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TECHNICAL BASES DOCUMENT

VOLUME 4

GENERIC EMERGENCY OPERATING GUIDELINE
IMPLEMENTATION GUIDE

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for

The B&W Sites for:

AmerGen Energy Company, LLC
Duke Energy Corporation
Entergy Operations, Inc.
FirstEnergy Nuclear Operating Company
Progress Energy – Florida

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List of Acronyms/Abbreviations

%	Percent
°F	Degree Fahrenheit
ΔT	Delta Temperature
~	Approximately
ACP	Approved Change Package
ACRS	Advisory Committee on Reactor Safeguards
ADV	Atmospheric Dump Valve
ANO-1	Arkansas Nuclear One, Unit 1
AP&L	Arkansas Power and Light
APPR	Approved
ARTS	Anticipatory Reactor Trip System
ATOG	Abnormal Transient Operating Guideline
ATWS	Anticipated Transient Without Scram
B&W	Babcock and Wilcox Company
B&WOG	B&W Owners Group
BWNS	Babcock and Wilcox Company Nuclear Services
BWNT	Babcock and Wilcox Company Nuclear Technology
CD-ROM	Compact Disc Read Only Memory
CFT	Core Flood Tank
CR	Crystal River
CR-3	Crystal River Nuclear, Unit 3
DBA	Design Basis Accident
DCP	Draft Change Package
DHRS	Decay Heat Removal System
ECCS	Emergency Core Cooling System
EFIC	Emergency Feedwater Initiation and Control
EFW	Emergency Feedwater
EHT	Excessive Heat Transfer

List of Acronyms/Abbreviations (cont'd)

EMER	Emergency
EOP	Emergency Operating Procedure
ES	Engineered Safeguards
FOIA	Freedom of Information Act
FP	Full Power
FTI	Framatome Technologies, Incorporated
FW	Feedwater
GE	General Electric Company
GEOG	Generic Emergency Operating Guideline
GPM	Gallons Per Minute
GPU	General Public Utilities Company
GTG	Generic Technical Guideline
GUID	Guideline
GVVG	Generic EOP Verification and Validation Guideline
HPI	High Pressure Injection
HPIC	High Pressure Injection Cooling
HR	Hour
HSPS	Heat Sink Protection System
I&C	Instrument and Control
ICC	Inadequate Core Cooling
IG	Implementation Guideline
INCL	Include
INEL	Idaho National Engineering Laboratories
INPO	Institute for Nuclear Power Operations
K	Thousand
LBLOCA	Large Break Loss of Coolant Accident
LHT	Loss of Heat Transfer
LOCA	Loss of Coolant Accident
LOFW	Loss of Feedwater

List of Acronyms/Abbreviations (cont'd)

LOOP	Loss of Offsite Power
LPI	Low Pressure Injection
LSCM	Loss of Subcooling Margin
MCR	Main Control Room
MFW	Main Feedwater
MS	Main Steam
MSIV	Main Steam Isolation Valve
MSLB	Main Steam Line Break
MSSV	Main Steam Safety Valve
MU	Make Up
MUP	Make Up Pump
NRC	Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
NSSS	Nuclear Steam Supply System
ONS	Oconee Nuclear Station
ORIG	Original
OSC	Operator Support Committee
PARA	Paragraph
PC	Proposed Change
PGP	Procedure Generation Package
PM	Project Manager
PORV	Pilot Operated Relief Valve
PRA	Probabilistic Risk Assessment
PSIG	Pound Per Square Inch Gauge
PSTG	Plant Specific Technical Guideline
PSTVS	Plant Specific Technical Verification Specification
PSWG	Plant Specific Writer's Guide
P-T	Pressure and Temperature
PTS	Pressurized Thermal Shock

List of Acronyms/Abbreviations (cont'd)

PZR	Pressurizer
QA	Quality Assurance
RB	Reactor Building
RBS	Reactor Building Spray
RC	Reactor Coolant
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
REF	Reference
REV	Revision
ROCK	Rockville
RPS	Reactor Protection System
RVLIS	Reactor Vessel Level and Indication System
SAD	Safety Auxiliary Diagram
SBLOCA	Small Break Loss of Coolant Accident
SCM	Subcooling Margin
SDM	Shutdown Margin
SECT	Section
SER	Safety Evaluation Report
SFRCS	Steam Feed Rupture Control System
SG	Steam Generator
SGTR	Steam Generator Tube Rupture
SMUD	Sacramento Municipal Utilities District
SP-GEOG	Special Generic Emergency Operating Guideline
SPPS	Secondary Plant Protection System
SSD	Safety Sequence Diagram
SU	Start Up
T.S.	Technical Specifications
Tave	Average Temperature
TBD	Technical Bases Document

List of Acronyms/Abbreviations (cont'd)

TBV	Turbine Bypass Valve
TED	Toledo Edison Company
Telecon	Telephone Conference
Tincore	Incore Temperature
TM	Technical Manager
TMI	Three Mile Island
TMI-2	Three Mile Island, Unit 2
T-S	Tube-To-Shell
V&V	Verification and Validation
VSSV	Vital System Status Verification

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Chapter I

Introduction

This volume of the Technical Basis Document (TBD), i.e., Generic Emergency Operating Guideline (GEOG) Implementation Guide (IG), provides information and expectations on the interpretation, implementation and use of the GEOG. Such information and expectations are in addition to any found in volumes 1 through 3 of the TBD.

These expectations include those of the B&W Owners Group (B&WOG), as represented by the Operator Support Committee (OSC), and the B&W plant NSSS vendor (now Framatome ANP, FANP). The B&WOG OSC has since transitioned to B&W site representatives on the Westinghouse Owners Group (WOG) Procedures Working Group (PWG). However, references to the B&WOG and the OSC are retained in this volume as they relate to historical agreements. These expectations have resulted in part from interactions between the B&WOG and the Nuclear Regulatory Commission (NRC) Staff during the development of GEOG and its predecessor documents, the TBD and the Abnormal Transient Operating Guidelines (ATOG). This Implementation Guide is also intended to record the understandings, agreements and commitments resulting from NRC Staff interactions.

Another factor has been the lessons learned from experiences including EOP inspections. Historically, the B&WOG approach to EOPs has been characterized by plant specific implementation of generic guidance. This approach offers latitude for plant EOPs to incorporate specific plant attributes and operating philosophies. However, this discretion has also permitted diversity to exist between the B&W sites in EOP implementation strategy and method. Experience has shown that such diversity can have significant effects. For example, because each plant's EOP program has been largely autonomous, applying the collective judgement of the B&WOG or sharing the lessons learned and experiences from other utilities can be difficult. The OSC had concluded that, by making implementation expectations more explicit in this Implementation Guide, such information exchange can be facilitated.

Additionally, by its nature, the high level B&WOG approach differs dramatically from the prescriptive approach of other NSSS owners groups. This difference has complicated B&WOG interactions with the NRC. For example, the B&WOG program experienced a protracted process of NRC review. Throughout this process, the NRC examined the B&WOG approach and made numerous agreements affecting its direction. However, this process has not previously resulted in documenting NRC conclusions on the B&WOG program nor has it provided an easily accessible record of the numerous agreements which have been integral to its character. Also, the NRC separately developed an EOP inspection procedure based on the approach of other NSSS owners groups. The B&WOG believes that NRC inspectors can use the TBD SER (Reference R31) as a basis to apply a different approach to EOP inspection which is required by the B&WOG EOP guidance process. Thus, the OSC has documented, in this TBD volume, the record of such NRC agreements to serve as a basis for future interactions with NRC EOP inspectors.

Along with the aforementioned topics, this Implementation Guide includes a number of additional topics on which greater consistency is desired between the B&W site representatives. The B&W site representatives believe that in preparing this TBD volume, the EOP programs of the B&W sites will be improved both individually and collectively.

Chapter II

Implementation Philosophy and Expectations

1.0 Introduction

This chapter defines the general expectations of FANP and the B&W site representatives for the use and implementation of the TBD.

Until now these expectations existed as an important but largely undocumented set of common perspectives and standard practices which developed in parallel with the evolution of the B&WOG EOP bases. These expectations include the intent of the authors of the bases and lessons learned by the B&WOG and FANP during the process of EOP development and maintenance.

These expectations reflect the significant investments by the B&WOG to develop the TBD. They include activities such as the Integrated Systems Tests and the extensive analytical work which forms the bases for the TBD, and ultimately the EOPs. These expectations also fulfill B&WOG commitments to the NRC that resulted from numerous interactions with the NRC during development of the TBD.

For these reasons, it is expected that the B&W utilities will continue to meet these expectations as they implement and maintain their EOPs.

2.0 Purpose of the TBD

Regulatory requirements provide that licensees develop guidelines for operator actions in EOPs based on analyses of plant events and responses. For the B&WOG, this purpose was initially accomplished by the plant specific TBD predecessor document, ATOG. The TBD was initially created to support long-term maintenance of the ATOG, but was subsequently expanded to supersede and replace ATOG. Chapter IX provides a detailed historical account of the events leading to the present TBD.

The purpose of the TBD is:

- To provide vendor guidance for strategies and action priorities to mitigate abnormal transients covered by plant EOPs.

- To provide the bases for abnormal transient mitigation strategies and priorities with the intent to improve utility understanding of the guidance, facilitate regulatory reviews, and to promote safe, consistent technical operation of the B&W plants.

- To provide an efficient long-term mechanism for the continuing maintenance of EOPs.

The TBD also provides some guidance for plant operations outside the scope of EOPs, and thus not provided in Volume 1, e.g., guidance for loss of DHR cooling.

3.0 Expectation for the Use of TBD

B&W utilities are expected to use the TBD in a program of continuing EOP maintenance. Such a program should assure that the EOPs (and all supporting documents) fulfill the mitigative strategies and priorities, or if not, to identify and justify deviations in accordance with applicable provisions discussed in Chapter V.

It is incumbent upon the utilities to assure that this expectation is met at all times and under all conditions, whether the EOPs are being revised to account for TBD revisions or are being revised for other plant specific reasons.

4.0 NSSS Vendor Guidance

The TBD provides the NSSS vendor guidance for B&W plant EOPs. The TBD is not intended to address equipment operation or issues outside the scope of the NSSS vendor which may nevertheless be required parts of the plant EOPs. The absence of such topics from the TBD is not intended to diminish the utility's obligation to address these matters in accordance with applicable requirements. Utilities are expected to assure that addressing such matters does not compromise accomplishment of TBD mitigation strategies.

5.0 Sources of Guidance/Definitions

5.1 Sources of Guidance

The TBD provides high-level, symptom-oriented guidance for EOPs in three volumes, described as follows:

- Volume 1, "Generic Emergency Operating Guidelines" (GEOG), is a functional example of how the TBD guidance drawn from the bases in Volume 3 can be assembled into one overall transient mitigative guideline. It represents the vendor-preferred path among the available, technically-acceptable options identified in Volume 3.

- Volume 2, "GEOG Step Bases," provides a concise summary of bases information for each GEOG step and a link to the extended bases and references in Volume 3.

- Volume 3, "Bases," is a compilation of technical bases, including analytical interpretations, industry experience and initiatives, and references, which identify and provide the foundation and rationale for available operator actions to mitigate transients at B&W licensee plants in accordance with NRC requirements.

- Volume 4, "GEOG Implementation Guide," provides information and expectations on the interpretation, implementation and use of the GEOG. Such information and expectations are in addition to any found in volumes 1 through 3 of the TBD.

5.2 EOP Guidance Is Based on the TBD in Whole

The mitigation strategies and action priorities for symptom-based event response are established by the TBD as a whole, including the GEOG, which provides one example to illustrate the application of these strategies and priorities. Thus, the GEOG is an integral part of the TBD and is intended to be used only with full knowledge of and reference to the entire TBD.

It is expected that B&W utilities will take actions necessary to assure that personnel responsible for EOP development and maintenance understand and remain familiar with all volumes of the TBD.

5.3 Use of Technically Acceptable Alternatives

The GEOG represents a functional example of how the bases in Volume 3 can be assembled into one mitigative guideline. Where technically acceptable alternatives exist in Volume 3, the B&WOG agreed with the NRC to include in GEOG the "vendor-preferred" guidance. This choice does not lessen the viability of other options in the TBD which remain "vendor approved." In implementing EOPs, the B&W utilities have, at their discretion, the option of choosing such technically acceptable alternatives from the TBD in lieu of the guidance in the GEOG. Under agreement with the NRC, this choice represents an identifiable deviation but invokes a special, reduced form of justification (Chapter V).

Utilities may also choose to use alternatives, if deemed technically acceptable, beyond those found in the TBD. In this event, utilities are to identify such cases as deviations and to provide a full technical justification for the deviation in accordance with the requirements in Chapter V.

5.4 Definition of "Current" Guidance

The TBD is a living document, continually undergoing review, revision and improvement. It is therefore necessary to establish the boundaries of guidance that will be considered as the working standard for application to plant EOPs. This is defined as the "current" guidance.

The current guidance is comprised of the following:

- The latest revision of the TBD.
- The interim guidance associated with all approved Proposed Changes (PC) to the TBD (Chapter VII). Interim guidance is only included in a PC when the subject is regarded as of such importance or urgency that its implementation should not be delayed until the next TBD revision.
- Approved Change Packages as noted below.

Approved PCs that do not have interim guidance are not included in the current guidance. The basis for this exclusion is that such approved PCs are often ideas offered (and approved) for investigation and/or consideration. They are not guidance suitable for incorporation into the TBD.

TBD change packages, which have been approved by the B&W site representatives in accordance with the TBD change control procedure of Chapter VII are not part of the current guidance and, therefore, their implementation is optional, with two exceptions. The first exception is Approved Change Packages (ACPs) that formalize previous "interim" PC guidance into permanent TBD guidance. The "interim" PC guidance associated with these ACPs is part of the current guidance and should be implemented when these ACPs are issued. Implementation of the remainder of the guidance associated with these ACPs is not part of the current guidance and, therefore, is optional. The second exception is for ACPs identified by FANP as containing information that should be implemented without waiting for the next scheduled TBD revision, even though the associated PC did not contain interim guidance. Past examples of such ACPs would be 98-01 with revised ICC curves and 00-12 with revised RCP restart restrictions. There will be similar cases where there is no identified interim guidance prior to developing the change package, but the approved changes contain new information that should be implemented without delay. All such ACPs will be explicitly identified by the associated transmittal letters. Implementation of any ACP, including "interim PC" guidance, should be accomplished in accordance with Chapter V, Deviations and Their Justifications. This implementation philosophy was established by the B&WOG in recognition of the time and expense needed to revise EOPs. This process is one that also includes extensive efforts to maintain supporting documentation as well as the preparations for and conduct of operator training. Such efforts may take months and must be conducted on a basis of non-interference with ongoing plant operations and training. Because it is a living document, TBD changes may be developed and approved frequently. But implementation of changes into the EOPs on such a schedule would be an unreasonable hardship on utilities and could have negative consequences on the abilities of operators to perform essential duties in times of emergency. The B&WOG elected therefore to constrain current guidance to

include only full revisions of the TBD and specific guidance which is considered to be of significant urgency.

The B&WOG developed a detailed written procedure for change control of the TBD. It includes information on the processing of PCs and TBD change packages which is useful in interpreting the foregoing definition of current guidance. This procedure is provided in Chapter VII.

6.0 Implementation Process Expectations

6.1 Use of Procedures and Documentation

During the early stages of the B&WOG EOP guidance development, it was recognized that specific utility EOP programs and documentation would be necessary to accomplish EOP guidance implementation in a manner consistent with B&WOG and regulatory expectations. This recognition was recorded in the B&WOG Recommendation Tracking System Items RG-002-OPS and RG-004-OPS. These recommendations required, respectively, that utilities develop and/or revise procedures to provide for incorporation of TBD guidance into EOPs and develop a system for documenting the identification and justification for deviations between the TBD and EOPs. All B&WOG utilities closed these action items, signifying that the recommended actions had been completed.

It is therefore expected that the implementation process expectations described herein following paragraphs will be administered in accordance with existing plant specific EOP program requirements.

As stated, FANP and the B&WOG acknowledged that the extended process entailed by TBD implementation requires both significant expense and time for the utilities and so have explicity taken this into account in the development of the existing TBD change control process. Therefore, it is expected that utility procedures and documentation requirements governing TBD implementation will include specific provisions for timeliness and that utilities will abide by these provisions in implementing the TBD.

6.2 TBD Maintenance

Multiple copies of the TBD have been provided to the B&W utilities as complete, controlled document sets. TBD revisions may be released as entire reissues of the TBD, in one or more affected volumes or as individual change pages.

Upon receipt of TBD revisions, utilities are expected to incorporate them into appropriate documents as governed by corresponding document control procedures. Except for this official revision process, utilities are expected to maintain their TBD copies as controlled

documents which ensure the documents remain unaltered and that only the appropriate revision level of the TBD is used as the official source of reference for EOPs.

Uncontrolled copies, including electronic versions of the TBD, may be used as working copies.

Similarly, utilities are expected to maintain a formal documented system for receiving and recording approved PCs with interim guidance, ACPs and the latest revision of the TBD.

6.3 Utility Review of TBD Revisions and PCs

Upon receipt of a TBD revision, an approved PC with interim guidance or an ACP, utilities are expected to conduct a review to ensure a thorough understanding of the revision and the scope and affect of the changes on the TBD.

The B&W utilities participate actively through interactive and integrated processes in the TBD change control process. However, as this process relates to plant specific implementation of TBD guidance, i.e., into EOPs, each utility utilizes its own specific internal processes. Thus, it is incumbent upon the utilities to ensure that a full understanding of TBD changes has been achieved. If such an understanding is not achieved to the satisfaction of the utility, it is expected that the utility will notify FANP to obtain clarification. Such notification will not only help the affected utility, it may also alert the site representatives and FANP to unrecognized difficulties at other B&W utilities or point to needed improvements in the TBD.

6.4 EOP Evaluation

The B&W utilities are expected to perform a functional evaluation of EOPs with respect to the current TBD guidance. This evaluation will establish that:

> Plant EOPs fully reflect the scope of the current guidance, including all applicable changes, and have the effect of accomplishing the mitigation strategies and priorities established in the current guidance, or otherwise identify the EOP changes required or deviations documented to accomplish this result.

The scope of this evaluation necessarily depends on the scope of the revision to the current TBD guidance. Utilities are expected to perform an evaluation at a depth commensurate with the revision, which may range from a narrow scope (for limited changes to the TBD or for PCs with interim guidance) to a complete re-review of the TBD (for wholesale revision of the TBD). Following this evaluation, the utilities are expected to perform a verification and validation of resulting EOP changes commensurate with the guidance provided in Chapter VI.

6.5 Documentation of Deviations

It is expected that changes to the EOPs (and all supporting documents) indicated as a product of the foregoing evaluation will be incorporated into the EOPs in the manner prescribed by the approved plant specific EOP programs. If the utility elects not to implement such changes to the EOP, it is expected that the utility will document the resulting deviations per Chapter V.

7.0 Expected Variability in EOPs

The above description of implementation process expectations is intended to accommodate a significant degree of variability between B&W plant EOPs. This variability is a historic legacy and results from a number of factors including the following:

- B&W plant EOPs were created from ATOG, which provided high-level, engineering guidance for EOPs. By this nature, and by the B&WOG's philosophy of EOP development, ATOG provided latitude for accommodation of plant specific attributes and permitted significant plant-to-plant variability. The TBD came after ATOG, initially as a support document. With the addition of GEOG, the TBD eventually replaced ATOG, but after the EOPs had been created. Thus GEOG was essentially a retrofit to existing EOPs and was not intended (with NRC agreement) to cause the EOPs to be rewritten.

- The GEOG was created as one example of how the guidance in the previous TBD could be assembled into an EOP guideline. It was not intended to sharply constrain the plant specific EOPs or to eliminate diversity between them, nor was it suited by its nature as a high-level document to do so.

- The GEOG is not intended to be a procedure nor a procedure model. It is intended to provide high-level, engineering guidance for EOP development, adapted by the utilities as necessary to incorporate plant specific attributes and operating philosophies. It is anticipated that the utilities will avail themselves of this latitude as they continue to use the GEOG in the future.

- Utilities may choose to use the GEOG directly as a reference for EOPs and/or to substitute technically acceptable alternatives from Volume 3.

- Utilities may also elect to use the GEOG to create a plant specific EOP guideline.

- The specific form and expression of EOPs will depend on plant specific writer's guides which differ between utilities. Use of these guides, or the matter of EOP form and expression including human factors considerations, are not within the scope of the TBD.

- Plant specific analysis.

Chapter III

B&WOG OSC Positions on EOP Related Issues

1.0 Introduction

This chapter documents the positions established by the B&WOG on issues related to TBD and EOP development, use and maintenance. The implementation of these positions may be evident in other TBD volumes, but this chapter is intended to address the issues specifically and define the positions and bases in one central location. These issues differ from those described in Chapter II.D of Volume 3 in that the issues in Volume 3 deal primarily with guideline coverage while the issues described in this chapter deal primarily with guideline and EOP implementation.

The specific issues described in this chapter are:

- Relevance of step sequencing between the GEOG and plant EOPs.
- Accounting for mission doses in EOP activities outside the MCR.
- Bypassing safety systems during EOP performance.
- Performing EOP-type validation and verification (V&V) on procedures referenced by EOPs.

2.0 Step Sequencing

This issue relates to the significance of GEOG step sequencing relative to the sequencing employed in plant specific EOPs. Sequence differences between the GEOG and EOPs are inevitable and may be benign, but to make this determination it is necessary to have a basis to establish if these differences compromise the intent of the guidelines. In addition, current NRC inspection guidance for EOP audits assumes a rigid adherence to GEOG sequencing will exist. This is not the case, and thus it is also important to document the basis for the B&WOG approach to step sequencing.

There are several reasons that sequence differences between the GEOG and the plant EOPs are inevitable, among them:

- The GEOG scope is smaller than the EOP scope; every added EOP step affects sequencing, and typically there will be many added steps.
- EOP sequencing may be modified to achieve better efficiency in operator movement, e.g., due to plant-specific MCR and plant layout.

- Each plant must consider design bases requirements that can affect step sequencing, e.g., initiating RB H_2 monitor and control.

- The GEOG was developed after the plant EOPs. The plant EOPs were developed from ATOG, which was specific to each plant, per plant specific writer's guides. Thus it was impossible to develop a single generic guidance document that would accurately mirror the individual EOP sequencing, nor was it necessary.

In addition to sequence differences being inevitable, the majority of step sequence differences are inconsequential in the successful mitigation of accidents. For this reason, requiring identification of each sequence difference and justification of the difference would be ineffectual and impose an undue burden on EOP maintenance thus detracting from more important needs. Therefore, the B&WOG reached agreement with the NRC during the GEOG development to preclude the necessity of identifying and justifying step sequence differences that did not affect the mitigation strategy (References B48 and B49).

However, it is important to ensure that those few cases, where the sequence difference may be consequential, are identified and adequately justified. This is necessary to ensure effective and complete EOP implementation of the guideline mitigation strategies. Therefore, the B&WOG developed the following elements in a structured approach to this aspect of EOP development, use and maintenance:

Position:

- Step sequencing that is important in achieving the guideline mitigation strategy is explicitly identified as part of the step bases in Volume 2 of the TBD.

- Volume 2 offers step-sequencing considerations that are not required for successful mitigation, but may be useful to EOP writers.

- Many step sequence relationships are logical and do not require specific GEOG identification. For example, a step to bypass a low-pressure actuation should logically come before a step to intentionally depressurize. In addition to being a logical application, sequence problems with such steps are readily identified during performance of V&V on the EOPs.

- GEOG steps that do not have specific sequence bases identified in Volume 2 do not require identification and justification of sequence differences in the EOPs.

- GEOG actions for scenarios beyond the design bases (e.g., rapid cooldown for a loss of SCM without HPI) should not be implemented in plant EOPs in a sequence that would delay time-critical actions that are required as part of the plant design bases.

This approach should ensure that important GEOG step sequences are properly translated in the EOPs while minimizing unnecessary burden on EOP writers by eliminating the need to develop and maintain detailed sequencing bases on many inconsequential sequence differences. While the V&V process is expected to addresses specific step sequencing it is also expected that the inconsequential nature of some step sequence differences may not be readily apparent to those not involved with EOP development and maintenance. Therefore, it is expected that owners of the EOPs and supporting documentation will be available to discuss why such sequences are inconsequential when asked.

3.0 Mission Dose

Mission dose issues relate to the assurance that EOP in-plant actions can be performed as necessary. This includes accounting for possible radiation concerns in the areas where the actions are performed or in areas where passage is required for ingress/egress to where the actions are performed. Item II.B.2 of NUREG-0737 (Reference R6) provides requirements related to equipment qualification and shielding considerations to allow performance of 'necessary' post-accident actions. However, the intent and the requirements are not explicit and have had numerous interpretations. Therefore, the B&WOG developed the following approach to ensure considerations for mission doses are adequately accounted for in EOP validation:

Position:

- If an in-plant action is required for successful mitigation of an accident, then the ability to perform the action must be demonstrated by one of the following methods:
  - Documentation of a mission dose calculation per the requirements of Item II.B.2 of NUREG-0737 showing acceptable results, or
  - Documentation that the action will always be performed prior to the time that access to the affected area may become prohibited due to increasing radiation levels, e.g., racking in a breaker required prior to being able to establish recirculation flow from the RB sump, or
  - Identification of available alternative actions that are not constricted by dose. In this case, any action that may require excessive personnel exposure should be denoted in the EOPs such as 'if accessible,' with the available alternative action identified if the area is not accessible.
- If an in-plant action is not required for successful mitigation, then a pre-determined dose evaluation does not have to be performed. However, the action should be denoted in the EOPs, e.g., as 'if accessible.' If the action is to be performed during an event

where radiation could be a concern, then real-time health physics coverage should be provided.

Pre-determined dose calculations are not recommended for actions that are not required. Such calculations either require conservative source terms that tend to negate the viability of the actions, or if more realistic source terms were used, would still require real-time health physics coverage.

4.0 Bypass of Safety Systems

Inappropriate bypassing of safety systems was a major issue resulting from the TMI-2 accident, and again became an issue following a plant transient in 1991. Because of this, the B&WOG developed a generic position on the issue of bypass and for overriding safety systems following actuation. The generic position is as follows:

Position:

- Safety systems (RPS, ARTS, SFAS, ES, EFIC, SFRCS, HSPS) must be allowed to perform their automatic function when required for transient mitigation.
- Safety systems must not be bypassed prior to automatic actuation except as follows:
  - Safety systems may be bypassed when directed by operating procedures for normal plant cooldowns.
  - Safety systems may be bypassed when directed by emergency/abnormal operating procedures for specific transients.
  - Safety systems may be bypassed without specific procedure guidance under direction of the Control Room Senior Reactor Operator if all of the following are true:
    - The safety system is not required to perform its intended safety function (i.e., SCM exists, SG pressures within acceptable limits, etc.).
    - The cause of the transient is understood or under the control of the operator.
    - Actuation of the safety system could increase the severity of the transient, damage equipment, or cause unnecessary operator burden.
- If a safety system has been bypassed, the operator now assumes the responsibility to actuate the system if necessary for transient mitigation.

- Equipment automatically actuated by a safety system must not be repositioned except as follows:

  - Equipment may be overridden and repositioned when directed by emergency/abnormal operating procedures for specific transients.

  - Equipment may be overridden and repositioned under direction of the Control Room Senior Reactor Operator. This may be done only after careful consideration as to whether the safety function is still required.

5.0 Performing V&V on Referenced Procedures

At issue is whether full verification and validation, as applied to EOPs, should also be extended to procedures referenced by EOPs. Predicated on previous NRC EOP audit experience, it could be conjectured that full V&V as applied to EOPs would be required for procedures referenced by EOPs. However, applying this point of view without limitation would conceivably spread the full V&V to every procedure in the plant's procedure network, which is clearly not intended. Therefore, the B&WOG developed the following position on V&V of referenced procedures:

Position:

- If the referenced procedure steps accomplished a function integral to the mitigation strategy, then the referenced procedure steps should have the same level of V&V as the EOPs. For example, if an operating procedure section is referenced for use in restoring a feedwater source during mitigation of a lack of heat transfer, then the referenced steps should have the same V&V as the EOPs.

- If the referenced steps are not required to accomplish a function integral to the mitigation strategy, then the level of V&V normally performed on the referenced procedure is sufficient. For example, if an operating procedure section is referenced to accomplish normal shutdown of the feed and condensate system after a trip, then the normal V&V prescribed for the referenced procedure is sufficient.

Chapter IV

Considerations on Error Correcting Values Used in the GEOG

1.0 Introduction

The guidance provided by the TBD is based largely on analyses of transients and candidate mitigating actions. Most of these analyses are performed using realistic codes and modeling while some uses more conservative licensing codes and models. Systems engineers who determine their applicability to the GEOG evaluate all of the results of these analyses. Those results deemed applicable to the GEOG are then drafted into proposed GEOG guidance. Following review and approval of the proposed guidance, it is incorporated into the GEOG.

In accordance with the aforementioned process, analyses results provide several kinds of values that are included in the GEOG. They are defined here as:

- Control Values
- Target Values
- Limiting Values

These values may be direct outputs of the analyses or derivatives of analyses and engineering evaluations. As they are used in the GEOG, only limiting values require error correction.

2.0 Discussion

2.1 Control and Target Values

Control and target values are used in the GEOG to specify an objective where the absolute values are not critical to transient mitigation. The parameter may be important, such as establishing a positive primary to secondary ΔT during attempts to restore heat transfer, but the specific value may not be critical; hence, they need not be error adjusted. Examples of control and target values are:

Control Value:

If the RCS is saturated during mitigation of a lack of heat transfer, the PORV is used to control RCS pressure between the PORV setpoint pressure and 1600 PSIG. The objective here is to take manual control of the PORV and operate it over a band to prevent rapid cycling of the valve (failure prevention mechanism). The upper pressure was chosen because that is where the PORV will open anyway. The 1600 PSIG lower pressure control point was chosen to maintain the SGs as a heat sink while easing operator determination of

when to close the PORV. This value also represented a reasonable compromise between reducing PORV cycles and requiring the PORV to be open for extended periods of time.

Neither of these control values is critical to transient mitigation. RCS pressure increases will be terminated by the pressurizer safety valves if pressure exceeds the PORV open setpoint and there is considerable margin to loss of heat sink between 1600 PSIG and the expected pressure in the SGs. For this reason, these values need not be error corrected.

Target Value:

During mitigation of a lack of heat transfer, a primary to secondary side ΔT of + 50°F is established when attempting to restore heat transfer to a SG (the target value is + 50°F). In this case, there is a need to establish a positive primary to secondary side ΔT in order to establish primary to secondary side heat transfer. Obviously, there is a range of values that would work. The value of 50°F was chosen because it is large enough to ensure the secondary side of the SG will be a heat sink and not so large that it leads to an excessive RCS pressure reduction due to contraction when circulation initiates. Because this target value inherently involves considerable margin, no error correction is required.

There is one apparent exception in the application of control values. The SG tube to shell ΔT limits are specified as control values that therefore require no error correction. However, these are limits imposed on the SG and thus error correction may appear warranted. Error correction is not required in this case because the SG tube to shell ΔT limits are constant values that bound the actual tube allowable loads over a wide range of conditions. Thus there is some margin inherent in the limits. In addition, any post-transient evaluation of these limits will use the same values as those available for their control. Finally, the limits are sufficiently low that application of error corrections could result in it being impossible to control within the limits.

2.2 Limiting Values

Limiting values are those that must be adhered to in order to preserve the analyses results or assumed margins upon which they are based. Some examples of limiting values are:

- minimum LPI flow for HPI pump termination when the core outlet is saturated (GEOG Rule 2.0)
- minimum EFW flow when SCM has been lost (GEOG Rule 4.0)

These values directly affect the intent and potential success of the guidelines, and therefore must be assured by accounting for instrument errors. GEOG parameters that require error correction are identified in the corresponding step bases in Volume 2. This includes

parameters whose values are plant specific, e.g., subcooling margin, since the intended use of such parameters still requires error correction.

It is recommended that the B&W sites consider use of a graded approach in applying instrument and process error corrections to parameters used in the EOPs. While limiting values need to be assured by accounting for errors, the types and relative sizes of the errors may vary depending on the use of the parameter.

Chapter V
Deviations and Their Justification

1.0 Introduction

The TBD is derived from extensive analyses, testing, and experience, including actual plant transients. The TBD has been reviewed by the NRC as the generic guidance for operation of B&W plants during emergencies and abnormal operation. Therefore FANP, the B&W site representatives, and the NRC expect that EOP deviations from the TBD will be identified and adequate justification for the deviations will be provided.

Deviations are defined as differences between the GEOG and plant specific EOPs. While it is desirable that users of the GEOG minimize these differences, some deviations are inevitable. This is because the TBD is generic, it only covers the NSSS scope, and it does not represent the only valid methodology. However, users must carefully consider any deviation and ensure that an adequate basis exists to justify the deviation. There are different types of deviations, and the level of justification that constitutes an adequate basis will vary depending on the significance of the deviation.

Section 2.0 of this chapter defines the different types of deviations, section 3.0 describes how to determine if a deviation is safety significant, and section 4.0 describes what constitutes adequate justification of a deviation.

The NRC expects that each user of the TBD will identify and justify deviations relative to the GEOG, i.e., vendor guidance. FANP considers all TBD volumes to comprise the vendor guidance, not the GEOG exclusively, and that the GEOG will only be used in conjunction with the TBD as intended. This basic difference is accommodated in the deviation identification and justification process by the following approach:

> Deviations should be identified between the GEOG and the plant EOPs. However, the existence of bases for the deviation in TBD Volume 3 is an acceptable level of justification for the deviation. All of the TBD volumes are comprised of vendor-approved guidance, and therefore provide adequate justification. Any deviation not supported by Volume 3 guidance must have justification provided by the Utility.

This basic approach to deviation identification and justification has been presented to the NRC and the NRC is in general agreement with the concept (References B48, B49, S23 and S25).

2.0 Deviation Types

For the purpose of this document, there are four basic types of deviations. These are sequence, substitution, omission and addition deviations. Each type is defined in the following sections. In addition, within each type of deviation there is a classification as to whether the deviation is safety significant or non-safety significant. The degree of justification required depends on this classification.

A safety significant deviation is essentially one that alters the basic mitigation strategy in the GEOG and is not provided as an option in Volume 3. The determination of safety significant versus non-safety significant is discussed in Section 3.0.

2.1 Sequence Deviations

Sequence deviations refer to differences between GEOG step sequencing and the coordinate EOP step sequences. Examples of a sequence deviation could range from displacing steps due to insertion of a plant specific step to moving entire strategies from a symptom mitigation tab to a cooldown tab.

By their nature, sequence deviations can be quite numerous, with the majority also being quite insignificant. The insertion of a single plant specific step early in an EOP places all of the remaining steps out of sequence. Since the GEOG is a high level document that focuses on the NSSS, there is expected to be a substantial number of plant specific steps added to EOPs. Repeated documentation of numerous, inconsequential sequence differences would tend to detract from the usefulness of deviation tracking and justification, as well as impose unnecessary burden on the plant staff. Therefore a specific position was developed on how to deal with step sequence deviations, as discussed in Chapter III, Section 2.0.

2.2 Substitution Deviations

A substitution deviation occurs when guidance included in the GEOG is replaced with other guidance considered to perform a function equivalent to that associated with the guidance it replaces. Examples of a substitution deviation could range from using a different component (e.g., TBV versus ADV) to using different mitigation strategies (e.g., HPI cooling versus steaming a generator with a tube leak).

2.3 Omission Deviations

An omission deviation occurs when guidance specifically delineated in the GEOG is not included in plant specific EOPs. These kinds of deviations can generally occur as a result of plant specific design differences. For example, differences in availability/operability of

SG drain systems and MSIVs, caused by design differences, may preclude executing a GEOG prescribed action.

2.4 Addition Deviation

An addition deviation occurs when guidance not included in the GEOG is included in plant specific EOPs. These kinds of deviations can generally occur as a result of plant design differences or the need to address concerns/equipment not included in the scope of the GEOG. For example, the GEOG does not address actions to secure the main turbine after trip or actions to notify plant staff that may be required by a plant's emergency plan.

3.0 Safety Significant versus Non-safety Significant

The degree of justification expected for a deviation depends on whether the deviation is considered safety significant. Determining whether a given deviation is safety significant can be at least partially subjective, and may depend on plant specific aspects. For example, if a GEOG step to bypass secondary plant protection actuation is not included in the EOP, it could be a relatively minor impact if an unnecessary actuation can be easily overridden without upsetting primary to secondary heat transfer. If, however, the unnecessary actuation caused a loss of heat transfer or could cause heat transfer restoration delay leading to HPI cooling, then the deviation may be safety significant.

Thus it is not practical to establish firm boundaries between GEOG steps that are always safety significant and steps that are never safety significant. Each intended EOP deviation from the GEOG must be assessed by the Utility on a case-by-case basis. The TBD does provide some additional guidance to aid this process:

- Volume 2 explicitly defines step-sequencing requirements imposed by the TBD. Deviating from any of these requirements is considered safety significant.

- Volume 2 defines the basic mitigation strategy at the beginning of each section. Deviating from this basic strategy, other than to implement an approved alternative strategy from TBD Volume 3, is considered safety significant.

- Volume 2 identifies all GEOG parameters that require error correction. Any such parameter is considered safety significant, both in its value and in how it is used in the GEOG.

- The functional intent of rules are considered safety significant.

Any deviation that is not addressed by the above criteria must be assessed by the Utility based on how it is used relative to the intent of the actions in the GEOG. The high level structure of the GEOG necessarily reduces it to the essential pieces, and therefore, if in

doubt, the user should assume that the GEOG step in question has safety significance. It is preferable to ensure adequate justification exists for a deviation that may not be safety significant than to not adequately justify a deviation that is safety significant.

4.0 Justification of Deviations

Justification of deviations is recommended on two basic levels, depending on whether the deviation is considered non-safety significant or safety significant. Justifications of non-safety significant deviations need not undergo the same degree of rigor as those associated safety significant deviations. Justification requirements are summarized in Table V-1.

4.1 Non-Safety Significant Deviation Justification

A non-safety significant deviation should be identified as such along with brief statements as to why the deviation exists and why it is a non-safety significant deviation. The one exception to this is for non-safety significant sequence deviations. Non-safety significant sequence deviations do not require identification and do not require any justification, per the position described in Chapter III, Section 2.0.

4.2 Safety Significant Deviation Justification

A safety significant deviation requires a more rigorous justification. Clearly this justification requires a thorough understanding of the GEOG actions, intent and bases. The user has the responsibility to ensure this understanding exists and, if not, to request clarification from FANP. This justification should include at a minimum:

- Description of and Reasoning for the Deviation

  The specifics of the deviation should be clearly described, and the reasoning behind the deviation should be explained. If the deviation exists because of plant design differences, then a very brief statement of the design difference should be provided or referenced. If the deviation exists due to philosophical differences or due to plant specific analyses, then the explanation should be sufficiently extensive to allow the reader to understand the implications of the deviation. References should be provided to more detailed supporting information.

  If the deviation involves only substitution of an option from Volume 3 of the TBD, then the only justification required is a statement to that affect and to state why the option was selected. The remaining items listed below are not required for such deviations.

- Analytical Bases

  Safety significant deviations that are not options from Volume 3 of the TBD should have supporting analyses and/or engineering evaluations that demonstrate that the deviation still provides for the safe mitigation of the event. It is expected that TBD guidance that is based on analyses will not be superceded by plant specific guidance without similar bases.

