how IPE guidance was used to identify and develop the strategies or other parts of the AMGs. A description of how the IPEs were used should be provided.

[S] CE - Additional detail on how the IPEs were used to identify and develop AMG strategies should be provided (e.g. containment vacuum)

STRATEGIES

- Are net pump suction head concerns for pumping systems addressed?

[S] B&W, CE, W

Recommend CHLAs indicate that net pump section head be considered for all pumping systems.

- Are concerns about the boron and enthalpy content of injection sources over emphasized?

[N] B&W - Concerns about boron and enthalpy content of injection sources may inhibit initiation of sufficient injection flow to recover vessel water level and achieve core cooling.
Should be less emphasis on boron and enthalpy content of water sources.

[S] CE - Same, but only with respect to boron.

STRATEGIES

- Are there cautions on feeding hot/dry steam generators?

[N] B&W, CE

Need to add cautions discussing the effects of adding water to hot/dry steam generators in CHLAs.

- Is scrubbing of fission products through steam generators recommended?

[N] B&W - No. Failed steam generators are isolated and then venting of reactor building is recommended in next CHLA. Could lead to higher population doses. Discussion of steam generator scrubbing should be included. Apparent conflict with current EOPs.

[S] CE - Yes. The benefits of scrubbing fission products should be discussed in greater detail.

STRATEGIES

- Is the long-term, de-inerting of containment via losses to ambient addressed?

[N] B&W - Steaming containment to inert containment atmosphere by maintaining steam percentage greater than 53% is recommended. Because of losses to ambient, will never be able to keep containment inerted over long-term to preclude hydrogen burn. Ambient loss de-inerting should be considered and discussed.

[S] CE - Discussion should be included to indicate that ambient losses from the containment will de-inert the containment.

- Is the manual isolation of containment and interfacing systems addressed?

[S] B&W, CE

Should provide additional guidance to utilities for development of procedures.

STRATEGIES

- Are concerns about pH of sump water over emphasized?

[N] B&W - Over emphasis should be eliminated since it may cause delay in creative use of water sources and distract staff from higher order concerns.

[N] CE - Cautions that pH of sump water may result in hydrogen generation, primarily from oxidation of aluminum and zinc surfaces in containment. Piping corrosion is also listed as a pH concern. Lower order concerns should be eliminated so that creative sources of water will be considered.

- Is the habitability of plant areas considered?

[S] B&W, CE

Habitability and access to plant areas during all strategies need to be addressed.

STRATEGIES

- Is the impact of steam explosions considered?

[N] B&W - There is currently insufficient information available to suggest that this is not a problem. At minimum, it should be acknowledged that this may be a problem. Will probably not change strategies, but something utilities should be aware of.

[N] CE - CHLA for RCS depressurization calls for depressurization to containment pressure as low as possible but does not caution for the possibility of steam explosions at pressures < 75 psi.

- Are there questionable strategies?

[N] B&W - Some strategies appear to be questionable in that they may result in either a delay of implementing more urgent actions or may have adverse consequences not considered. Should consider eliminating questionable strategies.

EQUIPMENT AND INSTRUMENTATION

- Is status of available equipment considered?

[N] B&W, CE

Need to provide a generic prioritization of equipment for repair and recovery and guidance for plant specific concerns for equipment operability during severe accidents.

[S] W - Provide additional details concerning subsystem support for equipment operability.

- Is reliability of instrumentation considered?

[N] B&W, CE

The reliability and accuracy of instrumentation under severe accident conditions needs to be discussed (e.g., adverse containment conditions). Alternative instrumentation also needs to be identified and its use in the flowchart discussed.

[S] W - Provide guidance to utilities on using instrumentation information in Background Documentation.

EQUIPMENT AND INSTRUMENTATION

- Do the strategies address the partial and total loss of instruments?

[N] B&W - Information should be added to address the partial or total loss of instrumentation.

- Are creative system cross-ties suggested?

[N] B&W - Need to make recommendations for alternative and creative injection sources, vent paths, etc.

