U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-373/91003(DRS); 50-374/91003(DRS)

Docket Nos. 50-373; 50-374 Licenses No. NPF-11; NPF-18

Licensee: Commonwealth Edison Company
Opus West III
1400 Opus Place, 6th Floor
Downers Grove, IL 60515

Facility Name: LaSalle County Station, Units 1 and 2

Inspection At: Marseilles, IL 61341

Inspection Conducted: January 28 through February 8, 1991

Inspectors: V Patricia Lougheed for 3/22/91
Peggy R. Rescheske, RIII Date
Team Leader

V Patricia Lougheed for 3/22/91
G. M. Nejfelt, RIII Date

V Patricia Lougheed for 3/22/91
R. A. Kopriva, RIII Date

P. L. Reagan, Consultant (COMEX)

G. M. Wilford, Consultant (SAIC)

Approved By: Thomas M Gwynn for 3/22/91
Monte P. Phillips, Chief Date
Operations Branch


Inspection Summary

Inspection on January 28 through February 8, 1991
(Reports No. 50-373/91003(DRS); 50-374/91003(DRS))
Area Inspected: Special announced team inspection to verify that the LaSalle Emergency Operating Procedures (EOPs) were technically correct and useable, and controlled and maintained over time. The inspection was conducted in accordance with Temporary Instruction 2515/92.
Results: No violations were identified; however, four Open Items require a licensee response. Team conclusions were as follows:

(1) Desktop Review - The EOPs were generally technically adequate. The control and documentation of the basis/justification for setpoints, plant specific data, and input data to calculations was not adequate. Further discussion is in Paragraph 3.a, with specific examples in Appendix B. (Open Item 373; 374/91003-01(DRS)).

(2) Walkdowns -- Numerous deficiencies were identified during walkdowns of the support procedures; however, walkdowns of control room actions resulted in few problems. Deficiencies were generally in the areas of: emergency lighting, labeling, support procedure details, equipment accessibility, and tool and material availability and control. The Team concluded that local actions could probably be performed; however, several tasks would only be accomplished after some confusion and time delay. Further discussion is in Paragraph 3.b, with specific examples in Appendix B. (Open Item 373; 374/91003-02(DRS)).

(3) Verification and Validation (V&V) - The V&V documentation for the EOPs and support procedures was not complete or well presented. The V&V procedures were generally not adequate in that the support procedures were not included in the verification, and the V&V program did not contain sufficient detailed guidance and objective criteria. The validation effort performed for the support procedures was not sufficient to ensure that the local actions could be performed as written or physically accomplished in a timely manner. Further discussion is in Paragraph 3.c. (Open Item 373/91003-03(DRS)).

(4) Simulator Exercises - Based on the scenario observations, the Team concluded that the operating crews understood and were able to effectively utilize the EOPs (LGA flowcharts) with no difficulty. Further, the specified actions detailed in the selected EOPs were technically correct, and could be accomplished using existing equipment, controls, and instrumentation located in the control room.

(5) Human Factors Review - The LaSalle Writers Guide (WG) may not be adequate to maintain the quality of the EOPs in future revisions of the LGA flowcharts. The WG contained internal inconsistencies and lacked specific guidance where needed. There was no specific writers guide for the support procedures, other than the process used for other plant procedures. This led to inconsistencies in content, format, and level of detail among support procedures. The support procedures are considered part of the EOP program and should be written and maintained with quality requirements equivalent to those required for the LGAs. Further discussion is in Paragraph 4, with specific examples in Appendix C. (Open Item 373; 374/91003-04(DRS)).

## REPORT DETAILS

1. Persons Contacted

Commonwealth Edison Company (CECo)

G. R. Diederich, Station Manager
W. R. Betourne, Nuclear Quality Programs Superintendent
J. A. Borm, Nuclear Quality Programs
W. R. Huntington, Technical Superintendent
J. N. Kish, Nuclear Safety
J. C. Dlika, EOP Coordinator
J. Lockwood, RA Supervisor
W. E. Morgan, Nuclear Licensing Administrator
J. V. Schmeltz, Assistant Superintendent, Operations
C. W. Schroeder, Production Superintendent
T. Shaffer, Training Supervisor
J. K. Walkington, Services Director
B. Wood, Nuclear Safety

U. S. NRC

J. B. Hickman, Project Manager, NRR
C. J. Phillips, Resident Inspector, RIII
M. P. Phillips, Chief, Operations Branch, RIII
W. D. Shafer, Chief, Projects Branch, 1, RIII
H. Simons, Projects Inspection, RIII
W. H. Swenson, DLPQ, NRR
T. M. Tongue, Senior Resident Inspector, RIII

Illinois Department of Nuclear Safety (IDNS)

J. Roman, Resident Engineer

Nuclear Installations Inspectorate (NII)

B. Gall (British Observer)

All of the above individuals attended the exit meeting held on February 8, 1991.

Other persons were contacted during the inspection including members of the licensee's operations, training, and quality assurance staffs.

2. Overview

a. Background

Emergency Operating Procedures (EOPs) have undergone significant changes due to the 1979 accident at the Three Mile Island (TMI) facility. The post-TMI procedures are symptom-oriented rather than event-oriented. Symptom-oriented EOPs provide the operator guidance on how to verify the adequacy of critical safety functions and how to restore and maintain these functions when they are degraded.

Symptom-oriented EOPs are written in a manner that the operator need not diagnose an event to maintain the plant in a safe shutdown condition for accidents that are within the scope of the EOPs. The purpose of this inspection was to verify that the LaSalle EOPs were technically correct; prepared in accordance with the writer's guide; that their specified actions could be accomplished using existing equipment, controls, and instrumentation; and that the available procedures have the useability necessary to provide the operator with an effective operating tool.

b. Inspection Methodology

The inspection consisted of a desk top review of all 10 LaSalle EOP flowcharts (LGAs); control room and in-plant walkdowns of the LGAs and selected local actions specified in 28 EOP support procedures; an exercise of 7 scenarios on the plant simulator which tested the use of all LGAs; and a human factors review of the procedures, walkdowns, and simulator exercises. In addition, users of the EOPs, namely licensed and non-licensed operators, were interviewed. A detailed listing of these activities is given in Appendix A of this report.

The following licensee documents were used during the course of the inspection:

- Control of EOPs and Procedures Generation Package (PGP) - LaSalle Administrative Procedure LAP-820-11, "Emergency Procedure Implementation and Control," Revision 3.

- Plant Specific Technical Guidelines (PSTG) - LAP-820-11TA, "LaSalle County Station Plant Specific Guidelines," Revision 4. These were developed utilizing revision 4 of the BWR Owners Group Emergency Procedure Guidelines (EPGs).

- Step Deviation Document (SDD) - OEI Document 8907-2L, Appendix A, Revision 0, "Derivation of the LaSalle Plant Specific Technical Guidelines."

- Setpoint Document (SD) - EOP-89-001, Revision 0, "EOP Calculation Setpoint Document"; and OEI Document 8907-2L, Appendix B, Revision 0, "Calculation Worksheets."

- Writers Guide (WG) - LAP-820-11TB, "LaSalle County Station Emergency Operating Procedure Writer's Guideline," Revision 1.

- Verification and Validation (V&V) Programs - LAP-820-11TC, "LaSalle County Station Emergency Procedures Verification Program," Revision 3; and LAP-820-11TD, "Emergency Operating Procedure and Support Procedure Validation Guidelines," Revision 2.

- EPG, Revision 4, V&V documents, dated January 1991 - "EOP Verification Documents," and "EOP Support Procedure Validation Documents."

3. Inspection Results

The Team concluded that the LaSalle EOPs were generally adequate to mitigate accidents within the scope of the EPGs and could be implemented by the plant staff. EOPs at LaSalle included the LGAs (flowcharts) and designated support procedures such as certain abnormal operating procedures (LOAs) referenced by the LGAs.

Primary concerns related to the control and quality of the EOP development and maintenance programs were identified. The Team identified weaknesses in the setpoint document, verification and validation process, and the writers guide (paragraph 4). In these areas, the EOP program was not consistent with the guidance and recommendations in NUREG 0899 and other documents accepted by the NRC; and several deficiencies identified did not meet the requirements of LaSalle administrative procedures or appropriate criteria from 10 CFR Part 50, Appendix B.

All inspection findings and conclusions were discussed with the licensee during the inspection, including those detailed in the Appendices to the inspection report. The detailed examples in Appendix B and C are representative findings from the desktop reviews and walkdowns of selected procedures, and may not include all deficiencies in a specific procedure.

a. Desktop Review

The desktop review consisted of a detailed comparison of the LaSalle PSTG to the BWR Owners Group (BWROG) Emergency Operating Procedure Guidelines (EPGs), NEDO-31331, Revision 4. Where deviations from the EPGs occurred, the step deviation document (SDD) justification was assessed. Calculations and setpoint documentation (SD) was also reviewed. The EOP flowcharts were reviewed against the PSTG utilizing the Writers Guide (WG).

