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EMERGENCY OPERATING PROCEDURE INSPECTION

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EXECUTIVE SUMMARY

This was a special announced inspection of the Vermont Yankee Nuclear Power Station Emergency Operating Procedures. The objectives of the inspection were to verify that the VY Emergency Operating Procedures (EOPs) are technically correct, that the VY EOPs can be physically carried out in the plant, that the VY EOPs can be implemented by the plant staff, and that the VY EOP programmatic controls are adequate.

During the latest revision to the VY Procedure Generation Package (PGP) and the EOPs, the licensee made significant improvements in their accident mitigation guidelines and procedures. In general, the VY Plant Specific Technical Guidelines (PSTGs) and EOPs were found to be technically adequate and previously identified deficiencies have been corrected. However, discrepancies were identified in the VY PSTGs that detract from the technical adequacy of the VY accident mitigation strategies. Additionally, some problems were noted with the technical adequacy of the EOPs and EOP support procedures, including some minor inconsistencies between the VY PSTGs and EOPs. The technical adequacy of the VY PSTGs, EOPs and EOP support procedures is considered to be unresolved pending licensee review and resolution (sections 3.1, 3.2, and 3.3).

The human factors review indicated that the VY EOPs were generally understandable and usable by operators to mitigate an emergency. Considerable improvements in the EOP flowcharts had been made in response to weaknesses identified by both the licensee and the NRC. The flowcharts comply with the human factors guidelines of the Operational Emergency Procedure (OE) Writer's Guide; however, a significant human factors weakness was identified in the implementation of OE 3100. The OE Appendices contain deficiencies that could prevent the task from being performed or hinder efficient and effective conduct of the specified task. These deficiencies are indicative of weaknesses in the verification and validation (V&V) process.

A number of the deviations taken from the BWROG EPGs are dependent on operator training to ensure that the intent of the accident mitigation strategy is maintained. The operators' training appeared to be adequate based on scenario observations, interviews, and in-plant procedure walkdowns with operators. The OE Study Guide was considered a strength.

The programmatic controls in place for the development and maintenance of the EOPs, though informal, appear to be effective in maintaining flowchart procedures of high quality. However, weaknesses in the program have resulted in EOP appendices and support procedures that are not of the same high quality. Additionally, the programmatic controls do not appear to be effective for ensuring that tools and materials will be available to support implementation of the EOP support procedures. The weakness in the EOP programmatic controls is considered to be unresolved pending licensee review and resolution (sections 6.1 and 6.2). Quality Assurance involvement in the EOP program appears to be adequate; however, an instance was noted where QA's findings may have been unduly influenced by the organization being audited.

Individually, the weaknesses and deficiencies identified during this inspection presented no immediate safety concern. However, these problems are important and of concern in that they could lead to inadequate operator actions in response to more complex or severe accident events involving multiple equipment failures.

DETAILS

1.0 Introduction

In June 1988, an NRC inspection team evaluated the Vermont Yankee Nuclear Power Station Emergency Operating Procedures (EOPs) as part of the NRC effort to evaluate the EOPs at licensee facilities. The team used the guidelines of Temporary Instruction (TI) 2515/92, "Emergency Operating Procedures Team Inspections." The team concluded that the plant operators were able to properly implement the EOPs during an event. However, deviations from the NRC approved BWR Owners Group (BWROG) Emergency Procedure Guidelines (EPGs) were not properly disclosed in the Plant Specific Technical Guideline (PSTGs) portion of the Procedure Generation Package (PGP). Further, Writer's Guide development and the verification and validation programs were not properly accomplished. The results of the team inspection are documented in Inspection Report No. 50-271/88-200.

The NRC requested that the VY PGP including the PSTGs with justifications for deviations from the BWROG EPGs be resubmitted. The licensee responded to these items in a letter dated March 20, 1989. The NRC staff reviewed these documents and issued a Safety Evaluation Report (SER), dated June 7, 1990. The report concluded that the program at VYNPC was acceptable, but still needed improvements. Since the VY PSTG was based on revision 3 of the BWROG EPG, the NRC staff did not evaluate the technical adequacy of the PSTG.

The licensee implemented Revision 4 of the BWROG EPG in July 1990. A follow-up inspection to address the items identified in the June 1988 EOP inspection was performed in October 1990. The inspection determined that the VY PGP contained the justification for deviations, deletions, and additions to the BWROG EPGs, but the scope of this inspection did not include a technical adequacy assessment of the justifications.

During preparation for NRC administered initial and requalification examinations in February 1991, the NRC staff noted that many of the deviations, deletions, and additions from the BWROG EPGs in the VY PSTGs did not appear to be adequately justified. VYNPC responded to these concerns in July 1991. The licensee took actions to update its PSTG, to develop a linkage document to reflect the relationship between the VYNPC implementing procedures and the PSTG, and to perform a verification and validation of the EOPs using an independent consultant.

During the week of February 24 - 28, 1992, an NRC team of inspectors conducted an inspection of the VY EOPs. The objectives of the inspection were to determine if the revision 4 EOPs were technically adequate; the programmatic controls properly established; if the EOPs could be physically carried out in the plant; and if the EOPs could be implemented by the plant staff.

Attachment 1 is the list of persons contacted during the inspection and Attachment 2 is the list of documents reviewed for the inspection.

2.0 Summary of Findings

- VY has taken a number of deviations from the BWROG EPGs that detract from the technical adequacy of the VY PSTGs; are not adequately justified; or are not identified in the differences documentation (Appendix E of the VY PGP) (section 3.1).

- The VY PSTG has been improved to better perform its intended function; however, deletion of actions specified in the BWROG EPGs were inappropriately justified by referencing plant specific procedures or Technical Support Center (TSC) assistance (section 3.1).

- Inconsistencies exist between the VY PSTGs and the VY EOPs in which the logic of the PSTGs is not preserved or the actions specified in the PSTG are not implemented in the EOPs (section 3.2).

- Discrepancies in the technical adequacy of the VY EOPs and support procedures exist such as procedures not accomplishing the intended function, conflicting instructions between the EOPs and other plant procedures, and inadequate procedural guidance (section 3.3).

- Technical adequacy and human factors deficiencies were identified in the implementation of the RPV Control guideline in OE 3100, "Scram Procedure" (sections 3.2 and 4.2).

- Considerable improvements have been made in the EOP flowcharts; and, in general, the flowcharts comply with the human factors guidelines of the OE Writer's Guide (section 4.2).

- Human factor deficiencies exist in the OE Appendices that could prevent the procedures from being performed as written or hinder effective conduct of the task (section 4.3).

- Licensed operator training on the EOPs was adequate. The OE Study Guide is considered a strength of the program (section 5.1).

- Licensed operators demonstrated that they can properly implement the VY EOPs based on their operator training (section 5.1).

- The licensee has taken a number of deviations from the BWROG EPG that are dependent on training to ensure that the intent of the accident mitigation strategy is maintained (section 5.3).

- The documented V&V process does not formally address some of the important components of an effective V&V program (section 6.1).

- The OE Writer's Guide and OE Verification and Validation methods have been revised to address the SER comments; however, these programmatic controls are not adequately applied to EOP support procedures (sections 4.1, 4.3, 6.1).

- The programmatic controls for ensuring equipment and material availability for implementing the OE Appendices are inadequate (section 6.2).

