July 9, 1987

Docket No.: 50-206

Mr. Kenneth P. Baskin
Vice President
Southern Carolina Edison Company
2244 Walnut Grove Avenue
Post Office Box 800
Rosemead, California 91770

Dear Mr. Baskin:

SUBJECT: SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 1
(SONGS-1) PROCEDURES GENERATING PACKAGE
(TAC NO. 44340)

The NRC staff has completed its initial review of the SONGS-1 Procedures Generation Package (PGP) submitted by your letter dated April 12, 1985. We have identified a number of issues upon which we have comments and/or recommendations that should be addressed in order to meet the requirements stated in Generic Letter 82-33 (Supplement 1 to NUREG-0737) and the objectives stated in NUREG-0899.

Enclosed is a Request for Additional Information identifying the concerns and recommendations resulting from our review. We request that you review our comments and revise the PGP accordingly. For comments or recommendations that you do not incorporate into the revised PGP, please provide us with your rationale for not doing so. Should you desire further discussion on any of the issues herein, please contact me and I will make the necessary arrangements.

Since upgraded, symptom-based Emergency Operating Instructions (EOIs) have already been implemented at SONGS-1, the staff concludes that the use of the current EOIs is acceptable, pending modification of the PGP and possible subsequent modifications to the EOIs.

This request is covered by Office of Management and Budget Clearance Number 3150-0011 which expires December 31, 1989. Comments on burden and duplication may be directed to the Office of Management and Budget, Room 3208, New Executive Office Building, Washington, D.C. 20503.

Sincerely,

Original Signed by
Richard F. Dudley, Jr.
Richard F. Dudley, Jr., Project Manager
Project Directorate V
Division of Reactor Projects - III,
IV, V and Special Projects

Enclosure:
As stated

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Southern California Edison Company

San Onofre Nuclear Generating
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Enclosure 1

REQUEST FOR ADDITIONAL INFORMATION
PROCEDURES GENERATION PACKAGE
SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 1

REVIEW CRITERIA

This report describes the review of the licensee's response to the Generic Letter (GL) related to development and implementation of EOPs (Section 7 of GL 82-33) for the San Onofre Nuclear Generating Station, Unit 1 (SONGS-1).

The purpose of the review was to determine the adequacy of the licensee's program for preparing and implementing upgraded EOPs for SONGS-1. This review was based on NUREG-0800 (formerly NUREG-75/087), Subsection 13.5.2, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants.

As indicated in the following section, the staff's review determined that the PGP for SONGS-1 has numerous items that must be satisfactorily addressed before the review can continue. The licensee should address these items in a revision to the PGP, or provide justification for why such revisions are not necessary.

FINDINGS, COMMENTS, AND RECOMMENDATIONS

In a letter dated April 12, 1985, the licensee submitted its PGP for SONGS-1. The PGP contained the following sections:

- Overview and Technical Guidelines Discussion
- Emergency Operating Instruction Writer's Guide
- Validation Program Description
- Emergency Operation Instruction Training Program Description

A. Plant-Specific Technical Guidelines (P-STG)

The P-STG program description was reviewed to determine if it described acceptable methods for accomplishing the objectives stated in NUREG-0899. The licensee described a process that will take the Westinghouse Owners' Group (WOG) generic Emergency Response Guidelines (ERGs), Revision 1, which were developed for a Westinghouse standard 4-loop plant design and, with appropriate changes, develop the EOPs for SONGS-1. The licensee identified the following source documents for use in generating EOPs for SONGS-1:

- Westinghouse Owners' Group ERGs
- SONGS Technical Specifications
- SONGS Final Safety Evaluation Report
- SONGS Existing EOIs
- Vendor-supplied information

The staff's review of the SONGS-1 P-STG identified the following concerns:

1. Section 32. of the Overview and Technical Guidelines discussion, Tasks 1 through 4, describing the method of producing "marked up ERGs" from the WOG ERGs. The P-STG should reference a basis document which includes all deviations from and additions (including plant-specific bracketed information) to the generic technical guidelines and an analysis or other technical justification supporting these differences. If the "marked up ERGs" are meant to be basis documents, they should be technically complete and should be formalized and maintained as part of the P-STG.

2. Safety significant differences from the ERGs and their justification were not included in the PGP. If any safety significant deviations from the ERGs were identified during the development of the P-STG, they should be included and justified in the PGP.

