

U.S. NUCLEAR REGULATORY COMMISSION

Report No.: 50-334/88-02

License No.: DPR - 66

Licensee: Duquesne Light Company
P.O. Box 4
Shippingsport, Pennsylvania 15077

Facility Name: Beaver Valley Power Station, Unit 1

Inspection at: Shippingsport, Pennsylvania

Inspection conducted: February 1 - 5, 1988

Inspectors: *P. Bissett* 4/13/88
P. Bissett, Senior Operations Specialist date

N. Dudley 4/13/88
N. Dudley, Senior Operations Specialist date

Approved by: *P. Eselgroth* 4/13/88
P. Eselgroth, Chief, PWR Operations Section date

Summary: Routine announced inspection on February 1-5, 1988
(Report No. 50-334/88-02)

Areas Inspected: A routine announced inspection was conducted in the area of operations to review licensee conformance to the NRC approved Procedure Generation Package regarding the development and implementation of their Emergency Operating Procedures (EOP). Areas examined included the Administrative Program; Technical Adequacy; Writer's Guide conformance; and Independent Verification of set point values. Temporary Instruction 2515/79, Inspection of Emergency Operating Procedures was used as inspection guidance.

Results: An apparent deviation of the licensee's commitment to follow its NRC approved Procedures Generation Package was issued based on the numerous problems identified during the inspection. The technical content of the licensee's EOP was found to be adequate. However, a number of inconsistencies between the Procedures Generation Package and the EOPs and Background Information documents were found in the areas examined. The basic documents for EOPs were not controlled, contained errors and were inconsistent with the guidance contained in the Procedure Generation Package (paragraph 2.5.1). The logic terms, branching statements, cautions and sentence structure of the steps in the EOP did not conform to the guidance in the Procedure Generation Package (paragraph 2.5.3). The nomenclature of plant components and instrumentation was not in accordance with the guidance contained in the Procedure Generation Package and led to operator uncertainty, (paragraphs 2.5.4, 2.5.5 and 2.5.6). The human factor deficiencies in the EOPs appear to have been compensated for by the training and experience of the operators.

DETAILS

1.0 PERSONS CONTACTED

1.1 DUQUESNE LIGHT COMPANY

* T. Burns	DIRECTOR OPERATOR TRAINING
* R. Druga	MANAGER TECHNICAL SERVICES
* L. Freeland	NUCLEAR OPERATIONS SUPERVISOR
* K. Grada	MANAGER NUCLEAR SAFETY
* W. Lacey	PLANT MANAGER
* F. Lipchick	SENIOR LICENSING SUPERVISOR
* A. Mizia	SUPERVISOR QA OPERATIONS
* A. Morabito	MANAGER NUCLEAR TRAINING
* T. Noonan	ASSISTANT PLANT MANAGER
* E. Schad	SIMULATOR COORDINATOR, TRAINING
* F. Schaffner	LICENSING ENGINEER
* B. Sepelak	LICENSING ENGINEER
* G. Smith	PROCEDURES ENGINEER
* J. Russell	SENIOR QA SPECIALIST

1.2 U.S. NUCLEAR REGULATORY COMMISSION

- * J. Beall, Senior Resident Inspector
- * S. Pindale, Resident Inspector

The inspectors also interviewed other licensee personnel during the inspection period.

*Denotes those present at the exit meeting conducted on February 5, 1988.

2.0 EMERGENCY OPERATING PROCEDURES

The purpose of this inspection was to verify that Duquesne Light Company's Emergency Operating Procedures (EOPs) were written, verified and validated in accordance with the licensee's NRC approved Procedures Generation Package and training was conducted on the use of the procedures.

2.1 REGULATORY REQUIREMENTS/REFERENCES

- Regulatory Guide 1.33, Rev. 2 - February 1978, Quality Assurance Program Requirements (Operations).
- ANSI N18.7-1976, Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants.

- Westinghouse Owners Group (WOG) - Emergency Response Guidelines (ERG) - High Pressure Version, Rev. 1, September 1983.
- Generic Letter 82-33, Supplement 1 to NUREG-0737, - Requirements for Emergency Response Capability.
- NUREG-0899, Guidelines for the Preparation of Emergency Operating Procedures.
- Technical Specifications.
- Emergency Operating Procedures Generation Package, Revision 1, April 1987.

