APPENDIX B

U.S. NUCLEAR REGULATORY COMMISSION
REGION III

Report No. 50-255/89019(DRS) Operating License: DRP-20

Docket No. 50-255

Licensee: Consumers Power Company
212 West Michigan Avenue
Jackson, MI 49201

Inspection At: Palisades Nuclear Power Plant

Inspection Conducted: July 24 through August 4, 1989

Team Leader: _____ 10/6/89
J. E. Gagliardo, Chief Date
Operational Programs Section,
Division of Reactor Safety,
Region IV

Team Members: J. Cummins, Inspector, Operational Programs Section, Division
of Reactor Safety, Region IV
T. Heller, Palisades Resident Inspector
[illegible] Damon, Licensing Examiner, Division of Reactor Safety, Region III
G. Bryan, Reactor Systems Specialist (Consultant)
I. Kingsley, License Examiner Specialist, (Consultant)
M. McWilliams, Human Factors Specialist, (Consultant)

Approved By: _____ 10/6/89
J. E. Gagliardo, Chief Date
Operational Programs Section,
Division of Reactor Safety,
Region IV

Inspection Summary

Inspection Conducted July 24 - August 4, 1989 (Report 50-255/89019(DRS)
Scope: This special, announced inspection was conducted in the area of emergency operating procedures (EOPs), including the implementation of vendor generic technical guidelines (GTG), overall technical adequacy of the procedures, validation and verification (V&V) program, the performance

of training on the EOPs, and the ongoing evaluation of the EOPs.
Results: No unsafe operational conditions were identified. The overall determination was that the EOPs could be effectively carried out in the plant and could be correctly performed by the staff. Training was adequate overall, but several areas needed improvement. Two violations were identified (inadequate training of auxiliary operators, paragraph 5.c; and insufficient oversight of EOP activities by QA, paragraph 6). The EOPs were generally capable of performing their intended function, but several discrepancies were noted and are documented as EOP technical review items and human factors element review items. A major concern was identified regarding the licensee's V&V process, which was not independent of the EOP writers, was not multidisciplinary in nature, and had not reviewed procedures referred to by the EOPs or attachments with actions performed outside the control room. These discrepancies will require further review by the licensee and will be the subject of followup inspection efforts.

One unresolved item (paragraph 3) was also identified regarding the tripping of the main feed water pumps following a reactor trip.

TABLE OF CONTENTS

DETAILS

1. Persons Contacted

The individuals contacted during the course of the inspection and those in attendance at the exit interview on August 4, 1989, are listed in Attachment V.

2. Executive Summary

Following the TMI-2 accident, the nuclear power industry embarked upon an upgraded EOP program to provide operators with direction to mitigate the consequences of a broad range of accidents and equipment failures. Supplement 1 to NUREG-0737 and NUREG-0899 were issued to establish, respectively, the requirement for the upgrade program and the process for development and implementation.

Palisades responded to these requirements with an EOP development program consisting of the following significant elements:

- Adoption of combustion engineering owners group (CEOG) CEN-152 as the GTG.
- Definition of the plant specific technical guidelines (PSTG) as the sum of four administrative procedures, the GTG, the Palisade Function and Task Analysis (F&TA) report, Technical Specifications, existing EOPs, the final safety analysis report (FSAR), EOP-related licensing commitment letters, and as-built plant drawings.
- Development of EOP basis documents to justify GTG/PSTG deviations.
- Incorporation of operator action setpoints into the EOP basis documents.
- Promulgation of an EOP Writer's Guide.
- Development of plant specific EOPs.
- Performance of a V&V program for the EOPs.
- Plant Review Committee (PRC) review and promulgation of the EOPs.

The Palisades EOPs listed in Attachment I were reviewed to ensure that the procedures were technically adequate and accurately incorporated the guidelines of the Combustion Engineering Emergency Procedure Guidelines CEN-152, Revision 3. The inspection was designed to verify that the

vendor step sequence was followed, the exit/entry points were correct, transfer between procedures was well defined and appropriate for procedures performed concurrently, the procedures could be implemented with the minimum staff required onshift, and notes and cautions were used correctly. Deviations from the CEN-152 guidelines were reviewed to ensure that they had been justified and that safety significant deviations were evaluated in accordance with 10 CFR 50.59 and reported to the NRC as required. The inspection team also verified that deviations warranted by the specific plant design were incorporated into the EOPs, prioritization of accident mitigation strategies were correct, and adverse containment values were also considered in the parameter measured/observed in the procedures.

The licensee had based their EOPs on Revision 3 (Submittal 2) to CEN-152 as approved by NRC letter to the CEOG dated November 5, 1986. Revision 3 (final) to CEN-152 had been subsequently issued and was reviewed and approved by NRC letter to the CEOG dated August 2, 1988. It was noted that the licensee had prepared Revision 1 to their EOPs to the guidance of Revision 3, Submittal 2, but as the revisions were about to be finalized, Revision 3 (final) was issued and some additional changes were made in the EOPs based on the final revision. The licensee indicated that Revision 3 (final) would be fully incorporated during the next biennial review of all of the EOPs.

The NRC team conducted inplant and control room walkdowns of the EOPs. Where the EOPs transferred to supporting procedures, the inspectors verified that the transfers were correct and walked down the applicable sections of the supporting procedures. With a few exceptions, nomenclature was found to be consistent between the control boards and the procedures. Those exceptions, which were evaluated as potential problems for operators acting under stress, are identified in Attachments II and III.

The inspection team's overall determination was that the licensee's EOPs could be effectively carried out in the plant and could be correctly performed by the Palisades staff. Although a number of human factors concerns were identified, none were determined to pose a significant safety concern. Training on the EOPs was adequate overall, but several areas needing improvement were noted.

The most significant concerns identified during the inspection involved the inspector's observations that (1) the EOP V&V program was not sufficiently comprehensive and needed to be better documented, (2) QA involvement and oversight of the EOP development, V&V, training, and feedback efforts were weak, and (3) the training of the auxiliary operators (AOs) on actions they were required to implement from the EOPs was very poor.

3. Palisades EOP/CEOG CEN-152 Procedure Comparison (25592)

3.1 Scope of Comparison

A comparison of the Palisades EOPs and the CEOG Emergency Procedure Guidelines (EPGs) CEN-152, Revision 3, was conducted for each of the EOPs identified in Attachment I. The objective of this review was to ensure that the licensee had developed sufficient procedures in the appropriate area to cover the broad spectrum of accidents and equipment failures that must be considered. The inspectors' review of the licensee's EOPs disclosed that the procedures had been developed in accordance with the CEOG recommendations.

The inspectors reviewed the licensee's documentation and interviewed licensee personnel to verify that any identified deviations from CEN-152 were justified. Discrepancies, identified by the team, between the EOPs and CEN-152, are discussed in Attachments II and III.

3.2 Findings

The team determined that, in general, the EOPs incorporated the procedure guidelines of CEN-152, Revision 3, and were technically adequate. This determination was based on the following findings observed during the review of the Palisades procedures:

- The EOPs generally followed the CEN-152, Revision 3, step sequence, with detailed instructions for operator actions required to cooldown the plant or place the plant in a stable condition.

- Entry or exit points in the EOPs were clearly stated and could be followed by trained reactor operators.

- The plant specific values were consistent with the plant design.

- The CEN-152 prioritization of the accident safety function hierarchy was maintained in the EOPs.

The licensee's standard post-trip action diagnostic flowchart for reactivity control was expanded from that of CEN-152 to more adequately address the attributes of reactivity control that must be addressed in the analysis.

The inspection team determined that a potential equipment problem pertaining to the main feedwater pumps existed. The basis for EOP 1.0 discussed securing the main feedwater pumps because past experience had shown that prolonged operation after a trip had caused over cooling and primary coolant depressurization. However, Section 7.5.1.3 of the FSAR stated that in the event of a reactor or turbine trip while control is in auto, the feedwater pumps are automatically ramped down at a rate of 1.58% per second to a speed corresponding to the flow required for decay heat The licensee normally operates the system in auto. Since operating experience indicated that the system would not perform as designed, but instead has caused overcooling or PCS depressurization, the licensee had incorporated a step in EOP 1.0 to trip the feedwater pumps after a reactor trip. This step was a deviation from the guidelines of CEN-152. For the small break LOCA, three of the five success paths depend upon steam generator heat removal, and the licensee's step prematurely securing an operating feed system to shift to an off-line system would decrease the probability of success by reducing success probability for three of the five success paths. The NRC team concluded that the EOP 1.0 deviation to secure main feed would not be required if the system was performing per the FSAR description.

Either the original system design failed to conform with the FSAR description, or modifications to the system have caused the system not to perform as designed. In the latter case, the 10 CFR 50.59 safety evaluation may have failed to appropriately consider the effects of this system in the determination of whether an unreviewed safety question existed. This issue is an unresolved item (255/89019-01) pending a determination of why the system does not perform as designed.

4. Technical Adequacy Review of the Emergency Operating Procedures (25592)

The Palisades EOPs listed in Attachment I were reviewed to ensure that the procedures were technically accurate and could be meaningfully accomplished using existing equipment, controls, and instrumentation.

The inspection team identified a number of technical deficiencies, which were addressed to the licensee. These deficiencies along with the licensee's responses, are listed in Attachment II, and will be identified as Open Item 255/89019-02. A summary of the technical deficiencies is presented below:

The technical deficiencies were found in the following key areas:

- Referral to other procedures not adequate.
- Special requirements to perform a step not being specified.
- Failure to have prefabricated piping/cables/procedures for identified EOP tasks.
- Preferred instrumentation for parameter monitoring not specified.
- Degraded containment effects on instrumentation not considered.

The team noted that most EOPs could be improved in the "refer to" and "go to" steps. In many instances only the procedure number was referenced and the applicable section number and/or step number of the referenced procedure was not specified. Operator response time and effectiveness would be improved with more detailed procedure referrals.

It was noted, during plant and control room walkdowns, that the EOPs lacked information about special requirements needed to perform a particular step. On a number of occasions, operators could not perform actions in the EOPs without first racking in a circuit breaker, unlocking a valve, or operating a key switch. There were also examples in which room keys, a step ladder, or fuse pullers were required to perform local equipment operations. As in the previous paragraph, more effort in detailing special requirements would ensure timely completion of operator actions in the high stress environment of implementing the EOPs.

During control room walkdown of the EOPs, the team identified several EOP steps that required parameter verification without clear direction as to which instrument to monitor. In several cases where core exit temperature or Tave was being monitored, the EOPs needed to be more specific as to which instrumentation should be used and the limitations for the use of each.

