TENNESSEE VALLEY AUTHORITY
BELLEFONTE NUCLEAR PLANT

PROCEDURES GENERATION PACKAGE

Effective pages:

1-45

Last Revision Date:

Approved: A M. Quails

Date: JUN 04 1985

*Revision

PART 1 - Attachment 2
INSTRUCTION REVISION LOG

INSTRUCTION PROCEDURES GENERATION PACKAGE

PLANT SUPERINTENDENT APPROVAL DATE / SIGNATURE	AFFECTED PAGE#(s)	DESCRIPTION OF CHANGE
/	1-45	Initial issue of the PGP required by NRC Generic Letter 82-33 (supplement 1 to NUREC 0737).

*Revision

JUN 0 4 1985

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I. INTRODUCTION

A. PURPOSE

The purpose of this Procedure Generation Package is to describe the Emergency Operating Procedures (EOPs) development program at Bellefonte Nuclear Power Plant (BLN). Bellefonte Units 1 and 2 are raised, two loop Babcock and Wilcox (B&W) PWRs.

B. SCOPE

This document was developed to provide a general description and documentation of the EOP development and implementation program as recommended in NUREG 0899, Section 7.0.

C. ORGANIZATION

This document consists of the following four parts:

1. Plant-specific Technical Guideline: B&W's Abnormal Transient Operating Guideline (ATOG).

2. Writers' Guide for EOPs.

3. EOP Verification and Validation Program.

4. EOP Training Program Outline.

Each part describes the approach to be taken as part of the EOP Implementation Plan for Bellefonte Units 1 and 2.

II. PLANT-SPECIFIC TECHNICAL GUIDELINES

A. GENERAL

This section outlines the method that will be used to develop EOPs based on plant-specific ATOG.

Personnel who will write the EOPs will be selected based on familiarity with plant operations, knowledge of plant systems, and understanding of the Bellefonte EOP development process. The Operations and Engineering Sections at Bellefonte will perform the work.

Personnel who write the EOPs will use the Writer's Guide portion of the PGP and ATOG to construct an EOP. When deviations are deemed necessary between the EOPs and ATOG Part II, an EOP Deviation Document (Figure 1) will be completed to explain significant deviations.

II. (continued)

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The following are additional instructions for adapting ATOG to BLN's EOPs and for completing the Deviation Document.

1. Minor modifications to ATOG are acceptable without justification provided that the change does not alter the intent of the guideline.

2. When ATOG omits plant-specific details or actions, add the information to the procedure. If the operator actions are highly routine or well within the knowledge of the operator, specific parts may be deleted. Consideration should be given to the minimum number, qualifications, training, and experience of the operating crew.

3. If the ATOG guideline fails to identify or address systems or actions that are unique to BLN, then steps should be included to encompass the necessary actions. (Deviation Document may be required.)

4. If ATOG specifies an action that cannot be performed at BLN, the action will be deleted or modified. (Deviation Document may be required.)

5. The completed EOP Deviation Documents will be maintained as source documents to assist in the EOP revision, review, and approval process.

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_____ Rev. _____

Page _____ of _____

EOP DEVIATION DOCUMENT

EOP:

ATOG:

JUSTIFICATION OF DIFFERENCES:

WRITER _____ DATE _____

Figure 1

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III. WRITER'S GUIDE FOR EOP

A. GENERAL

The writers' guide for EOPs is a plant-specific document that provides instructions on writing EOPs, using good writing principles. The writer's guide ensures EOPs are useable, accurate, complete, readable, conveniently located, and acceptable to control room personnel. The writer's guide helps to promote consistency within and between EOPs and their revisions and supports upgrading of the procedures, independent of the number of EOP writers. The writer's guide contains all the necessary information and guidance to bridge the transition from Plant-Specific Technical Guidelines (P-STG) to the plant's EOPs. The P-STG for Bellefonte is ATOG.

The writers' guide will be revised, as necessary, based on feedback from operator training, experience, and validation.

B. DOCUMENT DESCRIPTION

Information on the following major items are included in the plant-specific writers' guide for EOPs:

1. EOP Designation and Numbering
2. Format
3. Writing Instructional Steps
4. Mechanics of Style
5. Flow Chart
6. Graphs, Charts, Tables and Worksheets
7. Procedure Revisions
8. Production and Distribution

The BLN Writers' Guide for EOPs is based on the INPO EOP writing guideline (INPO 82-017) and NUREG-0899, Section 7. The BLN guide is provided as Attachment 1.

IV. EOP VERIFICATION AND VALIDATION PROGRAM

A. GENERAL

This section outlines the process by which BLN EOPs will be initially verified and validated.

The objectives, specific criteria, methods of Verification and Validation (V&V), personnel and documentation to support the program will be discussed. It is intended that this will be an ongoing program and when major modifications are made to procedures, a similar validation process will be conducted.

IV. (continued)

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B. OBJECTIVES

In evaluating each of the objectives, consideration must be given to the human factors aspects. The verification/validation process will address all of the following questions.

1. Are EOPs technically correct, i.e., do they accurately reflect the technical guidelines and other EOP source documents?

2. Are EOPs written correctly, i.e., do they accurately reflect the plant-specific writers' guide?

3. Are EOPs usable, i.e., can they be understood and followed without confusion, delays, and errors?

4. Is there a correspondence between the procedures and the control room/plant hardware, i.e., control equipment/indications that are referenced are available (inside and outside of the control room), use the same designation, use the same units of measurement, and operate as specified in the procedures?

5. Is the language and level of information presented in the EOPs compatible with the minimum number, qualifications, training, and experience of the operating staff?

6. Is there a high level of assurance that the procedures will work, i.e., will the procedures correctly guide the operator in mitigating transients and accidents?

C. RESPONSIBILITIES

The Operations and Engineering Supervisors or their representatives will be responsible for the V&V program. The reviewer or review team will be responsible for verifying that the criteria of the objectives are met and that discrepancies are documented. Review of the EOPs will be performed per plant administrative procedures as well as by the Office of Engineering (OE). The Plant Operations Review Committee (PORC) is responsible for final review of the emergency procedures. The plant manager is responsible for final approval of the EOPs.