2.2 PROGRAM REVIEW

The licensee's program for preparation of EOPs was reviewed to verify that:

- The licensee has developed a Procedure Generation Package which includes Plant Specific Technical Guidelines, a Plant Specific Writers Guide, a description of the program used for verifying and validating the licensee's EOPs, and a description of the program for training operators on EOPs.
- The licensee has developed Emergency Operating Procedures (EOPs) consistent with the guidance of Duquesne Light Company's and NUREG-0899.
- The EOPs use a consistent format, which was easy to follow and was as defined in their PGP.
- The operators have been trained to use the EOPs and the EOPs were useable.
- Differences between Westinghouse's Generic Guidelines and the licensee's specific EOPs were identified and justified.
- The licensee had an administrative program for developing the EOPs and controlling changes to them.
- The EOPs were technically adequate and capable of placing the plant in a safe condition following a reactor trip or actuation of the safety injection system.

2.3 PROGRAM IMPLEMENTATION

Procedures listed in Attachment A were reviewed by the inspectors against the requirements and commitments of paragraph 2.1.

2.3.1 ADMINISTRATIVE PROGRAM

The inspectors reviewed the program for controlling Operating Manual Deficiencies Reports (OMDR) for the EOPs to ascertain whether proper controls were being exercised. Several OMDRs were reviewed and the following items verified:

- An adequate description of the procedural change.
- An adequate description of the reason for the change.
- Documentation of required authorization.
- The Onsite Safety Committee review and approval of the change.
- Proper final disposition of each change.

2.3.2 TECHNICAL ADEQUACY

The inspectors compared seven EOPs against the ERGs and also performed concurrent evaluations of the technical adequacy of the EOPs. During this review, the EOPs were reviewed for consistency with the ERGs, against the step-by-step verification documentation and against the documentation which justified those steps which deviated from the ERGs.

2.3.3 HUMAN FACTORS

Five EOPs were reviewed to determine the extent to which they followed the format and content instructions committed to in the Duquesne Light Company Writer's Guide and whether they met the objectives found in NUREG 0899.

2.3.4 VALIDATION/VERIFICATION PROGRAM

Inspectors reviewed sample documentation of the validation/verification program for adequacy and verified the procedures during plant walk through and simulator scenarios.

2.3.5 WALK THROUGH

Inspectors conducted a walkthrough of two EOPs in the main control room. Comparisons were made between the EOPs and control room main panels, and between valve lineups contained in the Attachments to the EOPs and components outside the main control room, to determine whether:

- The controls/displays identified in the EOPs as being in the control room were there;
- The control/display nomenclature used in the EOPs was comparable to that found in the control room;

- The control/display to be used to complete a step were clearly defined;
- The components required to be checked outside the main control room were accessible and clearly marked; and,
- The displays could be read to the accuracy required by the EOPs.

2.3.6 SIMULATOR

An exercise of the EOPs was conducted on the Beaver Valley Unit 1 simulator. The exercise objectives were:

- To determine whether the EOPs are usable for the level of qualifications, training and experience of the operating staff, and
- To determine whether the EOPs are compatible with the minimum number of operating staff.

Three simulator exercises were developed to cover the subset of the EOPs that had been reviewed for the audit. The exercises included:

- Reactor Trip
- Stuck open PORV which is later SHUT; Multiple instrument failures
- Loss of ALL AC Power
Restoration of one Emergency Bus
All Steam Generators faulted

The scenarios were chosen because they exercised a large portion of the EOPs under review, and they covered a variety of emergency situations. The scenarios were developed to evaluate the use of instrumentation, the use of branching statements and the use of the critical function status trees.

2.4 QA/QC INVOLVEMENT

The inspectors contacted Quality Assurance (QA) personnel in order to determine what role QA had in the development and validation of the EOPs. QA management stated that their involvement to date included a review in March 1987 of the licensee's Procedure Generation Package (PGP) against IE Information Notice 86-64 and Appendix B of NUREG 0899. The inspectors reviewed QAs written comments following this review and the subsequent resolution to these comments as provided by the Procedures Group. The QA Supervisor stated that they had not yet performed any audits of the EOP

program or the EOPs themselves, however both areas are considered auditable items under the QA program.

2.5 FINDINGS

2.5.1 ADMINISTRATIVE PROGRAM

Portions of the licensee's procedural change program for EOPs were reviewed. The Nuclear Operation Supervisor (NOS) is responsible for approving all discrepancies prior to their incorporation into the EOPs in accordance with the Procedure Generation Package, paragraph VI.C.1.g. All deviations from and additions to the Westinghouse Owner's Group Emergency Response Guidelines (ERG) are required to be documented on EOP-ERG Deviation forms in accordance with paragraph VI.B.1.f. No temporary changes to the EOPs are allowed, and therefore, any procedural changes will result in a complete reissue of the affected EOP.

