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INSPECTION REPORT

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LICENSEE: Connecticut Yankee Atomic Power Company
P. O. Box 270
Hartford, Connecticut 06141

FACILITY: Haddam Neck Power Plant

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DETAILS

1.0 EXECUTIVE SUMMARY

A special, announced team inspection was conducted of the Connecticut Yankee Atomic Plant emergency procedures. The purpose of the inspection was to determine if the emergency procedures used at Connecticut Yankee Atomic Plant were technically correct; if their specified actions could be physically accomplished using the existing equipment, controls and instrumentation; and if the available procedures had the usability necessary to provide the operators with an effective operating tool. For this inspection, the term emergency procedures included the EOP-Ws (those EOPs which were based on the Westinghouse Emergency Response Guidelines), EOP-CYs (those EOPs which were developed by Connecticut Yankee), AOPs, and all procedures referenced directly within the EOPs and the AOPs specified above. The inspection consisted of reviewing facility documents and procedures, performing procedure walkdowns both in the control room and in the plant, testing in the simulator the effectiveness of the EOPs under various accident conditions and interviewing facility personnel.

The overall assessment of the Connecticut Yankee Atomic Plant (CYAP) emergency procedures in place at the time of the inspection is that the program for generation and maintenance of the procedures is good. The procedures were well written and the operators were able to use them during both the plant walkdowns and during the simulator exercises. The EOP-CYs and AOPs were identified as being in a somewhat less acceptable condition than the EOP-Ws. The EOP attachments also failed to follow the Procedure Generation Package guidelines. The principle problem was a failure to follow the PGP Writer's Guide rules regarding format and grammar.

The inspection team also reviewed the corrective actions relative to Deviation 50-213/87-10-01. The licensee's actions were acceptable and the deviation was closed.

2.0 BASIC COMPARISON OF OWNERS GROUP ERGs WITH FACILITY EOPs

2.1 PURPOSE:

To ensure that the licensee had developed sufficient procedures in the appropriate areas to cover the broad spectrum of accidents and equipment failures.

2.2 SCOPE:

The inspectors compared the Connecticut Yankee Atomic Plant (CYAP) EOPs to the Westinghouse Owners' Group (WOG) list of Emergency Response Guidelines (ERGs), Revision 1A of the High Pressure Version, to ensure the licensee had developed procedures in accordance with WOG recommendations. The

inspectors reviewed differences between the EOPs and the ERGs to assess the adequacy of the documentation of safety significant deviations.

2.3 FINDINGS:

All appropriate ERGs were included in the CYAP EOPs.

2.4 CONCLUSION:

The team determined that appropriate procedures addressing the broad spectrum of accidents and equipment failures had been developed and implemented by the licensee. Minor deviations and discrepancies are addressed in Attachment 2 to this report.

3.0 INDEPENDENT TECHNICAL ADEQUACY REVIEW OF THE EMERGENCY PROCEDURES

3.1 PURPOSE:

Review the emergency procedures to assure that procedures are technically adequate and accurately incorporate the guidelines of the ERGs.

3.2 SCOPE:

The EOPs listed in Attachment 1 were reviewed to verify that the appropriate prioritization of accident mitigation strategies were incorporated into the EOPs as directed by the ERGs. The EOPs followed the recommended vendor step sequence except where site specific design dictated otherwise, such as when the ERGs addressed electrical distribution or cold leg recirculation. All entry, exit, and procedural transition points were correct and could be followed. The EOPs were also reviewed for consistency with guidance provided in the CY EOP Writer's Guide and human factors principals as described in NUREGs 0899 and 1358.

3.3 FINDINGS:

A. DEVIATIONS BETWEEN EOPs and ERGs

The review of the deviations between the EOPs and ERGs identified two concerns.

Station Policy Deviation - During review of the supporting documentation for E-3, STEAM GENERATOR TUBE RUPTURE, the inspector noted that a time limited break flow termination existed. Specifically, FSAR Chapter 15.2.10 credits termination for tube rupture break flow within 30 minutes of accident initiation by closing the loop stop valves in the faulted loop. This is documented in the EOP Step Deviation Documents as justification for the attachment which provides for isolating a faulted loop.

Current station policy is not to utilize the reactor coolant system (RCS) loop stop valves to isolate a faulted loop. Break flow is to be terminated by depressurization of the RCS to a pressure below that of the faulted steam generator (SG).

To verify that this policy would support the intent of the FSAR assumption and accident analysis, a SG tube rupture (SGTR) scenario was run for two operating crews on the plant simulator. Both scenarios were identical: the "B" emergency diesel generator and "B" auxiliary feedwater pump were inoperable and there was a steam leak on the No. 2 SG safety valve. The initiating event was a tube rupture in the No. 2 SG.

Both operating crews complied with the station policy and did not isolate the faulted loop. Crew No. 1 did not terminate break flow within 30 minutes. Crew No. 2 terminated break flow within 25 minutes; however, break flow was immediately reinitiated when the operators continued with E-3. Specifically, the RCS was depressurized using the pressurizer PORV. When the PORV was closed, pressure immediately increased because of continuing safety injection system discharge into the RCS. The licensee has been aware of this inability to fulfill this accident analysis assumption and is continuing to evaluate methods for resolving it.

Justification of Deviations - Deviations between the plant specific EOPs and the ERGs in most instances had adequate technical justification. However, a few ERG provisions were not incorporated into the EOPs in exactly the same manner. The justifications for these modifications did not contain enough detail or were not completely developed. The following were examples of this lack of justification:

> In E-0, REACTOR TRIP OR SAFETY INJECTION, Step 20.b, SG pressures were checked "GREATER THAN 50 PSIG", but the ERG step checked SG pressures "COMPLETELY DEPRESSURIZED". The Deviation Document contained no justification for this deviation.
>
> In FR-Z.1, RESPONSE TO HIGH CONTAINMENT PRESSURE, Step 2, containment spray was initiated at 50 PSIG, but the ERG background document defined this pressure to be the containment design pressure, which was listed as 40 PSIG in the FSAR. The Step Deviation Document justified the use of a 50 PSIG value with a statement that containment spray was not credited in the design basis accident analysis. The justification stated that containment air recirculation fans (CARFANs) and their service water cooling coils were credited with keeping containment pressure below the design pressure limit of 40 PSIG and, therefore, containment spray would only be used when it was positively determined that containment pressure was outside the design basis envelope. The justification, as written, did not consider

the fact that CARFAN/service water malfunctions could result in containment pressures greater than the design limit without the use of the containment spray system.

In FR-I.3, RESPONSE TO VOIDS IN REACTOR VESSEL, Steps 18 and 20, the operator was directed to take action when RVLIS head indicated "greater than 49%", but the ERG directed the same action when the RVLIS indicated "upper head full." The Step Deviation Document justified the modification by stating that a level of 49% was used to prevent a water slug flow from damaging the head vent piping, but did not provide any justification to show that a 49% RVLIS head indication correctly satisfied the ERG specified requirement that the RVLIS indicated upper head full.

B. SETPOINT DOCUMENTATION

Several plant specific setpoints were selected from the EOPs and compared to the setpoint documentation. Most of the setpoints selected from the EOPs matched the setpoint documentation, but there was one area in which the validity of the setpoints was not well established. The area of concern involved the Steam Generator (SG) water level setpoints used throughout the EOPs. In the licensee's EOPs, the SG wide range level indication systems were used. The ERG used SG narrow range level indication systems. The licensee used the justification that the SG narrow range level indication systems were not EEQ qualified, but the SG wide range systems were EEQ qualified and that there were two wide range level indication systems vice the one narrow range level indication system for each SG. A graph titled, "STEAM GENERATOR WIDE RANGE/NARROW RANGE CORRELATION GRAPH," was developed using actual plant data obtained during a plant cooldown. This graph was used in the EOPs as a back page to provide operators with a correlation between narrow range and wide range indications over the temperature range the plant would normally operate. The graph was necessary, because the narrow range level indication system was calibrated when the plant was hot and the wide range level indication system was calibrated when the plant was cold. As a result, the two different level indication systems vary in the opposite direction with changing plant temperature. Throughout the EOPs, the same SG wide range level setpoints were used to correspond to the SG narrow range setpoints specified in the ERGs. There was no justification, however, in the Deviation Documentation addressing the fact that a SG wide range level that corresponded to a SG narrow range level at normal operating temperature would also correspond to the same SG narrow range level at a lower or higher temperature. The Deviation Documentation therefore, did not ensure that the SG level being maintained by the operator using the SG wide range indication system would be in agreement with the level specified in the ERG regardless of plant temperature.

C. EOP Writer's Guide and Human Factors

Guidance for the preparation and revision of EOPs at CY is provided in Attachment 1, Section 3 of ACP 1.2-6.13, "Writer's Guide for Emergency Response Procedures." In general, the guidance provided in this document is consistent with accepted human factors principals and guidance provided in NUREG-0899. There are some areas, however, where guidance is incomplete or not sufficiently restrictive to ensure consistency in the EOPs. Many of the human factors related deficiencies noted in the EOPs were reflective of incomplete guidance, although there were some problems identified for which guidance did appear adequate but was not consistently applied to the EOPs.

There were also organizational problems noted with the Writer's Guide. Discussion of related requirements is sometimes scattered across different (and sometimes inappropriate) sections of the document. For example, requirements for EOP division and numbering are discussed in three different sections (3.3.3, 3.4.5, and 3.4.11). Numbering of contingency action steps is addressed in a fourth section. Lack of succinct, well organized requirements in the Writer's Guide adds to the difficulty of ensuring consistency during the writing and verification of the EOPs.

Findings regarding the Writer's Guide and examples of human factors deficiencies identified in the EOPs are summarized below. Additional examples of human factors deficiencies are included in Attachment 2.

1) Step Numbering - The CY EOPs do not use a unique numbering system for designating instructional steps and substeps at different levels. As specified in Section 3.3 of the Writer's Guide, high level steps and third level steps are designated by Arabic numerals (1-99), and second level steps as well as fourth level steps both use lower case alphabet letters (a-z). This increases the possibility for operator error moving between the two columns or in transitioning to specific steps in the procedures.

2) Identification of Local Actions - Steps directing actions to be performed outside of the control room were not consistently identified as local actions. Because operators are accustomed to seeing most local action steps worded as "Locally perform," deviation from this convention increases the possibility of confusion as to the intent of the step. Although the Writer's Guide provides a definition of the term "local (locally)" as used in the EOPs, it does not discuss requirements for formating of instructions for local actions.

3) Transitions - Language used in the Cautions and Notes, and in the back pages to transition the operator to other procedures or attachments is not always consistent with the direction in the

Writer's Guide. For example, the Writer's Guide specifies using the phrase, "See Attachment XX," for transitions to attachments, and the phrase, "Go To" for transitions to other procedures. However, a note preceding step 16 of FR-H.1 states that the RHR system can be placed in service "using" Attachment A. A Caution preceding the same step refers to aligning the SI system for RHR recirculation "using" ES-1.3. By deviating from we ' defined transitional statements, it may not be clear to the operator whether or not the intent is to exit the procedure completely, or merely to perform the actions specified in the referenced procedure (or attachment) and then return.