The team determined that an extensive effort had been made to incorporate the effects of degraded containment on instrumentation used by the EOPs. However, in at least one instance, instrumentation accuracy was assumed to be adequate during degraded containment conditions. A pressurizer level of 20 percent was one of the conditions required to throttle safety injection. At 20 percent indicated level, with degraded containment, Palisades environmental equipment qualification (EEQ) analysis shows that actual pressurizer level may be as low as 1 percent (e.g. uncovering most pressurizer heaters). It is possible that a sustained loss of pressurizer

function may result from premature throttling of safety injection. The licensee agreed to review the findings of the study of instrument errors in a harsh environment, which was in progress under CEN Task 535, and to incorporate appropriate information obtained from the review in the EOPs to ensure they would function under harsh environment conditions.

The team identified several tasks in the EOPs that required the use of mechanical or electrical jumpers. However, the licensee did not have procedures for installing the jumpers, and it appeared to the team that, based on the complexity of the tasks, procedures would be appropriate. It appeared to the team that the licensee should develop procedures to install these jumpers.

The inspectors found the following instances where the procedures required performance of an action step that was not prestaged.

a. The first involved Step 6.a of EOP 3.0, which required installation of a temporary modification to provide temporary air to the steam generator atmospheric dumps.

b. The second involved Steps 2.a and 2.b of Attachment 8 of EOP 5.0, which required a special lineup to transfer a waste holdup tank to a filter waste monitor tank or to a clean waste receiving tank.

c. The third involved Attachment 3, Step 2.c of EOP 2.0, which discussed gravity feed from T-90 to T-2. The auxiliary operators would use Section 7.5 of SOP 12, "Feedwater System," Revision 14, which discussed in general terms the lineup required, but did not identify all of the valves required to be operated, nor was the SOP referenced in the EOP.

d. The fourth involved the location of the attachments to various EOPs (e.g. status sheets). Prior to the inspection, the licensee had moved the attachments to a file cabinet in the control room and did not inform the operators. The operators required some effort to locate the attachments.

The licensee was encouraged to document all cases that were similar to the above examples and formulate a plan to resolve these deficiencies.

5. EOP Training (25592)

The inspectors assessed the adequacy of the EOP training by reviewing three areas. The first dealt with observing an unrehearsed operating crew performing the EOPs on the site-specific simulator with scenarios designed to exercise selected areas of the EOPs. The operating crew was made up of two licensed operators and two simulator instructors. The second effort was to review lesson plans and training records for the hot licensed and requalification operator training programs as they pertained to EOP training. Finally, interviews were conducted with selected members of the operations and training staffs.

a. Simulator Scenarios

The inspection team developed scenarios similar to those used for licensed operator exams and the facility's EOP training. These scenarios included:

(1) A reactor trip with two control rods stuck out of the core,

(2) A loss of all AC power, including the diesel generators (D/G),

(3) A small break loss of coolant accident,

(4) A steam generator feedwater line break inside containment,

(5) A loss of all feedwater with service water backup available,

(6) A loss of all feedwater with no service water backup (feed and bleed), and

(7) A steam generator tube rupture with concurrent faulted steam generator (radiation release).

During the performance of these scenarios with the unrehearsed operating crew, the inspection team had the opportunity to: assess human factors elements associated with the performance of the procedures in a "real time" atmosphere; observe how the operators diagnose accident conditions and transition from one EOP to another; assess the licensee's operating philosophy; and observe operator performance. The team made the following observations:

- The operators exhibited good knowledge of the EOPs and the CEN-152 guidance.

- The procedures generally provided operators with sufficient guidance concerning their responsibilities during the emergencies.

- The procedures appeared to be organized in such a manner as to minimize physical interference between operators when carrying out the actions outlined in the procedures.

- Duplicate operator actions in the procedures appeared to have been minimized.

- There appeared to be no formal method used to track "continuous action" or "non-sequential" steps in the procedures. This presented a potential for overlooking some actions as the operator became involved with a lengthy procedure or when transitioning between procedures.

b. Formal Training Program

Lesson plans and simulator scenarios used for EOP training were reviewed to verify that the training covered the technical basis for the procedures as well as the structure and format. The following observations were made:

- There was no formal classroom lesson plan to cover EOP 3.0, "Electrical Emergency Recovery," which was issued on August 11, 1988. This EOP had been covered only in a lesson given during simulator training sessions.

- There were no lesson plans for the individual success path procedures of EOP 9.0, either in the simulator or the classroom phases of instruction.

- There was no lesson plan covering "rules of usage" for the EOPs. Examples of items that should have been included in such a lesson plan are: definition of common terms such as "available" or "operable"; the meaning and use of "non-sequential" or "continuous action" steps; the difference between "referencing" and "branching" to other procedures; and the difference between a "note," "caution," and "warning." There were inconsistencies exhibited by operators in their understanding of these areas during the EOP walkdowns and during the simulator demonstrations.

c. Operations and Training Staff Interviews

Operators were interviewed to determine their understanding of the EOPs and their responsibilities and required actions, both individually and as a team. The operators were also questioned to determine if they were knowledgeable of the requirements for transitioning from one procedure to another, and if training was conducted on revised EOPs before they were implemented.

The first training concern identified was that there did not appear to be adequate training on the actions in the EOPs which were to be implemented by AOs. The AOs seemed to be unfamiliar with sections of the EOPs that required action on their part. Most of the AOs were able to simulate the actions required by the EOPs; however, an inordinate amount of time was required. The AOs were unsure of the aim of the procedures and were using a simple "cookbook" approach to the procedures. AOs should be able to perform actions in the EOPs in a timely manner to ensure plant safety during the high stress period associated with an emergency.

Interviews with members of the training staff revealed that there was a formal training program in place for AOs; however, no formal connection was made between the training items in AO lesson plans and action items AOs would be expected to perform as specified in

the EOPs. Many of the actions AOs would implement which were required by the EOPs were covered by on-the-job training (OJT) items in the initial training journal which new AOs must complete prior to be fully qualified. However, not all of the EOP action items to be performed by AOs were covered in the initial training program; and not all of the AOs had completed the formal initial training journal. For the AOs who had not formally completed the initial training journal, particularly the AOs who had been qualified before the current program was implemented (more than three years as an AO), an individual evaluation was made by the training staff as to which items in the journal were to be completed by the AO to maintain his proficiency. During the walkdowns of the EOP actions that were to be performed outside of the control room, the inspectors found that none of the AOs involved or interviewed had been previously trained on the in-plant actions required by the EOPs. It was apparent that the AO training program was not being fully implemented to familiarize the AOs with the actions they would be expected to perform under the EOPs.

The training staff committed to perform a comparison between training journal OJT items and the EOP action items, and upgrade the training journal to include all AO action items included in the EOPs. The licensee representatives stated that particular care would be taken to compare items with subtle differences between the training journal and the EOP, and these items would be stressed in training. Action had been taken by the training staff to include AOs in the training sessions to be attended by reactor operators (RO), so that a more integrated approach to the training would be affected. The training staff also agreed to upgrade the existing items in the training journal to state more clearly the relationship between the OJT item and any applicable EOP action item.

The licensee's failure to provide adequate training on the actions the EOPs require the AOs to perform is an apparent violation 255/89019-03 of the requirements of Criterion II to 10 CFR 50, Appendix B, which requires that indoctrination and training of personnel performing activities affecting quality shall be provided as necessary to achieve and maintain suitable proficiency.

The second training concern was in the area of feedback of changes for the EOPs from the operation's staff. A number of operators indicated that they were not aware of the resolution to changes that they had requested. Inefficiencies existed in the current system in that several operators could request the same change over a long period of time, not knowing that the requested change had already been resolved. Changes made to an EOP procedure or other procedures should be addressed in the training curriculum. Conversely, reasons for not changing a procedure after such a suggestion has been made should be formally provided to the requestor.

The third training concern was in the area of training for licensed operators on the EOP bases. All licensed operators interviewed indicated that they had received very little training on the basis behind the EOP steps, and the overall strategy employed by the EOPs. Senior operators further stated that they saw a need to include ROs in classes that explained the "big picture" in the EOPs. They stated that most ROs did not know the reasoning behind the actions in the EOPs, and used a simple "cookbook" approach to the procedures. They expressed an interest in increased training in this area.

A fourth area of concern was simulator training. The licensed operators stated that most simulator scenarios rarely were carried out to completion. They particularly stated that success path procedures in EOP 9.0 were almost never completed while performing simulator scenarios designed to exercise these procedures. In addition, nearly all of the operators stated that they desired more simulator training contact time during the course of the training year. A third common theme discussed with the senior operators was "board time" at the simulator. All senior operators interviewed stated a desire to have more time to enhance their control board skills, as opposed to their supervisory skills. They noted that one of the responsibilities of a licensed senior operator was the ability to operate all facility controls, if required.

A fifth concern was that personnel outside the operations department, received little or no training in their assigned tasks under the EOPs. For example, instrument and control (I&C) technicians may need to install a jumper to enable equipment operability or mechanical maintenance may need to install a spool piece to enable the transfer of liquid from tank to tank. Training on these items would assure proficiency of plant personnel, but also assure that proper equipment was staged for the activity.

The inspectors also found that the operators were weak on the definition of certain key words used in the EOPs. The words "available," "check," "supplied," "warning," "integrated decay heat removal," and "operating" were not consistently understood by the operators.

The inspection team was concerned with the overall quality of training on the EOPs, especially training received by the AOs. The team concluded that the licensee needs to review the quality of training because of its impact on the ability of the operators to cope with conditions that could exist during an emergency.

Resolution of these training related issues will be identified as Open Item 255/89019-04.

6. On-Going Evaluation of EOPs (25592)

Section 6.2.3 of NUREG-0899 states that licensee's should consider establishing a program for the ongoing evaluation of EOPs. NUREG-0899 further states that the program should evaluate the technical adequacy of the EOPs in light of operational experience and use, training experience, and any simulator exercises and control room walkthroughs.

Section 6.9.6 of licensee Administrative Procedure 4.06, "Emergency Operating Procedure Development and Implementation," Revision 1, stated that the EOPs shall be periodically reviewed (every 2 years) and listed for review considerations the criteria that were identified in NUREG-0899.

Section 5.0 of the licensee's Administrative Procedure 10.41, "Procedures on Procedures," Revision 12, delineated the process for initiating a procedure revision. In addition to the formal process delineated in Procedure 10.41, an informal (not proceduralized) form was used. This was called a "FORM 40" and was used by licensee personnel to identify a potential problem (e.g. a procedure change). Based on discussions with licensee personnel in the plant, this was the most frequently used method of identifying potential EOP procedure problems. Form 40 was a three-part memorandum with carbon copies that enabled the individual initiating the form to retain a copy of it. There was also a reply section on the form so that the recipient could document his or her response and return a copy to the originator for feedback of the action taken to disposition the concern.

The inspectors also found that feedback from the training center was being provided to the staff by a letter which compiled all of the comments from the operators in a given training class. These letters and recent Form 40s were reviewed by the inspectors and provided adequate evidence that feedback was being provided. The inspectors were concerned, however, with the disposition of the feedback comments.

After the comments were dispositioned, the comments were destroyed and not retained. Several of the operators interviewed were also concerned that they had not received feedback on their comments. The licensee's ongoing review and feedback process needs to be more effectively controlled, and feedback comments need to be returned to the individuals submitting the comments. The existing system provided disincentives to the evaluation and feedback process.