The licensee has a formal program for initiating changes to the EOPs by using Operating Manual Deficiency Reports (OMDR). The OMDRs are reviewed by the NOS prior to being given to the EOP writer for resolution. The OMDRs are tracked on a computerized system. There is no formal program for disposition of the OMDRs once they are reviewed by the NOS. There is no supervisory review of the completed OMDRs or modified EOP-ERG Deviation forms. Only the EOP changes resulting from an OMDR are reviewed by supervisory personnel.

A review of the completed EOP-ERG Deviation forms by the inspectors identified technical errors. In one case a set point was lined through and a new set point written in. There was no initial or date for the line out and the new set point did not correspond to the set point in the EOPs. In a second case no EOP-ERG Deviation form existed for E-O step 29, even though deviation forms existed for similar steps. All EOP-ERG Deviation forms are hand written with numerous line outs of technical information and justifications without explanation or apparent systematic controls. Changes made to the EOPs as a result of one Onsite Safety Committee (OSC) meeting were not documented on the EOP-ERG Deviation forms.

The EOP-ERG Deviation forms did not contain sufficient detail to fully explain the technical reasons for deviations. In one case, the EOP writer needed to call the training department in order to explain the intent and basis for changing E-O step 1. In a second case, a high head safety injection pump was secured without a documented engineering basis.

Portions of the licensee's Background Information for EOPs was reviewed. The background information package for each EOP provides information on the event symptoms, entry conditions, exit conditions and recovery techniques used in each EOP. In addition the purpose, basis, actions, instrumentation, control equipment, knowledge and technical references for procedural step are provided in Step Description Tables. The majority of indications presented in the Step Description Tables do not include the benchboard identification of the instruments to be used as required in the Procedure Generation Package Appendix B Section IV.A.4.e. Examples of indications which were not defined by benchboard identification include total AFW flow and component cooling flow to RCPs. Many Step Description Tables did not provide technical references as required by the Procedure Generation Package Appendix B Section IV.A.4.e.

Failure to include the benchboard identification of the instruments to be used in the Step Description Tables as required by the Procedures Generation Package is a part of the deviation identified in paragraph 2.5.7 below.

As part of the review of the EOP-ERG deviation forms, a technical error was identified in the Procedure Generation Package Section 5, paragraph 11. The paragraph states that the Beaver Valley Unit 1 component cooling water (CCW) system is essentially identical to the CCW system of the reference plant, which is without an appropriate technical basis. The CCW system of the reference plant cools four components; the RHR heat exchanger, the seal water heat exchanger, the containment fan coolers and the reactor coolant pumps. However, the CCW system at Beaver Valley Unit 1 does not cool the RHR heat exchangers nor containment fan coolers, which result in differences between steps in the EOP and in the ERG. Review of Section 5 of the Procedures Generation Package is needed to ensure there are no other technical errors.

2.5.2 TECHNICAL ADEQUACY

The EOPs compare well technically with the ERGs. Minor discrepancies were found that were needed to compensate for the specific plant design and/or the technical specifications. Many instances were noted where additional steps were added over and above what was called for in the ERG. The majority of these additional steps were to provide further clarification and direction to the operators. EOP-ERG Deviation forms were generated as necessary, however as stated in paragraph 2.5.1, many forms did not contain sufficient detail to fully explain the technical basis for deviations.

In one instance the licensee deviated from a directive in the ERGs and did not provide a written technical justification for the deviation. The ERGs require that additional steps for verification of other essential equipment as required by the specific plant design, should be placed after E-0 step 12. The facility's EOPs contain seven additional steps prior to E-0 step 12 of the ERGs and no EOP-ERG Deviation form has been written. The licensee stated that the EOPs contained the additional steps because the superseded event based reactor trip procedure contained the same step sequences and in order to minimize the amount of operator retraining required to implement the new EOPs, the steps of the superseded trip procedures were retained. Training concerns are not considered to be a sufficient technical basis for deviating from the ERGs.

A problem was noted during the review of ECA O.O, "Loss of all AC Power." Several actions, such as operation of valves and pumps, are required during the time period when attempts are being made to restore AC emergency power to these components. Many of these steps will be impossible to complete as long as power is unavailable. ECA O.O requires further review to ensure that power would be available to all components which are required to be operated.

2.5.3 HUMAN FACTORS

The human factors review involved a comparison of the EOP with the Writer's Guide and with NUREG 0899. Discrepancies were grouped into five main areas. A summary of the major issues for each of the areas is provided below. Specific comments and examples of the major issues are provided in Attachment B.