B. Writer's Guide

The Writer's Guide was reviewed to determine if it described acceptable methods for accomplishing the objectives stated in NUREG-0899. The Writer's Guide provides administrative and technical guidance on the preparation of EOIs for SONGS-1. The staff's review of the SONGS-1 Writer's Guide identified the following concerns:

1. Notes and cautions provide operators with important supplemental information concerning specific steps or sequences of steps in EOPs. The information on notes and cautions in the Writer's Guide should be revised with regard to the following:

   a. The breaking of cautions and notes between pages disrupts the flow of information from procedures to operators. For this reason, cautions and notes should be presented entirely on one page. The Writer's Guide should state that each caution and note will appear wholly on a single page.

   b. Sections 4.5.1 and 4.5.2 (p. B-14) stated that cautions and notes should be on the same page as the step to which they refer "whenever possible". This section should be revised to indicate that cautions and notes should appear on the same page as the referenced step at all times.

2. Conditional statements and logic statements should be used in EOIs to describe a set of conditions or a sequence of actions. These statements can be confusing, so it is important that the Writer's Guide provide explicit guidance for their use. The discussion of the use of logic terms in the Writer's Guide should be revised with regard to the following:

   a. It will occasionally be necessary to use AND and OR in the same sentence. To prevent operator confusion in such cases, the Writer's Guide should be revised to provide guidance and examples of acceptable usage for these situations. See NUREG-0899, Appendix B, for additional information.

   b. Section 4.4.1 (p. B-9) includes the word NOT as a separate logic term. The text of the Writer's Guide contains no instructions for the use of NOT as a logic term. Other than with the logic term IF, it is not clear how NOT is to be used when writing EOIs. Although the example in Section 4.4.1 indicates that NOT is to be used with IF, this guidance should be explicitly stated in Section 4.4.

3. Section 10.0 discusses Critical Safety Function Status Trees (CSFSTs). This discussion should be revised to address the following:

   a. Section 10.2 (p. B-34) states that "CSFSTs are represented by a tree-like logic structure diagram". Since CSFSTs involve decisionmaking and branching, they would be more clearly presented in flow chart format.

   b. In Figure 5 (p. B-35), all of the text in the CSFST is capitalized. If all words are capitalized, then capitalization cannot be used for emphasis. Furthermore, text written in all capitals is more difficult to read than mixed case. The Writer's Guide should be revised to indicate that capitalization in CSFSTs will conform to the rules established for written procedures, and Figure 5 should be revised accordingly.

   c. The Writer's Guide does not specify the line spacing to be used in CSFSTs. The Writer's Guide should be revised to provide line spacing requirements. Because text can be more easily read if double-spaced, we suggest that the text in CSFSTs be double-spaced.

   d. Section 10.2 states that "entry into each Critical Safety Function Status Tree is always at a point indicated by an arrow at the left side of the tree". No such arrow appears in Figure 5, the example of a CSFST. The Writer's Guide should be revised so that examples and instructions are consistent.

4. Referencing of and branching to other procedures or sections of procedures can be disruptive and can cause unnecessary delays. Section 4.3 (p. B-9) discusses cross-referencing. The guidance offered in this section should be revised as follows:

   a. Section 4.3 discusses the delays that can result from cross-referencing. Because it is important to minimize these delays, Section 4.3 should discuss the criteria to be used when deciding if the necessary steps should be included in the text of the procedure or if cross-referencing should be used.

   b. Sections 4.3 does not discuss the proper format for a cross-reference. Although Table 5-1 (pp. B-20 - B-21) includes the terms GO TO, IMPLEMENT, and RETURN TO, which are apparently to be used when cross-referencing, Section 4.3 should specifically discuss the correct use of these terms when cross-referencing.

   c. The entire step number should be used at each of the two step levels. Then, if an operator is told to go to Step 4.b, for example, the entire step number will be in front of the step and there will be no confusion on the part of the operator as to whether he is at the correct step.

   d. To facilitate rapid movement from one part of EOIs to another, some method for easily identifying sections or subsections in the EOI, such as tabbing, should be specified.

   e. An example of a properly formatted cross-reference should be provided in Section 4.3.

5. The proper use of emphasis techniques can make procedures easier to understand. The following portions of the Writer's Guide, which discusses emphasis techniques, should be revised:

   a. Section 3.1 (p. B-4) states that the text of a top-level action step should be underlined. The examples of top-level action steps given in Figure 2 (p. B-6) are not underlined. The Writer's Guide should be revised so that examples and instructions are consistent.

   b. Section 4.4.3 (pp. B-10 - B-11) states that simple or compound conjunctions need not be capitalized or underlined; yet the conjunction "and" is capitalized in the example of an acceptance value given in Section 5.5 (p. B-19). The Writer's Guide should be revised so that examples and instructions are consistent.

6. Vocabulary and syntax used in EOIs should be readily understood by both procedure preparers and operators. So that EOIs can be clearly understood, the Writer's Guide should be revised as follows:

   a. Section 4.4.5 (pp. B-11 - B-13) gives a list of "Preferred Conditional Words". This list should be expanded from a list of "preferred" conditional words to an inclusive list of acceptable conditional words.

   b. Table 5.1 (p. B-20), the list of "Preferred Verbs," includes the word "locally," which is an adverb. The use of "locally" as a verb could lead to operator confusion during the execution of EOIs. To eliminate such confusion, the list of "Preferred Verbs" should include only verbs.