IV. (continued)

D. METHOD OF VERIFICATION/VALIDATION

To aid in meeting the above objectives, the personnel chosen to write the EOPs will be familiar with plant equipment, operations, technical requirements, operator knowledge level, the writers' guide and the technical guideline. This is considered as a factor in the V&V process.

V&V will be performed to meet each objective by the following criteria:

1. Are EOPs technically correct, i.e., do they accurately reflect the technical guidelines and other EOP source documents?

   a. The objective may be met by performing a step-by-step tabletop review of the EOP. The reviewer(s) should be familiar with plant equipment, operations, technical requirements, operator knowledge level, and the technical guidelines. Using the source documents, the reviewer(s) may also address the following concerns:

      1) Are the EOPs technically accurate and complete?

      2) Is correct plant-specific information incorporated into the EOPs, such as valve numbers, numerical values and operator tasks?

      3) Have all values been verified to the latest documents?

2. Are EOPs written correctly, i.e., do they accurately reflect the plant-specific EOP writers' guide?

   This objective can be met by performing a table-top review of the EOP. The review will be a comparison between the writers' guide and the EOP. The reviewer shall be familiar with the Writers' Guide for EOPs and should not be the writer of the EOP.

IV. (continued)

D. (continued)

3. Are EOPs usable, i.e., can they be understood and followed without confusion, delays and errors?

Operations and Training personnel will conduct simulator exercises. If certain aspects of the exercises cannot be modeled, then a control room or simulator walk-through will be performed in lieu of the simulator exercise. The simulator crew and observer(s) will attempt to identify problems where the user:

a. Allows a limit to be exceeded.

b. Fails to detect a key signal or parameter.

c. Does not perform an action or step. This also includes action required to take place at some time later based on continuous monitoring of a parameter.

d. Performs an action not in the procedure.

e. Selects the wrong procedure.

f. Performs an action out of sequence.

g. Has to re-read procedure steps (readability).

h. Takes excessive time to complete an action. This also includes action required to take place at some time later based on continuous monitoring of a parameter.

i. Fails to perform actions at the required time.

j. Fails to observe cautions or notes.

k. Has difficulty making transitions from one procedure to the next.

l. Is confused or uncertain about performance of an action.

Feedback received during EOP operator training will be used to improve EOP useability.

IV. (continued)

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D. (continued)

4. Is there a parallel between the procedures and the control room/plant hardware?

This objective can be met by performing a plant/control room walk-through. The reviewer(s) should be familiar with BLN equipment and operations. The reviewer(s) should verify the following for plant equipment specified in the EOP.

a. Equipment is available for operator use.

b. Equipment is identified properly.

c. Actual units of measurement and the range of indicators/recorders correspond to values specified in the EOP.

5. Are the language and level of information presented in the EOPs compatible with the minimum number, qualifications, training, and experience of the operating staff?

These objectives can be satisfied by having the Operations and Engineering Sections write the EOPs, since they are familiar with the above objectives. EOPs will be checked out on the simulator by Operations personnel and CRDR (Control Room Design Review) team members concurrently prior to operator training and, during EOP training sessions, the operator will be able to supply additional feedback to identify problems.

6. Is there a high level of assurance that the procedures will work,i.e., do the procedures correctly guide the operator in mitigating transients and accidents?

BLN EOPs will be tested on the simulator, control room or simulator walk-through and table-top review.

E. DISCREPANCY DETECTION

The purpose of the V&V program is to detect discrepancies. A reviewer or review team will be assigned to address each objective listed above. It will be the responsibility of the reviewer or review team to ensure that the criteria of the objectives are met and discrepancies are documented. Identified discrepancies will be documented on the EOP Verification and Validation Record (Figure 2). The reviewer(s) should also make recommendations to resolve discrepancies when appropriate.

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IV. (continued)

F. DISCREPANCY RESOLUTION

When a discrepancy is identified a resolution will be developed to satisfy the discrepancy. The solution to some discrepancies may involve correcting the procedure, while others may be addressed by increasing the level of operator training. The resolution will be written on the EOP Verification & Validation Record. The verification of the EOP is not complete until the discrepancies have been resolved. The Operations and Engineering Supervisor, or his representative shall approve of the disposition of each discrepancy.

G. DOCUMENTATION

The EOP Verification & Validation Record should be retained as plant records.

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EOP VERIFICATION & VALIDATION RECORD

Procedure No: _____ Title: _____

Rev. No. _____ Rev. Date _____

Reviewer _____ Review Date: _____

Final Approval _____ Page _____ of _____

STEP NO.	DISCREPANCIES AND RECOMMENDATIONS	FINAL RESOLUTIONS

Figure 2

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EOP VERIFICATION AND VALIDATION RECORD
(continuation sheet)

Page ____ of ____

STEP NO.	DISCREPANCIES AND RECOMMENDATIONS	FINAL RESOLUTIONS

Figure 2 (continued)

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V. EOP TRAINING PROGRAM

A. GENERAL

The EOP training program will be developed to support implementation of the EOPs. The EOP writer interfaces with Site Training Managers and Power Operations Training Center (POTC) to ensure a supportive program.

B. PROGRAM DESCRIPTION

When developing the EOP training program, the following major items will be considered:

- what type of operator training should be provided (initial, refresher, revisions)
- what method of operator training should be followed
- what operator knowledge and skill level is desired
- what procedure tasks exists that require operator decision-making
- what training material is needed to support EOP training requirements
- what current operator licensing requirements exist
- what method should be provided for operator feedback into the training program and EOP development

This description outlines the approach to be used to train license candidates and licensed operators on EOPs and to ensure the operators are informed and knowledgeable of future changes to the EOPs.

C. TRAINING PROGRAM GOALS

The initial, overall training goals for the EOP training program are as follows:

- to enable the operators to understand the structure of the EOPs
- to enable the operators to understand the technical basis of the EOPs
- to enable the operators to have a working knowledge of the technical content of the EOPs
- to enable the operators to use the EOPs under operational conditions

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V. (continued)

C. (continued)

Training program objectives designed to meet these goals will be developed in each lesson plan dealing with EOPs.