  In the special case of not providing EOP coverage for scenarios covered by the TBD, additional bases should be provided. The GEOG covers multiple failures and multiple events, and thus covers events beyond the design bases of the plant. This extended coverage is required by Item I.C.1 of NUREG-0737 (References R6 and R9). In addition, the ATOG SER (Reference R11) required coverage of some specific scenarios. Therefore, if a Utility decides not to cover a scenario, presumably on the basis of extremely low probability, then the following additional supporting bases should be provided:

  - Probability assessment that concluded the scenario was too infrequent to warrant EOP coverage.

  - Evaluation describing why the available guidance could not be included in the EOP without unduly hindering operator response to more probable events.

  - For scenarios required by either NUREG-0737 or the ATOG SER, a description of the bases for removing the commitment.

- 10CFR50.59 - Changes, Tests and Experiments Review

  GEOG mitigation strategies are important to plant accident mitigation. Therefore, any safety significant deviation should undergo a 10CFR50.59 review as part of its justification.

- FANP and B&W Site Representative Notification

  The potential importance of these deviations requires that FANP and the B&W site representatives be informed of safety significant deviations and their justification. This accomplishes several objectives. First, it affords FANP and the B&W site representatives the opportunity to consider potential improvements to the TBD and to plant EOPs. Second, it provides information exchange that allows all participants to have a better understanding of the generic guidance and plant specific issues. Finally, it allows a crosscheck to ensure that the TBD was not misinterpreted by the Utility making the deviation.

Table V-1
DEVIATION TYPE VS. JUSTIFICATION REQUIRED

DEVIATION CATEGORY		JUSTIFICATION OF DEVIATION
Non Safety Significant Deviation	- SUBSTITUTION - OMISSION - ADDITION	• identified as a deviation • brief statement as to why deviation exists • provide a brief statement as to why it is non-safety significant
Safety Significant Deviations	- SEQUENCE - SUBSTITUTION - OMISSION - ADDITION	• provide description of and reasoning for the deviation • provide analytical bases • perform 10CFR50.59 review • provide FANP and B&W site representative notification

Chapter VI

Generic EOP Verification and Validation Guideline (GVVG)

1.0 Introduction

The NRC initiated an EOP Inspection Program to determine if licensees were meeting the requirements of the TMI Action plan Item I.C.1 (NUREG-660, NUREG-0737 and Supplement 1 to NUREG-0737-References 1, 2 and 3 respectively). As a result of this inspection program the NRC issued NUREG-1358, "Lessons Learned From the Special Inspection Program for Emergency Operating Procedures" and its "Supplement No. 1".

As discussed in NUREG-1358 (Reference 4), and its Supplement No.1 (Reference 5), licensees are required to prepare a Procedure Generation Package (PGP) for use when upgrading EOPs. One element of each licensees PGP, as stated in NUREG-1358, is:

> "a description of the Validation Program to be used to confirm that the EOP system (i.e., operator/procedure/equipment/training) performs adequately so that the identified needs of the operator are satisfied and the operator tasks identified in the EOPs can actually be accomplished".

Two essential techniques are used to confirm that the EOP system is adequate as discussed here. They are "Verification and Validation". The process of verification and validation is intended to back up the use of complete and accurate control documents in the development and revision of the EOPs. It constitutes the final review before EOPs are implemented. Without an effective verification and validation process, operators may be dependent on unusable or incorrect procedures to mitigate an accident. The potential safety consequences from inadequate verification and validation of EOPs could be significant.

This chapter describes a "core set" of B&W site generic verification and validation requirements. These requirements are predicated on the previously indicated regulatory documents and represent the B&W site position on the issue of verification and validation. This "core set" of requirements represents the minimum generic verification and validation scope for a B&W site. A given B&W site representative's verification and validation program may be more extensive.

1.1 Verification and Validation

Verification is a process of "checking" or comparing EOPs with approved specifications to determine that the guidance meets these specifications. In NUREG-1358 it is stated that, "Verification is the process of checking that the procedures [EOPs] are technically correct, that there is a correspondence between the procedures and the hardware, and that the

procedures accurately adhere to the guidance found in the writer's guide". EOP verification has two distinctly different parts, written correctness verification and technical accuracy verification. The written correctness verification (1.1.2) ensures that the EOP is presented in a way that provides for successful transient mitigation. The technical accuracy verification (1.1.3) ensures that the technical bases of the supporting EOP guidance has been accurately included in the EOP.

Validation (1.1.4), as described in NUREG-1358, is a process of "exercising" the EOP to ensure it is usable, that the language and the level of information are appropriate for the personnel for whom they are intended and that the EOP will function as intended.

1.1.1 EOP(s) and Supporting Procedure Guidance

Verification and validation should be performed on the full set of procedures that constitute the EOP system. That is, if actions from an abnormal procedure or any procedure type (hereafter called supporting procedures) other than EOPs are required to fulfill mitigation strategies, then the applicable area(s) of those procedures should also be verified and validated for accuracy and usability. Verification and validation of supporting procedures should include such things as in-plant actions, location and use of staged equipment (if applicable), availability of equipment specified and lighting. Equipment necessary to perform in-plant actions should be demonstrated as available, but does not necessarily have to be pre-staged. Equipment labels and EOP step descriptions should 'match' sufficiently to preclude them from inducing operator errors. The degree of 'match' deemed necessary to achieve this goal is [plant specific].

Whether or not supporting procedures should have an equivalent "type and amount" of verification and validation as the EOP depends on their emergency operations support function. In general, support procedures that are integral to the successful completion of TBD mitigation strategies should have the same degree of verification and validation as the EOP.

1.1.2 Written Correctness Verification

The written correctness verification specification (another element of the licensees PGP) with which the EOPs should be compared, or "verified", is the Plant Specific Writer's Guide (PSWG). As discussed in NUREG-1358, the PSWG establishes plant policy for the presentation of information within the EOP and supporting procedures (if applicable) based on human factors principles and plant-specific conventions. This specification, i.e., the PSWG, provides specific guidance to EOP writers. This guidance covers such areas as the following:

- Procedure Completeness, Including Page Content and Structure
- Appropriate Use of Action and Logic Steps

- Referencing and Branching (Transitions)
- Appropriate Use of Cautions, Notes and Supporting Material/Attachments
- Vocabulary, Grammar and Punctuation
- Appropriate Use of Units of Measures/Numerals/Symbols/Plant Nomenclature
- Specific Formatting Techniques

The PSWG addresses all aspects of the structure of the EOPs and defines clearly how the EOPs are to be designed. Because of this, use of the PSWG as the specification for verifying written correctness ensures that the EOPs are readable, convenient to use and understood by plant operators. Also, this will lead to consistent production of high quality procedures over time and through personnel changes.

1.1.3 Technical Accuracy Verification

Technical accuracy is verified by comparing the revised EOP guidance against the "plant specific technical verification specification (PSTVS)[1]". This specification does not represent a specific document, but is rather a collection of technical bases that includes such things as NRC commitments, technical specifications, EOP setpoint bases documents, equipment specifications and the Generic Emergency Operating Guideline (GEOG).

The PSTVS should be compared with the revised EOP to determine that all appropriate guidance has been included. Because the GEOG is a B&W site generic specification, deviations may exist between it and plant specific EOPs (e.g., deviations caused by different plant designs and use of a non-preferred vendor option). Any deviations should be appropriately justified and documented (see Chapter V). This verification, which is a direct comparison of the EOP with the PSTVS, ensures that the EOP is technically accurate and that all referenced control room and plant equipment is in place, is correctly labeled and matches the hardware referenced in the procedures.

1.1.4 Validation

Validation is the process of exercising the revised EOP. The EOP is exercised in conjunction with a comprehensive set of transient scenarios. These scenarios are designed so as to exercise the entire set of EOPs, for an initial EOP set and new EOPs, or the revised EOP sections associated with lesser revisions. This validation includes supporting procedure guidance.

Validation is best conducted in a dynamic environment. This may include control room walkthroughs, use of a simulator or table-top methods. Depending on the type and magnitude of EOP revisions, validation may be accomplished by use of a combination of methods, e.g., table-top and walkthrough or simulator and walkthrough.

[1] This acronym originated with this document; it has no known counterpart in NRC documents.

1.2 Mission Dose Assessment

Mission dose is that integrated radiation dose that operating personnel would receive during execution of specific actions that support emergency operations. It is a function of radiation levels in the area(s) where the actions are performed, or through which operators must pass, and the time required to perform the actions. This attribute is assessed as part of the verification and validation process.

When assessing mission dose associated with executing actions that support emergency operations, cumulative dose should be considered. If multiple actions must be executed by a given operator, then the mission dose associated with each of these actions should be considered to determine the integrated dose. This can be especially important for EOP revisions that address a minimum number of steps, perhaps just one or two. Without due consideration of mission dose associated with other actions, performed by a given operator, mission dose assessments may be in error. For example, it may be that the existing guidance directs a given operator to perform two actions in a particular radiation area, for which adequate stay times to perform the actions, have been validated. If now an additional action is added to this or another radiation area, as part of an EOP revision, its mission dose should be assessed and integrated with the existing actions. Only in this way can accurate mission dose assessments be performed.

When computing mission dose time, i.e., time required to perform a given action as directed by the EOP, accepted and approved methods should be used. Such methods may include but are not limited to:

- Walkthrough Time Study

  In this method, execution of the guidance of interest is simulated via plant walkthroughs. The guidance of interest should be performed at least two times by different operators while performing time studies on all succinct time intervals, or operations, necessary to successfully execute the guidance. This includes such things as time to travel to and from the location where the action will be executed, time for the actual execution of the action and time requirements associated with use of aids/tools, e.g., gloves, goggles, air-breathing and air filtering equipment, protective clothing and ladders. In essence, these time studies should be "dress rehearsals" with conditions as close as possible to those expected during the subject emergency operations. Mission dose timing assessments should include conservatism, such as using the longest of the times measured.

  Attempting to simulate the actual execution of emergency mitigation devices, by operators, can be a subjective exercise. This is because the time to perform these device executions, or tasks, may not be known to any definitive degree. For example, depending upon conditions, opening a large valve that has been closed for an extended

period of time can require varying amounts of effort and, therefore, time. Such conditions would include environmental considerations and the physical capabilities of the operator(s) performing the operation. For these reasons, if the valve in question cannot be opened during actual mission dose time studies, it might be possible to use another valve to attain a representative time frame for the action. Such valves would be found in other systems, or perhaps in training laboratories, that can be operated during time studies.

- Computational Time Study

In this method, times to perform execution of the guidance of interest are computed via use of accepted standards for those actions that cannot be practically simulated via plant walkthroughs. Assumed walking rates and job task times are used in conjunction with plant floor plan/equipment location layout drawings to perform mission dose assessments. Distances to and from the location where the execution of the guidance of interest will occur can be obtained from plant layout drawings. Multiplying these distances by accepted walking rates should provide the time for operators to enter and exit the area. For example, Figure 1 shows a radiation area in which a valve is to be operated. As shown, the entrance and exit path is sketched on a plant layout drawing. From this sketch the total distance traveled by the operator(s) can be determined. Multiplying the assumed walking rate, in feet per minute, by the total calculated distance provides the required time the operators must be inside the radiation area for travel purposes to and from the valve. Straight lines are used to ease distance determinations and for conservatism.

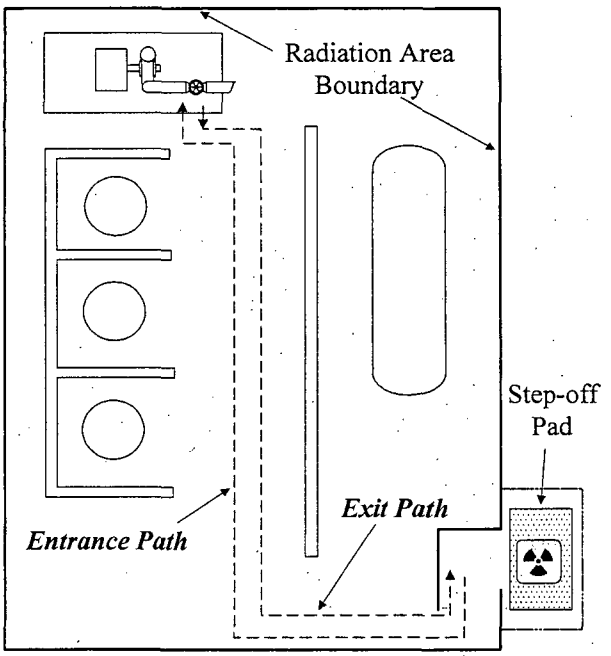

Figure 1 - Radiation Area Showing "Entrance and Exit" Paths

Next, the time required to perform the task, i.e., operate the valve, must be determined. This time may be obtained from accepted standards, if any are available, or ascertained from operator experience with the subject valve or a valve of similar design serving a similar function. Once this time has been determined, it is totaled with the required time to travel to and from the valve. This total time can then be used to compute the mission dose for this EOP revised guidance task. Care should be taken to factor in expected time delays caused by the

use of aids/tools, e.g., gloves, goggles, air-breathing and air filtering equipment, protective clothing and ladders. Such delay times might be determined via operator experience or through walkthrough simulations using similar devices/equipment in a non-controlled area.

Once mission dose times have been determined, they are used to compute mission doses. This is accomplished by multiplying expected radiation levels (mr/hr) for the controlled areas of interest by the time (hr) determined from mission dose time studies to perform the revised EOP guidance. These dose calculations should be performed in accordance with NUREG-0737, Item II.B.2, Design Review of Plant Shielding and Environmental Qualification of Equipment for Spaces/Systems Which May Be Used In Post Accident Operations. The criteria of II.B.2 are aimed at ensuring that licensees examine their plants to determine what actions can be taken over the short-term to reduce radiation levels and increase the capability of operators to control and mitigate the consequences of an accident.

Some EOP steps, including referenced supporting procedure steps, may not be required for successful mitigation of accidents. For steps that are deemed necessary for successful mitigation of accidents, all required actions outside the control room should have pre-determined accessibility verified by mission dose calculations. These calculations should include considerations such as performing the action prior to sump switchover.

Actions executed in radiation areas and promulgated by EOP steps (including supporting procedure actions, if applicable) that are not required for successful mitigation of accidents should be clearly defined as executed only "if accessible". This should be done with the understanding that real time health physics coverage will be provided at the time of performance. At the time of performance, if conditions will not allow sufficient stay times or contamination prevention, then the action should not be performed. This disposition is based on B&W site representative's conclusions that pre-determined dose consequences for non-required EOP (and supporting procedure(s), if applicable) actions is not beneficial. The reason for this is that if the doses are calculated using the conservative source term approach advocated for required actions, then a likely outcome is unnecessary removal of actions or development of alternative actions. Since these actions are not required, and in most cases would be accessible under "real life" conditions, pre-determining dose consequences for these actions is unrealistic. Also, performing dose calculations for these actions, using less than bounding assumptions on source terms, etc., could not preclude the requirement of real-time health physics coverage and, therefore, is not very useful.

2.0 Scope of Verification and Validation

Defining the scope, i.e., the type and amount, of verification and validation that should be applied to revised[2] EOPs depends upon the nature of the revision.

2.0.1 Defining Criteria for Determining Verification and Validation Scope of EOP Revisions

If a "major" revision is being made to the EOP or "significant" section(s) of the EOP is/are being revised, then consideration should be given to conducting a full and rigorous verification and validation. Given this, the definition of a "major/significant" EOP guidance revision can be developed.

The term "major" as applied here means revisions that represent either a change of the entire EOP (i.e., B&W site revises entire EOP) or preparation of a new EOP. This definition of a "major" EOP revision is fairly quantitative and, therefore, provides a clear and easily applied criterion upon which to base verification and validation scope determinations. However, the term "significant" is not so easily defined.

The term "significant" considers both the magnitude (i.e., the number of steps affected by the revision) and the importance of the revision (i.e., how essential are the steps to successful transient mitigation). Because this is not a quantitative definition, when determinations regarding the "significance" of a particular EOP revision are made, key attributes, such as the following should be considered:

- changes to equipment/system(s) that alter the function or operational characteristics of equipment/system(s) essential to successful transient mitigation are included in the revised steps
- time dependent steps are added or revised such that previously determined times may be in question
- the flow of the revised steps is altered, especially steps that affect branching (transitions) and interrelationships between systems and equipment
- changes to environmental conditions, including such things as atmospheric temperature, local radiation levels, physical impediments and stay times
- the revision affects GEOG mitigation strategies, i.e., either their execution or sequence of implementation as directed by the GEOG

By considering key attributes, the determination of what is a "significant" revision becomes somewhat analytic (i.e., reducing it into elemental parts or basic principles), thus enhancing its meaning and effectiveness.

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[2] Unless otherwise noted, the term revise/revised/revision, as used in this chapter, refers to <u>any</u> change to the EOP set (includes supporting procedures). This includes, but is not limited to, new EOPs, major/significant and minor/insignificant technical/writing changes, typographical changes and format and use changes.

If an EOP revision is not judged to be of a "major/significant" nature, then it may be considered as being of a "minor/insignificant" nature.

2.0.2 "Major/Significant" Scope - Verification and Validation Determination Considerations

For a revision of this nature, it is likely that many steps have been re-written/revised and/or there may have been a change in how mitigation strategies are applied. It is also possible that some of these steps have changed position within the EOP flow path. Hence, it is necessary to compare the revised EOP with both the written correctness verification specification (PSWG) and plant specific technical accuracy verification specification (PSTVS). Verification of the revised EOP against the PSWG will ensure that presentation of the revised EOP is understandable and usable. Verification of the revised EOP against the PSTVS will ensure that the PSTVS guidance is included in the EOPs and that GEOG mitigation strategies are correctly applied, including any GEOG required mitigation strategy sequencing considerations. Any deviations should be adequately justified and documented.

Validation of a change of this nature should consider use of at least simulation and plant walkthroughs. The combination of simulation and plant walkthroughs will ensure that plant operators can effectively use the EOPs and supporting procedures (if applicable) to successfully mitigate transients. This includes use of these procedures in the control room and other parts of the plant as necessary. Such a validation should consider the following:

- The revised EOP can be physically implemented without introducing undue impediments (e.g., equipment locations and spatial considerations) to transient mitigation.
- The revised EOP can be implemented within analytically assumed time periods and that the physical locations where associated actions are performed are accessible during the time of required execution. This should include considerations of such things as temperature (e.g., unusually high ambient temperatures may result from a high energy line break), flooding and radiological hazards.
- Operators can use the revised EOP, including supporting procedures, effectively in the control room and other parts of the plant as necessary.
- EOPs and supporting procedures performed outside the control room can be executed successfully with the equipment on hand.

2.0.3 "Minor/Insignificant" Scope - Verification and Validation Determination Considerations

EOP revisions do not always encompass large numbers of steps and some revisions may not affect any of the technical transient mitigation aspects of the supporting guidance. For such revisions, in order to ensure their usability/effectiveness and technical accuracy, verification should remain similar to that for more extensive revisions. However, validation can take a different approach.

Let it be assumed that only one loop/leg of the EOP flowpath, exclusively associated with control room operations, is affected by a proposed EOP revision. In such a case, validation need only be concerned with control room operations, i.e., no in-plant operations are necessary. Also, because only one loop/leg of the EOP flowpath is affected, it may be fully exercised by a minimum number of transient scenarios, perhaps only one. Further, there may be either none or a limited amount of diagnosis-mitigation actions found in the revised loop. Based on this information, validation may be adequately performed by use of table-top methods. Of course simulation validation may still be considered the better choice, if it is available. However, for a revision such as the one assumed here, and depending upon simulator availability, table-top methods would be appropriate and adequate for validating the revision.

2.1 Verification of Written Correctness - Scope Determination

Verification of written correctness, against the PSWG, should be performed by individuals familiar with the principles of the PSWG. This should be done for all EOP revisions. While this may appear overly conservative, it must be recognized that most any revision to the EOP would, at the very least, involve attributes associated with vocabulary, grammar and punctuation. It is also likely that the changes could include such things as units of measure, numerals, symbols and plant nomenclature. One may conjecture exceptions to this, e.g., revisions addressing specific unique occurrences of a misspelling or a typographical error; however, such situations are expected to be uncommon. Also, written correctness verification of such EOP revisions is not expected to be difficult to accomplish.

Extent of Written Correctness Verification That Should be Performed:

It is essential that EOP steps be presented in a consistently high quality manner throughout the EOP set, including supporting procedures. For this reason, it is recommended that all EOP revisions, no matter how "minor/insignificant", be verified against the PSWG (i.e., the written correctness specification). Relative to written correctness, revised steps cannot affect other steps (i.e., once they are verified as correct); therefore, only the revised steps need be verified against the PSWG.

2.2 Verification of Technical Accuracy - Scope Determination

Verification of the revised EOP against the PSTVS should be accomplished for all EOP revisions; this includes supporting procedures that address "technical" content as opposed to "written" content. Technical content may be considered to be any EOP information/attribute(s) other than that/those included in the PSWG. Specifically, it is information/attributes found in specifications that represent the PSTVS.

Extent of Technical Accuracy Verification That Should be Performed:

If the revision is of a "major/significant" (2.0.1) nature, then the affected sections of the EOP set should be verified. If this is not the case, then a partial EOP technical accuracy verification may be performed on only the revised EOP sections. In either case, the verification should be performed against the PSTVS.

2.3 Validation

The determination of what scope of validation to apply to revised EOPs is a two part process:

1. It is determined whether or not validation should be performed on the revised EOP.

2. If it is determined that validation should be performed, then the method of validation to be used is determined.

2.3.1 Determining Whether or Not Validation Should be Performed

Validation is intended to ensure that revised EOP works in an integrated fashion with the overall EOP set. To this end, validation provides assurance that revised EOPs:

- can be physically performed (e.g., considers access, lighting and other environmental factors, availability of necessary equipment and communications)
- is sufficiently detailed for use by newly qualified operator(s)
- appropriately reflects crew roles and responsibilities

These considerations cover a broad range of knowledge and skills that include areas such as plant operations, engineering, human factors familiarity and training. For this reason, the determination of whether or not validation should be performed is best accomplished by experienced personnel. This appears particularly important when assessing whether or not the revision represents a "significant" or "insignificant" change since, as discussed in 2.0.1, such determinations tend to be fairly subjective. For example, if the revision addresses only a few steps, unaltered in their order, that either diagnose (no action occurs) or execute simple non-integrating actions, then the value of validation appears

questionable. This is especially true if the actions directed by the revised steps are predicated on fact-based knowledge/skills (as opposed to cognitive-based knowledge/skills). In such a situation, if it is determined that validation will provide no added value in confirming that the EOP system is adequate, then validation may be omitted. On the other hand, a revision may include only a few steps that remain unaltered in their order but include a change that directs execution of an action that requires cognitive-based knowledge/skills and affects multiple systems. Such a revision should be validated in order to assess the overall affects on plant transient mitigation (simulation is likely required).

Validation provides an integrated assessment of the usability and effectiveness of the revised EOPs and, therefore, provides a powerful means of ensuring that EOP revision control documents are complete and accurate. For this reason, if there is any question as to whether or not validation should be performed, then as a conservative action it is recommended that validation be performed. Also, for this same reason, determinations of whether or not validation should be performed are best accomplished by experienced personnel. Generally, the only EOP revisions that do not need such an assessment, to determine that no validation is necessary, are those dealing exclusively with "minor/insignificant" editorial alterations such as correction of typographical errors.

2.3.2 Determining Method of Validation to Use

Validation may be accomplished by any or a combination of simulator exercises, walkthroughs (including in-plant) or table-top methods. One way to discriminate between the validation methods to be used is to determine at what location the revised EOP action, including receipt of feedback information, will be fulfilled. If a revision involves steps that are executed completely and exclusively, including parametric feedback information, from the control room, then in-plant walkthroughs would be of little value. The opposite is true for revisions that address steps that are executed completely and exclusively from an in-plant location. That is, other than checking communications links, little would be gained from a simulator validation; however, an in-plant walkthrough would be very appropriate. For revisions that refer to execution of steps, and diagnosis of parametric feedback information, from both control room and in-plant locations, a combination of simulator and in-plant walkthroughs is appropriate. Along with this, it may also be appropriate to include table-top methods. This discussion leads to the following considerations relative to choosing a validation method:

- Revisions Addressing Only Control Room Operations (Includes Feedback Information)
  In general, if the plant specific training simulator is available, it should be used. This method provides dynamic and rigorous validation in a manner that most closely approximates actual conditions. If the simulator is not available, then if practical control room walkthroughs should be used. Otherwise, use should be made of table-top methods.

- Revisions Addressing Only "Outside" the Control Room Operations (Includes Feedback Information)
  For these kinds of revisions, if local areas are accessible, then in-plant walkthroughs should be used. If such walkthroughs are not possible, then table-top methods may be employed.

- Revisions That Include Both Control Room and "Outside" the Control Room Operations
  This situation should, if possible, use the plant specific training simulator in conjunction with in-plant walkthroughs. If the simulator is not available, then if practical, use of control room walkthroughs in conjunction with in-plant walkthroughs should be used. If control room walkthroughs and/or in-plant walkthroughs are not practical/possible, then table-top methods may be used.

Along with the foregoing considerations, various characteristics of the revision should also be "factored in" when choosing a validation method. The different validation methods provide for assessing certain characteristics. These characteristics and their associated validation methods are provided in the following table:

VI-1
VALIDATION METHOD SELECTION TABLE

Characteristics Assessed	Simulator	Walkthrough	Table-top
Revision essential to successful mitigation of transients is sufficient and is consistent with training	X	X	X
Revision information is easily understood and useful	X	X	X
Revision is compatible with control room hardware	X	X	
Revision is compatible with remotely located hardware and response	X	X	
Revision is compatible with shift manning levels	X	X	
Revision is compatible with plant response	X		
Revision provides for accessibility, including environmental conditions and stay times		X	

When determining what validation method to use, consideration should be given to using one that applies to the location where revised steps will be fulfilled and assessing the revision for the characteristics listed in the above table. This list of characteristics is not

intended to be all inclusive or unique. It is intended to serve only as a guide to assessing such characteristics.

2.4 Prepare Validation Scenarios

Validation scenarios are structured plans of parameter and plant symptom changes that provide operating cues for conducting the assessment of revised EOPs. Relative to revised EOPs, the following applies to preparation of validation scenarios:

- All parts of the affected EOP should be exercised. This includes each loop/leg and each internal/external transition point.
- Mitigation strategies should be exercised.
- Single, multiple, concurrent and sequential failures should be addressed.
- The scenario should have a summary with clearly stated objectives, e.g., explaining what strategies will be exercised, what changes in plant configuration will be accommodated by the revision and how time dependent actions will be addressed.
- Each scenario should cover the path from its entry conditions to the point at which all desired evolutions are observed.
- Scenarios that require multiple passes through revised EOP should be considered, e.g., the revised EOP is exercised via logic/branching on the second pass through the associated loop/leg.

In addition to DBAs, it may be beneficial to consider including dominant accident sequences, events that have occurred at the subject facility or at a similar facility, licensee event reports and/or recent industry events.

2.5 Validation Performance

The overall objective of validating revised EOPs is to determine that the actions specified in the revision, including support procedures (1.1.1) can be followed by trained personnel to manage the emergency condition in the plant. In order to ensure that this objective is fully met, validation should be conducted using the minimum shift manning requirements and considering any step timing and environmental considerations, including stay time requirements. At a minimum, validation assessment should be performed by individuals familiar[3] with operations, training and human factors.

Step timing refers to time limit requirements placed on operators such that certain actions are executed within the prescribed time limits. These time requirements would likely have resulted from plant specific analysis and/or designs. For example, analysis may indicate

[3] Familiar, as used here, means that individuals performing simulator validation assessments are considered to be adequately competent in the areas of operations, training and human factors so as to be able to determine successful task outcomes.

that a normally aligned purification flow path from the RCS must be closed within a certain number of minutes following a LOCA. Hence, any "time delays" (2.6) associated with revised steps should not cause execution of associated actions to be delayed beyond prescribed limits.

Environmental conditions, including such things as atmospheric temperature, local radiation levels, physical impediments and stay times should be considered. Without this, the effectiveness and usability of the EOP cannot be fully confirmed.

No matter what method(s) of validation are chosen, execution of those method(s), should be accomplished using plant specific validation procedures.

2.6 Validation Assessment

The combination of validation participants, e.g., implementers and observers, should provide an assessment of the ability of the revised EOP to effectively mitigate transients.

It is the domain of the observers, e.g., engineers, operators and personnel familiar with human factors, to provide a formal assessment of revised EOP validation. This assessment should address the ability of the revised EOP to perform adequately so that the identified needs of the operator are satisfied and the operator tasks identified in the EOPs can actually be accomplished.

Time Delays:

When assessing revised EOPs via validation, time delays introduced by revised steps must be evaluated thoroughly in order to assure analytical timing assumptions are not violated. Such analytical timing assumptions can lead to certain "time critical" actions that must be accomplished within a specified time period for assumed plant operations that achieve successful transient mitigation. For example, SBLOCA analysis may indicate that within 30 minutes of loss of subcooling margin RCP seal injection and RCS makeup valves must be closed so that adequate core cooling is assured. These two actions, i.e., close the RCP seal injection valve and close the RCS makeup valve, would be "time critical" actions. As such, they must be executed before 30 minutes have elapsed following a loss of subcooling margin. To this end, validation should ensure that revised EOP steps do not prevent execution of any "time critical" action within analytically prescribed times.

Scenario Application:

When determining the number and type of scenarios to be applied to revised EOP steps the following scenario application attributes should be considered:

- Consider Exercising All Legs/Loops Downstream Of The Revised Steps

  By exercising all legs/loops downstream of revised steps the affects of these steps on downstream actions can be assessed. Depending upon the nature of the revision, e.g., global restoration of grid power, there may be little value in assessing all downstream actions. On the other hand a revision that affects a process flow, such as EFW, HPI or bypass steam flow may have a significant affect on multiple downstream legs/loops. Such a revision may require application of multiple scenarios for its complete evaluation.

- Consider Critical Tasks

  Validation scenario application should consider the affects of the EOP revision on critical tasks. This is true for both those critical tasks located downstream of the revised steps, i.e., in the same leg/loop, and those critical tasks that may be exercised, due to branching, subsequent to an initial pass through the revised steps, i.e., located in a different leg/loop.

- Consider Time Delay Issues

  Where revised step time delays are a concern, they should be assessed by considering use of scenarios that assess their integrated affect on the overall mitigation process.

  Time delays could be introduced into the mitigation flow path such that "time critical" actions might not be executed within their analytically prescribed times. This could be caused by time delays uniquely associated with addition of a new step or revision of an existing step. Such timing issues would likely be recognized by EOP writers; hence, their time delay effects would not easily be overlooked. However, time delays can be more subtly introduced via the integrated affects of executing combinations of steps in different legs/loops. In such situations, the revision may represent what is considered either a no timing or minimal timing affect issue. For example, assume that due to updated vendor information, a step is to be revised in a particular leg/loop that directs operators to check/verify operation of the subject equipment. On a validation "first pass" through the EOP, where this equipment is exercised with no other leg/loop or branching complications, this may not cause any timing concerns. As the scenario unfolds, however, a branch located below the revised step may cause procedure flow to revert to another mitigation path. Now, if there is a need for these same operators to perform "time critical" actions, they may not be available due to the new equipment

check/verification step. Because of this, validation scenarios that evaluate possible time delays should not be narrowly focused on only revised steps and their associated leg(s)/loop(s).

- Consider Using Licensed Operator Requalification Scenarios

Licensed operator requalification scenarios are scenarios prepared by B&W site training departments. They are used for requalification examination purposes and, among other things, include the location of critical tasks. These critical tasks have been delineated by the B&W site representatives for use in preparing requalification scenarios. The basis for critical task delineation, as described in NUREG-1021 (Reference 6), "Operator Licensing Examiner Standards, is that each critical task include the following elements:

- have safety significance to the plant or public
- provide at least one plant staff member with appropriate cues
- have measurable performance indicators
- give at least one plant staff member feedback on the plant staff's action or inaction
- requires operator intervention for successful implementation

In addition to the commonality of having critical tasks, requalification scenarios are generally prepared to equivalent standards in accordance with NUREG-1021, Operator Licensing Examiner Standards, Section ES-604 "Dynamic Simulator Requalification Examination". While the objectives of the training department may be different than those of EOP writers, many of the attributes included in requalification scenarios are germane to revised EOP validation. These attributes include:

- Realism/Credibility

This attribute includes such things as appropriate use of mechanistic and non-mechanistic failures and assuring that simulated events do not violate the laws of physics and thermodynamics.

- Event Sequencing

Event/malfunction sequencing should be initiated on the basis of plant parameters or operator actions.

- Simulator Modeling

The scenario should not exceed the limits of the facility's configuration management system by altering a simulator model to obtain a desired affect.

Because of their commonalties, including the coverage of critical tasks, use of requalification scenarios for revised EOP validation may provide an element of validation scenario standardization among the B&W sites.

Validation Results:

The results of this assessment may vary from total acceptability to varying degrees of comments/concerns and inadequacies. All comments/concerns should be addressed with appropriate resolution or justification provided for leaving the revised EOP "as is". EOPs containing inadequacies should be revised to eliminate the inadequacy. If necessary, re-validation should be conducted on the revised EOP.

Implementers, i.e., control room operators, auxiliary operators and others involved in execution of the revised EOP, may be too involved in role playing during the validation exercise to provide detailed structured assessments of the validation exercise. However, these personnel can provide important insights on the revised EOP and should provide their comments and concerns at a convenient time after the simulator exercise has ended. These comments/concerns should be thoroughly and rigorously investigated and resolved by cognizant personnel, e.g., engineers, experienced operators, personnel familiar with human factors and other support staff.

2.7 Use of Check Lists

In order to assure that the "essential elements" of verification and validation are addressed, consideration should be given to the use of check lists. Such check lists provide a convenient means of tracking execution of elements essential to an adequate verification and validation and are suitable as direct input for final documentation.

At the end of this chapter, in Figures VI-2, 3 and 4, the following representative checklists are provided:

Figure VI-2, Written Correctness Verification Checklist
Figure VI-3, Technical Accuracy Verification Checklist
Figure VI-4, Validation Checklist

3.0 Verification and Validation Process

3.1 Verification of Written Correctness

Verification of written correctness should be accomplished by performing a direct comparison of the revised EOP with the PSWG. This comparison should be performed in accordance with plant specific procedures. It should ensure that the revised EOP has been prepared in complete compliance with the elements of the PSWG.

The completed written correction verification should be appropriately documented, reviewed and approved in accordance with plant specific controlling quality assurance procedures.

3.2 Verification of Technical Accuracy

If the revision is of a "major/significant" nature then, the affected sections of the EOP set should be verified for technical accuracy. Otherwise, a partial EOP set verification can be performed on only the revised EOP sections.

Verification of technical accuracy should be accomplished by performing a direct comparison of the revised EOP with the PSTVS. A successful direct comparison means that each succinct element of the verification specifications can be traced to a one-for-one mapping from the specification to the EOP. This mapping need not address step sequences as they exist in the GEOG unless a particular GEOG step sequence has been delineated in Volume 2 as necessary to support a mitigation strategy (see Chapter V for additional details). It should, however, address sequencing of mitigation strategies as included in the GEOG. For example, loss of SCM should be treated before loss of primary-secondary heat transfer and upon loss of SCM, tripping of RCPs should be performed before any other mitigative actions.

Deviations between the elements found in the PSTVS and those found in the EOP guidance should be adequately justified and documented. Chapter V covers this topic in detail.

The technical accuracy verification should be performed in accordance with plant specific procedures and include verification that the revised EOP can be accomplished as intended. To this end, this verification should ensure that all referenced control room and plant equipment is in place, is correctly labeled and matches that hardware referenced in the procedures.

The completed technical accuracy verification should be appropriately documented, reviewed and approved in accordance with plant specific controlling quality assurance

procedures. In the event a validation is not performed (2.3.1/3.3), then this documentation should include the justification for this disposition.

3.3 Determine if Validation Should be Performed

This determination should be made by an experienced individual having a broad range of knowledge/skills such as plant operations, engineering, training and being familiar with human factors. Consideration should be given to the need for an integrated assessment of the usability and effectiveness, i.e., validation, of the revised EOP to ensure the EOP:

- can be physically performed (i.e., considers access, lighting and other environmental factors, availability of necessary equipment and communications)
- is sufficiently detailed such that it can be used successfully, to mitigate transients, by newly qualified operator(s)
- appropriately reflects crew roles and responsibilities

If there is any question as to whether or not validation should be performed, then, as a conservative action, it is recommended that validation be performed. If validation is not performed, then the completed written correctness verification (3.1) and the completed technical accuracy verification (3.2) documentation should be prepared into a final verification and validation report for archival purposes. This final verification and validation report should explain that validation was not performed and provide adequate justification for this disposition. The report should be prepared in accordance with plant specific controlling quality assurance procedures.

3.4 Determine Method of Validation to Use

The method of validation to be used should consider the location where the revised EOP steps are fulfilled, including the location of associated feedback information, and the need to assess important characteristics such as:

- Steps essential to successful mitigation of transients are sufficient and are consistent with training
- Step information is easily understood and useful
- Steps are compatible with control room hardware
- Steps are compatible with remotely located hardware and response
- Steps are compatible with shift manning levels
- Steps are compatible with plant response
- Steps provide for accessibility, including environmental conditions and stay times

3.5 Prepare Validation Scenarios

Validation is performed in conjunction with validation scenarios. Validation scenarios are structured plans of parameter and plant symptom changes that provide operating cues for conducting the assessment of revised EOPs. These scenarios are used in a script manner and are followed by validation implementers from a beginning to a final point. Through use of appropriate types and a sufficient number of scenarios, all revised EOP steps can be systematically exercised.

3.6 Perform the Validation

Validation is accomplished using plant specific processes. That is, whether simulation, walkthrough, table-top or a combination of methods is chosen, processes described by plant specific validation procedures should be used to execute the chosen validation method(s). Validation is best accomplished by a team of personnel with experience in operations, engineering and being familiar with human factors.

The completed validation should be appropriately documented, reviewed and approved in accordance with plant specific controlling quality assurance procedures.

3.7 Resolve Validation Assessment Comments/Concerns and Prepare Documentation

All comments/concerns should be addressed with appropriate resolution or justification provided for leaving the revised EOP "as is". Steps containing inadequacies should be revised to eliminate the inadequacy. If necessary, re-validation should be conducted on the revised EOP.

Upon completion of the verification and validation effort, the completed documentation for the written correctness verification, the technical accuracy verification and the validation should be prepared into an appropriate report for archival purposes. This final verification and validation report should be prepared in accordance with plant specific controlling quality assurance procedures.

