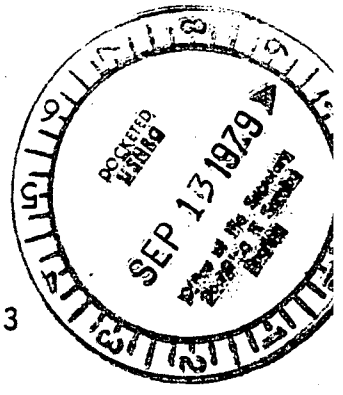
UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

AUG 24 1979



Docket Nos.: 50-269, 50-270, 50-287
50-289, 50-302, 50-312
50-313, 50-346

FACILITIES: Oconee Nuclear Station, Unit Nos. 1, 2, & 3
Three Mile Island Nuclear Station, Unit No. 1
Crystal River Nuclear Generating Station, Unit No. 3
Rancho Seco Nuclear Generating Station
Arkansas Nuclear One, Unit No. 1
Davis-Besse Nuclear Power Station, Unit No. 1

LICENSEES: Duke Power Company
Florida Power Corporation
Sacramento Municipal Utility District
Arkansas Power & Light Company
Toledo Edison Company
Metropolitan Edison Company

SUBJECT: SUMMARY OF MEETING HELD ON AUGUST 9, 1979, WITH THE BABCOCK & WILCOX (B&W) OWNERS' GROUP TO DISCUSS LONG-TERM GENERIC REQUIREMENTS FOR B&W OPERATING PLANTS

On August 9, 1979, members of the NRC staff met with the B&W Owners' Group (TMI-2 Follow-up Subcommittee) and representatives of the B&W Company, in Bethesda, Maryland to discuss various long-term generic requirements applicable to the B&W operating plants. Enclosure 1 is a copy of the meeting agenda. A list of attendees is provided as Enclosure 2.

BACKGROUND

During meetings held on July 18 and 19, 1979, between the NRC staff, the B&W Owners' Group, and the B&W Company, the Owners' Group committed to meet with the staff at a future date to discuss the following topics: (1) proposed outline for conducting an auxiliary feedwater/emergency feedwater (AFW/EFW) system reliability study, (2) proposed outline for providing the analyses, emergency procedure guidelines, and training needed to assure that the reactor operator can recognize and respond to conditions of inadequate core cooling. This meeting was arranged, at the request of the Owners' Group, to discuss these topics.

DISCUSSION

Agenda Item 1: FUNCTIONING OF THE B&W OWNERS' GROUP

During the July 19, 1979 meeting between the staff and the Owners' Group, the Chairman of the TMI-2 Follow-up Subcommittee (the Subcommittee) discussed the

membership, scope, objectives, and organization of the Subcommittee. It was agreed upon at that time, that correspondence from the NRC requiring the expenditure of funds would not be sent directly to the Chairman of the Subcommittee but rather would be addressed to the individual member licensees. The Director, Bulletins & Orders Task Force (Mr. D. Ross) was not at the July 19, 1979 meeting. Mr. Ross stated that in order to ensure timely resolution of all B&W generic items, it would be in the best interest of the staff and the individual members of the Owners' Group if the NRC could deal directly with the Chairman of the Subcommittee on all correspondence requiring action by the individual licensees. It was pointed out this was the procedure established by the other owners' groups (General Electric, Combustion Engineering, and Westinghouse). The Acting Chairman of the Subcommittee (Mr. R. Gill - Duke Power Company) pointed out the Owners' Group charter does not establish the Subcommittee as a legal entity and therefore it can assume no financial or legal responsibility for its members and as such all contractual matters and program funding are controlled by each individual member company. Since the members of the Subcommittee could not make commitments for their companies and since the Chairman of the Subcommittee could not speak or act for all its members, Mr. Ross expressed concern over the ability of the staff and the Subcommittee to reach timely resolution on outstanding generic issues. Mr. Ross agreed to continue working with the Subcommittee, in the manner in which the Owners' Group's charter is written; however, he pointed out that if negative experience resulted in dealing with the Subcommittee in this manner, he would direct his staff to stop interacting with the Subcommittee and would communicate directly with individual licensees.

Agenda Item 2: PROPOSED AFW/EFW SYSTEM RELIABILITY STUDY

As part of the long-term requirements of the Commission Orders issued to each operating B&W licensee in May 1979, each of the B&W operating plant licensees is committed to continued review and upgrade of its AFW/EFW system. In order for each licensee to assess which areas of its AFW/EFW system need improvement, the staff directed that each licensee perform a study of the AFW/EFW system reliability. This study should be of similar nature to that done by the NRC staff on each of the Westinghouse and Combustion Engineering operating plants. The Subcommittee Chairman stated that three of its member utilities had not yet contracted B&W to perform the study; however, any contractor picked to perform the study would utilize the same objective and scope as the proposed outline which B&W would present at this meeting. The B&W presentation covered two major areas: (1) program description and (2) schedule for completion. The approach taken by B&W was to include the same general methodology (fault tree techniques) as used by the NRC staff; however, the level of detail would be much more extensive. The proposed program description is contained in Enclosures 3 through 14 of this summary. The program scope and description was generally acceptable to the staff; however, as shown in Enclosure 13, the study, as proposed, would take almost seven months to complete. The staff pointed out that this was unacceptable since the terminology used in the Commission Orders to describe the implementation of the long-term items was "...as promptly as practicable...." The staff believed that an acceptable reliability study could be completed on a lead-plant (chosen by the Owners' Group) by mid-September 1979 and that the remaining plants could be completed by mid-October 1979.

Following detailed discussions, the NRC staff and the Subcommittee agreed on the following commitments:

(1) The level of detail of the study would be narrowed such that it could be completed in a time frame which the NRC staff considered as promptly as practicable.

(2) All licensees would contract B&W to perform the study with the possible exception of Toledo Edison Company (TECO) who had previously contracted with MPR Associates to do its study.

(3) By August 17, 1979, B&W would send a letter to NRC outlining its revised program description. Each licensee, in turn, would send a letter committing to the program and schedule outlined in the B&W letter. If TECO elects not to use B&W for its study, it will send a separate letter describing its program and schedule.

(4) The Owners' Group will pick a lead-plant and provide the draft results of its study to the NRC staff by September 17, 1979. The staff agreed to meet with the Owners' Group during the week of August 27, 1979 to review the status of the lead-plant study.

(5) The draft report will be provided to the staff for review on the remaining plants by October 22, 1979.

(6) The final report will be submitted to the NRC by December 3, 1979.

Agenda Item 3: ABNORMAL TRANSIENT EVALUATION

During a meeting with the Owners' Group on July 18, 1979, the NRC staff informed the Subcommittee that in addition to the evaluation of small break loss-of-coolant analysis previously required by the staff two more tasks should be undertaken: (1) an assessment of the symptoms of inadequate core cooling and (2) an evaluation of accidents and transients beyond current design analyses. In both cases, it was emphasized that focus should be placed on the information needed for operator training and information needed for the preparation of improved emergency procedures. The Owners' Group agreed at that time to meet with the staff at a future date to discuss its progress on these two items. These two items are addressed in recommendation 2.1.9 of NUREG-0578, "TMI-2 LESSONS LEARNED TASK FORCE STATUS REPORT AND SHORT-TERM RECOMMENDATIONS." B&W presented an outline, on behalf of the Owners' Group, which it stated would be responsive to these areas.