7. Instructions should be written for the various types of action steps that an operator may take to cope with different plant situations. The guidance provided in the Writer's Guide for writing instruction steps should be revised as follows:

   a. The Writer's Guide should address the definition of and formatting for the following types of action steps: (1) steps that are performed nonsequentially, and (2) steps that are performed concurrently with other steps.

   b. Section 4.6.1 (p. B-15) discusses recurrent steps. Because EOIs will be executed under stressful conditions, operators may not remember to repeatedly perform these steps. Although Section 4.6.1 indicates that direction will be provided to operators to perform recurrent steps, it should define the method to be used to tell operators how often to perform, and when to stop performing, a recurrent step.

   c. Section 4.6.3 (p. B-16) indicates that diagnostic steps will be used in SO1-1.0-10, REACTOR TRIP OR SAFETY INJECTION. So that writers can produce procedures that are consistently and correctly formatted, Section 4.6.3 should specifically discuss the formatting of diagnostic steps.

   d. Section 3.3 (p. B-5) states that substeps in the Response Not Obtained column that apply to all substeps in the Action/Expected Response column will be "written only once and identified with a bullet (o)". This bullet could be confused with the lower-case letter "o". Furthermore, when this bullet is used in Figure 2 (p. B-6), it is followed by a period; this use of punctuation could contribute to the confusion between "o" and the bullet. The formatting specifications for bullets should be revised to eliminate this ambiguity (e.g., use "°" instead of "o").

e. The minimize confusion, delays, and errors in the execution of EOI steps, instruction steps should be written so that physical conflicts between operators and unintentional duplication of tasks by operators will be minimized. The Writer's Guide should address this principle.

8. Information should be presented so that interruptions in the flow of information are minimal. The rotation of a page disrupts the flow of information from procedures to operators. For this reason, we recommemd that the rotation of pages should not be allowed. Section 6.5 (p. B-25) should be revised to indicate that the rotation of pages is unacceptable.

9. Acronyms and abbreviations used in EOIs should be readily understood by procedure writers and plant operators. So that EOIs can be clearly understood, the Writer's Guide should be revised with regard to the following:

   a. Table 5-2 (p. B-22) is a list of "Preferred Acronyms and Abbreviations". This list should be expanded from a list of "preferred" acronyms and abbreviations to an inclusive list of acceptable abbreviations and acronyms.

   b. Figure 4 (p. B-32), the example of a flow chart, includes the acronym "SUR". If this acronym is to be used in EOIs, it should be included in the inclusive list of abbreviations and acronyms.

   c. Section 5.2 instructs writers to pluralize abbreviations and acronyms by the use of "'s". The apostrophe should only be used if the abbreviation or acronym ends with a period.

   d. Section 5.2 states that abbreviations and acronyms referenced in EOIs will match panel markings "where applicable". To ensure that an operator is easily able to recognize the equipment and controls mentioned in procedures, the Writer's Guide should describe a method that will allow the operator to directly associate abbreviations and acronyms with control panel markings in all instances.

10. To ensure that EOIs will at all times be legible, we recommend that no part may be handwritten. Section 6.1 (p. B-23) notes that handwritten labels may be used on figures. Section 6.1 should be revised to indicate that labels will not be handwritten.

11. It is important that operators know where to find all instruments and controls that are referenced in the EOIs. Section 4.2 (p. B-8, fourth bullet) states that if a component would be difficult to find, location information should be given in parentheses. The Writer's Guide should be expanded to provide the format to be used when presenting location information. An example should also be provided.

12. EOIs should be reviewed and approved by qualified individuals to ensure their accuracy. There is no provision in the Writer's Guide for review and approval signatures on the EOI cover pages. So that the review and approval process can be documented, the Writer's Guide should state that these signatures will be included on the cover page.

13. Section 6.8 (p. B-26) and Section 9.1.5 (p. B-31) discuss High-Level Step Executive Summaries and Background Document flowcharts. To enhance the usability of this supplemental information, the Writer's Guide should be expanded to address the following points:

    a. Executive Summaries are used to show operators the broad view of an entire EOI and their position within the EOI. This information can be valuable to operators. However, the information contained in an Executive Summary would be better presented in standard flowchart format, rather than the format shown in Figure 3 (p. B-27). If a standard flowchart format was used, operators would be able to more easily follow the path through the EOI. The formatting instructions for Executive Summaries should be revised to more effectively present information to operators.