3.0 Technical Adequacy Review of the EOPs

Scope

The flowchart EOPs, EOP appendices, and supporting procedures in Attachment 2 of this report were reviewed to assure that the procedures are technically adequate and accurately incorporate the VY PSTGs. A comparison of the BWROG EPGs, VY PSTGs, and VY EOPs was also performed. Differences between the BWROG EPGs and VY PSTGs were assessed for adequate technical justification. The inspectors also reviewed the licensee's response to Examination Report 50-271/91-02 which addressed NRC concerns with the technical adequacy of the VY EOPs. Several calculations were also reviewed for technical adequacy.

The inspectors walked down the OE appendices indicated in Attachment 2 to ensure that the procedures are technically adequate and accomplish the intended tasks. Scenarios were conducted on the plant specific simulator as an additional evaluation of the technical adequacy of the EOP flowcharts. Licensed operators were interviewed to assess some of the concerns identified during desk top review of the PSTGs and EOPs.

Findings

The following paragraphs are a summary of the findings identified during the course of the technical adequacy review. Details of these and other related examples are listed in Attachment 3 of this report.

3.1 Comparison of BWROG EPGs and VY PSTGs

The VY PSTGs contain a large number of deviations from the BWROG EPGs. A number of the deviations were taken to improve the clarity of the accident mitigation guidelines and result in human factors improvements in the EOPs that are generated from the PSTG. For example, override statements were moved to the beginning of the guidelines to provide a consistent location for override statements and assure operator awareness.

The NRC staff identified deviations between the VY PSTGs and the BWROG EPGs that detract from the technical adequacy of the accident mitigation strategy of the VY PSTG. For example, the VY PSTG specifies depressurization of the Reactor Pressure Vessel (RPV) if torus water temperature is above 120°F. This direction is an addition to the mitigation strategy of the BWROG EPGs. This direction conflicts with the BWROG EPG and VY PSTG RPV Pressure Control (RC/P) guideline which does not allow RPV depressurization unless the reactor is shutdown or torus temperature is approaching the Heat Capacity Temperature Limit (HCTL). The deviations described in items B.1.a; B.3.a; B.4.a; C.1; C.2; E.1.a; E.1.c; E.2.b; E.3.a; and E.3.b of Attachment 3, Section 1, are other examples of deviations that are not technically adequate.

Several of the deviations between the BWROG EPGs and the VY PSTGs were not adequately justified in the differences documentation (Appendix E of the VY PGP). For example, the VY PSTG allows bypass of the high steam flow not in Run - Main Steam Isolation Valve (MSIV) isolation interlock to allow reopening the MSIVs during an Anticipated Transient Without Scram (ATWS). Bypass of these interlocks is not specified by the BWROG EPGs. The documented justification does not describe the bases for the high steam flow not in Run isolation interlock which is necessary to adequately justify the deviation. The deviations described in items A.3.a; A.4.b; B.2.a; B.3.b; E.1.a; and E.1.b of Attachment 3, Section 1, are other examples of deviations that are not adequately justified in the differences documentation.

A number of deviations between the VY PSTGs and the BWROG EPGs were inappropriately justified by referencing plant specific procedures or Technical Support Center (TSC) assistance for deletion of actions in the VY PSTG. For example, the BWROG EPGs contain transitions to the RPV Control guideline from the Primary Containment Control, Secondary Containment Control, and Radiation Release Control guidelines for conditions which require the reactor to be scrammed. For these conditions, the VY PSTG specifies entry into OE 3100 (Scram Procedure) rather than transition to RPV Control. This does not preserve the accident mitigation strategy of the BWROG EPGs. When the BWROG EPGs direct transition to a guideline, it is intended that the entire

accident mitigation strategy of the guideline be implemented. Transition to a plant specific procedure is not equivalent to transition to an accident mitigation guideline. Plant specific procedures do not describe accident mitigation strategies and do not serve the same purpose as the PSTGs. It is not appropriate to reference plant specific procedures or the TSC in the PSTG in place of guidelines for accident mitigation. The purpose of the PSTG is to describe the complete plant specific accident mitigation strategy. Therefore, actions that are intended to be used for accident mitigation need to be reflected in the PSTG. When BWROG EPG specified actions are not intended to be used, the deviation from the BWROG EPGs must be justified. The deviations described in items A.1; A.2.a; A.3.b; B.4.b; C.3.a; C.4.a; and E.4.a of Attachment 3, Section 1, are other examples of deviations that are inappropriately justified in the VY PGP differences document.

The NRC staff also identified several deviations between the BWROG EPGs and the PSTGs that were not identified in Appendix E of the VY PGP. In these cases, the VY PSTGs do not preserve the logic of the BWROG EPG accident mitigation strategy. For example, the VY PSTG specifies initiation of Alternate Rod Insertion (ARI) and reset of ARI only if reactor power is above 2% or cannot be determined. The BWROG EPGs specify initiation and reset of ARI regardless of reactor power level. Items A.4.a; D.1; E.2.a; and E.4.a of Attachment 3, Section 1, describe deviations that are other examples of deviations that are not identified or justified in the differences documentation.

The technical adequacy of the VY PSTGs, including the adequacy of the justification for deviations from the BWROG EPGs, is considered an unresolved item (271/92-80-01).

3.2 Comparison of VY PSTGs and VY EOPs

The NRC staff identified inconsistencies between the VY PSTGs and the VY EOPs in which the logic of the PSTG is not preserved in the EOPs. For example, OE 3102, step ALC/Q-21 directs exit from the Level/Power Control procedure if RPV water level can be maintained between 127" and 177" after the Hot Shutdown Boron Weight (HSBW) has been injected into the RPV. The VY PSTGs do not direct exit from Level/Power Control until it has been determined that the reactor will remain shutdown. It is important to remain in Level/Power Control until it has been determined that the reactor will remain shutdown so that, if power begins to increase, it can be controlled by lowering RPV water level. Other examples in which the logic of the PSTGs is not maintained in the EOPs are noted in items A.1, B.2.c, B.3.b, C.1.a, C.2.a, E.1.a, E.2.a, and E.2.b of Attachment 3, Section 2.

Some of the actions specified in the VY PSTG are not implemented in the VY EOPs and support procedures. For example, the VY PSTGs specify defeating Reactor Protection System (RPS) logic trips if necessary to initiate a manual scram to insert control rods. OE 3101 and OE 3107, "OE Appendices," Appendix F, "Initiation of a Manual Scram," do not contain direction to defeat RPS logic trips. Defeating RPS logic trips may be required to reset the scram to allow the Scram Discharge Volume (SDV) to drain prior to initiation of a manual scram. Additionally, some of the actions that are credited for justifying deviations between the BWROG EPGs and the VY PSTGs are not contained in the implementing procedures. Other examples of VY PSTG actions that are not included in the VY EOPs or support procedures are noted in Items B.1, B.2.a, B.2.b, B.3.a, B.3.b, B.4.a, D.1, and D.2.a of Attachment 3, Section 2. Some of these items are identified in the linkage document (Appendix F of the VY PGP); however, the justification for the implementation of these items is not technically adequate.

The most significant problems identified in the implementation of the VY PSTGs in the EOPs and support procedures are related to the implementation of the RPV Control guideline. The Reactor Power Control (RC/Q), Reactor Level Control (RC/L) and Reactor Pressure Control (RC/P) legs need to be executed concurrently in the RPV Control accident mitigation guideline. OE 3100, "Scram Procedure," is a series flowpath which would not allow concurrent execution; however, it contains a note which states "these are a suggested sequence of steps and may be deviated from at the discretion of the Shift Supervisor." The intent of this note was to allow concurrent execution of RC/Q, RC/L, and RC/P actions. However, this note has no limitations; therefore, the logic of the RPV Control guideline is not maintained in OE 3100. Additional problems were identified with the use of OE 3100 to implement the RPV Control guideline as discussed in items B.1, B.2.a, B.3.a, and B.3.b of Attachment 3, Section 2. These problems included inconsistencies in override statements and RC/P actions.