D. INITIAL EOP TRAINING METHODS

The EOP training program is established to instruct operators in the EOPs. It consists of classroom instruction and simulator exercises.

1. Classroom Instruction

Classroom instruction sessions will be conducted. Included in the information presented during this method will be the following:

- o the logic behind the development of EOPs
- o the process used to develop the EOPs
- o the EOPs themselves, including supporting technical and human factors information

2. Simulator Exercises

Training on the EOPs will be conducted for all licensed operators using scenarios on the control room simulator. Training will be conducted with all operators performing their normal control room functions stressing the team approach and concentrating on information flow and operator interaction. Additional training will be conducted where the members of a crew alternate responsibilities. This additional training is important to promote understanding of the other operators' responsibilities in the overall conduct of the actions, and it should lead to enhanced communications within the control room.

E. REQUALIFICATION TRAINING

All licensed operators and candidates will perform simulator exercises using the EOPs during requalification training. Scenarios will be developed to ensure the EOPs are exercised to an extent that operators are familiar with all major changes to aspects of the EOPs.

Training on EOPs will be conducted in such a manner that each crew performs the simulator exercise with each operator performing the actions that he normally would be responsible for during an emergency incident. Licensed operators not assigned to a shift will participate in the simulator exercise as part of a control room crew.

V. (continued)

E. (continued)

The Site Training Managers and POTC in cooperation with the Operations Staff will participate in the development and execution of refresher training. The training staff is responsible for developing the scenarios, observing and evaluating the simulator exercises, and critiquing the results. Any additional training needs will be determined from the performance of the operators.

The scenarios will be varied sufficiently to ensure the operators do not develop a set pattern of responses to incidents but are able to respond to the symptoms as they develop.

F. TRAINING ON REVISIONS

Training on minor procedure revisions will be conducted through a program of required readings (self-taught), preshift briefings, or lectures in the requalification program. Training on major revisions will be conducted by the use of classroom instruction and simulator exercises.

G. INPUTS INTO TRAINING PROGRAM CHANGES

1. Supporting Training Material Changes

Changes to supporting training material will be factored into updated lesson plans and operator memos. Some of the supporting material identified to date is as follows:

- o ATOG
- o background information

2. Operator Feedback and Evaluation

Operator feedback resulting from EOP verification, EOP validation, training critiques, and actual use of EOPs, will be used to keep the training program and EOPs current and relevant; and to ensure that the training program goals have been accomplished.

Operators will be encouraged to make notes directly on the EOP pages, when used, of any exceptions, abnormal conditions, or suggested improvements.

ATTACHMENT 1

WRITERS' GUIDE FOR EOPs

PURPOSE

The purpose of these guidelines is to provide administrative and technical guidance to be used in the preparation of Emergency Operating Procedures (EOPs). These guidelines are intended to help the writer present the information to the user (operator) in the most useful form; therefore, it may be necessary to present some information in non-standard format (i.e. strict adherence to the guidelines may not always enhance clarity).

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TABLE OF CONTENTS

PROCEDURE

A. EOP Designation and Numbering

Each EOP shall be uniquely identified. This identification permits easy administration of the process of procedure preparation, review, revision, distribution, and operator use.

1. Procedure Title

a. Every procedure shall have its own descriptive name that summarizes the scope of that procedure or states the event which it is intended to mitigate.

b. The title, if addressed in ATOG, should be consistent with ATOG; however, exact duplication is not required.

c. Use brief, concise wording, using keywords where possible.

2. Procedure Numbering

a. EOPs are to be subdivided in the following manner:

1) Symptom procedures address basic heat transfer symptoms that occur during transients and allow mitigation independent of the initiating event(s). Symptom procedures should be designated S; Example S-1 or S-3.

2) Event procedures are specialized optimized procedures which address the diagnosis or mitigation of designated events or conditions. Event procedures should be designated E; Example E-1 or E-2.

3) Multiple Failure procedures are contingency actions based on events that go beyond design basis events and single failures. Multiple failure procedures may or may not be covered in ATOG. Multiple failure procedures should be designated M; Example M-1.

4) Cooldown procedures address cooldown methods that go beyond the scope of normal cooldown procedures and usually follow Event or Symptom procedures. Cooldown procedures should be designated C; Example C-1.

A. (continued)

2. a. 5) Specific Rules are provided in a separate section as general guidance and to reduce repetition throughout the procedures. These rules apply whenever they are referenced in the procedures. These will be designated as Specific Rules.

Example: "Specific Rule 1 - Initiation of HPI."

b. Figures will be in a separate tabbed section at the end of each EOP Manual for easy reference. Figures shall be designated as "Figure 1," "Figure 4," etc.

B. Format

1. Procedure Organization

a. Each EOP will have a Title Page containing plant name, type of procedure, procedure designation, title, unit number, effective pages, last revision date, plant manager's approval and approval date.

b. Each EOP other than Specific Rules will have a Cover Sheet to summarize the procedure purpose and state entry symptoms and conditions. The Cover Sheet format will be full-width of page typing--not a 2-column format, and shall contain lists and tables as necessary.

c. Operator Actions comprise a large portion of each procedure and present the actual step-by-step guidance. The general criteria for page layout for operator actions will be explained in B.2.

d. A Flow Chart summarizes information that is continually required for operator guidance. Flow charts will be provided as necessary. General criteria for flow charts will be explained in Section E.

B. (continued)

2. General Page Criteria

a. Each page of the EOP for Operator Actions will use the same page structure except the Title Page (B.1.a), Cover Sheet (B.1.b), Flow Chart (B.2.d), Tables (F.6), and Work Sheets (F.7).

b. The pages for presentation of operator action steps will use a two-column format.

c. Only the fronts of pages shall be used.

d. The top heading, the bottom page number, and the step number will define the borders of the page and will ensure that information is not lost during reproduction. See enclosed example (Figure 1).

e. Normally procedure steps or substeps should be single spaced. Double spacing should be used between steps and substeps. Triple space between steps.

f. Each page will be uniquely identified and numbered by including the plant identification and unit number, procedure number, page number, and revision number in the upper righthand corner of the page. Present the page number in "Page ___ of ___" form. This will be single-spaced beginning on line three and column 65.