When transitions are made to steps that are preceded by a Caution statement, the EOPs sometimes include special wording to emphasize that the Note or Caution is to be observed. This is not done consistently, however, and is not required by the Writer's Guide which states only that such wording "may" be included. Because it is more likely that Cautions will be missed during a transition, this practice must be applied consistently and specified as a requirement instead of an option.

When transitions are made to CY-EOPs or CY-AOPs from the EOPs, the Response Not Obtained (RNO) instructs the operator to go to EOP-XX Step 1. The format for CY-EOPs or AOPs is not consistent with the guidelines of the PGP, in that there is not a step 1. The CY-EOPs have Section 4.0 for Operator Immediate Actions and Section 5.0 for Operator Subsequent Actions. In the CY-AOPs, Section 4.0 is for Operator Actions. This difference in procedure formats can become confusing to the operator.

4) Vocabulary - The terms "verify" and "ensure" are both used in the EOPs and AOPs to indicate to the operator that if a desired condition is not observed, to take appropriate action to establish this condition. The term "check," usually in conjunction with an action verb, is also used for this purpose (i.e., "check open or open diesel generator output breaker"). A consistent approach must be selected and maintained throughout the EOPs and AOPs. Also, there were some differences noted in operator's interpretations of the term "verify" (whether or not operator action was implied). The Writer's Guide as well as the User's Guide must include an expanded discussion on use of these terms, emphasizing the distinctions in their connotations.

5) Use of Logic Terms - In some cases, the terms AND, OR, and THEN are not highlighted when they should be; and, in other cases, they are inappropriately highlighted when used as simple conjunctions. The term OR is sometimes used inappropriately when presenting a hierarchy of contingent actions. There are a number of instances in which the term THEN is implied in a logic

statement rather than expressly stated, followed by a highlighted THEN which introduces a second contingent action. FR-H.1, Step 11.b (RNO) illustrates this problem, "IF HPSI pump can NOT be started, place HPSI pump control switches in TPO, THEN start at least one charging pump." This is inconsistent with guidance provided in Section 3.4.2.3 of the Writer's Guide.

6) Component Identification - The EOPs do not adhere to a consistent methodology for component identification. In many cases, references to valves include only the valve number. In other cases, only the descriptive name (e.g., loop drain header isolation valve) is provided; and, in some cases, both the descriptive name and the component identification number are used. When both are used, a consistent presentation order and format are not always followed. Guidance provided in Section 3.4.2.6 of the Writer's Guide states that equipment will be identified in "operator language"; however, this is insufficient to enure that a consistent approach is used. Use of component identification numbers is not addressed in the Writer's Guide.

7) Cautions and Notes - The CY EOPs contain a number of Cautions and Notes that call for transitions to other procedures or instructions to monitor plant conditions and take action when some specified condition is observed. For example, the Caution preceding step 3 of E-1 directs the operator to "Monitor DWST level. Start makeup to DWST before level decreases to 54,000 gallons." Although Section 3.4.2.4 of the Writer's Guide states that a Caution or Note may be used to provide a contingent transition based on changes in plant conditions and that passive action statements can be used to direct continuous monitoring of a plant parameters, this is contrary to guidance in NUREG-0899 which states Cautions and Notes should not include operator actions. It is also not clear how CY's use of Cautions and Notes differs from a continuous step (as described in Section 3.3.5) or a recurrent step (as described in Section 3.4.7.3).

In several cases, Cautions and Notes contained vaguely worded contingency actions or transitions, informing the operator that an action or transition "can" or "may be" performed, but not specifically directing the operator to do so. For example, a note in FR-H.1 informs the operator that if both turbine driven AFW pumps are not operable, then the electric AFW pump can be locally aligned ... to provide AFW flow. By not providing clear direction as to if and when these actions should be taken, the operator is placed in a position of interpreting or establishing operating policy.

8) Level of Detail - Some steps in the CY EOPs direct the operator to perform a function, but do not identify the specific actions to be taken to accomplish the function. There was not always

enough detail to ensure that the optimal method of task performance would be chosen or that necessary substeps would not be overlooked. Some steps also need to be more specific as to the instrumentation to be consulted by the operator. For example, steps that reference RCS temperature should indicate whether the operator should use hot leg, cold leg, or TAVG readings.

9) Back Pages and Attachments - According to the Writer's Guide, supplemental information that is related to specific EOP steps is to be provided on back pages facing the appropriate step, and information that is not step-specific is provided as attachments. In some cases, the back pages are not referenced in the text of the procedure, leaving it up to the operator to determine when this information is applicable. Attachments also may not be referenced, in which case the operator may not be aware that the information is available.

10) Instructional Step Format - Similar type steps in the EOPs are not always structured in a consistent manner. For example, E-0, Step 27 states "Check steamline radiation levels locally with portable radiation meter - INDICATE BACKGROUND." Step 6 in E-2 breaks this action into two separate substeps. Sections 3.4.2.1 and 3.4.2.2 of the Writer's Guide, which specify the requirements for formatting instructional steps, must describe the sentence structures that are allowed in the EOPs and specify when each is appropriate.

11) Adverse Containment Conditions - The EOPs provide different action level set points for use under adverse containment conditions. Although this practice appears to be standardized in the EOP, there is no discussion in the Writer's Guide of when these values should be provided or the format to be used.

The following problems were identified with the organization of content material in the Writer's Guide.

Section 3.3, "Format," inappropriately includes a discussion of "immediate action steps" (Section 3.3.4) and "continuous steps" (Section 3.3.5) even though there are no special formatting requirements for these types of steps. Discussion of these topics would be more appropriately included in a comprehensive discussion of various types of instructional steps (see comment below regarding Section 3.4.7).

Many other topics that are related to EOP format are not discussed in this section, but instead distributed in various other sections of the document. These include: Section Headings (Section 3.4.5), Divisions, Headings and Numbering (Section 3.4.11), and Status Tree Format (Section 3.5).

In addition to the discussion of instructional step types included under Section 3.3, Format, several other types of steps are discussed in Section 3.4.7, titled "Content of EOPs." This section must be expanded to provide a comprehensive discussion of step types (including those addressed in Section 3.3).

Section 3.4.2.7 is titled "Level of Detail." Included, however, is a partial discussion of recommended action verbs. This section must provide a more comprehensive discussion of requirements regarding level of detail, and discussion of action verbs should be addressed in Section 3.6.4, titled "Vocabulary."

Section 3.4.2, "Operator Actions" includes a discussion of the process for updating EOPs (Section 3.4.11). This information is unrelated to the other subsections that describe requirements for writing the operator actions section of the EOPs.

3.4 CONCLUSIONS:

The team review of the EOPs did not identify any significant deviations from the guidance provided by the Writer's Guide. The team determined that the EOPs were technically adequate and fully incorporated the guidance and intent of the Westinghouse Emergency Response Guidelines with the following exceptions:

The inability to terminate ruptured SG tube break flow within 30 minutes (Paragraph 3.3.A.) is a Deviation from the assumptions of the FSAR Steam Generator Tube Rupture Accident Analysis (213/90-81-01).

The uncertainty of the SG level setpoints used in the "STEAM GENERATOR WIDE RANGE/NARROW RANGE CORRELATION GRAPH" to provide accurate SG level information under all plant temperature conditions (Paragraph 3.3.B.) will be tracked as an unresolved item under Item No. 213/90-81-02.

Although the inspection team concluded that the EOPs were technically correct and useable by the operators, a number of inconsistencies were noted in the application of human factors principals.

4.0 REVIEW OF THE EMERGENCY PROCEDURES BY CONTROL ROOM AND PLANT WALKDOWN

4.1 PURPOSE

Walk down the emergency operating procedures (EOPs) to assure that the EOPs and abnormal operating procedures (AOPs) can be successfully accomplished using the installed equipment, instrumentation, and controls.

4.2 SCOPE

Inspection team members were accompanied by licensed and non-licensed operators during walkdowns of the procedures listed in Attachment 1 to this report. The walkdowns were conducted in the control room and in the plant to ensure that actions required by the procedure could be accomplished using the installed equipment, instrumentation, and controls; and procedural guidance was clear and sufficiently detailed such that operator confusion was minimized.

4.3 FINDINGS

Generally, the inspectors found the procedures contained a sufficient level of detail. The operators were familiar with the procedures and able to perform the required actions. Plant operators were able to easily locate plant equipment and the equipment was accessible. Local operator supply cabinets contained the correct procedures and appropriate materials (i.e., flashlights, batteries, and personnel safety gear). General plant labeling was observed to be good; plant labels are large and easy to read. The directory for breakers and motor control cabinets was observed to be a valuable operator aide.

During the procedure reviews and walkdowns, any deficiencies noted were discussed with operators and the EOP writer. The deficiencies identified are itemized in Attachment 2 to this report. In some cases, the licensee had already identified the particular deficiency and taken action to incorporate the change into the next EOP revision.

The inspectors observed a need for procedure improvement in the areas of consistency between plant labels and emergency procedure nomenclature and incorporation of human factors considerations into emergency procedures to avoid potential operator confusion. Examples of potentially confusing procedure steps included steps in which actions were directed prior to the steps which provide the instructions and steps where it was not specified if the action was to be taken in the control room or in the plant. The concern of incorporation of human factors considerations into the emergency procedures is discussed in detail in Section 3.3.C of this report.

4.4 CONCLUSION

The inspectors determined that the EOPs can be successfully performed using the installed equipment, instrumentation, and controls. Operators were knowledgeable of procedures and associated actions and equipment. The EOPs can be strengthened by incorporation of human factors considerations.

5.0 SIMULATOR OBSERVATION

5.1 PURPOSE:

Operating crews were used during simulated accident conditions to verify that emergency operating procedure (EOP) training provides the operators with the necessary background information needed to correctly implement the EOPs and to assess the usability of the EOPs.

5.2 SCOPE:

By observing the actions of two crews of licensed operators during unrehearsed scenarios, the team was able to assess the crews familiarity with and their ability to utilize the EOPs. The team was able to effectively assess the usage of the EOPs utilizing the simulator.

The scenarios were developed with the intent of providing the team with an opportunity to:

- Determine if the procedures provided the operators with sufficient guidance to perform their required actions.
- Assess the licensee's operating philosophy with respect to the emergency operating procedures, especially where initial reviews had identified differences from the Westinghouse Owners Group Emergency Response Guidelines.
- Observe the crews' ability to perform the emergency procedures with the minimum crew manning allowed by technical specifications and administrative procedures.
- Assess the human factors element associated with the performance of any particular procedure in a "real time" situation.
- Assess the crews' ability to use the EOPs, including transitions to other EOPs or other procedures as required.

The scenario sets consisted of the following: (Expected procedure usage is listed in parenthesis)

All scenarios began with the same initial conditions to provide realism and prevent the operators from trying to second guess the event. They are listed as follows:

- 100% Reactor Power
- 60 gpd tube leak in #2 Steam Generator
- B Diesel Generator danger tagged for maintenance
- B AFW pump danger tagged for repair
- B Control Air Compressor danger tagged for repair
- Hurricane Lili is 150 miles off the coast of Connecticut

First Crew

Scenario 1: Control Air Leak at the reservoirs (ramped to a large break), Steam Generator Feed Regulating Valve Failure, Reactor Trip, three Stuck Control Rods, Emergency Boration valve CH-MOV-366 fails closed (causing the operator to borate using the metering pump), (EOP 3.1-34, E-0, ES-0.1, Opposite page "Emergency Boration").