The problems identified with the implementation of the RPV Control guideline are considered to be an unresolved item (271/92-80-02). The technical adequacy of the EOPs and EOP support procedures, including the inconsistencies between the VY PSTGs and VY EOPs, is also considered to be an unresolved item (271/92-80-03, see section 3.3).

3.3 Technical Adequacy of VY EOPs and Support Procedures

The inspectors identified one technical adequacy problem that indicated that the associated procedures could not be utilized. A number of steps in the VY EOPs cannot be implemented as intended due to limited primary containment water level indication available in the Control Room. It is not possible to

maintain adequate core cooling by core submergence utilizing the Primary Containment Flooding procedure without challenging primary containment structural integrity. The details of this deficiency are described in item A of Attachment 3, Section 3.

The NRC staff identified other discrepancies in the technical adequacy of the VY EOPs and support procedures, including conflicting instructions between the EOPs and other plant procedures, inadequate procedural guidance, and procedures that do not accomplish the desired actions. These discrepancies are described in items B, C, D, and E of Attachment 3, Section 3.

The technical adequacy of the EOPs and EOP support procedures is considered to be an unresolved item (271/92-80-03).

3.4 Actions on Open Issues

During preparation for licensed operator examinations in February 1991, the NRC staff was concerned about the limited function of the VY PSTG. The licensee responded to this concern and indicated that the PGP would be revised to reflect the philosophy that the PSTG provide the overall guidance for implementation of the EPGs. Reviews during this inspection indicated that the PSTG has been improved to better perform its intended function. However, the methodology of recognizing other procedures for implementing accident mitigation guidelines as deviations from the EPGs remains a concern. As described in section 3.1, the function of the PSTG is to describe the entire accident mitigation strategy. Implementation of the PSTG guidelines in procedures other than the flowchart EOPs, is not considered a deviation from the BWROG EPGs.

In the latest revision to the PGP and EOPs, VY addressed the specific technical adequacy deficiencies that the NRC staff identified in Attachment 7 of Report No. 50-271/91-02. Items 1, 2, 3, and 6 were corrected in the PSTG; however, problems still exist with the implementation in the EOPs and support procedures (as described in items B.1, B.2.a, B.3.a, B.3.b, and D.1 of Attachment 3, Section 2). Item 5 had not been corrected at the time of the inspection (Attachment 3, Section 1, Item B.1.a), but the licensee committed to correct the deficiency. The remaining items (Items 4, 7, 8, 9, 10, 11, and 12) have been corrected.

CLOSED (UNR 271/91-02-03) Technical adequacy of deviations between the BWROG EPGs and the VY PSTGs. This unresolved item is closed based on the progress made by the licensee. The outstanding concerns will be addressed as part of the unresolved items identified during this inspection

associated with the technical adequacy of the VY PSTGs and EOPs and the implementation of the RPV Control guideline.

3.5 Emergency Diesel Generator Operability

The NRC staff had a concern related to the technical adequacy of OE 3107, Appendix M, "Alternate Injection Using Fire System to RHR." The procedure is used to provide fire water for injection into the RPV via the RHR injection path. The procedure directs isolation of emergency diesel generator (EDG) cooling if EDG operability is not required. The procedure does not define what is meant by "EDG operability required." Licensee representatives expressed differing views on the interpretation of the procedure step. Some licensee representatives indicated that cooling water would not be removed from EDG that were operable, even if they were not operating. Others stated that, if this were the only source of water to the vessel, it would be appropriate to isolate cooling water to EDG that were not operating to obtain the maximum flow possible.

The latter position was based upon the view that use of this procedure was synonymous with being in a beyond design basis condition. Since the BWROG EPGs do not specifically endorse making the EDG inoperable in order to inject fire water into the RPV and no plant specific safety evaluation was performed by the licensee, the NRC staff explored the licensee view on this matter. Numerous discussions were held with licensee representatives, both during and subsequent to the inspection, to further the NRC staff's understanding on the issue of supplemental EOP usage during beyond design basis conditions and their views on the applicability of 10 CFR 50.59, 10 CFR 50.54(x), and Technical Specification requirements.

As a result of these discussions, the licensee clearly indicated it was not their intent to remove cooling water from an operable EDG, even if it were not operating. The licensee committed to provide appropriate clarification in Appendix M to ensure a uniform understanding by all licensee personnel. As a result, the NRC staff's concerns involving licensee views on the applicability of regulatory provisions were resolved.

Summary of Conclusions

The majority of the deviations between the VY PSTGs and the BWROG EPGs do not adversely affect the technical adequacy of the accident mitigation strategy and are adequately justified. However, deviations were identified by the NRC staff that detract from the technical adequacy of the VY PSTGs or were inappropriately or not adequately justified. The NRC staff also identified deviations that were not identified in the VY PGP. The VY PSTGs have been improved to better perform their intended

function; however, the inspectors were still concerned that other plant procedures are used to justify deletion of BWROG EPG actions.

In general, the VY EOPs and support procedures are technically adequate and implement the accident mitigation strategies of the VY PSTG. However, problems were identified in the implementation of the RPV Control guideline, along with some minor inconsistencies between the VY PSTGs and EOPs. Additionally, some problems were noted with the technical adequacy of the EOPs and EOP support procedures.

During the latest revision to the PGP and the EOPs, the licensee made significant improvements in their accident mitigation guidelines and procedures. The majority of the concerns identified previously by the NRC staff have been corrected. The licensee committed to correct the deficiencies associated with the note in OE 3100 and the direction to depressurize in the T/T Control guideline. They also agreed to review the specific items identified by the NRC staff during this inspection.

4.0 Human Factors Review of the EOPs

Scope

The OE Writer's Guide was reviewed to ensure that the concerns raised by the Safety Evaluation Report issued by the NRC in June 1990 had been addressed. The team also performed table top reviews of selected EOP flowcharts and OE Appendices to ensure that they conformed to the OE Writer's Guide requirements.

The inspectors walked down the OE Appendices specified in Attachment 2 to confirm that the procedures can be understood and followed without confusion or delays. The purpose of the walkdowns was to verify that instruments and controls required to be used to implement the procedures are consistent with the installed plant equipment; ensure that the indicators, controls, and annunciators referenced in the procedures are available to the operator; and ensure that the task can be accomplished by the operator. Operators were observed during two simulator scenarios to assess the EOP flowcharts for the same purpose as the in-plant walkdowns.

Findings

4.1 Writer's Guide

The NRC SER on the VY PGP, issued in June 1990, identified a number of concerns related to the OE Writer's Guide. VY revised the OE Writer's Guide during the latest revision to the PGP to address the concerns identified by the NRC. The inspection team found that the OE Writer's Guide had been adequately revised to address the SER comments. However, the OE Writer's

Guide does not apply to the OE Appendices as a result of a change in the format of the OE Appendices made during the latest revision to the EOPs. OE Appendices and other EOP support procedures are prepared in accordance with AP-0831, "Plant Procedures," and the Vermont Yankee Procedure Writer's Guide. The Vermont Yankee Procedure Writer's Guide contains similar, but less specific, guidance for preparation of procedures compared to the OE Writer's Guide. Because the OE Appendices are intended to be used during emergencies, it is important that the human factors principles of NUREG-0899, "Guidelines for Preparation of Emergency Operating Procedures," that are applicable to text procedures, be applied to the procedures that support the EOP flowcharts. The Vermont Yankee Procedure Writer's Guide does not contain all the NUREG-0899 guidance that is applicable to text procedures.