The inspection team reviewed the involvement and oversight provided by QA in the development, implementation, and training on the EOPs. The inspector found that the QA organization had reviewed EOP 1.0 during the development stage, and the comments provided by the review were generally editorial in nature. The QA review had not included a walkdown of the procedures in the control room or in the plant.

The inspectors also reviewed the audits and surveillances performed by QA for activities related to the EOPs. A QA surveillance was begun in September 1987 and had a checklist that compared the EOPs to CEN-152, Revision 2. The checklist included four activities including verification of PGP commitments, compliance with the Writer's Guide, the adequacy of the V&V of the EOPs, and the adequacy of the training on the EOPs. The surveillance was not completed until July 1989, over two months after the licensee was notified when this NRC inspection would be conducted. At this point in time, the EOPs had been revised to conform with Revision 3 (Submittal 2) of CEN-152. The last two items on the surveillance checklist, verification of V&V and training, had been deleted from the checklist. There was no evidence that any specific audits had been implemented since the initial review of EOP 1.0 in June 1986. Audits of training activities at the simulator in 1988 and of operating procedures in 1989 did include some aspects of the EOPs. However, the training audit involved a review of training records without any observation of the actual training performed; and the audit of operating procedures did not include a walkdown of the EOPs in the control room or in the plant to determine if the EOPs were useable. As noted elsewhere in this report, the two most significant deficiencies in the EOP program related to V&V and training, the two areas deleted from the QA surveillance. There was no evidence that QA had ever conducted an audit of the EOPs since the 1986 comments were developed.

The licensee's failure to perform planned and periodic audits of the Palisades EOPs is an apparent violation (255/89019-05) of 10 CFR Part 50, Appendix B, Criterion XVIII, which requires that a comprehensive system of planned and periodic audits shall be carried out to determine the effectiveness of the program.

7. Human Factors (25592)

As a result of the evaluation of the Palisades EOPs, a number of human factors deficiencies were identified. Many of these appeared to be the result of a lack of specific guidance provided in the EOP Writer's Guide (Administrative Procedure 4.06) or the licensee's failure to consistently apply the guidance provided therein. These deficiencies were also indicative of the general programmatic failure to utilize a multidisciplinary team in procedure development and revision, and the lack of an effective V&V program. Human factors deficiencies are summarized in the following paragraphs, with specific examples provided in Attachment 3, and their resolution will be tracked as Open Item 255/89019-06.

a. EOP Structure and Format

EOP structure and format should provide for clear presentation of information in a consistent manner. Procedure AP 4.06, however, permitted the use of two widely differing formats for EOPs - a

two column format to be used for EOP 1.0 and a single column format to be used for all other EOPs. This format was reportedly adopted in emulation of the format used in CEN-152, Revision 3 (although the final submittal of CEN-152, Revision 3, adopted the two column format for all generic guidelines). Because of the predominance of contingency action steps throughout the Palisades EOPs, the two column format appears to be the more suitable of the two formats currently in use.

b. Transitions

Transitions are directives to the operator to move within and between procedures. These steps may instruct the operator to concurrently use more than one procedure, or to completely exit the procedure being used and move into a different procedure. An operator may also be required to reference tables, charts, attachments, or non EOP procedures. To avoid confusion and unnecessary delays, transitions should be minimized. When they cannot be avoided, it is important that the transition directions be clearly and consistently presented. NUREG-0899 states that when transitions are necessary, a method should be used that is quick and creates the least amount of disruption.

Section 6.4.2.g of Procedure AP 4.06 provided direction on referencing and branching to other procedures or steps. There was no direction provided, however, which indicated when it was required to reference a procedure or step. Consequently, references were not provided for steps or conditions that the EOP writer determined to be generally known or understood by the operators. Such information should be provided for use by the operator if necessary.

Procedure AP 4.06 stated that it was acceptable to reference or branch to a procedure giving only the procedure number without including the procedure title, page number, or the section of the procedure to be executed. Most references were found to not contain this information. At a minimum, references should direct the operator to the specific section applicable to the steps called for in the EOP in order to eliminate any confusion and delays in locating the appropriate steps. Several Control Operators (COs) and AOs indicated that they would have preferred having this additional information provided.

c. Use of Logic Terms

Section 6.4.2.b of AP 4.06 stated that logic terms, including AND, OR, NOT, IF, IF NOT, WHEN, and THEN should be capitalized and underlined. In practice, however, all instances of these words were highlighted in this manner even though the contextual use was not as a logic term. For example, the word "AND" when used as a simple conjunction in a sentence was consistently underlined and capitalized. Highlighting of the terms AND and OR should have been reserved for describing "necessary" (AND) or "sufficient" (OR) conditions of a

logic statement. The term NOT, unless included as part of an IF NOT statement or condition, also should not have been highlighted as a logic term. This practice detracted from the effectiveness of the highlighting used to call the operators attention to actual logic statements that required operator decisions.

Paragraph 1 of Section 6.4.2.b of AP 4.06 stated that when four or more conditions need to be joined, a list format shall be used. While no instances were found where more than three conditions were joined by AND in the same sentence, numerous instances were identified where list formats were used which also included AND between each condition. By prefacing the list of conditions with a statement indicating that all of the following conditions must be met, inclusion of these ANDs was extraneous and should have been avoided. It was noted that in other instances where such lists were used, the AND terms were not used.

The terms IF and THEN should have been used to indicate actions to be taken by the operator IF a certain condition existed (as described in paragraph 3 of AP 4.06 6.4.2.b). In some cases, however, IF/THEN statements were incorrectly used in the procedure to indicate expected plant response IF a certain condition exists. Use of IF/THEN as logic terms should have been reserved to those instances where operator actions were required.

d. Component Identification

Section 6.4.2.h of AP 4.06 described the requirements for identifying components referenced in the EOPs. Paragraph 2 stated that when engraved names and numbers on panel placards and alarm windows were referred to in the procedure, the engraving should be quoted verbatim. There were a number of instances where this requirement was not applied in the control room. There were also inconsistencies found between the format of component labels in the plant, and the referenced component ID numbers in the EOPs (e.g., MV779CA vs MV-CA779).

Paragraph 4 of AP 4.0.6 stated that when components were seldom used, or if the component may be difficult to find, location information should be provided in the procedure. While location of components within the control room presented no general problems, significant difficulties were encountered in locating components in the plant. On several occasions, AOs experienced difficulties or delays in locating valves and other components referenced in the EOPs, attachments to the EOPs, and SOPs referenced by the EOPs. In addition to addressing equipment location in AO training, this information should have been indicated in the procedures.

There were numerous inconsistencies found in the way that component identification was accomplished within the EOPs. In some cases, only the name of the component was provided. In other cases, only the

component ID number was provided. When both the name and ID number were provided, there were inconsistencies in the order of presentation and in the use of parentheses. The Writer's Guide needs to provide more specific guidance on the use of component ID numbers and describe a consistent format for presentation of identifying information.

e. Cautions and Notes

Section 6.4.2.c of AP 4.06 described use of cautionary information and notes. No discussion was provided, however, regarding the type of information that should be included in a caution statement, and very limited discussion was provided regarding information to be presented in notes. Instances were found where cautions contained incomplete information (especially regarding the consequences of actions). Instances were also found where information was presented as a caution that was more appropriate to present as a note and vice versa. There were also cases in which information in the form of a note should have been added to the EOP, there were also instances where information that was presented was not actually needed or appropriate to the associated step.

f. Sentence Structure and Vocabulary

Language used in EOPs should be as concise and direct as possible to minimize potential for operator confusion. Section 6.4.3.c of AP 4.06 stated that words used in the procedures should convey precise understanding to the trained person. In contradiction to this requirement, however, instances of vague, subjective, or indeterminant language were encountered that would require interpretation on the part of the operator. There were also instances of commonly used terms (some of which were defined in the Writer's Guide) being interpreted inconsistently by different operators on different crews.

There were several instances found of redundant instructions or steps, or inclusion of steps that would never be performed if the operator were to strictly follow the branching instruction provided in previous contingency steps. Such steps should have been eliminated as they provided unnecessary clutter and posed a potential source of confusion.

g. In-plant Component Labeling and Accessibility

To ensure that AOs and other plant personnel could efficiently carry out their responsibilities in implementing the EOPs, it was important that components were correctly labeled and easily accessible. In performing in-plant walkdowns of the EOPs and the interfacing procedures, a number of deficiencies were found. In several cases, components were not labeled, requiring the AO to refer to plant drawings to positively identify the component.

A number of instances were found where components were located at heights beyond easy reach of the AO and no ladder was located nearby. In one instance, accessibility of the nearest ladder was also hindered due to its placement behind a beam with a hose and communications cable hanging in front of the ladder rack.

Another hindrance to component accessibility that was observed during in-plant walkdowns was the requirement for AOs to obtain keys from the control room for operation of certain valves and electrical breakers. Although the rationale for such requirements was well founded, there was no indication in the procedures that a key was required. This information should have been provided (including specific key numbers where applicable) so that AOs could be provided with the needed keys prior to being dispatched to perform local actions. Operators agreed that in stressful situations, it may be easy to overlook the need for keys without such a reminder. This could result in significant delays in performing local actions, especially if protective clothing was required to enter the area.

h. Clarity of Instructional Steps

Instructional steps should have been more concise and as simple as possible. For equally acceptable steps, the operator should have been directed to carry out one of the alternatives with the other alternatives provided in the event that the designated step could not be accomplished. There were instances observed where the EOPs did not follow this guidance and provided directions for the operator to perform one of two or more alternatives. There were also a number of instances where EOP steps could have been reworded to reduce the number of steps or improve the overall clarity. There were some EOP steps that were redundant or unnecessary (for example, directing the operator to continue with the next step when following the logic of previous steps would have lead him there anyway).

i. Operator Aids

Overall, the flowcharts incorporated into the EOPs (EOP 1, Attachment 1 and EOP 9.0, Attachment 1) were found to be consistent with approved flowcharting practices and served as useful operator aids. Isolated problems involving improper use of a note and an overly complex statement within a decision box were found. No guidance was provided, however, in AP 4.06 regarding requirements for EOP flowcharts. To ensure consistency in new flow charts and revisions to current flow charts, flow chart requirements should be specified.

The general format of tables and graphs included as attachments to the EOPs was also found to be in accordance with accepted human factors principles. No problems with legibility or appearance were observed. Isolated problems with labeling of graph axis were observed and are discussed in Attachment III.

8. Validation and Verification Program (25592)

The inspection team reviewed the licensee's V&V program and the V&V efforts applied to the EOPs and subsequent revisions to the EOPs. The results of this review are documented in Attachment IV of this report, and resolution of the deficiencies identified will be tracked as Open Item 255/89019-07. The findings are summarized in the paragraphs below.

As noted in the previous sections, the walkdowns of the EOPs were generally positive, but deficiencies were noted in the technical adequacy of the EOPs and the applications of human factors.