    b. Aside from the example of Figure 3, the Writer's Guide gives no formatting instructions for Executive Summaries. The text of the Writer's Guide should be revised to include such formatting instructions (e.g., acceptable symbols, pitch size, margins, level of detail, use of headings) so that Executive Summaries can be consistently prepared by procedure writers.

    c. In Figure 3, the entire text of the Executive Summary is capitalized. If all words are so capitalized, then capitalization cannot be used for emphasis. Furthermore, text written in all capitals is more difficult to read than mixed case. For these reasons, capitalization in Executive Summaries should conform to the rules established in the Writer's Guide for written procedures.

    d. In Figure 3, the conditional Statment "$12x10^{-}$" appears to the left of Step 1. All instrument readings should include units of measure so they will not be misunderstood by operators. The Writer's Guide should be revised to reflect this concern.

    e. Figures 3 (p. B-27) and 4 (p. B-32) contain the term "PROCEDURE IN EFFECT". This term is not defined in the Writer's Guide and its use is not discussed. So that writers can prepare Executive Summaries and flowcharts that are consistently and correctly formatted, the Writer's Guide should be revised to define and discuss this term.

f. Section 9.1.5 (p. B-31) discusses flowcharts. Although these flowcharts are apparently not used by operators during emergency conditions, the flowcharts should be consistently and correctly formatted. If these flowcharts are to be prepared by procedure writers, appropriate guidance should be provided in the Writer's Guide (e.g., one of the diamond-shaped boxed in Figure 4 (p. B-32), the example of a flowchart, gives no option if the decision is no).

14. Section 4.1 (p. B-7, sixth bullet) states that limits should be expressed quantitatively "whenever possible." This requirement should be revised to include the specific criteria used to determine if a limit should not be expressed quantitatively. An example should be provided.

15. Section 6.3 (p. B-24) discusses foldout pages. This section should be revised to address the following:

    a. Foldout pages are subject to wear that may lead to tearing. Thus we recommend that the Writer's Guide should be revised to either specify another format be used to present the information contained on the foldout page or to state the manner in which such disadvantages of foldouts will be overcome.

    b. Although specific formatting instructions may depend on the quantity of information required on the foldout page, this section should be expanded to address general formatting instructions.

16. To prevent operator difficulty in reading EOIs, it is important that the quality of EOI copies approximates the quality of the original document. The Writer's Guide should be revised to address the following concerns:

    a. Section 8.0 (p. 29) should be revised to include the specific criteria for reproduction of EOIs, beyond saying that reproduction "should be in accordance with Station Administrative Controls". See NUREG-0899, Section 6.6.2 for further information. Alternatively, the appropriate Station Administrative Controls should be provided for review.

    b. Section 10.2 (p. B-34) discussed the use of color coding within the CSFST to indicate the priority of the response required to reestablish the Critical Safety Function. Such color coding can increase the usability of flowcharts. The Writer's Guide should describe how color-coded CSFSTs will be produced and reproduced so that color coding is maintained.

    c. Section 6.6 (p. B-25) discusses the use of reduced pages in EOIs. Section 6.6 should include specific readability standards for reduced pages, beyond saying that such pages "should be standard page size to improve readability".

17. Because they will be used in stressful circumstances and under time constraints, EOIs must be easily accessible to operators and easily identifiable. The Writer's Guide should address the accessibility of EOIs and techniques to distinguish them from other plant procedures.

18. EOIs must be current to be usable. The Writer's Guide should describe a system that will ensure EOIs are updated in a timely fashion when changes occur in plant design, Technical Specifications, technical guidelines, the control room, or other plant procedures that affect EOIs.

C. Verification and Validation Program

The description of the validation program was reviewed to determine if it described acceptable methods for accomplishing the objectives stated in NUREG-0899. The verification and validation program described in the PGP identifies as its objectives the assurance that:

- the EOIs should accurately reflect WOG Guidelines;
- the EOIs should accurately reflect the Writer's Guide;
- the EOIs should use language and present information at a level that is compatible with the minimum number, qualifications, training, and experience of licensed operators;
- the EOIs should reference controls, equipment, and hardware that are available. This equipment should have the same designation, units of measure, and method of operation as specified in the EOI;
- the EOIs can be understood and followed without confusion, delays, or errors; and
- the EOIs are assured to guide the licensed operator in mitigating transients and accidents.

The staff's review of the verification and validation program description identified the following concerns:

1. We recommend that procedure writers and human factors experts should be involved in desk top reviews, round table reviews, and simulator exercises. The criteria for the selection of these personnel and the roles and responsibilities of these personnel should be specified.

2. The validation program states that a combination of desk top, plant/control room, round table reviews, and simulator reviews will be used for procedure validation. The following items regarding procedure validation should be addressed:

   a. The verification and validation program should state that the simulator method, when applicable, is a necessary method of EOI validation. A review of the capabilities and the limitations of the generic simulator will identify what can be validated on the simulator.

b. For the parts of the EOIs that cannot be validated on the simulator, criteria for selecting the appropriate validation method(s) (e.g. control room walk-thru/talk-thru) should be specified.

