NUCLEAR MANAGEMENT AND RESOURCES COUNCIL

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November 21, 1989

Mr. Ashok C. Thadani
Director of Systems Technology
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

TAC 40577

Dear Mr. Thadani:

This letter transmits NUMARC comments to DRAFT Generic Letter 89-XX, Station Blackout Response Submittals Analyses and Responses. Our comments are provided as Enclosure 1 and reiterate the similar positions expressed during the recent meetings with you and members of your staff.

We have also provided additional information relating to identified inconsistencies in utility application of NUMARC 87-00, Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors. Enclosure 2 contains a series of questions and answers relating to portions of the NUMARC 87-00 document dealing with aspects of the coping analysis, AAC configurations and equipment operability. Enclosure 3 lists and describes major assumptions and bases contained in the NUMARC 87-00 document. We believe these enclosures address and clarify areas of misunderstanding and misapplication of the accepted guidance as noted during the staff audits. These enclosures are provided for your review and comment.

During the November 8, 1989 NUMARC Board of Directors meeting, Mr. John Opeka, Executive Vice President, Northeast Utilities and Chairman of the NUMARC Station Blackout Working Group, advised the executives of the Staff's findings noted in the draft generic letter. The NUMARC Board of Directors reaffirmed the commitment to assure successful resolution of the station blackout issue. To that end, we transmitted a letter to industry on November 21 emphasizing the importance, as well as benefits of utilizing NUMARC 87-00 in its entirety and stressing that instances of departure from the document be properly documented.

NUMARC has been monitoring utility implementation of the station blackout rule and associated guidance. We have kept abreast of issues arising from the NRC audits, as well as issues arising at other utilities. To assure the most complete guidance is presented to industry, we included in these enclosures several items in addition to those raised in the draft generic letter and our previous discussions.

Refers To TAC No. 40577

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We wish to provide the clarifying information contained in Enclosures 2 and 3 to the industry before the end of the year. It is important to us that we receive NRC concurrence on the content and we are prepared to meet with you and your staff as necessary. We look forward to hearing from you.

Sincerely,

Alex Marion

Alex Marion
Manager, Technical Division

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Enclosures:

1. Final Comments on Draft Generic Letter
2. Draft Questions/Answers
3. Draft NUMARC 87-00 Assumptions

Enclosure 1

Final NUMARC Comments on Draft Generic Letter

The following are NUMARC comments on the draft Generic Letter (GL) regarding NRC findings from review of several utility SBO responses and supporting documentation. In general, these comments were discussed with the NRC staff in meetings on October 30 and November 8. Both general and specific comments on the GL are provided below.

General Comments

We find that certain of the plant specific concerns raised in the GL may have broader implications, and that NUMARC clarification of NUMARC 87-00 guidance is appropriate to advise industry of problem areas encountered. Potentially generic concerns raised can be characterized as follows:

1. instances where utilities may not have verified and/or documented that NUMARC 87-00 assumptions and bases are applicable to their plant(s),

2. instances where utilities have misapplied aspects of NUMARC 87-00 guidance,

3. instances where departures from selected aspects of accepted NUMARC 87-00 methodology were not identified and addressed.

To address these concerns, NUMARC will provide to industry a list of primary assumptions which should be verified by utilities in order to utilize the various portions of the NUMARC 87-00 methodology. In addition, common areas of utility departure from NUMARC 87-00 methodology will be identified, and NUMARC will advise utilities that such departures require separate supporting documentation be provided for NRC review. Further, where existing guidance has been misinterpreted by utilities, NUMARC will provide the necessary clarification to ensure consistent interpretation.

NUMARC will advise utilities to reevaluate their previous submittals to NRC and consider supplementing their generic SBO responses, if necessary, to reflect departures from NUMARC 87-00 methodology or to correct a misapplication of the guidance.

In addition, NUMARC will reemphasize to industry consensus understandings relative to (1) operability assessments for certain SBO equipment in less than 120F environments and (2) application of a single failure relative to Alternate AC (AAC) power systems, which were reaffirmed by the Staff in discussions November 8.