[S] CE - Discuss more alternative and creative actions for supplying injection sources.

EQUIPMENT AND INSTRUMENTATION

- Are interlock defeats and bypasses discussed?

[N] B&W, CE, W

The necessity for the utilities to write detailed procedures for performing interlock defeats and bypasses should be discussed and guidance provided.

- Is there a discussion of the needed data sampling frequency of each parameter used to define PDCs.

[S] B&W, CE, W

A discussion of the data sampling rate necessary to accurately select PDCs should be included to assist utilities in utilizing their data collection process.

CALCULATION AIDS

- Are formulas for computing key variables provided and validated?

[N] B&W, CE, W

Key inputs, assumptions and limitations for each calculation aid need to be clearly identified so the applicability and limitation of the aid to the plant conditions can be determined (e.g., uniform mixing of hydrogen in containment assumed for hydrogen concentration calculation aid). The applicability of example graphs in the AMGs should be discussed.

- Can the calculation aids be easily used?

[N] CE - Many of the calculation aids are lengthy and cumbersome. Use of these could delay implementation of necessary actions (e.g., hydrogen).

IMPLEMENTATION INSTRUCTIONS

- Is there explicit guidance for developing CHLA implementation procedures?

[N] B&W, CE, W

Explicit guidance needs to be developed as to how actions need to be translated into procedures for use by the control room (e.g., valve alignments, bypasses, and interlock defeats by jumpering) and also special use hardware for manufacture and pre-staging needs to be identified (e.g., jumper cables, spool pieces, and blank flanges).

- Is a writers guide provided?

[S] B&W, CE

A writers guide or equivalent guidance should be provided.

IMPLEMENTATION INSTRUCTIONS

- Is guidance provided for reviewing TSC data sources and its presentation?

[N] B&W - Should provide guidance on reviewing data flow to support AMG decision making in the TSC.

- Is there a method for tracking all water inventories available for pumping sources?

[N] B&W, CE

Provide a method for tracking water inventories of tanks including alternatives and identification of makeup sources. These should be tied to the water requirements of the CHLAs.

IMPLEMENTATION INSTRUCTIONS

- Are specifics on containment vent paths provided?

[N] B&W

When evaluating the use of containment venting, no guidance is provided for determining the order of preference for available vent pathways. This guidance needs to be provided.

[S] CE, W

Additional guidance should be provided.

SUMMARY OF AREAS NEEDING IMPROVEMENT FOR B&W

- **Guidance for Transition from EOPs to AMGs Needs to be Improved**
- **Method for Identifying Plant Damage Conditions Needs Additional Detail on Flow Chart**
- **Three Additional CHLAs Need to be Considered**
- **Additional Information for Many CHLAs is Needed**
- **Technical Basis for Some CHLAs Needs Improvement**
- **Additional Guidance on Evaluation and Use of Plant Equipment is Needed**

SUMMARY OF AREAS NEEDING IMPROVEMENT FOR B&W

- **Discussion of Instrumentation Capabilities and Guidance on Its Use Needs to be Improved**
- **Additional Guidance on AMG Validation and Verification and Guidance on Utility Validation and Verification is Needed**
- **Implementation Instructions Need to be Improved in Several Areas**
- **General Lack of Necessary Detail**

SUMMARY OF AREAS NEEDING IMPROVEMENT FOR CE

- **More Specific Guidance for Transition from EOPs to AMGs is Needed**
- **More Complete Guidance for Entering Some CHLAs is Needed**
- **Guidance for CHLA Success Criteria and Effectiveness Evaluation is Needed**
- **Some Calculation Aids Need to be Simplified**
- **Discussion of Instrumentation Capabilities and Guidance on Its Use Needs to be Improved**
- **Additional Guidance on AMG Validation and Verification and Guidance on Utility Validation and Verification is Needed**

SUMMARY OF AREAS NEEDING IMPROVEMENT FOR W

- **Discussion on How CHLA and Prescribed Actions
Compliment/Contradict Prescribed Actions in EOPS is Needed**