The EOPs were generally technically adequate. Potentially safety significant concerns identified by the Team received prompt attention by the licensee. Concerns requiring further action by the licensee are identified below and in Appendix B. Other relatively minor concerns were resolved during the inspection. General observations were as follows:

- In a limited number of cases, such as using reactor water cleanup (RWCU) as an alternate blowdown path, the procedure LOA-RT-04 could not be performed as written.

- There was no specific procedure for local manual emergency starting the diesel generators. There were several diesel generator related procedures, but none specifically addressed the case when a local manual emergency start was required. This could cause significant delay in restoring AC power in the case when offsite power was lost and the diesel(s) failed to automatically start and load on the emergency buss(es).

- The Team was unable to conclude that the applicable support procedures adequately considered loss of instrument air and loss of electrical power off-normal conditions for procedure implementation. However, there were specific LOAs for restoration of instrument air and electrical power.

The control and documentation of the basis/justification for setpoints, plant specific data, and input data to calculations was not adequate. For example, vendor technical information (setpoint documents) used in preparation of the EOPs was not approved in accordance with LAP-100-15, "Control of Vendor Technical Information." Further, numerous examples were identified in which the basis for

setpoints in the EOPs was not documented and the setpoint was not controlled in the EOP program. The SD was needed as part of the technical/design basis for the EOPs, and as such needed to be controlled and maintained. None of the individual deficiencies identified were significant from a safety standpoint and the licensee initiated corrective action during the inspection. Resolution to the specific deficiencies in the SD and the programmatic weakness will be tracked as an Open Item (373; 374/91003-01(DRS)).

b. Walkdowns

Walkdowns of selected procedures (see Appendix A) were conducted with licensed operators, non-licensed operators, and technicians who would normally perform EOP tasks. The objective of these walkdowns was to verify that operator actions called for in the procedures could be performed in a timely manner with minimum potential for error. Results of these walkdowns are summarized in the following paragraphs. Examples of specific technical comments are provided in Appendix B.

No significant problems were observed concerning the ability of operators to locate and use control room instrumentation and controls. In general, control room instrumentation and controls called for in the EOPs were available and could be located by the user. In some cases, nomenclature differences and uncertainty concerning designation of post accident qualification of instruments caused delay in locating the correct instrument. Most annunciators for LGA entry conditions were appropriately marked with a red border, but the LGAs themselves had no specific annunciator window number reference for those cases in which an annunciator could be used to alert the operator to an LGA entry condition. Specific examples of weaknesses in this area were included with human factors comments in Appendix C.

During the walkdown of in-plant tasks, there were problems encountered in locating certain electrical panels, Motor Control Centers (MCC), and valves. The LOAs generally did not provide the location of seldom used components, consequently there was occasional difficulty in locating the correct component in a timely manner.

The Team determined that communication was generally adequate for EOP implementation, but EOP users were uncertain of communication system functionality upon loss of electrical power.

During the in-plant walkdowns, the Team found that effective methods were not in place for providing equipment operators with a written list of tools, equipment, and other items needed for EOP implementation. In some cases the LOAs were not implemented in a timely manner because needed tools, communication equipment, and keys had not been obtained by the EOP user.

The Team concluded that improvement was warranted in the efficiency with which in-plant activities could be performed. General observations were as follows:

- Emergency Lighting - Emergency lighting was not actually tested during the inspection, but the Team observed many areas where emergency lighting may not be adequate for successful performance of local actions. Licensee personnel involved in the walkdown of LOAs concurred that emergency lighting may not be adequate in all cases. Locating the correct component and doing tasks such as jumper installation was hampered by inadequate emergency lighting in some areas, such as Standby Gas Treatment (SBGT), auxiliary electrical equipment room(s), the stairway adjacent to the Operations Support Facility (OSC), and the reactor building raceways and corner rooms. The licensee stated that a modification to improve emergency lighting was planned.

- Labeling - Labeling of control panels was generally not consistent with the EOP nomenclature and was not always consistent with the noun names used in valve checklists. Labeling of valves and piping was incomplete or inconsistent. The licensee stated that labeling improvement programs were in progress.

- LOA related labels - A program to apply stencilled signs on the exterior of electrical panels and laminated labels on the interior or electrical panels was partially implemented. Not all such signs and labels were correct. Partially complete, and sometimes incorrect, signs and labels caused confusion and delay. Specific examples are provided in Appendix B.

Administrative controls for the application of LOA related signs and labels were inadequate. Attachments F and G of LAP-820-11, Revision 3, listed "LGA Support Procedure Panel Labels" for Units 1 and 2, respectively. LAP-820-11 did not proscribe the process for development, maintenance and control of LOA related signs and labels.

- Equipment checklist in LOA procedures - The Team noted that LOAs had no consistent format and content for listing items such as tools, radios, other equipment, and keys needed for successful LOA implementation. Some examples are described for specific procedures in Appendix B.

- LOA attachments - The format of LOA attachments used to document lifted leads, jumpers, and valve positions was inconsistent. Requirements for independent verification were not clearly delineated. This caused uncertainty concerning consistent and correct performance of the action.

- Lug nuts for HFA relays - Lug nuts were not provided in the LGA support locker for use in the installation of jumpers at HFA relays. It was not certain if the preferred installation technique was to install the jumper on top of the existing lug nut or loosen the installed nut then install the jumper. If the latter technique was used, the control or protective circuit response was not clearly defined in the LOA.

- Lifted lead tags - It was not clearly stated if lifted lead tags and temporary system change (TSC) numbers were required when implementing the LOAs. Some data sheets had space to record the TSC number, but this was not required.

- Sequence of lifting leads - The sequence of lifting leads and applying jumpers was generally not specified in the LOAs. The significance of doing such TSCs in a specific order (e.g., expected control or protective circuit response) was not clearly delineated in the LOAs.

- 10 CFR 50.54(x) - Requirements for obtaining approval and making reports concerning the defeat of primary containment isolation signals was not consistently included with all affected LOAs. Some affected LOAs had no 10 CFR 50.54(x) action statements and other LOAs had the action statement at an inappropriate location in the procedure.

Some LOAs incorrectly referred to "10 CFR 50.59(x)." Typical examples are listed in Appendix B.

- Tabs for procedure books - Books in the control room, LGA support locker, and shift engineer's office were not consistently tabbed to facilitate location of the desired LOA or LOP.

- Correlation with GSEP actions - The LGAs provided no references or branches to GSEP actions. This was not a requirement, but would be effective in helping to coordinate simultaneous implementation of the LGAs and GSEP actions. The licensee stated that graphical integration of LGA and GSEP actions was currently planned for an unspecified future date.

- Housekeeping - Housekeeping inside many electrical panels was poor. For example, the floor inside panel 1H13-P623 was found to contain broken tie wraps, pieces of electrical tape, nuts, and paper scraps. Also, several terminal strips had no protective covers and other covers were loosely attached.

The Team concluded that the local actions could probably be performed; however, several tasks would only be accomplished after considerable confusion and time delay. Resolution of the specific deficiencies identified and the programmatic weaknesses will be tracked as an Open Item (373; 374/91003-02(DRS)).

c. The V&V programs were controlled by LAP-820-11TC, "LaSalle Emergency Procedures Verification Program," and LAP-820-11TD," Emergency Operating Procedure and Support Procedure Validation Guidelines." The V&V program implemented for Revision 4 of the EPGs was documented in three volumes dated January 1991: EOP Verification Documents, EOP Validation Documents, and EOP Support Procedure Validation Documents. Areas of concern are described below.

(1) The V&V documentation for the LGAs and support procedures was not complete or well presented. For example:

- Verification cover pages (Attachment A of LAP-820-11TC) were not completed for the LGAs. The licensee added the cover pages during the inspection.

- Support procedure validation did not include dates when the validation was performed.

- Deficiencies identified by the licensee during the V&V effort were not adequately resolved. For example, several support procedures were revised subsequent to the validation to include tool and equipment lists; however, these lists were not always complete or accurate.

- The contracted human factor LGA validation was not adequately addressed in the validation document in that the validation criteria and results were not clearly stated.

- The support procedures were listed in Attachment A of LAP-820-11. Copies of support procedures listed in Attachment A were to be maintained in the LGA support locker. This list did not accurately reflect the current EOPs or the support procedures validated.

