NUREG-0899

Guidelines for the Preparation of Emergency Operating Procedures

Resolution of Comments on NUREG-0799

U.S. Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation

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Division of Human Factors Safety
Office of Nuclear Reactor Regulation
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ABSTRACT

The purpose of this document is to identify the elements necessary for utilities to prepare and implement a program of Emergency Operating Procedures (EOPs) for use by control room personnel to assist in mitigating the consequences of a broad range of accidents and multiple equipment failures. This document applies only to the EOPs so designated; it does not address emergency preparedness or emergency planning. It also represents the resolution of comments on NUREG-0799, "Draft Criteria for Preparation of Emergency Operating Procedures."

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FOREWORD

This document presents guidance that the U.S. Nuclear Regulatory Commission (NRC) will use in evaluating whether an applicant/licensee meets the requirements for Emergency Operating Procedures of Title 10 Code of Federal Regulations, Part 50.34(b)(6)(ii). It also represents resolution of public comments on NUREG-0799. Neither NUREG-0799 nor NUREG-0899 replaces the requirements in 10 CFR 50.34(b)(6)(ii) and compliance will not be required. However, the use of guidance different from that presented in this document will be acceptable only if it provides a basis for determining that the requirements of 10 CFR 50.34(b)(6)(ii) for Emergency Operating Procedures have been met.

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1.0 INTRODUCTION

1.1 Purpose and Scope

This document identifies the elements necessary for licensees and applicants to prepare and implement Emergency Operating Procedures (EOPs) that will provide the operator with directions to mitigate the consequences of a broad range of accidents and multiple equipment failures. These guidelines apply only to EOPs so designated; application of these guidelines to emergency preparedness or planning has not been considered.

In addition, the document is issued to assist applicants in meeting, and to ensure that licensees continue to meet, the requirements of Title 10 Code of Federal Regulations, Part 50.34(b)(6)(ii) for EOPs. The document provides an explanation of the process by which applicants and licensees should develop, implement, and maintain EOPs.

1.2 Background

The TMI Task Action Plan, "NRC Action Plan Developed as a Result of the TMI-2 Accident," 2 vols. (May 1980), NUREG-0660, and "TMI-Related Requirements for New Operating Licenses" (June 1980), NUREG-0694 (Item I.C.8), outline the pilot program for monitoring emergency operating procedures that the U.S. Nuclear Regulatory Commission (NRC) staff has been conducting for near-term operating license applicants. As a part of this program the staff conducted desk, simulator, and control room reviews to survey existing methods of developing and implementing EOPs at nuclear power plants. In developing NUREG-0899 the staff has considered the following.

- Information gained from the pilot monitoring program and from the reanalysis of transients and accidents that was required by Item I.C.1 of the Task Action Plan and clarified in Item I.C.1 of NUREG-0737, "Clarification of the TMI Action Plan Requirements" (November 1980).

- The NRC survey of human factors and technical writing guidance applicable to the preparation of EOPs, and

- Application of human factors and technical writing guidance to the near-term operating license reviews.

In identifying the objectives that follow, NUREG-0899 has drawn upon a wide range of expertise and literature to identify the best available information related to preparation of procedures in general and to Emergency Operating Procedures in particular. This information has been included in the Bibliography at the end of this document.

In this document the staff attempted to accommodate a broad range of acceptable programs being developed in response to Item I.C.1 of NUREG-0737. Although we recognize that there are necessary differences in EOPs which are dictated by variations in plant designs, we encourage that the approaches taken be as similar from one plant to another as possible. This consistency will facilitate

efficient EOP development by licensees and applicants with multiple reactor sites and reduce the impact on operators when they transfer from one unit to another.

This report represents NRC's first step in the development of a plan for upgrading those plant procedures as described in Item I.C.9 of the TMI Action Plan. Future staff actions under Item I.C.9 will address normal and abnormal operating procedures, maintenance, test, and surveillance procedures, and other safety-related procedures.

The staff recognizes that the development of Emergency Operating Procedures is, by necessity, a dynamic process and that new information should always be incorporated, as appropriate, into the EOPs (see Section 6.2). In addition, the reanalysis described in Item I.C.1 of the TMI Action Plan and the guidance in this document are intended to reduce the frequency and extent of revisions to EOPs by recommending a development and validation/verification process which will result in technically accurate and usable EOPs.

This document provides guidance on the following items:

- Emergency Operating Procedures Development Process. A description of the overall development process to be used in the preparation and validation/verification of EOPs.

- Technical Guidelines. A description of the technical guidelines, their development and validation.

- Plant-Specific Writer's Guide. General guidance for preparing the plant-specific writer's guide.

- Use and Maintenance of Emergency Operating Procedures. Guidelines for the control and use of EOPs, and for performing on-going evaluations and updates.

- Emergency Operating Procedures Generation Package. A description of the contents of the Procedures Generation Package to be submitted to NRC.

1.3 Implementation of the EOP Upgrade Program

To enhance the likelihood that EOPs will be properly developed, licensees and applicants should submit a Procedures Generation Package (see Section 7) to the NRC staff at least 3 months prior to initial operator training on the new or upgraded EOPs. The staff will review the Procedures Generation Package and provide feedback to the licensee or applicant in accordance with Section 7.1 of these guidelines.

2.0 EXPLANATION OF KEY TERMS

2.1 Safety Function

A safety function is a function specifically required to keep the plant in a safe condition so that public health and safety will not be endangered.

2.2 Emergency Operating Procedures (EOPs)

EOPs are plant procedures that direct operators' actions necessary to mitigate the consequences of transients and accidents that have caused plant parameters to exceed reactor protection system set points or engineered safety feature set points, or other established limits.

2.3 Event-Oriented EOPs

Event-oriented EOPs require that the operator diagnose the specific event causing the transient or accident in order to mitigate the consequences of that transient or accident.

2.4 Function-Oriented EOPs

Function-oriented EOPs provide the operator guidance on how to verify the adequacy of critical safety functions and how to restore and maintain these functions when they are degraded. Function-oriented emergency operating procedures are written in a way that the operator need not diagnose an event, such as a LOCA, to maintain a plant in a safe condition.

2.5 Technical Guidelines

Technical guidelines are documents that identify the equipment or systems to be operated and list the steps necessary to mitigate the consequences of transients and accidents and restore safety functions. Technical guidelines represent the translation of engineering data derived from transient and accident analyses into information presented in such a way that it can be used to write EOPs. There are two types of technical guidelines, as defined below.

2.5.1 Generic Technical Guidelines

Generic technical guidelines are guidelines prepared for a group of plants with a similar design.

2.5.2 Plant-Specific Technical Guidelines

Plant-specific technical guidelines are one of the following:

a. Technical guidelines prepared by plants not using generic technical guidelines, or

b. Where a plant is using generic technical guidelines, a description of the planned method for developing plant-specific EOPs from the

generic guidelines including plant-specific information (e.g., deviations from generic technical guidelines necessary because of different plant equipment, operating characteristics, or design).