VERIFICATION AND VALIDATION PROCESS FLOW CHART

Figure VI - 1

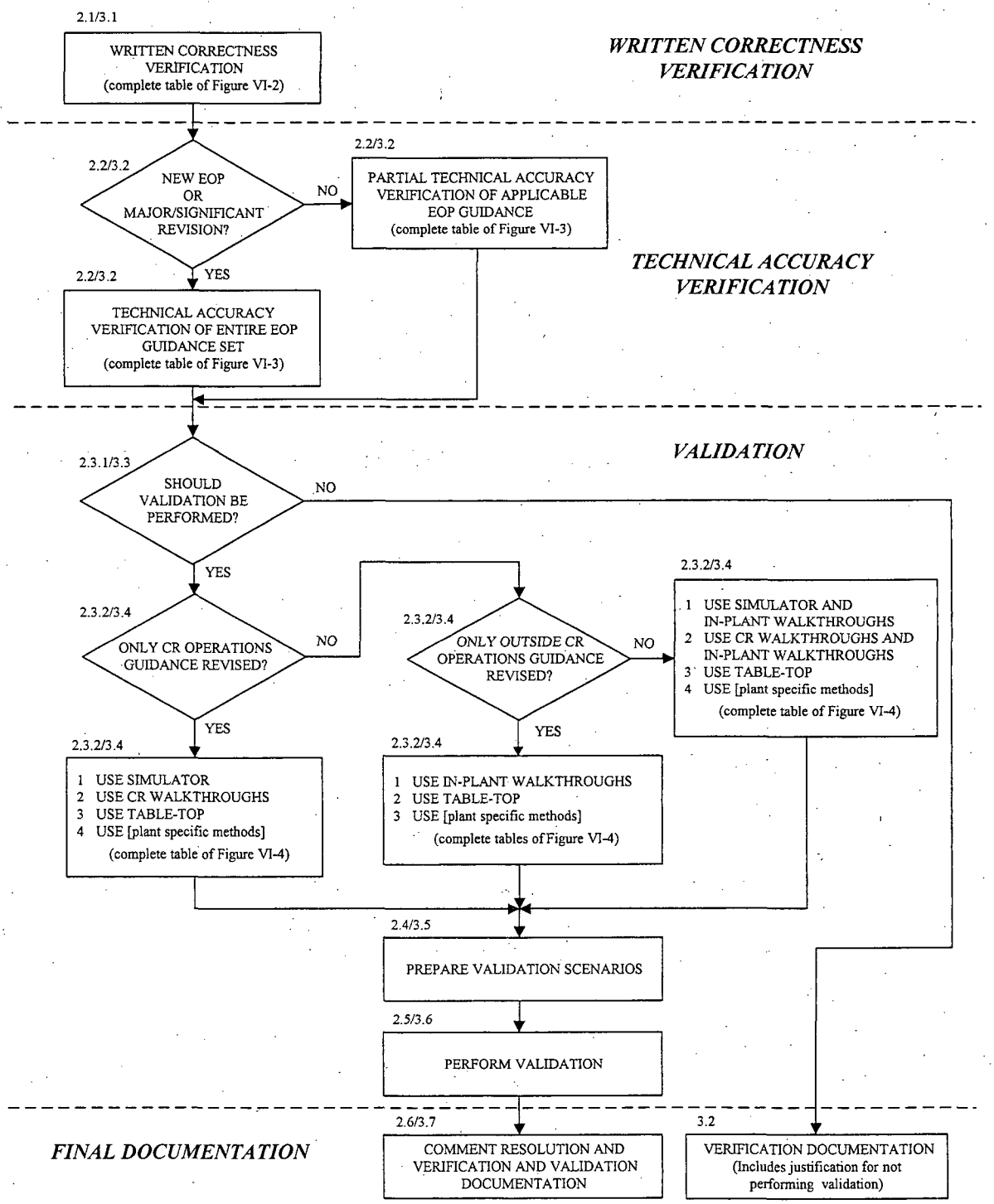


Figure VI-2
Written Correctness Verification Checklist

Essential Element	*YES*	*NO*	*N/A*
Legibility and Format			
All the information is legible (including text, figures, tables, attachments/enclosures.			
All required sections and other elements are present and in the appropriate order.			
The required identifying information appears on each page.			
The correct format is used for the Title Page, List of Effective Pages and Table of Contents.			
The pagination of the procedure is appropriate.			
Sections, subsections and steps are numbered appropriately.			
Figures and tables are numbered correctly and in the appropriate order.			
All steps, warnings, cautions and notes are formatted appropriately.			
Punctuation, grammar, use of capitalization and spelling is appropriate.			
Information Presentation			
Warnings, cautions and notes are used consistently and appropriately.			
Figures, tables, forms and other aids are used appropriately.			
All information including step statements, step logic/branching, warnings, cautions and notes are written appropriately.			
Charts, graphs and formulas are provided as necessary and prepared as appropriate.			
Adequate provisions are made to record necessary data and perform required calculations.			
All acronyms and abbreviations are presented as appropriate.			
Flow charts have been properly and accurately prepared.			
Use of values and units is consistent and appropriate.			
Logic/Branching			
All logic statements (e.g., IF_THEN, IF_AT ANYTIME and WHEN) are appropriately used and formatted.			
Transitions to other procedures (including exits, concurrent use of other procedures and use of other procedures before returning to originating procedure) are appropriately designated.			
Internal branching is appropriately designated.			

NOTE: The term "appropriate", as used in this table, means that the written correctness of the EOP is appropriate in accordance with the PSWG.

Figure VI-3
Technical Accuracy Verification Checklist

Essential Element	*YES*	*NO*	*N/A*
GEOG Guidance			
All the appropriate/germane GEOG guidance is included. For partial EOP revisions, only the appropriate/germane GEOG guidance need be verified. For complete EOP re-writes, all the GEOG guidance should be verified (this element of the PSTVS includes the entire TBD). Any deviations have been appropriately justified.			
"GEOG delineated" sequences have been adequately included. Any deviations have been appropriately justified.			
Ensure that a) mitigation strategies have been correctly included, if applicable for the subject revision, and b) that mitigation strategies have not been altered or negated by the revised EOP. Any deviations have been appropriately justified.			
PSTVS Guidance (other than the GEOG)			
Ensure that any commitments, e.g., NRC and licensing, relevant to the revised guidance have been appropriately and accurately included and that the revised EOP does not negate any existing commitments.			
Setpoints are used in a manner consistent with the plant specific setpoint bases document.			
Compare the remaining portions of the PSTVS, i.e. other than commitments and setpoint bases, with the revised EOP to ensure that all PSTVS guidance has been appropriately considered.			
Procedure Adequacy			
Sequencing of steps provides for efficient transient mitigation while maintaining technical accuracy of the EOP.			
Equipment labels and revised EOP descriptions match sufficiently to such that they do not cause operator errors.			
The revised EOP has numerical information and units associated with instrumentation accurately presented.			
For analog instruments, parametric values referenced in the revised EOP should consider the smallest increment available on the instrument indicator.			
For digital instruments, parametric values referenced in the revised EOP are limited to the values available on the indicator.			
Equations in the EOP are presented with sufficient information such that the operator can successfully complete the associated computation.			
Component location descriptions are sufficiently detailed so that the operator can locate the specified component.			
Where personnel qualifications, other than those associated with the minimum shift complement, are required to perform a task, assure trained personnel are available 24 hours/day or time is adequate to call out such qualified personnel.			
Procedures referenced contain accurate/appropriate information, including referencing the proper sections.			
Control room equipment, controls, indicators and instrumentation specified is available for use.			
Harsh environmental conditions (i.e., high temperature, moisture, pressure, water level and radiation) have been adequately considered.			

Figure VI-3
Technical Accuracy Verification Checklist (cont'd)

Essential Element	*YES*	*NO*	*N/A*
Plant Considerations			
For steps that require communication while performing the EOP, assure appropriate means of communication exists.			
Where EOP directs actions requiring electrical power, ensure sufficient power would be available.			
Special tools/aids (e.g., gloves, goggles, air-breathing and air filtering equipment, protective clothing and ladders) and keys specified by revised steps are available.			
In-plant lighting is adequate to allow successful and timely performance of revised steps under emergency conditions.			
Actions directed by the revised steps can be physically accomplished without introducing undue impediments (e.g., equipment locations and spatial considerations) to transient mitigation.			
Mission doses have been computed and found acceptable for applicable revised steps.			
Time critical actions can be executed within specified time periods and the physical locations where the actions are to be executed are accessible (e.g., access not impeded by such things as temperature, noise, flooding and radiation) during the time of required execution.			
The revised EOP can be successfully executed without undue delays by the minimum shift complement of personnel.			

Figure VI-4
Validation Checklist

Essential Element	*YES*	*NO*	*N/A*
Level Of Detail			
The EOP contains sufficient information such that the operator can successfully execute the specified actions and mitigate the transient.			
Decision points adequately describe available alternatives.			
The EOP is structured to appropriately manage recurrent checks and steps.			
Labeling, abbreviations/acronyms and locations are sufficient to allow for successful execution of the EOP without causing undue time delays.			
All information necessary to successfully manage the transient, is present.			
Procedures referenced contain proper information and proper sections are referenced.			
Adequate cautions/safety considerations are referenced.			
Understandability			
The EOP is written to provide for ease of use such that it can be successfully executed by the operator.			
Figures and tables are easy to read and accurate.			
Information/data derived from figures and charts can be understood by the operator.			
Cautions and notes are understood by the operator.			
The EOP does not rely on excessive use of cautions and notes to convey transient mitigation actions/principles.			
Branches provide for smooth flow through the EOP			
Plant Compatibility			
Specified actions can be performed in the designated sequence.			
Entry conditions are adequate to enable selection of the appropriate procedure.			
All information or equipment required to manage the transient condition is specified.			
Controls, equipment and instruments described are available when and where required.			
Nomenclature of annunciators is sufficiently consistent with annunciator window engravings and annunciator corrective response such that this nomenclature does not cause operator error.			
Reference documents specified in the revised EOP are readily available.			
Steps are ordered to prevent unnecessary interaction between control room personnel.			
Control room instrument readings and tolerances specified are consistent with actual indications.			
Special tools/aids (e.g., gloves, goggles, air-breathing and air filtering equipment, protective clothing and ladders) and keys specified by the revised EOP are available.			

Figure VI-4
Validation Checklist (cont'd)

Essential Element	*YES*	*NO*	*N/A*
User Compatibility			
The actions of the EOP can be performed within specified time intervals; time limits associated with "time critical" steps have not been violated.			
Steps can be performed by designated personnel.			
Steps achieve desired objectives.			
Specified actions can be performed using the minimum shift complement of personnel.			
All guidance branches are entered at the most appropriate point based on expeditious transient mitigation.			
Branching does not bypass (skip around) essential information and actions.			
The EOP can be physically implemented without introducing undue impediments (e.g., equipment locations, lighting and spatial considerations) to transient mitigation.			
Physical locations where the EOP is to be executed are accessible during the time of required execution; consider such things as ambient air temperature, flooding and radiological hazards.			
Communications equipment is available and adequate.			
All equipment referenced in the EOP is either pre-staged or has its location is known, including consideration of time to retrieve non pre-staged equipment and can be successfully employed by the operator.			

NOTE: Depending upon the method of validation chosen, and implementation of that method by individual utilities, some elements may not be applicable.

Chapter VII

TBD Change Control Process

1.0 Introduction

The TBD provides vendor guidance for use in developing and maintaining plant-specific EOPs. It is a controlled document and, as such, is subject to procedures governing its control. The FANP internal procedures that govern the development of operating guidelines, which includes the TBD, are prepared, maintained and controlled by FANP. In addition, the B&W plant site representatives on the Westinghouse Owners Group Procedures Working Group (WOG PWG) are responsible for resolving all issues related to the TBD, including ensuring that the TBD (a living document) is kept current. The B&W site representatives approve the proposed and final changes to the TBD as the ultimate end users of TBD related guidelines. Therefore, a separate process is required to govern this aspect of TBD change control such that a consistent approach to TBD maintenance is ensured.

This chapter defines the process for initiating and controlling revisions to the Emergency Operating Procedure Technical Bases Document - FANP Doc. No. 74-1152414. It also provides guidance to B&W site representatives for use of the documentation produced in developing such revisions. The change process defined in this chapter is separate from FANP internal procedures that address operating guidelines; however, the process is consistent with the requirements and controls associated with those procedures.

2.0 Definitions

2.1 Project Management (PM) Function - The FANP PM assigned to manage the commercial relationship with the WOG PWG and the B&W site representatives.

2.2 Technical Management (TM) Function - The FANP individual assigned to lead and manage the TBD maintenance project. This can be the same individual who fulfills the PM function.

2.3 Proposed Change (PC) - The input to the TBD revision process that includes a brief description of the change, justification for the change, and interim guidance, if applicable. With the exception of special projects (see 6.2), all changes to the TBD must first have an approved PC.

2.4 Interim Guidance - Guidance attached to a PC to be used in place of or in addition to published TBD guidance. Interim guidance becomes applicable immediately upon B&W site representative approval of the PC to which it is attached per Section 5.4 of Chapter II.

2.5 Draft Change Package (DCP) - The package of material, developed to address the issue(s) in PCs, that include the intended changes to the existing TBD guidance. DCPs are

prepared, reviewed, and approved by authorized FANP personnel, and are then sent to the B&W site representatives for review and approval.

2.6 Approved Change Package (ACP) - The package of material that includes material from the final DCP version that has been reviewed and approved by the B&W site representative. When an ACP is completed, any associated interim guidance (now considered current guidance) remains applicable and must continue to be considered when preparing plant specific EOP guidance. Other non-interim guidance associated with the ACP may be considered when preparing plant specific EOP guidance. However, this guidance must be considered on completion of the next TBD revision. (Current guidance is defined in Section 5.4 of Chapter II.)

2.7 TBD Revision Package - The release of an official update to the TBD that may incorporate one or more ACPs or incorporate changes or additions as a result of a special project (see 6.2). When a TBD revision is completed, all guidance associated with the ACPs that have been incorporated into the TBD, must be considered when preparing plant specific EOP guidance.

2.8 Current (existing) TBD Guidance - Guidance that has been sent to B&W site representatives for use in developing and maintaining plant specific EOPs, consisting of: (1) the latest revision to the TBD, (2) any approved PCs with interim guidance, (3) ACP guidance that addresses interim PC guidance and (4) any ACP guidance that the TM determines to be too important to wait until the next revision, regardless of whether the original PC contained interim guidance.

Approved PCs without interim guidance and all guidance associated with ACPs that do not address interim PC guidance are normally not included in current TBD guidance. Section 5.4 of Chapter II defines current guidance.

2.9 TBD Control Copy - A copy of the TBD used to track DCPs and ACPs until the next TBD revision.

3.0 General

3.1 The EOP TBD provides guidance to B&W site representatives for plant specific EOP development and maintenance.

3.2 PCs can be initiated by FANP personnel or B&W site representatives.

3.3 The process described herein has been subdivided into three succinct processes, i.e., 4.0 Proposed Change (PC) Process, 5.0 Draft Change Package (DCP) Process and 6.0 TBD Revision Process (refer Figure VII Parts 1 and 2). This has been done for the following reasons:

Each Process Is Well Defined And Unique

The PC, DCP, and TBD Revision processes all represent tasks that are well defined and have unique beginning and ending points, thus they lend themselves to being formatted as stand-alone processes. The processes are also separate in the sense that there may be significant time intervals between the completion of one process for a given change and the start of the next process.

Subdividing Simplifies Understanding and Delineation Of Responsibilities

Understanding of the overall TBD change process (from PC inception to final TBD revision) including its flow and user/interface responsibilities is greatly simplified by subdividing the process. Referring to Figure VII-1 Part 1 and 2, it is seen that each succinct process is clearly defined by its separate flow path. This is particularly relevant since the last step in both the PC and DCP Process flow paths is somewhat analogous to a hold point. That is, approved PCs are filed for subsequent preparation into DCPs and approved DCPs (i.e., ACPs) are filed until such time as a revision to the TBD is undertaken. This method of process flow formatting is indicative of a process that does not generally flow continuously from beginning to end, but rather is designed to accommodate points where archiving of material for future processing is appropriate.

By subdividing the overall process, it is easy to identify where in the process the various user/interface responsibilities occur. For example, in Figure VII-1 Part 2 - TBD Revision Process, all the step boxes but one have an F placed immediately to their side indicating that these steps are the responsibility of FANP. The one exception has an F/S next to it indicating that both FANP and the B&W site representatives have responsibility for this step. Hence, the B&W site representatives can easily determine their responsibility in this process. All the process flow charts are formatted in this same way. For the three process subdivisions, the FANP and B&W site representative interface/responsibilities are as follows (refer to Figure VII-1, Parts 1 and 2):

Step	Purpose	FANP	Site
	PC Process (4.0)		
4.1	Initiate PC	X	X
4.2 - 4.4	Review PC	X	
4.5 - 4.6	Approve or reject PC and disposition PC; Issue PC to B&W site representatives for review	X	
4.7	B&W site representatives approve, re-submit or reject PC; FANP issues approved PCs with interim guidance to B&W site representatives	X	X
4.8	Approved PCs filed for future processing	X	
	DCP Process (5.0)		
5.1 - 5.3	PCs to be developed into DCPs are determined; DCPs are developed and issued to the B&W site representatives	X	

Step	Purpose	FANP	Site
5.4	Each B&W site representative reviews and comments on or approves DCP		X
5.5	If applicable, comments (from 5.4) are resolved	X	
5.6	If applicable, B&W site representatives resubmit DCP; otherwise B&W site representatives approve DCP		X
5.7	FANP issues approved DCP (now ACP) noting terms of use; ACPs filed for future TBD processing	X	
	TBD Revision Process (6.0)		
6.1 - 6.3	Assemble ACPs for TBD revision; coordinate other revision material and complete TBD revision log	X	
6.4 - 6.6	Prepare TBD revision package, and if applicable, perform dry run distribute TBD revision package to control copy holders	X	
6.7	Control copy holders acknowledge receipt of TBD revision	X	X
6.8 - 6.10	TBD reference library updated, PC file completed and TBD revision closure performed	X	

3.5 All PCs to the TBD must be approved by the B&W site representatives prior to commencing work. One exception is a PC initiated by the vendor, FANP, which can be initiated without B&W site representative approval, if it is deemed necessary by FANP.

3.6 PCs that have been reviewed and approved but do not contain interim guidance may not be used as guidance to replace existing TBD guidance. This is because PCs, other than those with interim guidance, may contain only ideas to be considered and evaluated, and not reviewed and approved guidance. Signatures on PCs signify approval to proceed with the work to address the PC, but not acceptance of the PC as guidance.

3.5 An approved PC with interim guidance supersedes the affected TBD guidance as discussed in Section 5.4 of Section II. Timely B&W site representative review and approval of PCs with interim guidance is necessary to ensure that the current (existing) TBD guidance is correct. Interim guidance should only be used when it is deemed unacceptable to continue use of the current guidance until the next scheduled revision.

3.6 When an approved PC is issued with interim guidance (approval is noted by the B&W site representatives sign-off), a transmittal letter will inform each B&W site representative that this guidance supersedes the affected TBD guidance and should be used by B&W site representatives in making necessary changes to their EOPs.

3.7 An ACP can be used by B&W site representatives as approved guidance until a TBD revision officially replaces the existing TBD guidance (see 2.6). All portions of an ACP that implement interim guidance become part of the current guidance.

3.8 DCPs may not be used as guidance to replace existing TBD guidance. FANP signatures on a DCP only signify approval to submit the package to the B&W site representatives for review and comment, but not to use package material as guidance.

3.9 Approved PCs and ACPs can be rescinded with unanimous concurrence of FANP and the B&W Site Representatives. This is expected to be rare but may be necessary due to evolving issues or problems discovered after release.

3.10 The PM is the release authority for TBD revisions.

4.0 Proposed Change (PC) Process

This section describes the process for initiating and processing PCs. The paragraph numbers correspond to the numbered blocks on Figure VII-1.

4.1 Originator Describes And Justifies PC

a. The originator of a PC shall complete all sections of the PC form (Figure VII-3), except those sections marked FANP USE ONLY. Use the following as guidance:

Affected TBD Section(s): Include all applicable volumes. This listing is illustrative only and does not limit the scope of the TBD affected by the change.

Proposed Change: Describe the intent of the change in detail.

Justification: Explain why the change is needed.

Interim Guidance: If the current TBD guidance must be changed immediately, provide suggested interim guidance.

Affected TBD Section(s): List sections of the TBD to which the interim guidance applies. This listing must be complete.

References: List references used to support the PC. If possible attach appropriate references or excerpts from references to the PC. In the case of a PC revision, list the PC number in this section.

b. Originator forwards the PC Form to the PM.

4.2 PM Initiates PC Processing

a. The PM shall enter the date on the "Date Received" line on the PC Form.

b. The PM shall forward the PC Form to the TM.

4.3 TM Dispositions PC

The TM shall compare the PC to the PC Log (Figure VII-4) and the PC Rejection Log (Figure VII-7) for possible duplication. If the scope of the PC is included in a PC that is currently listed in the PC log, or one that was previously rejected, then the PC shall be logged per step 4.7.b and returned to the PM with justification.

4.4 PC Review

a. The PC shall be reviewed for technical merit by two engineers, neither being the originator of the PC. If the PC is rejected, a justification for the rejection shall be attached to the PC form. The TM may override rejections; however, justification for doing so shall be attached.

b. With the concurrence of the originator, the TM may revise the PC to better address the concern.

4.5 TM Records Approved And Rejected PCs

a. For approved PCs the TM fills in the PC Log (Figure VII-4). The PC number format is (YY-XX, rev. ZZ) where YY is the year, XX is a sequential number, and ZZ is the revision number (e.g., 98-01, rev. 01). Leave off the revision number to indicate revision 0.

b. For rejected PCs the TM fills in the PC Rejection Log (Figure VII-7). The PC rejection number format is (YY-XX R); YY is the year and XX is the sequential number (e.g., 98-02 R); R indicates rejected. The TM shall, when practicable, return rejected PCs to the originator with the justification attached.

c. The TM forwards the PC Form to the PM.

4.6 PM Review and Approval

The PM shall review the PC Form to ensure it contains the necessary information for presentation to the B&W site representatives. When satisfied with the content of the PC, the PM shall sign on the "Approved by" line on the PC Form.

4.7 B&W Site Representative Review Of PC

a. The PM shall forward the PC to the B&W site representatives. The B&W site representative has six weeks to provide comments on the PC. The end of the six weeks time period is specified by the PM in the transmittal of the PC. Lack of response by a B&W site representative within the six weeks time period will be taken as approval of the PC by that B&W site representative.

b. PCs shall be approved or returned with comments by each B&W site representative. Conflicting comments or outright rejection of a PC is resolved by consensus. The B&W site representatives shall assign a priority from 1 (highest priority) to 3 (lowest priority) to approved PCs. The priority will be determined by averaging the priority given the PC by each B&W site representative. The priority will determine the order in which the PCs are processed. The PM shall sign the PC Form as either "Approved" or "Rejected" based on the consensus. When approved PCs are issued, an updated PC log, which includes the PC's priority, will also be issued.

c. If a PC is rejected by the B&W site representatives or the TM, the originator may appeal the rejection to the PM. If the PM believes the PC was rejected because it was not presented in a manner that correctly conveyed the need for the change, the PM may add further justification to the PC and resubmit it to the TM and B&W site representatives. Ultimately, the PC must be approved by the TM, the PM, and a consensus of the B&W site representatives before DCP work can begin except as noted in 3.5. If the PC is rejected, the PM shall notify the TM to complete the PC Rejection Log per step 4.5.b.

d. The PM shall re-issue approved PCs with interim guidance to holders of controlled copies of the TBD. The transmittal letter will include information explaining that the interim guidance has been approved and therefore supersedes the affected TBD guidance. TBD control copy holders shall acknowledge to the PM, via email or letter, their receipt of PCs with interim guidance. The PM shall retain such acknowledgements for future reference; when the next TBD revision is completed they may be destroyed or filed in the TBD revision folder.

e. The PM shall forward the PC to the TM.

4.8 The TM shall collect and file all approved PCs for subsequent DCP preparation. The B&W site representatives shall, on an annual basis, review all outstanding approved PCs to determine if they are still applicable. If so, their priority is also re-evaluated and changed as necessary. PCs that are no longer applicable are dispositioned in accordance with steps 4.5.b and 4.6.

5.0 Draft Change Package (DCP) Process

This section describes the process for developing DCPs, including their approval into ACPs. The paragraph numbers correspond to the numbered blocks on Figure VII-1.

5.1 TM Initiates DCP Preparation

a. The TM shall decide which PC(s) are to be processed into DCPs based on relative priorities of the outstanding PCs and the needs of the B&W site representatives. Any conflicts shall be resolved with the B&W site representatives by the PM.

b. The TM shall assign a preparer to prepare a DCP for the assigned PC.

5.2 DCP Preparation

a. DCP preparation shall be accomplished in accordance with the DCP Check List, Figure VII-9.

b. References X.4.G and X.4.H shall be reviewed by the preparer. Reference X.4.G is reviewed to determine if the Critical Task Description Document should be revised as part of this DCP. Reference X.4.H is reviewed to prevent the DCP from inadvertently compromising previously agreed to changes, e.g., SER open item issue resolutions. Any conflicts found between the DCP and Reference X.4.H shall be resolved with the B&W site representatives by the TM or the DCP altered to eliminate the conflict.

c. Verification and Validation of Generic Emergency Operating Guidelines shall be addressed in accordance with Chapter VIII.

d. If in the development of the DCP it is becomes evident that significant engineering and/or analytical effort, beyond that typically required for DCP preparation, will be required, then work will be halted. Work will not continue until B&W site representative approval of the additional scope is obtained.

e. The completed DCP shall be attached to the DCP Cover Sheet, Figure VII-8. The preparer shall complete the DCP Cover Sheet by providing a short synopsis of the change, providing references used in preparation of the change, and signing and dating the Cover Sheet on the Prepared by line. A copy of the PC shall also be attached to aid review of the DCP.

f. The completed DCP shall have two independent reviews and subsequent approval of the PM. The reviewers (assigned by the TM) and PM sign the DCP Cover Sheet confirming their approval of the DCP.

g. The preparer shall mark the DCP changes to the current TBD guidance in the TBD Control Copy margins.

5.3 PM Distributes Copies Of DCP To B&W Site Representatives

The distributed DCP may be a marked up copy of the existing TBD or new material to be inserted into the existing TBD (text, figures, tables), or a combination. The DCP will be sent by hard copy and by e-mail.

5.4 B&W Site Representative Review And Comment Or Approve DCP

a. Each B&W site representative shall review and comment on the DCP.

Comments shall be submitted to the PM in writing, either hard copy by mail or electronic copy by e-mail. Comments via telephone are not acceptable. Submitting marked up copies of the DCP is acceptable for minor comments. Separate sheets should be used for lengthier comments.

b. B&W site representative review comments shall be submitted to the PM within six weeks.

The B&W site representative has six weeks to review and comment on or approve the DCP. The six weeks time period will be specified by the PM in the transmittal of the DCP. Lack of response by a B&W site representative member within the six weeks time period will be taken as approval of the DCP by that B&W site representative. The B&W site representative may approve the DCP without comment. If so, skip to step 5.7.

c. The PM shall forward the B&W site representative comments on the DCP to the TM.

5.5 Comment Resolution (if applicable)

a. The TM shall review the comments and attempt to reconcile conflicting comments via telephone or e-mail.

b. All comments and their proposed resolutions shall be reviewed and approved by the B&W site representatives.

c. All comments and their resolution shall be kept on file at FANP for future reference.

d. FANP shall incorporate the resolution to B&W site representative comments into the DCP per step 5.2.

5.6 B&W Site Representatives Determine If DCP Resubmitted Or Approved

a. The B&W site representatives shall determine, based on comment resolution of step 5.5, if a DCP can be approved after comments have been incorporated or if it must be resubmitted to the B&W site representatives for another review prior to approval.

b. If the DCP is resubmitted to the B&W site representatives for another review, steps 5.3 - 5.6 shall be repeated.

c. DCP Form (Figure VII-8) is signed off by the PM noting approval of the B&W site representatives and the DCP becomes an Approved Change Package (ACP).

5.7 PM Issues ACP

a. The PM shall issue a transmittal letter to each B&W site representative noting the DCP has been approved and is now an ACP.

ACPs are normally not part of the current guidance and, therefore, their implementation is optional, with two exceptions. The first exception is for ACPs that formalize previous interim PC guidance into permanent TBD guidance. The interim PC guidance associated with these ACPs is part of the current guidance and should be implemented when these ACPs are issued. The second exception is for ACPs that, at the TM's discretion, contain sufficiently important information that the inclusion in site EOPs should not be delayed until the next revision, even though the PC may have contained no interim guidance. An example would be revised ICC curves. Implementation of the remainder of the guidance associated with these ACPs is not part of the current guidance and, therefore, is optional.

b. The TM shall file the ACP until such time as a revision to the TBD is to be undertaken as deemed appropriate by the TM and the B&W site representatives.

c. The TM shall notify the preparer that the DCP has been approved. The preparer shall then verify or correct the mark-up in the Control Copy.

6.0 TBD Revision Process

This section describes the process for developing and releasing TBD revisions. The paragraph numbers correspond to the numbered blocks on Figure VII-1.

6.1 TM Prepares For Next TBD Revision

a. The TM shall assemble ACPs for inclusion in a revision to the TBD and initiate the TBD Revision Check List (Figure VII-10). A list of all ACPs to be included in the TBD Revision shall be attached to the check list.

b. When the TM and the B&W site representatives concur it is appropriate to issue a revision to the TBD, the TM shall coordinate the effort to produce the revision.

6.2 TM Shall Coordinate Other Possible Sources Of Revision Material

Normally, all revision material is developed through the change control process described herein, and the revision process is primarily the compilation of the individual ACPs. However, there are three other possible sources of revision material: special projects, tickler file items and late-breaking issues. The B&W site representatives sometimes sponsor special projects, such as a verification and validation of the GEOG or evaluation of issues like operator burden. These projects may result in identified changes to the TBD that either do not have specific PCs in place or satisfy the intent of existing PCs. The other possible sources are tickler file items and a late-breaking issue that arises during development of a revision. Tickler file items are small, non-technical changes that FANP and the B&W site representatives unanimously agree do not require a formal change control process. The B&W site representatives approve each item on the tickler file list but, once approved, do not review the specific changes resulting from each item prior to its appearance in the next published revision. Therefore tickler file items should not be approved if any B&W site representatives would prefer the opportunity to review the actual changes. In this case, the item should be submitted as a regular PC for approval. Use of the normal process control in the case of a late-breaking issue could preclude coverage of the issue in the revision, resulting in a PC with interim guidance being issued along with the revision. This is not desirable; therefore if the issue can be resolved to the satisfaction of FANP and the B&W site representatives during the revision process, then it is preferable to include the resolution in that revision. The resolution and specific changes should still be reviewed and approved by the B&W site representatives, though on a compressed schedule.

In either case, the revision material from these additional sources must have the consensus and approval of the B&W site representatives. In the case of material added without the existence of a PC, the change description in the Record of Revision pages should briefly note the change source. In the case of satisfying the intent of an existing PC, the PC folder shall be closed out by the inclusion of a closure statement that includes the same signature requirements as a change package.

6.3 TM Completes TBD Revision Log

The TM shall complete the TBD Revision Log sheet (Figure VII-5) to include:

a. Revision number

b. Date released

c. PC numbers included in the revision

6.4 TBD Revision Package Preparation

The TM shall assign a preparer to prepare a TBD Revision Package consisting of the following items:

a. Revised Table of Contents, if needed

b. Replacement pages with revised text marked with change bars and revision numbers in the margin. If the revision package is a complete reissue of all volumes of the TBD, this step is not performed.

c. Revised list of effective pages

d. Receipt Acknowledgement Form

e. Instructions for inserting the revision into the existing TBD

f. Record of Revision page(s) (Figure VII-2) with required signatures

g. Prepare an electronic copy of the TBD.

6.5 PM Performs "Dry Run" Incorporating TBD Revision (if necessary)

a. If the revision package is a complete reissue of all volumes of the TBD, step 6.5.b is not performed.

b. Prior to distributing the completed TBD Revision Package, the PM shall ensure that a "dry run" incorporating the revision has been performed successfully. This shall be done by inserting the TBD Revision Package into a controlled copy of the TBD.

6.6 PM Distributes TBD Revision Package

a. The PM shall distribute the TBD Revision Package to all holders of controlled copies of the TBD; such distribution shall include a statement of the need to acknowledge, without delay, receipt of these materials. This distribution includes release to the NRC (see Enclosure 1).

b. A TBD distribution list shall be maintained by the PM.

NOTE: Controlled copies of the TBD can be identified by the large numbers on the cover (e.g., D-1, Q-2, N-3, etc.). These are the official copies of the TBD. If a cover does not have a designator on it, it is not a controlled copy and should not be used for EOP maintenance and updates. Control copies should not be revised or annotated by users except when inserting official revisions.

Copies of the TBD may be supplied to users on floppy discs, CD-ROM, or by e-mail. Such copies are supplied for information only. Hard copy versions of the TBD only shall be used as an official reference.

6.7 TBD Holder Acknowledges Receipt Of Revision

a. Following insertion of the TBD Revision into the controlled copy of the TBD by the holder, the holder shall complete a Receipt Acknowledgement Form (Figure VII-6).

b. The holder shall return the completed Receipt Acknowledgement Form to FANP, acknowledging that the holder has entered the TBD revision into the plant's tracking system for future EOP revisions.

c. The PM shall maintain the signed Receipt Acknowledgement Form from all the holders of controlled copies of the TBD and the cover letters associated with the distribution of the TBD Revision Package.

6.8 PM Updates TBD Reference Library

The PM shall ensure the TBD reference library at FANP is updated as follows:

a. A copy of each added reference to the TBD shall be filed in the library and can be any of several forms, e.g., electronic file, microfiche and hardcopy.
b. The TM shall update the PC Log to indicate that the library has been updated.

6.9 TM Maintains Completed PC File

The TM shall maintain a file for completed PCs consisting of:

a. The PC Form

b. DCP/ACP

c. All comments and resolutions.

6.10 TBD Revision Closure

a. After a TBD Revision has been issued, the TM shall purge the PC Log of all completed PCs.

b. The TM shall update the PC History Log

(Figure VII-4 is also used as the PC History Log that provides a list of all the PCs, and what TBD revisions they are in).

c. The TBD revision preparer shall prepare a revision folder to document the sources of the revision to be filed with the closed PC folders.

The revision folder shall include a copy of the Revision Log (Figure VII-5), the TBD Revision Check List (Figure VII-10) and a brief summary of any inputs beyond PCs (e.g., special projects and late breaking issues). Revision folders shall be prepared starting with Revision 09.

Figure VII - 1
Flow Chart, EOP TBD Change Process -
"Proposed Change and Draft Change Package

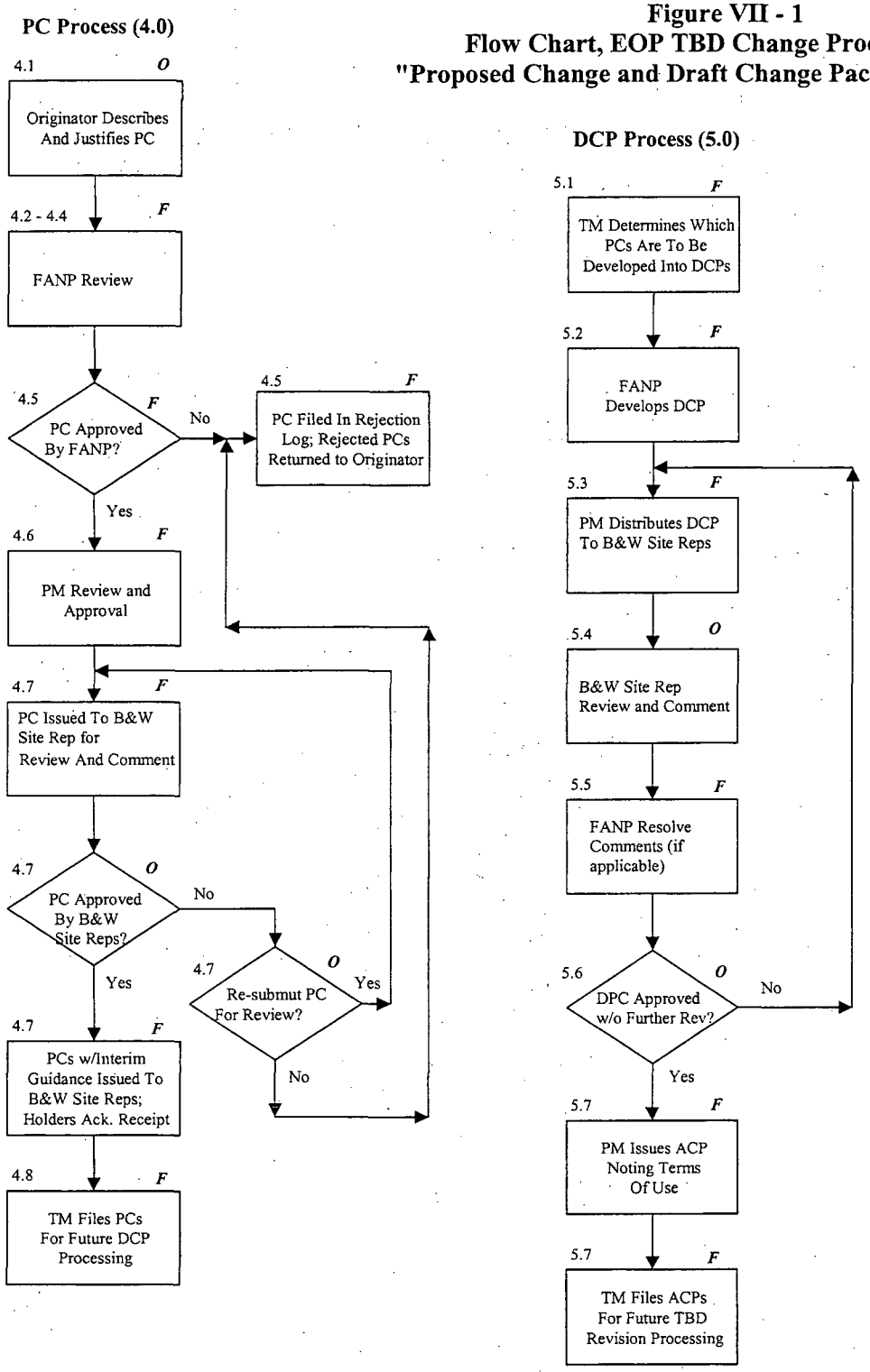


Figure VII - 1
Flow Chart, EOP TBD Change Process - Part 2
"TBD Revision Preparation"

TBD Revision Process (6.0)

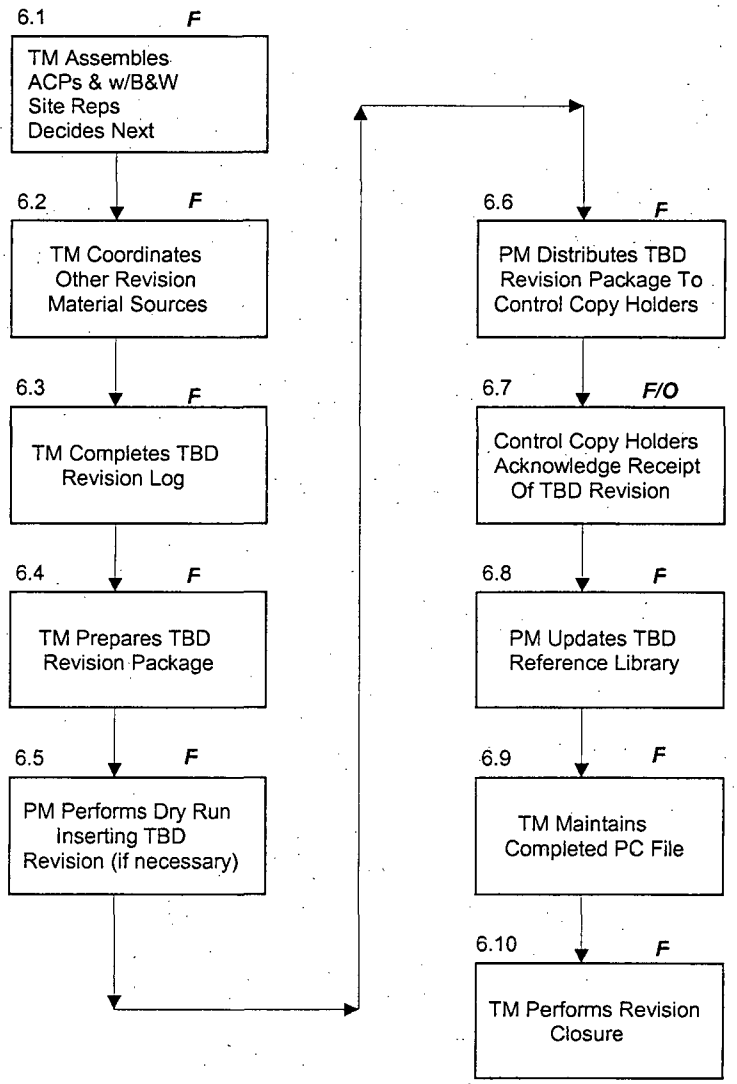


Figure VII-2

TBD RECORD OF REVISION

REV. NO.	CHANGE SECT/PARA.	DESCRIPTION/CHANGE AUTHORIZATION

Prepared By: _____ Date: _____

Reviewed By: _____ Date: _____

Reviewed By: _____ Date: _____

Approved By: _____ Date: _____

FIGURE VII-3

PROPOSED CHANGE

FANP USE ONLY
PC NUMBER:

ORIGINATOR **DATE**

PC TITLE

AFFECTED TBD SECTIONS

PROPOSED CHANGE AND JUSTIFICATION

Proposed Change:

Justification:

INTERIM GUIDANCE (if applicable)

Guidance:

Affected TBD Section(s):

REFERENCES

FANP USE ONLY

DATE RECEIVED:

Prepared By: _____ Date: _____
Reviewed By: _____ Date: _____
Reviewed By: _____ Date: _____
Approved By: _____ Date: _____
B&W Site Representatives _____
As documented by TM

Figure VII - 4

TBD PC Log Revision # ____ **PROPOSED CHANGE LOG** **Date _____**

PC #	Originator	Date Received	Title	Interim Guid.	Site Appr.	Draft in Progress	Draft Complete	FANP Appr.	B&W site rep Appr.	Ref. List Updated	Incl. In TBD Rev.		FANP Library Updated	Priority

Figure VII - 5

TBD REVISION LOG

Revision Number	Date Released	PC Number	Comments

Figure VII - 6

RECEIPT ACKNOWLEDGEMENT OF
TECHNICAL BASES DOCUMENT
REVISION # _____

To: Framatome ANP

We acknowledge receipt and incorporation of _____ copies of the above referenced TBD revision.