- LAP-810-11, Step F.7.b, required that support procedures be verified in accordance with LAP-820-11TC. This verification was not performed.

(2) The V&V procedures were not adequate. The following weaknesses were identified:

- The verification program (LAP-820-11TC) only applied to the LGAs. As a result, the support procedures were not verified.

- The V&V program provided nonrestrictive guidance on who should perform the V&V, and the scope of the effort. A multi-disciplinary team approach and objective criteria were not specified in the procedures. As an example of this weakness, the LGA verification was performed by a single verifier using portions of the WG checklists.

(3) The validation effort performed for the support procedures was not sufficient to ensure that the local actions could be performed as written or physically accomplished in a timely manner. This was evidenced by the results of the walkdowns conducted by the Team and discussed in

paragraph 3.b. Examples such as unavailable tools and equipment, labeling mismatches, and procedural deficiencies, led the Team to conclude that the validation walkdowns and checklists were not adequately completed.

Resolution of the specific deficiencies identified and the programmatic weakness will be tracked as an Open Item (373; 374/91003-03(DRS)).

d. Simulator Exercises

Five unique scenarios exercising all 10 LGAs were conducted on the LaSalle simulator to verify that the procedures provided the operator with an effective operating tool to place the plant in a safe shutdown condition for accidents and transients within the scope of the EOPs. The scenarios were run utilizing two different operating crews consisting of a shift engineer (SE), shift foreman (SF), two licensed reactor operators (NSO), and a shift control room engineer (SCRE). The first crew performed four unique scenarios and the second crew performed one unique scenario and two scenarios that were performed by the first crew with minor modifications.

Based upon the seven scenarios observed, the specified actions detailed in the selected EOPs were technically correct and could be accomplished using the existing equipment, controls, and instrumentation.

Operating strengths observed during the performance of the EOPs were: (1) the entry conditions for the LGAs were frequently reviewed to consider new problems, (2) the SCRE supported the SF using the LGAs (e.g., correcting a decision block error before action to the crew was directed), (3) the SF verified the LGA action taken (e.g., corrected an omission made by a NSO), and (4) the crew response for the exercises paralleled the anticipated scenario actions.

4. Human Factors Review

The EOPs were reviewed for consistency with guidance provided in LaSalle's EOP Writer's Guideline (LAP-820-11TB) and accepted human factosr principals as described in NUREGs 0899 and 1358. The review identified a number of areas where human factors related improvements could be made; however, none were determined to pose significant safety concerns. Areas where concerns were identified are discussed below. Specific examples are provided in Appendix C.

a. General LGA and Support Procedure Comments

- LGA Format - Dotted lines were not consistently used to connect flowchart elements to external information as required by the WG.

- LGA Presentation - Grid coordinates (e.g., as used on P&IDs) would be useful for LGA revisions, auditing, and simulator scenario development.

- Cautions and Notes - Cautions should be used to alert operators to hazardous conditions that may cause injury or equipment damage, and should describe the consequence of the hazard. Notes should be used to present supplemental information to the operator. Neither cautions nor notes should contain action statements. In general cautions and notes found in the LaSalle LGAs conform to this guidance. However, cautions that apply to items within a list of systems were found to follow the item to which they applied. This technique introduces inconsistency with regard to caution presentation within the LGAs and could result in the oversight of caution information by the operator. Within the LGA support procedures numerous examples of deviations from this guidance were found. In many cases notes and cautions followed the steps to which they applied. Notes and cautions were also found to contain operator actions. In some instances cautions did not provide information relating to hazardous conditions that may cause personnel injury or equipment damage, thus diluting the importance given to them by the operators.

- Procedure/Equipment Nomenclature - During the conduct of control room and in-plant walkdowns of LGA support procedures numerous examples of differences in nomenclature between procedure and plant equipment labeling were found. Though the differences did not prevent the operators from locating the equipment and accomplishing the task, the useability/readability of the procedure was degraded. The validation checklist found in LAP-820-11TD, Attachment B2, Item 5, requires there be an exact match between EPNs/noun names referenced in the procedure and equipment labels.

- Operator aids - Colored bands marking operating ranges were not consistently used on control room instrument scales. For example, the radiation monitors associated with LGA-02 had no green, yellow, or red bands on the instrument scales. Further, LAP-1600-14, Revision 0, established a control room annunciator window prioritization scheme. Control room annunciator windows for SCRAM, 1/2 Scram, isolation and LGA entry conditions were to be identified with a red border. However, not control all annunciator windows associated with LGA entry conditions were outlined in red. The following were some examples, with additional examples noted in Appendix B:

  (1) The "Drywell or Suppression Chamber Hydrogen" entry condition in LGA-03 had an alarm setpoint of four percent, which was equal to the required LGA entry condition, but the annunicator was not outlined in red.

  (2) The "Suppression Pool Level" entry condition in LGA-03 had alarm setpoints at a more conservative value than the stated LGA entry conditions. The annunciator windows were not outlined in red.

- Inconsistent step structure - Inconsistent step structure was found in the LGAs and LGA support procedures. In LGA-05, supplementary details for depressurizing were included as a system list within an action step on one leg and in another leg within the same procedure as a separate detail (LGA-D5). In the LGA support procedures, one area of inconsistency was in reference to local and control room actions. In some instances operator tasks were specifically referenced as "local" or "control room." In some cases within the same procedure control actions were not specifically designated as local or control room. Interviews with nonlicensed personnel substantiated the fact that this inconsistency lead to confusion as to where the tasks should be accomplished. In addition, LAP-820-1, "Station Procedures," Attachment D, Item G, required each step within the support procedures to be specified as a local or control room action. A second type of inconsistency was found in variations in wording of similar steps. Some steps stated "VERIFY CLOSED...." while others state "VERIFY .....CLOSED." Also within the LGA

support procedures there was inconsistent formatting of attachments. To enhance procedure useability, readability and understandability similar steps within the EOP network should be structured in the same manner.

- Inconsistent level of detail - Some LOAs, such as LOA-RI-05 had very useful sketches for HFA relay wire termination. This was not consistently done for all LOAs. Due to illumination levels and labels in the panel, such sketches were very valuable to ensure the correct relay and terminals were located. For example, it was very difficult to locate the correct terminals on relay 1B21H-K75 in LOA-RH-05 without a sketch. The LOAs were not consistently structured concerning restoration to normal. Some, but not all, LOAs included a checklist for LGA support locker inventory. Few LOAs included specific direction on what action was to be taken for restoration to normal conditions.

The LGA support procedures are part of the EOP network and need to be written to the same exacting standards as the LOAs with respect to style, format, content and applicable human factors guidance.

b. <u>Review of Writers Guide</u>

Guidance for the development of EOPs at LaSalle was provided in LAP-820-11TB, "LaSalle County Station Emergency Operating Procedure Writer's Guideline." The Team found numerous inconsistencies within the WG itself or where more specific or detailed guidance was needed. These inadequacies lead the Team to conclude that the quality of the LGAs and support procedures may not be maintained over time with the guidance contained in LAP-820-11TB. Weaknesses and/or deficiencies in the WG are identified below:

- The acceptable format, layout and content of the EOPs was described in text. However, the flowcharts were primarily graphical in nature. The WG should incorporate the use of graphic examples covering all possibly acceptable variations of flowchart implementations.

- Attachment A, Item G, Step 11 - Complex and composite structures were not defined nor examples provided.

- There was no authorized action verb list. This list should identify and define all action words that would be acceptable for use in the EOPs.

- There was no mechanism or described methodology for placekeeping when using the flowcharts.

- There was no guidance for distinguishing between control room and in-plant operator actions. Specific terminology (such as manually and locally) should be used to differentiate between these two types of actions.

- There was no table of contents, which made the document difficult to use when the writer was looking for a specific topic.

- There was no specified acceptable emphasis techniques (such as underlining or capitalization).

- Attachment I, Item 4c, allowed the placement of a caution following the item to which it applied when the caution applied to an individual item on an itemized list. Cautions should always precede the item or items to which they apply.

- Attachment I, Item A, did not specify that cautions and notes should be kept to one topic.

- Attachment I, Item E, did not provide guidance on the use of a rectangle for notes which applied to a series of steps (as Item A did for cautions).

- Attachment L did not incl e guidance on the use of GO TO as a consequence within a decision table as a means of transferring or cross referencing within a procedure.

- There was no specific guidance on how Tables or Figures were to be referenced.

- Attachment E did not specify how questions contained within the diamond symbol were to be worded. Questions within decision symbols should be phrased in a consistent manner.

- There was no type size specification for all flowchart elements (i.e., amplifying instruction/details, diamond branch path labels).