2.6 Validation and Verification

In the context of technical guidelines, "validation" refers to the determination that the guidelines are technically correct (see Section 4.2).

In the context of emergency operating procedures, the terms "validation" and "verification" have been used to describe the processes by which procedures are evaluated against a set of objectives. Typically, these objectives address the basic question of whether the procedures are prepared properly and are usable from both a technical and human factors standpoint. The distinction between validation and verification has not been consistent and clearcut, and no attempt at distinguishing between them for EOPs is made here. Regardless of any distinction made by the industry, each of the objectives, identified in Section 3.3.5.1, should be addressed using approaches currently being developed by the industry.

2.7 Writer's Guide

The writer's guide provides detailed instructions on how to prepare text and visual aids for Emergency Operating Procedures so that they are complete, accurate, convenient, readable and acceptable to control room personnel. Its recommendations address all aspects of writing procedures from a human factors standpoint.

3.0 EMERGENCY OPERATING PROCEDURES DEVELOPMENT PROCESS

The development of EOPs involves a multi-step program, an example of which is shown in Figure 3.1. In general, the process includes the following steps and chronology. First, where licensees and applicants elect not to use generic technical guidelines, they must develop plant-specific technical guidelines. For those plants using generic guidelines, the plant-specific technical guidelines will consist of a description of the planned method for developing plant-specific EOPs from the generic guidelines, and should include plant-specific information (e.g., deviations from generic technical guidelines necessary because of different plant equipment, operating characteristics, or design). During development of plant-specific technical guidelines, licensees and applicants should also develop a plant-specific writer's guide. This guide can be developed from a generic writer's guide, such as the one being developed by industry, or it can be developed independently from other sources. Once the plant-specific writer's guide has been developed, it should be used along with the technical guidelines in preparing the EOPs. The EOPs then need to be validated/verified by the licensee or applicant. If the EOPs are found to be incorrect, incomplete, or inadequate, corrective steps must be taken. Following or during validation/verification of the EOPs, appropriate personnel should be trained in their use. The EOPs will then be ready for implementation.

3.1 Use of Technical Guidelines

Technical guidelines serve as the technical basis for EOPs. Their development process is described in Section 4.

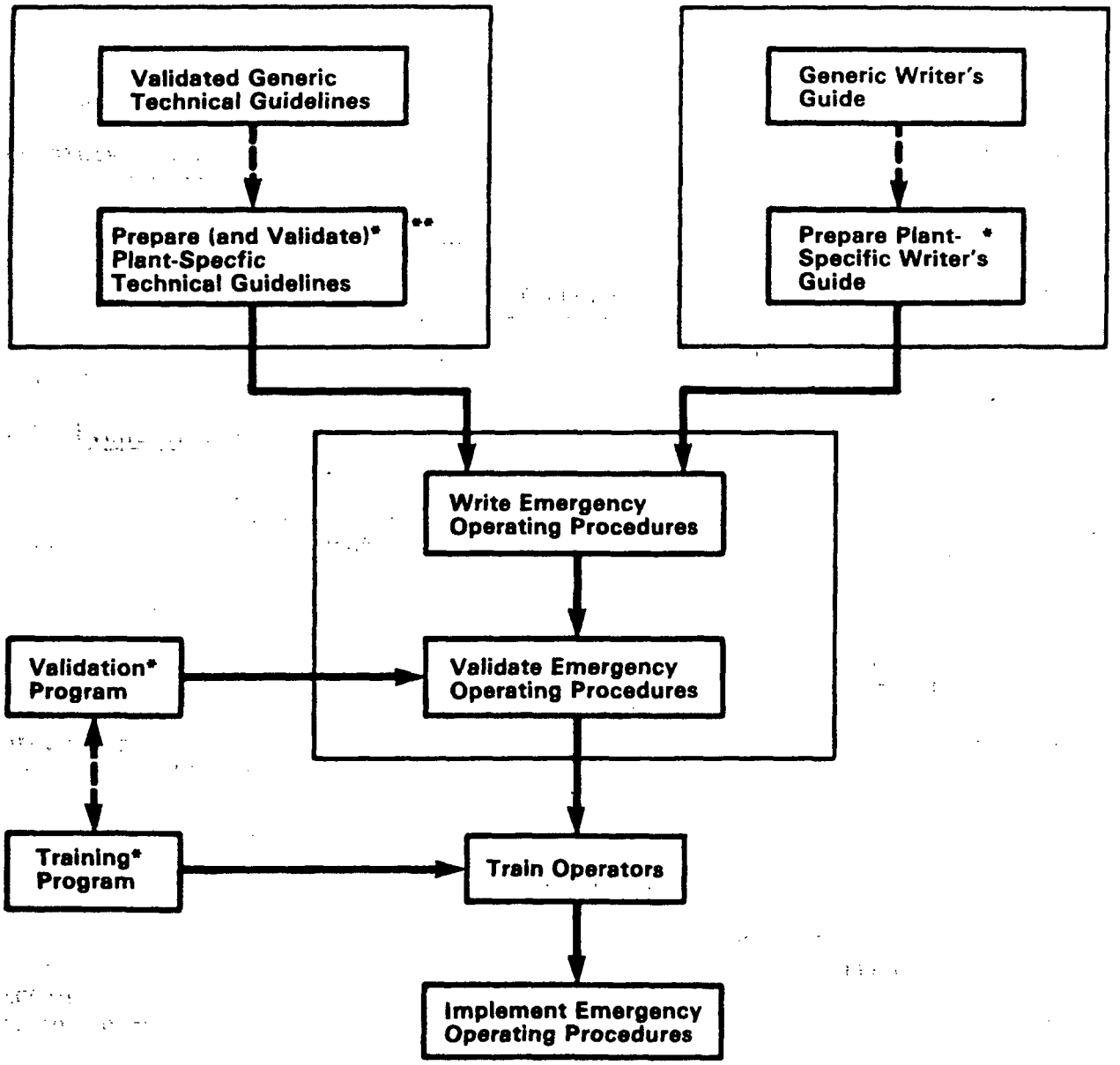
3.2 Use of the Writer's Guide

The writer's guide is used to ensure that the EOPs are clearly and explicitly written and organized. Development of the writer's guide is described in Section 5.

3.3 Development of the Emergency Operating Procedures

3.3.1 Translating Technical Guidelines into Emergency Operating Procedures

The process of translating technical guidelines into the action steps that make up EOPs will vary, depending upon the particular content and approach adopted in the technical guidelines. In varying degrees the technical guidelines will identify the plant objectives to be met, the systems and subsystems required, the required level of performance, the situations which require operator action and the order in which those actions must be carried out. It is the task of the procedure writer to extract the relevant information, and carry out any additional function, task, or technical analysis that is required to provide the plant-specific guidance necessary to prepare plant-specific EOPs. Operating experience, and information contained in the plant-specific writer's guide, is used throughout this process to help ensure that the EOPs are written in a form which will optimize operator performance. As the sequence and relationships among action steps are developed, the technical guidelines should be continuously followed by the EOP writers to ensure that the technical



KEY

— — — Optional
*In Procedure Generation Package
**Plants not using generic guidelines must validate plant-specific technical guidelines

Figure 3.1 Sample Program for Developing Emergency Operating Procedures

process of the guidelines are not violated. This entire EOP development process is iterative and usually begins at a system level and becomes more specific at the subsystem and component levels. It is during this iterative process that specific operator tasks are identified and written in the form of action steps. Appendix A provides an illustration of this process.