Scenario 2: Turbine Trip, Reactor Trip, A AFW pump fails to start, Both MFW pumps trip, Auto SI actuation fails, Small Break LOCA on Pressurizer Surge Line (E-0, ES-0.1, FR-H.1, E-1, ES-1.1).

Scenario 3: #2 Steam Generator Tube Leak increases to SGTR, #2 SG Safety Valve fails open 5%, RCS pressure fluctuations, SG level fluctuations, Reactor Trip, Manual SI (AOP-3.2-31, E-0, E-3, E-3 Attach B).

Second Crew

Scenario 1: Control Air Leak at the reservoirs (ramped to a large break), Steam Generator Feed Regulating Valve Failure, Reactor Trip, three Stuck Control Rods, Emergency Boration valve CH-MOV-366 fails closed (causing the operator to borate using the metering pump), (EOP 3.1-34, E-0, ES-0.1, Opposite page "Emergency Boration").

Scenario 2: All four Steam Generators Faulted, ATWS, 2 CAR Fans fail to start, (E-0, FR-S.1, E-2, ECA-2.1,).

Scenario 3: #2 Steam Generator Tube Leak increases to SGTR, #2 SG Safety Valve fails open 5%, RCS pressure fluctuations, SG level fluctuations, Reactor Trip, Manual SI.(AOP-3.2-31, E-0, E-3, E-3 Attach B).

5.3 FINDINGS:

The findings noted are classified into two categories: Procedure Interpretation/Training and Simulator Modeling.

Procedure Interpretation/Training: One crew initiated actions to mitigate an event prior to entering the EOPs, rather than relying on the EOP's diagnostic approach to guide them through the event. Briefly, the operators were required to emergency borate due to a reactor trip with three control rods stuck out of the core. The valve normally used for emergency boration, BA-MOV-366, was pre-programmed to fail shut. Since the crew attempted the boration prior to entering E-0, they did not utilize the RNO step and Opposite Page directions. Ten minutes of discussion and troubleshooting passed before the problem with MOV-366 was correctly

diagnosed by the Shift Supervisor (SS). However, the problem would have been resolved immediately had the crew followed the diagnostic approach of the EOPs, especially the RNO step and Opposite Page directions.

While the crews have been trained to terminate break flow by depressurizing the RCS to a pressure below that of the faulted steam generator, it was not apparent that they know to complete this task within 30 minutes. Both crews were given identical SG tube rupture (SGTR) scenarios on the plant simulator. Crew No. 1 did not terminate break flow within 30 minutes. Crew No. 2 terminated break flow within 25 minutes; however, break flow was immediately reinitiated when the operators continued with E-3. The results of this finding are further discussed in section 3.3.a.

Several misinterpretations of procedural steps were exhibited during a scenario which included all SGs faulted. First, an operator misinterpreted the Note to step 15 of E-0. The Note allows the operator to interpret whether total AFW flow can be obtained and maintained greater than 320 gpm. In the scenario, the Balance of Plant (BOP) operator reduced AFW flow to 25 gpm per faulted SG (100 gpm total AFW flow). The control room supervisor (CRS) then asked the BOP to verify if total AFW flow was greater than 320 gpm. The BOP responded "No", but did not inform the CRS that the low flow condition (< 320 gpm) was because he (BOP) had just reduced AFW flow. Based on the BOP's literal response to the CRS's question regarding AFW flow, the BOP misinterpreted the Note for step 15: Verify that total AFW flow can be obtained and maintained greater than 320 gpm. As a result of the BOP's misleading response, the CRS unnecessarily transitioned to a Functional Response Procedure (FR-H.1). The CRS then restated the question as "Can AFW flow of 320 gpm be obtained?" The BOP appeared reluctant to say "yes" to this question, stating that to feed any empty SG at a rate greater than 25 gpm was "against everything we are trained to do." This leads to the other misinterpretation. That is, while the BOP's statement regarding a 25 gpm limit accurately reflects what the Training Facility teaches, it is not an accurate reflection of what the procedures allow. In fact, FR-H.5 (Response to Steam Generator Low Level) allows the operators to use a band of 25 to 100 gpm AFW flow per affected SG, not just 25 gpm. These misinterpretations indicate that there is either a deficiency in the operator's understanding of the above portions of the EOPs or there are training deficiencies.

Either a procedure or training deficiency exists in the use of auxiliary spray to reduce reactor coolant system (RCS) pressure. During a scenario with a Red Path on Heat Sink, the operators were attempting to establish feedwater flow using the condensate system. In order to do this, step 7.a.1 of FR-H.1, directs the operators to reduce RCS pressure to 1800 psig using auxiliary spray. The first crew followed the procedure as written. As a result, RCS pressure decreased so slowly that they were forced to terminate the use of condensate as a source of feed and had to begin using the Feed and Bleed portion of the procedure. The second crew performed the same step somewhat differently. In their approach, when RCS pressure decreased so slowly, they opted to use the pressurizer power operated relief valve (PZR PORV) in order to effect a more rapid reduction in RCS

pressure. However, both crews neglected to perform two necessary steps which would have maximized flow through auxiliary spray, and subsequently, would have caused the desired, more rapid pressure drop. These steps are not specified in the EOP. The licensee informed the inspector that steps which detail the operation of equipment (in this case, auxiliary spray) are not included in the EOPs. Instead, the operators are trained in the proper operation of this equipment. Based on the above observation, there is either a deficiency in the EOP's direction regarding operation of infrequently used equipment, or there is a deficiency in the training that the operators receive on the operation of such equipment.

Simulator Modeling - The following simulator modeling problems were noted during the scenario dry-runs and crew observations:

- The simulator could not model a failure of automatic and manual SI actuation where the operators would have to operate each individual component.

- In attempting to create a scenario with a major feed line break, the Critical Safety Function Status Trees (CSFSTs) would not give a Red Path on Heat Sink with all SGs less than 63% level, because the model saw 320 gpm from the broken feed line.

- In attempting to create a scenario with a complete loss of all AC power and maximum SGTR, the simulator model would completely depressurize the RCS to 0 psig and give an Orange Path on Core Cooling.

- The operators expressed a lack of confidence in the simulator model regarding auxiliary spray to depressurize the RCS. Both crews stated that the effectiveness of auxilliary spray in the simulator is not like that at the plant.

5.4 CONCLUSIONS:

The inspectors determined that the crews were familiar with and were able to utilize the EOPs. The team also assessed that the operator training provided the necessary background information needed to correctly implement the EOPs. However, several deficiencies were identified and are as follows:

1. Some operators failed to utilize the built-in diagnostics of the EOPs, but instead relied on their own abilities to diagnose the event.

2. The Training Facility has not taught the operators that terminating break flow from a SGTR must be accomplished within 30 minutes.

3. Several EOP steps and Notes were misinterpreted.

4. There is either a lack of training on infrequently used equipment or lack of direction from the EOPs regarding the operation of such equipment.

In the area of simulator modeling, it is evident that the simulator is adequate to perform the necessary functions to properly train the operators. However, since the simulator is used to validate the EOPs that cannot be validated at the plant, it is necessary to ensure that modifications and changes accurately reflect the plant's response.

6.0 ONGOING EVALUATION OF THE EMERGENCY PROCEDURES

6.1 PURPOSE:

Determine if the licensee has established a long term evaluation program for the emergency procedures as recommended in Section 6.2.3 of NUREG-0899.

6.2 SCOPE:

A review of the Connecticut Yankee Atomic Power Station system of ongoing evaluation and revision of EOPs was conducted to assess whether the licensee's current system could ensure high quality EOPs over time. The system was evaluated on the basis of a number of elements, including:

A. the completeness of a method for ensuring that changes in plant design, Technical Specifications, Technical Guidelines, Writer's Guide, referenced plant procedures, and the control room are promptly reflected in the EOPs;

B. the completeness of a method for revising the EOPs to reflect the findings from operational experience and use, training experience, simulator exercises, and control room and plant walkdowns;

C. the timeliness of revisions to the EOPs when incorrect or incomplete information is identified;

D. the adequacy of the system for determining necessary training, validation, and verification when procedures are changed or revised;

E. the adequacy of basis documents, including Technical Guidelines and Writer's Guide;

F. the adequacy of verification and validation;

G. the effectiveness of a system of soliciting and utilizing feedback from procedure users and other cognizant personnel.

6.3 FINDINGS:

CY has established a program for ongoing evaluation and revision of the emergency procedure set. The program encompasses all of the elements listed above with guidance for implementation of program elements

provided in controlled documents. Specific findings concerning the adequacy of the existing program elements are stated in the following subsections.

A. Completeness of the method for ensuring that changes which effect emergency procedures are promptly reflected in the procedures.

The guidance applicable to this area is provided in ACP 1.2-6.13, Emergency Response Procedures Generation Guidelines. Section 3.4.10, Updating EOPs, provides general criteria for updating the EOPs when changes occur in plant/control room design, Technical Specifications, Technical Guidelines, Writer's Guide and other plant procedures or applicable information is obtained from operating/training experience, simulator exercises and control room walkthroughs. Although specific requirements for revising EOPs in a timely manner are not provided in ACP 1.2-6.13, the inspection team could not identify any instances where significant plant changes or operational/training experience had not been incorporated into the EOPs in a timely manner. Recent plant design changes, which occurred during CY's last refueling outage, were reviewed to verify that required EOP changes had been identified and incorporated into the appropriate EOPs and that operator training on these changes had occurred.

The licensee has established a computer program for systematically identifying all procedures, backpages or attachments that may be affected by a change to a particular EOP. EOPs contain many references, not only to other EOPs, but to other types of procedures as well (e.g., NOPs). When a certain procedure is altered, this program helps assure that the change will also be reflected in all supporting or similar procedures.

B. Completeness of method for revising EOPs to reflect findings from operational and training experience, simulator exercises, etc. This was addressed in paragraph 6.3.A. above.

C. Timeliness of revisions when incorrect or incomplete information is identified.

CY revises their EOPs en masse on an annual basis. This practice prevents EOP clarity and ease of use from being degraded by numerous individual change pages. There is a temporary procedure change (TPC) process that allows a technically significant change to be made promptly, outside of a full-scale revision. The inspection team noted that the Procedures Generation Package does not reflect the existing TPC policy.

D. Adequacy of system for determining training, validation, and verification requirements.

Paragraphs 4.1 through 6.2.5 of ACP 1.2-6.13 define CY's EOP Verification, Validation and Training programs. The following weaknesses were identified with these programs.

1) Verification Program

The Verification Team consists of representatives from the Operations, Training and Engineering departments. The team is headed by the Operations representative, who is also responsible for writing all EOP changes. Although no significant problems were identified with the implemented Verification program, the PGP does not adequately define the responsibilities of each of the members of the team. When performing a Verification review, the PGP identifies eight source documents which should be referenced during the review. The team reviewed the verification checklists used for the last EOP revision and found that only two of the source documents were used consistently and another two used occasionally.

2) Walkdown requirements.

The PGP does not adequately define requirements for walkdowns of new procedures and revisions, including walkdowns of step actions and attachments performed outside the control room and walkdowns of referenced procedures. The PGP does not provide objective criteria for determining when a walkdown is required. It does not state that the walkdown applies to all elements of an EOP including local actions, attachments, and referenced procedures. The PGP also does not provide complete and specific guidance on what factors are to be examined when conducting a walkdown.