- A writer's guide for Abnormal Procedures did not exist. As the LOAs were part of the EOP procedure network, commonality in style, language and other appropriate conventions between LGAs and LOAs would enhance procedure understandability and useability.

- The WG did not sufficiently explain/ illustrate/differentiate between inter and intra procedure transitioning.

- Continuous Action Statements - The WG did not discuss rules of usage for the bold downward pointing arrows within action statements. Such arrows were interpreted to mean that the operator should continue in the LGA while performing the associated action statement. The arrows were not consistently used in the LGAs.

- Some the of LGA flowcharts began with "START" enclosed in a rounded rectangle (LGA-08, LGA-06, LGA-07). Other flowcharts (LGA-05) began with "START" and provide information on how the operator would get to this point (i.e., from LGA xx). The current writers guide did not provide guidance covering these variations (see Attachment B). Sound human factors practice would require providing the operator information on how operators entered each flowchart within the LGA network.

- Some of the LGA flowpath legs terminated without specific exiting direction or feedback to the operator on what action should be taken next (LGA-08, LGA-03 Hydrogen leg and Primary Containment Pressure leg, LGA-10 Power leg). WG Attachment C did not address this and stated that exits from procedures or procedure sections shall be enclosed in rounded rectangles. Operators doing walkdowns stated they would wait for a change in plant conditions or for management direction before continuing.

- Overriding Statements - Graphical depiction of the vertical line below overriding statements was not consistent in the LGAs. This was allowed by the WG. That inconsistency caused confusion in some LGAs regarding applicability of the overriding statement. Some specific examples are noted in Appendix B and elsewhere in Appendix C.

The team concluded that the WG may not be adequate to maintain the quality of the EOPs in future revisions of the LGA flowcharts. The Team noted, however, that the WG used for the development of the LGAs was provided by

Operations Engineering Inc. (OEI). The licensee had revised the OEI WG and created the LaSalle WG controlled as LAP 820-11TB. The OEI WG appeared to be a more acceptable version from a human factors standpoint.

c. Operator Interviews

Operators (SROs and ROs) were interviewed to determine their understanding of the LGAs and support procedures as well as their responsibility in the implementation of the procedures as part of the control room team. Additionally, operator opinions were solicited regarding adequacy of training on the LGAs, opportunities for operator input in revising the procedures, and overall satisfaction with the technical accuracy and useability of the LGAs and support procedures. Interviews were also conducted with non-licensed operations staff regarding their roles in supporting the implementation of the LGAs.

In general, licensed operators demonstrated a good understanding of the LGAs and support procedures. No significant concerns with respect to accuracy and useability of the procedures were reported. Some of the licensed operators substantiated concerns identified by the Team. One such concern had to do with the content of a number of the exit and entry points in the LGA network. In some cases in the LGAs "START" symbols included the procedure from which the operator exited to get to this point, while in others this information was not provided. There were also examples of flowchart legs terminating with no specific direction as to the next action the operator should take (see Writers Guide discussion for specific procedures). Some of the operators interviewed expressed concern over this lack of guidance/feedback as well as the lack of consistency within the LGA network.

During the course of the interview, operators were asked about existing adminstrative procedures that would be used to initiate and accomplish a procedure change. In general, the operators had a good

understanding of this process. However more than one operator remarked that there was no formal mechanism in place (or they were unaware of such a mechanism) for providing initiators of procedure changes with feedback as to the disposition of the change request.

Interviews with non-licensed equipment operators supported a number of the findings with regard to the Alternate Boron Injection procedure, LOP-RT-14 (see Appendix C). Operators expressed concern that the appropriate chemicals should be staged locally in order for timely task accomplishment. Non-licensed operators also suggested that the support procedures contain a listing of the required tools necessary for procedure accomplishment. Another concern was that equipment location information be provided for infrequent operations. Non-licensed operators also expressed concerns over LGA support locker inventory. One concern was that only one copy of each LGA support procedure was contained in the notebook in the LGA support locker. Suggestions included breaking out each procedure into a separate easily identified package and including more than one copy of specific procedures for those that required more than one operator. Operators also suggested including valve operators (cheater bars) in the LGA support locker inventory.

The licensee needs to review the human factors deficiencies identified in the EOP program. Resolution of the specific deficiencies in the WG and EOP procedures, and the associated programmatic weaknesses will be tracked as an Open Item (373; 374/91003-04(DRS)).

5. Training and Qualification Effectiveness

Training records to support the implementation of Revision 4 of the Emergency Procedure Guidelines (EPGs) were reviewed. Licensed operator training included: (1) an overview of LGA changes, (2) flowchart usage, (3) review of each LGA procedural step, and (4) simulator training. Approximately 20 hours of classroom training and 20 hours of simulator usage were dedicated to provide each licensed operator the background to be proficient with the recently implemented EOP revision. The licensee took the initiative to increase the average annual hours for EOP training (i.e., 8 hours classroom and 60 hours simulator) for each RO and SRO by 10 hours (i.e., 12 hours classroom, 6 plant walkthrough, and 60 hours simulator), to achieve greater familiarity with the LGAs in the new training cycle (i.e., Modules 91-02 and 91-03).

Training records for non-licensed operators to support Revision 4 of the EPGs were reviewed. Approximately two hours of classroom work and six hours of plant walk-throughs were performed by the non-licensed operators.

Non-licensed operators who were qualified to lift leads used for local EOP action (e.g., High Voltage Switch (HVS) Qualified) received an additional month of classroom work and an additional month of on-the-job-training. Upon completion of this curriculum, a written test and an oral board were required for certification.

Requalification training presentation for determining equipment operability (Training Module No. LAP-220-5) was monitored on February 5, 1991. The material was presented clearly by the instructor and followed the Instructor Notes.

6. Quality Verification Effectiveness

The licensee conducted an annual Quality Assurance (QA) audit in the area of the facility emergency plan (GSEP) as required by Section 6 of the Technical Specifications. The audit routinely included review of specific aspects of the EOP program (e.g., verification of appropriate instrumentation). In 1988, an extensive audit of the EOP program was performed (in conjunction with the GSEP audit). This audit paralleled the NRC Temporary Instruction (TI) 2515/79, and included verification of the technical adequacy of the EOPs, and observation of simulator scenarios. In 1989, no significant review of EOPs was included in the GSEP audit. In 1990, the audit did include some scenario observation and review of EOP maintenance. In January 1991, the LaSalle EOPs were first implemented in flowchart form (utilizing Revision 4 of the EPGs). For the 1991 audit, the licensee had planned a detailed audit of the EOP program (similar to 1988); however, this portion of the GSEP audit was cancelled/postponed due to the NRC EOP Team Inspection.

The effectiveness of the QA audits of the current EOP program could not be assessed by the Team at this time. The licensee was planning to conduct a corrective action audit later in 1991, and was considering including a followup review of actions taken in response to the EOP Team findings identified in this report.

7. Open Items

Open items are matters which have been discussed with the licensee which will be reviewed further by the inspectors and which involve some action on the part of the NRC or licensee or both. Open items disclosed during this inspection are described in Paragraphs 3.a, 3.b, 3.c, and 4.

8. Exit Meeting

The inspectors met with licensee representatives (denoted in Paragraph 1) on February 8, 1991. The inspectors summarized the purpose, scope, and findings of the inspection and the likely informational content of the inspection report. The licensee acknowledged this information and did not identify any information as proprietary.

## Appendix A

## Description of Inspection Activities

EOP FLOWCHARTS(1)

| | |
|---|---|
| LGA-01 | RPV Control, Revision 8 |
| LGA-02 | Secondary Containment Control, Revision 8 |
| LGA-03 | Primary Containment Control, Revision 13 |
| LGA-04 | Blowdown, Revision 9 |
| LGA-05 | RPV Flooding, Revision 6 |
| LGA-06 | ATWS Blowdown, Revision 3 |
| LGA-07 | Steam Cooling, Revision 4 |
| LGA-08 | Primary Containment Flooding, Revision 4 |
| LGA-09 | Radioactivity Release Control, Revision 3 |
| LGA-10 | Failure to Scram, Revision 3 |