3.3.2 Orientation of the Emergency Operating Procedures

The orientation of the EOPs should parallel that of the technical guidelines. The EOPs should thus be function-oriented (with provisions for specific event-based actions, if desired).

Function-oriented EOPs provide the operator with guidance on how to verify the adequacy of certain safety functions and on how to restore and maintain those functions when they are degraded. Owners' groups have referred to these functions in a variety of ways, examples of which are as follows:

- Containment integrity
- Reactivity control
- Heat removal
- Reactor Coolant Inventory control

With function-oriented EOPs, the operator does not have to immediately diagnose an event, such as a small-break LOCA, to maintain the plant in a safe configuration. In some cases, the event may appear to be obvious, in which case the operator may wish to use a procedure that deals with the event immediately and directly. In these cases, safety functions should be monitored continuously and concurrently with the event-oriented procedures. Some events, such as a steam generator tube rupture, must be quickly diagnosed and operator actions taken to minimize radioactivity release to the environment. But even in these cases, an evaluation of safety functions must continue so that function-oriented procedures can be initiated to restore those functions if abnormal trends outside those expected for the diagnosed events occur.

3.3.3 Analysis of Functions and Tasks in the Development of Plant-Specific Emergency Operating Procedures

For the purpose of the discussion that follows, the term "function" refers to the means by which plant objectives are met. Hence, at one level of analysis, plant safety (plant objective) is achieved by functions such as containment integrity, reactivity control, inventory control and heat removal. It is this level of analysis that defines the desired "function orientation" of the EOPs. Functions are realized using systems or combinations of systems, which may themselves be composed of hardware, humans, or some combination of the two. For example, containment integrity (function) may be achieved in part by control room operating crew (system) initiation of containment spray (system). Other systems may also be activated to maintain containment integrity (e.g., containment isolation system). The successive refinement of functions ("function analysis") and the plant systems supporting these functions, is typically carried out to the point at which "tasks" may be specified. A "task" is a

well defined subdivision of a function which describes the specific action or actions that must be taken to achieve the function. Analysis of tasks provides the basis for defining the information needs of the operators. Tasks, like functions, may also be analyzed at different levels, depending upon the intended application of the analysis.

At some level of function analysis it will be possible to allocate functions between the operator and the hardware ("function allocation"). At this level of analysis, task specification may be very general (e.g., manually initiate containment spray). Once these broader levels of tasks are identified, a detailed "task analysis" may be performed which identifies the specific actions (tasks) required of the operator as well as other relevant information (e.g., the specific operator actions necessary to initiate containment spray, the circumstances under which the actions must be initiated, and the specific hardware which must be manipulated).

The process of analysis described above corresponds to that used to support the preparation of plant-specific EOPs for new plants. For operating plants, existing EOPs with supporting documentation and technical guidelines should provide a significant portion of the function and task analytic data. Thus, the plant-specific EOPs, the generic technical guidelines and/or plant-specific technical guidelines should provide the initial cut at identifying functions, their associated hardware systems, the actions that must be taken (by man and machine), and the circumstances under which they must be taken. To the extent that this information is not contained in the technical guidelines, or is not adequately addressed in the plant-specific EOPs, it will be necessary to carry out the task analysis as a separate effort.

The specific depth with which task analytic data needs to be collected will depend upon its intended application. Thus, in some form, task analysis can be used to support:

- Development of procedures,
- Evaluation of existing man/machine systems,
- Specification of design requirements for man/machine systems,
- Evaluation of existing training programs,
- Specification of training needs,
- Evaluation of existing personnel qualification criteria,
- Specification of personnel qualification criteria,
- Evaluation of existing staffing requirements,
- Specification of staffing needs.

Inasmuch as the information needs of these areas may overlap, a given task analysis may support a broad range of objectives. Hence, the task analysis supporting development of plant-specific EOPs will also provide support for

the control room design review to the extent that required controls and indications can be specified for emergency operation. Furthermore, coordinating control room design review activities with EOP development can provide useful information on preferable locations for controls and indications. The specific technique(s) for carrying out a task analysis may be based on approaches found in the literature (see the Bibliography), or may be based on approaches developed by the industry. For more information on the task analysis supporting the control room design review, licensees and applicants are referred to NUREG-0700, "Guidelines for Control Room Design Reviews" (September 1981).

The analysis of functions and tasks requires a variety of skills - both engineering/technical and human factors. The value of the analysis in enhancing the EOPs will most certainly be a function of how well these skills are brought to bear.

Once the necessary technical and operator task information is available, it will then be possible to use the information contained in a writer's guide, such as the one developed by the Emergency Operating Procedures Implementation Assistance Review Group (EOPIA), to produce plant-specific EOPs. This process selects plant-preferred approaches for presenting the operator actions and addresses concerns such as "content," "organization", "format," and "style of expression and presentation." The specific approaches selected for preparing the EOPs make up the plant-specific writer's guide. An example of the EOP development process demonstrating the progressive refinement of information is contained in Appendix A.

3.3.4 Approach to Writing Emergency Operating Procedures

Because of the variety of information and skills needed, writing the EOP requires a team approach. The team skills should include, but not be limited to, technical writing, human factors, power plant operation, operator training, and engineering design.

3.3.5 Validation/Verification of the Emergency Operating Procedures

After EOPs have been developed they must undergo a process of validation/verification. This process is used to establish the accuracy of information and/or instructions, to determine that the procedures can be accurately and efficiently carried out, and to demonstrate that the procedures are adequate to mitigate transients and accidents. Both technical and human engineering adequacy should be addressed in the validation/verification process.

3.3.5.1 Methods of Validation/Verification

Validation/verification of the EOPs may be accomplished in a number of ways. Some of these are as follows:

- Exercising EOPs on either a plant-specific simulator (if available) or a generic simulator,
- Control room walk-throughs,
- Desk top reviews,

- Seminars and workshops,
- Computer modeling/analysis.

Some combination of these or other methods should be used. Regardless of the approach, the validation/verification process should address all the objectives identified below.

a. That EOPs are technically correct, i.e., they accurately reflect the technical guidelines.

b. That EOPs are written correctly, i.e., they accurately reflect the plant-specific writer's guide.

c. That EOPs are usable, i.e., they can be understood and followed without confusion, delays, errors, etc.

d. That there is 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.

e. That the language and level of information presentation in the EOPs are compatible with the minimum number, qualifications, training and experience of the operating staff.

f. That there is a high level of assurance that the procedures will work, i.e., the procedures guide the operator in mitigating transients and accidents.