4.2 EOP Flowcharts

The team found that considerable improvements in the EOP flowcharts had been made in response to weaknesses identified by both the licensee and the NRC. In general, the flowcharts comply with the human factors guidelines of the OE Writer's Guide.

A significant human factors weakness was noted in the OE 3100 flowchart. The note in OE 3100, which allows the Shift Supervisor to deviate from the step sequence defined in the flowchart, circumvents the OE Writer's Guide instructions concerning entry conditions, concurrent actions, and override statements. Licensee personnel indicated that OE 3100 was not constructed as were other EOP flowcharts to allow for concurrent actions (e.g., parallel paths) in order to provide the preferred sequence for responding to a scram for use during the majority of events. The note was intended to allow for concurrent execution of parameter control when conditions warranted. However, the inclusion of a note which allows unlimited deviations in procedure adherence undermines the basic tenet of plant procedures which is specified in AP 0831, "Plant Procedures," section A.1, which states that "all written procedures are to be followed and considered as management directives." The deficiencies associated with the note in OE 3100 are considered part of the unresolved item on the implementation of the RPV Control guideline (UNR 271/92-80-02).

Operator performance during the simulator scenarios indicated that the flowchart procedures could be understood and followed without delays with minor exceptions. The licensee has included redundant transitions in the EOPs in excess of those specified in the BWROG EPGs to provide additional guidance to the operators. Deviations have also been taken from the BWROG EPGs that mix parameter control in procedure legs which differs from the philosophy of the BWROG EPGs. During a scenario which required multiple

transitions between procedure legs, the Shift Supervisor (SS) returned several times to the RPV pressure control leg to verify that all appropriate actions had been taken. Verification of actions was noted as a good practice; however, it appeared that the Shift Supervisor was not absolutely sure which procedure legs had been entered and exited during the scenario. Although no incorrect actions were taken, the inspectors were concerned that the additional transitions and mixing of parameter control adds complexity to the procedures. The net result could be confusing to the operator in an accident situation. If the operator was unsure of which procedure legs had been exited, rather than verification of actions, incorrect actions could actually be performed.

4.3 OE Appendices

The inspectors found deficiencies in the OE Appendices that indicated that the procedures could not or may not be able to be performed as written. They also identified weaknesses that do not support efficient and effective conduct of the specified task.

The OE Appendices did not always meet the standards specified in the Vermont Yankee Procedure Writer's Guide or conform to accepted human factors conventions. For example, some action steps contain multiple actions in one procedure step. Descriptions of controls and indications did not always meet the standards specified in the Vermont Yankee Procedure Writer's Guide and in some cases did not match plant configuration. For example, step 1 of Appendix I, "Local Firing of Squib Valve," does not include the valve numbers for the squib valves as required by VY Procedure Writer's Guide, Section D.2.h. Some descriptions of controls were not adequate for the operator to locate the equipment. During the walkdown of Appendix K, "Boron Injection Using CRD System From SLC Tank," the operator was unable to locate the SLC tank heater control switch.

In some cases, the OE Appendices did not provide sufficient information for performance of the task. Appendix J, "Boron Injection Using RWCU," had a number of deficiencies that would have hindered or prevented performance of the procedure. For example, the prerequisites do not define the amount of boric acid and borax that must be available and there is no method for measuring the specific quantity to be added. The procedure requires a determination of flow in the demineralizer vessel vent line; however, no method for determining flow is provided.

The tools and equipment needed to carry out the tasks were not always clearly specified in the procedure. For example, Appendix K does not provide a specific list of tools and adapters needed to perform the task. The operator performing the walkdown of the procedure initially indicated that the EOP

bypass flange and a 24" pipe wrench were needed. Additional review of the procedure determined that a 10" adjustable wrench was also needed. During the walkdown, it was determined that an additional flange connection was needed. The lack of specific designation of tools and equipment resulted in unnecessary confusion and delays in performing the task.

Summary of Conclusions

The OE Writer's Guide has been adequately revised to address the concerns identified in the NRC SER; however, the OE Writer's Guide does not apply to the OE Appendices. Considerable improvements in the EOP flowcharts had been made in response to weaknesses identified by both the licensee and the NRC. The flowcharts comply with the human factors guidelines of the OE Writer's Guide; however, a significant human factors weakness was identified in the implementation of OE 3100. Deficiencies in the OE Appendices exist that could prevent the task from being performed or hinder efficient and effective conduct of the specified task.

5.0 EOP Training

Scope

The inspectors reviewed the OE Study Guide and requalification training program instruction guides to evaluate the training on the recent revisions made to the EOPs. The instruction guide for initial EOP training was also reviewed to evaluate the training given during initial license training. Two scenarios were administered to a crew on the plant specific simulator. The crew was composed of staff licenses due to the unavailability of a shift crew. The scenarios were designed to test some of the technical adequacy and human factors questions raised during the table top reviews of the EOPs. Interviews with licensed plant operators were conducted as an additional evaluation of concerns identified during the simulator session and technical adequacy review. Selected EOP appendices indicated in Attachment 2 were walked down with licensed operators to assess the operators' training in implementing the procedures.

Findings

5.1 Training Materials

The OE Study Guide was developed from the BWROG EPGs as applied to VY. The Study Guide provides sufficient guidance to ensure that the BWROG EPG accident mitigation strategies are properly implemented. It is a controlled document that is distributed to areas such as the Control Room and the TSC. It is updated whenever a change or revision to the EOPs is made which makes it a reliable source. The Study Guide is a well written reference and widely used by both the operators and the training staff. The information

contained in the Study Guide is used by training staff to prepare lesson plans and instructor guides for licensed operator EOP training.

The Licensed Operator Requalification Training (LORT) instructor guides (IGs) were used to train the licensed operators on the changes made during the recent EOP revision. This training was given to all licensed operators prior to the implementation of the new revision of the EOPs. The LOT IGs reviewed were out of date. However, this was not a concern since there are no initial license classes currently in progress. Discussions with the licensee's training representative indicated that the LOT IGs would be revised prior to commencing a future initial license class.

The inspectors noted that the operators are trained to implement the RPV Flooding procedure in a more restrictive manner than that intended by the BWROG EPGs and the OE Study Guide. During one of the scenarios, all RPV level indication was lost. The operators were asked how they would determine that "RPV level indication is restored" to determine when to recommence injection for RPV flooding in accordance with step ALC/FRI-13 of OE 3102. They indicated that they would wait until indication was on scale for two independent RPV water level instruments. Additional operators that were questioned gave the same response. This is not consistent with the BWROG EPGs or the OE Study Guide which both define restoration of level indication as "when a consistent change in an RPV water level instrument is observed or a trend between water level instruments is established." There is no requirement for two independent indications. The training provided to the operators could result in delays in termination of RPV flooding and restoration of normal RPV water level control.

5.2 Simulator Observations

During the simulator portion of the inspection, the facility requested to use their new primary containment (PC) model. The model was undergoing review and testing on the simulator by the licensee. An extensive list of discrepancies had already been identified by the licensee. They stated that it was their intention to have the vendor correct the deficiencies. A special end-of-life initial condition was prepared for the scenario set. Noted improvements over the previous PC model were observed during the scenario set; however, many problems still exist. The licensee plans to correct the new PC modelling problems prior to using the model for operator training.