Example:
BLNP Unit 1
EOP E-1
Page 3 of 14
Rev. 2

g. Lines 8 and 10 are reserved for procedure titles & sections. Normally, only line 10 will be used. The titles should be fully capitalized, underlined, and centered.

h. The left hand and right hand column headings are on line 12 and begin in column 12 and 51 respectively. They are fully capitalized and underlined.

B. (continued)

2. i. Procedure steps, notes, cautions, and major headings will be contained between lines 15 and 57, inclusive. The statement "(THIS STEP CONTINUED ON NEXT PAGE)" may be placed below line 57 if necessary.

j. Each page will be numbered consecutively at the bottom center of the page on line 63 and column 44.

k. A vertical "line" shall exist between the left and right hand columns on and below line 15 in column 44. This "line" shall not divide notes, cautions, or major headings.

l. Typing should end on column 40 or 41 for the left hand column and 79 or 80 for the right hand column.

m. Margins should be set at 8 (left side) and 80 (right side).

n. Notes and CAUTIONS should begin on column 12. Double space before and after.

o. Major headings should be placed on line 15 (new page for each heading) and begin in column 8.

p. Suggested tabs to be used during typing: 12, 15, 18, 21, 44, 47, 51, 54, 57, and 65.

3. Instruction Step Numbering

a. Procedure steps will be numbered as follows:

Example: 1. High-level Step

a. Substep

1) Sub-substep

b. Substeps are numbered sequentially according to expected order of performance.

c. This same numbering scheme is to be used in both the right and left columns of the procedures.

d. Specific Rule step numbering may vary as necessary.

C. Writing Instructional Steps

1. Step Length and Content

Instruction steps will be concise and precise. Conciseness denotes brevity; preciseness means exactly defined. Thus, instruction steps should be short and exact. General rules to be used for step length and content are as follows:

a. Instruction steps should deal with only one idea or task and required substeps to accomplish that task or idea.

b. Short, simple sentences should be used in preference to long, compound, or complex sentences. Writing instructions in sentence fragments may be the best use of space.

c. A step should be wholly contained on a page (i.e. a step should not be broken up between pages, unless the step is more than one page long). If a step is continued onto more than one page, then use "THIS STEP IS CONTINUED ON NEXT PAGE."

d. Complex procedures should be described in a series of steps, with each step made as simple as practical.

e. All steps are assumed to be performed in sequence unless stated otherwise in a preceding Note.

f. For place keeping purposes, the operators will be trained to "X" over appropriate step or substep designation as it is completed.

g. Actions required in a particular step should not be expected to be complete before the next step is begun, unless specifically so stated. If a step cannot be completed, it should be circled.

h. The objective of operator actions should be specifically stated. This includes identification of exactly what is to be done and to what.

i. If a step contains four or more action items, they should be listed rather than embedded in the sentence.

j. Instruction content should be written to communicate to the user. Consideration should be given to the minimum number, qualifications, training, and experience of the operating crew. (See C.10.a.)

C. (continued)

1. k. Expected results of routine tasks need not be stated.

l. When actions are required based on receipt of an annunciated alarm, list the setpoint of the alarm for ease of verification.

m. When requiring resetting or restoration of an alarm or trip, list the expected results immediately following the resetting or restoration if it would be beneficial to the operator.

n. When considered beneficial to the user for proper understanding and performance, describe the system response time associated with performance of the instruction.

o. When system response dictates a time frame within which the instruction must be accomplished, prescribe such time frame. If possible, however, avoid using time to initiate operator actions. Operator actions should be related to plant parameters, not time.

p. When anticipated system response may adversely affect instrument indications, describe the conditions that will likely introduce instrument error and if possible, a means of determining if instrument error has occurred by using a Note.

q. When additional confirmation of system response or backup instrumentation is considered necessary (especially computer-driven aids), prescribe the backup readings to be made.

r. A procedure step should not rely only upon a parameter displayed only on a computer-driven aid; i.e. any readings or displays should be those the user can determine via other instrumentation should the computer-driven aid fail.

2. Instruction Steps, Left-Hand Column

The left-hand column of the two-column format will be used for operator instruction steps and expected responses and will be labeled ACTION/EXPECTED RESPONSE. The following rules of construction apply:

a. High-level steps are those steps that tell the user "what" to do. Substeps of the high-level step may be used to tell the user "how" to accomplish the high-level step.

C. (continued)

2. b. If only a single task is required by the step, then the high-level step may contain its own ACTION AND EXPECTED RESPONSES.

c. Left-hand column tasks should be specified in sequence as if they could be performed in that manner. The user would normally move down the left-hand column when the expected response to a particular step is obtained.

d. When the expected response is not obtained, the user will be trained to move to the right-hand column for contingency instruction.

e. Any immediate operator steps should start with IMMEDIATELY followed by that step.

3. Instruction Steps, Right-Hand Column

The right-hand column is used to present contingency actions which are to be taken in the event that a stated condition, event, or task in the left-hand column does not represent or achieve the expected result and will be labeled RESPONSE NOT OBTAINED. The following rules apply to the right-hand column:

a. Contingency actions should identify directions to override automatic controls and to initiate manually what is normally initiated automatically.

b. Contingency actions should normally be specified for steps or substeps for which the task requirements might not be satisfied. However, to avoid excessive clutter, it is permissible to delete overly obvious contingency actions.

c. Contingency actions should be numbered consistently with the action/expected response and will appear on the same line as its related step (this also applies to substeps).

d. Unless specifically instructed otherwise the user is expected to return to the same numbered step or substep in the left-hand column after taking contingency action in the right-hand column. If a contingency action cannot be completed, the user is expected to proceed to the next step or substep in the left-hand column unless specifically instructed otherwise. When writing the procedures, this rule of usage should be considered in wording subsequent left-hand column instructions.

C. (continued)

3. e. If contingency action must be completed prior to continuing, that instruction must appear explicitly in the right-hand column substep.

f. Not all steps in the left hand column will require a contingency action. See Section 10.a.