Logic Terms The Writer's Guide presents definitions and format instructions regarding the writing of conditional statements using the logic terms. While the instructions provided were incomplete, those which were provided were not applied correctly within the EOPs. Four major areas of concern were identified:

- The use of AND and OR (together and separately) within action statements.
- The inappropriate structuring of IF, THEN statements.
- The use of the implicit IF NOT in the Response Not Obtained (RNO) column.
- The use in the RNO column, of an IF NOT statement without an initial IF statement.

Referencing and Branching

The EOPs contained a number of transition terms which were undefined in the Writer's Guide and inconsistent with the guidance provided.

Notes and Cautions Cautions and Notes in the EOPs were often misused by their structure as directives or inclusions of inappropriate information (i.e., non-critical information in Cautions).

Sentence Structure The EOPs utilized inconsistent structural methods for similar types of statements, conflicting not only with the guidance provided in the Writer's Guide, but utilizing a number of different structures for one type of statement within a single EOP. In addition, action statements included two to three directives within one step.

Miscellaneous Other problems were found in the EOPs including use of vague terminology and inconsistent use of abbreviations and acronyms.

The licensee's failure to follow the Writer's Guide is discussed in a deviation identified in paragraph 2.5.7.

2.5.4 VERIFICATION/VALIDATION

Verification: The licensee's Procedure Generation Package described the verification of the EOPs for correctness, using the Writer's Guide as a basis for evaluation. The program is described as being carried out by a team of personnel from Operations, Training and Procedures groups. A checklist is used as a guide to the process and discrepancies are forwarded to the EOP writer for correction. A decision is made by the NOS whether a follow-up verification or validation of the draft EOP is needed.

Verification activities at Beaver Valley were carried out by Duquesne Light Company personnel with assistance from a human factor consultant during the initial verification.

A control room and plant walk through by inspectors to verify selected EOP steps identified a number of examples where the nomenclature of instrumentation in the EOPs was inconsistent with the nomenclature found in the control room and the plant. Some examples where the nomenclature in the EOPs was different than that found on the name plate data are:

- E-0 Entry Conditions refers to annunciator window A5-47 "Manual Reactor Trip From Main Control Board." The annunciator window is now in position A5-9.
- E-0, Attachment 2 refers to MOV-RW-113D "River Water to D.G. Heat Exch." which must be checked locally. Due to a design change MOV-RW-113D has been replaced by MOV-RW-113D1 which is in a different room.
- E-0 Attachment 2 refers to four valves which should be checked locally at the Diesel Generators, as "River Water to D.G. Heat Exch." The valves at the generator are labelled "RAW Water Valves #1 and #2."

The licensee had identified that the nomenclature in the main control room does not meet the requirements of the Writer's Guide.

Subsequent observation by the inspectors of the use of the EOPs on the simulator indicated that the nomenclature disparity between the EOPs and the control room panels presented no confusion to the operators. However, during the simulator scenarios the lack of detailed specifications of instrumentation resulted in the operators using instrumentation which was not in accordance with the licensee's plant specific background document. Some examples where incorrect instrumentation was used during the simulator scenarios are:

- E-0 step 6.a, the operator used breaker position and an annunciator window to verify an AC emergency bus was energized. The background document requires that the voltmeter be used.
- E-0 step 9.1, the operator used an annunciator to verify the turbine-driven AFW pump running. The background document does not provide an instrument to check for completing this step. It was the consensus of the operators that the position of steam valves are checked for ensuring the turbine-driven AFW pump is running.

Appendix F of the Procedure Generation Package, paragraph II.A.2.b, requires that the EOPs be reviewed for technical accuracy of "Operator Instrumentation and Control Needs." Failure to correctly translate control room and plant switch and indicator nomenclature into the EOPs as part of the verification program is a part of the deviation identified in paragraph 2.5.7 below.

Validation: The validation process is described in the licensee's Procedure Generation Package as a demonstration that the operating staff can manage the emergency condition through the use of the procedures and that the EOPs are operationally correct in respect to usability, technical correctness, operational correctness and effectiveness. The Procedure Generation Package indicates that table top reviews, control room walk through, or simulator exercises will be used to validate EOPs. The documentation for the validation of procedure E-0 was reviewed and found to be adequate for the table top review, simulator and control room walk through. However, the inspectors identified discrepancies in procedure E-0 during the plant walk through, as described below.

2.5.5 WALK THROUGH

The walk through of procedures in the main control room and in the plant identified deviations of EOP procedural steps and the recommendations in the Procedures Generation Package. The Writer's Guide in paragraph V.B.g states that "identification of components and parts should be complete." An example of a step which did not satisfy this requirement is:

E-0 Symptomatic Response/Unexpected Conditions, 1 a. CRR flow to RCP's - NO FLOW INDICATED.