SUPPORT PROCEDURES (2)

| | |
|---|---|
| LOA-CY-02 | Cycled Condensate Makeup To The Reactor, Revision 4 |
| LOA-FC-03 | Reactor Fill From Fuel Pool Emergency Make Up Pump, Revision 6 |
| LOA-FP-02 | Loss Of Both OA & OB Diesel Fire Pumps, Revision 6 |
| LOA-FP-03 | Diesel Fire Pump Makeup To The Reactor, Revision 2 |
| LOA-FW-02 | RPV Flooding - High Level MDRFP Trip Bypass, Revision 2 |
| LOA-HP-01 | RPV Flooding - High Level HPCS Isolation Bypass, Revision 5 |
| LOA-HP-02 | HPCS Suction From CY, Revision 0 |
| LOA-MS-01 | Main Steam Isolation Heat Sink, Revision 9 |
| LOA-MS-03 | Main Steam Isolation Bypass For Emergency Venting, Revision 1 |

| | |
|---|---|
| LOA-RD-07 | Simultaneous Operation Of Both CRD Pumps, Revision 6 |
| LOA-RH-05 | RHR Injection Via Shutdown Cooling Return Lines (Outside The Shroud), Revision 0 |
| LOA-RH-06 | RHR Injection Via Head Spray Line (Outside Shroud), Revision 0 |
| LOA-RI-04 | Defeating of RCIC Low Pressure Isolation, Revision 0 |
| LOA-RI-05 | Defeating Of RCIC Isolation Signals To Use RCIC To Depressurize The RPV, Revision 0 |
| LOA-RR-01 | Automatic Transfer Of Reactor Recirc Hydraulic Power Unit From Lead To Backup System, Revision 2 |
| LOA-RT-04 | Defeating RWCU Isolation Signals For RPV Depressurization In The RWCU Blowdown Mode, Revision 0 |
| LOA-RT-05 | Defeating of RWCU Isolation Signals To Use RWCU to Depressurize The RPV In The Recirculation Mode, Revision 0 |
| LOA-SC-02 | Initiation Of Standby Liquid Control, Revision 8 |
| LOA-SC-03 | Reactor Fill From SBLC Solution Tank And Test Tank, Revision 7 |
| LOA-SF-01 | Suppression Pool Makeup To The Reactor, Revision 2 |
| LOA-VP-02 | Primary Containment Temperature Reduction - Drywell Coolers, Revision 7 |
| LOA-VQ-02 | Primary Containment Hydrogen Reduction, Revision 0 |
| LOA-VQ-03 | Emergency Primary Containment Hydrogen Reduction, Revision 0 |
| LOA-VR-04 | Restart Of Reactor Building Vent After A Group IV Isolation, Revision 4 |
| LOP-RH-07 | Shutdown Cooling System Startup, Operation, and Transfer, Revision 25 |

| | |
|---|---|
| LOP-RH-16 | Raising and Lowering of Suppression Pool Level, Revision 9 |
| LOP-RT-14 | Alternate Boron Injection, Revision 2 |
| LZP-1330-26 | Sampling Of Containment Air At The High Radiation Sampling System, Revision 7 |

Notes:

(1) All LGAs were reviewed during the desk top review described in Paragraph 3.a. These procedures were also walked down as described in Paragraph 3.b. All LGAs were exercised during the simulator scenarios described in Paragraph 3.d.

(2) Selected local actions in the support procedures were walked down as described in Paragraph 3.b.

## Appendix B

## Detailed Technical Comments On

## The LGAs and Support Procedures

LGA-01

- No engineering justification was available to determine if the drywell temperatures measured without ventilation fans operating were representative of the bulk drywell temperature. Action taken using incorrect drywell temperature may result in action being taken either too early or too late (e.g., loss of reactor level indication based upon the RPV Saturation Limit (RSL) Curve, Detail LGA-D1). The licensee was reviewing this item.

LGA-02

- Entry Conditions - Reactor Building fferential pressure and Reactor Building or Fuel Pool vent radiation values were generally in accordance with the EPGs, but the SD did not provide the basis for plant specific values.

- Entry Conditions - The SD did not provide a basis for the reactor building area temperature limit values.

- SDD Page A95 - No justification was provided for deviation number three (regarding HVAC exhaust radiation level).

- Override Statement - The second contingency (regarding Reactor Building and Fuel Pool vent exhaust) was confusing and was not worded in a manner consistent with LOA-VR-04, step 7.

- PSTG DEV - The EPG required concurrent area cooler and Reactor Building sump pump operation. The action statements below the first override statement directed serial performance of those actions. No justification was provided in the SDD. A justification for the deviation was provided on a PSTG Verification Discrepancy Sheet. Also, absence of a downward arrow in the "run coolers as necessary" action statement caused confusion regarding permission to operate sump pumps prior to operating area coolers.

- Contingency for "Primary system discharging into reactor building" - No specific entry point was given for branching to LGA-01. Consequently, three SCRAMs could be required by the LGAs in quick succession (a SCRAM in LGA-02, followed by a SCRAM and placement of the mode switch to "shutdown" in LGA-01).

- Contingency for "Two or more areas above max safe..." - No procedural reference was provided to define the preferred method for shutting down the reactor.

- Reactor Building Parameters - The LGA did not specifically state that monitoring of Reactor building parameters was to be done, as required by the EPG.

- Reactor Building Radiation Limits Table - Annunciator setpoint values for unit 1 and 2 were different in some locations and deviated from the LGA alarm values.

- The identification number for the Auxiliary building containment purge radiation monitor was incorrect. The correct number was K602I.

- Reactor Building Area Water Level Limits Table - Signs were placed locally to define the maximum safe Reactor building area water level limits. There was no administrative control of those signs.

LGA-03

- Drywell Temperature Entry Condition - In accordance with the PSTG and Technical Specification section 3.6.1.7, an entry condition for LGA-03 was drywell temperature above 135oF. Annunciator windows A5-03 and B5-03 on panel 1(2) 1PM13J had alarm setpoints of 140oF. The annunciator windows were not designated as LGA entry conditions by marking with a red border. This was a potentially safety significant deviation and was not identified during the V&V process. The licensee promptly reviewed the matter and initiated a temporary system change to decrease the alarm setpoint to 125oF. The temporary change was installed on both Units on February 7, 1991.

- Primary Steps With Contingencies - In several places there was no specified end path when the conditional action statement was satisfied.

- Override Statement "Release Rate Reaches LCO" - The setpoint value "LCO" was not clearly defined in terms of control room instrumentation and caused confusion.

- Containment Flood Level Decision Points - The "containment flood level" decision point was not used consistently in the LGA. It was called "Suppression pool level" and "Primary containment water level." This caused delay in locating the appropriate control room instrument.

- Primary Step Under "Primary Containment Pressure" - The step implied that both SBGT and primary containment vent and purge systems were to be used. The intent was to use either of these two systems. As written, the step caused confusion.

- Suppression Chamber Pressure - The suppression chamber pressure setpoint was established at 10.9 psig in the SDD, but the LGA used a value of 11 psig. There was no justification for this difference in the SDD. The control room instrument used to determine suppression chamber pressure was not marked to designate its post accident qualification.

- Drywell Temperature - This section of the LGA referenced a detail chart (LGA-D1) concerning RPV water level indication, but did not specify the LGA containing that chart. This caused delay in locating the correct chart, and when found, the chart was difficult to interpret.

- Action Statement Under Drywell Temperature - The action statement below entry point 10 was confusing in two respects. The statement was to "Start all available drywell cooling," but the intention was to use sufficient drywell cooling to hold drywell temperature below 135oF. The pointer stated that it was "Ok to defeat isolation interlocks [LOA-VP-02]," but the referenced procedure was used for defeating interlocks and operating the system in this condition.

- Action Statement Under Pool Temperature - The action statement below entry point 11 was confusing. The statement was to "Start all available pool cooling," but the intention was to use sufficient cooling to hold suppression pool temperature below 105oF. Also, there was no continuing action arrow indicating permission to proceed with the subsequent actions while doing this step.

- Second Primary Step With Contingency Under Pool Temperature - The meaning of "If you are not in RPV Flooding or Steam Cooling" was not clearly defined and no reference to the applicable LGA was provided.

LGA-04

- Entry Conditions - The NOTE below the START indicated "this procedure overrides the control actions in" LGA-01 and LGA- 07, but this was not a complete list of entry conditions. LGA-04 was also entered from LGA-03. Lack of all entry conditions on LGA-04 caused delay in diagnosing the appropriateness of LGA-04 implementation.

- Depressurization Action Statement - Depressurization methods included the main condenser, but it was not clear what systems were used in the "main condenser" method.

- Drywell Pressure Setpoint - The 1.69 psig value was a technically correct site specific number, but the SD did not identify the basis for this setpoint.

- Suppression Pool Level Setpoint - The -18 ft value was a site specific number, but the SD did not identify the basis for this setpoint.

LGA-05

- PSTG DEV - The action statement below the first decision point (under entry point 12) required prevention of all RPV injection except SBLC and CRD. The LGA allowed RCIC injection but provided no justification for this safety significant deviation. The licensee promptly reviewed the matter and initiated a correction.