During the validation of the simulator scenarios, the inspectors noted that the response of the training crew validating the scenarios differed from that of the licensed operators. During an ATWS scenario, both recirculation pumps failed to trip when the ARI/RPT pushbuttons were depressed. The training crew did not trip the recirculation pumps when the ARI/RPT pushbuttons failed. The crew that participated in the scenarios, however, did trip the recirculation pumps. Discussion with licensee representatives about the differing responses to the event revealed that this condition had never been trained upon during requalification or initial license training. The licensee further stated that they were not certain how the plant operators would respond to this event. Additional licensed operators that were questioned indicated that, if the recirculation pumps did not trip when the ARI/RPT pushbuttons were depressed, they would manually trip the recirculation pumps. Their action was based on the definition of "initiate" which is to manipulate the controls as required to establish the specified condition.

The inspectors noted that timely entry into OE 3104 "Torus Temperature and Level Control," did not always occur. During a scenario in which torus water level increased above the EOP entry condition, the SS delegated the implementation of OE 3104 to the Supervisory Control Room Operator (SCRO). The SCRO did not refer to the OE 3104 flowchart until approximately ten minutes after the entry condition was reached. In another scenario, torus temperature exceeded the EOP entry condition. Neither Senior Reactor Operator (SRO) referred to the OE 3104 flowchart during the fifteen minutes following receipt of the entry condition. The Station Engineer (SE) referred to the OE 3104 flowchart and verified that no additional actions needed to be taken. Discussions following the scenarios revealed that the operators were aware of the actions required in OE 3104, but gave a low priority to the steps to be performed. The inspectors were concerned that even though the operators were aware of the entry into OE 3104, failure to refer to the flowchart in a timely manner could result in missed actions.

5.3 Technical Adequacy Issues

The licensee has taken deviations from the BWROG EPGs to simplify or clarify the PSTGs with the intention of maintaining the BWROG EPG mitigation strategy. The inspectors observed that training is used to ensure that the intent of the accident mitigation strategy is maintained for a number of these deviations. The following are examples of licensee deviations from the BWROG EPGs that are dependent on training to ensure that the accident mitigation strategy is implemented properly. These examples are based on the scenario observations and interviews with operators.

- The VY PSTG requires entry into RPV Control if RPV water level cannot be determined. This is a deviation from the BWROG EPGs that was added because it is prudent for the operator to assume that a low level condition exists if RPV water level cannot be determined. The BWROG EPGs and VY PSTGs require a reactor scram upon entry into RPV Control. OE 3100 directs a reactor scram; however, RPV water level not determined is not an entry condition into OE 3100. RPV water level not determined is an entry condition into OE 3101, but OE 3101 does not direct a reactor scram. If RPV water level cannot be determined and no scram condition exists, the VY EOPs do not direct a reactor scram as specified by the VY PSTGs. The operators that were questioned indicated that they would assume that RPV water level was low if it could not be determined and would enter OE 3100 on the low level scram condition.

- The BWROG EPGs require prevention of automatic initiation of the Automatic Depressurization System (ADS) if water level drops below the ADS initiation setpoint. The VY PSTG and OE 3102, step ALC/L-OR require prevention of automatic initiation of ADS if RPV water level cannot be restored and maintained above 82.5" (the ADS initiation setpoint). This deviation was taken to ensure that automatic initiation of ADS is prevented only during an actual low level condition, not during a level oscillation. The inspector questioned why it would not be appropriate to prevent automatic initiation during a level oscillation for the same reasons that ADS initiation is prevented for an actual low level condition. The licensee indicated that the deviation was taken to eliminate an unnecessary action because the ADS initiation signal would reset when level rose above 82.5" during a level oscillation. The inspector was concerned that the operator may not make the determination that level cannot be restored and maintained above 82.5" prior to automatic ADS initiation (120 seconds after receipt of an initiation signal). The OE Study Guide discusses the bases for preventing automatic initiation of ADS, but does not indicate that the action should not be taken during a level oscillation. The definition of "cannot be restored above" states that no specific time interval is implied, but that prolonged operation beyond the limit without taking the specified action is not permitted. Operators that were questioned understood the bases for preventing automatic initiation of ADS and indicated that they would prevent automatic ADS initiation before the system initiated.

- The BWROG EPGs require termination and prevention of injection into the RPV prior to emergency depressurization of the RPV during an ATWS. The VY PSTG and OE 3102, step ALC/D-1 direct termination

and prevention of injection; however, the direction is provided as an action rather than as a conditional statement as specified in the BWROG EPGs. The inspector was concerned that with this format for the step, there was no assurance that injection would be terminated and prevented prior to initiation of depressurization. The OE Study Guide does not address this issue; however, the operators that were questioned understood that termination and prevention of injection must be completed prior to commencing depressurization.

- The BWROG EPGs require venting of the RPV for primary containment flooding irrespective of offsite radioactivity release rates. The VY PSTGs and EOPs do not specify that venting of the RPV should be performed irrespective of offsite release rates. Instead, the VY PSTGs and EOPs rely on the TSC to provide concurrence and assistance for venting the RPV. The OE Study Guide describes the bases for venting the RPV for primary containment flooding, but does not clearly indicate that RPV venting must be performed even if offsite release rates will be exceeded. The operators that were questioned were not aware that the RPV should be vented irrespective of offsite release rates.

5.4 Actions on Open Issues

During an inspection of the licensed operator training program conducted in October 1991, the inspector had concerns of the appropriateness of conducting training on the Emergency Operating Procedures on-shift. The training that was being conducted was extensive and had the potential to distract the control room operators from their normal duties.

CLOSED (UNR 271/91-81-08): The licensee developed guidelines that defined how training is to be conducted on-shift. Further, the licensee is formalizing this guidance in the appropriate administrative procedure for control room conduct. The inspector reviewed the licensee's corrective actions and found them acceptable. Based on the above, this item is considered closed.

Summary of Conclusions

The licensee has taken a number of deviations from the BWROG EPGs that are dependent on training to ensure that the intent of the accident mitigation strategy is maintained. In most cases, the operators' training appeared to be adequate based on scenario observations, interviews, and in-plant procedure walkdowns with operators.

The OE Study Guide provides sufficient guidance to ensure that the BWROG EPG accident mitigation strategies are properly implemented. This document is considered a strength of the program.

The licensee has taken positive controls for conducting training during the operators on-shift time. The corrective actions taken to formalize their program should reduce the potential to distract the control room operators from their normal duties.

6.0 Programmatic Controls

Scope

A review of the licensee's procedures and discussions with licensee personnel were conducted to determine the effectiveness of the licensee's ongoing EOP evaluation program. The EOP verification and validation methods were reviewed to assess their effectiveness and ensure that the concerns raised by the Safety Evaluation Report issued by the NRC in June 1990 had been addressed. The team also performed table top reviews of selected EOP flowcharts and OE Appendices to ensure that they were generated in accordance with the OE Writer's Guide and the V&V requirements. The inspectors reviewed the V&V documentation and walked down the OE Appendices specified in Attachment 2 to assess the effectiveness of the V&V that was performed on the latest revision of the EOPs.

The inspection team reviewed the Quality Assurance (QA) organization involvement in the EOP program. The inspection focused on those policies, procedures, and instructions necessary to provide a planned and periodic audit of the EOP development and implementation process. The inspection team reviewed the involvement of site Quality Assurance in the EOP program by interviewing Quality Assurance Department personnel and by reviewing a sample of past QA audits and surveillances.

