SAFETY EVALUATION

PROCEDURES GENERATION PACKAGE

PILGRIM NUCLEAR POWER STATION

1. INTRODUCTION

Following the Three Mile Island (TMI) accident, the Office of Nuclear Reactor Regulation developed the "TMI Action Plan" (NUREG-0660 and NUREG-0737), which required licensees of operating reactors to reanalyze transients and accidents and to upgrade emergency operating procedures (EOPs) (Item I.C.1). The plan also required the NRC staff to develop a long-term plan that integrated and expanded efforts in the writing, reviewing, and monitoring of plant procedures (Item I.C.9). NUREG-0899, "Guidelines for the Preparation of Emergency Operating Procedures," represents the NRC staff's long-term program for upgrading EOPs, and describes the use of a "Procedures Generation Package" (PGP) to prepare EOPs. Submittal of the PGP was made a requirement by Generic Letter 82-33, "Supplement 1 to NUREG-0737 - Requirements for Emergency Response Capability." The generic letter requires each licensee to submit to the NRC a PGP which includes:

(i) Plant-specific technical guidelines

(ii) A writer's guide

(iii) A description of the program to be used for the verification and validation of EOPs

(iv) A description of the training program for the upgraded EOPs.

This report describes the review of the Boston Edison Company (BECo) response to the Generic Letter related to development and implementation of EOPs (Section 7 of Generic Letter 82-33) for the Pilgrim Nuclear Power Station (Pilgrim).

The review was conducted to determine the adequacy of the BECo program for preparing and implementing upgraded EOPs for Pilgrim. This review was based on NUREG-0800, Subsection 13.5.2, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants. Section 2 of this report briefly discusses the BECo submittal, the NRC staff review, and the acceptability of the submittal. Section 3 contains the conclusions of this review.

As indicated in the following sections, our review determined that there were several items that required resolution before the PGP was acceptable.

2. EVALUATION AND FINDINGS

In letters dated November 20, 1987 and December 14, 1987, from R. Bird (BECo) to the NRC, BECo submitted its PGP for Pilgrim. The PGP contained the following sections:

- Plant-Specific Technical Guidelines For Emergency Operating Procedures
- Plant procedures for preparing EOPs, i.e, writer's guide, verification and validation procedures
- Emergency Operating Procedures Training Program Description

The NRC staff conducted a review of the Pilgrim PGP, and visited the plant the week of March 14, 1988. This site visit supported the review of the program and the inspection of its implementation. During that time, additional documents describing the EOP development were reviewed and are identified in the sections below. The inspection report is identified as IR 50-293/88-11.

As a result of the site visit, a revised PGP was submitted to the NRC in a letter dated April 6, 1988 from R. Bird. The NRC staff review of the revised Pilgrim PGP is documented in the following subsections. The verification and validation program comments are combined in one subsection.

A. Plant Specific Technical Guidelines (P-STGs)

The P-STGs were reviewed to determine if they described acceptable methods for accomplishing the objectives stated in Standard Review Plan (SRP). BECo described the process to develop the Pilgrim P-STG from the BWR Owners Group Emergency Procedure Guidelines (EPGs), Rev. 4, and provided a markup of the EPGs and a basis for changes.

In the PGP submittal, the licensee provided Rev. 3 of the Plant P-STGs. The P-STGs were based on the generic BWR Emergency Procedure Guidelines (EPGs), Rev. 4 submitted by the BWR Owner's Group to NRC. The staff is allowing licensees to implement Rev. 4 pending its formal approval by the staff. The staff believes that Rev. 4 of the EPGs is a significant improvement over earlier revisions of the generic guidelines.

The licensee's submittal identified approximately seventy-six differences between the EPGs and P-STGs. Our review determined that the licensee has not taken any major deviation from the EPG, Rev. 4. In general, the differences exist for one of the following reasons:

1. Plant-Specific differences in equipment, nuclear Steam Supply System design, setpoints or procedures. The EPG is applicable for GE-BWR/ designs 1 through 6 and Mark I, II and II containment designs. Necessary changes were made for the Pilgrim plant (BWR/4, MKI)

specific features.