_____
Organization

By: _____
Signature/Date

Request to the Recipient:

Please acknowledge receipt and incorporation of the above referenced TBD revision or re-issue of all TBD volumes into the plant tracking system and return this sheet to the address below. Thank you.

Framatome ANP
3315 Old Forest Road
P.O. Box 10935
Lynchburg, VA 24506-0935

Attention:

Figure VII - 7

PC REJECTION LOG

Rejection Number	PC Number (If Applicable)	Title	Rejecting Body	Reason For Rejection	Date Closed

Figure VII-8

DCP COVER SHEET

DCP _____

PURPOSE OF CHANGE:

(Provide a short synopsis of the change including the reason for the change.)

TBD CHANGES:

(If there are no changes to a TBD volume, then the word "none" shall be inserted in each column for that TBD volume.)

VOLUME 1 CHANGES

PAGE	DESCRIPTION

VOLUME 2 CHANGES

PAGE	DESCRIPTION

VOLUME 3 CHANGES

PAGE	DESCRIPTION

VOLUME 4 CHANGES

PAGE	DESCRIPTION

CRITICAL TASK DOCUMENT CHANGES

PAGE	DESCRIPTION

REFERENCES:

(List references used in preparation of the DCP)

FANP

Prepared by: _____ Date: _____

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Approved by: _____ Date: _____

B&W Site Representatives

Approved by: _____ Date: _____

As documented by TM

Figure VII-9
DCP CHECK LIST
DCP _____

CHECK[1] BOX	TASK DESCRIPTION[2]
	Obtain the PC folder from the TM or the PC file (obtain copy of PC references if not already in the PC folder). Read and understand the issues involved with the PC. Verify the intent of the PC with the TM. Research all the issues; if there is any confusion about what needs to be accomplished in preparing the DCP, check with the TM.
	Determine if any commitments/bases of Reference X.4.H, Closure Report for ATOG and TBD SER Open Items (47-5010803-00), are impacted by the change. If so, provide an explanation to the TM so appropriate resolution can be made with the B&W site representatives.
	Perform a careful search of all TBD volumes and the Critical Task Description Document (CTDD) to be certain that all instances of existing issues identified in the PC are found, i.e., affected pages. Word searches of TBD files are beneficial in completing this process. Copies of MS Word files of all TBD volumes and the CTDD are stored on the J: drive. TBD files are stored in the existing revision folder, e.g., TBD Rev 09, and CTDD files are stored in the CT Doc folder
	Check affected pages identified in the TBD and CTDD against the TBD and CTDD control copies to determine if other DCPs affect the change package; ensure all such pages are coordinated in the change process. Address Verification and Validation in accordance with Chapter VIII of Volume 4.
	Once all the PC issues have been identified, address all TBD volumes and the CTDD to ensure that appropriate reference to and bases for the PC issues are addressed by the DCP. This includes ensuring that appropriate material addressing each PC issue has been prepared and properly inserted into copies of the pertinent sections of these documents (i.e., files) either on previously identified affected pages or as new material. MS Word files will be altered using the MS Word "tracking" feature. Drawings will be altered using VISIO. **Note:** **Do not alter any TBD or CTDD files stored on the J: drive; all working copies of the DCP should be separate copies and not saved to existing TBD revision or CT Doc folders.**
	If significant engineering and/or analytical effort, beyond that typically required, appears necessary for DCP completion, then stop work and discuss this issue with the TM. The TM will resolve this issue with the B&W site representatives and/or determine how and when DCP preparation should continue.
	As part of the DCP, include revisions that address typos, misspelled words and formatting problems that are found in the text that addresses the DCP. Do not attempt to make global TBD changes for these items. The TM's and other preparer's TBD copies may have some of these items earmarked.
	Prepare a DCP Cover Sheet (Figure VII-8) and attach it to the DCP; include a copy of the approved PC that the DCP is addressing. Review the DCP for completeness and sign the DCP as preparer.

Figure VII-9 (cont'd)

DCP CHECK LIST
DCP _____

CHECK[1] BOX	TASK DESCRIPTION[2]
	Save a copy of the DCP in the appropriate PC folder on the J: drive (J:\BWOG\TBD\PCs\PC#). Save a copy locally and ensure the copy on the J: drive is maintained current.
	Following FANP approval of the DCP, i.e., two independent reviewers, TM and PM have signed-off, then mark the DCP changes to the current TBD and CTDD guidance in the TBD and CTDD Control Copy margins; use pencil to allow multiple changes without cluttering the control copies. Note all pages affected by the DCP by vertical margin lines, date and initials.
	Submit the DCP to the TM for further processing.

1 When each task is completed the preparer initials and dates the check box.
2 If there is any doubt about how to proceed, consult with the TM.

Figure VII-10

TBD REVISION CHECK LIST
TBD REVISION _____

CHECK[1] BOX	TASK DESCRIPTION[2]
	Assemble ACPs for inclusion into TBD revision; list all ACPs to be included in the revision.
	Coordinate TBD revision preparation with FANP Owners Group Services.
	Coordinate other possible sources of revision material, e.g., special projects, tickler file entries and late breaking issues. The revision material from these additional sources must have the consensus and approval of the B&W site representatives. In the case of material added without the existence of a PC, the change description in the Record of Revision pages should briefly note the change source. In the case of satisfying the intent of an existing PC, the PC folder shall be closed out by the inclusion of a closure statement that includes the same signature requirements as a change package.
	Complete TBD Revision Log (Figure VII-5): - Revise Table of Contents, if needed. - Replacement pages and revised text; change bars and revision numbers in margin, if applicable. - Revised list of effective pages. - Include receipt acknowledgement form (Figure VII-6). - Prepare instructions for inserting revision into existing TBD. - Prepare Record of Revision page(s), Figure VII-2).
	Perform dry run (if applicable); insert the TBD Revision Package into a controlled copy of the TBD.
	Distribute TBD revision package to all holders of TBD control copies: - Include statement of need to acknowledge, without delay, receipt of revision package. - Maintain TBD distribution list. - Maintain signed receipt acknowledgement forms (Figure VII-6).
	Ensure TBD reference library is updated; includes all forms of archival material, e.g., electronic files, microfiche and hardcopy.
	Maintain completed PC file; includes the PC Form, DCP/ACP and all comments and resolutions.
	Close out the TBD revision. - Purge PC Log of all completed PCs (Figure VII-4). - Update PC History Log (Figure VII-4). - Prepare TBD revision folder; includes copy of Revision Log (Figure VII-5), the TBD Revision Check List (Figure VII-10) and summary of inputs beyond PCs, e.g., special projects, tickler file items and late breaking issues.

1 When each task is completed the preparer initials and dates the check box.
2 If there is any doubt about how to proceed, consult with the TM.

ENCLOSURE 1
NRC ADDRESSES

One electronic copy to:

U.S. Nuclear Regulatory Commission
Attention - Document control Desk
Washington, D.C. 20555

Chapter VIII

Verification and Validation of Generic Emergency Operating Guidelines (GEOG)

1.0 Introduction

NUREG-0899, "Guidelines for the Preparation of Emergency Operating Procedures" and NUREG-1358, "Lessons Learned From the Special Inspection Program for Emergency Operating Procedures" and its "Supplement 1" reference documenting the process used to develop vendor technical guidelines, i.e., the GEOG. These NRC technical reports indicate that this process should be documented in sufficient detail to show the flow of information from its analytical base to its use in the development of the GEOG, thereby providing an "audit trail". NUREG-1358 states "This documentation should address: (1) the assumptions upon which the analysis was based, (2) the results of the analysis, and (3) the actual process used to generate the technical guidelines [GEOG], including the verification and validation process". This chapter addresses the verification and validation process as it applies to the GEOG. This chapter describes GEOG verification and validation that has been performed, and provides guidelines for on-going GEOG verification and validation.

2.0 Historical Perspective

Subsequent to TMI-2 (June 1979), the B&WOG commissioned the Babcock and Wilcox Company, now FANP, to prepare a symptom oriented approach to emergency operations guidance, i.e., Emergency Operating Procedures (EOPs). This approach became known as the Abnormal Transient Operating Guidelines (ATOG) project. ATOG was based on the core commonality of the B&W NSSS design and was adapted for plant specific implementation.

In May 1981, the NRC published NUREG-0660, "TMI Action Plan" and in October NUREG-0737, "Clarifications to the TMI Action Plan". These documents expanded on previous requirements by adding multiple equipment failures, consequential failures and pre-implementation reviews. They also strongly encouraged, but did not mandate, the use of NSSS generic submittals as the basis for technical guideline review by the NRC.

In December 1982, the NRC published NUREG-0737 Supplement 1, "Requirements for Emergency Response Capability". This document provides the following guidance:

- EOPs should be predicated on human factored and function (symptom) oriented principles.
- EOPs should be capable of handling a broad range of initiators including multiple events, events occurring subsequent to transient initiation and unforeseen events.

- Operators should be able to successfully mitigate abnormal transients without requiring diagnosis of the events, including transient initiating events and events that occur subsequent to transient initiation.
- EOPs should be prepared in accordance with an NRC approved Procedure Generation Package (PGP)

In response to open ATOG NRC Safety Evaluation Report (SER) issues, the B&WOG developed the Technical Bases Document (TBD). This one volume document was issued on September 3, 1985. Its purposes are stated as:

1. To provide the bases for operator actions for mitigating abnormal transients using plant symptoms.
2. To provide a consistent technical bases for operation of nuclear plants with B&W supplied NSS systems.
3. To provide an efficient vehicle for document maintenance.
4. To consolidate related information.

This document, i.e., the TBD, provided a single, generic set of guidance intended to encompass the ATOG scope and an additional scope resulting from closure of ATOG SER open items. Utility EOPs based on ATOG were already in existence, and the TBD was conceived originally as a maintenance tool to update the bases as necessary.

Subsequent to this, the B&WOG commissioned preparation of a Generic Emergency Operating Guideline (GEOG) which would a) provide closure of remaining ATOG SER open items and b) define one way of applying vendor preferred strategy for event mitigation. The GEOG was not to be a procedure or a procedure model and, therefore, would not be prepared in accordance with accepted human factors principles. On December 14, 1990 the B&WOG issued the GEOG as Volume 1 of the TBD with the existing bases becoming Volume 3 of the TBD. A new Volume 2 would be added to provide the bases for each GEOG step.

On January 9, 1992, with the issue of revision 06 of the TBD, all three TBD volumes were completed. With this completion of a "stand alone" TBD, the B&WOG formally determined that the TBD superseded and replaced ATOG.

Verification and Validation of the Original GEOG (TBD Revision 04)

Preparation of the original issue of the GEOG, based in part on ATOG Part I, included verification of technical accuracy and validation. Verification was carried out in two ways. First, a systematic comparison of GEOG guidance with TBD mitigation strategies and mitigation guidance was conducted during initial GEOG preparation. Secondly, the GEOG was rigorously reviewed by subject matter experts familiar with the TBD analyses. At the

time of original GEOG preparation, schedule and simulator loading did not allow for a simulator validation. For this reason, validation was provided via table-top methods. This was accomplished by vendor engineers who provided review and approval of the GEOG. Following this, the B&WOG Operator Support Committee (OSC) provided a table-top validation of the GEOG. This was accomplished via a line by line review of the GEOG with the original GEOG preparer and reviewer(s) in attendance to answer questions. In concert with this review, various abnormal transient scenarios were applied to the proposed guidance to prove its ability to mitigate such transients. Hence, a rigorous verification and validation process was conducted on the original GEOG.

Verification and Validation of the GEOG Issued with TBD Revisions 05, 06 and 07

Revision 06 released the initial version of Volume 2, which was based entirely on the existing GEOG and, therefore, did not alter the GEOG in any way. All other GEOG changes resulting from these TBD revisions represented incremental changes that were not considered sufficiently significant to require validation of the entire GEOG or simulator validation. For this reason, only the revised sections of the GEOG were verified and validated. Verification was performed by way of review by subject matter experts familiar with TBD analyses. Validation was conducted via table-top methods by vendor personnel and OSC members.

Verification and Validation of the GEOG Issued with TBD Revision 08

Subsequent to issuing TBD revision 07, the OSC performed a comparison of each members' TBD-EOP deviation document. These documents record deviations (and their justifications) between the TBD and plant specific EOP(s).

The intention of this comparison was to determine if there were mutual areas where more than one B&WOG member's plant specific EOP(s) deviated from the GEOG guidance. Given that such mutual areas existed, and that they were not caused by diverse plant specific designs, then it might be possible to re-evaluate and alter the vendor guideline to eliminate some or all of these deviations. As a result of this comparison it was determined that a) mutual deviation areas did exist and b) the GEOG could be altered, without impacting its transient mitigation capability, to eliminate some of the deviations associated with these areas.

As a first step in this process, the OSC prepared a "special version" of GEOG revision 07 which became known as the SP-GEOG. The SP-GEOG originated from two sources, 1) FANP review of B&WOG members' TBD-EOP deviation documents and 2) a B&WOG member's verification and validation of the GEOG on its plant replica simulator. Comments from these two efforts were reviewed and combined by FANP to formulate the SP-GEOG. The SP-GEOG represented alterations to the GEOG that were intended to eliminate some of

the aforementioned deviations. It was used as a generic guideline model and underwent validation on a plant replica simulator.

OSC simulator validation of the SP-GEOG led to a GEOG version that eliminated some mutual areas of the GEOG guidance that had previously caused deviations between plant specific EOP(s) and the GEOG. Following preparation of GEOG revision 08, it was submitted to vendor subject matter experts, familiar with the TBD analyses, for the purposes of verification. Since the alterations made to the GEOG did not impact TBD mitigation strategy guidance or the overall mitigation flow paths, the original GEOG verification of TBD revision 04 was considered to remain valid. For this reason, the verification provided by the subject matter experts was considered to have provided both a check of this original verification as well as a comparison of the revision 08 changes with the TBD bases.

Verification and Validation of the GEOG Issued with TBD Revision 09

Revision 09 of the GEOG evolved as a result of the OSC's desire to further attempt to minimize TBD-EOP deviations. Along with specific GEOG changes, that would fulfill this intent, the GEOG was streamlined in areas where a high degree of prescription was not necessary. This streamlining, by eliminating unnecessary guidance details, further served to reduce TBD-EOP deviations.

Identification of specific GEOG changes and appropriate GEOG guidance for streamlining was accomplished through a process of comparing the GEOG with all B&WOG members' EOP(s) and defining commonalities among the various deviations. The revised GEOG, resulting from this process, then underwent verification and validation.

The TBD Revision 09 GEOG, prepared by qualified FANP personnel, was verified via a comparison of the revised GEOG guidance with relevant bases by vendor subject matter experts. Following this, it was validated by a team consisting of the FANP Technical Manager and OSC members. This validation was conducted during several sessions on a plant replica simulator and included scenarios that described the following events:

- Reactor trips including normal, initiation by LOOP and ATWS.
- Loss of SCM including hot and cold leg LBLOCAs, SBLOCAs of various break sizes and SBLOCA without MU/HPI.
- Lack of heat transfer including LOFW with recovery, LOFW without recovery leading to MU/HPI cooldown and LOFW leading to HPI cooling and subsequent recovery of primary-to-secondary heat transfer.
- Excessive heat transfer including SG overfills caused by MFW and EFW, isolable and unisolable steam leaks, failed MSSV and MSLB inside the RB.
- SGTR including tube leaks with and without RCPs, double ended rupture of one tube with and without RCPs and multiple tube failures leading to loss of SCM.

- Multiple failures including SGTR with SLB, SBLOCA with subsequent SGTR and SBLOCA with a steam leak.

Subsequent to each validation session lessons learned were reviewed, by the validation team, and adjustments made as appropriate to the GEOG guidance.

3.0 GEOG Revision Verification and Validation Process (Figure VIII-1)

As referenced in NUREG-1358 and stated previously here, the process used to prepare and maintain vendor guidelines, i.e., the GEOG, should be documented. Included in this documentation should be the actual process used for verification and validation of the GEOG. The methods used to verify and validate the GEOG, from its initial release through the GEOG released with TBD Revision 09, have been previously documented. This section describes the process that will be followed for all future GEOG revisions, including incremental changes associated with Proposed Changes (PCs) and entire new versions of the GEOG.

3.1 Written Correctness Verification

The GEOG does not adhere to any set of human factors principles other than to achieve consistency in the use of terms and provide for clear interpretation by users. EOP human factors principles are governed by each B&WOG members' Plant Specific Writer's Guide (PSWG). These principles are applied to EOPs by EOP writers during initial preparation and/or revision of plant specific EOPs. For this reason, the GEOG need not be compared or "verified" with an approved writer's guide. However, the GEOG must be "consistent in its use of terms" and provide for its "clear interpretation". For this reason, these specific aspects of the GEOG are verified. As such, GEOG guidance is confirmed to use consistent terms, concise and easily understood language and straightforward guidance flow paths. Confirmation that revised GEOG guidance adequately addresses the aforementioned attributes will be provided by qualified FANP personnel and approved by the site representatives.

3.2 Technical Accuracy Verification

Technical accuracy verification will be performed on all changes to the GEOG. This verification will be performed in concert with the processes for initiating and processing TBD Proposed Changes and developing and releasing TBD revisions. A description of the procedure that governs these processes, i.e., the Emergency Operating Procedure Technical Bases Document Change Procedure, is found in Chapter VII.

TBD Proposed Changes (PCs) That Affect The GEOG

Following submittal of a PC, which may include "interim" GEOG guidance, the PC is reviewed (or verified) for technical accuracy by two FANP approved engineers, neither of which is the originator of the PC. If the PC includes "interim" guidance, then it is further reviewed by the cognizant FANP Technical Manager. Following this, the PC is submitted to the site representatives for their review and approval. PCs that have been reviewed and approved but do not contain "interim" guidance may not be used as guidance to replace existing GEOG guidance. Signatures on such PCs signify approval only to proceed with the work to address the PC, not acceptance of the PC as guidance. An approved PC with interim guidance supersedes the affected GEOG guidance and should be used by B&WOG member utilities as approved guidance until the approved PC change package or TBD revision is released.

Site representative approved PCs are prepared into Draft Change Packages (DCPs) by approved FANP preparers. Subsequent to preparation of the DCP, it is reviewed or "verified" for technical accuracy by two independent FANP subject matter experts. These reviews include a comparison of the revised guidance with any supporting analysis and/or any other source information providing a basis for the revision. The "completed review" signature of these subject matter experts indicates that the verification has been completed and found to be acceptable. Upon completion of the technical accuracy verification, the DCP is forwarded to the cognizant FANP Project Manager for approval and submittal to the site representatives. Once approved by the site representatives, the DCP becomes an Approved Change Package (ACP) and is optional for use by B&W site representatives.

3.3 Validation

The GEOG is a high level generic guideline that provides vendor technical guidance to mitigate postulated events. This is accomplished through the appropriate presentation of analytically supported mitigation strategies accompanied by necessary implementing guidance. For this reason, determinations relative to the need for validation during PC preparation for interim guidance or DCP preparation, should consider the affect of GEOG revisions on these attributes. At a minimum, revisions to mitigation strategies and/or implementation guidance that affect guidance flow, e.g., mitigation path branching change/addition, should be validated. The method and extent of validation used should determine that such revisions will not render inadequate, or degrade, the plant's ability to mitigate postulated events. Included in this validation should be a determination of the adequacy of the revised guidance, including its TBD Volume 2 Bases, to provide the clarity and level of detail necessary to ensure the intent of required actions (i.e., actions confirmed as appropriate by the verification process) as presented to EOP writers. Also, areas considered sequence critical should be assessed to determine that GEOG revisions do not alter sequences that are necessary to ensure postulated event mitigation.

Generally, only revisions that affect a large portion of guidance, e.g., multiple steps in one or more mitigation paths, or significantly alter the mitigation strategies would necessitate the use of a plant replica simulator for validation. This is further supported by the high level generic characteristics of the GEOG. To this end, mitigation flow paths are straightforward, the use of branches is minimized and all mitigation guidance is generally in one guideline with no need to exit until mitigation is complete. For this reason, revisions that have little or no affect on mitigation flow paths, do not significantly affect mitigation strategies and affect only specific implementation guidance would not likely benefit from simulator validation. Hence, revisions of this kind may not require validation or may be adequately validated via table-top methods.

The determination of the need for, and method of, validation should be made by experienced personnel. For this reason, such determinations will be made by qualified PC (for interim guidance) and DCP preparers with approval of the FANP Technical Manager.

Subsequent validation of plant specific EOPs against the GEOG may indicate that inherent technical problems exist, e.g., transient mitigation strategies appear unduly difficult to accomplish. For such situations, cognizant B&WOG members should notify FANP so that investigations can proceed to determine whether or not revisions are warranted.

Validation Scenarios

Validation scenarios are structured plans of parameter and plant symptom changes that provide appropriate cues for conducting the assessment of revised GEOG guidance. These scenarios are designed, such that taken in the aggregate, they exercise every GEOG mitigation and cooldown path as described Table VIII-1 and Figures VIII-2 through VIII-10 at the end of this chapter. They are based on the current GEOG version issued with latest TBD revision and, therefore, represent a benchmark against which PCs to the current GEOG version can be validated. It is expected that any change to the GEOG can be validated by the use of one or more of these scenarios, either in whole or in part. They can be used with both simulator and table-top methods of validation.

The scenarios are designated in such a way as to indicate with which GEOG mitigation path they correspond. GEOG cooldown section paths are chained into appropriate mitigation path scenarios such that there is a mechanistic relationship between cooldown paths and mitigation paths.

Validation Performance

Validations performed during PC (for interim guidance) and DCP preparation, that do not use a simulator, will be performed by FANP personnel during PC or DCP preparation. Site

representatives may participate in this validation as desired. If a simulator is used for validation, then the validation will be performed by FANP personnel and site representatives. Validations should ensure revisions are in compliance with the following GEOG validation objectives:

- revisions will not render inadequate, or degrade, the ability to mitigate postulated events as discussed and analyzed in the TBD
- revised guidance, including its TBD Volume 2 Bases, should provide clarity and appropriate level of detail for use by EOP writers
- where sequencing of guidance is critical, revised guidance sequencing is not altered from that necessary to ensure postulated event mitigation

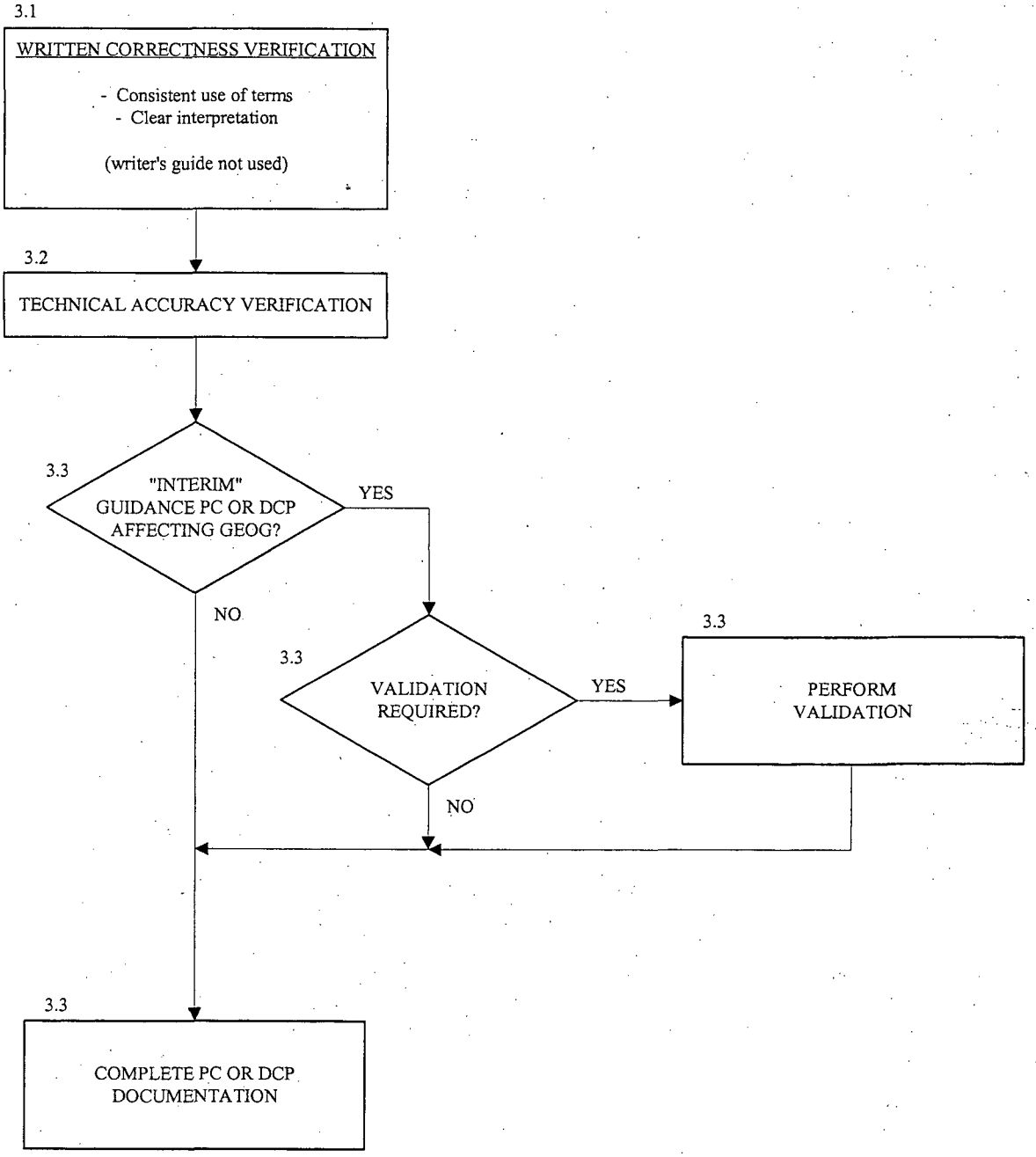
Some GEOG revisions will be relatively minor in nature, e.g., only a few or perhaps one step is altered/added/deleted, there may be minimal or no affect on mitigation strategies and guidance might only be affected in one flow path. For these kinds of GEOG changes, the scenario associated with the mitigation guidance path "containing the revised guidance" should be used for validation (see Table VIII-1 and Figures VIII-2 through 10). All the guidance associated with this path should be exercised as indicated by the scenario. There may be no need to exercise additional paths.

More significant GEOG revisions, e.g., many steps and/or multiple flow paths may be affected and there may be a change in application of mitigation strategies, will require a greater degree of validation. For these kinds of GEOG revisions, validation should make use of a comprehensive set of scenarios that will exercise all relevant mitigation guidance flow paths. This may require use of most if not all of the scenarios and mitigation guidance flow paths described in Table VIII-1.

Validation Documentation

Documentation of GEOG revision validation will be inherent to the PC, for interim guidance, and DCP documentation. Hence, a stand alone validation document is not necessary.

FIGURE VIII-1
GEOG REVISION VERIFICATION AND VALIDATION PROCESS



Considerations And Assumptions Associated
With Table VIII-1 "GEOG Mitigation Paths And Associated
Validation Scenarios"

The validation scenarios are prepared in such a way as to be mechanistic. While this may be a less valuable characteristic for generic guideline validation than for plant specific EOP validation, there is merit in maintaining realism and credibility. Such attributes indicate that the GEOG validation process strives for a degree of fidelity, without which it could be more easily challenged. In keeping with this the scenarios, in combination with their designated flow paths, exercise all GEOG guidance, thus providing a comprehensive validation tool useful for both minor (or incremental) and major (or more global) GEOG revisions.

Initial conditions are provided as target values for simulator initialization. This is because it can be difficult to initialize at exact decay heat levels and highly prescriptive post trip process parametric values, e.g., pressure, temperature and flow. Hence, the initial conditions are intended to indicate a general set of conditions rather than individual specific plant attributes. For example, 100% FP fixes a general set of plant conditions considered satisfactory for the purposes of GEOG validation. These conditions include such things as initial RCS pressure and temperature, SG pressure and feedwater flows, and decay heat levels. Where equipment is important to a scenario, its availability is specifically indicated.

Final conditions are based on the assumed termination point of the mitigation flow path being exercised. As with initial conditions, these final conditions are intended to provide a target point, in this case for scenario termination. Thus, scenario runs need not continue unduly, beyond a reasonable operational range for the subject plant, merely to attain a specific value. The final conditions should be used as a general guide.

The exercising of mitigation flow paths uses a specific convention that minimizes the need for redundant exercising of mitigation guidance. The first scenario in each major GEOG section, i.e., Entry, LSCM, LHT, EHT and SGTR, exercises what is termed the "success path" for that section. In every case, the first scenario exercises only the success path. For example, the first scenario in the LHT section (Section III.C, "Lack of Heat Transfer (LHT)") titled S-III.C.1 exercises flow path III.C.1 and only this flow path. Following this initial section exercise, scenarios are designed to allow for the "chaining together" of flow paths to be exercised. This allows for mechanistic flow through mitigation guidance, and where plausible, cooldown guidance. This can be seen at scenario S-III.C.2.a, where the scenario exercises paths III.C.2 and IV.B.1 (III.C.2 chains into IV.B.1). Since the guidance that precedes path III.C.2 (see Figure VI-3) has been exercised by the previous mentioned scenario, there is no need to exercise this guidance again, hence, scenario S-III.C.2.a is designed to allow commencement of mitigation with path III.C.2. It then provides conditions necessary to allow exercising of path IV.B.1. In this way redundant exercising of paths is minimized while ensuring the entire guidance set of the GEOG is exercised. Such an approach

was chosen to expedite validation while providing a comprehensive method of exercising GEOG guidance.

The guidance of the ICC section and cooldown sections, i.e., sections IV.A, IV.B and IV.C, is accomplished via use of scenarios designed to provide for a logical progression of chaining through this guidance.

Finally, each scenario includes a discussion that is designed to provide adequate information to allow an experienced, i.e., experienced in plant operations, user to pass through the scenario and make appropriate branching decisions such that the intended paths are exercised.

Table VIII - 1
GEOG MITIGATION PATHS AND ASSOCIATED VALIDATION SCENARIOS

SECTION III.A, EOP ENTRY SECTION IV.A, LOCA COOLDOWN			
GEOG Path	**Description of Path**	**Scenario**	**Description of Scenario**
III.A.1.	This is the main VSSV success path. First, guidance is provided to ensure reactor shutdown and turbine trip. Following this, guidance directs plant vital systems to be verified as in, or placed in, their appropriate alignments. Next checks are provided for adequate SCM, controlled heat transfer, SGTRs and RCS leaks. This path ends with further direction from Station Management.	S-III.A.1	**Initial Conditions:** Plant at 100% FP for > 40 days. **Discussion:** A LOOP occurs; there are no other failures. The reactor and turbine are confirmed as shutdown. Emergency AC power sources successfully start and operate properly as does all vital equipment. No abnormal transient symptoms occur and there is no indication of an RCS leak. RCS P-T are controlled and maintained stable. Cooldown is not required and the scenario ends with the RCS stable at hot shutdown conditions. **Final Conditions:** RCS stable at ~ 570°F Tave and ~ 2200 PSIG.
III.A.2	The initial guidance of this path ensures reactor shutdown and turbine trip. Following this, guidance directs plant vital systems to be verified as in or placed in their appropriate alignments. Next checks are provided for adequate SCM, controlled heat transfer, SGTRs and RCS leaks. This path ends with transition to IV.A, LOCA Cooldown, due to indications of an RCS leak.	S-III.A.2	**Initial Conditions:** Plant at 100% FP for 30 days. **Discussion:** RB monitors indicate an increasing trend and RCS leak rates indicate ~ 20 GPM leak. A PZR level instrument has been erratic for the last 24 hours; hence, a pressurizer instrument line is suspected of leaking and plant shutdown is commenced. During shutdown, at ~ 95% FP, a MFW valve fails closed causing a reactor trip on high RCS pressure. Reactor shutdown and turbine trip are confirmed and RCS P-T is stabilized within 5 minutes of the trip with SCM adequate. RCS makeup requirements are greater than normal MU capacity and plant cooldown is commenced. During plant cooldown and depressurization before reaching DHRS conditions, RCS leak rate diminishes to less than normal MU capacity. No further cooldown is necessary and the scenario ends. **Final Conditions:** RCS stable at ~ 480°F Tave and ~ 750 PSIG.
IV.A.4	After providing initial LOCA mitigation guidance, this path determines if the plant has returned to relatively normal conditions. If so, and there is primary-to-secondary heat transfer with no indication of a SGTR, then guidance flow transitions back to III.A, VSSV.		

SECTION III.B, "LOSS OF SCM" SECTION IV.A, "LOCA COOLDOWN"			
GEOG Path	**Description of Path**	**Scenario**	**Description of Scenario**
III.B.1	This is the main success path for mitigation of SBLOCA. First, guidance is provided to trip all RCPs. Following this HPI and EFW are initiated. After checks for possible leaks, cooldown commences. This path ends with transition to section III.A, Entry after checking for indication of LHT, EHT and SGTR.	S-III.B.1	**Initial Conditions:** Plant at 75% power and escalating following refueling outage. **Discussion:** A SBLOCA occurs causing a low RCS pressure trip; there are no other failures. The RCS returns to adequate subcooling at ~ 750 PSIG and required RCS make up flow less than that required for normal make up. The scenario ends with RCS P-T stable; further cooldown is not required. **Final Conditions:** RCS stable at ~ 480°F Tave and ~ 750 PSIG.
III.B.2	This path initiates with checks for inadequate HPI flow. It provides guidance if HPI flow is less than full flow for 1 HPI pump. A rapid RCS cooldown is initiated. During the cooldown RCS pressure is controlled via PORV operations. If SCM is not adequate and ICC symptoms occur before full flow from 1 HPI pump is established, then guidance flow transitions to III.F, ICC. If SCM or full flow from 1 HPI pump is established and ICC symptoms have not occurred, then guidance flow exits this path and continues with SBLOCA mitigation.	S-III.B.2/3	**Initial Conditions:** Plant at 100% FP for 100 days. **Discussion:** A SBLOCA occurs causing a low RCS variable pressure-temperature trip. RCPs are tripped and EFW initiates to raise level to the loss of SCM level. However, HPI does not initiate. Rapid RCS cooldown is initiated. The leak cannot be isolated. After RCS reaches 600 PSIG, HPI is restored to full flow of 1 HPI pump. Appropriate RCS cooldown rate is established. During subsequent cooldown and depressurization, RCS leak rate remains greater than normal make up requirements. The scenario ends with cooldown in progress and referring to Station Management for further directions. **Final Conditions:** The RCS is subcooled at ~ 280°F Tincore and ~ 426 PSIG.
III.B.3	This path provides guidance for the case where, following SBLOCA treatment in III.B, RCS make up is greater than normal makeup. In this situation, guidance flow transitions to IV.A, LOCA Cooldown.		

SECTION III.B, "LOSS OF SCM" SECTION IV.A, "LOCA COOLDOWN"			
GEOG Path	**Description of Path**	**Scenario**	**Description of Scenario**
IV.A.1	This path addresses situations where required RCS make up flow is greater than that required for normal make up and does not diminish to less than normal make up requirements during cooldown and depressurization. The guidance of this path places the RCS in a cooled-depressurized and safe-stable condition. SGs are available throughout the cooldown. The path ends with reference to Station Management for further direction.		
III.B.4	This path initiates with checks for inadequate heat transfer; SCM may or may not be adequate. If SCM is adequate, guidance flow transitions to GEOG section III.C, LHT. If SCM is not adequate, guidance flow transitions to section IV.B, HPI Cooldown. *Note: The guidance associated with the branch in path III.B.4, that is not exercised here, is exercised by scenario S-III.C.2.a in path III.C.2.*	S-III.B.4	**Initial Conditions:** Plant at 100% FP for 100 days. **Discussion:** A LOOP occurs. PZR level is increasing rapidly and SCM is lost. RCPs are tripped and HPI initiates. There is no EFW flow and the RC drain tank has a high temperature alarm. After checks for possible leaks, SCM recovers, however, the RCS is undergoing an uncontrolled increase in temperature. The scenario ends with transition to LHT guidance. **Final Conditions:** The RCS is at ~560°F Tincore and ~ 1035 PSIG and heating up.
III.B.5/ IV.A.2	This path initiates with checks for LPI flow coincident with RCS pressure less than DHRS operational pressure. If both these conditions exist, transition is made to section IV.A, LOCA Cooldown. This path ends with reference to Station Management for further direction.	S-III.B-5	**Initial Conditions:** Plant at 100% FP for 100 days. **Discussion:** A LBLOCA occurs with no other failures, e.g., ECCS and AC power operate properly. RCS pressure rapidly (within 30 seconds of LOCA initiation) decreases to less than the operational pressure for the LPI system. Once sump switchover criteria are met, ECCS suction is switched to the sump and HPI is secured; SGs are isolated. CFTs are subsequently isolated and post-LOCA boron control is established. This scenario ends with further direction from Station Management. **Final Conditions:** The RCS is at ~ 10 PSIG and ~ 240°F Tincore; RB pressure is at ~ 10 PSIG with the RBS system in operation.