It should be noted that item "d" above can only be adequately addressed using control room/plant walk-throughs, while item "f" should be addressed using an approach that includes simulation.

The process of verification/validation may be coordinated with training such that validation/verification on the simulator can be carried out concurrent with the training of experienced operators.

3.3.5.2 Correcting Discrepancies

The licensee or applicant should correct any discrepancies discovered during the validation process by making appropriate changes to the control room, the procedures, the staffing, the training, or some combination of these. For sites with multiple plants, an evaluation of the procedures for all plants should be conducted to determine the relevance of the changes in each plant and, where necessary, to make these changes.

3.4 Training for Initial Implementation of the Emergency Operating Procedures

Licensees and applicants should ensure that all operators receive training on the use of EOPs prior to their implementation. Other personnel should be familiarized with or trained on the EOPs, as necessary. During training,

operators should be encouraged to offer recommendations about how the EOPs might be improved.

Training may be accomplished in a number of ways, but a combination of classroom lectures, exercises on plant-specific simulators (where available), and self-study is likely to optimize training outcomes.

4.0 TECHNICAL GUIDELINES

Technical guidelines represent the translation of engineering data derived from transient and accident analysis into information presented in such a way that it can be used to write EOPs. Technical guidelines can be either generic or plant-specific as defined in Sections 2.5.1 and 2.5.2.

4.1 Technical Bases for EOPs

The technical guidelines are to be based on the reanalysis of transients and accidents as described NUREG-0660, Section I.C.1., and clarified in Item I.C.1 of NUREG-0737. Technical guidelines should be oriented so that EOPs written from them can be used by an operator to mitigate the consequences of an emergency without first having to diagnose the event causing the emergency. Function oriented technical guidelines can satisfy this objective. They deal with such issues as coolant inventory control and containment integrity, and designate the entry conditions to be used in the EOPs. The technical guidelines, then should provide the EOP writers with step-by-step information for transition from an emergency condition to one in which the reactor is stable, such as cold shutdown.

4.2 Validation of Technical Guidelines

Technical guidelines require validation. Generic guidelines are validated by the owners' groups and reviewed by NRC. If a licensee or applicant does not use generic technical guidelines to develop its plant-specific EOPs, then their plant-specific technical guidelines require validation. The validation process should include the use of generic simulators or, where available, plant-specific simulators, desk top reviews, and seminars and/or workshops. In addition, these approaches may be supplemented by other approaches, at the discretion of licensees and applicants.

4.3 Supporting Documentation

The process used to develop the technical guidelines should be documented in sufficient detail to show the flow of information from its analytical base to its use in the development of technical guidelines, thereby providing an audit trail. The development process should include documentation of the assumptions upon which the analysis was based, references to the results of the analysis, and a description of the actual process used to generate the technical guidelines, including the validation process. This documentation should be available to plant staff who are responsible for writing and maintaining EOPs. Where generic guidelines are used, information should also be available on the assumptions used to adapt the generic guidelines to the plant and a description included of how the plant differs from the generic model.

4.4 Quality Assurance

As a primary basis of plant Emergency Operating Procedures, plant-specific technical guidelines should be subject to examination under the plant's overall Quality Assurance (QA) Program (see Regulatory Guide 1.33). Licensees and

applicants are responsible for ensuring that its technical guidelines are accurate and up-to-date. Thus, review and control of the technical guidelines should be included in the established QA program.

5.0 PLANT-SPECIFIC WRITER'S GUIDE

This section provides general and specific guidance for the preparation of the plant-specific writer's guide for EOPs. The section is divided into the following subject areas:

- Preparation of the Plant-Specific Writer's Guide
- General Guidance
- Presentation of Information for Readability
- Organization of EOPS
- Format of EOPs
- Style of Expression and Presentation
- Content of EOPS
- Control Room Staffing and Division of Responsibilities

5.1 Preparation of the Plant-Specific Writer's Guide

In support of developing EOPs, each applicant or licensee should prepare a plant-specific writer's guide and include it as a part of the procedures generation package as described in Section 7. Use of this writer's guide will help ensure that the EOPs are usable, accurate, complete, readable, convenient to use, and acceptable to control room personnel. In addition, the guide will provide guidance to support upgrading of the procedures and thus ensure long-term consistency in the procedures.

The writer's guide should contain all the necessary information and guidance for translating the technical information into the plant's emergency operating procedures. The writer's guide may incorporate information from other writer's guides, such as the one prepared by the EOIPA review group, but should address, as a minimum, the objectives identified in this section.

There are numerous acceptable approaches to writing and formatting emergency operating procedures. Consequently, the guidance in this section is presented in terms of goals, intent and importance, rather than as specific requirements. This guidance will, however, be used in evaluating the acceptability of the plant-specific writer's guide. The plant-specific writer's guide should therefore identify the specific approaches, requirements, or recommendations which satisfy the goals and intent of the guidance that follows.

In developing the plant-specific writer's guide, each licensee and applicant should consider the unique circumstances in which EOPs are used in comparison with other procedures. These circumstances may typically involve some degree of stress (psychological, time or load) and/or degraded environmental conditions (e.g., low illumination resulting from limited availability of power) which

may not be present when other types of procedures are used. Furthermore, the manner in which EOPs are used under emergency conditions is often undesirable (e.g., read from a distance, and/or at an oblique angle). This situation makes what may be a seemingly trivial improvement in procedures potentially significant. For example, typeface, type size and line spacing may be considered relatively minor aspects of the procedures upgrade. Under emergency conditions, however, these factors can contribute significantly to the readability of the EOPs.

5.2 General Guidance

5.2.1 Consistency Among the Procedures

EOPs should be consistent in organization, format, style, and content. This consistency is important to ensure readability and smooth, uninterrupted transition when it is necessary to go from one procedure to another, or one part of a procedure to another.

5.2.2 Cross-Referencing Within and Among Procedures

Information necessary to perform a task should be consolidated in one place, if possible. The need to go from one procedure (or part) to another during a sequence of actions is disruptive and can cause errors or unnecessary delays. Consequently, once the sequence of actions has begun, they should continue without interruption. Reference to other parts of the Emergency Operating Procedures should be minimized. When cross-referencing is necessary, a method should be used which is quick, creates the least amount of disruption or chance of error, describes why the operator is leaving one part and going to another, and indicates if he or she needs to return. For example, an EOP may call for initiation of the standby liquid control system for boron injection. This action should be carried out following the steps specified in the system procedure, and it may be within the operator's capability to initiate boron injection without providing the steps to do so in the EOPs. The specific system procedure should, however, be referenced in the EOP, and used by the operator if necessary.

5.2.3 Operator Aids

Operator aids (such as figures, graphs, flow charts, and decision tables) may be used to assist the operator in making decisions. An operator aid can reduce decision making time and can help assure accuracy in the decision making process. Consequently, these aids can be an important asset to the operator, and as such are a significant component of the Emergency Operating Procedures.