3. Particular attention should be paid to deviations from and additions to the generic technical guidelines that are of safety significance during the verification and validation program. The steps can be accomplished separately or as a part of the program. The PGP should discuss how the deviations from and additions to the generic guidelines are to be verified and validated.

D. Training Program

The description of the operator training program on the upgraded EOIs was reviewed to determine if it described acceptable methods for accomplishing the objectives stated in NUREG-0899. The PGP lists the following objectives for the training program:

- to enable operators to understand the structure and format of the upgraded EOIs;
- to enable operators to understand the technical bases of the upgraded EOIs;
- to provide the operator with a working knowledge of the technical content of the upgraded EOIs; and
- to enable operators to use the upgraded EOIs under operational conditions.

The staff's review of the training program description for EOIs identified the following concerns:

1. The PGP should contain a statement of commitment to train all operators on all of the EOIs.

2. The training program description indicates that generic simulator exercises will be conducted. The following items regarding simulator training should be addressed:

a. When a generic simulator is used, it is not possible to fully exercise all parts of the EOIs. The training program description should describe a method for ensuring that operator training will cover areas missed in the simulator exercises.

b. Control room walkthroughs should include a wide variety of scenarios.

c. A indication should be made of planned operator roles and teamwork.

This request is covered by Office of Management and Budget Clearance Number 3150-0011 which expires December 31, 1989. Comments on burden and duplication may be directed to the Office of Management and Budget, Room 3208, New Executive Office Building, Washington, D.C. 20503.

Sincerely,

Original Signed by
Richard F. Dudley, Jr.
Richard F. Dudley, Jr., Project Manager
Project Directorate V
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IV, V and Special Projects

Enclosure:
As stated

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July 9, 1987

Docket No.: 50-206

Mr. Kenneth P. Baskin
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Dear Mr. Baskin:

SUBJECT: SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 1
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(TAC NO. 44340)

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Since upgraded, symptom-based Emergency Operating Instructions (EOIs) have already been implemented at SONGS-1, the staff concludes that the use of the current EOIs is acceptable, pending modification of the PGP and possible subsequent modifications to the EOIs.

Mr. Kenneth P. Baskin
Southern California Edison Company

San Onofre Nuclear Generating
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Enclosure 1

REQUEST FOR ADDITIONAL INFORMATION
PROCEDURES GENERATION PACKAGE
SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 1

REVIEW CRITERIA

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As indicated in the following section, the staff's review determined that the PGP for SONGS-1 has numerous items that must be satisfactorily addressed before the review can continue. The licensee should address these items in a revision to the PGP, or provide justification for why such revisions are not necessary.

FINDINGS, COMMENTS, AND RECOMMENDATIONS

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The Writer's Guide was reviewed to determine if it described acceptable methods for accomplishing the objectives stated in NUREG-0899. The Writer's Guide provides administrative and technical guidance on the preparation of EOIs for SONGS-1. The staff's review of the SONGS-1 Writer's Guide identified the following concerns:

1. Notes and cautions provide operators with important supplemental information concerning specific steps or sequences of steps in EOPs. The information on notes and cautions in the Writer's Guide should be revised with regard to the following:

   a. The breaking of cautions and notes between pages disrupts the flow of information from procedures to operators. For this reason, cautions and notes should be presented entirely on one page. The Writer's Guide should state that each caution and note will appear wholly on a single page.

   b. Sections 4.5.1 and 4.5.2 (p. B-14) stated that cautions and notes should be on the same page as the step to which they refer "whenever possible". This section should be revised to indicate that cautions and notes should appear on the same page as the referenced step at all times.

2. Conditional statements and logic statements should be used in EOIs to describe a set of conditions or a sequence of actions. These statements can be confusing, so it is important that the Writer's Guide provide explicit guidance for their use. The discussion of the use of logic terms in the Writer's Guide should be revised with regard to the following:

   a. It will occasionally be necessary to use AND and OR in the same sentence. To prevent operator confusion in such cases, the Writer's Guide should be revised to provide guidance and examples of acceptable usage for these situations. See NUREG-0899, Appendix B, for additional information.

   b. Section 4.4.1 (p. B-9) includes the word NOT as a separate logic term. The text of the Writer's Guide contains no instructions for the use of NOT as a logic term. Other than with the logic term IF, it is not clear how NOT is to be used when writing EOIs. Although the example in Section 4.4.1 indicates that NOT is to be used with IF, this guidance should be explicitly stated in Section 4.4.