SECTION III.C, "LACK OF HEAT TRANSFER (LHT)" SECTION IV.B, "HPI COOLDOWN" SECTION III.F, INADEQUATE CORE COOLING (ICC)			
GEOG Path	**Description of Path**	**Scenario**	**Description of Scenario**
III.C.1	This is the main success path for mitigation of LHT. In this path FW is restored and heat transfer is established without the need for additional actions; this occurs before HPI cooling initiation criteria are met. This path ends when guidance flow is routed to section III.A, VSSV after checks for a SGTR, LOCA and the possible need for a Forced Cooldown.	S-III.C.1	**Initial Conditions:** Reactor power at 20%. **Discussion:** A LOOP occurs during startup following a refueling outage. Reactor power is ~ 20% when the LOOP occurs. Subsequent to this, EFW does not initiate. Attempts to restore FW are successful and heat transfer is restored before SGs dry out. The scenario ends with SCM adequate and heat transfer controlled. Further plant cooldown is not necessary. **Final Conditions:** RCS is at ~ 525°F Tave and ~ 2150 PSIG.
III.C.2	This path initiates when all FW has been lost and criteria for establishing HPI cooling are met. Guidance is provided to establish HPI cooling, reduce RCS heat input and limit RC inventory losses. This path ends with transition to IV.B, HPI Cooldown.	S-III.C.2.a	**Initial Conditions:** Plant is at 100% FP. **Discussion:** An extended run of FP operations is on-going when a LOOP occurs. EFW does not initiate. Attempts to restore FW are not successful before HPIC initiation criteria are met. Attempts to initiate HPIC are successful. Further attempts to restore FW are not successful. Cooldown proceeds to DHRS conditions using HPIC. This scenario ends with the RCS at DHRS conditions. **Final Conditions:** RCS at ~ 250°F Tincore and ~ 475 PSIG.
IV.B.1	This path provides guidance to bring the RCS to DHRS operating conditions via HPI cooling. SGs do not become available during the cooldown.		
III.C.2	This path initiates when all FW has been lost and criteria for establishing HPI cooling are met. Guidance is provided to establish HPI cooling, reduce RCS heat input and limit RC inventory losses. This path ends with transition to IV.B, HPI Cooldown.	S-III.C.2.b	**Initial Conditions:** Plant is at 100% FP. **Discussion:** An extended run of FP operations is on-going when a LOOP occurs. EFW does not initiate. Attempts to restore FW are not successful before HPIC initiation criteria are met. Attempts to initiate HPIC are successful. Subsequent attempts to restore

SECTION III.C, "LACK OF HEAT TRANSFER (LHT)" SECTION IV.B, "HPI COOLDOWN" SECTION III.F, INADEQUATE CORE COOLING (ICC)			
GEOG Path	**Description of Path**	**Scenario**	**Description of Scenario**
IV.B.2	In this path SGs become available during HPI Cooldown. Guidance is provided to restore heat transfer and secure from HPI cooling. Guidance is also provided to stabilize RCS P-T and establish a PZR bubble. Following this the path ends with further direction being provided by Station Management.		FW are successful and heat transfer is restored; SCM is adequate. HPIC is secured. RCS leak flow is less than normal makeup and HPI is terminated. RCS P-T is stabilized and a PZR bubble is established. This scenario ends with operations being directed by Station Management. **Final Conditions:** RCS is at ~ 470°F Tincore and ~ 470 PSIG.
III.C.3	This path initiates when HPI cannot be initiated. It provides guidance to continue attempts to establish HPI flow and FW. RCS heat input via RCPs is terminated. Control of RCS pressure is by PORV operation. If HPI flow is established without FW being available, then HPIC is initiated and guidance flow transitions to IV.B, HPI Cooldown. If FW becomes available before HPI flow is established, then guidance transitions to path III.C.1 or III.C.3 depending the existence of heat transfer. In the event neither HPI flow or FW can be established before symptoms of ICC occur, then guidance is provided to transition to section III.F, ICC.	S-III.C.3	**Initial Conditions:** Plant is at 100% FP. **Discussion:** Following a reactor trip caused by loss of both MFW pumps, EFW is lost. FW is not restored before HPIC initiation criteria are met. HPI cannot be initiated. Attempts continue to initiate HPI and FW while maintaining RCS pressure and core heat removal via the PORV. Subsequent to RCS reaching saturation, at the core exit, HPIC is initiated. This scenario ends with adequate core cooling via HPIC. **Final Conditions:** RCS is at ~ 648°F Tincore and ~ 2165 PSIG.

SECTION III.C, "LACK OF HEAT TRANSFER (LHT)" SECTION IV.B, "HPI COOLDOWN" SECTION III.F, INADEQUATE CORE COOLING (ICC)			
GEOG Path	**Description of Path**	**Scenario**	**Description of Scenario**
III.C.3	This path initiates when HPI cannot be initiated. It provides guidance to continue attempts to establish HPI flow and FW. RCS heat input via RCPs is terminated. Control of RCS pressure is by PORV operation. If HPI flow is established without FW being available, then HPIC is initiated and guidance flow transitions to IV.B, HPI Cooldown. If FW becomes available before HPI flow is established, then guidance transitions to path III.C.1 or III.C.3 depending the existence of heat transfer. In the event neither HPI flow or FW can be established before symptoms of ICC occur, then guidance is provided to transition to section III.F, ICC.	S-III.C.4/5	**Initial Conditions:** Plant is at 100% FP. **Discussion:** Following reactor trip caused by loss of both MFW pumps, EFW is lost. FW is not restored before HPIC initiation criteria are met. HPI cannot be initiated. Attempts continue to initiate HPI and FW while maintaining RCS pressure and core heat removal via the PORV. FW is restored, however, heat transfer does not immediately initiate and SCM is lost. Attempts to restore heat transfer continue and eventually result in initiating heat transfer. HPI flow is subsequently established and SCM is quickly restored. The scenario terminates with SCM adequate and heat transfer controlled. Further plant cooldown is not necessary. **Final Conditions:** RCS is at ~ 435°F Tincore and ~ 450 PSIG.
III.C.4	This path initiates when HPI and FW are not available and FW is established. It provides guidance to transition out of path III.C.3, i.e., the no HPI and no FW loop. Following this transition, guidance flow continues with either III.C.1 or III.C.5, depending upon whether or not heat transfer is established.		
III.C.5	This path initiates when FW is established and there is no heat transfer. It provides guidance intended to initiate heat transfer to the SG(s) once FW has been restored. This path ends when either HPIC is initiated or heat transfer is restored.		

SECTION III.C, "LACK OF HEAT TRANSFER (LHT)" SECTION IV.B, "HPI COOLDOWN" SECTION III.F, INADEQUATE CORE COOLING (ICC)			
GEOG Path	**Description of Path**	**Scenario**	**Description of Scenario**
III.C.3	This path initiates when HPI cannot be initiated. It provides guidance to continue attempts to establish HPI flow and FW. RCS heat input via RCPs is terminated. Control of RCS pressure is by PORV operation. If HPI flow is established without FW being available, then HPIC is initiated and guidance flow transitions to IV.B, HPI Cooldown. If FW becomes available before HPI flow is established, then guidance transitions to path III.C.1 or III.C.3 depending the existence of heat transfer. In the event neither HPI flow or FW can be established before symptoms of ICC occur, then guidance is provided to transition to section III.F, ICC.	S-III.F.1	**Initial Conditions:** Plant is at 100% FP. **Discussion:** Following reactor trip caused by loss of both MFW pumps, EFW is lost. HPIC initiation criteria are met. However, HPI cannot be initiated. Attempts continue to initiate HPI and FW while maintaining RCS pressure and core heat removal via the PORV. Indications of ICC occur with the RCS P-T being in Region 2. Full HPI flow from two HPI pumps is subsequently restored. RCS P-T has not exceeded Region 2 and now returns to Region 1. Cooldown continues via HPIC with DHRS conditions as the target plant state. The scenario ends with the core adequately cooled by HPIC. **Final Conditions:** RCS is at ~ 560°F Tincore and ~ 1125 PSIG.
III.F.1	This path represents the main success path for ICC mitigation. Guidance is provided to establish ECCS flow and restore primary-to-secondary heat transfer while controlling RCS pressure and inventory. When RCS P-T conditions return to Region 1, guidance flow transitions to IV.A, LOCA Cooldown.		

SECTION III.D, "EXCESSIVE HEAT TRANSFER (EHT)" SECTION IV.C, "FORCED COOLDOWN"			
GEOG Path	**Description of Path**	**Scenario**	**Description of Scenario**
III.D.1	This is the main success path for EHT mitigation. A SG secondary side leak occurs post reactor trip causing an RCS cooldown that cannot be terminated. However, RCS cooldown rate is less than T.S. limits and proper level is being maintained in each SG. Guidance is provided for RCS inventory control and mitigation continues with checks for PTS and adequate SDM. The secondary side leak is isolated (e.g., weeping MSSV that reseats or is gagged). This path ends when guidance flow is routed to section III.A, VSSV after checks for a SGTR, LOCA and the possible need for a Forced Cooldown (SG isolated or unisolable steam leak exists).	S-III.D.1	**Initial Conditions:** Plant is at 100% FP. **Discussion:** During an extended run at FP, a reactor trip is caused by a maintenance technician while working in an RPS cabinet. Subsequent to the reactor trip, one MSSV fails to reseat, resulting in ~ 20°F/HR RCS cooldown rate. No other failures occur. Operation of the affected SG is maintained. RCS inventory is successfully controlled. The affected SG does not dry out and its level is maintained at the low level limit. SCM and SDM are adequate. SG T-S ΔTs are appropriately maintained. The MSSV reseats and RCS P-T is stabilized; further cooldown is not necessary. The scenario ends with further direction from Station Management. **Final Conditions:** RCS is at ~ 500°F Tave and ~ 2100 PSIG.
III.D.2	This path initiates following isolation of a SG secondary side leak, either by SPPS actuation or manual isolation. This path provides guidance to restore heat transfer to one or both SGs. After restoring heat transfer in one or both SGs, mitigation continues by providing guidance to stabilize RCS P-T and control RCS inventory. After checks for PTS and adequate SDM, this path ends after checks for SGTR, LOCA and the possible need for a Forced Cooldown (SG isolated or unisolable steam leak exists).	S-III.D.2	**Initial Conditions:** Plant is at 100% FP. **Discussion:** The plant is completing a 420 day run at FP when a MSLB occurs initiating a reactor trip on variable pressure-temperature. The leak is isolated and controlled heat transfer is restored to the unaffected SG; the affected SG dries out. RCS P-T is stabilized and RCS inventory is controlled. PTS is not invoked and SDM remains adequate. SCM is minimized and SG T-S ΔT limits are maintained during the subsequent cooldown. There are no indications of a SGTR or a LOCA; however, because there is a dry SG, plant cooldown is initiated. The scenario ends when DHRS conditions are achieved. **Final Conditions:** RCS is at ~ 250°F Tave and ~ 275 PSIG.

SECTION III.D, "EXCESSIVE HEAT TRANSFER (EHT)" SECTION IV.C, "FORCED COOLDOWN"			
GEOG Path	**Description of Path**	**Scenario**	**Description of Scenario**
IV.C.1	This flow path provides guidance to perform a plant cooldown to DHRS conditions using SGs. SCM is adequate and there are no indications of a tube rupture or a LOCA. One or two SGs are available.		
III.D.3	This path initiates with the determination that neither SG is available following attempts to mitigate EHT by isolating SGs. If adequate core cooling is being provided by break/HPI flow, then SGs are not necessary and may not be able to return to service (i.e., not enough core energy can transfer to the SGs to maintain their operation). In this situation, guidance transfers to IV.A, LOCA Cooldown. If break/HPI flow is not providing adequate core heat removal, then guidance transfers to path III.D.4.	S-III.D.3	**Initial Conditions:** Plant startup in progress with reactor power at ~ 10%; the main turbine is still on turning gear. RCS Tave is ~ 564°F and RCS pressure is ~ 2155 PSIG. **Discussion:** While at 10% reactor power during startup following a refueling outage, a SBLOCA occurs. RCPs are tripped; HPI and EFW are successfully initiated. Adequate SCM is restored with required RCS make up flow greater than that required for normal make up. There are no apparent RCS leaks that can be isolated. RCS cooldown rate is greater than desired and there are reports of steam in plant auxiliary areas. Isolating SGs does not significantly affect the cooldown rate. Subsequent to SG isolation, RCS cooldown continues on break/HPI flow alone. The scenario ends with cooldown towards DHRS in progress and referring to Station Management for further directions. **Final Conditions:** RCS is at ~ 450°F Tincore and ~ 510 PSIG.

SECTION III.D, "EXCESSIVE HEAT TRANSFER (EHT)" SECTION IV.C, "FORCED COOLDOWN"			
GEOG Path	**Description of Path**	**Scenario**	**Description of Scenario**
III.D.4	This path initiates when it is determined that break/HPI flow is not sufficient to adequately cool the core. Guidance is provided to attempt trickle feeding in the event a SG that cannot hold pressure is the only available SG. If trickle feeding is successful, then cooldown can continue by use of primary-to-secondary heat transfer with eventual transition to IV.C, Forced Cooldown. If trickle feeding will not be used, then cooldown will proceed using the HPI system. Guidance is provided to initiate HPIC. Following this, guidance flow transitions to IV.B, HPI Cooldown.	S-III.D.4	**Initial Conditions:** Plant is shutting down with reactor power at ~ 50%. **Discussion:** A MFW control system transient occurs at ~ 50% FP during shutdown after a 400 day FP run. This causes one SG to fill. The reactor trips on low RCS pressure with one MSSV failing full open on the non-overfed SG. This leads to isolation of both SGs. One SG is full, including some water induction into its associated steam line, and the other SG dry; SCM is adequate. The dry SG is operated via trickle feeding methods. This works initially, but causes EHT as decay heat diminishes. Subsequently, HPIC is initiated. The scenario ends following initiation of HPIC. **Final Conditions:** RCS at ~ 480°F Tincore and ~ 680 PSIG.
III.D.5	This path initiates when it is determined that break/HPI flow is not sufficient to adequately cool the core <u>and</u> continuous use of trickle feeding will not be pursued (leak location and or control issue) <u>and</u> HPI flow cannot be established. In this situation, guidance is provided to control RCS pressure and re-establish trickle feed while attempts continue to initiate HPIC. Following initiation of HPI, guidance directs terminating trickle feed and opening the PORV. Guidance flow then transitions to IV.B, HPI Cooldown.	S-III.D.5	**Initial Conditions:** Plant is shutting down with reactor power at ~ 50%. **Discussion:** A MFW control system transient occurs at ~ 50% FP during shutdown after a 400 day FP run. This causes one SG to fill. The reactor trips on low RCS pressure with one MSSV failing full open on the non-overfed SG. This leads to isolation of both SGs. One SG is full, including some water induction into its associated steam line, and the other SG dry; SCM is adequate. The dry SG is operated via trickle feeding methods. This works initially, but causes EHT as decay heat diminishes. Subsequently, attempts are made to initiate HPIC, which is not successful and trickle feed is re-initiated. Attempts to establish HPIC continue with eventual success; trickle feed is again terminated. The scenario ends following initiation of HPIC. **Final Conditions:** RCS at ~ 450°F Tincore and ~ 670 PSIG.

SECTION III.E, "STEAM GENERATOR TUBE RUPTURE" SECTION IV.A, "LOCA COOLDOWN"			
GEOG Path	**Description of Path**	**Scenario**	**Description of Scenario**
III.E.1	This is the main success path for SGTR mitigation. It starts with the plant at power. Guidance is prescribed to take the reactor and turbine-generator off line such that MSSVs and ADVs do not open. Immediately following this, guidance is provided that ensures the reactor and turbine are shutdown. Following reactor shutdown SCM is minimized and cooldown is initiated with both SGs. If the most affected SG is not required (e.g., to maintain adequate core heat removal and RCS cooldown), then it is no longer fed or steamed once RCS pressure is less than 1000 PSIG. Cooldown continues without the need to use SG drains to maintain SG operation. This path ends with the RCS at DHRS conditions and Station Management providing further direction.	S-III.E.1	**Initial Conditions:** Plant is at 100% FP. **Discussion:** A SGTR, ~ 50 GPM leak, occurs at 100% FP; there are no other failures. The reactor is shutdown, SCM is minimized and cooldown commences with both SGs. When RCS pressure is less than 1000 PSIG, the affected SG is no longer fed or steamed. Cooldown continues with no other transient related consequences. The scenario ends when the RCS is at DHRS conditions. **Final Conditions:** RCS is at ~ 250°F Tave and ~ 275 PSIG.

SECTION III.E, "STEAM GENERATOR TUBE RUPTURE" SECTION IV.A, "LOCA COOLDOWN"			
GEOG Path	**Description of Path**	**Scenario**	**Description of Scenario**
III.E.2	This path provides for SGTR mitigation with the reactor tripped when the SGTR occurs. For this reason, reactor shutdown is not necessary. Guidance is provided to minimize SCM and cooldown is initiated with both SGs. If the most affected SG is not required (i.e., to maintain adequate core heat removal and RCS cooldown), then it is no longer fed or steamed once RCS pressure is less than 1000 PSIG. Cooldown continues without the need to use SG drains to maintain SG operation. This path ends with transition of guidance flow to IV.A, LOCA cooldown due to indications of a LOCA.	S-III.E.2	**Initial Conditions:** The plant is at 100% FP. **Discussion:** The plant is being shutdown from an extended power run for repairs to an ongoing minor RCP seal leak and to investigate intermittent indications of a small tube leak in one SG (indications increase and decrease above and below limits on a given frequency). During the shutdown, at ~ 50% reactor power, a spurious control system upset causes a MFW transient on the non-tube leak SG. The reactor trips on low RCS pressure. MFW is restored to normal operations with the overfed SG level at 580 inches full range; the other SG level is at 200 inches SU range. The MS lines of the overfed SG are isolated (reduce possible dynamic water induced loads on steam lines). The overfed SG is now also indicating a tube leak. This is confirmed and estimates indicate the overfed SG has a tube leak of

IV.A.3	This path provides guidance to prevent overfill of SGs that have SGTRs. If SG(s) cannot be prevented from overfilling, then they are isolated and RCS pressure is maintained less than 1000 PSIG. If both SGs are isolated, then the PORV is eventually opened and guidance transitions to IV.B, HPI Cooldown, otherwise cooldown continues in this path to DHRS conditions.		~ 60 GPM and the other SG is now also leaking at ~ 60 GPM. RB particulate and iodine levels, which have been elevated due to the RCP seal leak, now increase to the alarm point. It is confirmed that these indications are accurate. RB sump level is rising commensurate with a 75 GPM in-leakage flow rate. Cooldown is commenced and at < 1000 PSIG RCS pressure, the overfed SG, which has already filled, is declared inoperable and completely isolated. Cooldown and depressurization continue via the remaining SG; however, its level is rising and will exceed overfill limits prior to reaching DHRS conditions. Attempts are made to limit and/or reduce the level using SG drains. These attempts are unsuccessful and cooldown continues via HPIC. The scenario ends with the RCS cooling down toward DHRS operational conditions. **Final Conditions:** RCS is at ~ 380°F Tincore and ~ 262 PSIG.

SECTION III.E, "STEAM GENERATOR TUBE RUPTURE" SECTION IV.A, "LOCA COOLDOWN"			
GEOG Path	**Description of Path**	**Scenario**	**Description of Scenario**
III.D.2	This path initiates following isolation of a SG secondary side leak, either by SPPS actuation or manual isolation. This path provides guidance to restore heat transfer to one or both SGs. After restoring heat transfer in one or both SGs, mitigation continues by providing guidance to stabilize RCS P-T and control RCS inventory. After checks for PTS and adequate SDM, this path ends after checks for SGTR, LOCA and the possible need for a Forced Cooldown (SG isolated or unisolable steam leak exists).	S-III.E.3	**Initial Conditions:** The plant is operating at 100% FP. **Discussion:** A MSLB occurs while at FP. This causes a reactor trip on variable pressure-temperature. The affected SG dries out (leak location rules out use of trickle feed on this SG). Controlled heat transfer is restored to the unaffected SG, which now exhibits indications of a tube leak. RCS P-T is stabilized and RCS inventory is controlled. PTS is not invoked and SDM remains adequate. SCM is minimized and SG T-S ΔT limits are maintained. The remaining operable SG begins to overfill due to the tube

III.E.3	This path initiates with the determination that a SG is overfilling while it is being steamed. It provides guidance for use of SG drains in an attempt to prevent overfill of affected SGs. If successful, guidance continues with cooldown per section III.E, SGTR. If unsuccessful and both SGs become unavailable, then guidance is provided to initiate HPIC. Guidance flow transitions to IV.B, HPI Cooldown.		leak. Attempts to prevent overfill via SG drains are unsuccessful. The SG is isolated and HPIC is initiated. The scenario ends following initiation of HPIC. **Final Conditions:** RCS is at ~ 400°F Tincore and ~ 310 PSIG.

SECTION III.F, "INADEQUATE CORE COOLING (ICC)"			
GEOG Path	**Description of Path**	**Scenario**	**Description of Scenario**
III.F.2	This path initiates when RCS P-T enters Region 3. Guidance is provided to continue attempts to restore ECCS and heat transfer. Also, if CF or LPI are available, then guidance is provided to attempt to reduce RCS pressure. When RCS P-T conditions return to saturation (Region 1), guidance flow transitions to IV.A, LOCA Cooldown.	S-III.F.1	**Initial Conditions:** Plant is operating at 100% FP for 100 days. Only one EFW pump and one emergency AC source are operable due to maintenance. **Discussion:** Following LOOP the EFW pump fails and no EFW flow is provided to the SGs. HPIC initiation criteria are met. However, HPI cannot be initiated. Attempts continue to initiate HPI and FW while maintaining RCS pressure and core heat removal via the PORV. Indications of ICC occur. Attempts to establish ECCS flow and restore primary-to-secondary heat transfer are not successful before RCS P-T enters Region 3. Attempts to initiate HPI and heat transfer continue. The PORV is opened in an attempt to reduce RCS pressure toward CF and LPI operational pressures. The RCS enters the Severe Accident region. The scenario ends with Station Management referring to Severe Accident guidance to provide further direction. **Final Conditions:** RCS is at ~ 900°F Tincore and ~ 430 PSIG.
III.F.3	This path initiates when RCS P-T enters the Severe Accident Region. In the event ICC conditions cannot be mitigated before indications of a Severe Accident occur, then this path provides guidance for implementing Severe Accident Guidance. This is via reference to Station Management for further direction.		

Figure VIII-2
III.A, EOP ENTRY/VSSV FLOWCHART

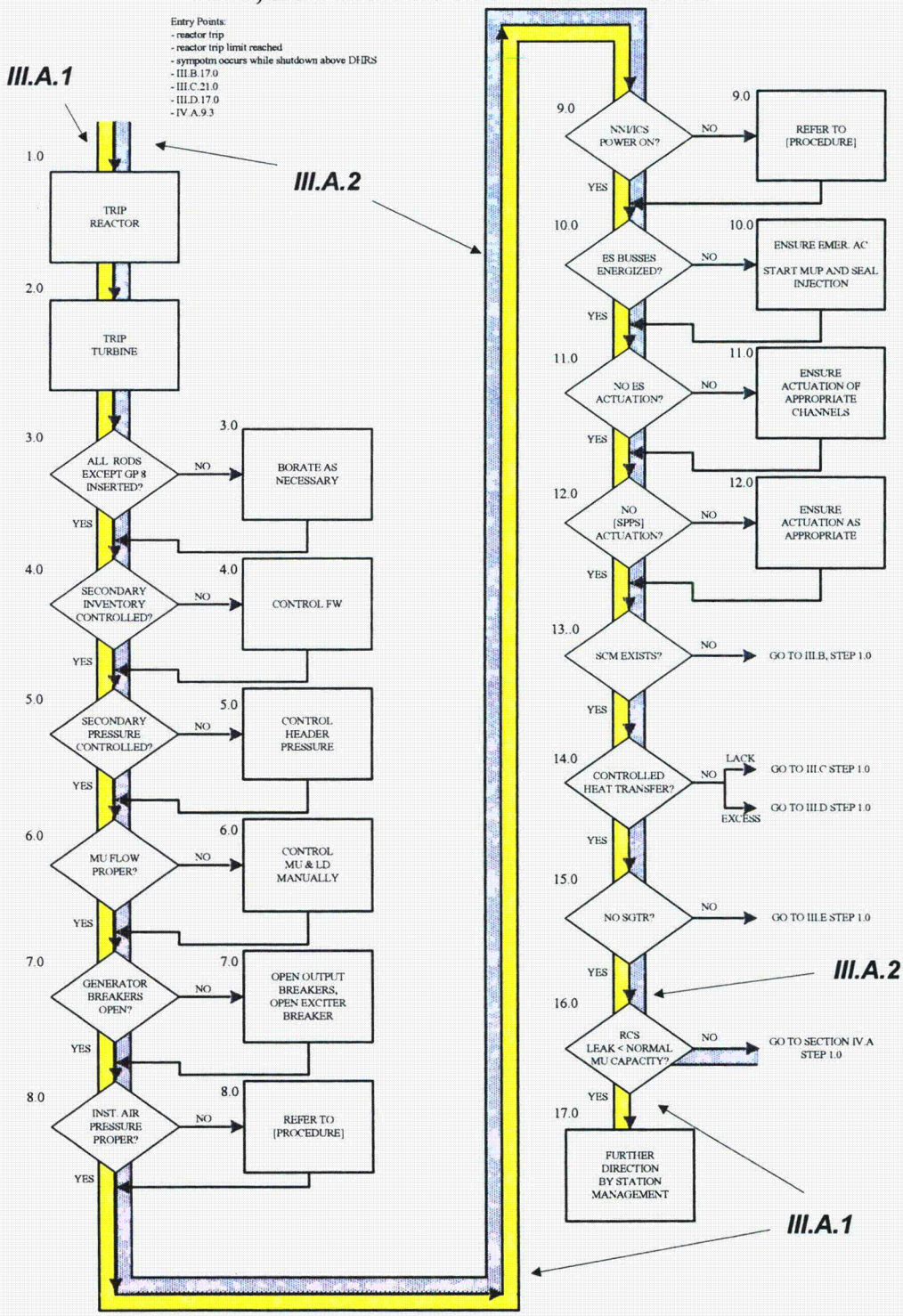


Figure VIII -3
SECTION III.B, LOSS OF SCM FLOWCHART (1 of 2)

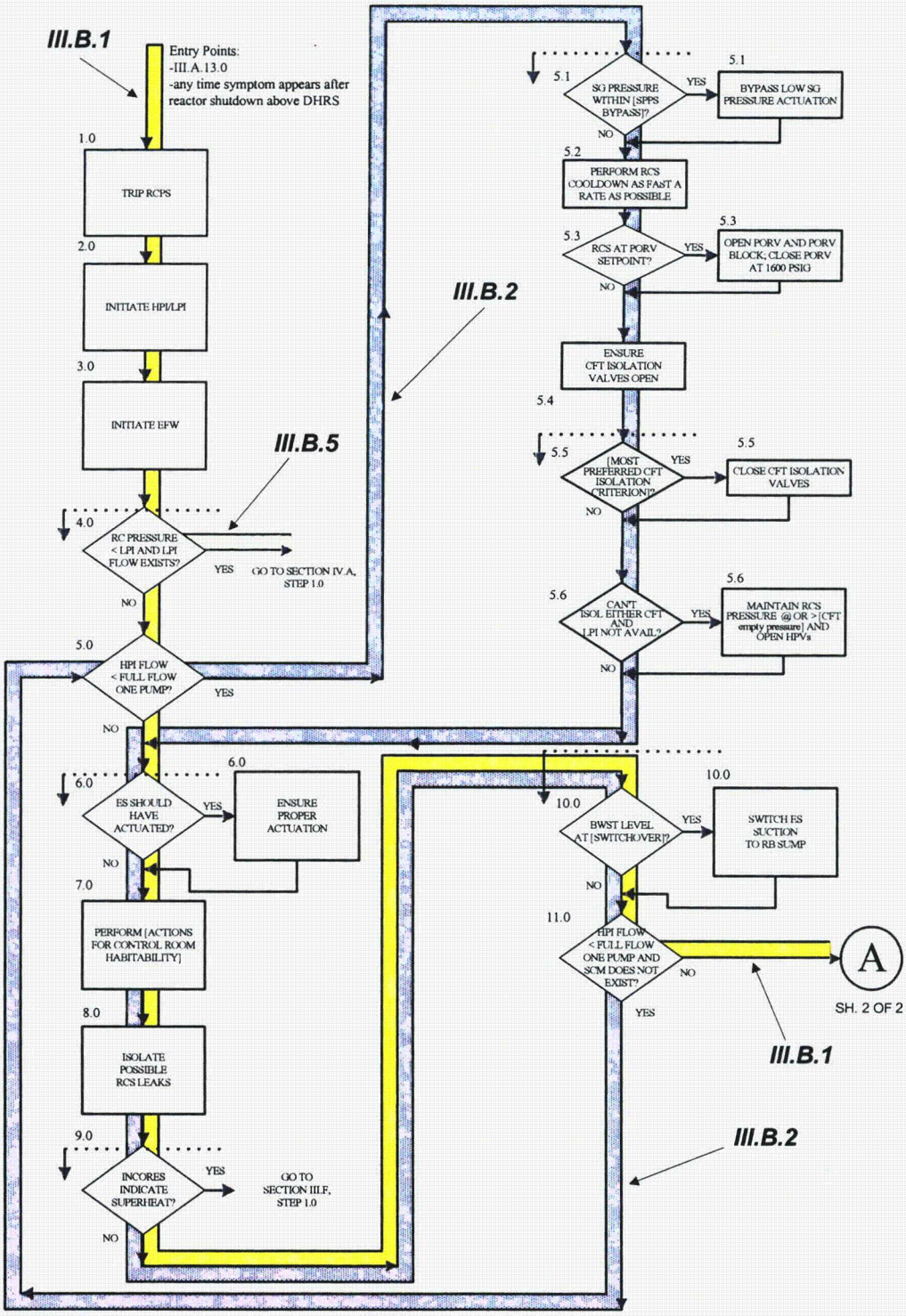


Figure VIII-3

III.B, LOSS OF SUBCOOLING MARGIN FLOWCHART (2 of 2)

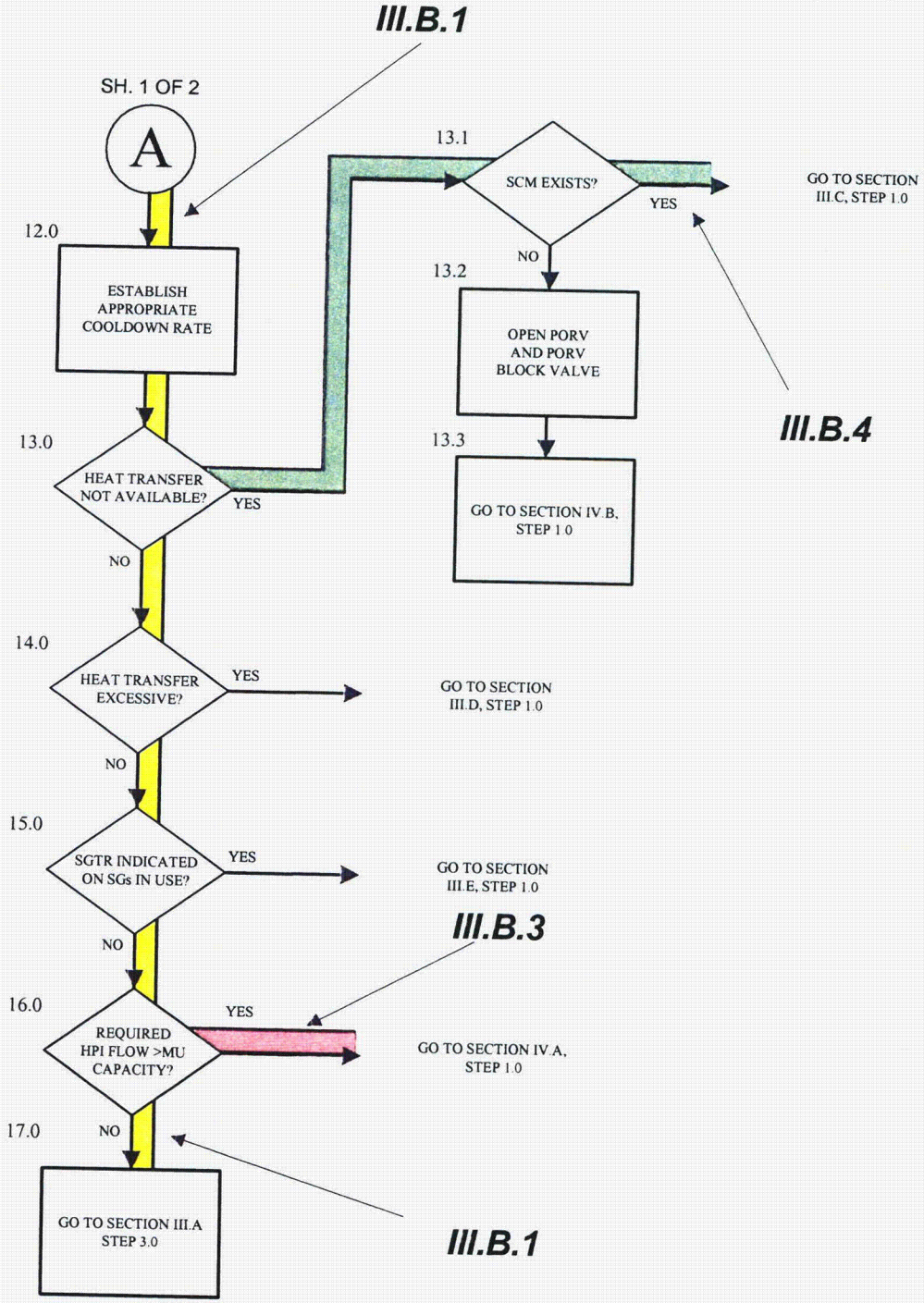


Figure VIII -4
III.C, LHT FLOWCHART (1 of 2)

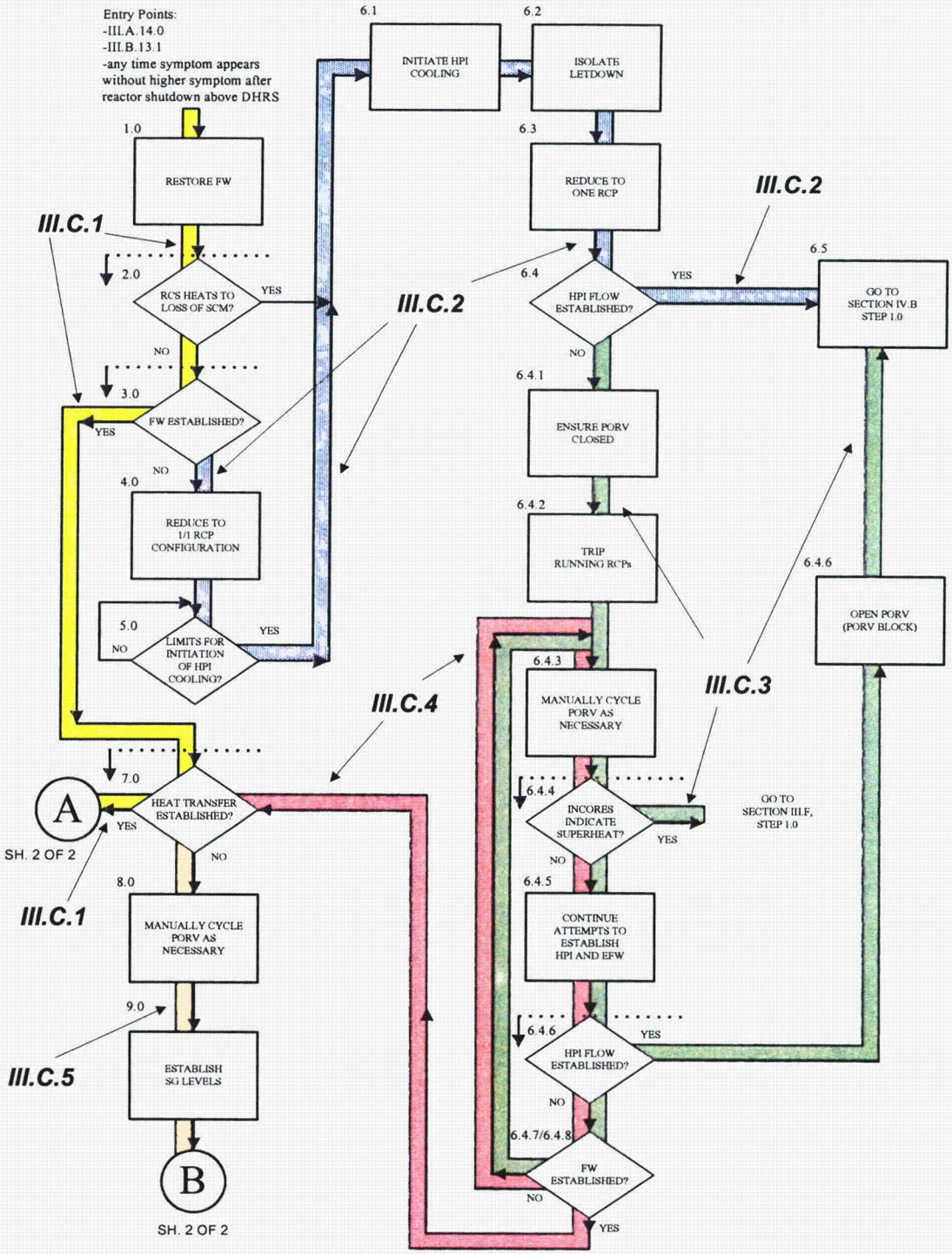


Figure VIII -4
III.C, LHT FLOWCHART (2 of 2)