The objective of B&W's program is to develop operator guidelines for a spectrum of abnormal transients. These guidelines may then be used by each licensee as a basis for developing detailed emergency procedures. The B&W operating guidelines will be divided into two parts - procedural and technical basis for the procedure. The procedural part will encompass: (1) method by which the operator can recognize the symptoms of a transient using available alarms and indications, (2) immediate

actions which must be taken upon recognizing the existing transient, (3) precautions and limits each operator must observe, and (4) specific follow-up actions the operator must take to place the plant in a safe condition. The technical basis portion of each guideline will include: (1) a description of the cases considered and the operational strategy for each event, operational objectives, and plant equipment and features used, (2) a description of the expected plant response, and (3) references to equipment performance assumptions and supporting system analyses.

In order to develop these guidelines, B&W will use an event tree approach and methodology. For each transient, once event trees are defined and prepared, realistic analyses to confirm expected plant behavior will be developed. Several factors will be incorporated into the guidelines prior to being issued by B&W: (1) previous transient experience on operating plants, (2) confirmation of installed equipment and equipment characteristics for each plant, (3) walk throughs with plant operating staffs, and (4) incorporation of the operating staffs' comments.

In order to be responsive to recommendation 2.1.9 of NUREG-0578, the first set of guidelines will deal with inadequate core cooling. The goals of this item will be to: (1) describe the symptoms by which an operator can recognize inadequate core cooling with existing instrumentation, (2) develop guidelines for operator action to recover from this situation, and (3) identify any additional instrumentation which may be required to indicate inadequate core cooling. Items (1) and (2) should be completed by October 31, 1979 and item (3) should be completed by January 31, 1980. In order to proceed with this program, B&W requested clarification of their definition of inadequate core cooling; namely, "...when the RV (reactor vessel) water level falls below the top of the core with RCPs off and is followed by an increasing fuel rod clad temperature." The staff pointed out that NUREG-0578 also included examples of inadequate core cooling caused by low reactor coolant system inventory with and without forced flow (RCPs operating/RCPs tripped). Subsequent to this meeting, on August 14, 1979, a phone conversation was held between Mr. Z. Rosztoczy (NRC) and Mr. E. Kane (B&W) to more clearly define the staff's position on the B&W program for inadequate core cooling. The staff desires that analyses be done for three specific conditions where inadequate core cooling can occur: (1) loss of inventory in the reactor coolant system (RCS) with reactor coolant pumps (RCPs) operating, (2) loss of inventory in the RCS with RCPs tripped, and (3) transients in which departure from nucleate boiling (DNB) occurs. Information obtained from these analyses may then be used to: (1) identify response of available instrumentation, (2) prescribe limiting values for instrumentation readout, (3) develop criteria for successful recovery, (4) develop operator action for recovery, and (5) develop suggested changes to provide improved indication of inadequate core cooling. These guidelines should be developed for all modes of operation, i.e., power operation, hot shutdown, refueling, etc.

In addition to providing guidelines for inadequate core cooling, B&W will utilize the same methodology for developing guidelines for other transients and accidents on a schedule that is compatible with that shown in NUREG-0578.

The transients presently selected by B&W for guideline preparation include: (1) small steam leaks, (2) excessive feedwater flow, (3) loss of feedwater, (4) loss of station power, (5) steam generator tube rupture, (6) inadequate core cooling, and (7) loss of coolant accident. The material used by B&W during this portion of the presentation is included as Enclosures 14 through 28 of this summary.

Agenda Item 4: REVIEW OF STATUS OF LONG-TERM GENERIC REQUIREMENTS FOR B&W PLANTS

Due to shortage of time, this item was not discussed at this meeting. However, on August 20, 1979, a letter was sent from Mr. D. Ross to all B&W operating plants (except TMI-1 and TMI-2) identifying all of the generic long-term requirements associated with the Commission Orders. This letter provides a status summary and a schedule for NRC and licensee action on each item.

CONCLUSIONS AND ACTION TAKEN SUBSEQUENT TO THIS MEETING

Agenda Item 1: On August 20, 1979, a letter was sent to each licensee from Mr. D. Ross in which he asked each licensee to consider modifying the TMI-2 Follow-up Subcommittee's scope of authority, within the Owners' Group, such that the membership of that Subcommittee would include individuals authorized to make commitments on behalf of their utilities, and ultimately help obtain prompt resolution of generic issues.

Agenda Item 2: On August 17, 1979, B&W forwarded a proposed schedule for completing the AFW/EFW reliability study. B&W desires to arrange a meeting on August 30, 1979 to discuss its progress on the lead-plant for the study (Rancho Seco).

Agenda Item 3: B&W has agreed to modify its program for developing operator guidelines for inadequate core cooling, such that it will incorporate the staff's position. However, due to the expanded scope, it may not be able to complete this work by October 31, 1979. Further discussions between B&W and the staff are necessary to resolve scheduling difficulties.

Agenda Item 4: On August 20, 1979, a letter was sent to B&W licensees identifying the long-term generic issues related to the Commission Orders of May 1979. This letter also provided a summary and schedule for NRC and licensee action for each item.

R. A. Capra

R. A. Capra, B&W Project Manager
Bulletins & Orders Task Force
Office of Nuclear Reactor Regulation

Enclosures:
1. Meeting Agenda
2. List of Attendees
3-27 - B&W Presentation Material

ENCLOSURE 1

AGENDA FOR AUGUST 9, 1979
B&W OWNERS' GROUP MEETING

1. Functioning of B&W Owner's Group (D. Ross)
   A. authority
   B. responsibility
   C. method of communication between owners' group and staff

2. Proposed AFW/EFW system reliability study (Owners' Group & B&W)

3. Abnormal transient evaluation (Owners' Group & B&W)
   A. outline of program for the development of operator guidelines
   B. event tree methodology
   C. determination of supporting analyses
   D. schedule

4. Review of status of long-term generic requirements for B&W plants (NRC staff)

   A. Long-term Order requirements:
      (1) failure mode and effects analysis for the ICS (S. Israel)
      (2) upgrade of anticipatory reactor trip to safety-grade (S. Israel)
      (3) continued operator training and drilling to assure a high state of preparedness (S. Israel)

   B. Long-term requirements discussed in the staff's evaluation of licensees' compliance with Orders:
      (1) analyses for LOFW and other anticipated transients - NUREG-0560, Section 8.4.1 (W. Jensen)
      (2) analysis for small break LOCA - NUREG-0560, Section 8.4.2 (W. Jensen)
      (3) analysis for lift frequency and mechanical reliability of PORV and safety valves - NUREG-0560, Section 8.4.6 (S. Israel)
      (4) pressure vessel integrity (S. Israel)
         (i) B&W Thermal-Mechanical Report
         (ii) revised operating curve for accident conditions