- Action Statement Below First Decision Point - Isolation of HPCS, RHR, FW and LPCS was required in the action statement below the first decision point (under entry point 12) to prevent all RPV injection (except SBLC, CRD and RCIC). No direction was provided to ensure this step would be consistently performed.

- PCLL - The primary containment level limit (PCLL) curve did not identify which instruments were to be used for determination of drywell pressure and containment flood level.

- Depressurization Action Statement - Depressurization methods included the main condenser, but it was not clear what systems were used in the "main condenser" method.

- Detail LGA-D6 - It was possible to be at this step without SBLC in service, but SBLC was not listed as an alternate flooding system.

- Action Statement "Close these valves" - The list was not complete and uncertainty resulted. For example, "RCIC steam isolation valves" was interpreted to mean the outboard and inboard isolation valves 1(2)E51-F008 and 1(2)E51-F063, respectively. Those valves had bypass valves, but it was not certain they should be closed because they were not identified in the LGA.

- Compound Statement Below Entry Point 13 - The pointer under LPCI was vague and lacked a procedure reference. As written, the step could be interpreted to mean all the

listed systems were to be used, rather than using only the listed systems "as necessary."

- Table LGA-T5 - No definition of "flooding time" was provided. It was not certain when to begin measuring the flooding time. Also, it was not certain how to use the table when the number of open SRVs varied with time.

- Action Statement Left of Table MCUTL - No guidance was provided for lowering RPV water level and it was not certain how the step was to be accomplished.

LGA-08

- RPV Water Level Setpoint - The -161 in. value was a site specific number taken from the TS, but the SD did not identify the basis for this setpoint.

- PCLL - The primary containment level limit (PCLL) curve did not identify which instruments to use for determination of drywell pressure and containment flood level.

- Primary Containment Water Level - There was no operator aid readily available in the control room or the procedure to correleate levels such as 726 ft, 738 ft and 789 ft with elevation of equipment such as TAF, main steam lines, and containment vents. This caused uncertainty as to the optimum recovery action. Also, the SD did not identify the basis for the setpoint values used in this LGA.

- Pointer In Last Action Statement - The action statement addressed systems that could be used to maintain primary containment water level. The pointer included an action statement to "recirculate from suppression pool," but did not define the steps to accomplish that activity.

LOA-FC-03

- Step D.1 - Emergency lighting was not actually tested during the inspection, but the inspector observed and the licensee concurred that emergency lighting may not be adequate for successful performance of local actions.

- Step D.3 - The inspector verified that the required spool pieces were in the local area, but they were not clearly labeled. Gaskets for one spool piece were located in the LGA support locker, but were not labeled. Additional gaskets were stored in the warehouse.

- No drains were installed in the line to the RHR emergency makeup line to facilitate spool piece installation. Also, Maintenance had no specific procedure to perform this

activity. If required to do so, Maintenance personnel stated that appropriate work control procedures could be prepared within approximately two hours.

- Caution above step D.7 - The local gauges used to measure suction and discharge pressures had calibration stickers dated several years ago. Also, the discharge gauge was liquid filled. Due to the liquid in the discharge gauge and the old calibration stickers on the gauges, there was uncertainty concerning accuracy of these instruments. The inspector verified these Pratt gauges were actually within their current calibration requirements and that the discharge gauge was properly liquid filled. The licensee agreed to remove the obsolete calibration stickers.

LOA-FP-02

- Step D.1.a - No location was specified for gauge 1PI-WS007 and that caused delay in locating the correct instrument. Also, 1PI-WS007 was associated with the "A" service water pump and indicated zero when the "B" service water pump was operating alone. 1PI-WS008 was associated with the "B" service water pump, but was not listed in the LOA.

- Step D.1.c - The step did not specify that non-essential equipment on both units must be shutdown.

- Step D.4 - This step caused confusion because it duplicated actions stated in step D.1.c.

LOA-FP-03

- Step D.2.d.1 - The list of items needed from the LGA support locker was not complete and the fittings were not clearly labeled.

- Step D.2.d.2 - Not all connection points were clearly identified and readily accessible.

- Step D.2.e.1 - The step indicated that seven "Y" connectors were needed. Only five "Y" connectors were actually required and there were five in the LGA support locker. The number of additional fire hose sections was not identified.

- Step D.2.e.3 - No sketch was provided to indicate the correct connections for this activity.

- Step D.2.g - It was not clearly understood if proper operation of fire protection hose reels required all of the fire hose to be pulled from the reel before opening the water supply valve.

LOA-FW-02

- Step D.2.a - The procedure required lifting the lead from terminals DD-32 or DD-33, but the laminated label in panel 1H13-P612 addressed only terminal DD-32.

LOA-HP-01

- Step D.1 - There was no instruction to obtain necessary tools, equipment, and an operating "LA" key prior to doing this step. This caused delay in procedure implementation.

- Steps D.2.f and D.3.c - These steps did not indicate location or elevation of the HPCS 1(2)E22-F001 valves. Identification and manipulation of these valves would be difficult due to their location (10-15 feet in air).

- No lifted lead tags were prepared prior to doing substeps a and b. It was not clearly understood if lifted lead tags were needed prior to doing this step.

- Panel 1(2) H13-P625 had no stenciled label marking it as appropriate for LOA-HP-01. This caused delay in locating the appropriate cabinet.

- No signs prohibited radio use in this area. The inspector questioned and the licensee concurred that such a restriction was appropriate.

LOA-MS-01

- Incorrect unit number was used in the entire section of Attachment D for Unit 2 (e.g., panel "1H13-P622" was referenced rather than "2H13-622" for procedural steps and drawings).

- Several careful readings were needed to determine required action for several "IF" statements in series (e.g., Step D.3).

- Typographical error that was printed on p. 2 incorrectly indicated Paragraph "D.4."

- To perform Step 3.a, the operator needed to perform the actions of:

  LOA-IN-03, "RECOVERY FROM A GROUP X ISOLATION," Revision 1, which then referenced. . .

  LOA-PC-04, "RECOVERY FROM A GROUP II ISOLATION," Revision 6, which provided no additionally needed information.

- Use of "X" and "10" was interchanged in referencing a Group Ten Isolation.

- Use of "#" and "psig" was interchanged.

- Step D.10 stated:

  > "IF these parameters [radiation monitors for main steam line and others] are not following expected trends or Technical Specification Release Limits are being exceeded, then ISOLATE or REISOLATE the MSIVs."

  The criteria for re-closing the MSIVs were not clearly identified for operator use (e.g., realarm or radiation monitors); and no administrative requirement to increase the periodic monitoring of radiation levels was established for trending.

- No emergency lighting was provided for the auxiliary electric relay rooms panels needed for this procedure in Unit 1 and Unit 2 (e.g., 1PA14J).

- In panel 1PA14J the terminal, BB-61 to BB-62, had a black banana jack installed. The specially made jumper for this terminal used alligator clips. Although the terminal could be jumpered as currently wired, it would be much more difficult attaching the alligator clip to the rear terminal screw.

- Safety terminal shields were missing in several panels referenced in procedure.

- Step D.3.c - Caution [1] has the operator install jumpers per attachment C(D). Of the four jumpers required (2 for Unit 1 and 2 for Unit 2) one jumper was a banana plug jumper and the other three were alligator clip jumpers. There should be consistency with all of the jumpers.

- Step D.4 through D.7 - The jumpers used were alligator clip jumpers that were just barely long enough for the task. The concern was that the jumpers may be easily dislodged.

- Step D.6.a - (Typographical error) Relay 1(2) B21H-K8A is incorrect. It should read 1(2) B21H-K8B.

LOA-MS-03

- There was no instruction regarding appropriate 10CFR50.54(x) approval and possible reporting requirements.

- Note above step D.2 - The step directed use of black jumpers but Attachment A referred to red jumpers at terminals

BB61-BB62. The laminated plastic label in Panel 1PA14J had a black label ("LOA-MS-01 1IN017 JUMPER BB61-62"), but no red plastic label for this step was in the panel. The painted stencil on the exterior of panel 1PA014J did not indicate jumpers for LOA-MS-01 were in the panel.

- Steps D.3 through D.6 - The terminals listed in these steps had banana plugs, but jumpers in the LGA support locker had spade connectors. This was identified by the licensee on August 17, 1990 during V&V of the procedure, but corrective action was not taken prior to this inspection. The inspector informed the licensee of the discrepancy and the licensee promptly placed the correct banana jumpers in the LGA support locker.

- Step D.7.b - The step did not state that the drain valves to be opened were the ones associated with the MSIVs to be opened.

LOA-RD-07

- Step D, Caution [5] - The designated "Cheater Bar" could not be located on either unit. The licensee was investigating this concern.