The walkdowns conducted by the inspection team identified numerous deficiencies in the instructions concerning local actions and in the accuracy and applicability of attachments and referenced procedures. These deficiencies should have been identified and corrected through V&V walkdowns. The licensee stated that walkdowns of EOP local actions, attachments, and referenced procedures have not been performed.

3) Tabletop and simulator validation requirements.

The PGP guidance for these other methods of validation also was determined to be weak. No objective criteria are provided for determining when tabletop or simulator validation is required. The licensee stated that simulator validation is the preferred method; but, when the simulator is not available, a tabletop validation is performed. As stated earlier, a walkdown validation is never performed. There was no explicit set of criteria for use when performing a particular type of validation. In

addition, the Validation team does not include anyone with a human factors background nor are the EOP changes reviewed by anyone with human factors training. The majority of problems identified with the EOPs were related to human factors concerns.

4) Training requirements.

There was no PGP guidance for determining training requirements. Training requirements are determined during Plant Design Change Request processing or during the Verification and Validation review. The PGP also does not address training requirements for non-licensed operators. It was determined the non-licensed operators receive training on all EOP changes to those portions of the EOPs in which they have some responsibility, but they never receive training in the integrated performance of the EOPs. During interviews and walkthroughs, the non-licensed operators stated that they did not have a good understanding of how their actions were related to the mitigation of a particular event.

E. The inspection team determined that verification and validation of the main body of the EOPs was performed adequately. As previously discussed, there were deficiencies in verification and validation program defined in the PGP.

F. System of soliciting and utilizing feedback from procedure users and other cognizant personnel. This was addressed in relation to item 6.3.A. above.

6.4 CONCLUSIONS:

The team determined that the licensee has an adequate ongoing EOP maintenance program, with the exception of the Verification and Validation program weaknesses discussed in Paragraph 6.3.D. Weaknesses identified in Paragraph 6.3.D. will be tracked as Item No. 213/90-81-03.

7.0 EOP USER INTERVIEWS

7.1 PURPOSE:

To augment and clarify findings from other inspection tasks through interviews with procedure users, developers, trainers, and other appropriate plant staff.

7.2 SCOPE:

Operators (ROs and SROs) were interviewed to determine their understanding of the EOPs and their responsibilities in executing the procedures as part

of the control room team. Additionally, operator opinions were solicited regarding adequacy of training on the EOPs, opportunities for operator input in revising the EOPs, and overall satisfaction with the technical accuracy and useability of the procedures. Discussions were also held with non-licensed operations staff regarding their roles in supporting the implementation of the EOPs, training staff, human factors staff, and the EOP coordinator, regarding procedure development, revision, and verification and validation (V&V) activities.

7.3 FINDINGS:

Interviews confirmed that the operators have confidence in the technical accuracy and useability of the EOPs. There were some instances where operators said that additional clarification or guidance might be helpful, but none were viewed as safety problems. Most operators felt that their training on the EOPs was adequate, and expressed confidence in the quality of the instructors and their familiarity with the CY plant. Operators stated that they are encouraged to comment on the EOPs during training and that this was the primary method for routing operator input to the EOP coordinator. Some operators expressed a hesitancy to make "minor" suggestions, however, due to the perception that the EOP coordinator is overloaded in his dual role as EOP coordinator and Shift Supervisor. The adequacy of resources committed to the EOP maintenance program at CY was a general concern noted by the inspection team and corroborated through discussions with other plant staff as well.

An area where some operators expressed concern was with the adequacy of non-licensed operator staffing (two AOs per crew) for performance of local EOP actions. Operators noted that in the past, AOs were sometimes included in simulator training, which provided a method of evaluating requirements for AO involvement, however this practice has been discontinued. While the inspection team did not identify any situations during the simulator scenarios where AO staffing appeared inadequate, only a limited number of scenarios were examined. This issue must be addressed during EOP validation of local actions.

The desk top review of the EOPs indicated a lack of thorough attention to human factors aspects of the procedures. Interviews with CY staff confirmed that human factors involvement in the development and review process had been minimal. Past Human Factors participation has consisted primarily of a representative from the Nuclear Safety Engineering Office providing examples to the EOP coordinator for him to follow in revising the EOPs. Also, a brief set of guidelines was provided; however, these were not comprehensive nor consistent with the requirements of the CY EOP Writer's Guide. Human factors staff were not involved in the ongoing maintenance of the EOPs, including V&V activities.

7.4 CONCLUSIONS:

Interviews confirmed that the operators have confidence in the technical accuracy and useability of the EOPs. Interviews also raised a concern

regarding the adequacy of the resources devoted to maintaining and improving the EOPs, especially in the area of human factors.

8.0 LICENSEE ACTION IN RESPONSE TO INSPECTION REPORT NO. 50-213/87-10

(Closed) Deviation (50-213/87-10-01): Licensee's Emergency Operating Procedures (EOP) and Background Information did not adhere to the guidelines specified in the NRC approved Procedures Generation Package (PGP).

Following a review of several selected areas that had been identified as deviating from the PGP, it was determined that the licensee had made significant progress in those areas of concern. Although some examples of the previously identified problems are still evident, the number and severity of these concerns has been greatly reduced. Areas that were reviewed and where substantial improvements were noted are as follows:

Inappropriate Use of Logic Terms "AND" and "OR" within the same step. Steps that previously used these terms together in a confusing fashion have been revised. Direction has been added to the Writer's Guide to provide an appropriate format for using both terms within the same step when necessary.

Inconsistent Language in EOP Transitions. In most cases, language used to transition operators to other EOPs is now consistent with the requirements of the Writer's Guide. (Some inconsistencies are still noted in transitions made from opposite pages and in Cautions and Notes).

Inconsistent Format of References. References to other procedures are now consistent with the Writer's Guide format which requires that the full title of the procedure be provided in capital letters, followed by the step number.

Incomplete List of Abbreviations. Abbreviations used in the EOPs that were previously omitted from Table 2 of the Writer's Guide have been added.

Lack of Place-Keeping Mechanisms. Ribbons are now used in the EOPs to mark progress in the event of transitions out of a procedure. During simulator scenarios, operators consistently marked across the step number as each step was completed as a method of tracking step completion.

Unnecessary use of "IF NOT" in RNO Column. Repetition of the phrase, "IF NOT," which is already implied in the RNO column, has been deleted.

Based upon this review, it was determined that significant progress had been made toward resolving previously identified concerns; therefore, this item is closed. Issues related to this deviation that have not been completely resolved are discussed in Section 3.3.C and included as weaknesses needing correction in Attachment 3.

9.0 MANAGEMENT MEETINGS

9.1 WORKING MEETING (October 16, 1990)

The details of the inspection findings were discussed with facility management at a working meeting. The purpose of the working meeting was:

A. to ensure that the facility understood all of the findings;

B. to give the facility a chance to refute the findings, as appropriate;

9.2 EXIT MEETING (October 17, 1990)

The major inspection findings were presented and the remainder of the findings were summarized. The Operations Manager acknowledged the NRC findings and stated that the findings were valid and would be addressed by the facility.

10.0 PERSONNEL CONTACTED

Licensee:

*	Gary Bouchard	Nuclear Unit Director
*	John Deveau	Senior Instructor
*	Jay Gionet	Quality Assurance Engineer
*	Jere LaPlatney	Operations Manager
*	Phil Rainha	Shift Supervisor
*	Allan Stave	Human Factors
*	John Stetz	Station Director

NRC:

*	Andra Asars	Resident Inspector-CY
*	Paul Bonnett	Operations Engineer
*	Mike McWilliams	Human Factors Specialist-SAIC
*	Charlie Meeker	Systems Engineer-COMEX
*	Jim Prell	Senior Operations Engineer
*	Susan Shankman	Chief, Training & Procedures-NRR
*	Tom Shedlosky	Senior Resident Inspector-CY

* Attended Exit Meeting on October 17, 1990

ATTACHMENT 1

DOCUMENTS REVIEWED

Document Number	Document Title

WESTINGHOUSE OWNERS GROUP:

--- WOG Emergency Response Guidelines, Revision 1A

EMERGENCY OPERATING PROCEDURES:

E-0 Reactor Trip or Safety Injection
E-1 Loss of Reactor or Secondary Coolant
E-2 Faulted Steam Generator Isolation
E-3 Steam Generator Tube Rupture

EMERGENCY CONTINGENCY ACTIONS PROCEDURES

ECA-0.0 Loss of All AC Power
ECA-0.1 Loss of All AC Power Recovery Without SI Required
ECA-0.2 Loss of All AC Power Recovery With SI Required
ECA-1.1 Loss of Emergency Coolant Recirculation
ECA-1.2 LOCA Outside Containment
ECA-2.1 Uncontrolled Depressurization of all Steam Generators
ECA-3.1 SGTR with Loss of Reactor Coolant-Subcooled Recovery Desired
ECA-3.2 SGTR with Loss of Reactor Coolant-Saturated Recovery Desired
ECA-3.3 SGTR without Pressurizer Pressure Control

EMERGENCY SUB-PROCEDURES

ES-0.0 Rediagnosis
ES-0.1 Reactor Trip Response
ES-0.2 Natural Circulation Cooldown
ES-0.3 Natural Circulation Cooldown with Steam Void in Vessel (With RVLIS)
ES-0.4 Natural Circulation Cooldown with Steam Void in Vessel (Without RVLIS)
ES-1.1 SI Termination
ES-1.2 Post-LOCA Cooldown and Depressurization
ES-1.3 Transfer to Sump Recirculation
ES-1.4 Transfer to Two Path Recirculation
ES-3.1 Post-SGTR Cooldown Using Backfill
ES-3.2 Post-SGTR Cooldown Using Blowdown
ES-3.2 Post-SGTR Cooldown Using Steam Dumps

CRITICAL SAFETY FUNCTION STATUS TREES:

F-0.1 Subcriticality CSFST
F-0.2 Core Cooling CSFST

ATTACHMENT 1 (Cont'd.)

CRITICAL SAFETY FUNCTION STATUS TREES (Cont'd.):

F-0.3 Heat Sink CSFST
F-0.4 RCS Integrity CSFST
F-0.5 Containment CSFST
F-0.6 Inventory CSFST

FUNCTIONAL RESTORATION GUIDELINES PROCEDURES:

FR-S.1 Response to Nuclear Power Generation/ATWS
FR-S.2 Response to Loss of Core Shutdown
FR-C.1 Response to Inadequate Core Cooling
FR-C.2 Response to Degraded Core Cooling
FR-C.3 Response to Saturated Core Cooling
FR-H.1 Response to Loss of Secondary Heat Sink
FR-H.2 Response to Steam Generator Overpressure
FR-H.3 Response to Steam Generator High Level
FR-H.4 Response to Loss of Normal Steam Release Capabilities
FR-H.5 Response to Steam Generator Low Level
FR-I.3 Response to Voids in Reactor Vessel
FR-P.1 Response to Imminent Pressurized Thermal Shock Condition
FR-P.2 Response to Anticipated Pressurized Thermal Shock Condition
FR-Z.1 Response to High Containment Pressure
FR-Z.2 Response to Containment Flooding
FR-Z.3 Response to High Containment Radiation Level
FR-I.1 Response to High Pressurizer Level
FR-I.2 Response to Low Pressurizer Level

EOP OPPOSITE PAGES:

SI Valve Proper Emergency Alignment
Containment Isolation Valves
Steam Generator Wide Range/Narrow Range Correlation Graph
Procedure to Reset Safety Injection and Containment Isolation
Procedure to Parallel and Shutdown a Diesel Generator
Procedure to Initiate Emergency Boration of RCS
Procedure to Restore Off-Site Power
Procedure for Establishing Letdown
Required Subcooled Margin for Adverse Containment
Valve Required for Sump Recirculation
Preferred Final Valve Position for Sump Recirculation using HPSI and Charging Pumps
Preferred Final Valve Position for Sump Recirculation Using Charging Pumps

ATTACHMENT 1 (Cont'd.)