   C. Additional items: (S. Israel)
      (1) core thermocouples (extended range and emergency power supplies)
      (2) demonstration of local manual operability of automatic steam dump valves
      (3) evaluation of SLBIC system for steam line break
      (4) evaluation of overfeeding steam generators

   * D. Lessons learned recommendations to be implemented by B&O: (references refer to page numbers in NUREG-0578)(NRC staff)
      (1) emergency power supply for pressurizer heaters, level indication, PORV and block valves (A-1
      (2) performance testing of PORV and safety valves (A-6)
      (3) direct indication for PORV and safety valves (A-9)
      (4) instrumentation for inadequate core cooling (A-11)
      (5) automatic initiation of AFW/EFW (A-30)
      (6) AFW/EFW flow indication to steam generators (A-32)
      (7) analyses of design and off-normal transients and accidents (A-42)(partially covered in item #3 above)
      (8) shift and relief turnover procedures (A-52)

* - discussion of these items if time permits

ENCLOSURE 2

LIST OF ATTENDEES

Duke Power Company	R. L. Gill (Licensing)
Florida Power Corporation	R. M. Bright (Nuclear Support Specialist)
Sacramento Municipal Utility District	R. A. Dieterich (Senior Nuclear Engineer)
Arkansas Power & Light Company	T. Kilgone (Manager, Availability Engineering) D. G. Mardis (Licensing Engineer) D. H. Williams (Nuclear Operations Engineer)
Toledo Edison Company	J. K. Wood (Associate Engineer)
Consumers Power Company	R. M. Hamm (Midland Nuclear Safety Task Force)
MPR Associates	R. Shawback (Engineer)
Babcock & Wilcox Company	B. J. Short (Project Manager) E. A. Womack (Manager, Plant Design) R. B. Davis (Project Manager) R. C. Twilley, Jr. (Plant Performance Services Engineering) E. R. Kane (Manager Operating Plant Licensing) R. E. Ham (Product Line Manager, Engineering Services)
NRC	D. F. Ross, Jr. (Director, Bulletins & Orders (B&O) Task Force) T. M. Novack (Deputy Director, B&O Task Force) C. J. Heltemes (Group Leader- Proj. Mgt., B&O Task Force) S. Israel (Group Leader-Systems, B&O Task Force) P. R. Matthews (Section Leader-Systems, B&O Task Force) M. A. Cunningham (Probabilistic Analysis) M. E. Mulkey (NRC Staff Counsel) D. L. Davis (NRC Staff Counsel) W. L. Jensen (Analysis Group, B&O Task Force) P. S. Tam (ACRS) J. G. Stampelos (ACRS) J. A. Olshinsky (Lessons Learned Task Force) G. M. Holahan (Lessons Learned Task Force) R. A. Capra (B&W Project Manager, B&O Task Force) R. W. Reid (Chief, Operating Reactors Branch #4)

ENCLOSURE 3

AUXILIARY FEEDWATER RELIABILITY STUDY

AGENDA

INTRODUCTION	E. R. KANE
PROGRAM DESCRIPTION	W. W. WEAVER
SCHEDULE AND SUMMARY	E. R. KANE

ENCLOSURE 4

OBJECTIVES

1. PRESENT GENERAL APPROACH TO RELIABILITY STUDY

2. OBTAIN CLARIFICATION OF ASSUMPTIONS

3. IDENTIFY SCHEDULE

ENCLOSURE 5

GROUND RULES

PERFORM AUXILIARY FEEDWATER RELIABILITY ANALYSIS USING FAULT TREE TECHNIQUES GIVING SYSTEM UNAVAILABILITY CONDITIONED ON:

- $\overline{\text{MFW}}$
- LOOP
- $\overline{\text{AC}}$

MISSION SUCCESS WILL BE DEFINED AS CHANGING STATE OF AUXILIARY FEEDWATER SYSTEM ON DEMAND. AUXILIARY FEEDWATER SYSTEMS ANALYZED AS OF 8/1/79.