The operator was uncertain what readings would be acceptable, and the basis document does not indicate the required instrument.

The Writer's Guide in paragraph VI.E.1.d states that "users should not be required to add or subtract numbers to determine acceptable values." Contrary to this:

- E-0 step 17, Verify Total AFW Flow - GREATER THAN 350 GPM; requires the operator to sum the values from three flow instruments.
- E-0 step 21.a.2.a, RCS/Highest D/P - LESS THAN 150 PSID; requires the operator to select the highest reading from one of nine pressure instruments and to subtract it from the reading of a tenth pressure instrument.
- E-0 step 12. a, Steam line pressure high rate of change - 99 PSIG DECREASE IN 50 SECONDS; requires the operator to calculate a rate of change.

The walk through in the plant was performed to assess the adequacy of various factors involved in the performance of ECA O.O "Loss of All AC Power." Areas reviewed which included equipment identification, accessibility of equipment, and the availability of emergency lighting and communications equipment (dedicated Appendix R phone service line) were found to be adequate. Valves and breakers were for the most part readily accessible, with the exception of a few instances where temporary scaffolding was in place (e.g., IA-90). Valves TV-CC-107E2 and D2 were difficult to access primarily because of piping configuration.

Valve identification tags were considered inadequate, especially when considering a loss of lighting, when a valve might have to be located and subsequently operated. Identification tag deficiencies, observed by the inspector, include tags that were missing, damaged or unreadable. The licensee utilizes a lightweight thin metal strip embossed with the letters/numbers of the appropriate valve. The dimensions of the tag are approximately 5" x 1/2" and the tag is normally attached at one end to the valve body. The inspector found it difficult, in a number of instances, to read the ID tag, even under normal lighting conditions. Valves TV-CC-107E2 and D2 are examples in which difficulty was experienced in reading the valve identification tag numbers. The ID tags had to be "in-hand" in order to accurately read them. The readability of the ID tags presently in use is questionable. Other examples of ID tag discrepancies include:

- 1 MOV-IFW-155B - ID tag missing
- 1 MOV-IFW-155A - ID tag damaged
- MSIVs vent panel valves - ID tags missing
- 1 MOV-FW-151 valves - ID tags missing or damaged
- Dedicated AFW pump valves - missing ID tags

The licensee stated that efforts have been underway to ensure that tag IDs are accurate and in place, however it is an ongoing program. Those areas where pump, valve and breaker manipulations might be called for under loss of lighting conditions require escalated action.

2.5.6 SIMULATOR

No procedural deficiencies were observed during the simulator portion of the audit. Problems identified during the walk through were confirmed in observations and discussions with the operators in the simulator. Operator actions were taken in accordance with the EOPs. However, the requirements contained in the ERG Users Guide were not followed during the development of the EOPs. For example:

- E-0 step 1, the operator transitions to FR-S.1 prior to checking reactor power decreasing. The ERG requires that power be checked prior to the transition.
- E-0 step 6.a, the operator reported power to the AC Emergency Bus even though the voltmeter indicated zero volts. The ERG requires the use of the voltmeter.
- E-0 step 24, the operator did not check the containment sump level recorder as required by the basis document.

Operator actions were slowed due to the wording of some procedural steps. ECA 0.0 step 32.a contained an "AND/OR" step which the operator had to reread several times before proceeding. The operator experienced difficulty determining subcooling margin requirements prior to transitioning out of ECA 0.0 "Loss of All AC Power," and finally referred to a pressure temperature graph which was not part of the EOPs. From observations of operators in the simulator and from discussions with the licensee, deficiencies identified in the wording, structure and format of the procedural steps appear to have been compensated for by operator training and experience instead of rewriting the steps to correspond to the Writer's Guide.

2.5.7 SUMMARY

The technical content of the licensee's EOPs was reviewed in detail and determined to be consistent with the Westinghouse Owners Group Emergency Response Guidelines and the licensee's Procedure Generation Package. A human factors review of the Writer's Guide, revealed numerous deficiencies including, but not limited to the incorrect and inconsistent use of logic statements in the EOPs. The documentation of the deviations identified by the validation program was found to be deficient. The basis document for the EOPs do not include detailed instrument specifications nor references in accordance with the Procedures Generation Package. The verification program failed to correctly translate control room and plant switch and indicator nomenclature into the EOPs.