EOP OPPOSITE PAGES:

Preferred Final Valve Position for Sump Recirculation
Using HPSI Pumps
Preferred Final Valve Position for Two Path Recirculation
Valves Required To Isolate Faulted Steam Generator
Procedure to Manually Start an Emergency Diesel Generator
Procedure to Fill the DWST From the PWST or RPWST
Procedure to Fill the DWST From the Fire Water System
Nuclear Instrumentation Channel Overlaps

EOP ATTACHMENTS:

ATTACH A Natural Circulation Verification
ATTACH B Isolate Loop With A Ruptured Steam Generator
ATTACH C Procedure To Cooldown an Affected Loop

ATTACH A (ES-3.2) Procedure To Cooldown an Affected Loop
ATTACH A (ECA-3.3) Procedure to Operate the Pressurizer Solenoid Vent Valves
ATTACH B (FR-I.3) Procedure to Operate the Pressurizer Solenoid Vent Valves
ATTACH A (FR-I.3) Reactor Vessel Head Venting Period Guideline

ABNORMAL OPERATING PROCEDURES:

AOP 3.2-51 Local Manual Operation of the Auxiliary Feedwater System

OTHER DOCUMENTS:

Connecticut Yankee Technical Specifications
Procedures Generation Package, ACP 1.2-6.13
Emergency Operating Procedures User's Guide, ACP 1.2-6.15
ERP Step Deviation Documents
Normal Operating Procedures (NOP) as referenced by EOPs
PDCR #0931-"HPSI Pump Miniflow Modification"
PDCE #89-162 - "Provide Flushing Water to RMS-22"
EOP completed Verification Checklists
EOP completed Validation Checklists
Memo-"HFE Input to EOPs", from A.M. Stave to S.A. Thickman, 2/22/88

ATTACHMENT 2

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

E-0: REACTOR TRIP OR SAFETY INJECTION

1. E-0, Step 1, page 2

   Wording of this step directs the operator to go to FR-S.1 if any of the indications for a reactor trip are not obtained. The wording is to clearly reflect the intent of the step, which transitions the operator to FR-S.1 based on overall assessment of indications.

2. E-0, Step 3, page 2

   Step is not structured consistent with other steps directing checks on plant status. Status indication (i.e., ENERGIZED) is usually at the end of the statement.

3. E-0, Step 3.b. RNO, page 2

   The term "and" is inappropriately highlighted as a logic term.

4. E-0, Step 4, page 2

   Step directs operator to check that "one OR both" SI WL relays tripped. This wording is inconsistent with other steps that direct operator to check "at least one" piece of equipment is operational or energized.

5. E-0, Step 5 RNO, page 3

   This step directs operator to manually or locally close containment isolation valves. Local operation of the valves is actually a second contingency action, however (i.e. IF valves can NOT be closed manually, THEN close valves locally), is not an equally preferred condition as the logic term OR implies.

6. E-0, Notes preceding Step 15, page 7

   Notes preceding step 15 include conditional statements that are poorly worded and not consistent with directions in the Writer's Guide for formatting logic statements.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

7. E-0, Step 15, page 7

There are several problems with this step:

1. This step directs the operator to verify that total AFW flow is greater than 320 GPM. Because the note preceding this step gives direction to the operator based on verifying that 320 GPM "can" be obtained, there may be question as to whether the capability to obtain flow of 320 GPM is sufficient verses actually having flow of 320 GPM.

2. The use of the term "verify" is not consistent. It is not clear as to whether the operator must take action to obtain the desired flow level based on the implied direction of the statement to "verify" level, or if he must transition to the RNO column for instruction on how to obtain the 320 GPM level.

3. Based on not having 320 GPM flow, the first RNO contingency states "IF wide range level in any steam generator is greater than 63%, THEN control feed flow to maintain wide range level greater than 63%." A third contingency states, "IF total AFW flow greater than 320 GPM can NOT be established, THEN GO TO FR-H.1, Response to Loss of Secondary Heat Sink, Step 1." As written, this step could be interpreted as directing the operator to transition to FR-H.1 based on low flow regardless of the SG level, which is not the intent. This step must be written to indicate that either 320 GPM AFW flow OR SG level above 63% are acceptable conditions for continuing in this procedure as presented in Step 23.b.

8. E-0, Step 17.b. RNO, page 9

Place the logic term THEN after the initiating condition (i.e., IF cooldown continues, THEN reduce total AFW flow ...). As written, THEN is incorrectly used to introduce a second contingent action.

9. E-0, Step 18.b., page 10:

The step states to check "PRZR PORV block valves," but the switches associated with these valves were labeled "relief isolation valves."

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

10. E-0, Caution preceding Step 26, page 14

This is a continuous action step which provides direction to monitor DWST level and to start makeup.

11. E-0, Caution preceding Step 32, page 15

This is a continuous action step directing the operator to monitor RCS pressure and start LPSI pumps when pressure decreases to less than 405 PSIG.

12. E-0, Step 32.c, page 15:

The step stated to Stop LPSI pumps and place in "Standby," but the switch position is labeled "AUTO".

13. E-0, Step 33.a., page 16

Same comment as for Step 3.

14. E-0, Step 33.a.1. RNO, page 16:

The first four bullets are local actions, but they are not indicated as such.

ECA-0.0: STATION BLACKOUT

1. ECA-0.0, Step 2.d., page 2

This pump is located outside of the control room and the procedure does not specify local action.

2. ECA-0.0, Step 5.c. RNO, page 4

Steps 1, 2 and 4 are local actions and the procedure does not indicate as such. Step 4 actions occur in a respirator area.

3. ECA-0.0, Step 10.d., page 6

The step instructs the operator to "Locally close all four SG blowdown manual isolation valves." Valve numbers are not provided to aid the operators.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

4. ECA-0.0, Step 13.b RNO, page 8

   Step does not refer the operator to the Opposite Page "Valves Required To Isolate a Faulted S/G" as in Step 12 RNO.

5. ECA-0.0, Step 14.b. RNO, page 8

   Step states "shed all large nonessential DC loads." The operator was not sure what were all of the nonessential loads on the DC bus.

ECA-0.1: STATION BLACKOUT RECOVERY WITHOUT SI REQUIRED

1. ECA-0.1, Step 3.b.1 RNO, page 3

   Step does not specify the valves that are to be aligned as necessary for the component cooling water system.

ES-0.1: REACTOR TRIP RESPONSE

1. ES-0.1, Step 5.a. RNO, page 6

   The fifth bullet is performed locally and the procedure does not indicate as such.

2. ES-0.1, Step 10 RNO, page 10

   The RNO transition to the CY EOPs, states go to step 1. In the present CY ECP format, there is no step 1.

3. ES-0.1, Step 11. a.1.c. RNO, page 11:

   Step states "Start oil lift pump" but label reads "Jacking Pump."

4. ES-0.1, Step 17.a.3, page 13

   Step states "Start oil lift pump" but label reads "Jacking Pump."

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

ES-0.2: NATURAL CIRCULATION COOLDOWN

1. ES-0.2, Step 1.a.1., page 2

   Number 2 horizontal terminal board in the upper RCP breaker cabinet is not positively identified. There are banana clips installed on the terminals for the wires to be jumpered, however, the terminals and wires are not positively identified.

2. ES-0.2, Step 1.a.2, page 2

   Step states "Start oil lift pump" but label reads "Jacking Pump."

3. ES-0.2, Step 19, page 9

   Valves are located in the PAB Blowdown Room.

ES-0.3: NATURAL CIRCULATION COOLDOWN WITH STEAM VOIDS IN VESSEL (WITH RVLIS)

1. ES-0.3, Step 1.b.1., page 2

   Number 2 horizontal terminal board in the upper RCP breaker cabinet is not positively identified. There are banana clips installed on the terminals for the wires to be jumpered; however, the terminals and wires are not positively identified.

2. ES-0.3, Step 1.b.2, page 3

   Step states "Start oil lift pump" but label reads "Jacking Pump."

3. ES-0.3, Step 9, page 7

   Valves are located in the PAB Blowdown Room.

ES-0.4: NATURAL CIRCULATION COOLDOWN WITH STEAM VOIDS IN VESSEL (WITHOUT RVLIS)

1. ES-0.4, Step 1.b.1., page 3

   Number 2 horizontal terminal board in the upper RCP breaker cabinet is not positively identified. There are banana clips installed on the terminals for the wires to be jumpered, however, the terminals and wires are not positively identifi[illegible]

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

2. ES-0.4, Step 1.b.2, page 3

Step states "Start oil lift pump" but label reads "Jacking Pump."

3. ES-0.4, Step 7, page 6

Valves are located in the PAB Blowdown Room.

E-1: LOSS OF REACTOR OR SECONDARY COOLANT

1. E-1, Caution preceding Step 3, page 3

This is a continuous action step which provides direction to monitor DWST level and to start makeup.

2. E-1, Step 4, page 3

These substeps are not formatted consistent with other steps that direct the operator to check the status of a plant parameter, followed by a dash and then the expected plant status (i.e., Check air ejector RMS-NORMAL).

3. E-1, Step 5.c. page 4:

The step states to check "PRZR PORV block valves," but the switches associated with these valves were labeled "relief isolation valves."

4. E-1, Step 8.b.1.a. RNO, page 5:

The step states, "Open" circuits A13 and B13 in DC panels A and B, but the switches read "ON-OFF."

5. E-1, Step 10.a.1. RNO, page 6:

The first four bullets are local actions, but they are not indicated as such.

6. E-1, Step 11.b, page 7

Same comment as for Step 4.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

7. E-1, Step 11.b. second bullet RNO, page 7:

This bullet does not identify which valves are to be checked to verify that letdown has been isolated

8. E-1, Step 13.b. and 13.d., page 8:

Identification tags are missing from SW-V-234 adams filter isolation valve and SW-V-237 adams filter outlet valve to the CARFAN coolers.

ECA-1.1: LOSS OF EMERGENCY COOLANT RECIRCULATION

1. ECA-1.1 Step 1.b., page 2:

Reads "Check manual sump suction, RH-V-808A - OPERABLE." The operator expressed some confusion as to what was required of him to determine if RH-V-808A was operable - i.e., general awareness of its status versus a review of the last surveillance test results.

2. ECA-1.1, Step 15.b., page 9:

A kickout step to direct the operators to the appropriate procedure if the engineering staff determines the RHR System should be placed in service is needed.

ECA-1.2: LOCA OUTSIDE CONTAINMENT

1. ECA-1.2, Step 2.c. RNO, page 4:

The RNOs purpose of aligning the valves is not stated - i.e., to isolate the leak.