Staff concern relative to improper credit for hurricane procedures (discussed later), is considered to be plant specific and will therefore not be addressed in the envisioned NUMARC communication to industry.

Specific Comments

Item 1

Some utilities may have inappropriately determined their I group. Misapplication of NUMARC 87-00 guidance in this area has likely caused improper determinations. NUMARC will provide a communication to industry to clarify existing SBO guidance contained in NUMARC 87-00, Section 3.1.D. This clarification will emphasize the expectation that all safe shutdown buses are transferred upon loss of the normal source of AC power and will offer a time limit for execution of manual transfers.

Item 2

Approved SBO guidance (and therefore the rule response format) is silent on the use of auxiliary shutdown capability for recovery from SBO. We believe this issue is limited to very few plants and is therefore not a generic concern. NUMARC will remind utilities utilizing remote shutdown panels that recovery from SBO may require operator action or monitoring from the control room.

We note that in the first example cited by the Staff, evacuation of the main control room was only one option being considered for a temporary coping strategy -- pending the installation of new station batteries. This option was not pursued. In the other example, it is our understanding that similar evacuation of the main control room is contemplated by the utility.

As noted on November 8, Staff reference to achieving "normal cold shutdown conditions" is inappropriate. It is understood that the proper focus for shutdown in the SBO context is "safe shutdown" which can be hot shutdown, hot standby or cold shutdown as reflected in the plant design basis.

Item 3

The Staff has identified instances where utilities have either misapplied/misinterpreted NUMARC 87-00 methodology or did not identify and support use of alternative methodology. We believe it is important to note that NUMARC 87-00 consists of guidance acceptable to the Staff for demonstrating compliance with the SBO rule. Acceptable alternative methodologies certainly exist, however these generally require the utility to identify and document departures from the accepted guidance of NUMARC 87-00. NUMARC will identify common problem areas encountered and recommend that such departures from NUMARC 87-00 be identified to the Staff. Further, NUMARC will advise utilities that they may need to consider providing NRC with

additional supporting information to that previously furnished in the generic rule response.

Item 4

The noted concern is limited to one utility, and it is understood that the plant specific matter is being resolved between that utility and the NRC. As already noted, NUMARC will reemphasize to utilities the need to identify and address departures from methodologies contained in NUMARC 87-00.

Item 5

We believe the Staff position that AAC power systems must be designed to withstand an arbitrary single failure is inappropriate and inconsistent with understandings achieved between industry and NRC as reflected in approved SBO guidance.

Concerns relative to the susceptibility of a given AAC configuration to disablement are adequately addressed by Criterion B.8.e of NUMARC 87-00 which requires that "no single point vulnerability shall exist whereby a likely weather related event or single active failure could disable any portion of the on-site EAC or the preferred power sources and simultaneously fail the AAC power source(s)."

Item 6

As previously stated, NUMARC will reiterate to utilities that departures from accepted methodology established in NUMARC 87-00 need to be identified and addressed. Further, utilities will be reminded to ensure that assumptions, calculations and analyses contributing to SBO coping assessments are appropriate and properly supported. RCS inventory and suppression pool heat-up calculations are examples where proper documentation is necessary.

The example cited of the undefined atmospheric dump valve modification underscores the need for utilities to clearly identify proposed SBO modifications.

Item 7

In general, and as previously stated, utilities using NUMARC 87-00 are expected to verify the applicability of baseline assumptions to their plants.

The Staff provided alternative language for this item at the November 8th meeting. Based on discussion of this new language, NUMARC will reemphasize to industry the following:

Item 7, continued

1. Dominant Areas of Concern (DACs) are determined by engineering judgement based on guidance contained in NUMARC 87-00 Sections 2.7 and 7.2.4. These determinations should be appropriately documented. Question/Answer 4 of Responses to Questions Raised at the NUMARC 87-00 Seminars (October 1988) also specifically addresses the considerations for determining dominant areas.

2. SBO temperatures in DACs shall be calculated. If less than 120F, it is accepted and understood that reasonable assurance of SBO equipment operability exists. If greater than 120F, reasonable assurance of operability must be established.