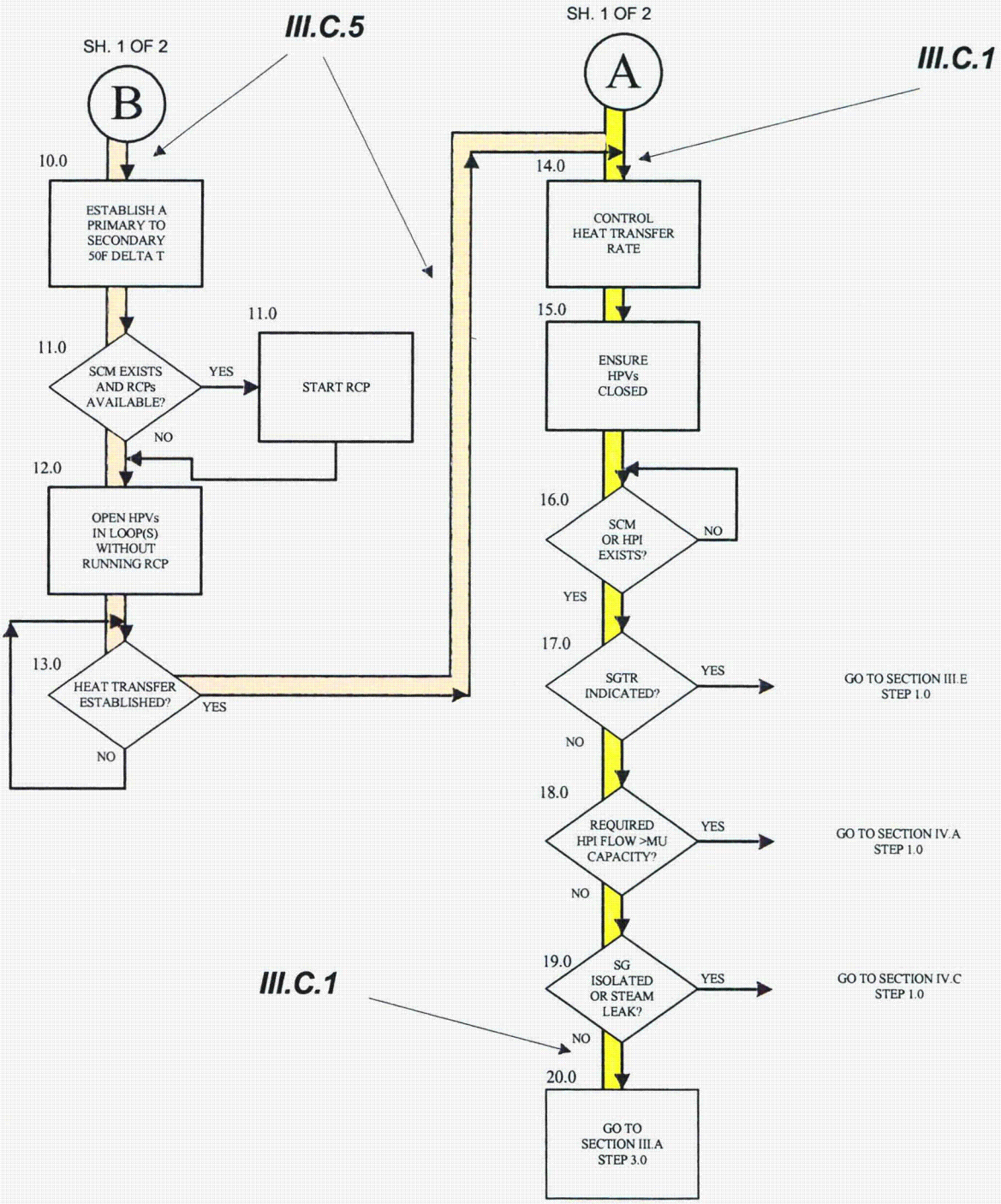


Figure VIII -5
III.D, EHT FLOWCHART (1 of 2)

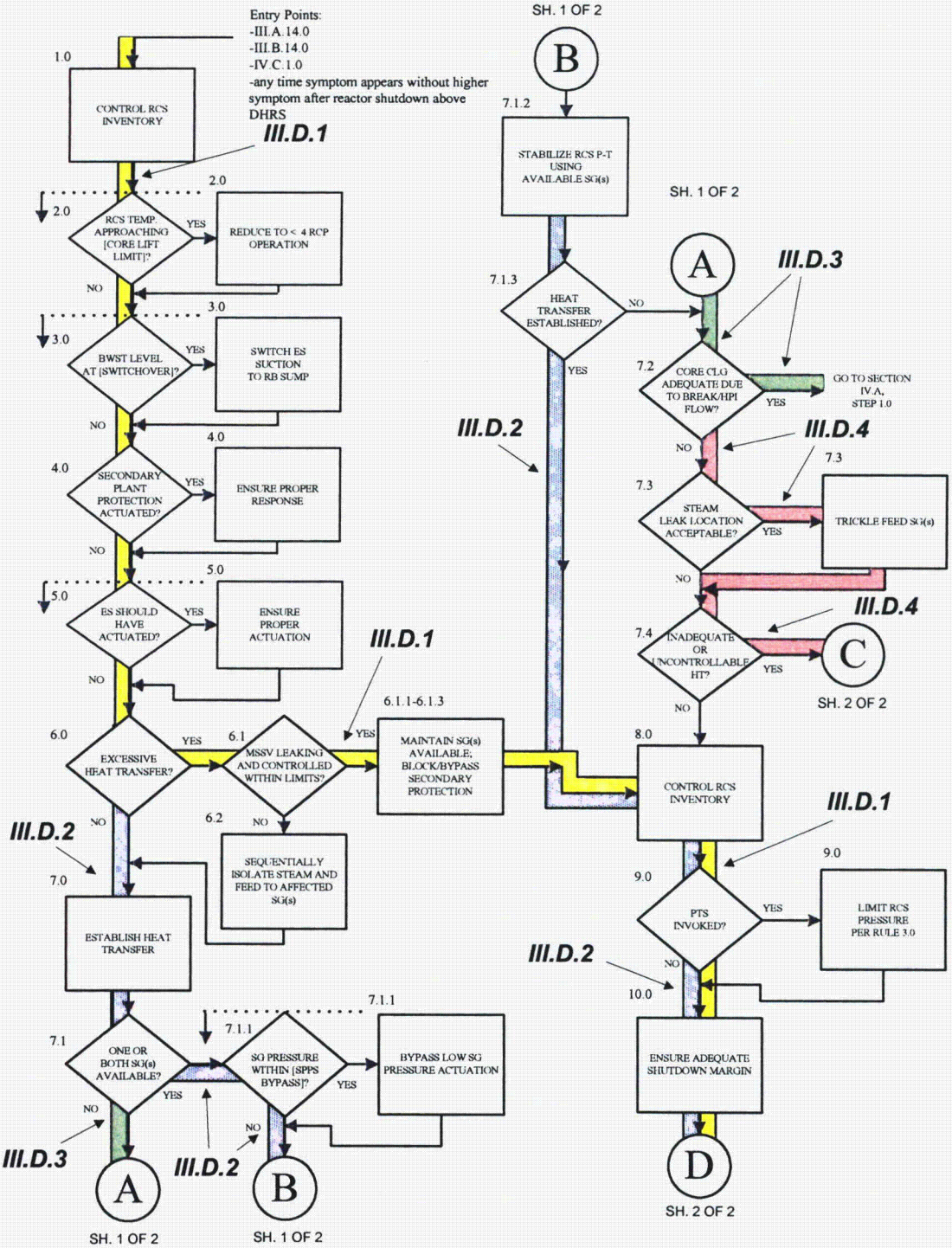


Figure VIII -5

III.D, EHT FLOWCHART (2 of 2)

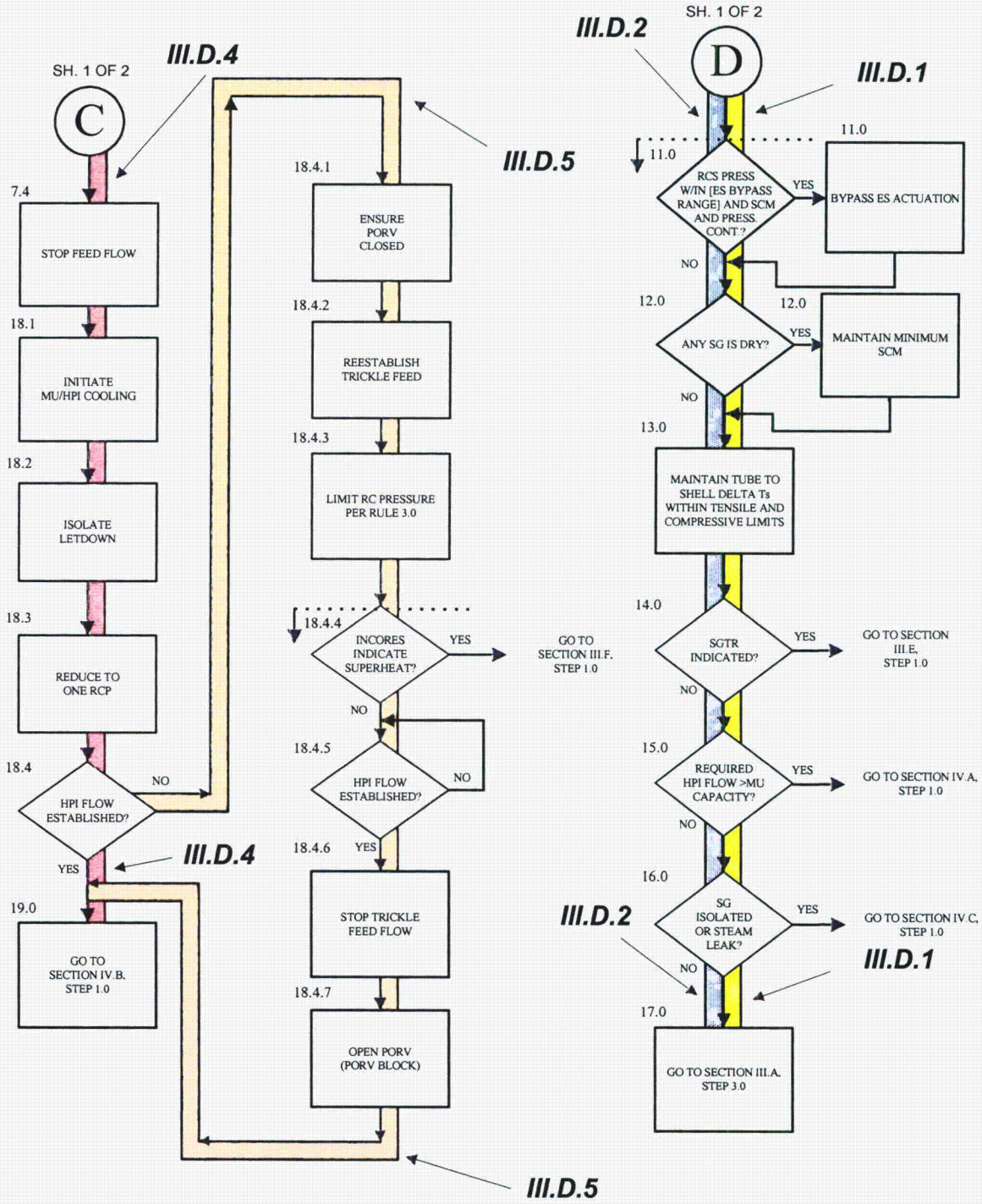


Figure VIII -6
III.E, SGTR FLOWCHART (1 of 2)

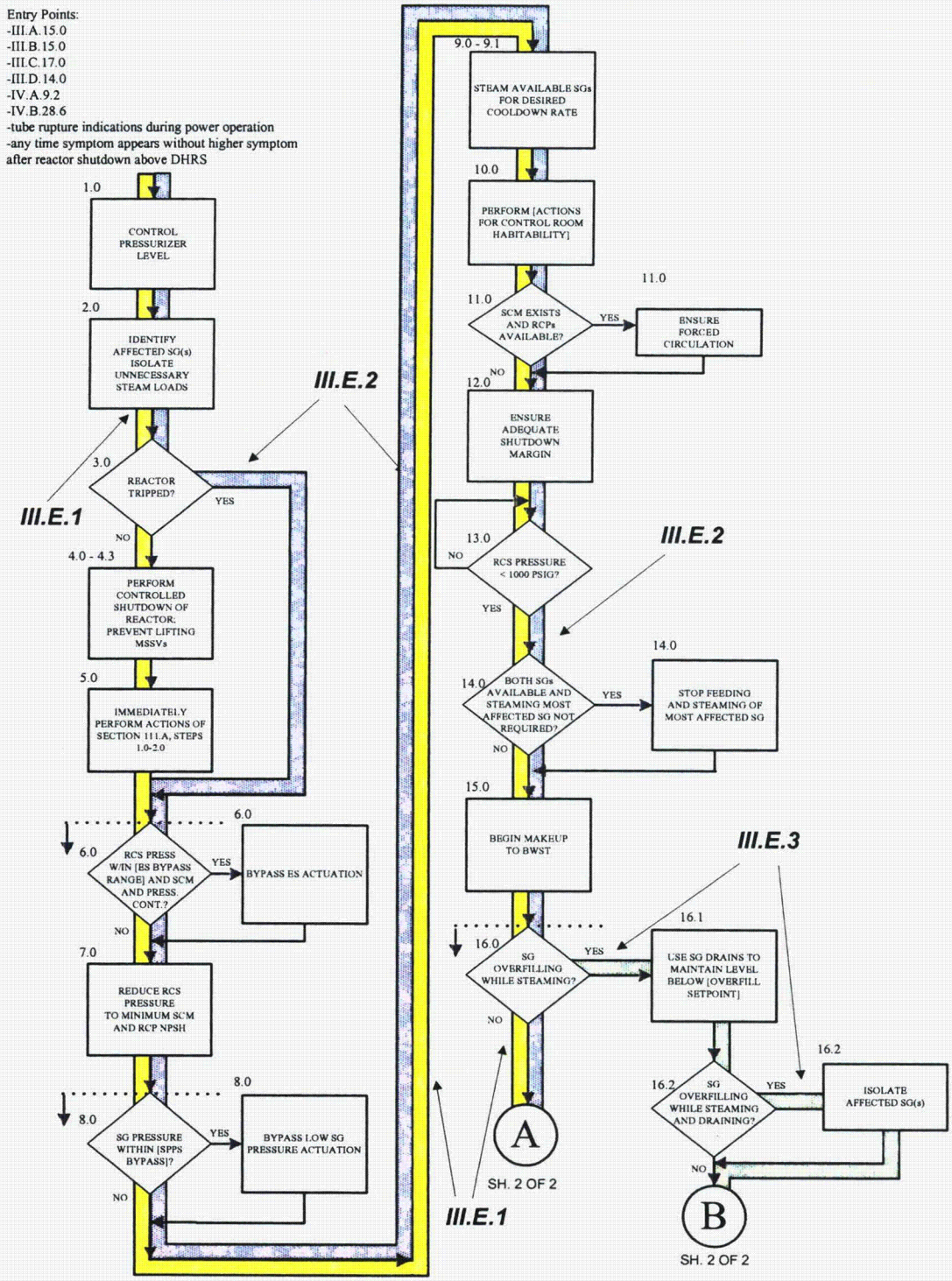


Figure VIII -6

III.E, SGTR FLOWCHART (2 of 2)

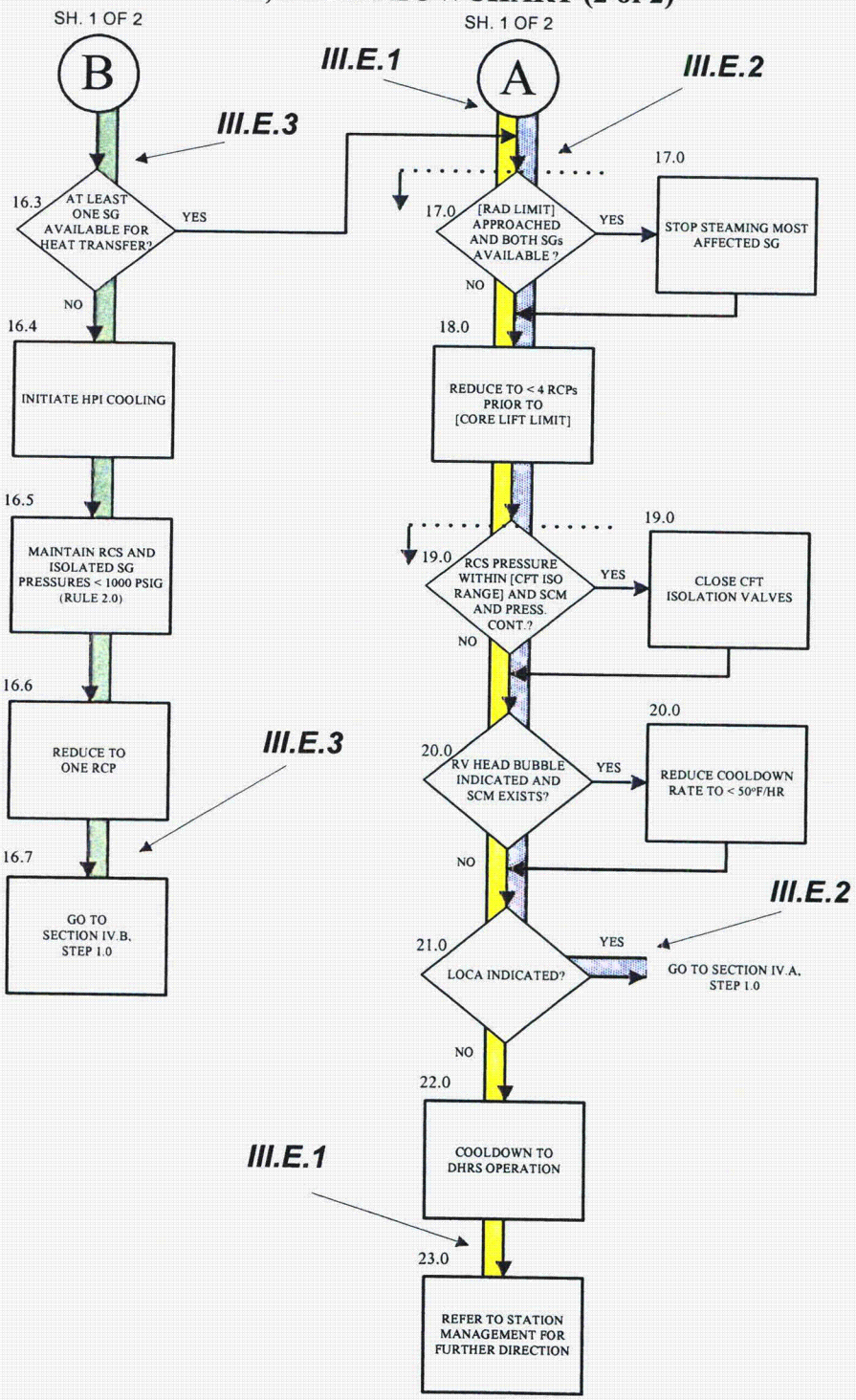


Figure VIII -7
III.F, ICC FLOWCHART

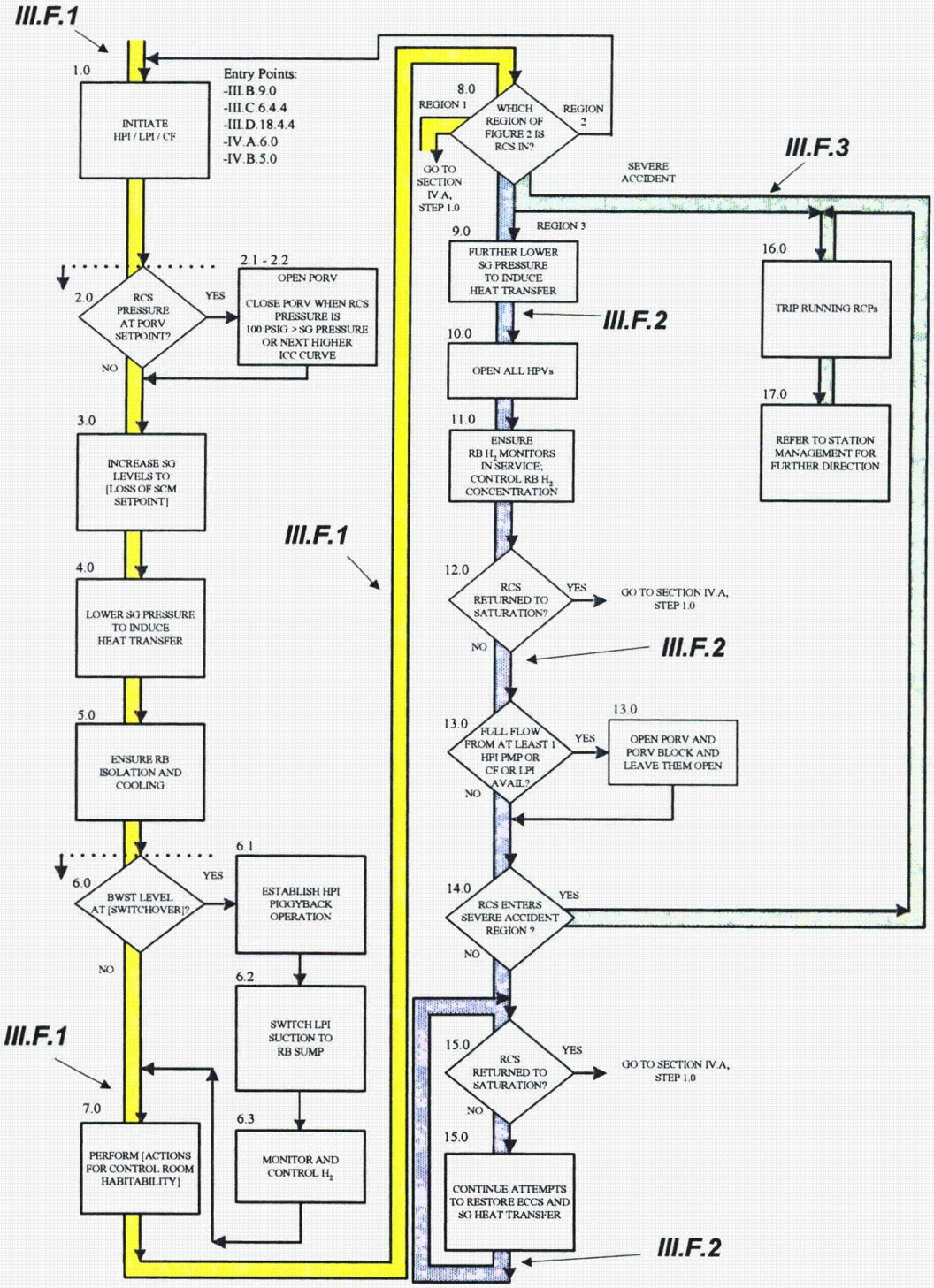


Figure VIII -8
IV.A, LOCA COOLDOWN FLOWCHART (1 of 2)

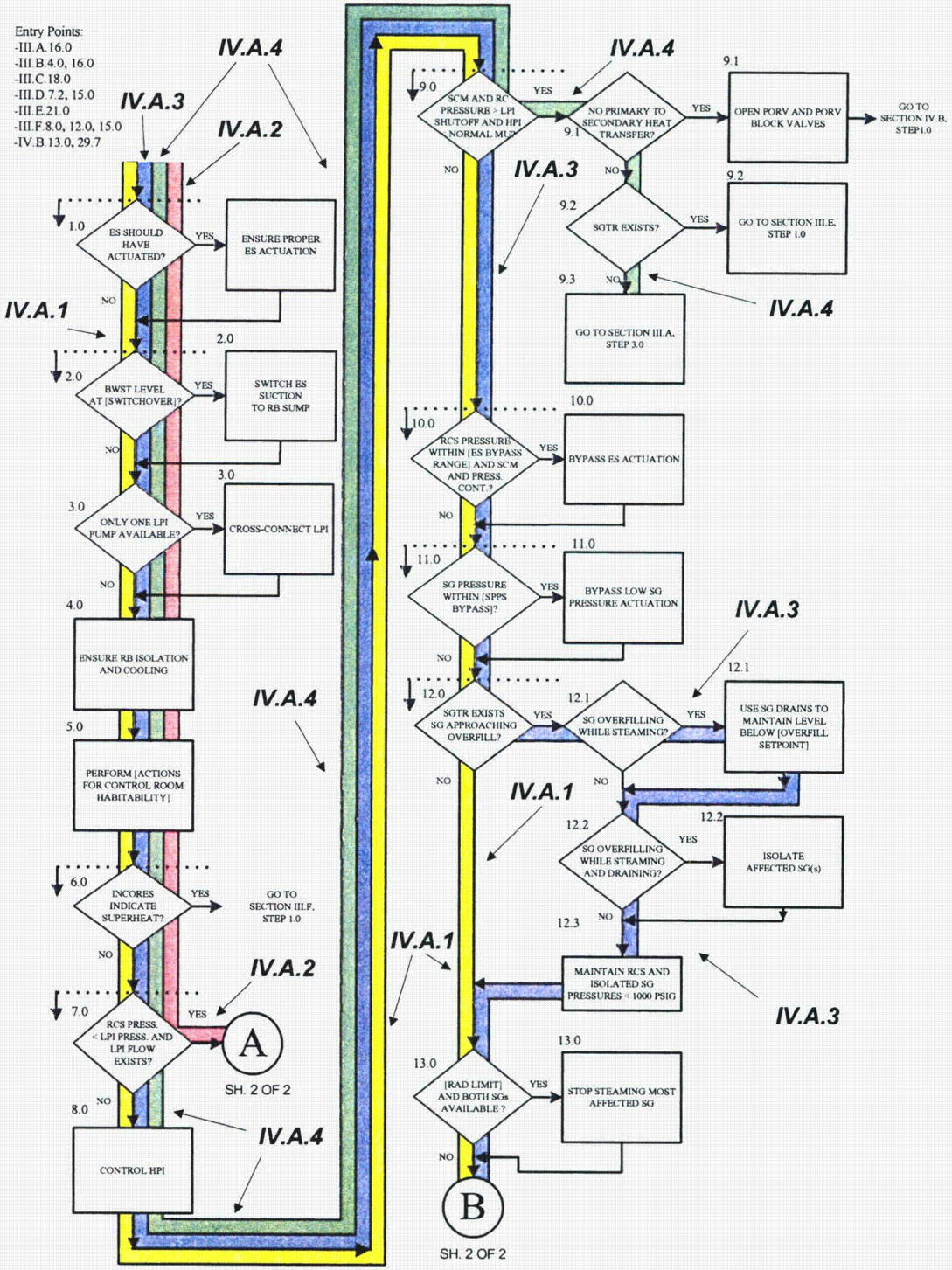


Figure VIII -8

IV.A, LOCA COOLDOWN FLOWCHART (2 of 2)

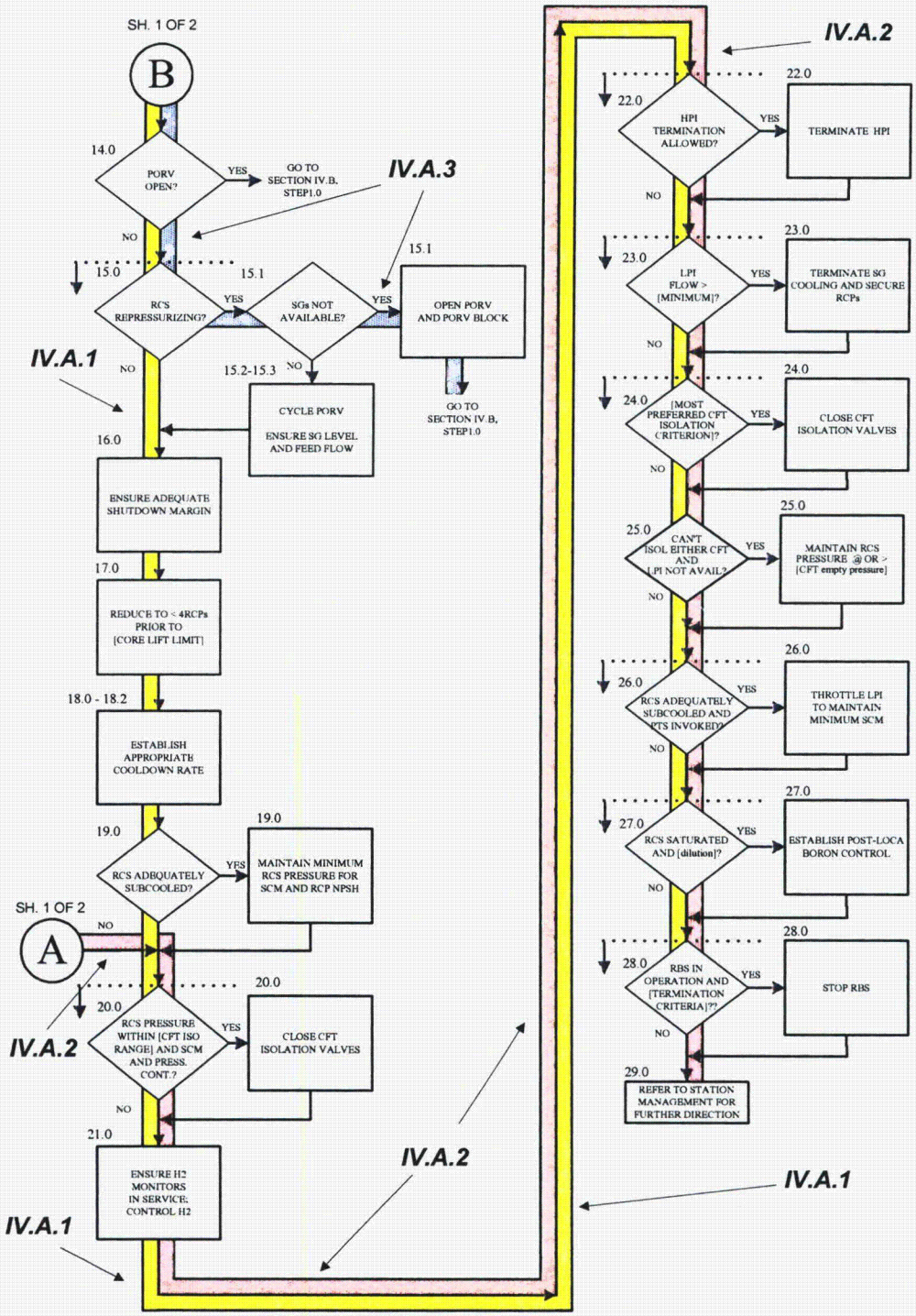


Figure VIII -9
IV.B, HPI COOLDOWN FLOWCHART (1 of 2)

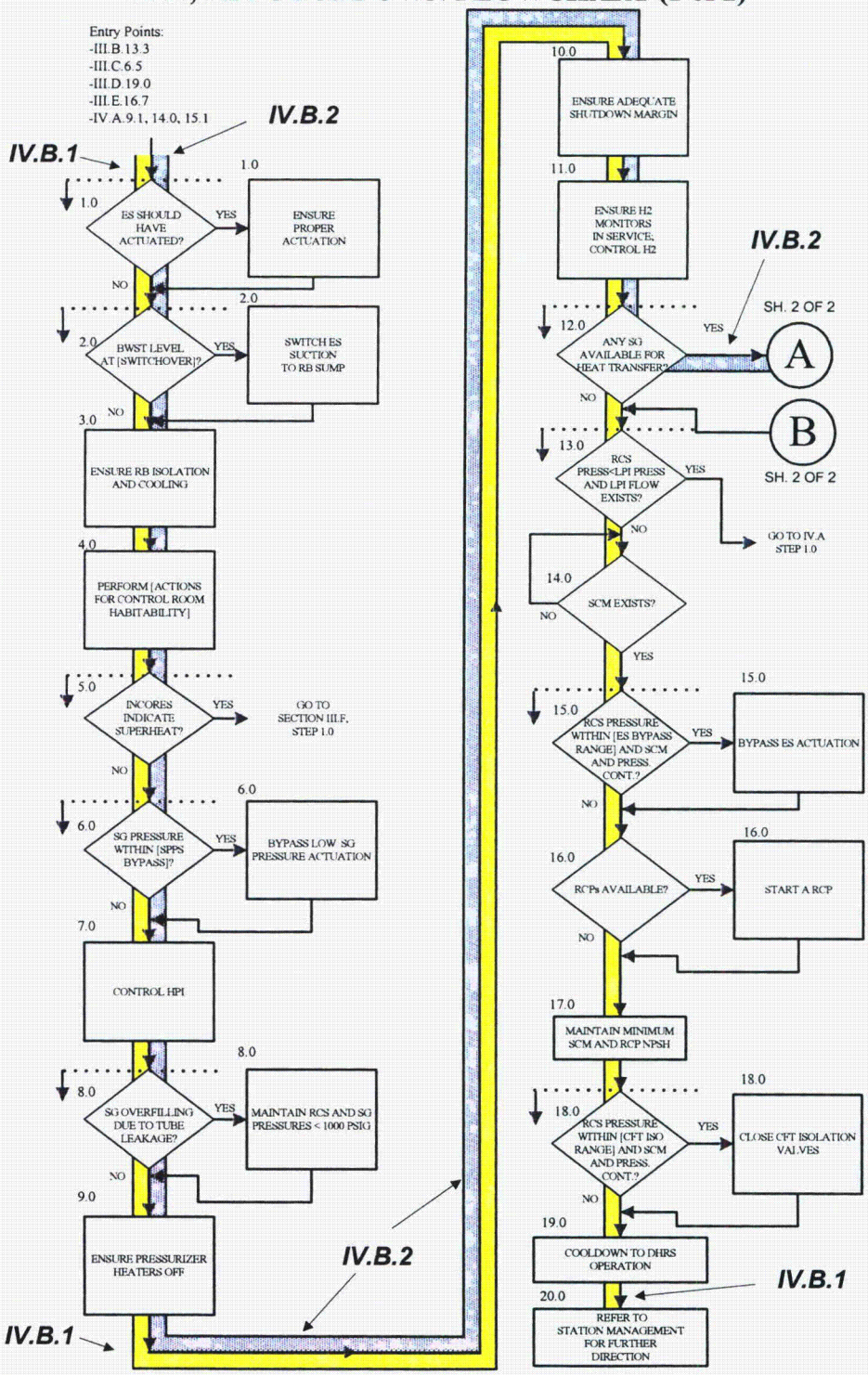


Figure VIII -9
IV.B, HPI COOLDOWN FLOWCHART (2 of 2)

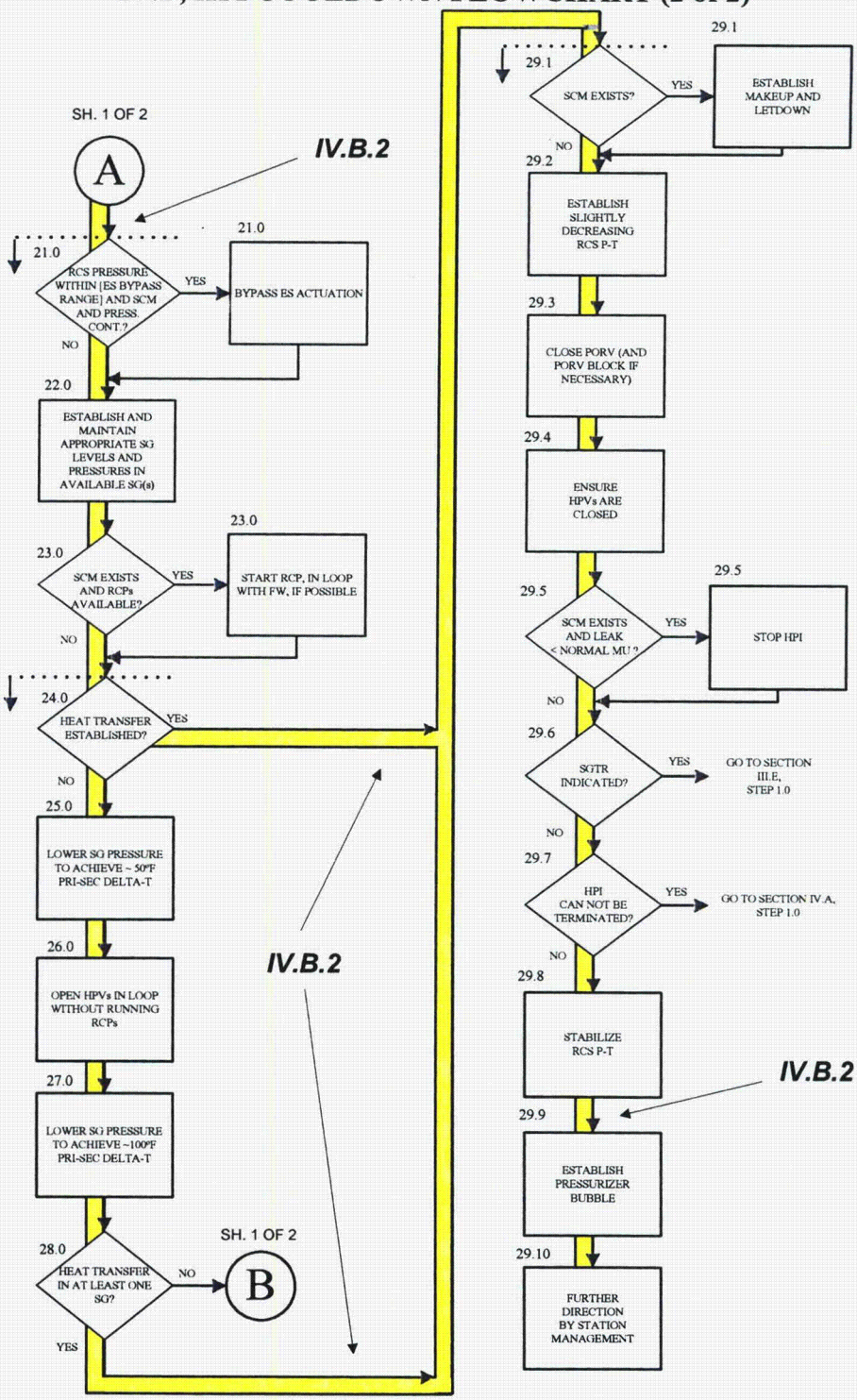
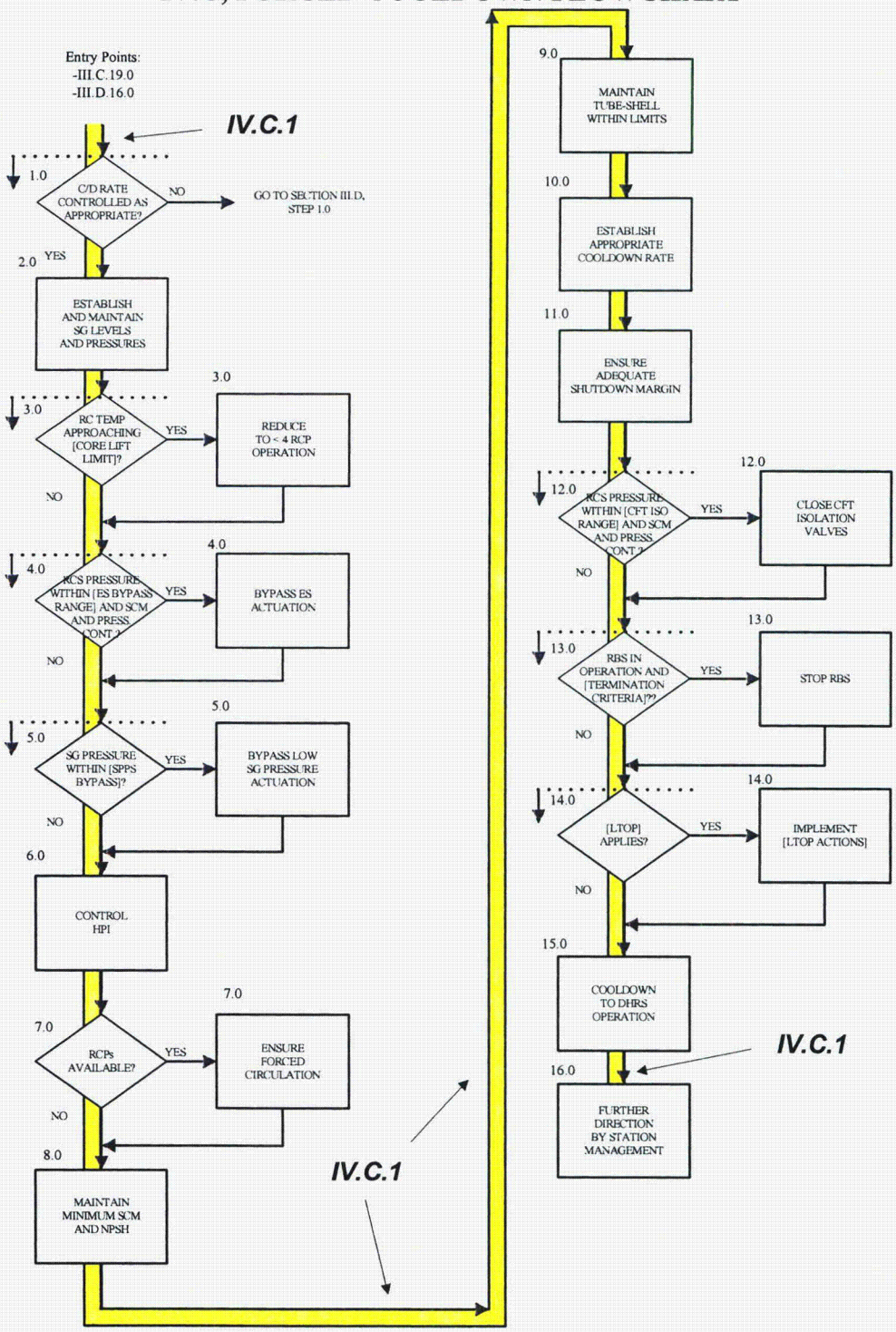


Figure VIII -10
IV.C, FORCED COOLDOWN FLOWCHART



Chapter IX

Chronology of the B&WOG EOP Guidance and Related Issues

For the period March 1979 through September 1986, this chronology relies extensively on a chronology previously developed by the B&WOG Operator Support Committee and issued to the NRC by letter in September 1986 entitled "A History of ATOG." This letter is item B27 in the references in Chapter X. Bracketed numbers in the following chronology denote the reference in Chapter X.