ENCLOSURE 6

ANALYSIS WILL

INCLUDE

HARDWARE FAILURES

MAINTENANCE AND TEST CONTRIBUTIONS

INTERFACING SYSTEM FAILURES

OPERATOR ACTIONS AND ERRORS

EXCLUDE

FIRE

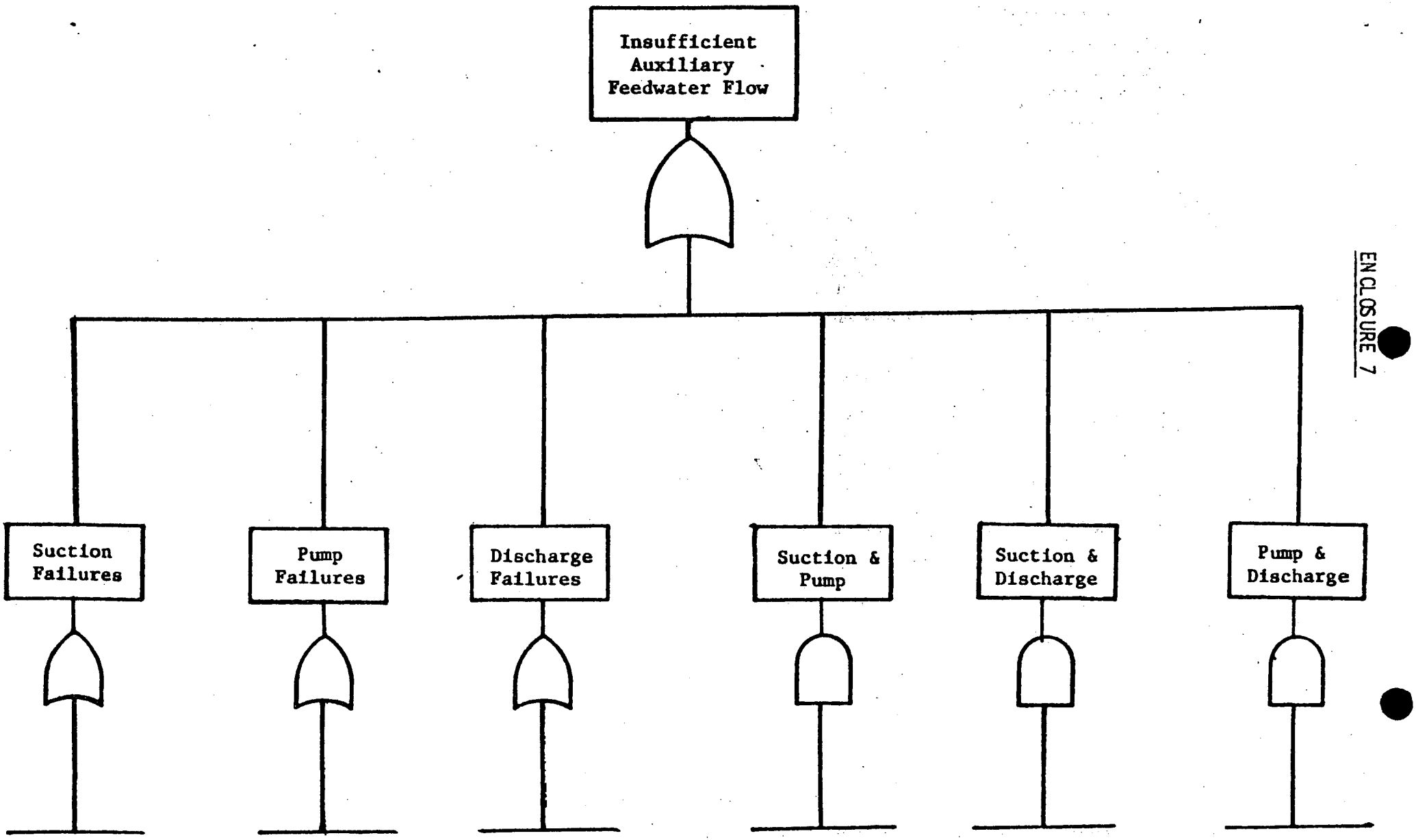
FLOOD

SEISMIC

HIGH ENERGY LINE RUPTURES IN PWR SECONDARY SYSTEMS

WATER HAMMER

RUPTURE OF PIPING, VALVES, TANKS IN AFW SYSTEM


Insufficient Auxiliary Feedwater Flow
Suction Failures
Pump Failures
Discharge Failures
Suction & Pump
Suction & Discharge
Pump & Discharge

ENCLOSURE 7

ENCLOSURE 8

FAULT TREE QUANTIFICATION

FTAP AND KITT

SAMPLE MAY BE USED.

FTAP

MORE VERSATILE

MORE EFFICIENT

THAN PREP.

ENCLOSURE 9

CLARIFICATIONS NEEDED

- $\overline{\text{MFW}}$ - POWER ↑, STEAM ↑
- LOOP - GRID ↓, DIESEL GENERATORS ↑, STEAM ↑
- $\overline{\text{AC}}$ - DC ↑, STEAM/NO DEPENDENCIES ON AC ↑

ADDITIONAL CLARIFICATIONS/ASSUMPTIONS ON HANDOUT.

ENCLOSURE 10

REFERRING TO TABLE 1

Page 20 I. COMPONENT (HARDWARE) FAILURE DATA

A. Valves

- MOV
  - Control Circuit - Valve operator only? $\lambda = 5.5 \times 10^{-6}$/hr?
    - Test consists of opening and closing valve?

B. Pumps

- Control Circuit Electric Pump λ = ? Quarterly and monthly tests give inconsistent failure rates
- Control Circuit Turbine Pumps λ = ?

C. Actuation instrumentation λ = ? per train
Q = ? for logic 1 out of 2

Page 21 II. TEST AND MAINTENANCE OUTAGE CONTRIBUTORS

$$Q_{test} \sim \frac{(\#\ hrs/test)(\#\ tests/yr)}{\#\ hrs/yrs}$$

hrs/yr = calendar or operating time

tests/yr = generic or specific; generic = ?

Q diesel due to test = ? Why are diesels unavailable during test?

Instrumentation test frequency = ? Can take credit for placing trains in logic in tripped position while tests are being performed?

$$Q_{maint.} \sim \frac{.22(\#\ hrs/maintenance\ act)}{720}$$

Is PM while unit is down considered in frequency of maintenance acts?

Page 22 III. HUMAN ACTS AND ERRORS

A. Clarify X ≡ No. of valves in population at choice auxiliary feedwater system valves only? Similar as far as MOV or manual? Location factors? Functional factors?

B. More than one valve is affected (coupled errors) - 1×10^{-4}
- Identify requirements for choosing coupled valves. (Any additional factors than those listed under category A. above?)

C. Miscalibration of Sensors/Electrical Relays
- Identical equipment only?
- Δ from 1×10^{-3} to 3×10^{-3} due to checking? Redundant people performing initial operation? What about both of the above, Δ = ?

Page 23 IV. ACTS AND ERRORS OF A POST-ACCIDENT NATURE

A. Do operator failure rates consider that operator has unmistakeable indication; indication requiring some thinking; conflicting indication requiring more thinking; no indication? Indication probabilities used if any.

B. Operator failure rates during stress - Anything more specific than listed in WASH-1400, Table III 6-1?

AUXILIARY FEEDWATER SYSTEM RELIABILITY

TRANSIENT EVENTS		LMFW			LMFW/LOOP			LMFW/LOSS OF ALL AC		
PLANT/#	UNITS	LOW	MED	HIGH	LOW	MED	HIGH	LOW	MED	HIGH

ENCLOSURE 11

TRANSIENT EVENTS — LMFW | LMFW / LOOP | LMFW / LOSS OF ALL AC

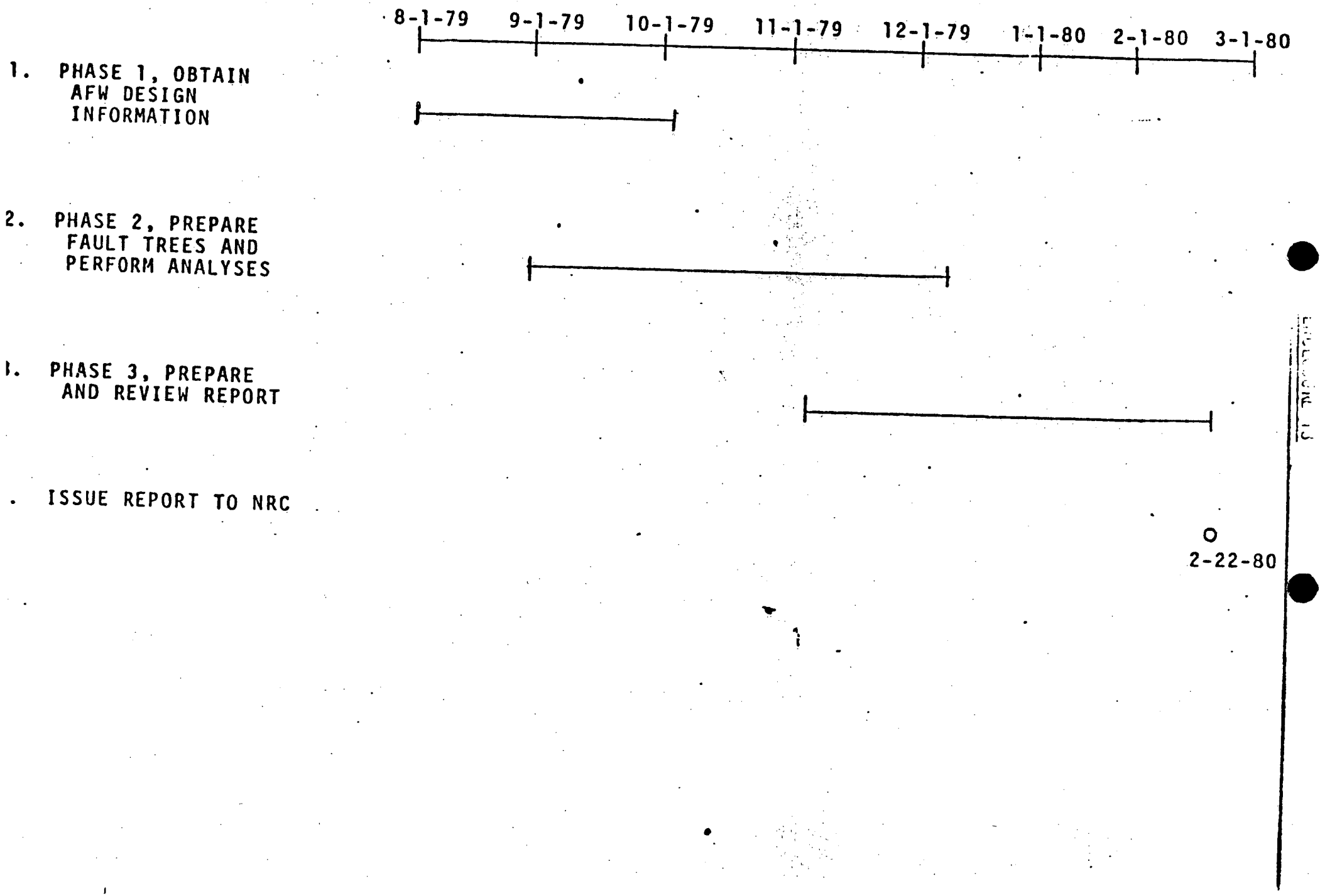
UNIT	# UNITS	LMFW Low	LMFW Med	LMFW High	LMFW/LOOP Low	LMFW/LOOP Med	LMFW/LOOP High	LMFW/LOSS OF ALL AC Low	LMFW/LOSS OF ALL AC Med	LMFW/LOSS OF ALL AC High
1	1									
2	2									
3	1									
4	1									
5	1									
6	1									
7	1									
8	2									
9	1									
10	2									
11	1									
12	1									
13	1									
14	1									
15	2									
16	1									
17	1									
18	1									
19	1									
20	2									
21	2									
22	2									
23	1									
24	2									
25	1									