Findings

6.1 Verification and Validation Program

The NRC SER on the VY PGP, issued in June 1990, identified a number of concerns related to the OE Verification and Validation program. VY revised the OE V&V program during the latest revision to the PGP to address the concerns identified by the NRC. The inspection team found that the SER comments had been resolved; however, the documented V&V process does not formally address some of the important components of an effective V&V program.

The NRC commented in the SER that the V&V program should specify that personnel from varied disciplines should be involved in all phases of the V&V process. The VY PGP specifies that OE V&V is performed by a member or members of the Operations Department (and/or Training Department for validation) as assigned by the Operations Supervisor. There is no requirement for a multi-disciplined approach and no mention of human factors involvement in the V&V process. Instead, the licensee credits the procedure review and approval process, including Plant Operation Review Committee (PORC) review, for providing a multi-disciplined approach. The licensee's response to the SER comment indicates that the V&V evaluators are normally independent from the OE writer; however, no independence is required by the PGP. An independent consultant performed the verification on the latest revision of the PSTGs and EOPs. The NRC staff identified a number of the same concerns identified by the consultant. The consultant's comments were resolved by the licensee representative responsible for preparing the revision. The resolution of the comments was reviewed as part of the PORC review. However, the deficiencies in the resolutions were not identified and the problems were not corrected prior to the inspection.

One of the objectives of the OE Validation Program is to ensure that the procedures will work and that they accomplish their intended function. However, the validation checklist (Attachment 1 of Appendix D of the PGP) does not address this objective. The licensee indicated that validation is performed by qualified operators, who would identify any problems that would prevent the procedure from performing its intended function. The installation of jumpers for bypassing interlocks is an example of potentially insufficient validation as a result of informal accomplishment of this objective. The EOP toolbox in the control room contains both screwdriver installed jumpers and clip lead type jumpers. The licensed operator conducting the walkdown of Appendix P, "Bypassing of Group I Isolation Signals," indicated that he would use the clip lead type jumpers. The NRC staff questioned whether these were the appropriate jumpers to be used in all cases and whether the integrity of the installation method had been tested. The licensee indicated that training had been performed using the jumpers on test terminal blocks, but that the jumpers had never been tested in the control room panels. The NRC staff was concerned that, without actual installation in the control room panels, there is no assurance that the jumpers can actually be installed and will remain intact.

VY PGP, Appendix C, "OE Verification Methods," and Appendix D, "OE Validation Methods," do not provide any specific instructions for verification and validation of OE Appendices. The OE Human Factors Verification Sheet only addresses verification of flowchart procedures. Discussions with cognizant personnel indicated that verification of OE Appendices is based on AP 0831, Figure 1, "Plant Procedure Routing Slip," which includes a block to

be initialed indicating that the procedure conforms to the Writer's Guide or PGP. Review of the documentation for validation of current versions of OE Appendices indicated that validation checklist items such as "was the OE step understood?" and "were the instructions appropriate for the emergency condition?" had been indicated as "N/A" for the OE Appendices. This review also indicated that the validation had been conducted by operators without the assistance of human factors specialists or guidance on the standards to be used for validation.

The inspectors found that the PGP was also silent on verification and validation to be conducted on procedures referenced by the OEs and OE Appendices such as normal operating procedures (OPs) and the Accident Mitigation Guidelines. Applicable portions of the V&V process were not applied to these procedures. For example, steps spelled out in the OPs or other procedures were not reviewed to ensure that they are appropriate for the emergency condition and documents such as the Accident Management Guidelines were not be reviewed to ensure that they accomplish their intended function and incorporate any plant configuration changes.

Due to the number and nature of the weaknesses identified in the OE Appendices, the inspection team determined that the programmatic controls (V&V program and the OE Writer's Guide discussed in section 4.1 , above) for the OE Appendices and support procedures to be inadequate. The informality of the V&V program and the weaknesses associated with the control of EOP support procedures is considered an unresolved item (271/92-80-04).

6.2 Tools and Materials

Some of the equipment and materials called for in the OE Appendices was unavailable. For example, there were insufficient hose connectors available for performing Appendix H, "Vent the Control Rod Drive Over Piston Volume." The most significant example of unavailable materials was an insufficient quantity of boron required to perform Appendix J, "Boron Injection Using Reactor Water Clean-Up (RWCU)." Five (5) drums of Boric Acid and 5.5 drums of Borax must be injected into the RPV to provide the Cold Shutdown Boron Weight (CSBW). During the walkdown of this appendix, only one drum of Borax was staged locally. The plant operator believed the remaining amount of Borax could be obtained from the warehouse.

Discussions with the licensee disclosed that there were no reserve drums of Borax available in the warehouse. During the validation process in October 1991, the licensee had identified that insufficient borax was staged locally. However, they did not identify that the borax was not available in the

warehouse until an inventory was performed in January 1992. The borax had been moved to the warehouse to allow for plant maintenance several years ago and apparently had been inadvertently disposed of by the warehouse personnel. At the time of the inspection, the licensee had not replaced the borax. The licensee recognized that they were not timely in their response to this issue and committed to replace the borax prior to restarting the plant after the upcoming refueling outage.

Tools and materials needed to accomplish several of the procedures are maintained in toolboxes in the Control Room and the Reactor Building. The box in the Control Room is inventoried semi-annually; however, the box in the Reactor Building is not inventoried on a periodic basis. The Reactor Building toolbox did not contain gloves which would be needed to perform Appendix H due to the thermally hot fluids that may exist in the CRD system. There was no positive control (e.g., lock or cable-tie) over the contents of either toolbox.

The licensee's programmatic controls for ensuring the availability of tools and materials needed to implement the EOPs and support procedures are not adequate. The weaknesses in the licensee's programmatic controls for ensuring that tools and materials are available for implementation of the EOPs are considered an unresolved item (271/92-80-05).

6.3 QA Involvement

The most recent QA audit that was conducted in January 1992 (VY-92-01) evaluated the Operations Department's activities. The audit included a review of the EOP development process, the independent EOP technical evaluation conducted by a contractor, and the training on the revised EOPs that was conducted prior to procedure implementation. The licensee's audit identified no concerns in the area of EOPs.

The review of QA surveillance reports indicated a discrepancy associated with implementation of one of the OE Appendices. A blank flange was installed in place of valve CUFD-57 which is used during implementation of the procedure for injecting boron using RWCU. At the time of the QA report, the valve had been removed for 16 months awaiting a replacement valve and it was expected to be another 12 months before the valve would be replaced. QA identified that the OE Appendix in which this valve was used could not be implemented due to the current system configuration and that neither a temporary modification (TM) nor a temporary change to the affected Appendix had been implemented. QA also documented that changes to the EOP's should be made in a timely manner as per NUREG-0899. Operations resolved the problem by initiating a Temporary Modification as required by AP-0020, "Control of Temporary Modifications." However, instead of initiating a temporary change

to the procedure, procedural instructions were provided on the TM Control Sheet, which all operators are required to read daily as part of the TM log review. Although the instruction given on the TM control sheet was adequate, there was no assurance that the operator would recall the instructions if the procedure needed to be implemented.

In the QA Surveillance report the discrepancy concerning the blank flange installed in place of CUFD-57 was classified as an "observation" rather than a "deficiency." Procedure OQA-X-1, defines a deficiency as a condition of noncompliance which QAD identifies as violating approved procedures, applicable codes, standards, technical specifications, and regulations and defines an observation as a condition which, if left uncorrected, could lead to a deficiency or a breakdown in management control. QA identified in the report that the removal of this valve prevented implementation of the PORC approved OE Appendix. Using the guidelines defining deficiencies, it appears that this finding should have been documented as a deficiency. Discussions with licensee representatives indicated that QA had initially identified the discrepancy as a deficiency. However, following discussions with Operations management it was classified as an observation. The classification was changed because repair of the valve was intended as soon as practicable and was being tracked as a maintenance action. Additionally, the effected procedure would only be needed for beyond-design-basis events.