Paragraph 3.3.5 of NUREG-0899 states that, after development, the EOPs were to undergo a process of V&V to determine that the procedures were technically adequate, addressed both technical and human factors issues, and could be accurately and efficiently carried out.

The licensee's V&V program was based upon INPO Guidelines 83-004 & 83-006 and was described in the Palisades PGP submissions. The current program was defined in Administrative Procedure 4.06.

The licensee provided documentation to show that the purpose of the verification program was to confirm the written correctness of the EOP procedures, ensure that GTG and PSTG guidance was properly incorporated into the EOPs, and to verify that application of human factors aspects had been addressed.

The Palisades EOP verification program contained the following elements:

- Quality assurance review for conformance to the Writer's Guide.
- Technical review to ensure:
  - Accuracy of the EOP steps,
  - EOP compatibility with operator experience, training and plant hardware, and
  - Identification of EEQ list requirements imposed by EOP equipment usage.
- Control room walkthroughs of the EOPs

The licensee also provided documentation to show that the purpose of the validation program was to determine if the control room operators could effectively manage emergency conditions using the EOPs. Program emphasis was on usability and operational correctness.

Validation methodology consisted of the following elements:

- Simulator validation
- Tabletop validation
- Walkthrough validation

The inspection team reviewed administrative procedures to ensure that adequate controls existed to incorporate changes to the EOPs, that the latest revisions were available to the operators, and that they were easily accessible. Verification and validation supporting documentation was reviewed on a sampling basis. Control room, simulator, and plant EOP walkdowns were conducted to ensure that the procedures were validated and verified by the licensee.

The inspection team found that the defined V&V process limited QA involvement in the EOP process to a check for Writer's Guide conformance. It did not extend to other potential areas of QA involvement such as confirmation of V&V feedback into the EOPs, GTG/PSTG audit and review of deviations, verification that operator action setpoints were available and incorporated into the EOPs, definition of EOP training requirements, verification that preferred V&V methods were chosen from the available options, confirmation that independent technical reviews were conducted by individuals other than the procedure writer, and EEQ applicability. The NRC concluded that QA involvement in the EOP process should be extended beyond its present bounds of EOP Writer's Guide conformance. This is another example of the apparent violation (255/89019-05) against the requirements of Criterion XVIII of 10 CFR 50, Appendix B, which was cited in paragraph 6 of this report.

The Palisades plant specific technical guidelines (PSTG) included four administrative procedures, the GTG, the F&TA report, Technical Specifications, existing EOPs, FSAR, EOP related licensing letters, and as-built plant drawings. This body of documents is very voluminous and portions of the PSTG are neither plant specific (e.g. CEN-152) nor technical (e.g. four administrative procedures, the Writer's Guide, FT&A). As a result, the PSTG was an unweildy document, which was difficult to verify or validate.

The inspection team noted some references in the EOPs were incorrectly identified and that the specific training requirements in support of the EOPs were occasionally undefined (e.g. the meaning of "qualified CETs" in the subcooling margin check). During previous simulator V&V runs of the EOPs, records were made to flag EOP training support requirements. However, these EOP training support requirements were apparently not communicated to the training organization.

The deficiencies identified in these areas indicated an inadequate V&V program or an inadequately implemented V&V program. The licensee's failure to perform a V&V of the supporting procedures, attachments, and documents to which the EOPs direct or refer the operators, and their failure to

perform the V&V (that which was completed) independent of the procedure writers was a major contributor to the fact that the deficiencies identified in this report had not been previously identified. A comprehensive V&V process would have enabled the licensee to identify and correct the problems before the inspection team arrived.

9. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, violations, or deviations. An unresolved item disclosed during the inspection is discussed in paragraph 3.

10. Open Items

Open items are matters which have been discussed with the licensee, which will be reviewed further by the inspectors, and which involve some action on the part of the NRC or licensee or both. Open items disclosed during the inspection are discussed in paragraphs 4, 5, 7, and 8.

11. Exit Interview (30703)

The inspectors met with licensee representatives (denoted in Paragraph 1) on August 4, 1989, to discuss the scope and findings of the inspection. In addition, the inspectors also discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspector during the inspection. The licensee did not identify any such documents or processes as proprietary.

ATTACHMENT I

LIST OF PROCEDURES REVIEWED

A. EOPs Reviewed

1.	EOP 1.0	Standard Post Trip Actions
2.	EOP 2.0	Reactor Trip Recovery
3.	EOP 3.0	Electrical Emergency Recovery
4.	EOP 4.0	Loss of Coolant Accident Recovery
5.	EOP 5.0	Steam Generator Tube Rupture
6.	EOP 6.0	Excess Steam Demand Event
7.	EOP 7.0	Loss of All Feedwater (LOF)
8.	EOP 8.0	Loss of Forced Circulation Recovery
9.	EOP 9.0	Functional Recovery Procedure

B. Procedures Reviewed Which Were Referenced in EOPs

1. Administrative Procedure 9.31 (Revision 4), "Temporary Modification Control"

2. ARP 3 (Revision 46), "Electrical Auxiliaries and Diesel Generator"

3. EI-1 (Revision 15), "Activation of the Site Emergency Plan/Emergency Classification"

4. EI-6.3 (Revision 4), "Release Rate Determination From High-Range Effluent Monitors

5. EI-7.0 (Revision 3), "Emergency Post Accident Sampling Decision Process"

6. EM-04-08 (Revision 20), "Shutdown Margin Requirements"

7. EM-04-23 (Revision 0), "Shutdown Margin For Emergency Cooldown"

8. EPS-E-7 (Revision 2), "Local Tending of 2.4 kV Bus 1 C Switchgear"

9. EPS-E-8 (Revision 2), "Local Tending of Diesel Generator 1-2 (K-6B) and 2.4 kV Bus 1D Switchgear"

10. GOP 9 (Revision 9), "Plant Cooldown From Hot Standby/Shutdown"

11. GOP 10 (Revision 6), "Emergency Shutdown From Power"

12. MO-27c (Revision 2), "Functional Check of PCS Overpressure Protection system Setpoint 310 PSIA During Cooldown"

13. MO-27D (Revision 1), "Functional Check of PCS Overpressure Protection System Setpoint 575 PSIA - Plant Operating"

14. PFM-E-1 (Revision 0) "Emergency Post-Fire Maintenance Guideline Repair Procedure For Going To Cold shutdown In A Safe And Expedient Manner"

15. ONP 2.1 (Revision 2) "Loss of AC Power"

16. ONP 2.2 (Revision 1) "Loss of All Immediately Available AC Power"

17. ONP 6.1 (Revision 3), "Loss of Service Water"

18. ONP 20 (Revision 13), "Diesel Generator Manual Control"

19. ONP 24.1 (Revision 13), "Loss of Preferred AC Bus Y10"

20. ONP 24.2 (Revision 13), "Loss of Preferred AC Bus Y20"

21. ONP 24.3 (Revision 12), "Loss of Preferred AC Bus Y30"

22. ONP 24.4 (Revision 12), "Loss of Preferred AC Bus Y40"

23. ONP 24.5 (Revision 13), "Loss of Instrument AC Bus Y01"

24. ONP 25.1 (Revision 1), "Fire Which Threatens Safety Related Equipment"

25. ONP 25.2 (Revision 3), "Alternate Safe Shutdown Procedure"

26. SOP 2A (Revision 16), "Chemical and Volume Control System Charging And Letdown: Concentrated Boric Acid"

27. SOP 3 (Revision 9), "Safety Injection and Shutdown Cooling System"

28. SOP 4 (Revision 5), "Containment Spray and Iodine Removal System"

29. SOP 5 (Revision 5), "Containment Air Cooling and Hydrogen Recombining System"

30. SOP 8 (Revision 22), "Main Turbine and Generating Systems"

31. SOP 12 (Revision 14), "Feedwater System"

32. SOP 24 (Revision 8), "Ventilation and Air Conditioning System"

33. SOP 30 (Revision 10), "Station Power"

34. SOP 38 (Revision 5), Gaseous Process Monitoring System

C. Administrative Procedures Reviewed

1. Administrative Procedure 4.02, "Control of Equipment Status"

2. Administrative Procedure 4.06, "Emergency Operating Procedure Development and Implementation"

ATTACHMENT II

TECHNICAL DEFICIENCIES

The following are specific deficiencies that were discussed with the licensee. The licensee representatives agreed to either correct the deficiency or to further review the issue for resolution

1. EOP 1.0 "Standard Post Trip Actions"

   - Step 5.d addressed AC power transfer to station power, but did not address DC power. DC power was addressed in CEN-152, Revision 3, paragraph 3. The licensee's representative stated that DC power availability was addressed in a bracketed step in CEN-152, Revision 3. The basis of the step was to "Reflect the automatic disconnect of the Main Turbine Generator and the transfer of power to offsite . . ." He stated that loss of DC would affect the ability of the AC buses to complete their transfer. Therefore, AC bus availability was the primary operator action. The licensee's representative stated that they will consider documenting the above as a deviation from CEN-152.

   - Step 6.c required loop Th to be at least 25° F subcooled and then the operator was referenced to a footnote at the bottom of the page. The inspector noted that if the footnote was vital to the step, then why was it included as a footnote to the procedure. The licensee's representative stated that they will evaluate this comment.

   - Paragraphs 7 and 8 did not include a requirement to trend the specified parameters. This was included in paragraphs 5 and 6 of CEN-152, Revision 3. The licensee's representative stated that the EOPs were written to Revision 3 (Supplement 2), which did not require trending. He stated that the comment will be incorporated when the EOPs are revised to Revision 3 (final) as a result of the biennial review.

   - The contingency of Step 8 described natural circulation. The inspector questioned the necessity of this step since natural circulation cannot be verified for approximately 10 to 15 minutes. Since EOP 1.0 is a prerequisite to the other EOPs, the time delay in waiting for indication of natural circulation, could delay getting into the other EOPs. The licensee's representative stated they will consider deleting the unnecessary steps and document this as a deviation from CEN-152.

   - Paragraph 9 did not address minimum flow to the steam generators, however, CEN-152, Revision 3 did. The licensee's representative stated that they will evaluate this comment.

- The contingency steps of paragraph 11 did not address the flow of one pump to a single header or the flow of one pump to both headers. These options are discussed in CEN-152, Revision 3. The licensee's representative stated that he believed the contingency step, as written, identified the desired pump configuration. He stated that if the configuration was not adequate, the diagnostic flowchart would address the optional or recovery procedure. The licensee agreed to document the change in the basis document.

- Steps 10.c and 10.e had no contingency actions. CEN-152, Revision 3, had a contingency statement to consider steam generator tube rupture. The licensee agreed to evaluate this comment.

- Step 12.b required operator verification that two CCW pumps were running. All of the operators interviewed stated that the plant currently operated with only one CCW pump in-service and that the operators were trained to start the second CCW pump and consider the instructional step as being met. The licensee's representative stated that they will evaluate this comment.