3/28/79 TMI-2 incident.

4/79 NRC Issues I&E Bulletin 79-05, requiring review and revision of operating procedures and operator training based on events and scenarios stemming from TMI-2. IEB79-05 is followed by 3 additional supplements in the period through 7/79. [R1]

4/25/79 B&W Owners Group organizes a new Subcommittee for TMI-2 Followup. [B27]

6/13/79 The TMI-2 Subcommittee meets and defines ATOG name and concepts. [B27]

7/79 NRC issues NUREG-0578, including section 2.1.9 concluding that existing EOPs were not adequately supported by vendor guidance and that FSAR analyses were often inappropriate as EOP bases. Recommended: (1) new analyses to determine plant response and proper operation actions during: (a) SBLOCA, (b) ICC and (c) other transient and accidents. Also recommended: (2) corresponding guidelines for operator actions; (3) upgraded EOPs; and (4) operator training. Suggested the need for multiple and consequential failures to be defined in future. [R2]

7 to 8/79 TMI-2 Subcommittee meets with NRC to present ATOG, a symptom-oriented, two-part format, starting with 5 event tree analyses. B&WOG is operating at its own initiative; NRC responds enthusiastically. [B27]

9/13/79 NRC issues letter formally implementing NUREG-0578. [R3]

9/13/79 TMI-2 Subcommittee meets with NRC. Event trees, safety sequence diagrams, system auxiliary diagrams and their function in ATOG are described. B&WOG announces its intention to develop plant specific guidelines. NRC expresses concern about use of non-safety grade indications. [B2, 27]

10/79 NRC issues Lessons Learned Task Forces's Final Report, outlining policy issues, recognizing an inadequate NRC review process for EOPs and recommending an inter-disciplinary safety review of EOPs by NRC with a SER issued upon conclusion. [R4]

10/15/79 NRC meets with B&W, EDS and AP&L in Lynchburg. B&WOG describes efforts including number and quality of personnel and data. Completed event tree for excess feedwater were presented and delivered to NRC including assumptions and computer codes. The role of a human factors consultant in format development was identified. Data requirements specifications were presented. Simulator limitations for use in walk through was questioned by NRC. The B&WOG indicated its intentions to proceed even without timely NRC input. [B27]

11/779 AP&L dockets a paper on safety sequence analysis, with explanations of the role of SSD's and DAD's in ATOG, excessive feedwater SAD and previously delivered excessive feedwater event tree. [B3, 27]

2/22/80 ATOG Subcommittee meets with NRC to review design of the program. ATOG symptom categories were identified. The ATOG display was identified and explained and a detailed ATOG outline was presented. NRC staff agreed (and later documented) acceptability of ATOG for compliance with Item 2.1.9 of NUREG-0578. [B4]

4/16/80 B&WOG submits to NRC five event trees (3 or more copies), five SSD's (3 copies), 10 SAD's (3 copies), instructions for using SSD's and SAD's and Event Tree Guidelines (description, bounding assumptions, methodology, and application). [B5,27]

5/80 NRC issues NUREG-0660 (NRC TMI Action Plan), combining NRC and licensee actions into a single action plan with schedules. Included are recommendations from numerous groups including the Lesson Learned Task Force. Plan requires NRC review/ audits of on-going analyses and EOP upgrade activities and confirmatory accident analyses by NRC. For licensees, specifies completion schedules for on-going analyses, guideline preparation, EOP upgrades and operator training are required. [R5]

6/16/80 AP&L formally dockets the 4/16/80 submittal. [B6,27]

8/21/80 ATOG Subcommittee meets with NRC. Draft guidelines were delivered. NRC staff described ATOG approach as acceptable (later documented). B&WOG program design was again reviewed. Operational changes identified in ATOG presented and guideline content was presented in depth. This was first involvement of NRC procedures and test review branch. ATOG similarity to GE approach was noted by NRC. NRC disagreement on pre-implementation review was noted. [B27]

10/31/80 NUREG-0737 (Clarification of TMI Action Plan) issued, including Item I.C.1. This item expands on requirements of NUREG-0600 by requiring consideration of multiple failures including consequential operator errors; requires pre-implementation review of

guidelines and EOPs; and strongly encourages licensees to base EOP guidelines on generic submittals. NUREG also modifies dates for completion. [R6]

11/29/80 & 12/4/80 Presentations by GPU of ATOG to ACRS. Response is extremely enthusiastic. GPU version of display used in presentation. [B27]

12/16/80 ATOG Subcommittee meets with NRC. Repeated the August presentation plus some on display flexibility for varied use. NRC announced plans for NUREG-0799. Draft AP&L guidelines agreed on as a satisfactory document for NRC to use to meet the January 1, 1981, submittal requirement of NUREG-0737. [B27]

12/19/80 AP&L dockets its position on ATOG compliance with NUREG-0737 stating that ATOG is considered to be adequate without complete compliance. Utilities' ability to change procedures under 10CFR 50.59 noted. [B27]

12/31/80 AP&L dockets the draft guidelines delivered in August 1980 in recognition of the NUREG-0737 submittal requirements as agreed in the December 1980 NRC meeting. [B27]

2/23/81 AP&L establishes and documents ATOG compatibility with Regulatory Guide 1.33 and current Tech. Spec requirements referencing Regulatory Guide 1.33. [B27]

3/81 NRC calls B&WOG to indicate they have concerns with ATOG and suggests a meeting. B&WOG agrees but requests informal transmittal of concerns in order to prepare for meeting. [B27]

4/3/81 Duke Power dockets Oconee Draft Guidelines. [B7,27]

6/1/81 NRC transmits formal letter to each B&W licensee stating that a preliminary review has been completed of the ANO-1 ATOG submitted as a "generic" guidelines in response to NUREG-0737 I.C.1. NRC finds deficiencies including: No basis for consideration of multiple and consequential failures; incomplete provision of bases for multiple failures; failure to include operator errors; failure to address certain specific multiple failures; and inadequate transition from EOPs into ICC. [R7]

7/2/81 AP&L responds to 6/1 NRC letter pointing out errors, stating that ATOG is too far along to modify and noting that NRC has had two years to provide input. Suggests more NRC review and states AP&L's intention to proceed independently. (Other licensees send similar letter in same time frame. At least one includes a comprehensive program description). [B27]

8/14/81 B&WOG Operator Support Subcommittee (OSC) meets with NRC. Review problems with plant specific approach aired. NRC agrees to review ANO-1 and Oconee Part 2 guidelines and transient information documents to compare other units. NRC agrees to attend orientation on ATOG at B&W simulator. NRC announces that the documents submitted in 4/80 have been lost and have never been reviewed. Reactor Systems branch announces it has never seen Oconee guidelines nor the ATOG program description submitted by Duke Power. NRC agrees to review ATOG calculation files in Lynchburg. B&WOG agrees to document explanation of ATOG addressing symptoms of natural disasters. Stalemates were reached over disagreements on whether to address containment issues and degraded core issues in ATOG. Considerable agreement reached on ATOG symptom approach. [B27]

9/4/81 NRC observers witness ATOG guidelines on B&W simulator. Very favorable comments received. NRC indicates it will recommend ATOG be approved and allowed to proceed. [B27]

11/5/81 NRC (RSB) reviews ATOG Technical Basis in Lynchburg. Favorable comments. [B27]

12/3/81 NRC informally expresses concerns with ATOG. This change in perspective apparently motivated by October 23 meeting with H. Denton on SBLOCA methods and a desire to make ATOG a negotiating point on that issue. [B27]

2/82 NRC issues NUREG-0899 to provide assistance to licensees in methods of meeting NRC expectations under NUREG-0737 I.C.1. Document defines terms such as Plant Specific Writer's Guide and Plant Specific Technical Guidelines. (documents which translate analysis data into EOPs so as to identify systems/equipment which need to be operated and list the steps necessary to mitigate events.) Also refers to a Procedure Generation Package (PGP) process and stresses human factors issues in EOP style and format. [R8]

3/3/82 NRC informally asks for more information on ATOG but indicates that ATOG program should proceed. [B27]

3/4/82 B&WOG OSC meets with NRC and the March 3 information requests are discussed. All requests are addressed. Owners remind NRC of plans to move ahead with implementation. NRC encourages B&WOG to do so. [B8,9]

4/82 to 6/82 NRC staff, through frequent conversations with B&WOG and B&W, completes their review and develops draft SER. NRC's initial reviewer departs (returns to Finland). [B27]

5/82 AP&L completes first draft of complete ATOG procedure. [B27]

9/15/82 B&WOG OSC meets with NRC and discusses the draft SER and plans for formalizing the ATOG approval per NUREG-0737. NRC agreed that SER would not be issued on any docket and accomplished via the expected letter on SECY-82-111 superceding NUREG-0737 Item I.C.1. NRC concurred with utility plans to implement under 10CFR 50.59 prior to approval by NRC. [B27]

11/82 AP&L performs verification on its completed ATOG procedure. [B27]

12/13/82 Members of B&WOG OSC meet with NRC in Lynchburg. New reviewer (Lyon) presents 633 questions/comments grouped into 14 technical concerns. NRC agrees that none should impede implementation. Only real issue is RCP trip criteria. New reviewer will issue his own SER under plan previously agreed to. [B27]

12/82 AP&L completes validation process on completed ATOG procedure, initiates operator training on ATOG. [B27]

12/17/82 NRC issues NUREG 0737, Supplement 1. Requires EOPs to be human factored and function (symptom) oriented for a broad range of initiators with multiple subsequent failures and operator errors without requiring diagnosis. Requires guidelines to include operator tasks and I&C needs. Requires EOPs to be consistent with Writers Guide. Requires licensee to submit a Procedure Generation Package (PGP) to include: (1) plant specific technical guidelines (PSTG); (2) writer's guide; (3) validation program for EOPs; and (4) description of training program for upgraded EOPs. Document states PSTGs can be originated as a plant specific document or include a referenced generic technical guideline (GTG) with description for conversion from GTG to PSTG [R9]

2/83 AP&L completed formal operator training and implemented ATOG procedure. [B27]

2/83 NRC and B&W met for three days in Lynchburg to go over 275 questions from new reviewer from RSB (reduced from original 633 questions in the December meeting). Results of this session were: 206 questions resolved (deleted), 20 questions resolved by short-term supplement to ONS ATOG, and 49 questions, grouped under 11 categories, agreed upon as longer term open items to be identified in the SER. Note: Subsequent to this meeting, SER responsibility shifted to PTRB with new reviewers. One of these reviewers then became the principal reviewer of generic tube rupture guidelines. [B10]

5/83 Several telephone conversations between B&W and NRC PTRB reviewer, who attended the February meeting with the RSB reviewer, indicated that several of the "resolved" questions were being re-categorized as "open items" and would appear in the SER. [B27]

5/83 NRC informs B&W that another short-term supplement is required to the ONS ATOG prior to issuance of the SER. This supplement is to address ATWS and cyclic boiler-condenser cooling phenomena. [B27,S1]

5/5/83 & 5/21/83 B&WOG issues two letters to NRC stating that ATOG program is completed with forthcoming issuance of short-term supplement. Letters also commit B&WOG to pursue a higher level generic document for future expanded scope. This generic document will be referenceable by all B&WOG members and will provide the mechanism to assure continued maintenance of a valid up-to-date basis for ATOG. [B11,12]

7/83 NRC internal memo acknowledges that B&WOG is moving toward a generic guideline document applicable to all B&W plants and states that "we have been advocating this approach since ATOG was initiated." [R10]

7/83 B&WOG submits short-term supplement to the ONS ATOG to address ATWS and cyclic boiler-condenser cooling. [B14]

9/14/83 NRC delivers the ATOG SER (Generic Letter 83-31) in a meeting with B&WOG executives. Finds that ATOG for Oconee-3 is acceptable for improved plant procedures. Requires that (in absence of a generic ATOG) all licensees must provide sufficient information in the form of plant specific ATOGs and Transient Information Documents so that NRC can perform comparisons with the Oconee-3 ATOG. Acknowledges a 5/4/83 B&WOG letter promising a "more generic document" in the future. Finds that ATOG can be used under NUREG-0899 to develop acceptable EOPs. SER approval is conditional on 4 actions including ATWS, upgrades to better handle RCS voids (cyclic boiler-condenser cooling), receipt of a comprehensive plan and schedule for handling "open" items and agreement with SER within 30 days. SER open items list comprise a total of 29 items, grown from the 11 agreed upon in the February meeting with the RSB reviewer. [R11]

12/9/83 B&WOG OSC letter to NRC provides the B&WOG plan and schedule for resolving the open items on the ATOG SER. The plan identifies the development of the Technical Bases Document (TBD) as the generic guideline vehicle for resolution of these items. The letter also identifies previous submittals addressing ATWS and RCS voids issues. [B15]

12/9/83 NRC issues a supplement to the ATOG SER to cover the ATOG supplement submitted in July on ATWS and cyclic boiler-condenser cooling. [R12]

1/23/84 NRC internal memorandum discusses B&WOG response to an open item issue and then notes that proposed B&WOG plan for TBD represents a change to what NRC expected for a generic ATOG (a TBD in lieu of a generic technical guidelines which would allow NRC to avoid redundant, detailed reviews of plant specific PGPs). NRC expresses disappointment with this outcome. [R13]

3/2/84 NRC telephone call with OSC. NRC had hoped for a "stripped down Oconee guideline" to facilitate on-going reviews; states that the TBD does not fit this need. [B18]

3/84 NRC letter to B&WOG responding to OSC 12/83 plan submittal. States that TBD concept is acceptable, but expressed need for earlier submittal of tube rupture guidelines and requested consideration of a "generic ATOG" by elimination of plant specific information from the ONS ATOG. [R14]

6/8/84 B&WOG (OSC) letter to NRC explains that "generic ATOG" is not appropriate and proposes an alternative solution of ATOG comparison documents to aid NRC review of PGPs. [B19]

6/84 The OSC informally provides a draft copy of the new multiple SGTR guidelines to the NRC reviewers. Representatives from B&W and the OSC then met with the NRC reviewers later in the month in Bethesda to discuss the draft SGTR guidelines and the TBD concept. [B27]

8/84 B&WOG representatives meet with the NRC reviewers in Bethesda to discuss the on-going NRC review and the OSC plan and schedule for the TBD and resolving open items on the ATOG SER. The NRC stated again the TBD, specifically the SGTR chapter, should contain more direct analytical support. Utilities, as end users of the TBD, do not want analytical information included. In addition, ATOG did not contain this information nor did the ATOG SER require it; the SER specified expanded guidelines, which the TBD provided. [B27,R15]

10/84 The NRC provided the OSC with a draft list of 4 general and 29 specific questions on the SGTR guidelines. In addition, the NRC identified 12 areas of perceived non-compliance with the ATOG SER in the OSC's plan and scheduled submitted on 12/9/83. [B27]

11/84 The NRC reviewer met with the OSC in Lynchburg to discuss the draft questions on the SGTR guidelines and the areas of perceived non-compliances with the SER, which

had been reduced to six. The OSC agreed to some modifications of the SGTR guidelines, including the addition of references to the analytical support. The NRC reviewer agreed to accept references in the TBD as opposed to direct analytical information. [B27]

12/84 NRC reviewers called B&W to discuss the six areas of perceived non-compliance with the ATOG SER as a follow-up to the November meeting. Five of the areas were resolved pending documentation by OSC. The remaining sixth item required further investigation by B&W. [B27]

2/19/85 B&WOG OSC letter to NRC clarified the OSC plan and schedule for resolution of the ATOG open items. The letter specifically addressed the six areas of perceived non-compliance. In addition, the letter requested written NRC agreement with the OSC plan and schedule, the only item remaining in the implementation program describe in the ATOG SER (Generic Letter 83-21). [B20]

3/85 The B&WOG submitted the completed SGTR guidelines as Chapter III.E of the yet-to-be published TBD. The SGTR chapter was submitted as soon as it became available at the request of the NRC reviewers. [B21]

4/85 NRC letter to the OSC chairman responding to the 2/85 request for written agreement with the OSC plan. This letter stated that the NRC agreed, with three clarifications, that the proposed B&WOG program provides an appropriate forum to address the ATOG SER long-term open items. Letter also noted, however, that "overall closure of I.C.1 requirements includes areas other than generic technical guidelines activities...These areas of review are covered on a plant-specific basis in response to NUREG-0737, Supplement 1." [R16]

10/85 NRC reviewer, in a telephone call to B&W, noted an upcoming NRC reorganization that would result in another changeover in reviewers of the TBD. The B&WOG Executive Committee Chairman asked NRC to take actions to minimize impact on B&WOG EOP reviews. [B24]

10/85 NRC expressed interest in B&W or the OSC providing training on ATOG for the regional examiners. [B27]

11/85 The OSC submitted the completed TBD (Original Issue) for NRC review. The submittal letter, addressed to G. C. Vissing, identified the open items of the ATOG SER that were addressed by this submittal. [B23]

11/85 The NRC issued 27 questions on the SGTR guidelines (Chapter III.E of the TBD). [R18]

2/86 B&W provided three days of classroom and simulator training for ten NRC regional examiners. The OSC had requested that the new NRC reviewers for the TBD attend this session but this did not occur. [B27]

6/86 The B&WOG submitted responses to the 27 NRC questions on the SGTR guidelines. In addition, a separate document was provided to describe the major differences in mitigation strategies between the ONS ATOG and the TBD. [B26]

9/5/86 With the understanding that NRC is assigning a new reviewer, the B&WOG OSC provides letter summarizing the history of ATOG and providing a revised plan/schedule for addressing ATOG SER open items. [B27]

8/17 & 10/1/87 B&WOG meeting with NRC and INEL (NRC contractor) and follow up report regarding INEL review of TBD against ATOG SER open items. INEL identified 116 individual items and concluded that TBD had addressed about half of them. [B28]

10/21/87 B&WOG letter to NRC reviewer (Lyon) documenting agreements reached with previous reviewer. Agreements noted included certain points on SGTR guidelines and certain limitations on analytical contents of TBD. [B29]

11/20/87 B&WOG letter to INEL responding to INEL findings on TBD. [B30]

6/88 B&WOG issues TBD Revision 01 (including distribution to NRC) [B31]

10/25/88 B&WOG meeting with NRC to review status of TBD and NRC's review. B&WOG stresses desire to see path for closure. Restates that all B&WOG EOPs are based on ATOG, supported by TBD; all B&WOG plants are documenting deviations from TBD. NRC expressed concerns on maintenance of EOP upgrades and the use of "general" guidance from TBD. NRC stated that a step-by-step guidelines, as part of the TBD, would assist the staff and licensee in understanding overall mitigation strategy. Encouraged B&WOG to consider alternatives which would meet these NRC objectives. [B33, R22]

10/31/88 B&WOG OSC is encouraged by INPO to provide generic guidelines (as part of TBD) and, in doing so, to review other Owners Group GTGs, and to resist differences in EOP content and format to the extent possible. [B32]

11/1/88 B&WOG OSC initiates TBD proposed change PC 88-06 to develop a new TBD section similar to ATOG part 1. [S1]

12/16/88 B&WOG meets with NRC to present B&WOG plans to address NRC concerns (of 10/25/88). B&WOG commits to upgrade TBD to a "stand-alone" guidance document of three volumes, officially superseding ATOG, in which one volume will be a new Generic Guidelines, similar to ATOG part I. The TBD will also include a statement of preferred strategy where alternate paths are available. [B34, R23]

1/17/89 BWNT meeting with NRC and EG&G to review TBD review status and resolution of open items. Status: 60 issues remain open, 56 are closed and 3 will be deferred. NRC expects open items to be addressed by planned ATOG upgrade. NRC expects upgrade will provide "generic" SGTR guidelines as opposed to leaving plant-specific flexibility. [B35]

5/3/89 B&WOG meeting with NRC to resolve ATOG open item issues and attain final closure. NRC observes that a new plan is necessary in light of B&WOG agreement to issue a revised TBD to replace ATOG. Observes that B&WOG has agreed to issue a new TBD which will contain guidelines roughly equivalent to ATOG part I, containment guidelines and clear guidance where more than one option is provided. NRC agrees that the next TBD revision: (1) will be stand-alone (i.e. no longer dependent on ATOG); (2) will address ATOG SER issues; and (3) will not be an EOP or an EOP model. Meeting notes also documents 19 requirements for SER closure plus 5 additional items that were beyond the scope of SER closure. [R24]

7/12/89 NRC letter to AP&L, states most significant deficiency found at most plants including ANO-1 is lack of adequate GTG. States that B&WOG is now committed to developing a GTG. Observes AP&L plans to continue using Oconee-3 ATOG. Cites several concerns with this approach including lack of conformance with 0730 I.C.1. [R25]

10/89 NRC issues NUREG-1358 summarizes findings from first round of NRC inspections of licensees for compliance with NRC requirements. [R26]

11/89 B&WOG prepares updated ATOG SER close-out schedule calling for completion of new EOP guidelines by 8/90. Closure of SER open items varies. [B36]

11/89 B&WOG meeting with NRC to discuss B&WOG plans for SGTR guidelines. B&WOG presents a new consensus approach which allows exceptions if lifting of MSSVs is thought probable. NRC agreed with the approach as a "balanced risk" perspective. [B37]

12/89 Further B&WOG meeting with NRC to discuss SGTR guidelines. [B37]

2/23/90 B&WOG/BWNT issues letter defining closure status of ATOG SER items. States that 13 of the original ATOG SER open items were at least partially plant specific and 9 of

these are now fully generic; generic coverage by TBD will resolve issues from a generic standpoint, but plants will still have to demonstrate compliance or document deviations. Moreover, this process is not expected to require re-submittals by each utility, but plant specific packages are expected in preparation for regional examiners. [B38]

5/90 B&WOG issues TBD Revision 02. This revision addresses numerous changes including 4 ATOG SER open issues. [B39]

7/90 B&WOG prepares for "final review" of the original issue of GEOG (TBD Vol. 1). [B40]

8/90 INPO comments on GEOG; principal comments involve human factors (specifically excluded from GEOG by agreement with NRC). [B41]

11/12/90 B&WOG provides letter to NRC updating TBD/SER schedule.

11/90 B&WOG issues TBD Revision 03. This revision directly addressed two of the ATOG open items. [B42]

12/90 B&WOG issues original release of GEOG as TBD Revision 04, the remaining portions of the TBD become Volume 3; a future revision will supply a new Volume 2, to include a step-by-step basis for GEOG. The original GEOG contains the following statements: (1) the GEOG is not a procedure nor should it be used directly as a model for a procedure; (2) each guidance step is followed in succession unless otherwise directed; and (3) the GEOG uses vendor-preferred option whenever more than one method is provided in Volume 3. This does not lessen the viability of other options. [B43]

6/91 NRC issues NRC Inspection Manual 420001. The preamble for EOP review task expressly assumes the prior existence of approved NRC GTGs and uses these as basis to evaluate licensee conformance, (or otherwise looks for 10CFR50.59 processes to justify deviations.) EOP review task substeps includes: comparison of table of contents between EOPs and GTG; "verification" that EOPs has an appropriately prioritized mitigation strategy in accord with GTG step sequence, and existence of adequate technical justification for deviations between GTG and EOPs. [R21]

7/91 B&WOG issues TBD Revision 05. [B44]

2/92 B&WOG issues TBD Revision 06, including new Volumes 1 and 3 and the original issue of Volume 2, the GEOG basis. Cover letter to NRC notes that this completes B&WOG's commitment to issue TBD as a "stand-alone" document, superseding plant specific ATOGs. [B45]

9/10/92 B&WOG completes a several month effort to establish a position on operator blocking or overriding of safety systems. This guidance is intended to be incorporated appropriately in TBD via Proposed Change 92-05.

10/92 NRC issues NUREG-1358 Supplement 1. Summarizes complete findings from NRC inspections of licensees for compliance with EOP requirements. Principal weaknesses included: incomplete/inadequate justification for deviations between PSTGs and GTGs; incomplete documentation for plant specific parts of PSTGs; incomplete setpoint documentation; inadequate maintenance of PSTGs and deviations between PSTGs and EOPs. Also lack of multi-disciplined approach to EOP development; inadequate QA of EOPs, and continuing inadequacy of writer's guides. [R26]

10/9/92 BWNS participates in a telephone call with NRC reviewer (Lyon). NRC process for completion of TBD SER review process is outlined: (1) complete review of TBD Rev. 06; (2) convene public meeting in Lynchburg; (3) resolve questions without formal RAI; (4) prepare draft SER; (5) NRC CRGR review; (6) ACRS subcommittee hearing; (7) publish in Federal Register with 45-day comment period; and (8) resolve comments and then issue SER. [B46]

11/6/92 NRC publishes notification of public meeting in Lynchburg

11/17/92 BWNT telephone call with TBD SER reviewer. NRC states their expectation that the new Volume 1 would be a generic EPG and that it would be valid independent of Volume 3. Neither expectation has been met. NRC questions value of Volume 1 to regulators since it will not support A-to-B comparisons to EOPs. NRC stated that EOP guidance taken from Volume 3 which is not in Volume 1 would be considered a deviation. BWNT reiterated the basis of GEOG initiation in 1988/89 agreements that GEOG would not be procedure/procedure model and that Volume 3 guidance is vendor approved. NRC agreed that they do not want B&WOG's EOPs to be rewritten nor 6 plant specific versions of the GEOG. [S2]

11/20/92 B&WOG participates in a telephone conference call with NRC, including reviewers of TBD Rev. 06. NRC made the following points: (1) Volume 1 (GEOG) should be stand alone separate from other TBD volumes which are only backup. EOP differences from GEOG are deviations—even if they are permitted options in other TBD sections. Use of options from Volume 3 is difficult to assess; (2) B&WOG GEOG is not like other Owners Groups GTG in that step sequencing is not unique; and (3) NRC doesn't believe the B&WOG approach, as it is, complies with process described in 0737 Supplement 1. B&WOG response: (1) Volume 1 was never intended to be stand-alone; (2) plant specific EOPs are based on PSTGs which include more than GEOG; (3) use of guidance from Volume 3 is not a deviation; all three volumes were meant to be

treated as stand-alone together; and (4) step-by-step comparisons in Volume 1 were meant to be indicative but not absolute. [B48]

12/1/92 B&WOG/NRC meeting in Lynchburg. NRC again reiterates its position on Volume 1 being stand-alone. However, B&WOG/BWNT perceive that the objectives of B&WOG and NRC are moving closer—reviewer seems to agree that real deviations should only involve technical/mitigation strategy differences; step-wise comparisons and justification of inconsequential differences should not be required. For example, auditors noticing different step sequencing should require only verbal confirmation that technical deviations are not involved. BWNT expects the reviewer to include limitations of this type in the body of the SER. B&WOG EOP deviation documents only need to be expanded to address EOP options that are in Volume 3 but are not in Volume 1 (because, although valid, they are not "vendor-preferred".) Twenty-seven additional technical issues were also addressed. [B49]

4/8/93 B&WOG OSC telephone conference call; B&WOG members are not unanimous in agreement to limit EOP references to just TBD Volume 1 and elect not to publish a generic position to this effect. [B50]

5/11/93 BWNT meeting with NRC on SGTR bases and SER status. [S3]

8/18/93 BWNT telephone conference with NRC reviewer (Lyon). NRC review must now include traceability of all original ATOG SER open items through closure. No impact on TBD SER is expected, except for the delay. NRC will contract with a national laboratory to review B&WOG SGTR approach. Reviewer still does not consider GEOG as "stand-alone," but could be made so with addition of two specific items: trickle feed and RVLIS. [S4]

11/93 to 12/93 NRC audits CR-3 EOPs. NRC report cites violations including licensee EOPs which are not included in GTGs (and which are not therefore in accordance with "vendor guidelines") and numerous deviations between EOPs and GTGs which changed mitigation strategy without adequate justification. [R27]

12/21/93 BWNT meets with NRC and EG&G to discuss evaluation of B&WOG SGTR approach.[B51]

2/94 BWNT telephone call with NRC reviewer (Lyon): TBD SER is nearing completion; main issue is SGTR. NRC hopes contractor (INEL) probability study will resolve issue. NRC hopes to have SER by 5/94. [B53]

2/94 B&WOG OSC convenes meeting to consider lessons learned from CR-3 audit. One of the CR-3 violations (SBLOCA without HPI) is traceable in part to the issue of whether

only Volume 1 of the TBD is referenced or all three volumes. The B&WOG decide that the current TBD location of this guidance is correct and will not to change it. The B&WOG decide to validate the GEOG on the CR-3 simulator. [B52]

3/94 B&WOG issues TBD Revision 07. [B54]

4/94 At request of FPC, B&WOG Executive Committee undertakes consideration of ideas to improve B&WOG EOPs and generic guidance to avoid problems such as that faced by CR-3. [B55]

5/94 B&WOG conducts validation of GEOG at CR-3 simulator.

6/94 B&WOG issues a report on the results of the CR-3 validation of the GEOG. 78 recommended changes are identified. [B56]

6/94 FPC, BWNT and B&WOG representatives meet with NRC to review the implications of CR-3 audit for future EOP maintenance at CR-3. A key issue was EOP related interpretations and agreements made verbally by NRC over time but not formally documented. Specific case in point is deviations written against Volume 1 to accommodate EOP guidance originating in Volume 3. NRC indicated their agreement that deviations should be written only against Volume 1; if a deviation occurs because of guidance incorporated from Volume 3, then the deviation document need only state why the utility chose that alternate approach—but no further engineering analysis would be required. The NRC refused to state this for the record, however, because the TBD SER had not been issued. It was agreed that timely completion of the SER was of paramount importance. (NRC's subsequent meeting minutes noted only that meeting was "working-level in nature and did not result in specific actions.") [B57, R28]

6/94 BWNT met with NRC and INEL to review results of INEL study on B&WOG SGTR guidelines approach. BWNT considered the report inconclusive. The NRC reviewer was perceived as believing the B&WOG approach to be correct, but that the report does not provide the needed support to assure NRC upper management acceptance of the B&WOG SGTR approach. This may impact the issuance of an SER. [B58]

10/94 B&WOG completes a review of plant specific deviations from the GEOG. This study revealed a wide diversity in plant EOPs and the content and detail of deviation documents. This result is due in part to the historical path by which GEOG came into existence. [B59]

12/94 NRC reviewer provides summary of telephone call: identifies subjects discussed and provides guidance on 8 subject areas. NRC reviewer considers SER on TBD complete

with a commitment from B&WOG these specific items will be addressed. Expected SER letter will identify these items to B&WOG. [B60]

2/17/95 NRC Letter, Holahan to B&WOG OSC states: NRC has completed its review of B&WOG response to NURE-0737 I.C.1 and is finalizing SER. Letter requested commitment from B&WOG to address seven specific items and asked for plan. Action requested within 30 days to NRC can "promptly close our generic review." [R29]

3/20/95 B&WOG provides letter to NRC committing to evaluate the identified 7 issues for inclusion in TBD. Inclusion, if appropriate, to be accomplished through the normal TBD revision process. A detailed plan and schedule for addressing the issues to be developed in 5/95. [B61]

3/95 & 4/95 NRC Memoranda, Lyon to Jones, presents the B&WOG SGTR approach for consideration by NRC management (report is neutral) and provides results on the EG&G study of this approach (results are inconclusive as to a preferred approach to SGTR). [S5]

5/95 & 6/95 B&WOG OSC develops plan for addressing the 7 remaining items committed to NRC in connection with TBD SER closure. Plan is formally transmitted to NRC as follows: [B63]

1. Subcooling Margin	12/15/95
2. Criticality and recriticality	12/15/96
3. Priorities	12/15/95
4. RCS Inventory Measurement	12/15/97
5. SG Trickle Feed	Complete
6. SGTR	12/15/96
7. LOCA outside Containment	12/15/97

9/95 B&WOG completes second validation of GEOG at CR-3 simulator. [B64]

10/95 B&WOG formally transmits revised schedule to NRC: [B66]

1. Subcooling Margin	Complete
2. Criticality and recriticality	12/15/96
3. Priorities	Complete
4. RCS Inventory Measurement	12/15/97
5. SG Trickle Feed	Complete
6. SGTR	12/15/96
7. LOCA outside Containment	12/15/97

6/96 B&WOG Executive Committee directs OSC to develop a matrix of differences in EOPs at B&WOG plants and an associated cost for eliminating the difference. Objective: make the EOPs as much alike as possible within a reasonable cost. [B65]

8/96 B&WOG formally transmits another revised schedule to NRC. [S6]

1. Subcooling Margin	Complete
2. Criticality and recriticality	Complete
3. Priorities	Complete
4. RCS Inventory Measurement	12/15/97
5. SG Trickle Feed	Complete
6. SGTR	Complete
7. LOCA outside Containment	12/15/97

9/96 B&WOG OSC undertakes detailed consideration of what is needed to have standard EOPs. Steps would include: re-write of GEOG as a procedure and then corresponding re-writes of plant EOPs. These would entail new EOP validation, new supporting documentation, and new training. OSC decides to present 4 options to Executive Committee: (1) complete standardized EOP project; (2) tune up of existing EOPs to eliminate technical deviations as far as possible; (3) do nothing; and (4) test existing EOPs to prove they are fully adequate. OSC recommends option 2. [B68]

12/96 B&WOG OSC formally reports to Executive Committee that a standard EOP approach would require $200K in generic costs and up to $600K in plant specific costs. The tune up approach is recommended and receives concurrence of Steering Committee. [B69]

12/96 B&WOG issues TBD Revision 08. [B70]

1/97 B&WOG Executive Committee accepts the OSC recommendation for EOP tune up. [S7]

3/97 B&WOG OSC identifies a list of 12 areas of deviations as targets for greater EOP similarity.

4/97 B&WOG OSC develops new set of GEOG tabs with intent that plant EOPs will be made consistent with the same tabs. Evaluation of deviations continues. OSC also decides on a new direction, streamlining of GEOG (removal of unneeded detail) to facilitate similarity between EOPs and GEOG. [B72]

4/97 B&WOG Executive Committee considers input from the OSC Executive Committee sponsor. There are benefits to greater EOP similarity, but there is entrenched resistance to change and a perception that utility management does not strongly support a major EOP revision program. The present OSC approach of "streamlining the GEOG" is a

first step which will provide a goal toward which plant EOPs can "evolve" over time. [S8]

4/97 to 12/97 — B&WOG meets 7 times in working meetings designed to streamline GEOG and resolve EOP deviations.

9/97 — B&WOG submits final status on the 7 remaining items committed to NRC in connection with TBD SER closure: [B73]

1. Subcooling Margin	Complete
2. Criticality and recriticality	Complete
3. Priorities	Complete
4. RCS Inventory Measurement	Complete
5. SG Trickle Feed	Complete
6. SGTR	Complete
7. LOCA outside Containment	Complete

10/97 & 1/98 — NRC audit of CR-3 EOPs results in numerous violations. One inspector observes that the procedural approach to EOP guidance (of other NSSS owners groups) is preferable over that of the B&WOG. [S9]

2/98 — B&WOG conducts verification and validation of GEOG on CR-3 training simulator. There is concern by some that the B&WOG is heading in the wrong direction on GEOG streamlining to achieve similarity. Executive Committee representative counsels OSC to maintain present course, barring any further significant event (an audit at another B&WOG plant, similar in outcome to the CR-3 audit). The continuing lack of an SER is discussed. [S10]

3/98 — FTI requests an informal meeting with NRC to obtain update on status of TBD SER. NRC responds that there is no significant safety issue involved and declines to meet. [S11]

7/98 — B&WOG continues to consider implications of the CR-3 audit results; initiates a task to document these implications. FPC is strongly promoting a redirection away from further streamlining of the GEOG as a means of assuring more EOP similarity. [S12]

8/98 — B&WOG OSC and Steering Committee decide in a telephone conference call that the direction of the program must be settled by the Executives, possibly through interaction with the NRC. B&WOG requests a position paper be developed as a basis for recommended decisions. Position paper would include a survey of B&WOG collective and individual compliance with requirements; historical summary of relevant events; investigation of the status of other NSSS owners groups and recommendations for the future. [S13]

9/98 to 11/98	FTI develops the requested draft B&WOG position paper and issues for review. To support paper, FTI makes an FOIA request (10/98) to obtain documents related to B&WOG TBD SER. Draft paper concludes that a major problem for B&WOG is lack of SER as vehicle to document NRC agreements and understandings, coupled with NRC's inspection procedure 42001 which treats B&WOG like other NSSS owners groups. Leaves inspectors little room to find B&WOG EOP approach acceptable. [S14, 15]
12/98	B&WOG OSC meeting at which results of draft position paper are discussed. B&WOG agree to request change to IP42001. [S16]
1/99	B&WOG Executive and Steering Committees are provided presentation on results of position paper. A need to change IP42001 is agreed to, as part of an overall effort to improve EOP guidance program. For this purpose, OSC is directed to meet with NRC by June and informal communications at working level will be used to start this process. [S17]
2/12/99	FTI receives the results of the 1998 FOIA request. Includes an "unissued SER" which shows that many of the NRC understandings and agreements would have been formalized if the SER had ever been issued. Package also illustrates that most, if not all key B&WOG positions with respect to GEOG reached in discussions with NRC reviewer had been understood, but were never put into writing. [S18]
2/24/99	B&WOG continues with verification and validation of GEOG on CR-3 training simulator. Results of the FOIA request are reviewed including the "unissued" SER. Group decides to produce proposed changes to 42001 as part of a request for an NRC meeting. [S19]
4/99	B&WOG review and finalizes proposed changes to IP42001 [S20].
6/99	B&WOG Executive Chairman sends letter with proposed changes to IP42001 and formally requests meeting. [S21]
6/99	B&WOG meets with NRC. NRC agrees that with no SER and with IP42001, B&WOG plants are left in difficult position during inspections. NRC indicates that revision of IP42001 may occur at some point in the future. NRC generally accept philosophy in GEOG. B&WOG decide to attempt to get NRC main points in writing. [S22,23]
8/99	B&WOG documents its perceptions of NRC meeting in a letter and requests NRC to confirm or clarify these points. [S24]

9/99 B&WOG is informed that SER will be produced in the near future. [S25]

11/99 NRC issues SER on TBD. [S25]

11/99 FTI transmits electronic version of NRC SER to B&WOG. [S26]

1/00 NRC issues letter to respond to B&WOG perceptions of "key points" from 6/17/99 meeting on EOP guidance issues. [S27]

Chapter X

References

1. B&WOG References

The following are references to communications, actions or events initiated by the B&WOG, including the Operator Support Committee and its predecessors (which included a variety of titles) and also including the NSS vendor (including a variety of corporate names) for the period covered by Chapter IX.