ES-1.1: SI TERMINATION

1. ES-1.1, Step 9.d. RNO, page 4:

Substeps 9.d.3.,4.,and 5. do not have to be done in sequence. Bullets are to be used instead of numbers preceding them.

2. ES-1.1, Step 18.a.1.c. RNO, page 8:

Step states "Start oil lift pump" but label reads "Jacking Pump."

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

ES-1.2, POST-LOCA COOLDOWN AND DEPRESSURIZATION

1. ES-1.2, Step 12.a., page 8:

   A verb is needed in this step.

2. ES-1.2, Step 13.a., page 9:

   A verb is needed in this step.

3. ES-1.2, Step 13.f., page 10:

   A verb is needed in this step.

ES-1.3: TRANSFER TO SUMP RECIRCULATION

1. ES-1.3, Back Pages

   This procedure provides tables of preferred valve lineups for sump recirculation in three different pump configurations: HPSI, Charging, Charging and HPSI. During walkdown of the procedure, these three different tables were not immediately recognized as corresponding to different pump configurations and different sections of the procedure, leading the operator to remark that the lineups were incorrect. Emphasizing the applicable pump configuration in the title of each table, and referencing each table to the specific section in the procedure will help prevent confusion.

2. ES-1.3, Note Preceding Step 1, page 2

   The first note informs operator that steps 1 through 10 needs to be performed without delay. Section 3.4.2.4 of the Writer's Guide gives an example of a similar message as a Caution. As a Caution, this message needs to inform the operator of the consequence for delaying actions.

3. ES-1.3, Step 2.e. RNO, page 3

   Conditional statement has logic term THEN placed in wrong location.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

4. ES-1.3, Step 4.f, page 4

Operator is directed to place LPSI start block switches in the off position. On/off positions are not indicated on the control board.

5. ES-1.3, Step 7, page 8

Names of valves used in procedure are not consistent with labeling in the control room.

EOP	Control Room
HPSI Pump Recirculation Isolation	RWST Return Isolation
HPSI Pump Suction from RHR	RHR to HPSI Crosstie
HPSI Pump Suction from RWST	BHPS Suction Isolation

6. ES-1.3, Step 12, page 10

Step directs operator to "Verify RHR, charging and HPSI flow by monitoring reactor vessel fluid level, temperature and subcooling to ensure adequate core cooling." This complex step needs to be divided into multiple steps or substeps.

ES-1.4: TRANSFER TO TWO PATH RECIRCULATION

1. ES-1.4, Step 1.b.7.,8., and 9. RNO, page 2:

These steps are not addressed in the step deviation document.

E-2: FAULTED STEAM GENERATOR ISOLATION

1. E-2, Step 1, page 2

The operator is directed to check that the main stea isolation valve of the affected SG is closed. Other steps refer to steamline "trip" valves instead of isolation valves.

2. E-2, Step 3.a. RNO, page 2

The term "and" is improperly used to connect two distinct steps and is inappropriately highlighted as a logic term.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

3. E-2, Step 4.a.2. and 3, page 3:

The steps state to close "Main feedline MOV" and "Main feedline bypass AOV," but the switches associated with these valves were labeled "S/G Feed Stop" and "S/G FW bypass."

4. E-2, Step 4 RNOs, page 3:

The steps direct the closing of many locally operated valves, but the valves were not listed on the associated back page. The valves discussed in the ACTION/EXPECTED RESPONSE column were listed on the associated back page. Since the valves discussed in the RNO column are infrequently used valves, a listing of these valves is helpful to the operators to efficiently perform the task.

5. E-2, Step 6, page 3

Step to check secondary radiation is inconsistent with similar step (Step 27) in E-0.

ECA-2.1: UNCONTROLLED DEPRESSURIZATION OF ALL STEAM GENERATORS

1. ECA-2.1, Step 1, First NOTE, page 2:

The Note discussed the use of the Electric AFW pump if the Turbine-Driven AFW pumps were unavailable, but the Note does not recognize the fact that the Main Feed pumps and the Condensate pumps may also be used. The note also did not state that the Main Feed pumps and Condensate pumps were preferable to trying to use the Electric AFW pump.

2. ECA-2.1, Step 1, page 2:

The step directed the operation of many valves, both in the Control Room and locally, but they were not listed on the associated back page. A listing of these valves is helpful to the operators to efficiently perform the task.

3. ECA-2.1, Step 3.d, page 3:

The step stated to close all four "seal water return MOVs," but the switches were labeled "RCP seal WTR RET MOV."

ATTACHMENT 2 (Cont'd.)

. .NOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

4. ECA-2.1, Step 3, RNO e.2, page 3:

The step stated to close "RCP oil cooler component cooling water return valve," but the switch was labeled "RCP oil cooler CC return trip."

5. ECA-2.1, Step 7.d, page 5:

The step stated to Stop LPSI pumps and place in "Standby," but the switch position was labeled "AUTO."

6. ECA-2.1, Step 9, RNO d, page 6:

The wording of the step was not consistent with the wording of the identical action step in E-0, REACTOR TRIP OR SAFETY INJECTION, Step 23, RNO d.

ECA-2.1, Step 15.b, page 8:

The step stated to Stop HPSI pumps and place in "Standby," but the switch position was labeled "AUTO."

ECA-2.1, Step 16, page 8:

Same comment as Step 7.d. above.

9. ECA-2.1, Step 18, RNO, page 8:

The labeling on the controller for #1 AFW Turbine that is to be used in this step was very difficult to read, and the labeling was different than the labeling on the controller for #2 AFW Turbine.

10. ECA-2.1, Step 20, RNO b, page 9:

Several actions in this step were performed locally, but they were not identified as local actions in the step.

11. ECA-2.1, Step 24, RNO, page 10:

There was an unnecessary blank line before NOP 2.8-1, which complicated the reading of the step. In addition, adding the specific section number after the titles of the NOPs referenced in this step would assist the operators in finding the correct section of the NOPs and expedite the performance of these NOPs.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

12. ECA-2.1, Step 25, RNO, page 10:

Same comment as Step 20 above, and the location of the Battery charger breakers were not addressed for the operators in locating the items.

13. ECA-2.1, Step 25, RNO h, page 10:

The wording of this step was unclear in how it related to the requirements stated in the RNO step just prior to it. Step g stated, "One service water pump for each diesel," but Step h stated, "IF service water is used for RHR HX, THEN use two service water pumps." It was not clear to the operator if the service water pumps being run to support the requirement of step g could also be counted to fulfill the requirements of step h.

14. ECA-2.1, Step 26, RNO a.1.b, page 11:

The step stated "Open loop bypass valve," but did not indicate that the valve had to be locally energized before it could be operated.

15. ECA-2.1, Step 26, RNO a.1.i, page 11:

Add the word "associated" after "Open" to prompt the operator to open the correct valve.

16. ECA-2.1, Step 29.a. and b, page 14:

The steps do not include the action to close the discharge valves prior to stopping the Main Feed pump and Condensate pump to avoid check valve slam. Add these actions to the procedure, if appropriate.

17. ECA-2.1, Step 34, RNO, page 16:

The step stated to "ESTABLISH AN RCS COOLDOWN RATE OF 100 F/HR IN THE RCS COLD LEGS," but the ERG stated that the cooldown rate should be "less than" 100 F/HR. This deviation is incorrect and was not justified in the deviation document.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

18. ECA-2.1, Step 35, page 16:

The step used two values for RCS pressure if adverse containment existed, 0 PSIG and 610 PSIG. The reason for using two values was not addressed in deviation document.

19. ECA-2.1, Step 36.a, second bullet, page 16:

Same comment as Step 35 above.

20. ECA-2.1, Step 37.b, page 17:

The step stated to "Check wide range level in all SGs-LESS THAN 69%." Minor error "is" should be "in", but the major concern in this step involved the justification for using the wide range SG level instead of the narrow range level specified in the ERG. The only justification provided was that the narrow range was not EEQ qualified. The justification did not address the fact that a 69% wide range level in a plant cooled down to 300 degrees did not correlate to a 50% narrow range level as directed in the ERG. See the description of this problem in the Technical Adequacy section of the basic report under SETPOINT DOCUMENTATION.

21. ECA-2.1, Foldout Page Step 2.e, page 19:

The setpoint for action was 50 PSIG which was 10 PSIG above the design internal pressure of the containment and there was no justification for this deviation in the deviation document. There is more discussion of this modification in the Technical Adequacy section of the basic report.

E-3: STEAM GENERATOR TUBE RUPTURE

1. E-3, Step 5a., pg. 6:

This step directs operators to check power available to the block valves. These valves are labeled relief isolation valves.

2. E-3, Step 15b. and 15c., pg. 12:

Pressurizer spray is initiated in Step 15b for RCS depressurization and step 15c determines if spray is effective. If the spray is not effective, the RNO fails to direct the operator to turn off spray.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

3. E-3, Step 29b., pg. 21:

Typographical error; condenser high level dump isolation valve is CD-V-635, not -634.

4. E-3, Attachment B, pg. 26:

This attachment meets neither the criteria for an attachment nor the Writers' Guide for a procedure.

The inspectors compared the guidance in Attachment B with the corresponding instructions in E-3. The following is a sample of the differences noted:

- Attachment B, step 1 directs the operator to check the ruptured SG isolated; E-3 step 3 provides an opposite page which lists all applicable valve numbers, procedure steps for isolating the ruptured SG and the desired SG levels.

- Attachment B provides instructions for RCS depressurization only; E-3 provides for both depressurization and cooldown. Attachment B, step 7, RNO column directs the operator to continue with the RCS cooldown, but does not provide any instructions.

- Attachment B, step 6.a provides abbreviated instructions for depressurizing; E-3, step 15 provides detailed depressurization steps.

- Attachment B, steps 10 and 11 establish isolated loop pressure indication and open the loop bypass valves, respectively, but do not give any RNO actions.

5. E-3, Attachment C, pg. 29:

This attachment also fails to meet either the attachment criteria or the procedure Writers' Guide.

Attachment C provides abbreviated instructions for lineup, cooldown, and draindown of an isolated loop with a ruptured steam generator. This attachment contains the type of information which is normally contained in a recovery procedure.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

ECA-3.1: SGTR WITH LOSS OF REACTOR COOLANT - SUBCOOLED RECOVERY DESIRED

1. ECA-3.1, Step 18, pg. 15:

   Awkward page transition from page 14 to 15 within step 18.

2. ECA-3.1, Step 23, pg. 18:

   Typographical error; condenser high level dump isolation valve is CD-V-635, not 634.

3. ECA-3.1, Attachment B, pg. 22:

   This is identical to E-3, Attachment B. This attachment also fails to meet either the attachment criteria or the procedure Writers' Guide.

4. ECA-3.1, Attachment C, pg. 25:

   This is identical to E-3, Attachment C This attachment also fails to meet either the attachment criteria or the procedure Writers' Guide.

ECA-3.2: SGTR WITH LOSS OF REACTOR COOLANT - SATURATED RECOVERY DESIRED

1. ECA-3.2, Step 14, pg. 13:

   Awkward page transition from page 12 to 13 within step 14.

2. ECA-3.2, Attachment B, pg. 20:

   This is identical to E-3, Attachment B. This attachment also fails to meet either the attachment criteria or the procedure Writers' Guide.