There has been no human factors or quality assurance involvement in the validation of the latest revision of the EOPs. Numerous human factors issues, related to the Writer's Guide, and numerous deficiencies identified in the EOP-ERG Deviation Forms and the Background Information documents indicate deviations from the Procedures Generation Package. Based upon the above and the detailed discussions in paragraph 2.5.1, 2.5.3, 2.5.4, 2.5.5, and Attachment B, this is an apparent deviation of the licensee's commitment to follow the NRC approved Procedures Generation Package (50-334/88-02-01).

3. INDEPENDENT VERIFICATION

The inspectors independently verified that various levels and values given in the EOPs were consistent with the indicators found in the control room and that the operators were knowledgeable of where various switches were located. The inspectors reviewed the documentation of five plant specific setpoints and determined that the engineering analysis to support the plant specific setpoints were not referenced in all cases. This failure to reference supporting documentation contributed to the apparent deviation summarized in paragraph 2.5.7.

4. EXIT INTERVIEW

An exit meeting was held February 5, 1988, to discuss the inspection scope and findings, as detailed in this report (see paragraph 1.0 for attendees).

At no time was written material given to the licensee. The inspector determined that no proprietary information was utilized during the inspection.

ATTACHMENT A

DUQUESNE LIGHT COMPANY, BEAVER VALLEY UNIT 1, PROCEDURES REVIEW

- E-0 Reactor Trip or Safety Injection, Issue 1, Rev. 1
- E-3 Steam Generator Tube Rupture, Issue 1, Rev. 1
- ES-1.1 SI Termination, Issue 1, Rev.1
- ES-3.1 SGTR With Loss of Reactor Coolant - Subcooled Recovery
Desired ECA - 3.1, Issue 1, Rev. 1
- ECA 0.0 Loss of All AC Power, Issue 1, Rev. 1
- ECA 0.1 Loss of All AC Power Recovery Without SI Required, Issue 1,
Rev. 1
- ECA 2.1 Uncontrolled Depressurization of All Steam Generators,
Issue 1, Rev. 1

ATTACHMENT B

REVIEW OF WRITER'S GUIDE

1. The Writer's Guide, Section V.E., presents definitions and format instructions regarding the writing of conditional statements using logic terms. The instructions provided are not applied consistently within the EOPs. The following problem areas were identified.
 - a. When used as conjunctions, "and" and "or" join lists, multiple actions or alternatives. When used as logic terms, they indicate decision points. It is important that appropriate emphasis be used when these words are being used in a conditional statement, to signal to the operator that a decision point has been reached. When used to indicate multiple actions, alternatives or a list, "and" and "or" should not be emphasized as logic terms. The Writer's Guide does not provide explicit direction on the different use and formatting of "and" and "or". The EOPs contain different types of formatting for these words which are not consistent with the Writer's Guide.

Example: E-0, step 25.b and c.

25.b. Secondary heat sink:

- Total feed flow to intact SGs - GREATER THAN 300 GPM
- OR -
- Narrow range level in at least one intact SG - GREATER THAN 57.

25.c. RCS pressure - STABLE OR INCREASING

This step uses the conjunction "or" in two different formats. Because "or" is functioning as a conjunction in both uses, it should be formatted consistently. While the Writer's Guide lacks format information for the use of "or" as a conjunction, neither use of "or" within the above step is consistent with the guidance provided in Section V.E of the Writer's Guide for the emphasis of the logic term OR.

Other examples of this type of problem found in the EOPs sampled include:

<u>EOP</u>	<u>STEP</u>	<u>PROBLEMS</u>
E-0	35	-or-
E-0	36.b	-AND-
ES-1.1	2 RNO	AND (not a conditional statement)
E-0	3.a	and
E-0	3 RNO	or
E-0	13.a	-or-
E-0	13.b RNO	AND (not a conditional statement)
E-0	22.a RNO	and (a conditional statement)

- b. The Writer's Guide provides direction on the use of the logic sequence IF, THEN in paragraph V.E.

There are a number of IF NOT, THEN statements which are not formatted consistently with the guidance provided.

Example:

E-0 Step 7 RNO
Check if SI is required: ...

IF SI required, THEN manually actuate.

IF SI is NOT required, THEN GO TO ES-0.1,
"Reactor Trip Response," Step 1.

This step conflicts with the format directions in the Writer's Guide, which indicates that the term IF NOT will not be split.

Other examples of this problem found in the EOPs sampled include:

<u>EOP</u>	<u>STEP</u>
E-0	6.a RNO
	9.f RNO
	20.a RNO
	20.b RNO

Example:

ECA-0.0 step 7.a.3 RNO

Verify proper emergency alignment of AFW valves. IF NOT properly aligned, THEN manually align AFW valves [MOV-FW-151A-F] as necessary

The step does not contain the first conditional IF.