5.3 Presentation of Information for Readability

The manner in which information is presented in the emergency operating procedures determines their readability. Readability, as it is used here, is that characteristic of written material that determines how easily, rapidly, and precisely the material can be read and understood. In the guidance that follows readability is considered from the standpoint of legibility and intelligibility. Legibility refers to the typographical characteristics of

the symbols and their arrangement. Intelligibility refers to the way in which the written material is presented. Procedures that are legible and intelligible have the following characteristics:

- They can be easily read,
- They can be read rapidly without interruption,
- They can be precisely understood,
- They can be understood without the aid of additional material,
- The reader accepts the information presented,
- They can be easily learned,
- They can be retained,
- They can be used easily for instruction, and
- They are simple, ordered and pertinent.

The remainder of Section 5 provides guidance on how to achieve the goal of readability.

5.4 Organization of EOPs

A number of acceptable approaches to organizing procedures exist. The following organization is an example of such an approach:

- A cover page
- A table of contents (if desired)
- A brief statement of scope
- A set of entry conditions (i.e., the conditions under which the procedure should be used)
- A set of automatic actions (i.e., actions important to safety that will occur automatically without operator intervention)
- A set of immediate operator actions to be taken without reference to any written procedures
- A set of steps to be taken next and to be referred to in the written procedures
- An attached set of supporting material

The elaboration of this basic organization is left to the discretion of the personnel who prepare the plant-specific writer's guide.

5.4.1 Cover Page

A cover page should be used for each EOP and, as a minimum, should specifically identify the EOP, give its revision number and date, number of pages (so that missing pages can be identified), provide a place for review and approval signatures, and indicate the unit and facility to which the EOP applies. This information may also be presented in the first page of the procedure if a cover page is not used.

5.4.2 Table of Contents

An operator should be able to locate specific sections of an EOP in a minimum amount of time and without confusion. To help achieve this goal a table of contents or thumb tabs may be used. Regardless of the approach, it is desirable to adopt some means of assisting the operator in locating specific parts of a procedure.

5.4.3 Scope

Each EOP should contain a brief statement that describes what it is intended to accomplish. In many cases it may be possible to include the scope in the title of the EOP without making the title too long.

5.4.4 Entry Conditions

It is important that each EOP contain a list of the conditions under which a given procedure is used. This list of entry conditions would assist operators in verifying that they are in the appropriate EOP.

5.4.5 Automatic Actions

The EOP should provide the operator with an indication of which systems important to safety should be activated automatically, without operator intervention.

5.4.6 Immediate Operator Actions

Immediate operator actions are those actions that operators should take immediately, when there are indications of an emergency. These actions are taken to stop further degradation of existing conditions, to mitigate their consequences, and to allow the operators to evaluate the situation. Operators normally memorize these actions and perform them without having to refer to an EOP. These actions should be included in the EOPs so that their execution can be verified. Further discussion of Immediate Operator Actions may be found in ANSI/ANS-3.2-1980, Draft 8, April 1981, "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants."

5.4.7 Subsequent Operator Actions

The action steps that the operators use to return the plant to a normal, stable, or a safe steady-state condition or to provide for a safe extended shutdown period under abnormal or emergency conditions, form the major body of the EOPs. These steps should contain those actions the operators must take to

achieve the objectives of the EOPs. Further discussion of subsequent operator actions may be found in ANSI/ANS-3.2-1980, Draft 8, April 1981.

5.4.8 Supporting Material (Attachments)

Material needed to carry out actions in the EOPs, but which cannot be included in the body, should be attached to it (e.g., certain operator aids). Operators should be afforded quick and easy access to the appended material, the parts of which should be readily distinguishable.

5.5 Format of EOPs

The format of EOPs can contribute significantly to their comprehensibility and can minimize operator confusion and errors. Specifically, the EOP format helps to determine how accurately and quickly information can be located and acted upon by the operator. The format should be designed to minimize the time required of operators to read and respond to procedure instructions.

A general approach should be selected that addresses overall EOP layout and structure. It should include the physical layout of information, the narrative style, and the levels of information presentation. Physical layout refers to the arrangement of the action steps and their supporting information, if any, on a given page. For example, different levels of instructions may be set off by indentation. Narrative style refers to the manner in which the steps are phrased. For example, they may be written as complete sentences, short phrases, or some combination of the two. Levels of information presentation refers to the different degrees of detail that are included in the procedures. The amount of detail included in section identification and instructions should reflect the experience and training of the intended user.

There are a wide variety of approaches to the formatting of EOPs. Licensees and applicants should select an EOP format that allows operators to find and comprehend essential information efficiently and effectively.

5.5.1 Identifying Information

Each page of the EOPs, including the cover page, should contain sufficient information to aid in identifying the EOP, its currentness, how many pages it contains, and which unit it applies to. This information should be placed consistently in the EOP where the operator can readily locate it.

5.5.2 Page Layout

For ease of readability it is important that information be displayed with minimum clutter, sufficient distance between lines, and sufficient margins for reproduction and binding. In addition, the binding should not obscure any information and allow for ease of handling.

Information should be presented so that interruptions in the flow of information are minimal. To achieve this, each procedure (or subprocedure) should begin on a new page, and each action step should be wholly contained on a single page.

5.5.3 WARNING, CAUTION, and NOTE Statements

For the purposes of EOPS, warnings and cautions are assumed to be synonymous. The licensee or applicant should select one term and use it consistently throughout the EOPs. Warnings and cautions are a means of attracting attention to essential or critical information in procedures. Such information addresses conditions, practices or procedures which must be observed to avoid personal injury, loss of life, a long-term health hazard, or damage to equipment. Notes are a means of presenting important supplemental information in procedures. This information would aid in job performance and operator training, and would facilitate decision making. The placement of warnings, cautions and notes should meet the following objectives:

- WARNINGS and CAUTIONS should be emphasized to attract the attention of the operators,
- WARNINGS and CAUTIONS should immediately precede the step(s) to which they refer,
- WARNINGS, CAUTIONS and NOTES should be written to preclude confusion as to which step or evolution they refer,
- WARNINGS and CAUTIONS should be written so that they can be read completely without interruption by intervening steps or page turning.

5.5.4 Placekeeping Aids

It is important that operators have a means of keeping track of the current step while they are performing the designated actions. Therefore, some type of placekeeping aid should be used (e.g., checkoffs).

5.5.5 Divisions, Headings and Numbering

The manner in which the text is organized and divided should be evident through the use of headings and an alphanumeric numbering system. The system used should provide operators with a logical means of determining where they are located in relationship to the overall document. Further, the approach selected should allow operators to identify steps in the procedures.

5.5.6 Emphasis

It is often desirable that operator attention be focused on certain information contained in the procedures. This information should, therefore, be emphasized using an approach that is consistently applied throughout the procedures.

5.5.7 Identification of Sections Within a Procedure or Subprocedure

Operators may need to locate a specific section of a procedure or subprocedure quickly. A technique should be selected to provide quick identification of specific sections within a procedure or subprocedure.