3. In addition, a control room heat-up analysis is required to demonstrate that the SBO temperature is less than 120F. If the SBO temperature in the control room is 120F or above, reasonable assurance of SBO equipment operability must be established.

Item 8

As stated at our October 30 meeting, the Staff is well aware of the coordinated industry activity on the B-56 issue. The suggestion that utility SBO responses have been deficient due to a lack of a documented commitment is inappropriate.

NUMARC has been working with NRC on the development of a revised NUMARC 87-00 Appendix D that delineates a graded approach program for maintaining EDG target reliabilities. This document is under review by NRC in conjunction with development of a revision to RG 1.9. Until the final form of these documents is established, we believe it is premature to seek specific utility commitments in this area.

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Enclosure 2

NUMARC 87-00 SUPPLEMENTAL QUESTIONS/ANSWERS

GENERAL QUESTIONS

0.1 Q: Are utilities required to apply the NUMARC 87-00 assumptions and methodology to their station blackout calculations and supporting documentation?

A: NUMARC 87-00 consists of guidance acceptable to the NRC for demonstrating compliance with the station blackout rule. Alternative methodologies may be used by utilities, but will be reviewed independently by the Staff. It is recognized that utilities may have used alternative methodologies that conservatively bound those of NUMARC 87-00.

Virtually all utilities utilized the approved generic response format in providing to NRC information required under the station blackout rule. The generic response contains a statement that the utility used NUMARC 87-00 methodology and technical bases in preparing the submittal. Where this was not the case, it is important to identify and document the alternative methodology used. If this has not been done, utilities should consider providing additional information to the NRC.

0.2 Q: What level of planning must be complete to support modifications (if any) which a licensee proposed in the station blackout submittal?

A: Licensees should have identified the nature of any modifications required to meet the station blackout rule and a proposed schedule for implementation. The implementation status of proposed modifications should conform to 10CFR50.63 Sections C(1)(iii), C(3) and C(4).

SECTION 1: INTRODUCTION

1.1 Q: Is it necessary to perform further analyses to verify that baseline assumptions of NUMARC 87-00 are valid for each plant, or is an assumption a "given"?

A: Section 1.3 of NUMARC 87-00 suggests that utilities ensure baseline assumptions are applicable to their plants. Per Question/Answer 3 from Responses to Questions Raised at the NUMARC 87-00 Seminars (NUMARC 87-00 October 1988), "utilities are not expected to perform rigorous analyses or evaluations in verifying the assumptions of NUMARC 87-00." However, the validity of assumptions for each plant should be established and documented. A list of major assumptions among those to be verified has been provided to

utilities by NUMARC. Each assumption on the list should be reviewed to assure applicability to individual plants.

SECTION 2: GENERAL CRITERIA AND BASELINE ASSUMPTIONS

2.5 Reactor Coolant Inventory Loss

2.1 Q: Must the assumed 25gpm reactor coolant pump seal leak rate be used by all plants (BWR and PWR)?

A: No. It is acceptable to NRC to use 18gpm for BWR recirculation pumps. Leakage rates lower than 25 gpm for PWRs or 18 gpm for BWRs may be used, provided a justification exists and the NRC is informed that lower rates are being utilized.

2.7 Effects of Loss Ventilation

2.2 Q: Is it necessary to provide reasonable assurance of equipment operability in dominant areas of concern where temperatures are below 120F?

A: The need to establish reasonable assurance of equipment operability applies only to dominant areas of concern. See Section 2.7.1 of NUMARC 87-00. A dominant area of concern (DAC) exists when, based on documented engineering judgement, areas containing station blackout response equipment have substantial heat generation terms and lack of adequate heat removal systems due to the blackout. See NUMARC 87-00, p. 7-18.

If temperatures in the DAC are calculated to be equal to or less than 120 degrees F, this establishes reasonable assurance of equipment operability without further analysis. If temperatures in the DAC are calculated to be in excess of 120 degrees F, reasonable assurance of equipment operability must be provided. NUMARC 87-00, Appendix F, and its accompanying topical report provide acceptable methods for assuring equipment operability.