Other examples of this type of problem found in EOPs sampled include:

<u>EOP</u>	<u>STEP</u>	
E-0	13.a.1	RNO
E-0	13.a.2	RNO
E-3	21.a.2	RNO
ECA-0.0	20.c	RNO
ECA-0.0	21.b	RNO
ECA-0.0	33.a	RNO
ECA-1.1	13.f	RNO
ECA-2.1	15.b.2	RNO

- c. The two column format used in the EOPs is structured so that the right hand column includes an implicit "if not" relationship to the left hand column. In a number of statements in the EOPs, the "if not" has been repeated in the right hand column, unnecessarily cluttering and complicating the procedure, and not taking advantage of the RNO structure.

Examples:

E-0 step 4.b RNO

IF reheater flow control block valves will NOT close, THEN manually close main steam line trip, bypass and non-return valves.

E-0 step 11.a RNO

a. IF CIA has NOT actuated

THEN manually actuate CIA

-OR-

Manually align CIA valves

Other examples of this type of problem found in the EOPs sampled include:

<u>EOP</u>	<u>STEP</u>	
E-0	12.b	RNO
E-0	23.d	
E-0	23.d	RNO
E-0	25.b	RNO
ES-1.1	9	RNO
ES-1.1	11	RNO
E-3	17.d	RNO
E-3	23.b	RNO
E-3	26	
ECA-0.0	14	RNO
ECA-0.0	24	RNO

2. The Writer's Guide Section V.H. 2. defines "go to" as the transition term to be used within the EOPs and provides format instructions. The EOPs, however, use a number of different terms to indicate movement within and between EOPs. The Writer's Guide does not define the minimum number of terms necessary for clear instruction to operators on transitions.

Examples:

E-0, Step 23 RNO

GO TO E-3 "Steam Generator Tube Rupture," Step 1 AND in conjunction complete only Steps 23b through 23d.

This step contains two transition terms which is not in accordance with the Writer's Guide and one of the terms is not defined in the Writer's Guide.

ES-1.1 Step 15 RNO

- a. WHEN PRZR level greater than 18% THEN perform Step 16.

Other examples of this type of problem found in the EOPs sampled:

<u>EOP</u>	<u>STEP</u>		<u>TRANSITION TERM USED</u>
ES-1.1	27.a	RNO	"do"
E-3	3	RNO	"do"
E-3	30.b	RNO	"do"
ECA-0.0	18	RNO	"perform"
ECA-0.0	16.b	RNO	"do"
ECA-0.0	26.a	RNO	"GO TO...THEN do"
ECA-2.1	7.f.2	RNO	"do"

3. Cautions are used to describe a hazardous condition which can cause injury or equipment damage and should describe the consequences of the hazard. Notes are intended to provide supplemental information to the operator. Neither Cautions nor Notes are to include action statements. The human factors review revealed several problem areas related to Cautions and Notes:

Caution(s) and Note(s) in the EOPs sampled were found to contain directives and references which are action statements. Some Cautions lack a statement of the hazard at hand and possible consequences. Following are instances of improper use and structure of Caution(s) and Note(s):

E-0, page 23

CAUTION: RCS pressure should be monitored. If RCS pressure decreases to less than 250 PSIG, the LHSI pumps must be manually restarted to supply water to the RCS.

This Caution lacks identification of the hazard and consequences related to a low RCS pressure. The Caution also contains a directive which more appropriately is an action statement.

Other examples of these types of problems found in the EOPs sampled include:

<u>EOP</u>	<u>PAGE</u>	<u>PROBLEM</u>
E-0	13	Note contains action statement.
E-0	14	Note contains action statement.
ES-1.1	10	Caution lacks identification of the consequences of the hazard. Caution contains action statements.
E-3	7	Caution lacks identification of hazard or consequence.
E-3	7	Caution contains branching statements.
E-3	14	Caution contains logic statement. Caution lacks identification of hazard or consequence.
E-3	30	Caution lacks identification of consequence.
ECA 0.0	17	Note contains action statement.
ECA 0.1	16	Caution contains logic statement.

4. Sentence structure is an important factor in the presentation of clear and understandable instructions. The inspector's review identified several problem areas related to sentence structure in the EOPs.
 - a. The Writer's Guide, paragraph V.B.1 indicates that steps are to be written concisely, describing just the task to be performed and that complex evolutions are to be broken down. The following step includes more than one action:

E-3.1 step 5.C

Trend RCS temperature and pressure on the main computer at 10 minute intervals. Initial the trend every half hour to ensure that cooldown does not exceed 100F/hr in RCS cold legs.