3. ECA-3.2, Attachment C, pg. 23:

   This is identical to E-3, Attachment C. This attachment also fails to meet either the attachment criteria or the procedure Writers' Guide.

ECA-3.3: SGTR WITHOUT PRESSURIZER PRESSURE CONTROL

1. ECA-3.3, Step 3.a.1, pg. 3:

   This step requires the operator to check that pressurizer PORV air supply pressure is available. Better detail on required air pressure was given in E-3, step 8.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

2. ECA-3.3, Step 16, pg. 11:

Typographical error, condenser high level dump isolation valve is CD-V-635, not 634.

3. ECA-3.3, Step 17, pg. 11:

This step requires the operator to check the RCP cooling systems, but does not specify thermal barrier and oil coolers as done by E-3.

4. ECA-3.3, Attachment A, step 5, pg. 19:

Operators are to review the pressurizer venting termination criteria. Strengthen this step by stating that the venting termination criteria are found in Attachment A, step 2 (the previous page).

ES-3.1: POST-SGTR COOLDOWN USING BACKFILL

1. ES-3.1, Step B, pg. 1:

The entry conditions do not include the fact that this procedure may be entered from Attachment B, steps 8 and 12, to E-3, ECA-3.1, and ECA-3.2.

ES-3.2: POST-SGTR COOLDOWN USING BLOWDOWN

1. ES-3.2, Step B, pg. 1:

The entry conditions do not include the fact that this procedure may be entered from Attachment B, steps 8 and 12, to E-3, ECA-3.1, and ECA-3.2.

2. ES-3.2, Attachment A, pg. 12:

This is identical to E-3, Attachment B. This attachment fails to meet either the attachment criteria or the procedure Writers' Guide. Additionally, the use of this attachment entirely bypasses ES-3.2 and may be more appropriate as a separate recovery procedure.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

ES-3.3: POST-SGTR COOLDOWN USING STEAM DUMP

1. ES-3.3, Step B, pg. 1:

   The entry conditions do not include the fact that this procedure may be entered from Attachment B, steps 8 and 12, to E-3, ECA-3.1, and ECA-3.2.

FR-S.1: RESPONSE TO NUCLEAR POWER GENERATION ATWS

1. FR-S.1, Step 1.b. RNO, page 2

   Logic term "OR" is inappropriately used indicating that manually inserting control rods OR deenergizing 480V buses 4 and 7 are equally acceptable steps. Deenergizing the breakers is a secondary contingent action to be performed in the event that manual insertion of control rods is not successful.

2. FR-S.1, Step 1.b, page 2

   There is no label on the control board for the reactor trip breaker indication other than the letters "A" and "B" hand written next to each switch.

3. FR-S.1, Step 4.c.3., page 3

   Operator is directed to close MCC supply breakers as necessary. To determine which equipment is energized through which MCCs, a list will aid the operators in the control room.

4. FR-S.1, Step 5.a.1 RNO, page 4

   Transition directs operator to go to Step 5b. Because step 5.a.1.b is identified only as "b.", the operator could easily transition to the wrong level substep. This is an example of potential problems caused by current step numbering system.

5. FR-S.1, Step 5.b., page 4

   This step directs the operator to emergency borate using the metering pump, but is only performed contingent on normal boration path not being available. As a contingent action, this step would be more appropriately contained in the RNO column, therefore eliminating the need for a transition around it when the boric acid pump starts as expected.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

6. FR-S.1, Step 5.c.1, page 4

The word "and" is to be highlighted as a logic term.

7. FR-S.1, Step 8.a & b, page 6

These steps are local actions but not indicated as such by the phrase "locally check." Also, substep a needs to be more specific in indicating valves are actually to be checked closed.

8. FR-S.1, Step 12, page 7

Operator is directed to isolate faulted SG by isolating steam supply to atmospheric vent and terry turbine. This is a local action and is to be identified as such.

FR-S.2: RESPONSE TO LOSS OF CORE SHUTDOWN

1. FR-S.2, Back of Page 1

This figure is not referenced in the body of the procedure.

FR-C.1: RESPONSE TO INADEQUATE CORE COOLING

1. FR-C.1, Step 5.a, page 3:

The step stated "Check RVLIS PLENUM indication - GREATER THAN 15%" which determined if the water level was above the top of the active fuel region. However, the ERG step wanted the water level to be greater than 3.5 feet above the bottom of the active fuel. This deviation was not justified in the deviation document.

2. FR-C.1, Step 17.c, fourth bullet, page 9:

The steam line pecker head vent valves were added to this step but not to other similar steps such as step 12, and the deviation was not justified in the deviation document.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

FR-C.2: RESPONSE TO DEGRADED CORE COOLING

1. FR-C.2, Back of Page 1

Names of valves used in procedure are not consistent with labeling in the control room.

EOP	Control Room
Core Deluge Isolation Valves	Core Deluge Stop Valves
Charging Pump Discharge Valves	Charging Header Stop Valves
Charging Pump Suction Valves	RWST to Charging/VCT Outlet Valves
Letdown Isolation Valve	Letdown Header Stop Valve

2. FR-C.2, Caution Preceding Step 1, page 2

Operator is directed to align SI for RHR recirculation "using" ES-1.3 if the RWST level decreases to less than 130,000. It is not clear if this action is to be taken in parallel with the present procedure, or if the operator is to transition out of the present procedure to ES-1.3. The Writer's Guide does not specify the action intended by a statement telling the operator to perform an action "using" a certain procedure.

3. FR-C.2, Step 1, page 2

Instructions to verify SI valves in proper alignment do not refer operator to alignment table on back of page 1.

4. FR-C.2, Step 3d, page 4

Instruction directs operator to check drain header is isolated. There are alternate methods of isolating the drain header. This step does not specify the optimal alternative (which is specified in the RNO column). During the walkdown, the valves listed in the RNO column were not the ones checked by the operator.

5. FR-C.2, Step 3e, page 4

Instruction directs operator to check letdown is isolated. As per comment for step 3d, step needs to be more specific, identifying which valves to check closed.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

6. FR-C.2, Steps 6 & 7, page 5/6

Several substeps transition operator to step 8 which is preceded by a Caution; however, a reminder to observe the Caution is not included, as typically done for transitions.

7. FR-C.2, Back of Page 5

No reference to the graph showing the correlation between wide range and narrow range steam generator levels. As defined by the Writer's Guide, this is more appropriately included as an attachment.

8. FR-C.2, Step 9a, page 7

Step directs operator to maintain cooldown rate in RCS cold legs of less than 100F/HR. This is not an action step, however, but places limits on performing the next step (dumping steam to the condenser).

9. FR-C.2, Step 12c, page 8

Same comment as for step 9a. Also this "caution" to limit cooldown rate is provided after substep b which directs operator to depressurize SGs to atmospheric pressure. Warning needs to be provided before direction to depressurize.

FR-H.1: RESPONSE TO LOSS OF SECONDARY HEAT SINK

1. FR-H.1, Caution Preceding Step 1, page 2

Second Caution improperly includes directions for operator actions, directing the operator to check CETs and SG levels, and perform steps 10 through 15 if certain conditions are observed. Also, it is not clear whether these parameters should be checked continuously or just prior to performing Step 1. Also, logic terms in conditional Cautions are not all properly highlighted.

2. FR-H.1, Step 1.a., page 2

Step directs operator to check that RCS pressure is greater than any non-faulted SG pressure. Use of the term "any" can be confusing in that it can be interpreted as meaning "all" or "any one."

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

3. FR-H.1, Step 1.b., page 2

Directs operator to check RCS temperature but is not specific as to what instrumentation to use (cold leg, hot leg, or TAVE) as is done in other steps.

4. FR-H.1, Note preceding step 2, page 3

Note states that if both turbine-driven AFW pumps are not operable, then the electric AFW pump can be locally aligned to provide AFW flow. This Note, which appears to be a contingent action, is not clear as to whether this action should be taken, or merely can be taken at the operator's discretion. It is also not clear as to whether the desired action is merely alignment of the system or operation.

5. FR-H.1, Step 2.c. RNO, page 3

This step does not conform to the format specified in the Writer's Guide for conditional actions (i.e, "IF the A turbine driven AFW pump is operating, THEN perform the following:").

6. FR-H.1, Step 5.b. RNO, page 4

Transition to step 7 should include message to observe Caution preceding this step.

7. FR-H.1, Step 7.a., page 6

Step directs the operator to depressurize RCS to less than 1800 PSIG. The operator felt there should be a lower limit (of 1700 PSIG) indicated to prevent SI initiation.

8. FR-H.1, Step 7.a.1 RNO, page 6

Contingent action to use auxiliary spray if PRZR PORV not available is unnecessary in that normal progression through the procedure would have the operator perform this action in step 7.a.2.

9. FR-H.1, Step 7.a.2, page 6

Procedural steps should be given to ensure the operators utilize maximum flow through the auxiliary spray line.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

10. FR-H.1, Step 7.b., page 6

Direction to wait until RCS pressure is less than 1800 PSIG should be provided prior to instruction to block SI.

11. FR-H.1, Step 11.b. RNO, page 9

In this logic statement, the term THEN belongs in front of the first contingent action ("place HPSI pump control switches in TPO").

12. FR-H.1, Step 14.c.1 RNO, page 11

Instruction to open head vents and PRZR vents does not provide instruction to locally energize breakers.

13. FR-H.1, Step 15.c. RNO, page 12

Transition at end of contingency action directs operator to go to Step 16. This is the step that the operator would go to next following normal progression of the procedure. This unnecessary transition statement could be interpreted as implying that the operator should skip the Caution and Note that are provided between steps 15 and 16.

14. FR-H.1, Step 23.d., page 18

This step is worded much differently than similar step 11.d in this procedure.

15. FR-H.1, Attachment A, Step 6.a, page 20

This step (closing SS-V-951) is not identified in the procedure as a local action.

16. FR-H.1, Attachment A, Step 8, page 20

This step directs operator to place letdown in service, but does not provide instructions on a back page or reference a procedure as do other similar steps. Only directions provided are for opening HCP operated letdown isolation valves.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

17. Figure FR-H.1, page 25

This figure (Minimum Core Cooling Flow Rate verses time After Reactor Trip) is not referenced anywhere in the procedure. Conversely, a figure that is referenced in the procedure (Tech Spec Figure 3.4-5, Reactor Vessel Temperature Pressure Limitations for Cooldown) is not provided in the procedure.

FR-H.2: RESPONSE TO STEAM GENERATOR OVERPRESSURE

1. FR-H.2, Step 1.a, page 2:

The step specified a setpoint of 1034 PSIG, but that was difficult to determine because the meter was divided into 50 PSIG increments.

2. FR-H.2, Step 4, RNO, page 2:

The step directed the operator to "GO TO STEP 6," but did not include a warning to the operator to observe the Caution before the step.

3. FR-H.2, Step 7, RNO, page 3:

The step stated "COOLDOWN RCS TO LESS THAN 535 F BY DUMPING STEAM FROM THE UNAFFECTED SG(s)," but the ERG stated "Affected SG." The deviation document said there was "no difference," and the background documentation stated that the "unaffected" SG(s) would be used.

FR-H.3: RESPONSE TO STEAM GENERATOR HIGH LEVEL

1. FR-H.3, Step 2 b&c RNO, page 2

Names of valves identified for local operation are inconsistent with labels in the plant.