5.5.8 Figures and Tables

Figures and Tables should be used in procedures to assist operators in making decisions and in locating information. To most effectively achieve this goal, tables and figures should:

- Be explicitly and uniquely identified so that they are easy to find when referenced in the text
- Contain only the relevant information needed to clarify or accomplish the purpose referenced in the text
- Be prepared according to standard technical graphics practices
- Be located to facilitate access and usability.

5.5.9 Use of Flowcharts

Flowcharts may be used as job performance aids to support EOPs, or may be used for presentation of diagnostics, initial steps of procedures or as training aids.

5.6 Style of Expression and Presentation

EOPs should be written in a style that presents information in a simple, familiar, specific and unambiguous manner.

5.6.1 Vocabulary

The simplest, most familiar, and most specific words that accurately convey the intended meaning should be used. Operators should understand all words used in the procedures. To achieve this overall objective, the following guidance should be followed:

- Use short words and words that are common in ordinary conversation
- Use nomenclature and idioms that the operator is trained to use and which are standard in the nuclear power industry
- Use concrete and specific words that describe precisely what the operator is to do or observe
- Use words and meanings consistently throughout the procedures
- Avoid using adverbs that are difficult to define in a precise manner (e.g., frequently, slowly).

5.6.2 Abbreviations, Acronyms and Symbols

The abbreviations, acronyms, and symbols used in the EOPs should be those familiar to the operators so that there is no need to consult a glossary of abbreviations, acronyms, or symbols. When these abbreviations, acronyms, or

symbols are used to identify labels or equipment parts, the operator should be able to immediately recognize the identity and location of the label or equipment part.

5.6.3 Sentence Structure

Sentences, clauses, and phrases should be short and written using a word order common to standard American English usage. Sentences which require the operator to do something or observe something should be written as a directive (imperative mode).

5.6.4 Punctuation

The rules of punctuation for standard American English should be used. Punctuation helps to reveal the precise relationship among thoughts and communicates the writer's intention. Accordingly, consistent and proper use of punctuation will lessen the chances that operators might misinterpret what the EOP writer intended to say.

5.6.5 Capitalization

Capitalization should conform to standard American English usage, but may also be used as a technique for emphasizing certain words or phrases.

5.6.6 Units

Units of measure should be familiar to the operator. The operator should be able to relate the units to those referenced on plant instrumentation without conversion, translation or mental manipulation.

5.6.7 Numerals

Numerals (representing values of parameters or equipment designations) should be written in a style familiar to the operator. Numerals should correspond to those designated on panels so that the operator can recognize and locate the panel designation immediately. When numerals are used to refer to instrumentation readings, the operator should be able to immediately relate those numerals to those used on the instrumentation, without conversion, translation or manipulation.

5.6.8 Tolerances

Tolerances should be used to bound numerical values and to avoid approximations. The units in which tolerances are expressed should be the same as the units on the display or control to which they refer.

5.6.9 Formulas and Calculations

The operator's use of formulas and need for calculations in the EOPs should be minimized because of the time they require and because they increase the possibility of operator error. When calculations are required they should be as simple as possible, and space should be provided for the calculations.

5.6.10 Conditional Statements

Conditional statements or logic sequences are commonly used in EOPs to describe a set of conditions or a sequence of actions. Because of their importance and complexity it is important that these statements be constructed using the principles and techniques of formal logic so that they are logically correct, unambiguous, and complete, i.e., that all statements are understandable and all conditions are covered. The logic approach used should be applied consistently throughout the EOPs. Further, logic terms and sequences should be highlighted or emphasized so that the operator can clearly identify all conditions and the extent of a given logic sequence.

Since staff experience in the I.C.8 Pilot Program indicated considerable difficulty in presenting logic sequences, and because of the lack of good reference material, an acceptable method for using conditional statements and logic sequences has been included in Appendix B.

5.7 Content of EOPs

This section provides guidance for presenting the contents of Emergency Operating Procedures.

5.7.1 Sequencing

Tasks and action steps should be sequenced according to technical necessity, which should be the overriding consideration. Additionally, the physical layout and organization of the control room is an important consideration in sequencing tasks for optimal staff movement and monitoring when performing a sequence of tasks and actions. Further, the objective of a sequence of actions should be conveyed to the operator so that he or she will know the purpose and end results of the sequence of actions. The EOPs should state when the action steps do not have to be performed in the sequence given.

5.7.2 Verification Steps

Verification steps are used to determine whether the objective of a task or a sequence of actions has been achieved. There are three common methods for verification:

- Checking that an action has resulted in a command signal to a piece of equipment. The operator should not rely on this type of check, but should use a more positive indication.

- Checking that an action has resulted in a positive indication that the equipment has responded to a command.

- Checking that an operator has correctly performed an action or has carried out a series of steps.

These types of verification steps should be used where appropriate in the procedures to ensure that equipment responses and operator actions have occurred and are correct.

5.7.3 Nonsequential Steps

A given step may require that an action be carried out at various intervals throughout a procedure (e.g., "Verify SI pump suction switchover from RWST to sump on Low-Low level in RWST"). These nonsequential steps should be written into procedures using an approach that clearly identifies to the operator where and when these steps apply, the conditions under which they apply, and/or the time sequence required for their performance.

5.7.4 Equally Acceptable Steps

Equally acceptable steps are those for which any one of several alternative steps or sequence of steps may be equally correct. For these steps, the operator should always be directed to carry out one of the alternative steps (or sequences), but should also be given the other alternatives when it is possible that the designated steps (or sequence) cannot be done (e.g., a designated piece of equipment is unavailable).

5.7.5 Recurrent Steps

Recurrent steps are those that require the operator to repeatedly perform a given action, typically, monitoring or controlling some plant parameter. (e.g., "Check condensate storage tank level every 30 minutes"). For these steps, the operator should be told when or how often the steps are to be performed, be reminded to perform the steps, and be told the conditions for which the steps should no longer be carried out.

5.7.6 Time-Dependent Steps

Time-dependent steps are those that are required of the operator at some specified time interval, or some time after an action has taken place. A means should be provided to assist the operator in performing the step(s) within the required time frame.

5.7.7 Concurrent Steps

Concurrent steps are those which have to be performed at the same time. The EOPs should explicitly indicate which steps are concurrent so that operators can easily refer to both (or all) sets of steps. The maximum number of concurrent steps should not be beyond the capability of the control room staff to perform them.

5.7.8 Diagnostic Steps

Diagnostic steps are those which lead the operator to the appropriate section of the EOPs. These steps should assist the operator in diagnosis, and provide clear and unambiguous guidance leading to the diagnostic decision, as well as clear and unambiguous referencing to the appropriate section of the EOP. These steps may include the use of flow-diagrams, graphs or other operator aids.

5.7.9 WARNING and CAUTION Statements

Warnings and cautions are derived initially from technical guidelines. They contain information used to prevent actions by control room operators which could injure plant personnel, damage equipment, or endanger public health and safety. Warning and caution notices should be accurate and concise, and should contain only the information relevant to the warning or caution. They should not contain operator actions.