- The note on page 8 of 8 to the diagnostic flowchart appeared to be a logic flowpath action statement and should be included in the tree. The licensee agreed to review the diagnostic flowchart and revise it as necessary.

- The inspectors noted that if the first diamond of page 8 of 8 of the diagnostic flowchart was answered with "yes" the operator was directed to consider the appropriate functional recovery procedure. The logic path of the flowchart had provided a "consider" block for all EOPs except EOP 2.0. The licensee agreed to review the diagnostic flowchart and revise it as necessary.

2. EOP 2.0 "Reactor Trip Recovery"

Section 2.0

In Step 2.a, the term "uncomplicated Reactor Trip" had not been defined but was discussed in the basis document. The team was told that it involved a reactor trip for which all the left hand column steps (conditions of EOP 1.0) had been satisfied. Using this definition, the operator would never get to this point, and Step 2.a could be eliminated by adding to Step 1, "and directs implementation of EOP 2.0." The licensee's representative stated that they will evaluate this issue for possible change.

Section 4.0

General Comment - Many of the steps in Section 4.0 are contingency actions. This procedure was ideally suited for two column format.

- Step 2 was redundant and could be eliminated. The licensee's representative stated that they will evaluate this issue for possible change.

- In Step 4, if the definition of an uncomplicated reactor trip, was consistent with that of CEN-152, Revision 3 (e.g., all Safety Function Status Check acceptance criteria satisfied), then the conditions of this step could not be met and it should be eliminated. The licensee's representative stated that they would evaluate combining this step with Step 3.

- Step 5 should address "vital AC buses" and the contingency action should direct action such as, "THEN attempt to restore power to the buses by implementing the following procedures." The licensee's representative stated that this step would be corrected as noted.

- In Step 6, the statement "(refer to EM-04-08)" implied that EM-04-08 provided instructions on how to emergency borate, in lieu of calculating the shutdown margins. EM-04-08 specified the RO (CO) as one of the persons with minimum skills to do the calculations. During the walkdowns, the team found that the ROs were trained annually on doing this calculation. During the walkdown, some of the ROs interviewed stated that they could not reliably perform the calculation. More training is needed for the COs in performing the calculation or they should be removed from the list of people with the skill levels to perform the calculations. The licensee's representative stated that they would evaluate this issue for possible change.

- Step 9 did not specify how the operators were to know that a spray with excessive delta-T had occurred. The licensee's representative stated that this was a training issue and they would evaluate the need for possible changes in the training on this point.

- In Step 10 the preferred method to be used should be specified. The licensee's representative stated that they would evaluate the need for a possible change in this step.

- The "Note" after Step 11 should be moved to follow Step 13. The licensee's representative stated that this note may be more appropriately located just before Step 13. He agreed that they would evaluate the possible change.

- Step 12 appeared to be redundant and should be eliminated. The licensee's representative stated that they would evaluate this issue for possible change.

A new step should be considered following Step 20, to refer the operators to the appropriate startup procedures. The licensee's representative stated that they would provide a new step as noted.

Attachment 3

Step 2.c provided for a gravity feed from Tank T-90 to Tank T-2, provided "the spool piece is installed." SOP 12, Section 7.5 discussed in general terms the lineup required for this mode of inventory makeup, but the instructions did not include all of the valves to be operated. Furthermore, SOP 12 was not referenced by this step of the EOP. The licensee's representative stated that they would clarify this step.

Attachment 4

- In Step 1.a the words "at least" were not necessary. The licensee's representative stated that they would correct this step.

- Step 1.c directed the operator to determine if CCW had been interrupted for more than 10 minutes, but it did not indicate how the operator was to make this determination. The licensee's representative stated that this was a training issue and would be evaluated to determine if the change was needed.

- Step 4 clearly stated that it is the oil lift pump to be started and not the PCP. Words such as "start AC or DC Oil Lift Pump for applicable PCP" would clarify this step. The licensee's representative stated that they would correct the step as noted.

3. EOP 3.0 "Electrical Emergency Recovery"

General Comments

It appeared that the basic strategy of CEN-152 was not followed for Procedure EOP 3.0 in two cases. The two cases noted were:

- Step 5 of Section 10.0 in CEN-152, deals with restoring power to a vital and nonvital bus from a diesel generator. This step was covered, but only in part, by Procedure EOP 3.0, Steps 9, 16, 19, 25, 29, 30, and 31.

- Step 6 of Section 10.0 in CEN-152, deals with stripping DC busses to minimize battery discharge current. This step was covered, but only in part, by Procedure EOP 3.0, Steps 14, 20, 21, 22, and 23.

Specific Comments

Purpose

Section 2.b did not specify which busses were considered "vital 480V AC." Some of the operators interviewed were confused on this issue. The licensee's representative stated that "Vital 480V AC busses" were defined in Technical Specifications.

Operator Actions

- In Step 6.c if Tave is less than 515° F, the display would lockup and be useless for maintaining the limits of Attachment 3. If Tave were less than 515° F, another temperature must be used. The temperature indication to be used (hot or cold) should be specified. The licensee agreed to evaluate this issue to determine the best temperature indication to be used for this case.

- For step 8b, none of the operators questioned know of any reason to wait 60 seconds before going to cutout before stopping the D/G from the control room. The licensee stated that this switch will be removed in the fall outage, and the step in the EOP will be deleted.

- There was confusion on the part of the AO asked to walkdown Step 45. There were no designations for the breakers to be operated, and it was not clear to the AO what actions were desired. The AO stated that he would refer to SOP 30 to perform the task desired, as the SOP was written in a much clearer manner. The licensee agreed to evaluate this step for revision.

- The breaker specified normally in Step 59.b.3.e was normally left in the racked-out position. The procedure did not explicitly state to rack the breaker in before attempting to close the breaker. The licensee agreed to evaluate adding a substep to instruct the AO to rack in the breaker before attempting to close it.

- There was a difference of opinion among the operators interviewed as to what the term "operating" means in Attachment 1, Step 9.a. Some operators thought it meant that the diesel was simply running unloaded, while others thought that it meant that the diesel was loaded. The licensee agreed to evaluate the use of the term "operating."

- Step 1.a of Attachment 13 needs a key to operate these valves, but there was no "note" explaining this. The licensee's representative stated that having key numbers on placards located under the keyswitch was adequate to inform operators of the need for a specific key.

- The inspector could find no definition of the term "throttle open" used in Steps 1.c and 1.d of Attachment 13. The procedure did not specify how far open "throttled open" is. The licensee will evaluate the need to make the procedure clearer on this matter.

- Step 9 referred to Procedure ONP-20 to locally start and load available diesel generators (D/Gs). The following comments relate to ONP-20, "Diesel Generator Manual Control":

  * Step 4.2.b - the "note" stated that a ladder may be required. A ladder was necessary and fuse pullers should also have been required. The ladders outside of Switchgear Room 1C were too large for this application. The licensee agreed to evaluate a rewrite of the note.

  * Step 4.3.b resets the lockout relay by placing the D/G's output breaker control switch to the "tripped" condition. Step 4.3.c implied that the above action starts the D/G. If it does, 4.3.b should so state. The licensee agreed to rephrase the steps as necessary.

  * Step 4.3.c - the last line in this step was redundant and should have been deleted. The licensee stated that no change was contemplated at this time.

  * Step 4.6.1.d - the "note" should have been at the end of the step. The licensee agreed to evaluate moving the note.

  * Step 4.6.1 - a small ladder would be required to perform the substeps in this step. The licensee agreed to evaluate adding a note to this step.

  * The "notes" in ONP-20 did not appear to meet the guidelines for notes in the EOPs. The licensee agreed to evaluate the "notes" and "cautions" in accordance with the EOP Writer's Guide and Administrative Procedure 10.51.

4. EOP 4.0 "LOSS OF COOLANT ACCIDENT RECOVERY

- Palisades EOP 1.0 required that the operator secure both main feed pumps after a reactor trip, which was in deviation from the guidelines of CEN 152. The FSAR stated that main feed should ramp down in auto at 1.5%/sec. to the decay heat removal level. However, the basis document stated that operating experience indicated the system will not perform as designed, but instead has caused over cooling or primary coolant systems (PCS) depressurization. Because of this

deviation, entry into the LOCA procedure would always be made with main feed secured and S/G heat removal dependent upon establishing auxiliary feed. For the small break loss of coolant accident (LOCA), 3 of the 5 success paths depended upon S/G heat removal, (e.g., upon feed flow). Only HPCI feed and bleed and shutdown cooling remained as options and the latter was not available until temperature and pressure entry requirements for DHR had been met. The NRC team concluded that the EOP 1.0 deviation to secure main feed would not be required if the system were performing as designed. Further, the team noted that the question was academic for the LOCA inside containment since containment high pressure would shut the main steam isolation valves (MSIVs) and thus eliminate the main feed pumps. However, for the LOCA outside containment, prematurely securing an operating feed system to shift to an off-line system would decrease the probability of success by reducing success probability for 3 of the 5 success paths.

The licensee acknowledged: that the auto ramp down did not perform in accordance with the FSAR description, that past experience indicated the EOP 1.0 immediate action main feed pump trip was required as a deviation to the CEN-152, that restoration to design conditions could not be economically justified and stated that the deviation would be retained. Supporting rational was based upon the fact that under LOCA conditions, main feed could only be expected to survive for the small LOCA outside containment and even then it would have to be secured relatively early in EOP 4.0 because of inadequate throttling control or pump steam demand contribution to cooling.

- CEN-152, Step 4, stated to ensure maximum SI and charging flow, however, this statement was not included in the EOP. The licensee agreed to add the caution or emphasize the issue in EOP support training.

- Steps 4 and 5 were incorrectly sequenced. Step 5 should have appeared first. That was the only way the direct transfer could be made to EOP 9.0. As written, the operator who had misdiagnosed the LOCA would be delayed in a loop from EOP 1.0 to EOP 4.0, Step 4 back to EOP 1.0 until he was directed to EOP 9.0 by the status checks. The licensee stated that correction was planned.

- Step 13.d should have been referred to PCP CCW flow or specific valves, not to "any CCW valve isolation valve closed". It was possible to have many CCW isolation valves closed without loss of flow to the PCS pumps. The licensee agreed to clarify the step.

- Step 25.d "checked" open MO-2087. The Writer's Guide indicated that "check" is to compare with a procedural requirement. During the walk down, the operator was unable to define check and could not find procedural authority to close a valve he knew had to be closed. The licensee agreed to add this to the training program.

- In Step 48, the recirculation actuation signal (RAS) shift to the sump was correctly identified as 2% safety injection refueling water tank (SIRWT) level. However, ARP-8 incorrectly listed RAS shift as 9.7 percent SIRWT. When this was pointed out to the licensee, a TCN was issued the same day.

- Step 49.e incorrectly stated to transfer valves to an alternate controller. This should have read transfer valves to an alternate supply. the licensee agreed to revise the step.