2. Preferential differences of a non-technical nature that reflect the licensee's preferred methods for operation.

3. Three cautions were deleted. Caution #2, dealing with reference leg reactor pressure vessel water level, and Caution #5, dealing with pump net positive suction head (NPSH) for high pressure core spray system, were deleted since they are not applicable for Pilgrim. Caution #6, - shutdown cooling rate limit, was incorporated into necessary steps.

In summary, the staff reviewed the licensee's plant-specific technical guidelines and the licensee identified deviations from Revision 4 of the EPG's, and finds that the Pilgrim plant-specific technical guidelines program should accomplish the objectives stated in the SRP and should provide adequate guidance for translating Revision 4 of the EPG's into Pilgrim EOPs. The Pilgrim plant-specific guidelines are acceptable for near term implementation. In the longer term, the licensee will be subject to the findings of the staff's final safety review of the EPGs.

B. Writer's Guide

The writer's guide was reviewed to determine if it described acceptable methods for accomplishing the objectives stated in the SRP. The purpose of the writer's guide is to specify instructions, requirements, and conventions for writing Pilgrim EOPs.

The Pilgrim EOPs are primarily flowcharts which contain the technical guidance of the plant-specific technical guidelines. The more detailed instructions necessary to perform some of the guidance contained in the EPGs are provided in other procedures called "satellite" procedures. This review covered the development of all procedures implementing the generic technical guidelines. Our review of the Pilgrim writer's guide identified several concerns. These concerns were presented and discussed with the licensee during the March 14-18 site visit. In a letter from R. Bird (BECO) to the NRC dated April 6, 1988, the licensee responded to these concerns. These concerns and the licensee's responses are discussed below.

1. Cautions and notes provide operators with important and useful information concerning steps or sequences of steps in EOPs. The writer's guide was revised to address the following concerns:

   a. Section III.A.12 discusses "supplemental information". However, the writer's guide did not (adequately) define supplemental information or how it differs from notes. The writer's guide did not tell the writer when to use supplemental information instead of notes or vice versa. The writer's guide was revised to better define supplemental information and its use in comparison to notes.

b. There was no guidance provided as to the use of capitalization in caution and note statements. The writer's guide was revised to add guidance on this topic for notes and the licensee committed to make this addition for cautions.

c. When cautions and notes contain multiple topics the importance of any one topic is obscured. The writer's guide was revised to add guidance on this topic.

2. Logic statements are used in EOPs to describe a set of conditions or a sequence of actions. Because of their importance and complexity, it is important to provide explicit guidance for their use. The writer's guide was to be revised to address the following concern:

   Table 1, a list of logic terms, includes the word EXCEPT. If the word EXCEPT is used with conditions for action statements, the conditions that follow the actions may result in operators performing the actions before reading the conditions. However, the licensee's use of EXCEPT is for restrictions on the action, not conditions, and is considered acceptable for this use.

3. It is important that a consistent method of section heading and step numbering be used throughout EOPs. The use of overall headings and an alpha-numeric numbering system for each step is usually needed so that operators can keep track of where they are in the procedure and know how to move easily and quickly to other parts of the procedure. The flow charts have a system of titles and a numbering system to identify procedures; and overall headings for flow sequences. However, there was no alpha-numeric numbering system for sections or symbols within the flow chart. This makes it difficult to refer to a section or symbol and an operator may not be able to keep track. For example, if one operator wants to indicate a particular step to another operator there is no easy way to verbally refer to the section or symbol. This was also a finding of the licensees EOP validation. They have committed to incorporate some type of numbering system within the flow charts, as part of their next major EOP revision.

4. Figures and tables help operators make decisions and locate information. The writer's guide on page 15 stated that the units used on the axes of graphs should correspond to those of associate control room instruments, but the same guidance was not given for tables discussed on page 17. The writer's guide was revised to include this guidance for tables.

5. It is important that the operators know where to find all of the instrumentation and controls that are referenced in the EOPs. The writer's guide (on page 29) provided criteria to determine if location information should be put in a step. However, this guidance did not state the basic format for the information statement or provide an example. The writer's guide has been revised to include this guidance.