For the control room, even though it may not meet the DAC criteria, a heatup analysis should be documented to demonstrate that temperatures do not exceed 120 degrees F. If temperatures exceed 120F, reasonable assurance of station blackout response equipment operability must then be provided. NUMARC 87-00, Appendix F, and its accompanying topical report provide methods for assuring equipment operability.

For additional information, refer to Question/Answer Nos. 4, 6, and 82 from the Responses to Questions Raised at the NUMARC 87-00 Seminars (NUMARC, October, 1988).

2.3 Q: May masonry, sheet metal or gypsum walls be assumed as heat sinks in the NUMARC 87-00 room heatup calculations?

A: The NUMARC 87-00 methodology assumes poured concrete walls to be the heat sink. Other wall materials are not addressed by the methodology. If other wall materials are used, additional calculations must be performed and the use of such calculations should be identified to the NRC.

2.4 Q: May air volumes above drop ceilings, such as in the control room, be used for calculation of room temperatures using the NUMARC 87-00 methodology?

A: Generally, no. A continuous ceiling is assumed by the methodology to inhibit any heat transfer to the volume above unless ceiling tiles are removed, by procedure, at the start of the blackout. If air volumes above drop ceilings are used and ceiling tiles are not removed by procedure, additional heat transfer calculations would be necessary and the basis of such calculations should be identified to the NRC.

2.5 Q: What wall temperatures may be assumed when applying the NUMARC 87-00 methodology to poured concrete walls acting as heat sinks in air conditioned rooms?

A: If the room on the outside of the wall is warmer than the room on the inside, the average wall temperature should be used. The wall, in this case, will not be as effective a heat sink as a wall uniformly at the inside room temperature.

2.6 Q: Are any restrictions placed on taking credit for opening doors to an outside room?

A: Yes. To allow credit for opening doors for cooling, the outside room should be cooler than the room being analyzed and should be sufficiently large that hot air from the inside room will not appreciably alter the temperature of the outside room. Opening the control room door to a closet or kitchen for example will not provide a sufficient heat sink and should not be credited. Furthermore, blackout response procedures should identify the doors to be opened.

2.7 Q: Are there circumstances where cabinet doors need not be opened as provided in Question/Answer No. 82 of Responses to Questions Raised at NUMARC 87-00 Seminars (October, 1988) to ensure that the control room is not a DAC?

A: Yes. For example, cabinet doors need not be opened where fans are powered during SBO to provide forced ventilation of cabinets or if HVAC is provided during SBO to maintain the control room below 120F.

SECTION 3: REQUIRED COPING DURATION CATEGORY

3.2, Part 1D, Evaluating Independence of Off-site Power System

3.1 Q: How quickly must manual transfers be made, when evaluating the independence of off-site power systems (I Group)?

A: Any manual method of transferring power sources for all safe shutdown buses is acceptable providing the transfer can be accomplished in a reasonable time, such as less than one hour. Thus, a manual transfer involving operation of a disconnect link requiring several hours to complete may not be acceptable.

3.2 Q: How independent must switchyards be for the purpose of I Group determinations?

A: A "no" answer to Criterion A, p. 3-11 of NUMARC 87-00 requires that multiple switchyards must be electrically independent. Electrical independence can be provided by normally open breakers between switchyards or busses.

3.3 Q: Where normal AC power is provided by the unit main generator and only one of two safe shutdown buses is automatically or manually transferred to preferred or alternate off-site sources, does that qualify as a transfer of all safe shutdown buses?

A: No. All safe shutdown buses must be transferred per Criteria B(1) and B(2), p. 3-11, of NUMARC 87-00.

3.2.2, Part 2.B Determine the Number of Necessary EAC Standby Power Systems

3.4 Q: When determining the number of EAC standby power sources necessary to operate safe shutdown equipment, what safe shutdown loads should be considered?

A: Safe shutdown loads may be determined from the plant's design basis shutdown loads following a loss of off-site power (LOOP).

3.5 Q: Does safe shutdown mean cold shutdown?

A: No. The plant should be brought to the design basis safe shutdown condition, which may be hot standby, hot shutdown, or cold shutdown.