- CEN-152, Supplementary Instruction 6, required that the operator should be cautioned against premature manual RAS initiation which could lead to insufficient sump inventory. No caution was contained in the EOP, no deviation existed, and the item was not specifically addressed in EOP support training. The licensee agreed to resolve the issue either by procedure change or training and to document it as a deviation if applicable.

- Step 60.h should have referred to the required section in HR-3 since the operators were not familiar with the procedure, no index was available, and the required section was 31 pages into the procedure. The licensee agreed to revise the step to facilitate entry.

- The portion of Step 68.a which addressed the hydrogen monitor was not required; the hydrogen monitor was placed in service at the first run of the containment atmosphere safety function status check. The licensee agreed to revise this step to have the operator verify the hydorgen monitor was in service.

- Steps 68 and 70 should have been reworded to eliminate any attempt to close an already closed power relief valve (PRV). To do so runs the risk of the operator going to reset, then to close via open. The momentary opening of the valve runs the risk of a stuck open open head vent. The licensee agreed to either revise the procedure or factor the item into training.

- Step 77.c required at least one S/G available for PCS heat removal as a prerequisite for LOCA shift to DHR. Although the step was consistent with the CEN-152 requirements earlier in the LOCA sequence, at this point in the EOP, the NRC team was unable to justify that requirement. For example, given that DHR was otherwise available, but

no S/G was available as a heat sink, it made no sense to abort the shift to DHR; in fact the shift to DHR became more imperative. The licensee agreed that S/G availability was not a DHR prerequisite and indicated that it was in the procedure only because it was in the CEN-152 equivalent step. Deletion of this prerequisite will be evaluated, and if it is deleted, a deviation will be issued.

- Step 79 should have offered the alternative of a return to Step 77 to attempt to establish DHR a second time. the licensee agreed to incorporate this into the procedure.

- In Step 81, the operator was free to choose from many options in any sequence (e.g. throttle SI, secure SI pumps, secure charging pumps etc). Although this flexability was acceptable, a note or caution should have been added to remind the operator of boration requirements. The licensee agreed to modify the procedure to incorporate the boron consideration.

- Step 83 appeared to be incomplete; no consideration was given to radiation level, PCS activity, and normal vs post-accident sampling system (PASS) sample. The licensee agreed to evaluate this item.

- In Attachment 1, page 5, Step 6.a.ii the note indicated that decalibration could occur under adverse containment conditions and inferred that attachments 6 and 8 should be used in that case. Therefore, substeps a and b should have been labled actual level. The licensee will revise the procedure.

- Based upon walk down comments from one auxiliary operator (AO) and three COs, the operation required in Step 2.c of Attachment 9 was infrequent enough such that a procedure reference was required, e.g. "... feed to T-2 in accordance with Section 7.5 of SOP 12." The licensee agreed to revise the procedure.

- In Step 50.c, the second "go to" transfer should have been to Step 50a. The licensee agreed to revise the step.

- Step 62.b, the sentence was poorly worded. Since PCS pressure was a DHR entry condition, this portion of the statement could be deleted. The licensee agreed to revise the step.

- Step 73 used the word "check" as it was defined in the Writer's Guide. Since the operators had not received training in the guide, they were unaware of its meaning. The licensee agreed to incorporate this in EOP training.

- In Step 77.f, the word acceptable was used without definition. Walkdown operators were not certain what was acceptable. The licensee will clarify the step.

- In Attachment 8, the graph on page 1, was contrary to the standard convention which was followed for all other graphs in this procedure (e.g. input variable on the X axis and output on the Y axis). The licensee will evaluate this item.

5. EOP 5.0, "Steam Generator Tube Rupture"

- Step 20.c stated that the operator was to perform steam line radiation surveys upstream of the main steam isolation valves (MSIVs). A note should have be added to alert the health physics technician to take a radiation monitoring instrument with a long extension on the detector, since the steam lines were approximately 10 feet above the floor level.

  The licensee agreed with this observation and agreed to incorporate information in the procedure identifying the need for a radiation monitoring instrument with an extension on it.

- Step 53.a stated, "Block MSIV closure by pushing the BLOCK ISOLATION pushbutton on panel C-01." However, the label plate for the switch on Panel C-01 did not clearly describe this function. The licensee agreed to make the label information on the panel and the EOP identification match.

- Step 2 of Attachment 5 stated "Transfer Main Turbine Gland Sealing Steam to Plant Heating System per SOP 13, Section 7.6.1." The AO, walking down this procedure, did not think it was the correct procedure because of the wording in SOP 13, Section 7.6.1, which discussed putting the Steam Superheater M-911 in operation. The licensee agreed to review the wording in SOP-13 and EOP 5.0 and clarify it, if necessary.

- Steps 2.a and 2.b of Attachment 8 stated, "Commence Special Valve Lineup." The required valve lineups were not delineated and the operators were required to go to the drawings and determine the required valve lineups. The licensee agreed to develop a procedure to delineate the special valve lineups.

- Step 62.a referred to SOP-5, Step 7.2.1.b referred to Hydrogen Recombiner M-65A instead of M-69A. The licensee agreed to correct this error.

- CEN-152 entry conditions included high activity and conductivity in the steam generator liquid sample and an increasing steam generator level. EOP 5.0 did not include these two parameters as entry conditions. The licensee had not identified this as a deviation. The licensee gave as justification for not using these two parameters

that enough parameters (e.g. high radioactivity alarms, volume control tank level decreasing, standby charging pumps started, pressurizer level decreasing, and pressurizer pressure low) were already used.

- Step 6.b of Attachment 1, "Safety Function Status Check Sheet," gave the acceptance criteria as Tave less than 545° F whereas CEN-152 gave RCS Th less than [525° F]. The licensee justification for this difference was that the RCS Th temperature had been changed from RCS Tave in Supplement 2 of Revision 3 to Th in the final Revision 3 of CEN-152. The licensee's representative stated that they were waiting for NRC approval of Revision 3 to the Combustion Engineering Emergency Procedures Guidelines before incorporating this change. As noted in paragraph 2 of this report, NRC approval has already been issued and the licensee's representative committed to revise the EOPs to this revision during the next biennial review of the EOPs.

- Step 4.0.7 stated that the operator was to commence emergency boration to establish cold shutdown boron concentration. There was no comparable step for this action in CEN-152 and it was not discussed by the licensee as a deviation. The licensee's basis document only discussed increasing the shutdown margin. This observation was discussed with licensee personnel and appeared to be a conservative action which would not negatively impact safe operation of the plant.

- EOP 5.0 provided instructions (Steps 15 through 19) for primary coolant pressure control prior to determining which steam generator had a tube rupture rather than following the sequence in CEN-152. The licensee did not identify and justify this deviation. The licensee's representative stated that identifying the steam generator with the leaking tube would take time and in the interim the leak rate could be reduced by reducing primary coolant pressure. The licensee was evaluating the addition of justification for this step sequence deviation to the basis document.

- Step 12 of CEN-152 stated that the operator was to control pressurizer pressure at less than 1000 psia and approximately equal to the isolated steam generator pressure (+/- 50 psia). The EOP 5.0 comparable step specified to restore or maintain the pressurizer pressure as low as possible within the limits of the pressure-temperature curve. This deviation was not discussed in the deviation document, however, the licensee's representative stated that to reduce the pressure to less than 1000 psia could result in violating the pressure-temperature curve restrictions. The licensee agreed to consider including a discussion of this deviation in the basis document.

- The wording of Steps 5 and 6 in Attachment 8 was such that the inlet valve to one miscellaneous waste filter could be opened and the outlet valve to the other filter could mistakenly be opened. These steps should be rewritten to ensure the inlet and outlet valves for the same filter are opened. The licensee agreed to clarify the wording in these steps.

- The caution after Step 6 in Attachment 8 warns of potential high radiation levels, but did not suggest health physics coverage or the use of a radiation monitoring instrument. The licensee agreed with this observation and will correct the step.

- The AO and the I&C technician that walked down Attachment 8 with the inspectors had not received training on the procedure and had some difficulty finding specified valves and electrical terminals. They were both well qualified, appeared to know the plant well, and found all the designated components; however, it was apparent that training on the EOPs would have ensured the required actions being taken in a timely manner. It appeared that component location information, if added to some of the procedures, would have been of benefit in helping locate components in a timely manner. The licensee agreed to evaluate this observation.

- In Step 2.c it was not clear whether one or two standby charging pumps starting constituted the entry condition. According to the operator, one pump starting could be an indication. Inconsistent component references also contributed to lack of clarity in this instance. The previous step indicated component ID numbers using an "or" between numbers. The licensee agreed to evaluate this observation.

- In Step 10, no reference was given for the PCP operating limits. The licensee's position on this observation was that operating the PCPs was within the skills of the operator using existing indications and alarm response procedures.

- Step 17 refers to the use of the core exit thermocouples (CETs), different operators used different methods in using the CETs. The licensee agreed to evaluate the need for guidance in obtaining and using CET information.

- In Step 35 the operator was referenced to Attachment 4, "if additional PCPs are desired," however, no criteria was provided for operating additional PCPs. The licensee agreed to evaluate this observation.

- The caution prior to Step 52 should have informed the operator of the consequences of exceeding the specified limits (i.e., "exceeding a PZR cooldown rate of 150 degrees F/hr or a PZR spray delta T of 350 degrees F could cause . . . ."). The licensee agreed to evaluate this observation.

6. EOP 6 "Excess Steam Demand Event"

- Step 2 directed sampling for S/G activity, but sample results were not used to determine corrective actions. The licensee agreed to evaluate and consider expanding the step and/or directing an exit to EOP 9.0.

- Procedure EM-04-08, Steps 5.5.L and T request Xenon reactivity at the "desired" time after shutdown. However, there was no place to record the desired time. An operator reviewing the calculations or verifying the proper boron concentration would not know the date and/or time upon which the calculations were based. The licensee agreed with the comment and will evaluate this concern.

- Step 26.b referred the operator to Attachment 5. Attachment 5 did not reflect the pump parameters of FSAR Table 6-2 for the LPSI pumps and Table 6-3 for the HPSI pumps. For example, Table 6-2 stated that the maximum pump flow was 4500 gpm for a two pump total of 9000 gpm. The appropriate chart to Attachment 7 did not go to 9000 gpm. Also, the installed flow meters would provide a total flow of only 8000 gpm. Similar comments were applicable to Table 6-3. The licensee agreed to evaluate this concern.

- The Step 29 CAUTION statement did not include concerns with PTS that were addressed in CEN-152, Revision 3, Submission 2 (and final). The licensee agreed to rephrase the CAUTION to include PTS concerns.

- The Step 37 basis included a condition of imminent loss of suction to require shifting charging pump suction. This condition did not appear in the step. The licensee agreed to evaluate and change either the step or the basis.

- Step 40.d required the use of qualified CETs (number not specified); however, CEN-152, Revision 3, stated the "average of the CETs". This deviation was not addressed. The licensee stated that the term "qualified CETs" will be defined in future training along with other EOP terminology. The licensee agreed to further evaluate this concern.