3. Section 10.0 discusses Critical Safety Function Status Trees (CSFSTs). This discussion should be revised to address the following:

   a. Section 10.2 (p. B-34) states that "CSFSTs are represented by a tree-like logic structure diagram". Since CSFSTs involve decisionmaking and branching, they would be more clearly presented in flow chart format.

   b. In Figure 5 (p. B-35), all of the text in the CSFST is capitalized. If all words are capitalized, then capitalization cannot be used for emphasis. Furthermore, text written in all capitals is more difficult to read than mixed case. The Writer's Guide should be revised to indicate that capitalization in CSFSTs will conform to the rules established for written procedures, and Figure 5 should be revised accordingly.

   c. The Writer's Guide does not specify the line spacing to be used in CSFSTs. The Writer's Guide should be revised to provide line spacing requirements. Because text can be more easily read if double-spaced, we suggest that the text in CSFSTs be double-spaced.

   d. Section 10.2 states that "entry into each Critical Safety Function Status Tree is always at a point indicated by an arrow at the left side of the tree". No such arrow appears in Figure 5, the example of a CSFST. The Writer's Guide should be revised so that examples and instructions are consistent.

4. Referencing of and branching to other procedures or sections of procedures can be disruptive and can cause unnecessary delays. Section 4.3 (p. B-9) discusses cross-referencing. The guidance offered in this section should be revised as follows:

   a. Section 4.3 discusses the delays that can result from cross-referencing. Because it is important to minimize these delays, Section 4.3 should discuss the criteria to be used when deciding if the necessary steps should be included in the text of the procedure or if cross-referencing should be used.

   b. Sections 4.3 does not discuss the proper format for a cross-reference. Although Table 5-1 (pp. B-20 - B-21) includes the terms GO TO, IMPLEMENT, and RETURN TO, which are apparently to be used when cross-referencing, Section 4.3 should specifically discuss the correct use of these terms when cross-referencing.

   c. The entire step number should be used at each of the two step levels. Then, if an operator is told to go to Step 4.b, for example, the entire step number will be in front of the step and there will be no confusion on the part of the operator as to whether he is at the correct step.

   d. To facilitate rapid movement from one part of EOIs to another, some method for easily identifying sections or subsections in the EOI, such as tabbing, should be specified.

   e. An example of a properly formatted cross-reference should be provided in Section 4.3.

5. The proper use of emphasis techniques can make procedures easier to understand. The following portions of the Writer's Guide, which discusses emphasis techniques, should be revised:

   a. Section 3.1 (p. B-4) states that the text of a top-level action step should be underlined. The examples of top-level action steps given in Figure 2 (p. B-6) are not underlined. The Writer's Guide should be revised so that examples and instructions are consistent.

   b. Section 4.4.3 (pp. B-10 - B-11) states that simple or compound conjunctions need not be capitalized or underlined; yet the conjunction "and" is capitalized in the example of an acceptance value given in Section 5.5 (p. B-19). The Writer's Guide should be revised so that examples and instructions are consistent.

6. Vocabulary and syntax used in EOIs should be readily understood by both procedure preparers and operators. So that EOIs can be clearly understood, the Writer's Guide should be revised as follows:

   a. Section 4.4.5 (pp. B-11 - B-13) gives a list of "Preferred Conditional Words". This list should be expanded from a list of "preferred" conditional words to an inclusive list of acceptable conditional words.

   b. Table 5.1 (p. B-20), the list of "Preferred Verbs," includes the word "locally," which is an adverb. The use of "locally" as a verb could lead to operator confusion during the execution of EOIs. To eliminate such confusion, the list of "Preferred Verbs" should include only verbs.

7. Instructions should be written for the various types of action steps that an operator may take to cope with different plant situations. The guidance provided in the Writer's Guide for writing instruction steps should be revised as follows:

   a. The Writer's Guide should address the definition of and formatting for the following types of action steps: (1) steps that are performed nonsequentially, and (2) steps that are performed concurrently with other steps.

   b. Section 4.6.1 (p. B-15) discusses recurrent steps. Because EOIs will be executed under stressful conditions, operators may not remember to repeatedly perform these steps. Although Section 4.6.1 indicates that direction will be provided to operators to perform recurrent steps, it should define the method to be used to tell operators how often to perform, and when to stop performing, a recurrent step.

   c. Section 4.6.3 (p. B-16) indicates that diagnostic steps will be used in S01-1.0-10, REACTOR TRIP OR SAFETY INJECTION. So that writers can produce procedures that are consistently and correctly formatted, Section 4.6.3 should specifically discuss the formatting of diagnostic steps.

   d. Section 3.3 (p. B-5) states that substeps in the Response Not Obtained column that apply to all substeps in the Action/Expected Response column will be "written only once and identified with a bullet (o)". This bullet could be confused with the lower-case letter "o". Furthermore, when this bullet is used in Figure 2 (p. B-6), it is followed by a period; this use of punctuation could contribute to the confusion between "o" and the bullet. The formatting specifications for bullets should be revised to eliminate this ambiguity (e.g., use "°" instead of "o").

e. The minimize confusion, delays, and errors in the execution of EOI steps, instruction steps should be written so that physical conflicts between operators and unintentional duplication of tasks by operators will be minimized. The Writer's Guide should address this principle.