LOA-RH-05

- Step D 7 - The step described actions to be taken pursuant to 10CFR50.54(x), but the step did not precede defeat of primary containment isolation signals in step 1.

LOA-RH-06

- Step D.1 - Actions to be taken pursuant to 10CFR50.54(x) and defeat of primary containment isolation signals were not stated.

- Attachment B - The LGA support locker contained a prefabricated jumper for this step. The identification tag on that jumper was a laminated plastic label that inappropriately listed both the jumper and the lifted lead.

LOA-RI-04

- There was no regular (slot) screwdriver in the LOA control room equipment locker as listed on Attachment A.

- Electrical tape was not included on the Attachment A inventory list, although the operator stated that the leads lifted would be taped.

- Step D.2.h - This step verified that reactor vessel pressure would be 57 psig, but did not specify the instrument to use.

LOA-RI-05

- Checklist - There was no checklist for required tools and equipment stored in the LGA support locker. This caused delay.

- Step 4 - The step described actions to be taken pursuant to "10CFR50.59(x)," but the Code of Federal Regulations reference was incorrect. Also, the step did not precede defeat of primary containment isolation signals in step 1.

LOA-RR-01

- Step C.1 - [illegible] guidance was provided in case the flow control valve was found to be in "LOCKUP."

- Step D.1.b - The LOA referenced LOP-RR-11, but that procedure was written for initial system operation and required primary containment entry. It did not specifically address the action performed at this step.

- Step D.3 - Lack of a specific building location caused delay in locating the correct MCCs.

- Step D.4 - Labels were missing on the hydraulic control units and there was no sketch provided to help with correct identification of valves and instruments.

- Step D.5 - No instructions were provided concerning the action to be taken if an oil leak was determined to have occurred in the primary containment.

- Step D.5.a.2 - The step required placing caution cards on panels 1(2) H13-P602 and 1(2) H13-P624, but the latter control room panel was not associated with this activity.

LOA-RT-04

- Step D.4.b - The step lacked adequate instructions to ensure the step could be successfully and safely done. For example, apparent weaknesses included:

  - No caution was given regarding possible radiological concerns.

  - Step D.4.b - Prior to doing step D.4.b.1, it was necessary to verify closed valves G33-F040 and G33-F042.

- Step D.4.b.1 - Filling and venting was to be done using LOP-RT-01, but that procedure did not include appropriate instructions to do this step.

- Step D.4.b.5 - Prior to warming the RWCU regenerative heat exchanger, it was necessary to open valve G33-F354.

o Step D.4.b.2 - The valves to be manipulated were not well identified. Better identification and lighting would be beneficial.

o Step D.4.b.3 - No indication as to location or elevation of the valves was specified.

o Step D.5 - There was no caution regarding use of radwaste as a potential blowdown path. The blowdown to radwaste from RWCU went to a vented tank of approximately 25,000 gal and was not the preferred blowdown path.

o Step 9 - The action statement did not specify what notification was to be provided and it was not clear that the step was in the appropriate sequence in the LOA.

o Step 10 - The step described actions to be taken pursuant to "10CFR50.59(x)," but the Code of Federal Regulations reference was incorrect. Also, the step did not precede defeat of primary containment isolation signals in step 2.

o Attachments A and B - The listed terminals had banana plugs, but jumpers in the LGA support locker had spade connectors. Lack of a location for panels 1(2) H13-P622/3 caused delay in finding the correct panel. The format of these attachments was not consistent with other LOAs and caused confusion concerning requirements for independent verification.

LOA-SC-02

o Procedure did not consistently use equipment identification number with equipment noun name (e.g., Step D.2.b, "The Reactor Water Cleanup ISOLATES. . . ." rather than including the equipment identification number, such as, 1G33-F004 for the RWCU isolation valve). Other steps in this procedure used both noun name and equipment identification number (e.g., Step D.4.a).

o Operator must manually turn off SBLC pump at 50 gallons to avoid damaging the pump. In doing so, the operator must read half of the smallest initial increment of 100 gallons between 0 and 100 gallons for a scale ranging from 0 to 6, 000 gallons (level indicator 1(2)C41-P601 at panel

1(2) H13-P603). No annunciation is provided for this 50 gallon setpoint.

LOA-SC-03

- Step D - There was no checklist of equipment required for successful implementation of the LOA.

- Step D Caution - Substep [5] did not address the case when SBLC was previously initiated.

- Step D.2 - No instructions were provided for local manual firing of squib valves 1(2) C41-F004A/B. This was required when the squib valves failed to properly operate from the control room.

- Caution above Step D.4 - No caution was provided regarding operation of SBGT, fuel pool vent, and other potentially highly radioactive systems while personnel were in the SBLC area. No instruction was provided to periodically check the reactor building standby gas area radiation monitor (1(2) D21-N003A) while personnel were working in that area.

- Step D.4 - Emergency lighting was not actually tested during the inspection, but the inspector observed and the licensee concurred that emergency lighting may not be adequate for successful performance of local actions. For example, valve tags were difficult to read in normal lighting, the SBGT system duct blocked direct illumination of the SBLC area, and emergency lighting was not directed at local sight glasses and instruments.

- Step D.5 - No tools were available locally to remove the bolts on the SBLC solution tank manway. Also, it was not clearly understood if proper operation of the fire protection hose reel required all of the fire hose to be pulled from the reel before opening the water supply valve.

- No requirement was stated for placing a status tag in the control room concerning the lack of sodium pentaborate in the SBLC solution tank.

- Step D.6 - No instructions were provided to secure the local fill of the SBLC solution tank.

- Step D.7 - Lack of a specific building location caused delay in locating the correct MCC.

- Step D.9.a - No guidance was provided concerning operation of bypass valves 1(2)C41-F301/303.

- Step D.9.b - A local sign was used as an operator aid to determine SBLC head tank level, but was not administratively controlled as an operator aid.

- Step D.10 - There was no requirement to continuously monitor and locally control SBLC test tank and head tank levels during this evolution.

- Step D.15.d - Clear instructions were not provided for eventually restoring the SBLC to a normal configuration.

LOA-SF-01

- Step D.1.c - Regular lighting was not operable in the High Pressure Heater valve room. There was no emergency lighting and the operator did not have a flashlight.

- Step D.2 - A better method of identifying valves requiring manipulation would be necessary on Mechanical Checklist LOA-SF-01M(02). Lighting was poor in the raceway.

LOA-VQ-02

- Step D.1.f - No location was given for local manual nitrogen valves 1(2)VQ057 and 1(2)VQ058. Determination of the exact location of these valves was not done in a timely manner.

- Liquid nitrogen storage tank(s) outlet valves 0VQ-V-19A and 0VQ-V-19B were tentatively located in an ice mass below the tanks. It was not immediately apparent how these valves were to be uncovered, identified and operated.

- Attachments A and B - The laminated labels in the LGA support locker, attached to jumpers for valves 1VQ037 and 1VQ038, indicated both terminal points for the jumper and the lifted lead(s). This was not consistent with other lifted leads that were to be individually marked with a lifted lead tag.

LOA-VQ-03

- Attachments A and B - Description of the changes and terminals for valves 1(2)VQ037 and 1(2)VQ038 was not consistent with the identical actions to be performed in LOA-VQ-02.

LOA-VR-04

- Caution above Step D.1 - The caution was not consistent with step D.7. Also, this step and step D.7 did not address the case when release rates would be expected to exceed allowable limits if the reactor building or fuel pool vent

systems were restarted. Further, there was no discussion of potential inaccuracies in determining radiation levels when there was no flow through the vent system.

- Step D.3 - No expected value was provided when monitoring steam tunnel differential temperature and no conditional action statement was provided.

- Step 7 - The step described actions to be taken pursuant to 10CFR50.54(x), but the step did not precede defeat of primary containment isolation signals in this step.

- Caution below step D.7.d - "No potential for Rad release" was an overly restrictive statement that conflicted with prior guidance in the LOA.

LOP-RH-07

- Step F.1.d - The 1(2)E12-F085 B valve is located high in the room, and there was no indication of location in the procedure.

- Step F.3.d - This step required a special key which is obtained from the Shift Engineer. This was not designated anywhere in the procedure, but was indicated at the breaker which was in the reactor building.

- Step F.7.a.4 - The valves identified do not indicate any valve numbers. There was no location or identification associated with the Recirculation Pump Seal Purge.

- Step F.7.d[3]5.a - Relay 1B21H-K75 was not labeled at panel 1H13-623 (for Unit 1).

- Step F.10.b - Flow indicator 1(2)E12-N012 was not the identification that would be found in the control room. This was inconsistent to the other number identifications used in previous steps of this procedure. The identification found in the control room was 1(2)E12-R607.