Summary of Conclusions

The NRC SER comments related to the OE Verification and Validation program have been resolved; however, the documented V&V process does not formally address some of the important components of an effective V&V program. The programmatic controls in place for the development and maintenance of the EOPs, though informal, appear to be effective in maintaining flowchart procedures of high quality. The VY PGP does not provide specific instructions for V&V on the OE Appendices and other support procedures. Due to the number and nature of the weaknesses identified in the OE Appendices, the programmatic controls (V&V program and the OE Writer's Guide) applied to EOP support procedures are not adequate. Additionally, the programmatic controls for ensuring that tools and materials will be available to support implementation of the EOP support procedures are not effective.

Vermont Yankee's site Quality Services Group's involvement in the EOP program and Operations Department activities is adequate. It appears that QA's findings may have been unduly influenced by the organization being audited.

7.0 Safety Assessment

Throughout the inspection, the team members discerned a view among licensee personnel that, because the EOPs, especially the appendices and other support procedures, address situations that go beyond the design basis of the plant and have a low probability of occurrence, they do not need to be controlled at the same level as other procedures. The lack of evaluation of the EDG operability issue (section 3.5), the failure to promptly procure borax (section 6.2), and the classification of the discrepancy associated with the blank flange as an observation (section 6.3) were indicative of this view.

This view concerned the team, because they perceived that the EOPs and support procedures were not being treated with a safety perspective appropriate to maintaining the defense-in-depth necessary for an effective EOP program. For example, the reliance on training to compensate for deficiencies in the procedures rather than ensuring that all portions of the EOP program (procedures, training, and hardware) are of the highest quality undermines the defense-in-depth concept. The NRC staff's perception was discussed with licensee management following the inspection. The licensee indicated that it was not their intent to treat the EOPs and associated procedures differently from other procedures.

Individually, the weaknesses and deficiencies identified during this inspection presented no immediate safety concern. For example, the unavailability of the borax was not an immediate concern because the Standby Liquid Control system was operable and would have been available to inject boron in an emergency. Licensee representatives agreed to review all deficiencies and weaknesses identified during the inspection. The NRC staff's concerns related to the licensee's attitude toward the EOPs were ameliorated based on discussions with management, the commitments made by the licensee, the improving trend of the licensee's EOP program, and good performance demonstrated by licensed operators. However, the identified deficiencies and weaknesses are important and of concern in that they could lead to inadequate operator actions in response to more complex or severe accident events involving multiple equipment failures.

8.0 Exit Meeting

Management was informed of the purpose and scope of the inspection at the entrance interview on February 24, 1992. The findings of the inspection were periodically discussed with station management throughout the inspection period and were summarized at the exit meeting on February 28, 1992.

Attendees at the exit meeting are listed in Attachment 1 of this report.

Attachments:
1. Persons Contacted
2. Documents Reviewed
3. Detailed Technical Adequacy Comments

ATTACHMENT 1

PERSONS CONTACTED

Vermont Yankee Nuclear Power Corporation

* A. Chesley, Interim Training Supervisor
* L. Doane, Operations Supervisor
  D. Dyer, Quality Services Group
  R. Grippardi, Quality Services Group
* E. Harms, Operations Training Supervisor
* J. Herron, Operations Supervisor
* W. Murphy, Senior Vice President, Operations
* M. Palionis, Senior Operations Engineer
* D. Reid, Plant Manager - Vermont Yankee
* T. Trask, EOP Coordinator
  R. Tucker, Audit Group
* R. Wanczyk, Operations Superintendent

The inspectors also held discussions with licensed operators and training instructors during the inspection.

Nuclear Regulatory Commission

* L. Bettenhausen, Operations Branch Chief, Division of Reactor Safety
* P. Bonnett, Senior Operations Engineer
* J. Caruso, Operations Specialist
* H. Eichenholtz, Senior Resident Inspector
* P. Harris, Resident Inspector
  J. Rogge, Section Chief, Division of Reactor Projects
* T. Walker, Senior Operations Engineer
* T. Mazour, Human Factors Specialist
* M. Sjoberg, Emergency Preparedness Specialist/Swedish Nuclear Power Inspectorate

* Denotes those present for the exit meeting on February 28, 1992.

ATTACHMENT 2

Documents Reviewed

Flowchart EOPs

OE 3100, "SCRAM"	rev. 7
OE 3101, "RPV Control"	rev. 7
OE 3102, "Alternate Level Control"	rev. 8
OE 3103, "Drywell Pressure, Temperature, and Hydrogen Control"	rev. 8
OE 3104, "Torus Temperature and Level Control"	rev. 7
OE 3105, "Secondary Containment Control"	rev. 9
OE 3106, "Radioactivity Release Control"	rev. 0

Emergency Support and Related Procedures

OE 3107, "OE Appendices" rev. 0

Appendix A, "Scram Conditions"
* Appendix B, "Primary Containment Isolation Groups"
* Appendix C, "Deenergization of Scram Solenoids"
* Appendix D, "Manual Isolation and Venting of the Scram Air Header"
Appendix E, "Individual Control Rod Scrams"
Appendix F, "Initiation of a Manual Scram"
Appendix G, "Manual Insertion of Individual Control Rods"
* Appendix H, "Vent the Control Rod Drive Over Piston Volume"
* Appendix I, "Local Firing of Squib Valve"
* Appendix J, "Boron Injection Using RWCU"
* Appendix K, "Boron Injection Using CRD System from SLC Tank"
Appendix L, "Alternate Injection Using RHRSW System"
* Appendix M, "Alternate Injection Using Fire System to RHR"
* Appendix N, "Alternate Injection from Condensate Transfer System"
* Appendix O, "Alternate Injection Using SLC Test Tank"
* Appendix P, "Bypassing of Group I Isolation Signals"
Appendix Q, "Bypassing RWCU Filter/Demineralizers and Defeating RWCU"
Appendix R, "Feedwater/Condensate High RPV Water Level"
Appendix S, "Primary Containment Spray Using Fire System to RHR"
Appendix T, "Torus Makeup from HPCI"
Appendix U, "Torus Makeup from RCIC"
Appendix V, "Torus Makeup from RHR System"

* Denotes those procedures walked down

Emergency Support and Related Procedures (cont.)