8. Information should be presented so that interruptions in the flow of information are minimal. The rotation of a page disrupts the flow of information from procedures to operators. For this reason, we recommemd that the rotation of pages should not be allowed. Section 6.5 (p. B-25) should be revised to indicate that the rotation of pages is unacceptable.

9. Acronyms and abbreviations used in EOIs should be readily understood by procedure writers and plant operators. So that EOIs can be clearly understood, the Writer's Guide should be revised with regard to the following:

   a. Table 5-2 (p. B-22) is a list of "Preferred Acronyms and Abbreviations". This list should be expanded from a list of "preferred" acronyms and abbreviations to an inclusive list of acceptable abbreviations and acronyms.

   b. Figure 4 (p. B-32), the example of a flow chart, includes the acronym "SUR". If this acronym is to be used in EOIs, it should be included in the inclusive list of abbreviations and acronyms.

   c. Section 5.2 instructs writers to pluralize abbreviations and acronyms by the use of "'s". The apostrophe should only be used if the abbreviation or acronym ends with a period.

   d. Section 5.2 states that abbreviations and acronyms referenced in EOIs will match panel markings "where applicable". To ensure that an operator is easily able to recognize the equipment and controls mentioned in procedures, the Writer's Guide should describe a method that will allow the operator to directly associate abbreviations and acronyms with control panel markings in all instances.

10. To ensure that EOIs will at all times be legible, we recommend that no part may be handwritten. Section 6.1 (p. B-23) notes that handwritten labels may be used on figures. Section 6.1 should be revised to indicate that labels will not be handwritten.

11. It is important that operators know where to find all instruments and controls that are referenced in the EOIs. Section 4.2 (p. B-8, fourth bullet) states that if a component would be difficult to find, location information should be given in parentheses. The Writer's Guide should be expanded to provide the format to be used when presenting location information. An example should also be provided.

12. EOIs should be reviewed and approved by qualified individuals to ensure their accuracy. There is no provision in the Writer's Guide for review and approval signatures on the EOI cover pages. So that the review and approval process can be documented, the Writer's Guide should state that these signatures will be included on the cover page.

13. Section 6.8 (p. B-26) and Section 9.1.5 (p. B-31) discuss High-Level Step Executive Summaries and Background Document flowcharts. To enhance the usability of this supplemental information, the Writer's Guide should be expanded to address the following points:

    a. Executive Summaries are used to show operators the broad view of an entire EOI and their position within the EOI. This information can be valuable to operators. However, the information contained in an Executive Summary would be better presented in standard flowchart format, rather than the format shown in Figure 3 (p. B-27). If a standard flowchart format was used, operators would be able to more easily follow the path through the EOI. The formatting instructions for Executive Summaries should be revised to more effectively present information to operators.

    b. Aside from the example of Figure 3, the Writer's Guide gives no formatting instructions for Executive Summaries. The text of the Writer's Guide should be revised to include such formatting instructions (e.g., acceptable symbols, pitch size, margins, level of detail, use of headings) so that Executive Summaries can be consistently prepared by procedure writers.

    c. In Figure 3, the entire text of the Executive Summary is capitalized. If all words are so capitalized, then capitalization cannot be used for emphasis. Furthermore, text written in all capitals is more difficult to read than mixed case. For these reasons, capitalization in Executive Summaries should conform to the rules established in the Writer's Guide for written procedures.

    d. In Figure 3, the conditional Statment "$12x10^{-}$" appears to the left of Step 1. All instrument readings should include units of measure so they will not be misunderstood by operators. The Writer's Guide should be revised to reflect this concern.

    e. Figures 3 (p. B-27) and 4 (p. B-32) contain the term "PROCEDURE IN EFFECT". This term is not defined in the Writer's Guide and its use is not discussed. So that writers can prepare Executive Summaries and flowcharts that are consistently and correctly formatted, the Writer's Guide should be revised to define and discuss this term.

f. Section 9.1.5 (p. B-31) discusses flowcharts. Although these flowcharts are apparently not used by operators during emergency conditions, the flowcharts should be consistently and correctly formatted. If these flowcharts are to be prepared by procedure writers, appropriate guidance should be provided in the Writer's Guide (e.g., one of the diamond-shaped boxed in Figure 4 (p. B-32), the example of a flowchart, gives no option if the decision is no).