4. Use of Logic Terms

a. The logic terms AND, OR, NOT, IF, IF NOT, WHEN, and THEN are often necessary to describe precisely a set of conditions or sequence of actions. When logic statements are used, logic terms will be highlighted so that all the conditions are clear to the operator. Emphasis will be achieved by using full capitalization and underlining.

b. The use of AND and OR within the same action shall be avoided. When AND and OR are used together, the logic can be very ambiguous.

c. The dual-column format used equates to the logic, IF NOT the action in the left-hand column, THEN follow the action specified in the right-hand column.

d. When attention should be called to combinations of conditions, the word AND shall be placed between the description of each condition. The word AND shall not be used to join more than three conditions. If four or more conditions need to be joined, a list format shall be used.

e. The word OR shall be used when calling attention to alternative combinations of conditions. The use of the word OR should always be in the inclusive sense. Additional qualifications will be needed to specify the exclusive "OR", the following may be used: "Either A OR B but NOT both".

f. When action steps are contingent upon certain conditions or combinations of conditions, the step shall begin with the words IF or WHEN followed by a description of the condition or conditions, a comma, the word THEN, followed by the action to be taken. WHEN is used for an expected condition. IF is used for an unexpected but possible condition.

g. Use of IF NOT should be limited to those cases in which the operator must respond to the second of two possible conditions. IF should be used to specify the first condition.

C. (continued)

4. h. THEN shall not be used at the end of an action step to instruct the operator to perform the next step because it runs actions together.

5. Use of Cautionary Information and Notes

a. Because the present action-step wording is reduced to the minimum essential, certain additional information is sometimes desired, or necessary, and cannot be merely included in training. This non-action information is presented as either a Note or a CAUTION.

b. CAUTION denotes some potential hazard to personnel or equipment associated with the following instructional step.

c. Note is used to present advisory or administrative information necessary to support the action instruction.

d. To distinguish a CAUTION from an action step, it will extend across the entire page.

e. CAUTION or Note which must be observed prior to the execution of a step shall precede the step. CAUTION or Note applicable after the completion of a step should follow the step.

f. The word CAUTION should be underlined and fully capitalized in large type. The word Note should have the "N" capitalized and then be underlined.

g. CAUTIONS and Notes should be able to be read completely without interruption by intervening steps. CAUTIONS and Notes will be wholly contained on the same page as steps to which they apply.

h. CAUTIONS and Notes should be accurate and concise.

C. (continued)

5. i. As a general rule, neither a CAUTION or Note will be used to replace an instruction/operator action step. However, procedure transitions can be included as non-action information in a Note when necessary.

Examples:

1. OPEN HOT LEG HIGH POINT VENTS.

   a. Monitor HLLMS to verify Hot Leg level.

   Note

   HLLMS will indicate inaccurately when High Point vents are open.

   ---

2. ---

   Note

   Flow chart should be open.

   ---

3. **********

   CAUTION

   RCPs must be tripped within 3 minutes upon loss of subcooling margin.

   ****

6. Calculations

   a. If a value has to be determined in order to perform a procedural step, a chart or graph should be used whenever possible.

   b. Use of formulas or the need for calculations should be avoided. However, when calculations are required they should be simple.

   c. Space should be provided to perform the computation and to record the results.

C. (continued)

7. Emphasis

a. Avoid excessive use of underlining and capitalizations.

b. Underlining key words and phrases is permissible, but this practice should be used with discretion. Too much underlining may result in reduced effectiveness; too little underlining may result in key words or phrases not standing out when necessary.

8. Referencing and Branching to Other Procedures or Steps

a. Minimize cross-referencing in and out of one procedure to another.

b. When a step references the operator to another step and that step is preceded by a CAUTION or Note, a warning should be included to tell the user to read the preceeding Note or CAUTION. Example: Go to step 6 and read the preceding CAUTION.

c. All procedures should end with a transition to another EOP or to some other normal plant procedure. Example: Go to EOP S-1, "Reactor Trip OR ESFAS."

d. Tabs will be used to locate the beginning of each procedure and the procedure's title will be on the tab. The title on the tab may be abbreviated if necessary.

Example:

1) EOP E1 SGTR

2) EOP S1 Rx Trip/ESFAS

9. Component Identification & Location

With respect to identification of components, the following guides are to be used by the EOP preparer.

a. Equipment, controls, and displays will be identified in operator language (common usage terms). When the engraved names and numbers on panel placards and alarm windows are needed in the procedure for clarity, the engraving should be quoted and printed to represent the exact label.

C. (continued)

9. b. Certain prominent or unique plant components will not require UNID for their identification. However, many will require at least some part of their UNID. If the type of component (valve, pump, etc.) has been identified in the text, an abbreviated UNID may be used.

c. If the component is seldom used or it is felt that the component would be difficult to find, location information should be given in parentheses following the identification.

10. Level of Detail

a. Avoid excessive detail for routine operations. Any information which an operator is expected to know (based on training and limited experience) should not be included. The desired level of detail is one in which enough details are presented so that the operator has all the information he needs, but not so many details that the operator becomes burdened or confused by superficial or redundant information. The Validation and Verification Program will help determine if the level of detail is adequate.

b. The level of detail of component identification should be based on expected operator knowledge.

c. Constructing steps that are concise and precise will aid in reducing the level of detail. Many actuation devices (switches) in the control room are similar, even though the remotely performed functions are not, so certain action verbs listed here are recommended (also refer to part D.4).

1) Use "START/STOP" for power-driven rotating equipment.

2) Use "OPEN/CLOSE" for valves.

3) Use "OPEN/CLOSE" for electrical breakers.

4) Use "PLACE IN AUTO" to refer to equipment when actuation is to be controlled by automatic logic circuitry.

5) Use "SELECT" on multiposition switches.

D. Mechanics of Style

1. Spelling

Spelling should be consistent with modern usage.

2. Punctuation

Punctuation should be used only as necessary to aid reading and prevent misunderstanding. Word order should be selected to require a minimum of punctuation.