3.6 Q: At a multi-unit site, if an EAC source is used as an AAC source, should that EAC/AAC source be excluded from the number of EAC standby power supplies used to determine the blacked-out unit's EAC Group?

A: Yes. An AAC source which is also an EAC source must be subtracted from the number of EAC sources available as EAC standby power supplies. To do otherwise would be double-counting as discussed in NUMARC 87-00, p. 3-14.

SECTION 4: STATION BLACKOUT RESPONSE PROCEDURES

4.2.1 Station Blackout Response Guidelines

4.1 Q: Is it acceptable to dispatch an operator from the control room to the remote shutdown panel for the purpose of providing power from the Appendix R diesel or the safe shutdown facility?

A: Yes. However, the control room should not be abandoned. It is anticipated that recovery from a station blackout may require operator action or monitoring from the control room.

SECTION 7: COPING WITH A STATION BLACKOUT EVENT

7.1 Q: When ensuring containment integrity, can normally closed valves be excluded from consideration similar to valves normally locked closed during operation per NUMARC 87-00, Section 7.2.5, Step 1 (1).

A: No. A normally closed valve may not be considered to be a normally locked closed valve unless some action is taken to prevent valve operation. Such actions would include removing control power fuses or racking out breakers supplying power to motor operators.

APPENDIX B: ALTERNATE AC POWER CRITERIA

B.1 Q: What single failure considerations are applicable at a multi-unit site where EAC sources are utilized for AAC?

A: When a Class 1E emergency AC (EAC) source is used as an AAC source, a single failure is applied to one of the EAC power sources in the non-blacked-out unit. If the remaining EAC source meets the criteria of NUMARC 87-00 Appendix B, AAC power is assumed to be available to the blacked-out unit. Refer to NUMARC 87-00, p. 2-2 through 2-4.

B.2 Q: What single failure considerations are applicable to SBO AAC power systems?

A: Per Criterion B.8.e of NUMARC 87-00, the AAC power source must not be susceptible to a single point vulnerability whereby a likely weather-related event or single active failure could disable any portion of the onsite emergency AC power sources (in the blacked-out unit) or the preferred (offsite) power sources, and simulanteously fail the AAC power source. Random failures other than the type addressed by Criterion B.8.e are not contemplated and need not be considered.

B.3 Q: What loads must be carried by an AAC source which is also an EAC source?

A: The AAC source must carry the safe shutdown loads on the non-blacked-out unit (see question and answer 3.4, above) and the station blackout loads on the blacked-out unit. Criterion B.9 of NUMARC 87-00 states, "The AAC power system shall be sized to carry the required shutdown loads for the required coping duration determined in Section 3.2.5, and be capable of maintaining voltage and frequency within limits consistent with established industry standards that will not degrade the performance of any shutdown systems or component. At a multi-unit site, except for 1/2 Shared or 2/3 emergency AC power configurations, an adjacent unit's Class 1E power source may be used as an AAC power source for the blacked-out unit if it is capable of powering the required loads at both units." It is expected that AAC sizing determinations consider both steady state and dynamic loading effects.

APPENDIX C: SAMPLE AAC CONFIGURATIONS

C.1 Q: Is it acceptable to connect the AAC source to the blacked-out unit by a single cross-tie?

A: Yes. However, when the AAC source is one of the available Class 1E EAC sources, the cross-tie must be able to supply power to the blacked-out unit from any EAC/AAC source.

Example 1. A single cross-tie connected to either of two EAC sources is acceptable. Figures A and B, Attachment 1, show two such cross-tie configurations, although acceptable configurations are not limited to these examples. In this case, a single failure of one EAC source does not prevent use of the second EAC source for AAC power.

Example 2. Figure C, attached, illustrates a potentially unacceptable single cross-tie connecting one EAC source to a second EAC source, and then connecting the second EAC source to the blacked-out unit.

In Figure C, assume Unit 1 is the blacked-out unit. Thus, diesels 11 and 12 are not available, and either diesel 21 or 22 is assumed to fail per the EDG single failure. The remaining diesel (21 or 22) may be designated as an AAC source provided Appendix B criteria are satisfied. However, a single active failure of Bus 21 would violate Criterion B.8.e regardless of which EAC source (21 or 22) is the AAC source.