$\Sigma_i = 33$

→ ORDER OF MAGNITUDE IN UNAVAILABILITY REPRESENTED BY THE INDIVIDUAL POSSIBLE EVENTS OF INTEREST

ENCLOSURE 12

SCHEDULE FOR AFW RELIABILITY ANALYSIS



ENCLOSURE 14

ABNORMAL TRANSIENT OPERATIONAL GUIDELINES

AGENDA

INTRODUCTION	E. R. KANE
PROGRAM DESCRIPTION	E. A. WOMACK
1. GENERAL APPROACH	
2. GUIDELINE STRUCTURE	
3. TRANSIENTS TO BE EVALUATED	
4. SCHEDULES	
EVENT TREE METHODOLOGY	J. J. KELLY

ENCLOSURE 15

OBJECTIVES

1. PRESENT GUIDELINE STRUCTURE
2. PRESENT TRANSIENTS TO BE EVALUATED
3. PRESENT SCHEDULE
4. PRESENT EVENT TREE APPROACH AND METHODOLOGY

ENCLOSURE 16

LESSONS LEARNED TASK FORCE RECOMMENDATION

PROVIDE THE ANALYSIS, EMERGENCY PROCEDURES, AND TRAINING TO SUBSTANTIALLY IMPROVE OPERATOR PERFORMANCE DURING A SMALL BREAK LOSS-OF-COOLANT ACCIDENT.

PROVIDE THE ANALYSIS, EMERGENCY PROCEDURES, AND TRAINING NEEDED TO ASSURE THAT THE REACTOR OPERATOR CAN RECOGNIZE AND RESPOND TO CONDITIONS OF INADEQUATE CORE COOLING.

PROVIDE THE ANALYSIS, EMERGENCY PROCEDURES, AND TRAINING TO SUBSTANTIALLY IMPROVE OPERATOR PERFORMANCE DURING TRANSIENTS AND ACCIDENTS, INCLUDING EVENTS THAT ARE CAUSED OR WORSENED BY INAPPROPRIATE OPERATOR ACTIONS.

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PARAGRAPH 2.1.9

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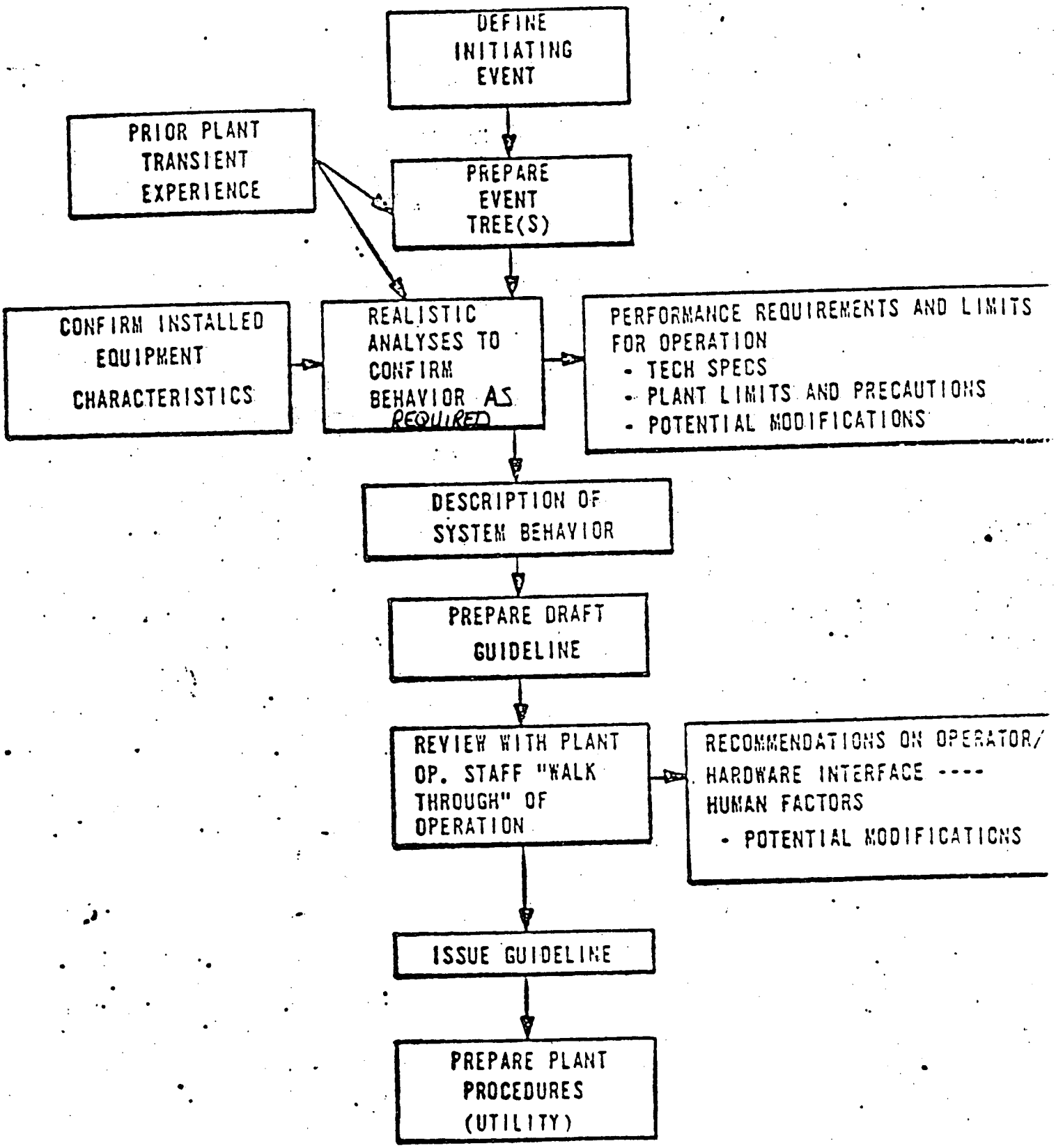
ENCLOSURE 17