3. Capitalization

Capitalization may be used in the procedure for emphasis in the following cases:

a. Plant Locations:

1) Capitalize the first letters of major plant areas or buildings

e.g. Auxiliary Building

b. Systems and Components

1) Capitalize the first letters of titles of plant systems

e.g. Makeup and Purification

2) Capitalize the first letters of titles of major plant equipment

e.g. Decay Heat Removal Pump

3) When words from a title of a system are used but do not reference the system directly, the words should be in lower case.

c. Major headings should be fully capitalized and underlined.

d. High level steps in the Action/Expected Response column (left hand column of instructions) should be fully capitalized. Lower level instructions in the left hand column, ALL right hand column steps, and all engineering units will use normal capitalization except as dictated in the Writers' Guide.

e. First letters of titles of procedures will be capitalized and the titles placed in quotation marks whenever referenced within any procedure.

D. (continued)

4. Vocabulary

Words used in procedures should convey precise understanding to the trained person. The following rules apply.

a. Use simple words. Simple words are usually short words of few syllables. Simple words are generally common words.

b. Use common usage if it makes the procedure easier to understand.

c. Use words that are concrete rather than vague, specific rather than general, familiar rather than formal, precise rather than blanket.

d. Define key words that may be understood in more than one sense.

e. Some words have unique meanings. Refer to Table 1 for a glossary of terms.

f. In some cases, certain other words should be avoided simply because they are not adequately defined when used without modification. These include: rapidly and slowly. The same words become acceptable when some clarification is provided.

Example: Rapidly (up to 100°F/HR) cool down the RCS.

These words can be used without clarification, when the meaning would not present confusion.

5. Numerical Values

a. All numerical values presented in the procedures should be consistent with what can be read on instruments in the control room (i.e., consistent with instrument scale and range).

b. The number of significant digits presented should be equal to the reading precision of the indicator.

D. (continued)

5. c. Acceptance values should be stated in such a way that any addition or subtraction operations are avoided, if possible. This is done by stating acceptance values as limits. Examples: 2500 psig maximum, 350°F minimum, between 450°F and 500°F. Tolerances can be expressed by stating the nominal value followed by the acceptable range in parenthesis.

   Example: 550 (540 to 560)°F

   Avoid: 550°F ± 10°F

   d. Engineering units should always be specified when presenting numerical values for process parameters. They should be the same as those used on the control room displays.

   e. When ATOG specifies a numerical value to be calculated, the method of derivation should be documented and verified.

   f. To identify values to be used during adverse containment conditions, the adverse containment values will be enclosed in brackets.

6. Abbreviations, Acronyms and Symbols

   a. Minimize the use of abbreviations. Abbreviations may be used where necessary and when their meaning is unquestionably clear to the intended reader. Refer to Table 2 for approved list.

   b. Unfamiliar abbreviations and acronyms should not be used.

   c. Periods should be omitted from acronyms and abbreviations.

   d. The plural of an acronym should have no apostrophe (i.e., RCPs).

7. Hyphens

   a. Avoid overuse of hyphens. Avoid using hyphens if they might be confused for minus signs (e.g. between numbers).

   b. Examples for acceptable use of hyphens are:

      U-235, N-16, pre-position, twenty-one and one-half, self-contained, O-ring, dump-to-sump.

E. Flow Chart

1. The Flow Chart is intended to summarize only that information which an operator should have continuously available, so page content will vary by procedure. The page will be constructed so the entire flow chart can be available while using the EOP; i.e., 10" left margin and folded.

2. The Flow Chart page will be the final page of the procedure and will use a flow chart format.

3. The Flow Chart title will be fully capitalized and underlined for emphasis. Example: FLOW CHART FOR EOP S-1.

4. Each block of operator information included in the Flow Chart will be numbered according to the related EOP step number and have an explanatory description.

F. Graphs, Charts, Tables and Worksheets

1. They should be legible, readable, and easy to use under the expected condition of use.

2. Units of scale and measurement should be readily available and usable to the operator. Units used in the graphs (for example) should correspond to the units used on the MCR indications.

3. Titles should be descriptive of contents and use.

4. Printed aids should be compatible with the procedure.

5. Numbering for the above should be consecutive in each procedure. Examples: EOP E-1 Graph 1; EOP E-1 Chart 2.

6. Tables may be used throughout procedures where large blocks of information need to be presented in concise form. Tables may extend across the page and are not confined to a one column format.

7. Worksheet format will vary as needed.

G. Procedure Revisions

Refer to plant administrative instructions for guidance in procedure review and revision control. When making procedure revisions, review related procedures that may also be affected. The writer's guide will be used in development of revisions to the EOPs.

H. Production and Distribution

The EOPs should be contained in a loose-leaf ring binder. A complete set of EOPs should be contained in one volume. The procedures should be punched with a large (3/8") hole-punch for ease of manipulation. All approved procedures should be printed using the same printer. All copies should be made using the same high quality copier.

A complete set of EOPs will be maintained in each Main Control Room, Aux. Control Room, Tech. Support Center, and at other locations as defined in Plant Administrative Instructions.

I. REFERENCES

1. INPO Guidelines 82-017, EOP Writing Guideline
2. B&W's ATOG

J. ATTACHMENTS

1. Figure 1 - Procedure Page Example (Format Only)
2. Figure 2 - Page Format Example
3. Table 1 - Glossary
4. Table 2 - Abbreviations & Acronyms

SECTION II

VITAL SYSTEM STATUS VERIFICATION

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1. REACTOR POWER DROPPING ON INTERMEDIATE RANGE	1. START full HPI from BWST
2. ALL CONTROL RODS FULLY INSERTED CHECK ROD BOTTOM LIGHTS ON AND SELECT "ABSOLUTE" ON SWITCH TO VERIFY RPIs AT 0% AND VERIFY TRIP CONFIRM LIGHT ON	2. a. Place Diamond Control Panel in Manual AND insert control rods at run speed. b. Begin maximum boric acid addition to RCS: 1) Manually START full HPI from BWST, per "Specific Rule 1." 2) Maximize letdown. 3) Minimize Normal Makeup. c. Based on rapid accessibility, dispatch an operator to 480V swgr 1XA-2 to OPEN 480V Bkr to CRD MG SETS (identified by unique coloring) AND continue to the CRD MG set room to OPEN the CRD trip bkrs.