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FIGURE A (Acceptable)

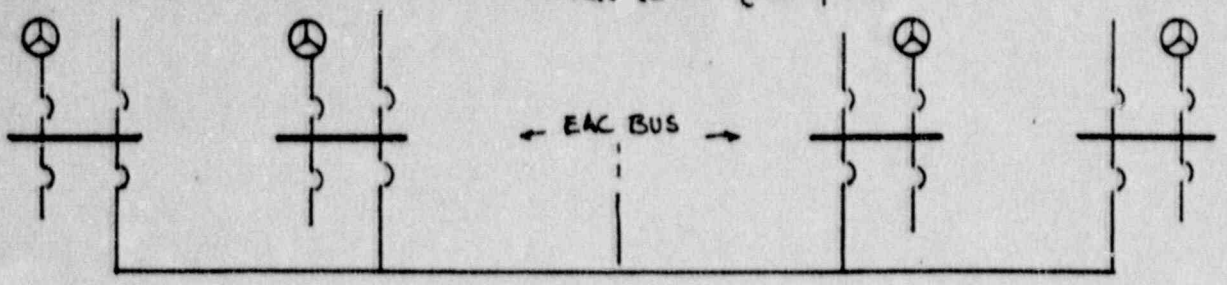


FIGURE B (Acceptable)

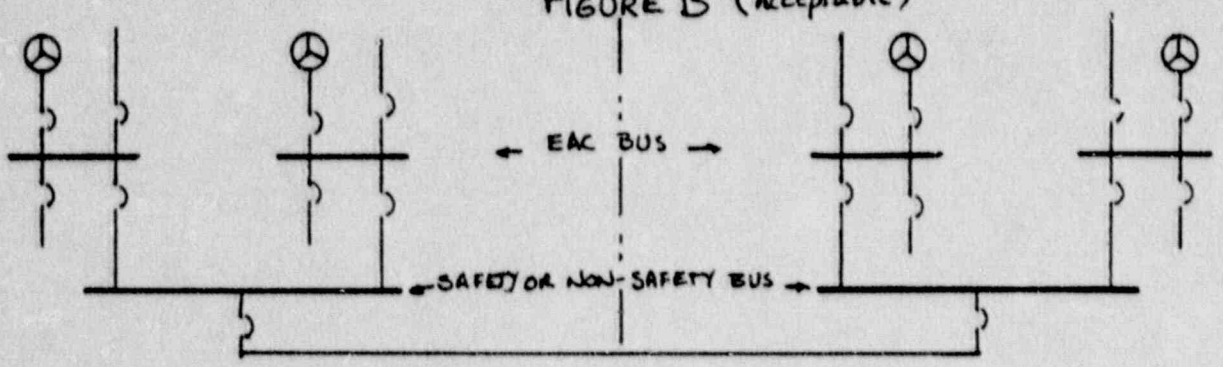
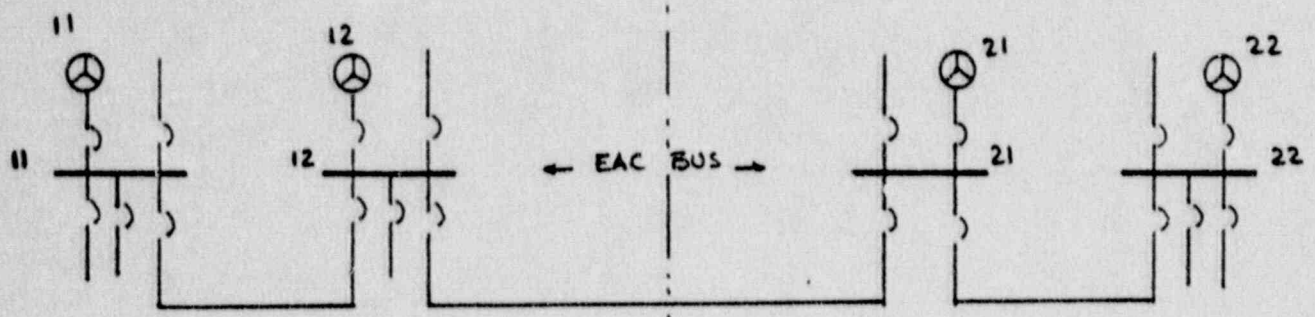