Abnormal transient operation guidelines



INITIAL PREPARATION OF GUIDELINES

FIGURE 1-1

A02

ENCLOSURE 18

B&W Operating Guideline Concept

- Procedural outline and system behavior basis a single, revision-controlled document.
- Guidelines keyed to event categories.
- Initial responses to be event - independent.
- Event recognition and diagnosis keyed to a few fundamental indications.

B & W operating guideline concept

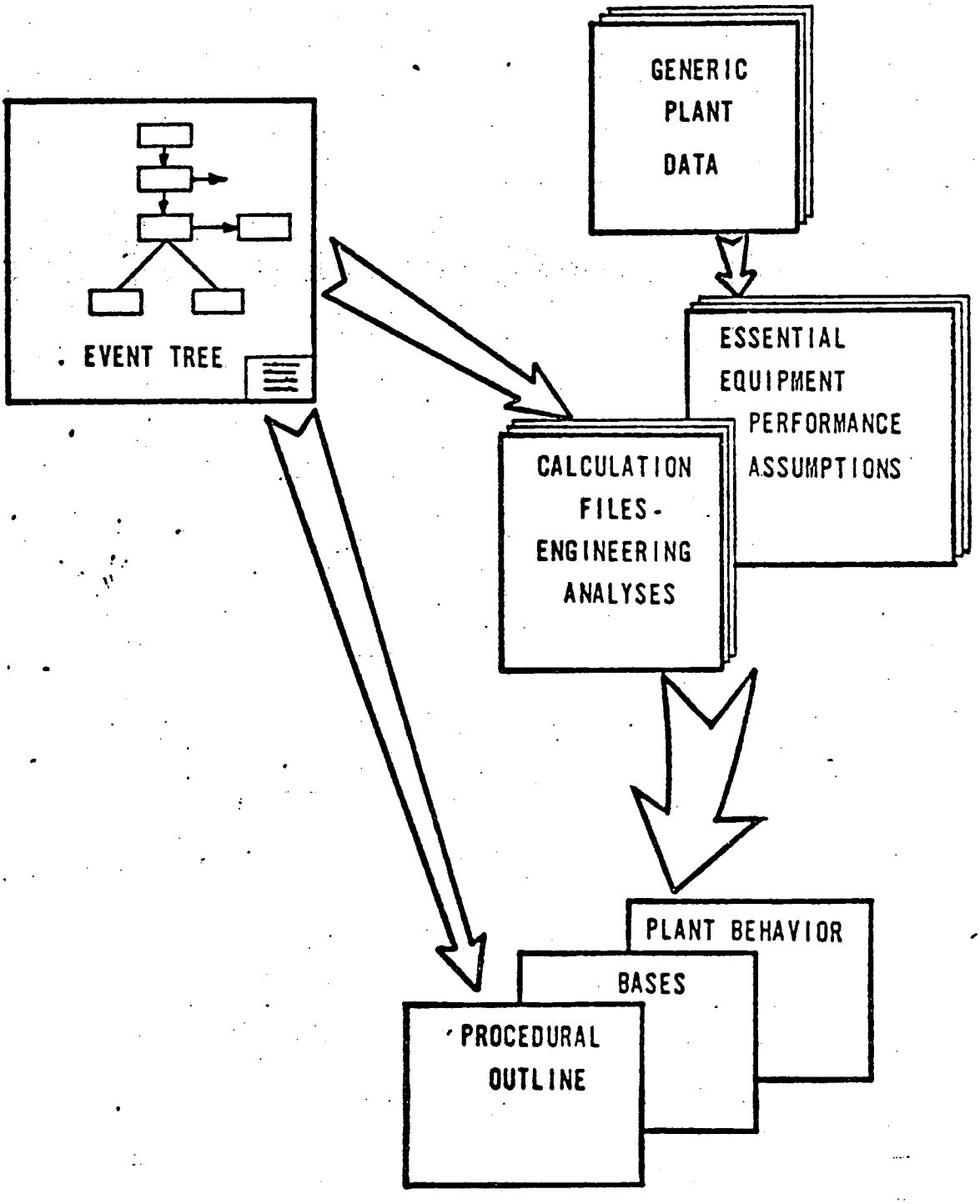
PART I: PROCEDURAL	1.0 SYMPTOMS	EVENT RECOGNITION SIGNALS FROM AVAILABLE ALARMS AND INSTRUMENTATION
	2.0 IMMEDIATE ACTIONS	ACTIONS TO BE TAKEN IN IMMEDIATE RESPONSE TO THE SYMPTOMS
	3.0 PRECAUTIONS	LIMITS TO BE OBSERVED IN THIS EVENT
	4.0 FOLLOW-UP ACTIONS	SPECIFIC ACTIONS TO ACCOMPLISH SAFE RECOVERY
PART II: TECHNICAL BASIS	5.0 BASES	DESCRIPTION OF THE CASES CONSIDERED AND THE OPERATIONAL STRATEGY FOR EACH (EVENT TREES). DESCRIPTION OF THE OPERATIONAL OBJECTIVES AND PLANT FEATURES USED.
	6.0 PLANT RESPONSE	DESCRIPTION OF THE PLANT BEHAVIOR EXPECTED DURING THIS EVENT.
	7.0 REFERENCES	REFERENCE TO THE ENGINEERING DESIGN BASIS - ESSENTIAL EQUIPMENT PERFORMANCE ASSUMPTIONS - SYSTEM ANALYSES