References beginning with a "B" refer to B&WOG (including B&W, BWNT or FTI) communications or actions; "R" refers to NRC matters. The numbering of both reference types has been retained from that used in the B&WOG Position Paper on EOP Guidance Compliance, issued on January 11, 1999. References beginning with "S" are supplemental references which have been added since that time.

Ref.	*Description*	Date	Synopsis of Content
B1	B&WOG Actions on EOP guidance	3/79 to 9/79	No specific references identified
B2	Meeting w/NRC	9/13/79	Submittal of ATOG event trees, SSDs, SADs and ATOG description
B3	AP&L Letter to NRC	11/79	Initial docketing of ATOG SSDs for ANO-1
B4	B&W Letter to B&WOG (ESC-52)	2/26/80	B&WOG presentation to NRC of ATOG event trees, draft guidelines,
B5	B&W Letter to B&WOG (ESC-79)	3/19/80	B&WOG definition of ATOG package to submit to NRC on ATOG
B6	AP&L Letter to NRC	6/16/80	Completion of ANO-1 ATOG docketing by AP&L
B7	DPCo Letter to NRC	4/13/80	Duke Power dockets Oconee-3 ATOG
B8	B&WOG (CPCo) Letter to NRC	3/31/82	B&WOG response to NRC Staff Review of Oconee-3 ATOG submittal

Ref.	*Description*	Date	Synopsis of Content
B9	B&WOG (SMUD) Letter to NRC	6/15/82	B&WOG response to additional NRC review comments on Oconee-3 ATOG submittal
B10	B&W Letter to B&WOG ESC-075	3/14/83	Description of meeting with NRC in Lynchburg to resolve 275 additional questions raised by new NRC ATOG reviewer
B11	B&WOG (SMUD) letter to NRC	5/4/83	B&WOG commitment to a "higher level" generic document (eventually TBD)
B12	B&WOG (SMUD) Letter to NRC	5/21/83	B&WOG commitment to an ATOG supplement to address ATWS, and ATOG handling of interrupted natural circulation.
B13	B&W Record of Telecon	6/8/83	B&W discussion with NRC reviewer about adequacy of ATOG supplement and other issues.
B14	B&WOG (SMUD) Letter to NRC	7/2/83	B&WOG transmittal of ATOG supplement covering ATWS and ATOG handling of interrupted natural circulation
B15	B&WOG (SMUD) Letter to NRC	12/9/83	B&WOG submittal of a schedule and plan for addressing the ATOG SER Open Items, including a description of TBD
B16	B&W Record of Telecon	1/25/84	B&W telecon with NRC in which NRC states it wanted a generic version of the Oconee-3 ATOG for review purposes; B&WOG will have to justify changing direction from 5/83 promise.
B17	B&W Letter to B&WOG (ESC-001)	1/3/84	Description of telecon with NRC in which 6 inconsistencies were noted by NRC reviewers between the ATOG SER and the B&WOG plan and schedule for resolving SER open items
B18	B&WOG (TED) Letter to B&WOG	3/23/84	Discussion of NRC reviewers telephone call regarding stripped down Oconee-3 ATOG
B19	B&WOG Letter to NRC	6/8/84	B&WOG describes a position that a generic ATOG based on stripped down Oconee-3 ATOG is not appropriate; suggests that other ways can be used to meet NRC needs
B20	B&WOG Letter to NRC	2/19/85	B&WOG addresses the 6 discrepancies noted by NRC on 3/3/84 and suggests that, subject to TBD issuance and completion of IST, B&WOG will have met all obligations under NUREG-0737 I.C.1

Ref.	*Description*	Date	Synopsis of Content
B21	B&WOG Letter to NRC	3/22/85	B&WOG submits SGTR guidelines chapter in the (still under development) TBD
B22	B&WOG Letter to B&WOG	4/18/85	B&WOG notes NRC's acceptance of plan and schedule for close out of ATOG SER open items, subject to 3 additional items.
B23	B&WOG Letter to NRC	9/11/85	B&WOG delivers the initial release (Rev. 0) of the TBD
B24	B&WOG Letter to B&WOG Executive Committee	10/2/85	Requests assistance to asking that NRC postpone reassignment of NRC reviewer for TBD SGTR chapter.
B25	B&WOG Letter to B&WOG	12/2/85	Distributes NRC comments on TBD SGTR chapter.
B26	B&WOG Letter to NRC	6/17/86	B&WOG responses to NRC's request for additional information on SGTR
B27	B&WOG Letter to NRC	9/5/86	B&WOG provides an updated plan and schedule for resolution of ATOG open items, includes a "history of ATOG"
B28	B&W Letter to B&WOG	10/8/87	Distributes INEL report on the ATOG SER response
B29	B&WOG Letter to NRC	10/21/87	Discusses a meeting with NRC's reviewer of SGTR chapter of TBD and agreements reached on this and other issues regarding ATOG
B30	B&WOG Letter to INEL	11/20/87	Responds to INEL's report on ATOG, provides additional information that was not available to INEL reviewer.
B31	B&W Letter to NRC (ESC-555)	6/28/88	Submits TBD Revision 01
B32	TED Letter to B&WOG	10/31/88	Reports on INPO encouragement to B&WOG to review and adopt practices of other owners groups in regard to EOP guidance and similarity of plant EOPs
B33	B&W Letter to B&WOG (ESC-963)	11/3/88	Minutes of 10/24-26/88 meeting of B&WOG which included 10/25 meeting with NRC. Describes NRC's concerns with TBD and ATOG that are effectively stopping progress on closure. Describes B&WOG resultant decision to proceed with a generic guidelines document

Ref.	*Description*	Date	Synopsis of Content
B34	B&W Letter to B&WOG (ESC-2011)	12/22/88	Minutes of 12/16/88 B&WOG/NRC meeting at which B&WOG commits to a generic guidelines document and the rationale underlying this decision.
B35	B&W Letter to B&WOG (ESC-185)	2/27/89	Minutes of 1/24/89 meeting with NRC including overview of ATOG open item closeout status and further defining nature of the upcoming GEOG.
B36	BWNS Letter to B&WOG (ESC-1066)	11/15/89	Reports on status of ATOG SER open item closeout status
B37	BWNS Letter to B&WOG (ESC-1089)	11/27/89	Reports on meeting with NRC regarding SGTR issues and ongoing analytical efforts
B38	BWNS Letter to B&WOG (ESC-216)	2/23/90	Identifies ATOG SER open items that require plant specific efforts to close beyond the current generic program.
B39	BWNS Letter to B&WOG	5/24/90	Issues TBD Revision 02. (Distributed to NRC by B&WOG Letters OG-729 on 6/25/90 and OG-755 on 9/2/90)
B40	BWNS Letter to B&WOG (ESC-768)	7/31/90	Describes changes to GEOG as a result of the B&WOG's final review meeting
B41	INPO Letter to B&WOG	8/9/90	INPO provides comments on the draft GEOG. Most comments are relating to human factors issues.
B42	BWNS Letter to B&WOG	11/29/90	Issues TBD Revision 03 (Distributed to NRC on 12/11/90 by B&WOG letter OG-807)
B43	BWNS Letter to B&WOG	12/90	Issues TBD Revision 04—first issue of the GEOG (Distributed to NRC on 4/3/91 by B&WOG letter OG-873)
B44	BWNS Letter to B&WOG	7/91	Issues TBD Revision 05
B45	BWNS Letter to B&WOG (ESC-073)	2/12/92	Issues TBD Revision 06 (Distributed to NRC by B&WOG Letter OG-992 on 2/12/92). TBD becomes a stand-alone document superseding ATOG and closing out all ATOG open items.
B46	BWNS Memo: Record of Telecon	10/9/92	Telecon between BWNS and NRC reviewer. Describes stepwise NRC approach to final closeout of TBD SER based on Rev 06

Ref.	*Description*	Date	Synopsis of Content
B47	BWNS Letter to B&WOG (ESC-993)	11/17/92	Records minutes of telecon between NRC reviewer and BWNS in which NRC states view that TBD V-I (GEOG) is not what they thought they'd get. Licensee would need to use all three volumes. NRC reviewer indicated there were no requirements for a GTG, but called back with further NRC management concerns regarding B&WOG approach. NRC reviewer states position that NRC does not want EOPs rewritten, nor do they want 6 versions of GEOG
B48	BWNS Letter to B&WOG	11/20/92	Minutes of telecon with B&WOG, BWNT and NRC in which NRC states its views that TBD V-I should be stand-alone, questions use of V-I vs. V-III, discusses step sequencing issues. B&WOG's response is also described in detail.
B49	BWNS Letter to B&WOG (ESC-1031)	12/9/92	Minutes of B&WOG/NRC meeting to resolve concerns with TBD. Meeting resolved issues on use of TBD V-I vs V-III, and the generic handling of step sequence difference identification/justification. Agreements lead way to resolution of some NRC concerns.
B50	BWNS Letter to B&WOG (ESC-272)	4/8/93	Minutes of B&WOG conference call; BWNS encourages B&WOG to develop deviation documents between GEOG and plant specific EOPs as a means of facilitating NRC closure of TBD SER. B&WOG position on this question is not uniform and B&WOG elects not to take an owners group position. Reports that NRC reviewer will include understandings on step sequence handling as part of SER.
B51	BWNT Memo	12/22/93	Documents a 12/22/93 B&WOG/NRC/EG&G meeting on on-going probability study of B&WOG' SGTR approach. Notes NRC hopes for usefulness of work and BWNT concerns with approach.
B52	BWNT Letter to B&WOG (ESC-070)	1/25/94	B&WOG meeting minutes in which discussions with NRC reviewers are described relating to B&WOG SGTR approach. NRC reviewer stated that TBD guidance "appears appropriate" but quantification is needed for justification. BWNT concerns with approach are reiterated.
B53	BWNT Memo	2/3/94	Documents telecon with NRC reviewer on SGTR issues and SER closure status. NRC informs BWNT that SER is complete with the exception of the SGTR issue.
B54	BWNT Letter (ESC-195)	3/3/94	Issues TBD Revision 07

Ref.	*Description*	Date	Synopsis of Content
B55	B&WOG Letter to B&WOG Executive Committee (OG-1358)	3/24/94	FPC urges B&WOG to take up consideration of a more generic EOP guidance process and develop EOP which are more alike
B56	BWNT Letter to B&WOG (ESC-410)	6/1/94	Documents results of the limited scope validation of GEOG using the CR-3 simulator
B57	BWNT Letter to B&WOG (ESC-94-472)	6/24/94	Minutes of B&WOG/FPC/NRC meeting to discuss implications of 1993 EOP audit at CR-3. Reveals differences regarding interpretation of GEOG and includes agreement by all that the TBD SER must be issued soon to provide documented guidance on this matter.
B58	BWNT Memo	6/24/94	Minutes of a BWNT/NRC/INEL meeting to discuss preliminary results of INEL analysis of B&WOG approach for SGTR. Contains BWNT's conclusion that results will be inconclusive.
B59	BWNT Letter to B&WOG (ESC-94-786)	10/13/94	Documents BWNT review of plant specific EOPs in comparison to GEOG to identify "common deviations" with objective of changing GEOG for better agreement with EOPs
B60	BWNT Letter to B&WOG (ESC-94-976)	12/20/94	Meeting minutes of B&WOG OSC meeting. Includes record of telecon with NRC reviewer on 10/5/94, 11/29/94, 12/1/94 and 12/2/94 in which prospective SER is detailed and agreements on interpretation and use of GEOG is described. B&WOG is congratulated for "doing a fine job" on TBD and GEOG.
B61	B&WOG Letter to NRC (OG-1487)	3/20/95	Commits the B&WOG to address the final 7 SER items identified in NRC's letter of February 17 for closeout of the TBD SER.
B62	BWNT Letter to B&WOG (ESC-95-395)	5/26/95	Meeting minutes of OSC, in which B&WOG discuss whether its even possible to identify and accommodate "step sequencing differences" between EOPs (which are procedures) and the GEOG (which is, by definition, not a procedure).
B63	B&WOG Letter to NRC (OG-1522)	6/13/95	Provides a schedule and plan for addressing the final 7 TBD SER issues. One issue "SG Trickle Feed" is complete.

Ref.	*Description*	Date	Synopsis of Content
B64	BWNT Letter to B&WOG (ESC-95-804)	11/7/95	Documents comments on second validation of GEOG on the CR-3 simulator.
B65	FTI Letter to B&WOG Executive Committee	5/30/96	Executive Committee meeting minutes in which an action item is assigned to OSC to develop a matrix of differences in B&WOG plant EOPs, their significance and cost estimate to eliminate.
B66	B&WOG Letter to NRC (OG-95-15460	10/2/95	Updates the B&WOG plan for resolving the final 7 issues requested by NRC for TBD SER closure.
B67	FTI Letter to B&WOG (ESC-96-380)	6/25/96	Meeting minutes in which B&WOG attempts to define the basis for standardizing the EOPs
B68	FTI Letter to B&WOG (ESC-96-494)	9/4/96	Meeting minutes in which B&WOG defined options for EOP similarity ranging from do nothing to rigid equality. Final recommendation: EOP "tune-up"
B69	B&WOG Letter to B&WOG Executive Committee (OG-1628)	12/2/96	Estimates costs for EOP similarity at $200K generic and $400K to $600K each plant specifically. Recommends "tune up" approach
B70	B&WOG Letter to NRC (OG-96-16340)	12/30/96	Submits TBD Revision 08
B71	FTI Letter to B&WOG Executive Committee (INS-97-565)	2/12/97	A paper on the benefits of a common EOP guidance approach with "talking points"
B72	FTI Letter to B&WOG (INS-97-1428)	4//11/97	Meeting minutes in which B&WOG considers approaches to EOP similarity, including common strategies and elimination of common deviations. 12 common deviation areas identified. Streamlining the GEOG discussed
B73	B&WOG Letter to NRC (OG-1670)	9/11/97	Final submittal on 7 TBD SER items. B&WOG considers these followup items closed by inclusion of appropriate PCs in the TBD change control process.

2. NRC References

The following are references to NRC communications, documents, actions or events initiated by the NRC Staff.

Ref	Document	Date	Synopsis of Relevant Information	Comment
R1	NRC I&E Bulletins 79-05, -05A, -05B & -05C Nuclear Incident at Three Mile Island; (and Supplements)	4/79 to 7/79	A series of expanding requirements to review and revise operating procedures and operator training based on events and scenarios stemming from TMI-2.	These were the initial NRC post-TMI requirements, beginning 5 days after the accident.
R2	NUREG-0578 **TMI-2 Lessons Learned Task Force Status Report and Short-Term Recommendations** (Section 2.1.9 – "Analysis of Design and Off-Normal Transients and Accidents")	7/79	Found that existing EOPs were not adequately supported by vendor guidance and FSAR analyses were often inappropriate as EOP bases. Recommended: (1) new analyses to determine plant response and proper operation actions during: (a) SBLOCA, (b) ICC and (c) other transient and accidents. Also recommended: (2) corresponding guidelines for operator actions; (3) upgraded EOPs; and (4) operator training. Suggested the need for multiple and consequential failures.	The NRR Lessons Learned Task Force was one of at least 4 separate groups developing TMI-2 recommendations in the months following the incident.
R3	NRC Letter to All Operating Nuclear Power Plants Followup Actions Resulting From The NTC Staff Reviews Regarding (TMI-2)	9/13/79	States that "…all operating plant licensees should begin to implement the actions contained in NUREG-0578, as modified and supplemented (herein)…"	This letter implemented NUREG-0578 recommendations as requirements for operating plant licensees.

Ref	Document	Date	Synopsis of Relevant Information	Comment
R4	NUREG-0585 **TMI –2 Lessons Learned Task Force Final Report** (Section 2.3.4 "Emergency Procedures" and Appendix A.4)	10/79	Recognizes inadequate NRC review process for EOPs. Recommends an inter-disciplinary safety review of EOPs by NRC with a SER issued upon conclusion.	The Task Forces' Final Report outlines policy issues (as distinct from technical issues addressed in NUREG-0578)
R5	NUREG-0600 **NRC Action Plan Developed as a Result of the TMI-2 Accident** (Task I.C "Operating Procedures")	5/80	Requires NRC review/ audits of on-going analyses and EOP upgrade activities and confirmatory accident analyses by NRC. For licensee, specifies completion schedules for on-going analyses, guideline preparation, EOP upgrades and operator training	This document combines NRC and licensee actions into a single action plan with schedules. Included recommendations from numerous groups including the Lessons Learned Task Force.
R6	NUREG-0737 **Clarification of TMI Action Plan Requirements** (Item I.C.1 "Guidance for the Evaluation and Development of Procedures for Transients and Accidents")	10/80	Expands on requirements of NUREG-0600 by requiring consideration of multiple failures including consequential operator errors; requires pre-implementation review of guidelines and EOPs. Strongly encourages licensee to base EOP guidelines on generic submittals. Modifies dates for completion.	This is a letter under 10CFR50.54 from Director of Licensing, NRR, requiring confirmation of schedule compliance as provided.

Ref	Document	Date	Synopsis of Relevant Information	Comment
R7	Generic Letter 81-16 Novak to B&WOG plant licensees (except ANO-1 NUREG 0737, Item I.C.1, Abnormal Transient Operator Guidelines	6/1/81	States that the NRC staff has completed a preliminary review of the ANO-1 ATOG as "generic guidelines" for the B&WOG plants. Finds deficiencies including: No basis for consideration of multiple and consequential failures; incomplete provision of bases for multiple failures; failure to include operator errors; failure to address certain specific multiple failures; and inadequate transition from EOPs into ICC.	This was essentially the first written response by NRC to the work of the B&WOG on ATOG since its inception with TMI. A similar letter was sent the same day to ANO-1.
R8	NUREG-0899 (Revision 1) Guidelines for the Preparation of Emergency Procedures – Resolution of Public Comments on NUREG-0799	2/82	Provides "assistance" to licensees in methods of meeting NRC expectations under NUREG-0737 I.C.1. Defines terms such as Plant Specific Writer's Guide and Plant Specific Technical Guidelines. (Technical Guidelines translate analysis data into EOPs so as to identify systems/equipment which need to be operated and list the steps necessary to mitigate events.) Also refers to a Procedure Generation Package (PGP) process and stresses human factors issues in EOP style and format.	This is a guidance document only. Licensees are "encouraged" to consider the methodology presented.

Ref	Document	Date	Synopsis of Relevant Information	Comment
R9	NUREG-0737, Supplement 1 Requirements for Emergency Response Capability (Generic Letter 82-33) (Section 7, "Upgrade Emergency Operating Procedures")	12/82	Requires EOPs to be human factored and function (symptom) oriented for a broad range of initiators with multiple subsequent failures and operator errors without requiring diagnosis. Requires guidelines to include operator tasks and I&C needs. Requires EOPs to be consistent with Writers Guide. Requires licensee to submit a Procedure Generation Package (PGP) to include: • Plant Specific Technical Guidelines (PSTG) • Writer's Guide • Validation Program for EOPs • Description of training program for upgraded EOPs PSTG can be (1) originated as a plant specific document or (2) include a referenced generic technical guideline (GTG) with description for conversion from GTG to PSTG.	This document incorporates significant refinements of the NUREG-0737 I.C.1 requirements based on three years of NRC licensing interactions and followup including pilot plant inspections and pre-implementation reviews.
R10	Memo: Thompson to Eisenhut B&W Owners Group Emergency Procedures Guideline	7/83	States that in a 5/4/83 Letter from DD Whitney, the B&WOG stated its intention to develop a generic ATOG.	This letter indicates recognition that a generic ATOG will be produced eventually; sets the stage for NRC's ATOG SER.

Ref	Document	Date	Synopsis of Relevant Information	Comment
R11	Letter: Eisenhut to All Operating License Holders…for Babcock and Wilcox Pressurized Water Reactors Safety Evaluation of "Abnormal Transient Operating Guidelines" (GL 83-31)	9/83	Finds that ATOG for Oconee-3 is acceptable for improved plant procedures. Requires that in absence of a generic ATOG, all licensees must provide sufficient information in the form of plant specific ATOGs and Transient Information Documents so that NRC can perform comparisons with the Oconee-3 ATOG. Acknowledges a 5/4/83 B&WOG letter promising a "more generic document" in the future. Finds that ATOG can be used under NUREG-0899 to develop acceptable EOPs. SER approval is conditional on 4 actions including ATWS, upgrades to better handle RCS voids, receipt of a comprehensive plan and schedule for handling "open" items and agreement with SER within 30 days. Open items comprise a total of 29 items.	This SER was cleared predicated on the concept that B&WOG would soon be upgrading ATOG to include a "higher level generic document" The 29 Open Items represented a significant expansion from the 11 long-term items which the NRC and B&WOG had agreed would be in the SER. These 11 represented the culmination of many months of negotiation.
R12	Letter: Crutchfield to B&WOG OSC Abnormal Transient Operating Guidelines (TMI Action Plan I.C.1) (Includes attached SER Supplement)	12/83	NRC SER supplement accepts B&WOG-provided ATOG supplement covering ATWS and Interrupted Natural Circulation	

Ref	Document	Date	Synopsis of Relevant Information	Comment
R13	Memo: Ziemann to Lainas Update to NRC and B&W Owners Group Interaction (Including attached draft NRC letter for Eisenhut's signature)	1/84	Observes that B&WOG has changed from a promised GTG, based on ATOG, to a Technical Basis Document (TBD). Attached draft letter requests justification for departing from a "uniform review process" as intended by 0737. States that B&WOG plan "falls short" of expectations. Cover memo also mentions "internal conflicts" within the B&WOG.	This letter was the result of written and oral communications between B&WOG and NRC in which B&WOG clarified that TBD would not be a GTG based on expanded ATOG.
R14	Letter: Eisenhut to B&WOG OSC B&WOG Plan and Schedule for Addressing the Safety Evaluation of ATOG	3/84	Expresses NRC disappointment about B&WOG decision on TBD, requests B&WOG to return to the original plan in which a GTG would be produced; indicates benefits to "other utilities" for use of a GTG. States that NRC cannot see how objectives of 0737 will now be met. Provides a list of SGTR issues which need to be resolved.	Continuing encouragement from NRC to develop a GTG.
R15	Letter: Kadambi to B&WOG Summary of Meeting with B&WOG Representatives to discuss the ATOG Review	7/84	Meeting notes by NRC includes reference to "...the ongoing generic guideline developmental work."	By this time, the B&WOG had agreed that TBD could be made to meet NRC's expectations for a generic technical guideline.

Ref	Document	Date	Synopsis of Relevant Information	Comment
R16	Letter: Laina to B&WOG OSC B&WOG Plan for Addressing ATOG Open Items	4/85	Responds to suggested resolutions for several ATOG open items. Concludes by stating that "overall closure of I.C.1 requirements includes areas other than generic technical guidelines activities…" (referring to plant specific issues)	Responds to a B&WOG Letter which had asserted that a resolution of the subject issues would "complete obligations under NUREG 0737 I.C.1."
R17	Standard Review Plan (NUREG-0800) Operating and Maintenance Procedures (Section 13.5.2 and Appendix 13.5.2A)	7/85	Establishes review criteria and processes procedures as part of license applicant's Safety Analysis Report. (Guidance is equivalent to that found in NUREG-0737 Suppl 1.) This document details how the PSTG will be reviewed; it makes specific reference to the B&WOG use of a "lead plant" (Oconee) concept in lieu of a GTG. It introduces the concept of a deviations document relating PSTG to GTG. It defines safety significant deviations, recognizes that review is necessarily subjective and cautions against identifying EOP deficiencies that are "semantic" in nature.	As a guidance document for reviewers, this version provides for a more flexible approach than that found in the NRC Inspection Manual 420001.
R18	Letter: Paulson to B&WOG OSC (Request for Additional Information on SGTR)	11/85	Provides a list of 27 detailed questions on B&WOG's proposed SGTR guidelines	

Ref	Document	Date	Synopsis of Relevant Information	Comment
R19	Letter: Boger to B&WOG OSC (Feedback on ATOG training course for NRC inspectors)	1/86	Provided positive feedback on the quality of the ATOG training course including a statement about the excellent review of standard EOPs. Also cited weaknesses including: shallow coverage about why's and how's of EOPs, lack of detailed analysis and poor exposure to the basis document (ATOG Part II).	
R20	Inspection & Enforcement Notice 86-64 Deficiencies in Upgrade Programs for Plant Emergency Procedures Inspection & Enforcement Notice 86-64 Suppl. 1 (same title)	8/86 4/87	I&E Notice and supplement document findings of NRC inspections. Findings include widespread weaknesses including failure to adequately justify deviations from "Owners Group" technical guidelines; failure to account for plant specific differences when such differences exist with respect to GTGs; inadequate compliance with "commitments to V&V", inadequate writer's guides and inadequate training.	

Ref	Document	Date	Synopsis of Relevant Information	Comment
R21	Temporary Instruction 2515/92 Emergency Operating Procedures Team Inspections NRC Inspection Manual 420001 Emergency Operating Procedures	4/88 6/91	These documents (original instruction and subsequent final inspection manual) specify conduct of NRC team inspections for EOPs. Sections address Review of EOPs (for technical correctness), Usability of EOPs, Operator Capabilities, Programmatic Controls and Followup (42001 only). The preamble for EOP review task expressly assumes the prior existence of approved NRC GTGs and uses these as basis to evaluate licensee conformance, (or otherwise looks for 10CFR50.59 processes to justify deviations.) EOP review task substeps include: comparison of table of contents between EOPs and GTG; "verification" that EOPs has an appropriately prioritized mitigation strategy in accord with GTG step sequence, and existence of adequate technical justification for deviations between GTG and EOPs.	These documents guide regional EOP audits. They oversimplify the complexities of EOP generation under actual conditions: • The alternative of developing EOPs without recourse to GTGs is not acknowledged. • Required plant specific portions of PSTGs/EOPs (not applicable to GTGs) is not acknowledged • The possibility and use of a more diffuse GTG (eg. 3-vol. TBD) is not acknowledged.

Ref	Document	Date	Synopsis of Relevant Information	Comment
R22	Memo: Jones to Hodges Minutes of October 25, 1988 Meeting with B&WOG on EOPs	11/88	States NRC concerns on maintenance of EOP upgrades and the use of general guidance in TBD. Further stated view that a step-by-step guideline, as part of the TBD, would assist the staff and licensee in understanding overall mitigation strategy. Encouraged B&WOG to consider alternatives which would meet the NRC's objectives	Continued NRC encouragement for a more prescriptive GTG approach.
R23	Memo: Lyon to Hodges Minutes of B&WOG Meeting on EOPs December 16, 1988	12/88	Memo documenting NRC meeting on 12/16/88 in which B&WOG commits to "...an expanded TBD scope that includes B&WOG recommended EPGs."	This letter did not address the full scope of understandings that were made during the meeting about the potential interpretations and use of GEOG.

Ref	Document	Date	Synopsis of Relevant Information	Comment
R24	Letter: Hodges to B&WOG OSC Emergency Procedures Guidelines Review	7/89	Documents meetings on 1/89 (NRC/BWNS) and 5/89 (NRC/ B&WOG) in attempts to resolve ATOG open item issues and attain final closure. NRC observes that a "new plan" is necessary in light of B&WOG agreement to issue a revised TBD which will obsolete ATOG. Observes that B&WOG has agreed to issue a new TBD which will contain guidelines roughly equivalent to ATOG part I, containment guidelines and clear guidance where more than option is provided. Among other things, it is agreed that the next TBD revision: • Will be stand-alone (i.e. no longer dependent on ATOG), • Will address ATOG SER issues • Will not be an EOP or an EOP model Letter also documents 19 requirements for SER closure plus 5 additional items that were beyond the scope of SER closure.	This letter reflects NRC's recent expectations (based on B&WOG discussions) of a GEOG-type document to become a new part of TBD

Ref	Document	Date	Synopsis of Relevant Information	Comment
R25	Letter: Hebdon to Campbell (AP&L) Emergency Operating Guidelines	7/89	States that the most significant deficiency found at most plants (including ANO-1) is lack of adequate GTG. States that B&WOG is now committed to developing a GTG, but that AP&L is not planning to use this document, but plans to continue using Oconee-3 ATOG. Cites several concerns with this approach including lack of conformance with NUREG 0737 item I.C.1. Requests meeting or, alternatively, a commitment to change positions.	

Ref	Document	Date	Synopsis of Relevant Information	Comment
R26	NUREG-1358 Lessons Learned from Special Inspection Program for Emergency Operating Procedures (March – October 1988) NUREG-1358 Supplement 1 Lessons Learned from Special Inspection Program for Emergency Operating Procedures	10/89 10/92	The NUREG and its supplement summarize findings from successive rounds of NRC inspections of licensees for compliance with NRC requirements. Principal weaknesses included: incomplete/ inadequate justification for deviations between PSTGs and GTGs; incomplete documentation for plant specific parts of PSTGs; incomplete setpoint documentation; inadequate maintenance of PSTGs and deviations between PSTGs and EOPs. NUREG Supplement also added lack of multidisciplined approach to EOP development; inadequate QA of EOPs, and continuing inadequacy of writer's guides.	NUREG 1358 contained as an appendix Temporary Instruction 2515/92. NUREG 1358 Suppl 1 contained as an appendix, NRC Inspection Manual 42001.
R27	Letter: Gibson to Beard Notice of Violation	2/94	NRC inspection report citing violations at CR-3 during an inspection of EOPs. Violations cited included licensee EOPs which are not included in GTGs (and which are not therefore in accordance with "vendor guidelines") and numerous deviations between EOPs and GTGs which changed mitigation strategy without adequate justification.	All violations were sustained by the NRC in 5/94 following an FPC response challenging certain of the findings.

Ref	Document	Date	Synopsis of Relevant Information	Comment
R28	Letter: Raghavan to FPC Summary of Meeting on June 23, 1994 Regarding CR-3 EOPs	6/94	Documents results of "working" meeting between NRC and FPC. Meeting also attended by BWNS, TED on behalf of B&WOG. Minutes stated only that "The discussions were general and working level in nature and did not result in specific actions."	NRC discussed substantive issues, particularly use of Vol I of TBD versus all three volumes, and an appropriate corresponding use of deviation documents. A philosophy of approach was agreed to.
R29	Letter: Holahan to B&WOG OSC B&WOG Emergency Procedures Guidelines Review (The Technical Bases Document) TAC No. M54946	2/95	States that the NRC has completed its review of B&WOG response to NUREG 0737, I.C.1 and is finalizing SER. Identifies 7 areas where further attention is warranted. Asks for a response within 30 days so that "...we may promptly close our generic review."	
R30	Memo: Lyon to Jones Resolution of Issues Identified in the 1983 SE of the B&WOG ATOG	6/95	This memo summarizes the categorization of ATOG open issues into "bins" in support of a final review of the draft SER. It draws no conclusions.	
R31	NRC Letter to B&WOG	11/5/99	Documents NRC review of B&W EOP Guidelines (TAC NO. M54946); this is the completed SER for TBD.	

Ref	Document	Date	Synopsis of Relevant Information	Comment
R32	Letter: Richards to Kelly Completion of Review of the Babcock & Wilcox Emergency Operating Procedures Guidelines (TAC NO. M54946)	11/5/99	Based on Review of TBD Revision 6, the staff concludes… there is no need for continuation of the generic review. The enclosed safety evaluation closes our (NRC's) generic review.	

3. Supplementary References

The following are references supplementary to those provided above. They include communications, actions or events by either the B&WOG, FTI, and the NRC staff.

Ref.	Description	Date	Synopsis of Content
S1	B&WOG Proposed Change to TBD: PC 88-02	11/01/88	PC initiated to develop a TBD procedural guideline similar to ATOG Part 1.
S2	BWNT Letter to B&WOG (ESC-993)	11/30/92	Record of telecon between BWNT and NRC reviewer in which reviewer states: NRC believed TBD Vol. 1 would be a generic EPG but is not, TBD Vol 1 is not stand-alone, and use of guidance from Vol 3 is a deviation.
S3	BWNT Letter to B&WOG	6/1/93	Meeting minutes in which BWNT/NRC telecon is reported. NRC reviewer suggests possibility of a PRA analysis of B&WOG SGTR approach.
S4	BWNT Record of Telecon	8/18/93	NRC reviewer details his approach to final closure of TBD SER
S5	NRC Internal Memoranda Lyon to Jones	3/95 & 4/95	Discusses EG&G results from PRA examination of B&WOG SGTR approach. Results are generally inconclusive.
S6	B&WOG Letter OG-1607	8/28/96	Provides update on B&WOG schedule for examining the last 7 issues related to TBD SER closure.
S7	FTI Letter INS-97-583	2/13/97	Meeting minutes of Exec. Comm: discusses presentation by OSC to Exec. Comm. on findings and recommendations regarding differences in EOPs. Differences included: widely varying detail with document lengths from 30 to 300 pages, significant technical differences (i.e., approaches to handling a given transient), and widely differing formats. Execs agreed with OSC on an incremental approach to making EOPs more similar.
S8	FTI Letter INS-97-1867	5/12/97	Meeting minutes of Exec. Comm.: Comm. received input from OSC on EOP similarity project. Exec. Comm sponsor defines approach in which GEOG is streamlined to support similarity, but utilities are allowed to "evolve" toward commonality rather than having major changes imposed quickly.

Ref.	Description	Date	Synopsis of Content
S9	NRC Letters NOV/Insp. Rpt 50-302/97-12 and 98-02	2/23/98 4/16/98	Detailed NRC reports on the NRC inspection of EOPs at CR-3 in December 97 and January 98.
S10	Meeting Notes E-mail to OSC from BBrooks	2/26/98	Describes the business meeting of the OSC in which CR-3 presented background on its recent EOP audit, plans to respond to generic implications are discussed by the OSC and the Exec. Comm. sponsor counsels the group to hold the present course.
S11	Minutes of Telecon E-mail to OSC from RWDorman	3/16/98	Describes interaction via FTI representative (Bob Borsum) to NRC staff requesting informal meeting on TBD SER status. NRC doesn't consider it a safety issue; doesn't have time to meet.
S12	FTI Letter FTI-98-1933	6/23/98	B&WOG OSC Meeting minutes: Describes discussion of group on wisdom, rationale for continuing the direction of streamlining the GEOG
S13	FTI Letter FTI-98-2582	8/27/98	Describes B&WOG telecon at which decision is made to develop a B&WOG position paper on EOP guidance as a basis for recommendations to Exec. Comm for future direction of EOP similarity project, including potential interfacing with NRC.
S14	FTI Letter to NRC FTI-98-3173	10/21/98	Letter makes a Freedom of Information Act (FOIA) request for all information related to TAC #M54946 (B&WOG TBD).
S15	FTI Letter to OSC FTI-98-3815	12/14/98	Letter provides draft B&WOG Position Paper on EOP Guidance Compliance and related issues.
S16	FTI Letter to OSC FTI-98-3945	12/28/98	Draft meeting minutes of December 98 OSC meeting during which disposition of EOP position paper is discussed. Decision is to attempt to have IP42001 revised and to provide necessary input to support such revision
S17	FTI Letter to B&WOG FTI-99-389	1/29/99	Letter describes OSC presentation to Exec/Steering Committees and provides Exec/Steering Comm. direction to OSC for interacting with NRC on EOP guidance issues.
S18	FTI Letter to OSC FTI-99-600	2/15/99	Letter transmits a portion of the proceeds of the FTI FOIA request to the OSC: a copy of an "unissued SER" on the B&WOG TBD, drafted by NRC staff in February 1996.

Ref.	Description	Date	Synopsis of Content
S19	FTI Letter to OSC FTI-99-841	3/4/99	Draft minutes of OSC business meeting in Feb. 1999 at CR-3. OSC decides on approach to NRC interfacing with regard to changing IP42001.
S20	FTI Letter to OSC FTI-99-1428	4/27/99	Draft meeting minutes of OSC meeting at which OSC reviews and revises proposed changes to be submitted to NRC for IP42001
S21	B&WOG Letter (Hutchinson) to NRC (Birmingham) OG-1755	5/24/99	Letter transmits proposed IP42001 changes to NRC and formally requests follow-up meeting to discuss the changes.
S22	FTI Letter to OSC FTI-99-2048	6/28/99	Letter provides meeting notes from OSC meeting with NRC staff on issues relating to EOP guidance. NRC generally agrees with B&WOG on philosophy of GEOG and EOP approach, will not soon revise IP42001.
S23	NRC Letter to B&WOG (Transmitted by FTI Letter FTI-99-2288)	6/29/99	NRC meeting minutes of 6/17/99 meeting with B&WOG on EOP Guidance issues.
S24	B&WOG Letter to NRC OG-1767	8/23/99	Documents B&WOG perceptions of NRC's "key points" from 6/17/99 meeting on EOP guidance issues. Requests that NRC confirm and/or correct these perceptions as applicable.
S25	FTI Letter to B&WOG FTI-99-3414	10/15/99	Exec. Comm. Meeting minutes from meeting with NRC 9/23/99
S26	FTI Letter to B&WOG FTI-99-3661	11/8/99	Transmits the NRC's Safety Evaluation Report (SER) on the B&WOG Emergency Operating Procedure (EOP) Technical Basis Document (TBD). [R32]

Ref.	Description	Date	Synopsis of Content
S27	NRC Letter to B&WOG	1/4/00	Response to August 23, 1999 Letter Related to the Babcock & Wilcox Owners Group Emergency Operating Procedure Guidance NRC response to B&WOG perceptions of "Key Points" from 6/17/99 meeting on EOP guidance issues. [S24] The enclosure, coupled with the SE [R32] issued on November 5, 1999, should clarify issues related to the staff's inspection of EOP's at the plants of the B&WOG.

4. Volume 4 References

A. NUREG-660, TMI Action Plan, May 1981.

B. NUREG-0737, Clarification To The TMI Action Plan, October 1981.

C. Supplement 1 to NUREG-0737, Requirements For Emergency Response Capabilities, December 1982.

D. NUREG-1358, Lessons Learned From The Special Inspection Program For Emergency Operating Procedures, March - October 1988.

E. NUREG-1358, Supplement 1, Lessons Learned From The Special Inspection Program For Emergency Operating Procedures, October 1988 - September 1991.

F. NUREG-1021, Operating Licensing Examiner Standards, Revision 7, January 1993.

G. FANP Document No. 47-5010803-00, Closure Report for ATOG and TBD SER Open Items, 12/13/00.

H. FANP Document No. 47-5007765-01, Review Of NRC "Safety Evaluation Report" Of The B&WOG Emergency Operating Procedure Technical Basis Document, 11/16/00.