(THIS STEP CONTINUED ON NEXT PAGE)

(Figure 1)

SECTION II

VITAL SYSTEM STATUS VERIFICATION

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2.	2. d. Maintain proper primary to secondary heat transfer: 1) Monitor P-T trace for proper heat transfer 2) Maintain steam pressure as stable as possible 3) IF MFW NOT available, ensure AFW operating per "Specific Rules 3 AND 4." a. Do NOT proceed until rods are inserted OR reactor is at least 1% $\Delta k/k$ shutdown on rods OR boron.
3. ALL MAIN TURBINE STOP VALVES SHUT	3. a. Manually CLOSE control valves. b. IF all four main Turbine Stop valves are OPEN, THEN Trip turbine from front standard. c. IF it is obvious that an overcooling is being caused by the failure of the Turbine Control AND Stop valves to CLOSE, THEN CLOSE all four MSIVs.

(Figure 1)

SECTION II

VITAL SYSTEM STATUS VERIFICATION

ACTION/EXPECTED RESPONSE		RESPONSE NOT OBTAINED
1. 12345678901234567890123456789 12345678901234567890123456789	/	1. 12345678901234567890123456789 12345678901234567890123456789
a. 123456789012345678901234567 12345678901234567890123456	/	a. 123456789012345678901234567 12345678901234567890123456
1) 1234567890123456789012	/	1) 1234567890123456789012
2. 12345678901234567890123456789 12345678901234567890123456789	/	2. 12345678901234567890123456789 12345678901234567890123456789

****

CAUTION

123456789012345678901234567890123456789012345678901234567890123456789012345678
****

3. 12345678901234567890123456789	/	3. 12345678901234567890123456789

(Figure 2)

TABLE 1

GLOSSARY

Allow	To permit a stated condition to be achieved, for example, "allow discharge pressure to stabilize".
Available	A system, subsystem, train, component, or device is operable and can be used as desired; however, it need not be operating.
Automatic (Auto)	1. A mode of system or component control which does not require operator intervention for design operation. 2. A response or action which does not require operator initiation.
Check	To note a condition and compare with some procedure requirement. To perform a physical action that determines the state of a variable or status of equipment without directing a change in status, such as "check for satisfactory lube oil level".
Close	To change the physical position of a mechanical device to the closed position so that it prevents fluid flow or permits passage of electric current, for example "Close valve NV-IFCV-387".
Complete	To accomplish specific procedural requirements, for example "complete valve checkoff List X".
Control	To manually or automatically operate equipment as necessary to satisfy procedure requirements.
Decrease	Should not be used because of communication problems.
Ensure	To observe that an expected characteristic or condition exists and, if necessary, to take actions to make the condition occur.
Establish	To make arrangements for and develop a stated condition, for example, "establish communication with control room".
Increase	Should not be used because of communication problems.
Initiate	To begin a process.
Inspect	To measure, observe, or evaluate a feature or characteristic for comparison with specified limits; method of inspection should be included, for example, "visually inspect for leaks".

TABLE 1 (continued)

GLOSSARY

Intact	Describes a steam generator which has neither a tube rupture nor any other fault.
Local (locally)	An action performed by the operator outside the main control room.
Maintain	To continuously control a given plant parameter to some procedure requirement. Example: "Maintain steam generator level in the narrow range.
Manual (Manually)	1. A mode of system or component control which requires operator action to change operating status. 2. A response or action which is initiated or performed by an operator.
Monitor	Similar to "check", except implies a repeated function.
Normal	A value of a process parameter experienced during routine plant operations and conditions.
Open	To change the physical position of a mechanical device to an unobstructed position that permits access of flow or prevents passage of electrical current. Example: "Open valve NV-IFCV-387".
Operable/ Operability	A system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s), and when all necessary attendant instrumentation, controls, electric power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function(s) are also capable of performing their related support function(s).
Record	To document a specified condition, characteristic, or parameter, for example, "record discharge pressure".
Ruptured	Used in describing a steam generator with a tube(s) break.
Select	Used in describing the placement of multiposition switches to one of the available positions.
Set	To physically adjust to a specified value an adjustable feature, for example, "set speed to 1600 rpm".
Start	To originate motion of an electrical or mechanical device, for example, "Start pump".

TABLE 1 (continued)

GLOSSARY

Stop	To cause motion of an electrical or mechanical device to cease, for example, "Stop pump".
Throttle	To operate a valve in an intermediate position to obtain and maintain a certain parameter.
Trip	To activate a semi-automatic feature, for example, "Trip breaker".
Vent	To permit a gas or liquid confined under pressure to escape at a vent, for example, "vent pump 1A".
Verify	To prove to be true, exact, or accurate by observation of a condition or characteristic for comparison with an original or a procedural requirement, for example, "verify discharge pressure".

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TABLE 2

ACRONYMS AND ABBREVIATIONS

ac	Alternating current
ACR	Auxiliary Control Room
ADS	Automatic Dispatch System
ADV	Atmospheric Dump Valve
AFW	Auxiliary Feedwater System
AFPT	Auxiliary Feed Pump Turbine
AHU	Air Handling Unit
amp	Ampere
ASE	Assistant Shift Engineer
ATOG	Abnormal Transient Operating Guidelines
AUO	Assistant Unit Operator
Auto	Automatic
Aux	Auxiliary
Ave	Average
BAAT	Boric Acid Addition Tank
Bkr	Breaker
Bldg	Building
BLN	Bellefonte Nuclear Plant
BOP	Balance Of Plant
BTU	British Thermal Unit
BWST	Borated Water Storage Tank
CA&BRS	Chemical Addition and Boron Recovery System
CACS	Containment Air Cleanup Subsystem
CARS	Containment Air Recirculation Subsystem
CBAST	Concentrated Boric Acid Storage Tank
C/D	Cooldown
CCS	Component Cooling Water System
CDV	Condenser Dump Valve
CECS	Containment Environmental Control System
cfm	Cubic feet per minute
cfs	Cubic feet per second
CFS	Core Flooding System
CFT	Core Flood Tank
Ch	Channels
Ci	Curies
CIC	Containment Isolation and Cooling
CNTM	Containment
CRD	Control Rod Drive
CRDM	Control Rod Drive Mechanism
CRDS	Control Rod Drive System
CRT	Cathode Ray Tube
CSSV	Cold Safe Shutdown Valve
CST	Condensate Storage Tank
DACOADA	Data Acquisition and Control, Operations Recording and Fire Detection, Annunciation Data Logging, and Access Control System
DBA	Design Basis Accident
DBE	Design Basis Event
dc	Direct current
DGSAS	Diesel Generator Starting Air System
DHR	Decay Heat Removal System