14. Section 4.1 (p. B-7, sixth bullet) states that limits should be expressed quantitatively "whenever possible." This requirement should be revised to include the specific criteria used to determine if a limit should not be expressed quantitatively. An example should be provided.

15. Section 6.3 (p. B-24) discusses foldout pages. This section should be revised to address the following:

    a. Foldout pages are subject to wear that may lead to tearing. Thus we recommend that the Writer's Guide should be revised to either specify another format be used to present the information contained on the foldout page or to state the manner in which such disadvantages of foldouts will be overcome.

    b. Although specific formatting instructions may depend on the quantity of information required on the foldout page, this section should be expanded to address general formatting instructions.

16. To prevent operator difficulty in reading EOIs, it is important that the quality of EOI copies approximates the quality of the original document. The Writer's Guide should be revised to address the following concerns:

    a. Section 8.0 (p. 29) should be revised to include the specific criteria for reproduction of EOIs, beyond saying that reproduction "should be in accordance with Station Administrative Controls". See NUREG-0899, Section 6.6.2 for further information. Alternatively, the appropriate Station Administrative Controls should be provided for review.

    b. Section 10.2 (p. B-34) discussed the use of color coding within the CSFST to indicate the priority of the response required to reestablish the Critical Safety Function. Such color coding can increase the usability of flowcharts. The Writer's Guide should describe how color-coded CSFSTs will be produced and reproduced so that color coding is maintained.

    c. Section 6.6 (p. B-25) discusses the use of reduced pages in EOIs. Section 6.6 should include specific readability standards for reduced pages, beyond saying that such pages "should be standard page size to improve readability".

17. Because they will be used in stressful circumstances and under time constraints, EOIs must be easily accessible to operators and easily identifiable. The Writer's Guide should address the accessibility of EOIs and techniques to distinguish them from other plant procedures.

18. EOIs must be current to be usable. The Writer's Guide should describe a system that will ensure EOIs are updated in a timely fashion when changes occur in plant design, Technical Specifications, technical guidelines, the control room, or other plant procedures that affect EOIs.

C. Verification and Validation Program

The description of the validation program was reviewed to determine if it described acceptable methods for accomplishing the objectives stated in NUREG-0899. The verification and validation program described in the PGP identifies as its objectives the assurance that:

- the EOIs should accurately reflect WOG Guidelines;
- the EOIs should accurately reflect the Writer's Guide;
- the EOIs should use language and present information at a level that is compatible with the minimum number, qualifications, training, and experience of licensed operators;
- the EOIs should reference controls, equipment, and hardware that are available. This equipment should have the same designation, units of measure, and method of operation as specified in the EOI;
- the EOIs can be understood and followed without confusion, delays, or errors; and
- the EOIs are assured to guide the licensed operator in mitigating transients and accidents.

The staff's review of the verification and validation program description identified the following concerns:

1. We recommend that procedure writers and human factors experts should be involved in desk top reviews, round table reviews, and simulator exercises. The criteria for the selection of these personnel and the roles and responsibilities of these personnel should be specified.

2. The validation program states that a combination of desk top, plant/control room, round table reviews, and simulator reviews will be used for procedure validation. The following items regarding procedure validation should be addressed:

   a. The verification and validation program should state that the simulator method, when applicable, is a necessary method of EOI validation. A review of the capabilities and the limitations of the generic simulator will identify what can be validated on the simulator.

b. For the parts of the EOIs that cannot be validated on the simulator, criteria for selecting the appropriate validation method(s) (e.g. control room walk-thru/talk-thru) should be specified.

3. Particular attention should be paid to deviations from and additions to the generic technical guidelines that are of safety significance during the verification and validation program. The steps can be accomplished separately or as a part of the program. The PGP should discuss how the deviations from and additions to the generic guidelines are to be verified and validated.

D. Training Program

The description of the operator training program on the upgraded EOIs was reviewed to determine if it described acceptable methods for accomplishing the objectives stated in NUREG-0899. The PGP lists the following objectives for the training program:

- to enable operators to understand the structure and format of the upgraded EOIs;
- to enable operators to understand the technical bases of the upgraded EOIs;
- to provide the operator with a working knowledge of the technical content of the upgraded EOIs; and
- to enable operators to use the upgraded EOIs under operational conditions.

The staff's review of the training program description for EOIs identified the following concerns:

1. The PGP should contain a statement of commitment to train all operators on all of the EOIs.

2. The training program description indicates that generic simulator exercises will be conducted. The following items regarding simulator training should be addressed:

   a. When a generic simulator is used, it is not possible to fully exercise all parts of the EOIs. The training program description should describe a method for ensuring that operator training will cover areas missed in the simulator exercises.

   b. Control room walkthroughs should include a wide variety of scenarios.

   c. A indication should be made of planned operator roles and teamwork.