EOP	In-Plant
feedline bypass AOV	FDWTR BYPASS VALVE OUTLET
feedline isolation MOV	SG FEED STOP

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

2. FR-H.3, Step 3.c., page 2

Operator is directed to maintain wide range SG level between 67% and 69% for adverse containment. Caution statement, however, directs operator to evaluate for overfill condition at 68%. During the walkdown, the operator was unsure of the rationale for this apparent contradiction.

3. FR-H.3, Step 8, page 3

Steam generator lineup to blowdown tank is not identified in the EOP as a local action. Identification of valve numbers would be helpful to AOs.

FR-H.4: RESPONSE TO LOSS OF NORMAL STEAM RELEASE CAPABILITIES

1. FR-H.4, Step 2, RNO, page 2:

The step did not list the available means of dumping steam that were provided to the operator in FR-H.2, RESPONSE TO STEAM GENERATOR OVER-PRESSURE, step 4, and discussed under this step in the Deviation Document.

FR-H.5: RESPONSE TO STEAM GENERATOR LOW LEVEL

1. FR-H.5, Step 2, page 2:

The step stated to "LOCALLY CLOSE BLOWDOWN ISOLATION VALVE FROM AFFECTED SG(s)." The valve numbers are not included in the step to ensure the correct valves are isolated. The operator was not sure if the valves of this step were the same as the Trip valve isolation valves listed on the back of page 2 in E-2, FAULTED STEAM GENERATOR ISOLATION.

FR-Z.2: RESPONSE TO CONTAINMENT FLOODING

1. FR-Z.2, Step 1, page 2:

Some of the actions in this step were local actions, but they were not identified as such in the procedure.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

2. FR-Z.2, Step 1, RNO a, page 2:

The operator was not sure which valves to operate to accomplish the action of this step. Specific valve numbers were not listed. The deviation document referred to a drop in return pressure in the service water header as another indication of problems, but this aspect of fault identification was not included in the procedure.

3. FR-Z.2, Step 1, RNO b, page 2:

The actions in this step would result in a partial loss of Component Cooling Water which was covered by another procedure, which was not referenced in this step.

4. FR-Z.2, Step 2.a, page 2:

The step stated "Draw local grab sample", but the term "grab" was not defined.

FR-Z.3: RESPONSE TO HIGH CONTAINMENT RADIATION LEVEL

1. FR-Z.3, Step 2.a, page 2:

The step stated, "Check all face dampers - OPEN," but the labels for these dampers read "CONT. RECIRC" not "face".

FR-I.1: RESPONSE TO HIGH PRESSURIZER LEVEL

1. FR-I.1, Step 2, Caution, page 2:

The Caution contains an additional phrase, "OR THE PRZR WATER SPACE TEMPERATURE MAY BE LESS THAN SATURATION TEMPERATURE FOR PRZR PRESSURE," but there was no justification for this in the Deviation Document.

2. FR-I.1, Step 2.a, page 2:

The expected response had an additional statement, "(STOP ONE PUMP IF TWO PUMPS RUNNING AND PLACE ITS CONTROL SWITCH IN TPO)." This is actually another RNO action, but was not written to reflect that fact.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

FR-I.2: RESPONSE TO LOW PRESSURIZER LEVEL

1. FR-I.2, Step 4, RNO, page 2:

   The title of E-1 was incorrectly stated as, "LOSS OF REACTOR COOLANT" instead of the correct title, "LOSS OF REACTOR OR SECONDARY COOLANT."

2. FR-I.2, Step 5.b, page 3:

   The step checked pressurizer level greater than 11.5%. Include the alarm annunciator location associated with this setpoint in this step to assist the operator in checking this parameter.

FR-I.3: RESPONSE TO VOIDS IN REACTOR VESSEL

1. FR-I.3, Step 4.c, page 3:

   The step stated, "Check RCS hot leg temperatures - STABLE." The operator was also provided directions if the hot leg temperature was increasing in the RNO column, but the operator was given no guidance if the hot leg temperatures were decreasing.

2. FR-I.3, Step 6, RNO a. and b, page 4:

   The RNO step directs the operator to "GO TO Step 9," but does not warn the operator to observe the Caution and Note before Step 9.

3. FR-I.3, Step 9.c, page 6:

   This step was added to the procedure, but not justified in the Deviation Document.

4. FR-I.3, Step 13.b, page 6:

   The step stated, "Block SI actuation using SI block switches," but the labels on these switches state, "Core Cooling," vice, "SI."

5. FR-I.3, Step 16.a, page 7:

   The step stated "Isolate containment," but the operators were not sure how to perform this action. This was a very complicated step and the operators need more information to perform it correctly and in a timely manner. The ERG step also stated that a plant specific list should be included in the step.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

6. FR-I.3, Step 18.a, fifth bullet, page 9:

The step used a RVLIS head level of 49% as the setpoint vice the Upper Head full setpoint of the ERG and justified the 49% by stating that it would prevent water slug flow from damaging the head vent piping. There was no information to indicate that a 49% level would satisfy the requirements of the procedure and allow the operator to safely proceed with the procedure. There is more information on this setpoint under the technical adequacy section of the basic report.

7. FR-I.3, Step 20, page 10:

Same comment as step 18.a. above.

8. FR-I.3, Attachment A, Caution, page 12:

The fourth bullet stated "CONTAINMENT PRESSURE greater than or equal to 14.7 PSIA," but the meter reads in PSIG.

9. FR-I.3, Attachment A, Caution, page 12:

The sixth bullet stated, " . . . CONTAINMENT CARFANs RUNNING.", but did not state how many fans must be running to fulfill the condition.

10. FR-I.3, Attachment B, Step 4.a, page 14:

Same as comment on Step 16 above.

ATTACHMENT 2 (Cont'd.)

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BACK PAGES

PROCEDURE TO RESET SAFETY INJECTION AND CONTAINMENT ISOLATION

1. Step 2:

   The step referred to "CARFAN dampers," but the switch labels referred to "CONT. RECIRC dampers."

2. Step 5:

   The step directed the operator to check that, "HCP RESET SI TO HCP BLOCKED" annunciator is actuated, but did not include the alarm panel annunciator location information in the step. This unnecessarily complicated the performance of this step.

3. Step 7.b:

   The step referred to SI block switches which were labeled Core Cooling block switches.

4. Step 7.c:

   Same as comment in step 5 above.

5. Step 9.b:

   The step referred to CIAS/HCP reset buttons, but the buttons had an explanation label next to them, but no identification label.

PROCEDURE FOR ESTABLISHING LETDOWN

1. Step 3:

   The step directed the operator to open the valve to 50%, but the meter that the operator would use to do that had a scale from 0 to 15. The step does not give the operator the valve that corresponds to the setting on the meter being used. Mathematical actions are to be avoided whenever possible.

2. Step 4:

   The step referred to charging line isolation valves, but the labels for the switches called them charging header stop valves.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

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BACK PAGES (Cont'd.)

3. Step 6, Note:

The Note contains actions that would be required prior to steps 6, 7, and 8. Notes are not to contain actions steps.

4. Step 6, Note paragraph b:

To perform this step a key was required. The step does not include the key number that would expedite locating it in the key locker.

5. Step 7 and 8:

The letdown valves were called, "isolation" and, "stop" in the procedure, but the switches were labeled "header trip" and "header stop."

6. Step 11:

The step referred to NOP 2.6-1, SEAL WATER SYSTEM STARTUP, NORMAL OPERATION, but the procedure was titled NOP 2.6-1, SEAL WATER SYSTEM OPERATION, PLACING SEAL WATER SYSTEM IN OPERATION.

7. Step 12:

The step referred to the "high temperature divert" valve, but the switch was labeled "DEMIN High Temp BYPASS." The non-regenerative heat exchanger outlet temperature indication is labelled letdown temperature on the main control board.

REQUIRED SUBCOOLED MARGIN FOR ADVERSE CONTAINMENT

1. The y-axis is labelled PRZR PRESSURE when, in fact, RCS pressure indication is used to determine the subcooled margin requirements.

VALVES REQUIRED TO ISOLATE FAULTED STEAM GENERATOR

1. The first three sets of valves in this procedure were not listed in the same sequence as they appeared in step 4 of the EOP.

2. The plastic labels on three of the four Terry Turbine/Atmospheric Vent Steam Supply Isolation valves were missing and the remaining valves plastic label was partially melted. One Main Steamline Trip Valve Bypass Valve (MS-NRV-47) label was melted. Two of the Main Steamline Trip Valve Drain Line Isolation Valves (MS-V-105A and MS-V-205A) were difficult to reach and would be hard to operate in an emergency.

ATTACHMENT 2 (Cont'd.)

MINOR DEFICIENCIES IDENTIFIED

EMERGENCY OPERATING PROCEDURES

BACK PAGES (Cont'd.)

3. The Main Feedline MOV description is not consistent with the main control board. These valves are labelled the steam generator feed stops.

PROCEDURE TO PARALLEL AND SHUTDOWN A DIESEL GENERATOR

1. Shutdown Procedure, Step f:

   The operators were not familiar with this procedure and would have pressed the pushbuttons labelled, "Diesel Stop," and not used the "normal shutdown" pushbuttons specified in this step.

PROCEDURE TO RESTORE OFF-SITE POWER

1. Step 6.1:

   The step stated, "Place the TIE BKR SYNCH switch to the on position," but for this step the TIE BKR SYNCH switch is to be placed in the off position.

2. Step 6.p, third bullet:

   The step stated, "reset lockout relays 27Y-11 and 27-11B using push button reset on Panel AB6," but the buttons on the panel were labeled, "Bus 11UV Lockout Reset."

PROCEDURE TO MANUALLY START AN EMERGENCY DIESEL GENERATOR

1. The second bullet is not clear as to all components that is intended to be checked.

PROCEDURE TO FILL THE DWST FROM THE PWST OR RPWST

1. Local valve markers for DW-V-509 and DW-V-542 were labeled as PW.

2. Noun names on the local valve markers differ from that of the procedure.

ATTACHMENT 3

LIST OF DEVIATIONS, UNRESOLVED ITEMS AND WEAKNESSES IDENTIFIED

WITH THEIR TRACKING ITEM NUMBERS

Item No	Para. No.	Description
90-81-01	3.4	A deviation from FSAR commitments which is discussed in Paragraph 3.3.A. Develop clear EOP guidance on the proper response to a SGTR event which is consistent with FSAR commitments.
90-81-02	3.4	An unresolved item which is discussed in Paragraph 3.3.B. Verify that the, "STEAM GENERATOR WIDE RANGE/NARROW RANGE CORRELATION GRAPH" can provide accurate SG level information under all plant temperature conditions.
90-81-03	6.4	A weakness which is discussed in Paragraph 6.3.d. Expand the Verification and Validation Program defined in the PGP-Writers Guide, ACP 1.2-6.13, to address the weaknesses identified in Paragraph 6.3.D.
90-81-04	ATT. 2	Resolve weaknesses identified in Attachment 2. Correct noted human factors deficiencies in EOPs, including deficiencies related to step numbering, identification of local actions, transition statements, vocabulary, highlighting of logic terms, component identification, level of detail, attachments, and instructional step format. Upgrade level of detail provided in the Writer's Guide for those areas discussed in Paragraph 3.3.C, where guidance was noted to be lacking. Correct noted organizational problems with the Writer's Guide.