TABLE 2 (continued)

ACRONYMS AND ABBREVIATIONS

Disch	Discharge
DNB	Departure from Nucleate Boiling
DNBR	Departure from Nucleate Boiling Ratio
dpm	Decades per minute
ECCI	Emergency Core Cooling Injection
ECCS	Emergency Core Cooling System
ECI	Essential Controls & Instrumentation
ECS	Environmental Control System
EMO	Electric Motor Operated
EOL	End of (Core) Life
EOP	Emergency Operating Procedure
ERCW	Essential Raw Cooling Water
ERCWS	Essential Raw Cooling Water System
ESF	Engineered Safety Features
ESFAS	Engineered Safety Features Actuation System
°F	Farenheit
FOGG	Feed Only Good Generator
FP	Full Power
fps	Feet per second
FR	Full Range
ft	Foot
FW	Feedwater
FWP	Feedwater Pump
gpm	Gallons per minute
H_2	Hydrogen
HEPA	High Efficiency Particulate Air
Hi (Hi Hi)	High (High High)
HLLMS	Hot Leg Level Monitoring System
HPI	High Pressure Injection
HPIS	High-Pressure Injection System
HPFP	High-Pressure Fire Protection System
ICC	Inadequate Core Cooling
ICS	Integrated Control System
IM	Incore Monitoring
IMS	Incore Monitoring System
in	Inch
IR	Intermediate Range
kV	Kilovolt
kW	Kilowatt
LBLOCA	Large Break Loss-Of-Coolant Accident
lb	Pound
lbm	Pound mass
lo	Low
LOCA	Loss-of-Coolant Accident
LOFW	Loss of Feedwater
LOOP	Loss of Offsite Power
LPI	Low-Pressure Injection
m	Meter
MADV	Modulating Atmospheric Dump Valve (upstream of MSIV)
Max	Maximum

TABLE 2 (continued)

ACRONYMS AND ABBREVIATIONS

MCR	Main Control Room
MFIV	Main Feedwater Isolation Valve
MFW	Main Feedwater
MFWP	Main Feedwater Pump
MG	Motor Generator
mils	Thousandths of an inch
ml	Milliliter
MOV	Motor Operated Valve
mrem	Millirem
MS	Main Steam
MSGTR	Multiple Steam Generator Tube Rupture
MSIV	Main Steam Isolation Valve
MSLB	Main Steam Line Break
MSSV	Main Steam Safety Valve
MU	Makeup
MUP	Makeup Pump
MUPS	Makeup and Purification System
MUT	Makeup tank
MWe	Megawatt electric
MWt	Megawatt thermal
N_2	Nitrogen
NDT	Nil Ductility Temperature
NNI	Non-Nuclear Instrumentation
NR	Narrow Range
NIS	Nuclear Instrumentation System
NPSH	Net Positive Suction Head
NSSS	Nuclear Steam Supply System
OBE	Operational Basis Earthquake
OTSG	Once-Through Steam Generator
PAC	Protection System Auxiliary Cabinets
PAM	Post-Accident Monitoring
PAX	Private Automatic Exchange
PMS	Plant Monitoring System
PORV	Power Operator Relief Valve
ppb	Parts per billion
ppm	Parts per million
PR	Power Range
psia	Pounds per square inch, absolute
psid	Pounds per square inch, differential
psig	Pounds per square inch, gauge
P-T	Pressure Temperature Diagram (or Trace)
PWR	Pressurized Water Reactor
Pzr	Pressurizer
RB	Reactor Building
RBC	Reactor Building Coolers
RBES	Reactor Building Emergency Sump
RBS	Reactor Building Spray
RC	Reactor Coolant
RCDT	Reactor Coolant Drain Tank
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
rem	Roentgen Equivalent Man

TABLE 2 (continued)

ACRONYMS AND ABBREVIATIONS

REP	Radiological Emergency Plan
RIVA	Reactor Internals Vent Assemblies
RO	Reactor Operator
RPI	Rod Position Indicator
rpm	Revolutions per minute
RPS	Reactor Protection System
RTD	Resistance Temperature Detector
RTP	Rated Thermal Power
RV	Reactor Vessel
RVLIS	Reactor Vessel Level Instrumentation System
Rx	Reactor
SBLOCA	Small Break Loss of Coolant Accident
SCACS	Secondary Containment Air Cleanup System
scfm	Standard cubic feet per minute
SCPPCS	Secondary Containment Purge and Pressure Control Subsystem
SE	Shift Engineer
sec	Seconds
SG	Steam generator
SGTR	Steam Generator Tube Rupture
SPDS	Safety Parameter Display System
SRO	Senior Reactor Operator
SSCS	Solid State Control System
SSE	Safe Shutdown Earthquake
SUR	Startup Rate
swgr	Switchgear
T-ave	Average Temperature
T-sat	Saturation Temperature
TBS	Turbine Bypass System
TBV	Turbine Bypass Valves
Tc	T-cold, Reactor Coolant System Loop (Cold Leg) Temperature
T/C	Thermocouple
Tech Specs	Technical Specifications
Temp	Temperature
Th	T-hot, Reactor Coolant System Loop (Hot Leg) Temperature
TM	Turbomat
TRSG	Tube Ruptured Steam Generator
ULD	Unit Load Demand
UPS	Uninterruptable Power Supply
Vent	Ventilation
VRS	Vacuum Relief Subsystem
w/o	Weight per cent
WR	Wide Range
Δt	Differential temperature
Δp	Differential pressure

Minimum - will be spelled out
Minute - will be spelled out
Decontic - will be spelled out