6. Writers should be given sufficient information in the writer's guide to produce procedures that are consistently formatted. The writer's guide stated that for boldface type a slightly larger type size should be used. This larger type size should be specified. The guide also mentions various thicknesses of lines to be used in the flow charts. The writer's guide should provide guidance on thickness sizes. This was also a finding of the validation effort and the licensee has committed to provide this information in the next major EOP revision.

The staff review determined that the Pilgrim writer's guide adequately meets the criteria stated in the SRP and should provide adequate guidance for translating the technical guidelines into EOPs that will be usable, accurate, complete, readable, convenient to use, and acceptable to control room operators.

C. Verification and Validation Program

The descriptions of the verification and validation program were reviewed to determine if they provided acceptable methods for accomplishing the objectives stated in the SRP. The verification program determines that consistency has been maintained between the writer's guide, EPGs, and the flow chart EOPs by evaluating each EOP for written correctness and technical accuracy. The validation program determines that the control room operators can manage emergency conditions in the plant using the flow chart EOPs by evaluating each EOP for usability and operational correctness. Our review of the Pilgrim verification and validation program descriptions identified a small number of concerns. These concerns were discussed with the licensee during the March 14-18 site visit. In a letter from R. Bird (BECo) to the NRC dated April 6, 1988, the licensee responded to these concerns. These concerns and the licensee's responses are discussed below.

1. The verification and validation program descriptions provided personnel qualifications for those individuals involved in the verification and validation programs, but did not include all of the types of disciplines which should be involved. The descriptions were revised to indicate that, at a minimum, plant operators, subject matter experts, procedure writers, and human factors experts will be involved in the verification and validation process.

2. The validation program needed to be revised to include the criteria for the selection of scenarios that would fully exercise EOPs under complex accident scenarios. Pilgrim provided a set of criteria for scenario development, but they did not ensure that multiple and complex failure scenarios would be used. The validation program description was revised to include criteria to ensure that multiple (simultaneous and sequential) failures are a part of some of the scenarios used for validation.

3. The validation program needed to be revised to state that EOP validation and revalidation would be conducted with minimum control room staffing. This was added to the validation procedure.

This review determined that the Pilgrim procedures for verification and validation meet the objectives stated in the SRP and provide assurance that the EOPs adequately incorporate the guidance of the writer's guide and the technical guidelines and will guide the operator in mitigating emergency conditions.

D. Training Program

The description of the operator training program on the Pilgrim upgraded EOPs was reviewed to determine if it described acceptable methods for accomplishing the objectives stated in the SRP. The goals of the EOP training program are to enable the operator to: understand the structure and technical bases of the EOPs, develop a working knowledge of the EOPs, and use the EOPs under adverse operating conditions. To achieve these goals, both classroom and simulator training (on the Pilgrim plant-specific simulator) are provided. Our review of the Pilgrim training program description for EOPs identified some concerns. These items were discussed with the licensee during the March 14-18 site visit. In a letter from R. Bird (BECo) to the NRC dated April 6, 1988, the licensee responded to these concerns.

The training program description was revised to make the following items clear:

1. That all operators (current and new) would be trained on EOPs, to their fullest extent i.e. up to multiple failures, on the Pilgrim plant-specific simulator.

2. That all current operators will be trained on the EOPs prior to their implementation in the control room.

3. That all operators (current and new) will be trained on revised EOPs, and on major revisions to EOPs, prior to their implementation in the control room.

The staff's concerns with the Pilgrim training program were adequately resolved; therefore, the Pilgrim training program meets the objectives stated in the SRP and should result in appropriate training for the Pilgrim operators on the upgraded EOPs.

3. CONCLUSIONS

Based on our review, we conclude that, the revised PGP submitted by the Boston Edison Company for the Pilgrim Nuclear Power Station adequately addresses the requirements stated in Generic Letter 82-33 (Supplement 1 to NUREG-0737) and provides acceptable methods for accomplishing the objectives stated in NUREG-0899 in accordance with the guidance provided in the Standard Review Plan (NUREG-0800). Further changes to the PGP should be made in accordance with 10 CFR 50.59.

This evaluation was performed with the assistance of Battelle Columbus and Pacific Northwest Laboratories' personnel.

This report closes out the NRC's review of Task Action Plan Item 1.C.1 for the Pilgrim plant.