- Step 55 directed the operator to block safety injection actuation signal (SIAS), but allowed the operator to wait until 1605 psia,

which was the SIAS setpoint. Thus, SIAS might actuate before the operator had a chance to block it. The licensee agreed to evaluate this concern but stated that this had not been a performance problem.

7. EOP 7.0 "Loss of All Feedwater (LOF)"

- Step 7.b. directed the operator to exit the procedure and go to EOP 9.0, "Functional Recovery Procedure". CEN-152, Revision 03, required the operator to consider "Excess Steam Demand Event Optional Recovery Guideline." The licensee's representative believed that the appropriate action was to enter EOP 9.0, and then if appropriate, go to the excess steam demand event optional recovery procedure.

- Prior to Step 49, the operators should have established lake water feed to the steam generators via the auxiliary feedwater pumps. Step 49 directed the operators to EOP 9.0 "Function Recovery Procedure," instead of using a TSC/PRC approved procedure. It did not appear that EOP 9.0 addressed the situation and it may have been more appropriate to prepare a procedure that addresses the situation. The licensee agreed to review this comment.

- Paragraph 11 had a caution note that implied that feed to a dry S/G could happen; however, the previous steps sent the operator to EOP 9.0. The inspector questioned if the caution was appropriate. The licensee agreed to review this comment.

8. EOP 8.0 "Loss of Forced Circulation Recovery"

Section 2.0

- The "THEN" statement in Step 2 was confusing. The licensee's representative stated that they will correct the step as noted.

- The term "Uncomplicated Loss of Forced Circulation" in Step 3 was not defined. The licensee's representative stated that they will evaluate the possible need for changing this step.

Section 4.0

- Step 4 would never be entered because Step 3 sent the operators out of the procedure. If the concern of the basis document occurs, this could best be handled by the use of a "Note." The licensee's representative stated that they will evaluate the possible need for combining this step and Step 3. to resolve this concern.

- Step 5 was similar to Step 6 in Section 4.0 of EOP 2.0. The licensee's representative stated that they will evaluate the need for revising this step and the step in EOP 2.0.

- In Step 7, a "Note" should be added to have the auxiliary operator start the "B" air compressor. The licensee's representative stated that they will evaluate the possible need for adding the note.

- Step 14 needed to specify if the step was referring to the main feed line, the auxiliary feed line, or any feed line. The operators were confused on this. The basis document stated main feed line, but it appeared that the step should be applicable to any feed line. The licensee's representative stated that they will evaluate the need to clarify this point.

- The inspectors questioned if EOP 8.0 would still be applicable if in Step 16.a.i a PCP is operating. This could have been clarified by adding the word "verify" after the word "THEN", or replace "THEN" with "AND." The licensee's representative stated that the first part of this statement will be retained because it is their standardized SI throttling statement. The second part of the step will be corrected as noted.

- Acceptance criteria for degraded pump or a break in an injection line needs to be defined and addressed in Step 18.b. The licensee's representative stated that they will evaluate the possible need for resolving this issue.

- The logic of Step 24 should have been reverse to eliminate the "go to" statement, which transferred the operator to the next step. The licensee's representative stated that they will evaluate the need to revise this step.

- Step 32.a was redundant and should have been eliminated. The licensee's representative stated that they will evaluate the need to eliminate this step.

- The meaning of the "refer to" in Step 45 was different from that in Step 47. This needed to be clarified at this point and throughout the procedures. The licensee's representative stated that they will evaluate the need for revising the step and/or providing additional training on the meaning of the "refer to" statement.

- Step 51.j was not needed. The licensee's representative stated that they would evaluate the need for eliminating this step.

Palisades did not have an EOP operator action setpoint document, single source approved document from which EOP writers and reviewers extract operator action parameter values (e.g., under adverse containment conditions, the pressurizer should be considered solid when board instrumentation reads X). Instead, operator action setpoints and

supporting calculations had been merged into the individual EOP basis documents which serve primarily to document deviations between the GTG and the PSTG. The licensee needed to create a single source EOP operator action setpoint document.

The licensee was unwilling to commit to resolution of this recommendation.

Paragraph 6.4.1.3.2 defined the Palisades safety functions. The radioactive control safety function was not included in the definition nor was the safety function included in the EOPs. Supporting documentation noted the deviation is based upon installed radiation monitoring equipment and implementation of the Palisades Emergency Plan. These items addressed accident assessment and dose reduction.

The licensee correctly stated that the direct radiation component of this safety function was addressed. The indirect radiation component of the function was not treated because the GTG did not treat it. The item was discussed in the PGP submission to NRC. The licensee did not commit to treat indirect radiation in the EOPs.

ATTACHMENT III

HUMAN FACTORS DEFICIENCIES

The following human factors deficiencies were observed in the Palisades EOPs. These items are provided as specific examples of the general human factors concerns discussed in Section 8 of the report.

1. Structure

In EOP 1.0, Step 8 the format of contingency actions was inconsistent with the format used in previous steps. In previous steps, contingency substeps directly paralleled the instructional substep by the same alphanumeric designation, in Step 8, this convention was not used.

In EOP 4.0, pages 14 and 21, large blank spaces were left at the end of the page, which appeared to indicate the end of a section even though related steps continued on the next page.

EOP 5.0 contained 40 contingency action steps and provided an example of how the procedures were heavily dominated by IF/THEN conditional statements.

2. Transitions

EOP 2.0, Step 15 required the operator to determine if PCP operating limits were satisfied, however, no reference was provided for these limits.

EOP 2.0, Attachment 3, Step 2.c indicated the need for a special valve lineup as a source of available feedwater inventory; however, no reference was provided for the valve lineup required for this mode of inventory makeup.

During walkdown of EOP 3.0, the AO stated that he would refer to SOP 30 for guidance in performing the task required by Step 45; however, no reference to SOP 30 was provided.

The reference to EOP 4.0, Step 50.c identified substep (a) only, and did not identify the higher level step (50). Since the reference immediately preceding this step (Step 50.b) was to Step 51, this could have been misleading.

In EOP 5.0, Attachment 5, Step 3, the reference to Section 7.6.1 of SOP 12 appeared to be incorrect. Section 7.3.3 of SOP 12 appeared to be the correct reference.

In EOP 5.0, Step 33, several interfacing procedures were referenced; however, the step did not identify the purpose of the reference (e.g.,

to energize a bus or regain power). The applicable sections of the referenced procedures were not specified, nor the order in which they should be implemented.

The reference to the Technical Data Book in EOP 5.0, Step 7 did not identify the applicable figure that was required for this step.

EOP 6.0, Steps 20.c, 20.d, and 25.c referred the operator to Attachment 1, but did not specify the applicable section(s).

No reference was provided in EOP 8.0, Step 49.b.i to the applicable SOP that defined shutdown cooling entry conditions.

3. Component Identification

The reference to the ITC switch in EOP 3.0, Step 8.b was inconsistent with the actual labeling of the switch in the control room (labeled Backfeed). Also, the position referred to in the procedure as "cutout" was not consistent with the labeled position (transfer cutout).

EOP 3.0, Step 13 was illustrative of instances where the format of the procedural references to components was not consistent with the labeling conventions used in the plant.

EOP	Plant	EOP	PLANT
MV-WE008	MV-008WE	MV-CD133	MV-133CD
MV-WE050	MV-050WE	MV-CD136	MV-136CD
MV-WE007	MV-007WE	MV-CD138	MV-138CD
MV-WE026	MV-026WE	MV-FP119	MV-119FP
MV-SW124	MV-124SW	MV-120	MV-120FP
MV-FP180	MV-180FP		

The reference to the block isolation pushbutton in EOP 5.0, Step 53.a was inconsistent with the actual labeling of the switch in the control room.

EOP 5.0, Attachment 5, Step 8 directed the operator to check closed the blowdown tank vent valves (MV-MW158 and MV-M5160); however, MV-MW158 was the flash tank vent valve.

During the walkdown of EOP 5.0, Step 2.a.3, the RO had difficulty locating Stack Gas Monitors RIA-2318 and RIA-2319. Since these monitors were backups that were infrequently used and located on a back panel

separate from primary monitors, a notation should have been made as to their location.

The numerous component references on containment isolation checklist in EOP 6.0, Attachment 7 were inconsistent with labels in the control room.

The bus number in ONP 2.1, Step 1.2.a should have been added behind the breaker number (e.g., 152-305 at Bus 1E) to aid the AO in locating the breaker.

4. Clarity of Instructional Steps

EOP 2.0, Step 2 was unnecessary in that the operator would not be directed to this procedure unless safety function criteria had been met.

If the operator observes the logic of EOP 2.0, Step 3, he will never get to Step 4. If these steps were considered simultaneously, they become contradictory.

The sequence in EOP 3.0, Attachment 6, Steps 2, 3, and 4 needs rewording. If Step 2 instruction (to open PCV-0632) was followed, then the Step 4 condition (IF PCV-0632 is closed) would never be applicable. Step 3 was unnecessary.

EOP 4.0. was illustrative of the extensive use of continuous and nonsequential steps (17 and 54 respectively) in the Palisades EOPs. The designation of such steps did not always appear to be consistent. Operators expressed differing opinions on when these steps should or could be performed. Although sequential steps have a marginal line for use in place keeping, no effective means existed to track unaccomplished nonsequential actions nor was there a single page display to use as a reminder of continuous action steps.

The placement of Step 12 in EOP 4.0. interrupted the flow of the related steps.

5. Use of Logic Terms

The conditional phrase "IF at least one PCP operating" in EOP 1.0, Step 8.c, was improperly provided as a footnote and was also used improperly to indicate a plant condition when no operator action was required.

EOP 2.0, Steps 7, 8, 10, and 11 were illustrative of incorrect highlighting of terms when they were not used in a conditional logic statement. This was a general problem found in all EOPs.

EOP 2.0, Step 19, implied a desired plant condition IF certain conditions were met rather than instructing the operator to perform specific action (e.g., "THEN go to GOP 9, Section ____ to initiate plant cooldown").

WHEN/THEN logic terms were used in EOP 3.0, Attachment 1, Step 7.c.ii to indicate plant conditions for acceptance criteria rather than contingent operator actions.

EOP 4.0, Step 11 this step used layered logic statements. The condition stipulated in Substep C was repetitive of the condition stipulated in the higher level step.

EOP 4.0, Step 27 was an example of an inappropriate use of IF/THEN logic terms since this was not an action statement.

EOP 4.0, Steps 28/29 and 30/31 used inconsistent format in presenting IF/THEN and IF/NOT statements. Steps 28 and 29 presented IF/NOT conditions as a separate step, while Steps 30 and 31 presented IF/THEN and IF/NOT conditions as part of the same step.

6. In-Plant Labeling and Accessibility

EOP 5.0, Attachment 8, Step 3, required the AO to operate Valve MV-DRW809, which was located at a height requiring a ladder for some AOs to reach. No ladder was provided in the area.