Other examples of these type of problems found in the EOPs sampled include:

<u>EOP</u>	<u>STEP</u>
ECA-0.0	11
ECA-0.0	26.b RNO
ES-1.1	2
ES-1.1	5.b.3
ES-1.1	22.a
ES-3.1	5.e
ES-3.1	9.b
ES-3.1	9.e
ES-3.1	11.a
ES-3.1	33
ES-3.1	35.b.3

- b. A system of step numbering and identification can assist the operator in moving through procedures without confusion. The review of the EOPs revealed an inconsistency in the use of bullets which indicate no preferred order of completing action steps. In some steps where a check is made of multiple indications, bullets are used, in other steps AND is placed between the indications; and in other steps individual letters are used.

Examples:

E-0 step 3

Verify Turbine Trip

- a. Throttle and governor valves - CLOSED
- b. Reheat steps and interceptors - CLOSED

E-0 step 22

Check If SGs Are Not Faulted

- o NO SG PRESSURE DECREASING IN AN UNCONTROLLED MANNER
- o NO SG COMPLETELY DEPRESSURIZED

E-0 step 36

Verify CNMT Instrument Air - AVAILABLE ...

b. CNMT instrument air receiver pressure -
GREATER THAN 95 PSIG

- AND -

Annunciator A6-110, "CNMT
Instrument Air System - Pressure
Low" - NOT LIT

Other examples of these types of inconsistencies found in
the EOFs sampled include:

<u>EOP</u>	<u>STEP</u>	<u>METHOD</u>
ES-1.1	1	Letters
ES-1.1	2	Bullets
ES-1.1	7	- AND -
ES-1.1	13.d.1	Single bullet
ES-1.1	14	Letters
ES-1.1	24	Single bullet
E-3	17.g	AND
ES-3.1	2.a	Bullets
ES-3.1	9.a	Numbers
ES-3.1	10.a	Bullets separated by - or -

5. A number of statements in the EOPs are vague and do not describe specific operator behaviors. For example, the operators are instructed to perform an action "maintain" with no criteria provided as to what the requirements are. In order to ensure that procedures are understood, directions should be defined quantitatively. The following are examples of the use of vague terms noted in the EOPs:

<u>TERM</u>	<u>EOP</u>	<u>STEP</u>
Stable (without desired range)	E-0	25.c
	ES-1.1	21
Maintain (without requirements)	ES-1.1	11
	ES-1.1	31.b
	E-3	5.a
As necessary	ES-1.1	14.a
	ES-1.1	31.a
	E-3	25.b

6. Other weaknesses identified during the review are noted below:

- a. The Writer's Guide includes Table 2, "Abbreviations used in Procedures," yet the EOPs include a number of abbreviations and acronyms which are not included in Table 2 or are included in Table 2 in another form. In addition, the EOPs include multiple forms of a number of abbreviations. In order to minimize confusion and ensure consistently prepared procedures, all acronyms and abbreviations to be used in the EOPs should be listed in the PGP.

NOT INCLUDED IN TABLE 2

IA
NCO
NSA
PID
R
Rad Con
R/hr
V

INCONSISTENT WITH TABLE 2

AMPS vice Amp
amps vice Amp
Ft vice FT
D/P vice dP
S/G vice SG
gpm vice GPM

- b. The Writer's Guide paragraph V.E.2 states, "the use of AND and OR within the same action should be avoided." ECA-0.0 steps 32.a and b both contain an AND/OR logic term.
- c. The Writer's Guide paragraph V.F.2 states, "the contingency actions will be specified for each circumstance in which the expected results or actions might be achieved." ECA-0.0 step 22.a contains the response not obtained action in the left hand column. Other verification or monitoring steps which do not include response not obtained actions include:

<u>EOP</u>	<u>STEP</u>
ECA-0.0	1.c
ECA-0.0	8
ECA-0.1	15.c
ECA-2.1	31.c

- d. The Writer's Guide paragraph V.C.1.a states that expected indications should be presented in the left hand column. ECA-0.0 step 22.b which checks for DC Bus Loads does not specify the expected indications.
- e. The use of the words OR and AND in the example in section V.A.3 and 6 of the Writer's Guide is inconsistent with the section VI.C.1 of the Writer's Guide which allows underlining of OR and AND only if they are used as logic terms. The use of lower case letters for the expected response in section V.A.7 of the Writer's Guide is inconsistent with the section VI.B.1.f.3 statement that "any condition following a hyphen in the left-hand column should be capitalized."