ENCLOSURE 19

Mad

ENCLOSURE 20

Operating guideline
Documentation structure
For each event



MAC

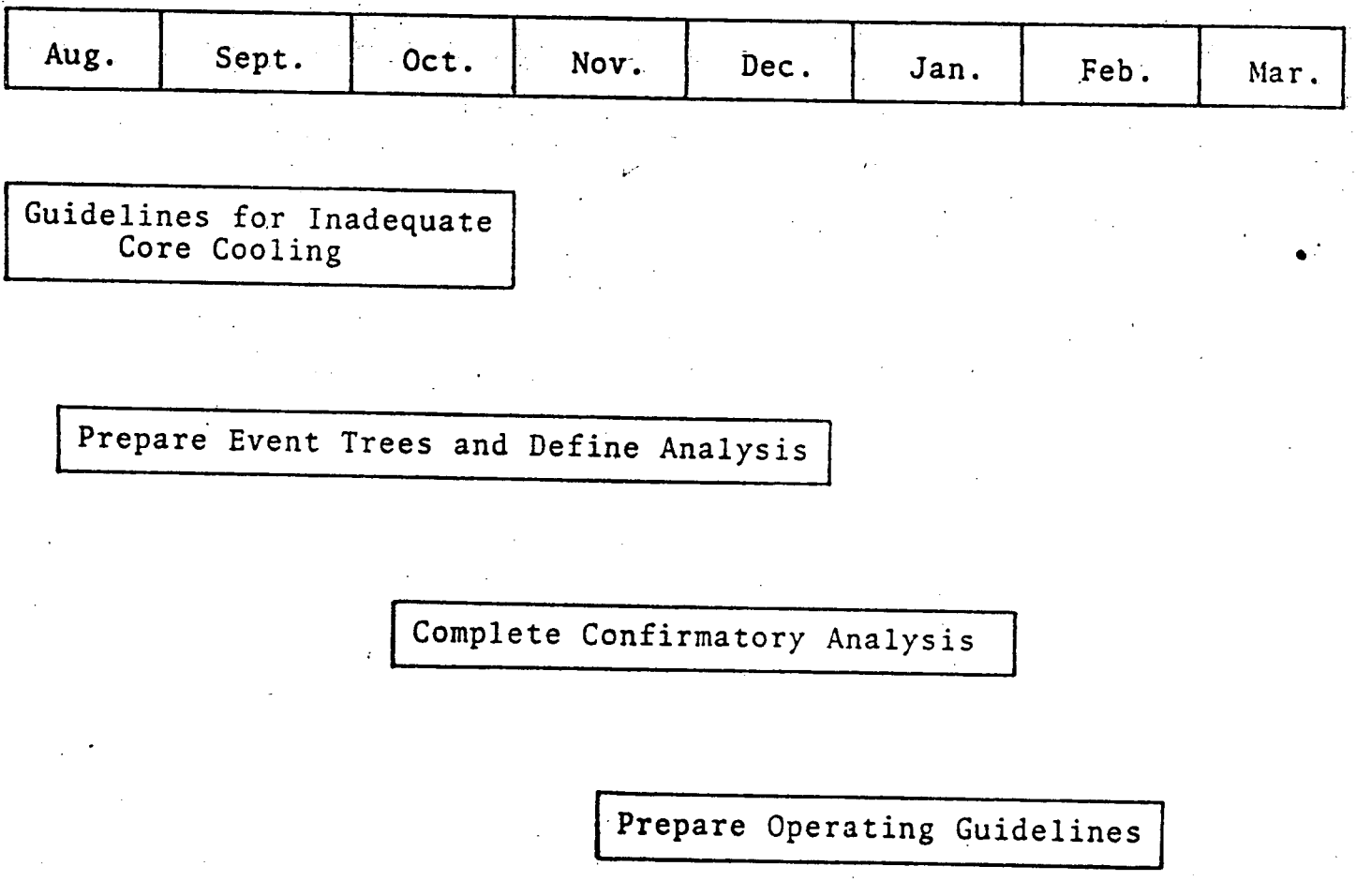
ENCLOSURE 21

TRANSIENTS SELECTED FOR GUIDELINE PREPARATION

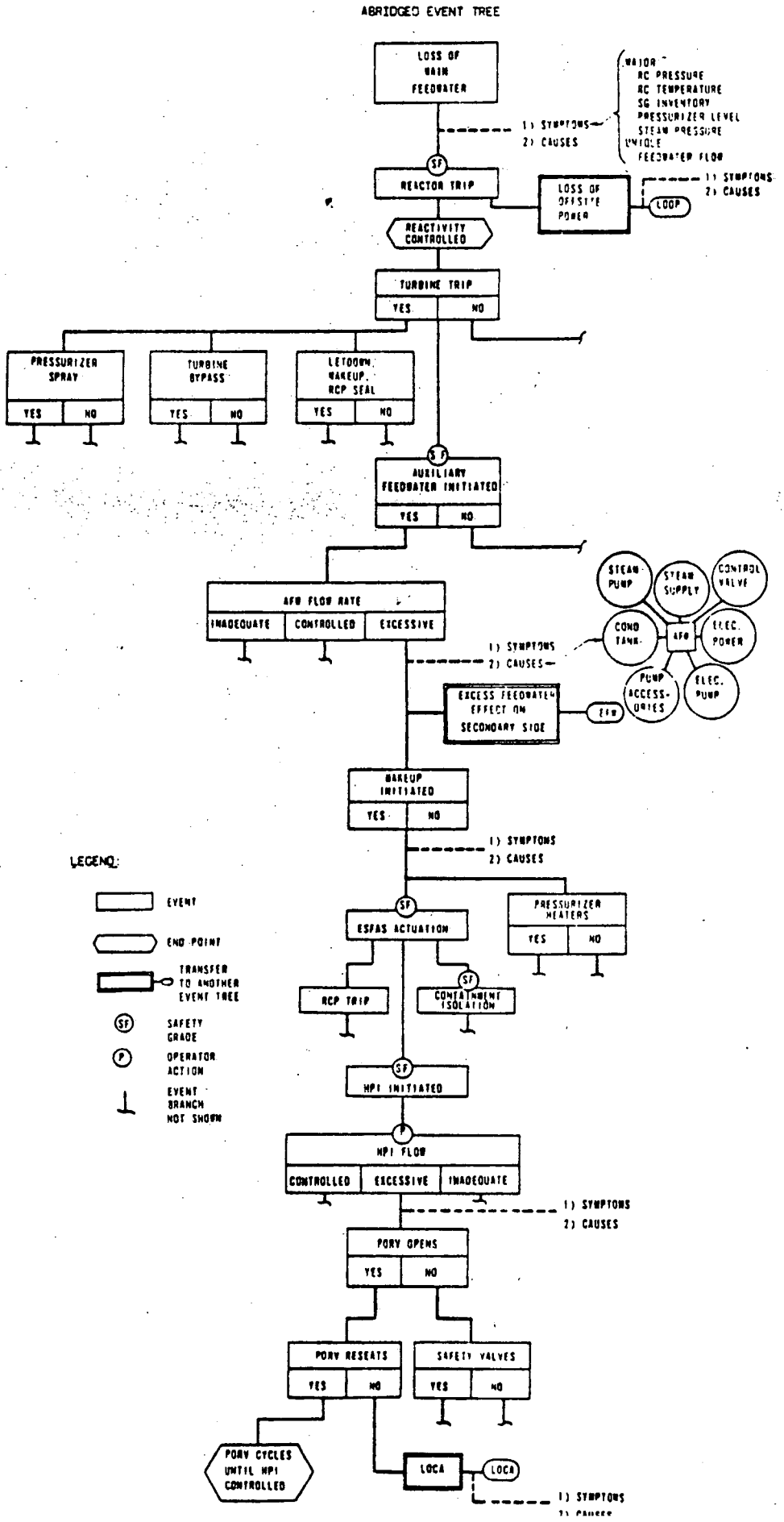
- INCREASE IN HEAT REMOVAL BY SECONDARY SYSTEM
  - SMALL STEAM LEAKS
  - EXCESSIVE FEEDWATER FLOW
- DECREASE IN HEAT REMOVAL BY SECONDARY SYSTEM
  - LOSS OF FEEDWATER
  - LOSS OF STATION POWER
- DECREASE IN REACTOR COOLANT INVENTORY
  - STEAM GENERATOR TUBE RUPTURE
  - INADEQUATE CORE COOLING
  - LOSS OF COOLANT