5.7.10 NOTE Statements

Note statements provide operators with supplemental information concerning specific steps or sequences of steps in the EOP. These statements should provide operators with enough information, and be located so as to ensure that they can easily relate the note to the step or steps to which it applies. Because they are supplemental, notes should not direct operators to perform actions.

5.7.11 Location Information

The EOPs should provide operators information on the location of equipment, controls, or displays that are infrequently used, are in out-of-the-way places, or are otherwise difficult to find.

5.8 Control Room Staffing and Division of Responsibilities

This section considers staffing in the control room, and the division of responsibility and leadership among the control room staff as it applies to the use of EOPs. The variable nature of control room events and staff capabilities, and the turnover in control room shift crews, make the goals of this section difficult to achieve. However, the following guidelines are important to the efficient and accurate development, and execution of EOPs, and should be followed to the extent possible.

5.8.1 Consistency Between Staffing and Procedures

The EOPs should be structured so that the number of people required to carry out specific actions, concurrent actions, and other responsibilities, does not exceed the minimum shift staffing required by a plant's Technical Specifications.

5.8.2 Division of Responsibility

During an emergency, it is vital that the actions of the control room staff be carried out efficiently and accurately. This will be determined in part by the quality of the EOPs and the training of the operators. However, for the benefits of good procedures and training to be realized, it is important that control room personnel operate as a team with pre-established leadership roles and divisions of responsibility. The plant should consider defining leadership roles and division of responsibilities with respect to carrying out the various aspects and actions of the EOPs.

5.8.3 Staffing of the Control Room

The number and qualifications of personnel available in the control room will determine the number of sequential actions, concurrent actions and other responsibilities that can be carried out, and the efficiency with which they can be carried out. The following goals should be considered in writing the EOPs:

- Minimize physical conflicts between personnel (carrying out actions at the same locations at the same time, or crossing paths),
- Avoid unintentional duplication of tasks by control room personnel,
- Ensure that the control room supervisor should be able to keep up with staff actions and plant status.

6.0 USE AND MAINTENANCE OF EMERGENCY OPERATING PROCEDURES

The purpose of this section is to provide guidance on the use and maintenance of EOPs, including their on-going evaluation and update.

6.1 Use of the Procedures

Although no single approach for locating, accessing, and using EOPs is optimal for all plants, the following guidance should be considered:

6.1.1 Documentation

The approach adopted for locating, accessing, and using EOPs should be documented as part of the plant's administrative procedures.

6.1.2 General Availability

The location of EOPs within the control room is primarily dictated by control room layout. EOPs should be located so that they are immediately accessible to operators while they perform their control room duties. Also, EOPs should be usable without interfering with work station activities and without covering up controls and displays. Finally, all relevant procedures should be available at all locations in the plant where equipment is to be manually operated under emergency conditions.

6.1.3 Number of Copies

All plants should have an adequate number of hard copies of EOPs available in the control room, and at other locations where the EOPs may need to be referred to (e.g., technical support center). Where two or more control rooms share a common area, each control room should have a separate and sufficient set of EOPs that contain only the EOPs for that particular unit.

6.1.4 Accessibility

Accessibility refers to the ease with which the operator can identify and access the relevant Emergency Operating Procedures. The EOPs should be uniquely identifiable and should be labeled to facilitate rapid identification and access to any procedure or any part of a procedure.

6.2 Maintaining EOPs

In accordance with Plant Technical Specifications, Section 6, Administrative Controls, licensees and applicants must have a documented program for on-going evaluation and up-date of EOPs. Guidance for such a program is outlined in Sections 6.2.1 through 6.2.4.

6.2.1 Document Control of Procedures

EOPs should be controlled within the existing plant document control system consistent with the licensee's or applicant's administrative procedures, and

with the guidance in Regulatory Guide 1.33, "Quality Assurance Program Requirement (Operation)" and ANSI/ANS-3.2-1980, "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants."

6.2.2 Reproduction of Procedures

All copies of EOPs should be clearly legible. When it is necessary to replace the entire procedure or parts of the procedure because of revisions, use, wear, etc., the quality of the replacement copy should be equal to that of the original. Personnel who reproduce pages should ensure that when copies are made, the entire page is reproduced (i.e., that no instructions or parts of instructions are omitted).

6.2.3 On-Going Evaluation

Licensees and applicants should consider establishing a program for the on-going evaluation of the EOPs. Such a program should include the following considerations:

- Evaluation of the technical adequacy of the EOPs in light of operational experience and use, training experience, and any simulator exercises and control room walk-throughs,

- Evaluation of the organization, format, style, and content as a result of using the procedures during operations, training, simulator exercises, and walk-throughs,

- Evaluation of staffing and staff qualifications relevant to using the EOPs.

6.2.4 Updating EOPs

When changes occur in the plant design, Technical Specifications, Technical Guidelines, Writer's Guide, other plant procedures or control room that will affect the EOPs, the EOPs should be revised on a timely basis to reflect these changes. In addition, when operating and training experience, simulator exercises, control room walk-throughs, or other information indicate that incorrect or incomplete information exists in the EOPs, the EOPs should be revised on a timely basis. These changes should be reviewed to ensure consistency with the Technical Guidelines and the Writer's Guide. Operators should be encouraged to suggest improvements to EOPs.

7.0 EMERGENCY OPERATING PROCEDURES GENERATION PACKAGE

7.1 Submittal of the Procedures Generation Package

Each applicant or licensee should submit to the NRC a Procedures Generation Package at least three months prior to the date it plans to begin formal operator training on the upgraded procedures. The plant's EOPs should be developed and implemented in accordance with their Procedures Generation Package. Each Procedures Generation Package will be reviewed by the staff to ensure that the applicant or licensee has an acceptable program for upgrading EOPs. To expedite industry implementation of upgraded EOPs, preimplementation review of the Procedures Generation Package by the staff will not be required. However, if requested by an applicant or licensee, the staff will perform a limited review of the submittal and provide a preliminary evaluation. This preliminary evaluation may reduce the risk of generating EOPs that could require extensive rewrite or revision. Should the staff take exception to any part of the package, they will notify the licensee or applicant.

To ensure that the program is effective, NRR will audit upgraded EOPs at selected plants. Furthermore, resident inspectors will verify that upgraded EOPs are prepared in a manner consistent with that described in the Procedures Generation Package.

7.2 Contents of the Procedures Generation Package

The Procedures Generation Package should contain the following items:

- Plant-Specific Technical Guidelines (see Section 4)
- Plant-Specific Writer's Guide (see Section 5)
- A description of the Validation/Verification Program for EOPs (see Section 3.3.5.1)
- A description of the Program for Training Operators on EOPs (see Section 3.4).

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APPENDIX A

Example of an EOP Development Process

The following example illustrates the systematic refinement of plant-related information that can be used to support the development of plant specific EOPs from technical guidelines. It is intended to illustrate a process rather than a preferred or best approach. The particular approach adopted by licensees and applicants will largely depend on the specifics of the technical guidelines, availability of existing procedures and bases, and preferences of the licensee or applicant.