EOP 5.0, Attachment 5 referred to SOPs 12 and 13. Valve MV-VAS915 and Temperature Indicator TI-8929 called out in the SOPs were not labeled. Also, the TI located near TI-8929 was not labeled.

ONP-20, Step 4.2.c required the use of a ladder, however, the ladder that was provided outside of Swithchgear Room 1C was too long for this application.

ONP-20, Step 4.6.1 required the use of a small ladder, which was not available in the immediate area.

7. Cautions and Notes

The caution in EOP 3.0, Step 21 related only to Substep b, but was not so indicated.

A note should have been added to EOP 5.0, Step 20.c which would alert the health physics technician to the requirement for using a monitoring instrument with a long handle or extension, because the steam lines to be monitored were approximately 10 feet above floor level.

The note in ONP 20, Step 4.5 was provided on the page prior to the associated step, and the note and caution provided for this step implied operator instructions.

The note in EOP 5.0, Step 47 contained instructions for plant restart that were not necessary or appropriate for the operator while in this EOP.

8. Vocabulary

Operators differed in their interpretation of the statement "Verify qualified CETs" in EOP 1.0, Step 6.c. The number of qualified CETs they would check varied from as few as one to as many as five, and some said they would printout all of the values. The location of the core matrix from which they were to be selected (some from center or near center, some from perimeter) was also a source of confusion.

Some operators interpreted the statement "Auxiliary Feedwater flow available" as meaning that flow must be present to meet this condition, and some interpreted it as meaning that power to the auxiliary feed pump breaker was sufficient.

Some operators defined "Uncomplicated reactor trip" as a trip for which all left hand column steps (conditions of EOP 1.0) had been satisfied.

Some operators interpreted the statement "Service water available" in EOP 3.0, Step 8, to mean being supplied, while others interpreted it to mean "can be supplied if necessary."

The "Warning" in EOP 3.0, Step 12, was not defined in the Writer's Guide, nor was it addressed in lesson plans for operator training.

Many operators indicated that they did not know the meaning of the term "integrated" in the caution step of EOP 3.0, Step 14.

The term "Delta T" in EOP 4.0, Step 42, should be defined for clarity since it does not refer to the usual Th minus Tc.

9. Operator Aids

The first decision block (PCS SUBCOOLING RISING OR EITHER S/G PRESSURE < 700 psia?) on page 6 of EOP 1.0, Attachment 1, was identified by operators as being confusing because of the "OR" and that "<" had recently been changed from ">". This block would be clearer if split into 2 blocks, which would avoid the OR condition.

The conditional statement on page 8 of EOP 1.0, Attachment 1, included as a note should have been included as a decision block(s) in the flowchart structure.

The presentation of the graph in EOP 4.0, Attachment 8, page 1, was not consistent with the convention followed on other graphs in this attachment (e.g., input variable on the X axis and output variable on the Y axis).

When questioned, there was a discrepancy among operators on how to use "non-sequential" steps. Some operators stated that these steps could be performed at any time, while others stated that the procedure must be completed up to that step before the step could be completed in a "non-sequential manner." Several operators were confused as to the difference between a "non-sequential" step and a "continuous" step. The licensee stated that "non-sequential" and "continuous" steps may be performed at any time. The licensee will evaluate the need for such a large number of "non-sequential" steps.

Alarm panels were indexed in different manners on different parts of the control boards. One set of panels was indexed from the top left, left to right, and top to bottom. Other panels were indexed from the top left, top to bottom, and left to right. The licensee's representative stated that the alarm response manuals were written in such a manner as to preclude any performance problems associated with alternate indexing methods. The licensee did not plan to modify the alarm indexing scheme.

ATTACHMENT IV

VERIFICATION/VALIDATION DEFICIENCIES

Specific deficiencies regarding of the V&V program are provided below. The licensee committed to evaluate the identified programmatic weaknesses. Some examples of V&V weaknesses as evidenced in the EOP procedures are included as illustrations.

It should be noted that the deficiencies in Attachment II and III were not identified during the Palisades V&V and, therefore, generally constitute V&V weaknesses as well as technical or human factors items. It is also noted that NUREG-1358 was issued shortly before this inspection and the licensee did not have time to review and incorporate its guidance into the EOP upgrade program.

Programmatic weaknesses:

1. V&V was not required and had not been accomplished on the EOP supporting procedures to which the EOPs refer or transfer.

2. The V&V process instructions did not require an independent review. Administrative Procedure 4.06, Sections 6.6 and 6.7 described technical reviewer and validation team staffing requirements, but did not include a requirement that these personnel be independent of the EOP procedure writers.

3. Administrative Procedure 4.06 contained reference to technical notebook(s). The notebooks were no longer being used.

4. Administrative Procedure, Section 6.6 verification requirements did not extend into the plant; only control room walkthroughs were required.

5. Validation requirements could be met with only simulator validation and without a control room walkthrough. To the extent that the simulator differed from the main control room, such a validation may have been inaccurate.

6. Paragraph 6.7.2 listed validation methods in the order of simulator, tabletop, and walkthrough. This order inferred that the table-top would be preferred to walkthrough.

7. Paragraph 6.7.3.a.2 indicated the operations superintendent was responsible for determining if validation was required. A minimum requirement for validation should have been stated (e.g., all EOP numbered revisions will be validated).

Specific V&V comments:

EOP 3.0

1. Steps 13 and 24: Nomenclature differences between plant labels and the EOP were found in the case of 7 valves. EOP labeling was MV-WExxx; plant labeling is MV-xxxWE in Step 13 and MV-CDxxx vs MV-xxxCD in Step 24.

2. Step 59 b.3.e: The breaker was normally racked out. The procedure did not require rack in.

EOP 4.0

1. Steps 4 and 5 were incorrectly sequenced; Step 5 should have appeared first, which was the only way the direct transfer could be made to EOP 9.0. As written, the operator who had misdiagnosed the LOCA would be delayed in a loop until he was directed to EOP 9.0 by the status checks.

2. Step 13d: This step should have been related to PCP CCW flow or particular valves, not to "any CCW valve isolation valve closed." It was possible to have many CCW isolation valves closed without loss of flow to the PCS pumps.

3. Step 49.e: Valves were transferred to an alternate controller, not an alternate supply.

4. PSTG DEV: GTG Supplementary Instruction 6 required that the operator should be cautioned against premature manual RAS initiation, which could lead to insufficient sump inventory. No caution was contained in the EOP, no deviation existed, and the item was not specifically addressed in EOP support training.

5. Attachment 2 pump curves: Step 29.b labeled the curves as minimum flow requirements. The curves did not indicate minimum. In addition, since the four individual meters upper limit was 250 gpm, the curves for two pump operation should have stopped at 1000 gpm.

6. Step 12 was interspersed between Steps 11.c and 13, which evaluate and maintain CCW to the PCS pumps.

7. Step 50.c: The second "go to" transfer should have been to Step 50.a.

8. Step 77.f: The word acceptable was used without definition. Walkdown operators were not certain what was acceptable.

9. Attachment 8, graph on page 1: This presentation was contrary to the standard convention, which was followed for all other graphs in this procedure (e.g., input variable on the X axis and output on the Y axis). The licensee agreed to evaluate this item.

EOP 5.0

1. SOPs 12 and 13 were rarely used; equipment location was not specified.

2. Some plant components were unlabeled; lack of labeling contributed to delays during AO walkdowns (e.g., MV-VAS 915 and TI-8929 were missing labels; an ID number marker near MV-VAS 915 appeared to read 913)

3. A ladder was required to reach Steam Traps ST-8641 and 8928 in the evaporator boiler room. The nearest ladder was two rooms away and searching for the ladder contributed to walkdown delays and would also delay EOP response.

4. Component referencing was sometimes inconsistent (e.g., MV-118FW was referenced in the procedure as MV-F118; MV-RWS120 as MV-RW 120)

5. Attachment A referred to Step 7.6.1 in SOP 12; the proper step was 7.3.3

6. Steps 5 and 6 of Attachment 8 identified inlet and outlet valves for Tanks F59 and F62. However, the identification was not unique to a particular tank.

Administrative Procedure 4.06

Paragraphs 6.2.1 and 6.2.2 defined the Palisades PSTG, which consisted of four administrrative procedures, the GTG, the F&TA report, Technical Specifications, existing EOPs, the FSAR, EOP related licensing letters, and as-build plant drawings. This was about 30 seperate publications which would stack over 5 feet high. Portions of the PSTG were neither plant specific (e.g., CEN-152) nor technical (e.g., four administrative procedures, the Writer's Guide, FT&A). As a result, the PSTG was an unweildy document which was extremely cumbersome to use effectively.

The NRC team noted that this deficiency had little impact on success of the program, principly because the entire development program was accomplished by a few well qualified individuals whose span of control extended to all facets of the program. However, in the event of a significant process or staffing change, the lack of a consolidated PSTG could inhibit the program.

ATTACHMENT V

Persons Contacted

Consumers Power Company

G. Slade, Plant General Manager
J. Lewis, Technical Director
*R. Orosz, Engineering and Maintenance Manager
*R. Rice, Operations Manager
*W. Beckman, Radiological Services Manager
*J. Hanson, Operations Superintendent
H. Tawney, Mechanical Maintenance Superintendent
K. Osborne, Projects Superintendent
R. Brzezinski, I&C Superintendent
L. Kenaga, Radiation Protection Manager
*C. Kozup, Licensing Engineer
J. Brunet, Licensing Analyst
*D. Malone, Licensing Analyst
L. Dicks, General Simulator Instructor
R. Massa, Shift Supervisor
B. Dusterhoft, Operations Support Coordinator
L. Schmiedeknecht, Supervisory Instructor
C. Oberline, Senior Instructor
D. Armstrong, General Simulator Instructor
D. Rogers, Training Administrator
P. Schmidt, Senior Nuclear Instructor
J. Lewis, Auxiliary Operator
G. Beechan, Control Operator
J. Sherman, Auxiliary Operator
S. Cogswell, Control Operator
R. Stanton, Control Operator
G. Perkins, Control Operator
D. Peterson, Operations Support Coordinator (Training)
T. Watson, Senior Nuclear Operations Analyst
G. Alkire, Senior Reactor Operator
S. Cogswell, Reactor Operator
J. Schwanekamp, Auxiliary Operator
R. Shaffer, Auxiliary Operator
B. Kubacki, Senior Reactor Operator
D. Retton, Auxiliary Operator
M. Holbein, Shift Supervisor
M. Kane, Shift Supervisor
J. Ford, Control Operator 1
J. Waskiewicz, Control Operator
B. Bensen, Shift Supervisor
G. Groff, Reactor Operator
T. Bauer, Auxiliary Operator

Nuclear Regulatory Commission (NRC)

*E. Swanson, Senior Resident Inspector
G. Wright, Chief, Operations Branch, Region III

*Denotes some of those present at the Management Interview on August 4, 1989.