LZP-1330-26

- Step C - It was uncertain if the procedure could be performed with either no instrument air or no off site power.

- There was no checklist for tools and equipment that could be needed to implement the LZP.

- Step C.3 - The step did not designate if the unit 1 or unit 2 switch was to be placed in the "ON" position.

- Step D.1 - The step required notification of "Rad/Chem Supervision," but the responsible organizational element was Radiation Protection.

- Steps D.1 through D.6 - These steps were either precautions or prerequisites for actions done previously in step C.

- Step D.4 - The LZP had no requirement (or reference) to place the high radiation sampling system (HRSS) HVAC system in service, but this was necessary.

- Step F.1.c - Lack of a location and breaker name for MCC 136X-1 (236X-1) caused delay in doing this step.

- Step F.16 - There was no caution to monitor dose rates, but dose rates could be very high when sampling.

- Step F.25 - Sample labels and sample information sheets were neither attached to the LZP nor located in the high radiation sampling room.

## Appendix C

## Examples of Human Factors Findings

LGA-01

- Details LGA-D1 and D2 were not connected to the applicable step in the procedure by means of a dashed line as required by Attach I, C4 of the WG.

- One of the methods used to stabilize RPV pressure below 1043 psig was by using RCIC. The caution followed the item. Cautions should precede items to which they apply.

- There was inconsistent use of underlining as an emphasis technique. "Any, all, or at least xx" were not consistently underlined. The writers guide did not address the use of underlining as an emphasis technique.

LGA-02

- Last Conditional Action Statement - The last conditional action statement was not graphically depicted in accordance with the WG. Also, absence of a standard conditional action statement format caused confusion.

- Exit - No exit was provided and the end path procedure for optimal recovery was not identified.

- Tables - The three tables of Reactor building parameters were not graphically depicted to be related to a procedure action statement, as required by the WG.

- Reactor Building Parameters - Nomenclature for locations did not correlate with the associated control room annunciator windows. For example, locations "RWCU Pump Rooms" and "RWCU Hx Rooms" were related to annunciator window C4-10 (on panel 1(2)H13-P601) "LD RWCU ROOMS AMB TEMP HI." Another example was that location "HPCS Room" was actually related with an annunciator labeled "RB SE/SW EQUIP DRN SUMP TROUBLE." The differences in nomenclature combined with the lack of a red border on the associated control room annunciator windows significantly delayed recognition of the appropriate parameter.

- Reactor Building Area Temperature Table - A majority of the values given exceeded the level of accuracy of available control room indication.

LGA-03

- Before Statements - Parenthetical statements were placed adjacent to four "before" statements. They were either an

  action statement or noun names that generally related to a subsequent action. Their meaning was not clear and they caused confusion.

LGA-04

- The flowchart stated "depressurize using methods listed below." It did not specify any, all, at least 2, etc. This level of guidance was inconsistent with similar steps in other LGAs.

LGA-05

- "Depressurize using methods listed below while continuing with flooding" - Supplementary details for this step were in a format inconsistent with that used for Detail LGA-D5 and Detail LGA-06.

- Table LGA-T4 - Values given for RPV pressure exceeded the level of accuracy of available control room instrumentation.

- Caution Below Entry Point 12 - From this point to the wait statement was very confusing. It's graphical depiction was a composite structure that included a caution statement within the action statement, followed by action statement substeps, followed by contingencies, and all depicted without intervening line space. This was allowed by the WG.

  Also, the expected value of "hold" was not clearly defined and it was not clear that the intended action was to raise pressure and open at least one SRV. Further, the actions and expected responses of the contingencies were not clearly understood.

- Consistency of Action Statements - Action statements related to increasing or controlling water flow to the reactor pressure vessel (RPV) were not consistently phrased. Both "injection" and "RPV injection" were used and this caused confusion.

LGA-08

- START - Entry conditions were not stated. For rediagnosis, it was not clear what conditions were appropriate for this EOP.

- Override Statement - The override statement near the start of the EOP was an IF/THEN conditional action statement that applied "While in this procedure." Absence of a bold vertical line extending downward from the left of the overriding step block was inconsistent with other EOPs and caused confusion. As written, the overriding step was structured in accordance with the WG.

- Overriding Step - The expected value of 161 in. exceeded the level of accuracy (5 in. increments) of available control room instrumentation.

- "RPV venting in progress?" - It was not clear what actions were intended to be determined at this decision point.

- Exit Point - No exit point was provided as required by the WG. The end path procedure for optimum recovery was not defined.

LGA-10

- Details LGA-D3 and LGA-D4 were not connected to applicable steps with a dashed line.

LOA-CY-02

- Numerous examples of procedure/control room nomenclature mismatch.

- Section D third caution item - This item did not fit the criteria for a caution (personnel harm or equipment danger). This item also did not specify from where the locked valve key should be obtained.

LOA-FC-03

- Step 2 - This was a maintenance task and should be specified as such.

- There was a nomenclature mismatch between procedure and equipment labels.

LOA-FP-02

- Step D.1.a - This step required the operator to maintain fire header pressure at or above 126.7 psig on indicator OPI-FP004. This indicator had 5 psig increments on its scale. 126.7 psig could not be accurately determined.

- Step D.1.a - The expected value of 140.5 psig exceeded the level of accuracy of the installed gauge.

LOA-FP-03

- Step D.1.a - The fire header pressure of 126.7 psig exceeded the level of accuracy of the control room instrument which had a 10 psig minimum scale division.

- Step D.2.a.1 - FW005 was not located on PM03J. This valve was located at panel P603.

- Step D.2.d.2.c - Connection of the fire hose to "C" MDRFP Suction Strainer Drain Valve would result in kinking of the hose due to proximity of the floor. A 90 degree elbow would be needed to alleviate this problem.

- Step D.2.e.1 - This step required 7 FP Y-connectors, however, only 5 were found in the LGA Support Locker.

- Step D.2 - Nomenclature for valves 2WS113 and 1WS113 caused confusion. The LOA used "service water strainer crosstie valves," but they were actually labeled "U0 SERVICE WATER STRAINER OUTLET" and "U-2 S.W. FROM STRAINER "0" M.O. SUPPLY STOP."

- Step D.9 - TSS was not an approved acronym according to LAP-820-1 and caused confusion because it was not certain if the step intended notification of the Technical Support Center or the Technical Support Supervisor.

LOA-MS-03

- Step D.2 - The structure of this step caused confusion. The "CAUTIONs" were not clearly stated. There were two IF/THEN statements nested within a conditional action statement. Assumptions were stated at the end of the step. There was an IF/WHEN/THEN statement followed by an IF/THEN statement with several substeps.

LOA-RH-06

- Step D.4 - The step required use of the "Head spray valve" for injection to the RPV, but the control switch was labeled "RHR HEAD SPRAY VLV."

- Attachments A and B - The format of attachments A and B was not consistent with other LOAs.

LOA-RI-05

- Attachment A - No order of performance was specified and it was not clear if leads could be lifted and jumpers installed in any sequence.

LOA-RR-01

- Step C.1 - The step required checking that "LOCKUP" of the affected flow control valve had not occurred, but the indication was actually "MOTION INHIBIT."

- Step D.3 - Nomenclature differences caused confusion. MCC breaker labels were not consistent with the procedure. For example, MCC 136Y-2 "B HPU Subloop 1" was actually labeled "RX RECIRC HYD CONT UNIT MOT 1B 1B33-D003B" and MCC 134X-2 "B HPU Subloop 2" was actually labeled "RX RECIRC HYD CONT UNIT MOT 2B 1B33-D003B."

- Step A.1 - The step caused confusion because "1A/2A" was used in reference to flow control valves 1A(2A) and 1B(2B), and each had HPU subloops 1A, 1B, 2A and 2B.

LOA-RT-04

- There was inconsistent reference to local or control room actions in step D.4.a.

- There were numerous examples of procedure/equipment nomenclature mismatch.

- Steps D.5.B.1 and D.11.a - This was an example of inconsistent wording of the same type of action step.

- Step D Caution - The caution was confusing. It included three substeps that blended into the subsequent action statements. The caution contained conditional action statements that were not structured in a manner consistent with other LOAs. "Poison," rather than "boron," was used concerning the SBLC system.

- Step D.1 - The required action was not adequately clear and no reference was given to the applicable operating procedure (LOP-RT-04).

- Step E - The discussion contained information that was redundant to information presented earlier in the procedure and added three pages of clutter to an eight page procedure. It was not consistent with the level of detail in other LOAs and delayed procedure implementation due to the volume of information contained in step E.

LOA-SC-03

- Step D Caution - The format of the caution caused confusion. It was a six part section that included cautions, notes and action statements.