ENCLOSURE 22

ABNORMAL TRANSIENT OPERATING GUIDELINES SCHEDULE



ENCLOSURE 23



ENCLOSURE 24

GROUNDRULES
FOR
EVENT TREES & ANALYSES

OBJECTIVES:

- REALISTIC FORECASTING OF EVENT
- STRUCTURED TO PRODUCE GUIDELINES

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1. INITIAL CONDITIONS

- PRIOR OPERATION AT STEADY POWER

2. FAILURES

- INITIATING EVENT (+) CONSEQUENTIAL ACTIVE FAILURES
- OPERATOR ERRORS (+) CONSEQUENTIAL ACTIVE FAILURES

DEFINITIONS: CONSEQUENTIAL FAILURE IS A FAILURE OF ANY ACTIVE FLUID SYSTEM COMPONENT CHALLENGED BY THE EVENT.

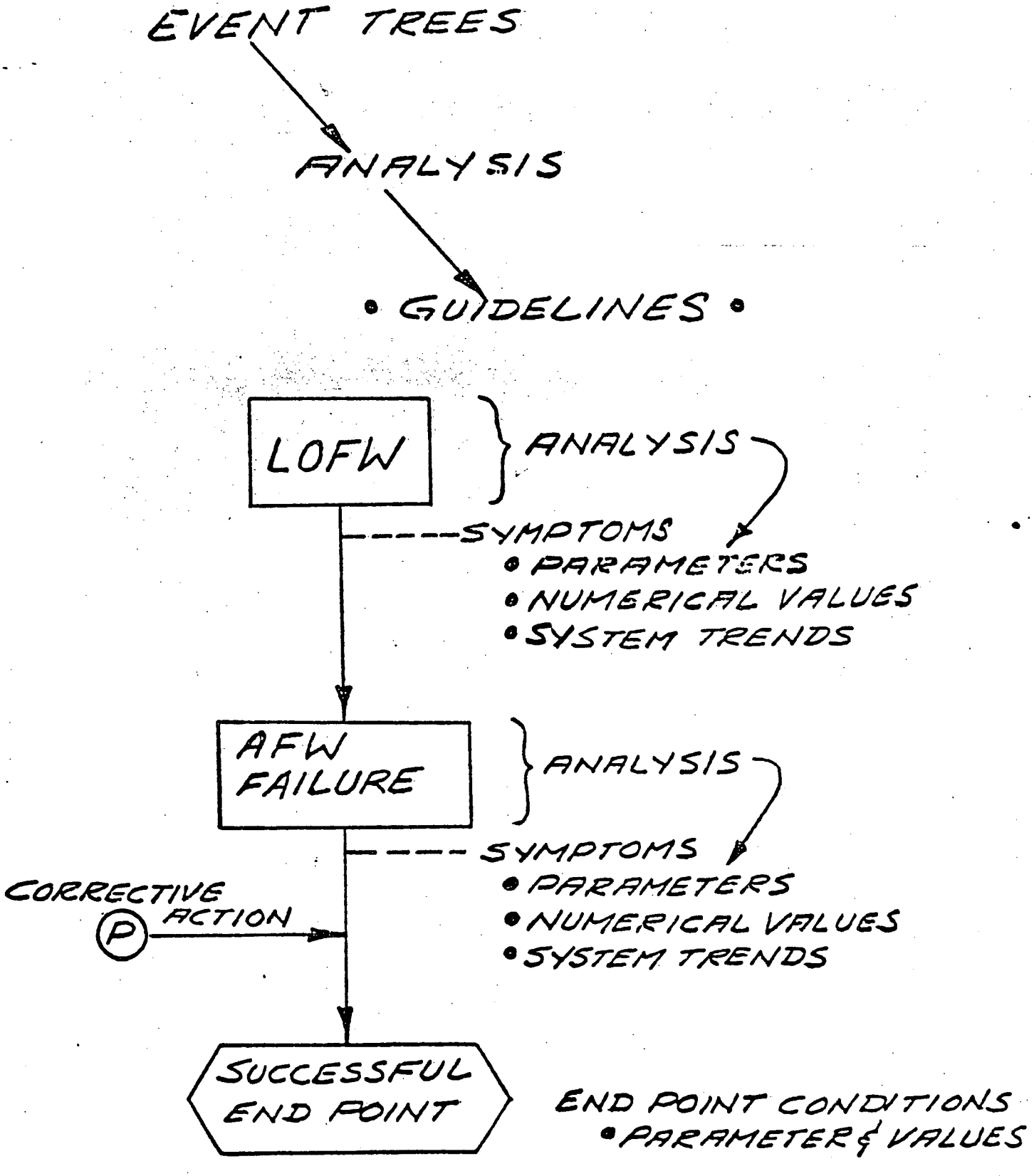
3. OPERATOR ACTION

- CORRECT ACTION
- NO ACTION
- INCORRECT ACTION
- TIME DELAY = TIME TO REACT

4. END CONDITION

- HOT OR COLD SHUTDOWN

ENCLOSURE 25



ENCLOSURE 26

INADEQUATE CORE COOLING

- NUREG-0578

  Provide the analysis, emergency procedures, and training needed to assure that the reactor operator can recognize and respond to conditions of inadequate core cooling.

- B&W GOALS (BASED UPON TMI-2 EXPERIENCE AND ANALYSIS)

  - Describe symptoms for operator to recognize inadequate core cooling with existing instrumentation.
  - Develope guidelines for operator action to recover.
  - Identify any additional instrumentation to indicate inadequate core cooling.

- OUTPUT PRODUCT

  - Operating guidelines to prescribe instrumentation limits and operator action to recover from a condition of inadequate core cooling - October 31, 1979.
  - Suggested changes to provide improved indication of inadequate core cooling - January 31, 1980.

ENCLOSURE 27

RECOGNITION AND RECOVERY

- DEFINE INADEQUATE CORE COOLING
  - Begins when RV water level falls below top of the core with RC Pumps off.
  - Is followed by an increasing fuel rod clad temperature.

- IDENTIFY RESPONSE OF AVAILABLE INSTRUMENTATION
  - Increasing fuel rod clad temperature detected by
    1) Incore Thermocouples.
    2) Hot Leg RTD's.

- PRESCRIBE LIMITING VALUES FOR INSTRUMENTATION READOUT
  - Maximum allowable temperatures.
  - Correlated to need for operator action.

- DEFINE OPERATOR ACTION FOR RECOVERY
  - More HPI flow.
  - Start RC Pumps.
  - OTSG depressurization.

- DEFINE CRITERIA FOR SUCCESSFUL RECOVERY
  - Core heat removal.
  - RC pressure control.
  - RC inventory control.

based upon available instrumentation

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