For each level of analysis specified below there may be multiple elements identified. For example, a large number of systems may be associated with containment integrity. Each of these systems may in turn be analysed at function and task levels to provide the technical basis for the steps in the plant-specific EOPs. Since each level of analysis may branch to many elements, for simplicity, the example below follows a single path, from the identification of a plant objective (safety), to a specific set of steps in a procedure. At each level of analysis the specific path to be followed and refined is designated by underlining.

LEVEL OF ANALYSIS	EXAMPLE ELEMENTS
Plant Objective	<u>Safety</u> Power Generation : :
Function (high level)	<u>Reactivity Control</u> Containment Integrity : :
System	<u>CRD System</u> Reactor Protection System Standby Liquid Control System : :
Function (low Level)	<u>Rapid Insertion of Negative Reactivity</u> Slow Insertion of Negative Reactivity : :

Task	Rapidly Insert Control Rods Initiate Standby Liquid Control System : :
Function Allocation	Machine - Automatic Scram for Reactor Protection System Trip Signal Man - Manual Scram for ATWS Manual Scram/Operator Judgment : :
Operator Tasks	Identify Condition Manual Scram
Task Descriptions	Manually Scram Reactor a. Hit manual scram buttons b. Set Mode Switch to Shutdown c. Verify Rod Insertion 1. ROD IN light on (green) 2. Observe "00" position each rod d. Verify Reactor Power Decrease 1. APRMs full downscale 2. Switch recorders to IRMs 3. Insert IRM detectors 4. Select proper IRM range flux indication 5. Observe flux decrease : :
Procedural Steps with Application of Writer's Guide	4.0 Operator Actions: 4.1 Scram Reactor 4.1.1 Hit manual scram push button (RCP 802) 4.1.2 Set mode switch to SHUTDOWN (RCP 802) 4.1.3 Verify rod insertion (RPIS) 4.1.4 Verify reactor power decrease (APRMs/IRMs) : :

APPENDIX B

Conditional Statements and Logic Sequences

The logic terms AND, OR, IF, IF NOT, THEN, and WHEN are often used in EOPs to descibe a set of conditions, to sequence action steps contingent upon conditions, or to express complex combinations of conditions, other antecedents, and actions. Each of these logic terms should have a specific function, and should be used consistently within the EOPs and in accordance with an accepted convention. Further, when used in combination, care must be taken to avoid vague and difficult to understand instructions. In the discussion that follows, examples illustrating acceptable methods for using logic terms and combinations of logic terms, are presented.

Use of IF, IF NOT, WHEN and THEN

When action steps are contingent upon certain conditions or combinations of conditions, the step should begin with the words IF, IF NOT, or WHEN followed by a description of the condition or conditions (the antecedent), and the word THEN, followed by the action to be taken (the consequent). For example:

(1) IF RPS scram has not initiated,
THEN initiate SLC and isolate RWCU.

(2) WHEN pressurizer level reaches 50%,
THEN stop the charging pump.

Use of IF NOT should be limited to those cases where the operator must respond to the second of two possible conditions. IF should be used to specify the first condition. For example:

> IF pressure is increasing, THEN stop the injection pump, IF NOT, THEN start an additional injection pump.

The logic word THEN should not be used at the end of an action to instruct the operator to perform another action within the same step, because it runs actions together. For example:

> Verify all SI accumulators are isolated, THEN cooldown pressurizer with auxiliary spray.

Actions which are embedded in this way (1) may be overlooked and not be performed, (2) make it difficult to verify the performance of each action step when a check-off or sign-off is used, and, (3) can be confused with a logic statement.

Use of AND

Action steps will normally be performed in sequence so that a conjunction such as "and" is not required between the steps. However, in the case of combinations

of conditions, the word AND should be placed between the description of each condition. For example:

IF RCS pressure is increasing,
AND pressurizer level is increasing,
AND RCS temperature is increasing,
THEN go to subprocedure 6.1

In order to simplify a long sequence of conditions, the word AND should not be used to join more than four conditions. If more than four conditions need to be joined, a list format should be used. For example:

IF all of the following conditions are met,

a) Condition 1
b) Condition 2
c) Condition 3
d) Condition 4
e) Condition 5
:
:

THEN (action)

When used as a simple or compound conjunction, the word "and" need not be emphasized (e.g., to connect actions in a step, as in: "stop low-head SI pumps and place them in standby").

Use of OR

The word OR should be used to call attention to alternative combinations of conditions. The use of the word OR, for conditions, should be in the inclusive sense. i.e., any one or all conditions may be present. For example:

IF RCS pressure is less than or equal to ruptured Steam Generator pressure,

OR

IF Pressurizer level is greater than 20%,

THEN stop RCS depressurization.

For alternative actions, the use of OR should be minimized and priorities should be established where possible. If priorities cannot be established, and alternative actions are equally acceptable, then it is necessary to specify the exclusive "or" using an approach similar to that illustrated in the example that follows:

Start either number 1 diesel OR number 3 diesel, but not both.

Combinations of Logic Terms

ne use of AND and OR, along with IF and THEN, within the same step should be avoided. When AND and OR are used together, the logic statements can be confusing and ambiguous. For example:

> IF condition A AND condition B OR condition C occurs,
> THEN go to step 5.3.6

This statement has two possible meanings:

(1) IF both condition A AND condition B occur,
THEN go to st 5.3.6

(2) IF both condition A AND condition B occur,
THEN go to step 5.3.6

OR

IF both condition A AND condition C occur,
THEN go to step 5.3.6.

If the use of AND and OR within the same step cannot be avoided, the more explicit form (as illustrated in examples 1 and 2 above) should be used.

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The purpose of this document is to identify the elements necessary for utilities to prepare and implement a program of Emergency Operating Procedures (EOPs) for use by control room personnel to assist in mitigating the consequences of a broad range of accidents and multiple equipment failures. This document applies only to the EOPs so designated; it does not address emergency preparedness or emergency planning. It also represents the resolution of comments on NUREG-0799, "Draft Criteria for Preparation of Emergency Operating Procedures."

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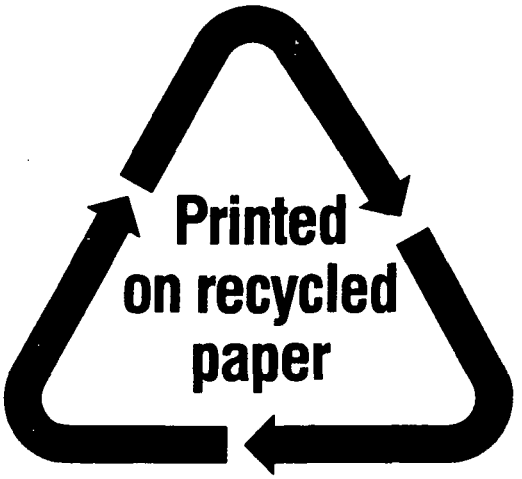

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