FIGURE C (Unacceptable)



UNIT 1

UNIT 2

Attachment 1

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Enclosure 3

NUMARC 87-00 ASSUMPTIONS

As stated in NUMARC 87-00 Section 1.3, it is important that utilities verify that baseline assumptions are applicable to their plants. Chapter 2 of NUMARC 87-00 discusses baseline assumptions; however, other chapters include additional assumptions, as well. Many assumptions are verified in the course of performing the various coping calculations, but some assumptions require specific verification.

The rigor to be applied by licensees in verifying assumptions is stated in Question/Answer 3 of Responses to Questions Raised at the NUMARC 87-00 Seminars (October 1988): "utilities are not expected to perform rigorous analyses or evaluations in verifying the assumptions of NUMARC 87-00." However, justification appropriate to verify applicability of assumptions to individual plants should be documented and available for review.

Listed below are major assumptions which in some cases have not been satisfactorily verified. Preceding each assumption is the number of the applicable NUMARC 87-00 section.

- 2.4.1(1) The event ends when AC power is restored to shutdown busses from any source. To support AC power restoration it will be necessary to close breakers. This can be done either manually or electrically via DC power. For those utilities utilizing DC power, the ability to close breakers at the end of the blackout should be included in the battery calculation. The first available power source can be an EDG; therefore flashing of the EDG field should also be included in the calculation.

- 2.5.2 Reactor coolant pump seal leakage is assumed not to exceed 25 gpm per pump. It is recognized that BWRs do not have reactor coolant pumps; however recirculation pump leakage should be evaluated. The NRC staff has indicated that 18 gpm is an acceptable assumed leakage rate for BWR recirculation pumps. BWRs/PWRs taking credit for lower leakage rates should have documentation to support use of the lower rates.

- 2.7 Loss of ventilation effects.

  - 2.7.1 Temperatures resulting from loss of ventilation are enveloped by LOCA and HELB profiles. LOCA/HELB transients dump large amounts of energy into a containment in a short time, thus, this assumption may seem intuitive. However, LOCA/HELB analyses assume fans and coolers are operating. During SBO, containment fans and coolers may not be available. This assumption, therefore, should be verified.

- 2.7.1(2) (a) Control room temperature does not exceed 120F. Utilities usually verify this assumption, but sometimes misapply the methodology of NUMARC 87-00, Section 7.2.4. See below.

Typical problems encountered with utility use of the methodology of Section 7.2.4 to calculate SBO temperatures in the control room and dominant areas of concern are as follows:

1) Initial wall temperatures assumptions are not verified by actual measurement;

2) Wall temperatures for walls acting as heat sinks in air conditioned rooms are assumed to be at the initial room temperature. This is valid if the rooms on both sides of the wall are air conditioned to the same temperature. If the outside wall temperature is hotter, i.e., not air conditioned, the average wall temperature, not the air conditioned room temperature, should be used;

3) Where a continuous drop ceiling prevents free passage of air out of the dominant area of concern, air volumes above can not be included in the analyzed room's free volume when using the NUMARC 87-00 methodology. Other analyses can properly take credit for heat transfer across the ceiling tiles, and these additional analyses should be identified to NRC;

4) Only poured concrete walls may be used as heat sinks, not cinder block or wallboard (Section E.3.1). Other analyses can properly take credit for other types of wall materials, and these additional analyses should be identified to NRC;

5) In order to take credit for opening doors to an adjacent room, the adjacent room must be large and at a lower temperature relative to the room in question. (See Section E.3.3.) Opening a closet door, for example will not provide a significant heat sink and can not be credited.

- 2.7.1(2) (b) Loss of heating in the battery room is assumed not to affect battery capacity. Provided battery capacity calculations used the lowest electrolyte temperature anticipated under normal operating conditions, further consideration of loss of battery capacity is not required, per NUMARC 87-00, p.7-7.