Appendix W, "Torus Makeup from Core Spray System"
Appendix X, "Torus Makeup from RHRSW System"
Appendix Y, "Torus Level Reduction Using HPCI"
Appendix Z, "Torus Level Reduction Using RCIC"
Appendix AA, "Bypassing Reactor Building HVAC Trips"

ON-3153, "Excessive Radiation Levels"	rev. 7	11/27/91
ON-3158, "Reactor Bldg. High Area Temp./Water Level"	rev. 5	01/22/92
OP-0109, "Plant Restoration"	rev. 6	11/27/91
OP-2115, "Primary Containment"	rev. 28	01/15/92
OP-2116, "Secondary Containment Integrity Control"	rev. 14	01/22/92
OP-2120, "High Pressure Coolant Injection System"	rev. 20	10/18/90
OP-2121, "Reactor Core Isolation Cooling System"	rev. 22	10/07/91
OP-2124, "Residual Heat Removal System"	rev. 27	08/28/91
OP-2125, "Containment Atmosphere Dilution System"	rev. 14	11/27/91
OP-3140, "Alarm Response"	rev. 11	
3-E-3, "Area Radiation Monitoring"	rev. 2	
4-M-6, "Reactor Building Floor Drain System"	rev. 3	
5-G-6, "Primary Containment"	rev. 3	

Training Documents

Vermont Yankee Emergency Operating Procedures Study Guide	rev.1	10/91
LOR-91.5-001, Licensed Operator Requalification Training Program Instruction Guide, "Emergency Operating Procedure Training"	rev. 0	11/91
LOT-09-011, Licensed Operator Training Program Instructor Guide/Student Handout, "RPV Control"	rev. 4	12/90
LOT-03-208, Licensed Operator Training Program Instructor Guide/Student Handout, "Reactor Building HVAC"	rev. 6	01/92

QA Documents

QA Audit Report No. VY-92-01, dated February 18, 1992
QA Audit Report No. VY-91-01, dated April 26, 1991
QA Surveillance Report No. 90-36, dated March 30, 1990
QA Surveillance Report No. 91-10, dated January 22, 1991
QA Surveillance Report No. 91-57, dated May 20, 1991
QA Surveillance Report No. 91-92, dated August 2, 1991
QSG Quarterly Surveillance Schedules, dated January 6, 1992
Quality Services Annual Surveillance Plan for 1992
OQA-X-1, "Quality Assurance Surveillances," Revision 14

Calculations

OPS-[illegible], "Boron Injection Variables for EPG, Rev. 4" rev. 1
OPS-37, "Drywell Spray Initiation Limit for EPG, Rev. 4"
OPS-50, "RPV Variables with Bypass Valves for EPG, Rev.4"

Administrative Procedures and Other Documents

AP-0831, "Plant Procedures"	rev. 19	01/17/92
AP-0020, "Control of Temporary Modifications"	rev. 14	10/30/91

Vermont Yankee Procedure Generation Package (PGP) rev. 7
Appendix A, "Plant Specific Technical Guideline (PSTG)"
Appendix B, "OE Writer's Guide"
Appendix C, "OE Verification Methods"
Appendix D, "OE Validation Methods"
Appendix E, "EPG to PSTG Differences"
Appendix F, "PSTG to OE Differences"

Letter, M.C. Daus, Ciel Consultants, to T.C. Trask, VYNPC, "PSTG/EOP Verification Comments," MCD 91-099, dated September 3, 1991

Memo, T.C. Trask to M.E. Palionis, "Resolution of Ciel Consultants Phase 2 Verification Comments," dated October 7, 1991

Memo, T.C. Trask to J.T. Herron, "Response to NRC Safety Evaluation Regarding the Procedure Generation Package for Vermont Yankee Nuclear Power Station," dated August 1, 1991

Completed EPG to PSTG and PSTG to OE Verification Sheets

EOP Human Factors Verification sheets and Revision Checklists

ATTACHMENT 3

DETAILED TECHNICAL ADEQUACY COMMENTS

The detailed findings of the review of the VY PSTGs, EIPs, and EOP support procedures are described in this attachment. The items are examples of the deficiencies identified in the technical adequacy of the PSTGs, the differences documentation, the EOPs, and the support procedures. This attachment is not a complete list of the discrepancies identified during the inspection. The licensee committed to review and correct, as necessary, the specific items identified by the NRC staff during this inspection. Individually, the deficiencies presented no immediate safety concern; however, they could lead to inadequate operator actions in response to complex or severe accidents.

Section 1 - Comparison of BWROG EPGs and VY PSTGs

A. RPV Control

1. Transitions from Other Guidelines - The BWROG EPGs contain transitions to the RPV Control guideline from the Primary Containment Control, Secondary Containment Control, and Radiation Release Control guidelines for conditions which require the reactor to be scrammed (i.e., prior to emergency depressurization of the RPV). For these conditions, the VY PSTG specifies entry into OE 3100 (Scram Procedure) rather than transition to RPV Control. This does not preserve the accident mitigation strategy of the BWROG EPGs. It is not appropriate to reference plant specific procedures in place of accident mitigation guidelines.

2. Reactor Water Level Control (RC/L)

a. Injection Through the RHR Heat Exchangers - The BWROG EPGs specify injection through the heat exchangers as soon as possible when using Low Pressure Coolant Injection (LPCI) for RPV water level control. The VY PSTGs do not specify injection through the heat exchangers when using LPCI. The licensee's justification for this deviation is that the operating procedure for the Residual Heat Removal (RHR) system directs injection through the heat exchangers as soon as conditions permit; therefore, it does not need to be specified in the PSTGs. The justification for this deviation is not appropriate in that it references a plant specific procedure as justification for deletion of the action from the PSTG.

3. Reactor Pressure Control (RC/P)

a. Override to Reopen MSIVs - The VY PSTG allows bypass of the high steam flow not in Run MSIV isolation interlock to allow reopening the MSIVs during an Anticipated Transient Without Scram (ATWS). The BWROG EPGs only allow bypass of low RPV water level isolation interlocks. The high steam flow not in Run isolation interlock is not designed for ATWS events; therefore, it is does not detract from technical adequacy of the accident mitigation strategy to bypass it during an ATWS. The licensee's justification does not describe the bases for the high steam flow not in Run isolation interlock which is necessary to adequately justify the deviation.

b. Initiation of Shutdown Cooling - The BWROG EPGs specify initiation of shutdown cooling when the shutdown cooling RPV pressure interlock clears. The VY PSTGs do not specify initiation of shutdown cooling. The justification for this deviation references OP 0109, "Plant Restoration," for direction concerning operation of shutdown cooling. OP 0109 directs initiation of shutdown cooling only if shutdown to cold shutdown is required. No criteria is provided to determine when shutdown to cold shutdown would be required. Additionally, OP 0109 would not be entered until RPV water level is under control which differs from the BWROG EPGs. The justification for this deviation is not appropriate in that it references a plant specific procedure as justification for deletion of the action from the PSTG.

4. Reactor Power Control (RC/Q)

a. Initiation of Alternate Rod Insertion and Reset - Step RC/Q-3.1 of the VY PSTG specifies initiation of Alternate Rod Insertion (ARI) and reset of ARI only if reactor power is above 2% (the APRM downscale alarm setpoint) or cannot be determined. The BWROG EPGs specify initiation and reset of ARI regardless of reactor power level. This deviation is not identified and justified in the differences document.

b. Increasing Control Rod Drive Differential Pressure - VY has deleted increasing Control Rod Drive (CRD) cooling water differential pressure as a method for inserting control rods. The justification for deleting this option is that differential pressure cannot be increased significantly without exceeding the range of the indicating instrumentation. The justification also indicates that increasing CRD cooling water differential pressure would only be used with reactor power above 2%. The BWROG EPGs specify use of this method anytime the reactor is not shutdown without limitation on power level. It does not appear that

sufficient evaluation was done to justify deletion of this option for inserting control rods.

B. Primary Containment Control

1. Suppression Pool Temperature Control (SP/T)

a. RPV Depressurization - The VY PSTG specifies depressurization of the RPV if torus water temperature is above 120°F and the RPV is isolated from the main condenser in the Torus Temperature Control (T/T) guideline. This direction is not included in the BWROG EPGs. This direction conflicts with the BWROG EPG and VY PSTG RC/P guidelines which do not allow RPV depressurization unless the reactor is shutdown or torus temperature is approaching the Heat Capacity Temperature Limit (HCTL). Step RC/P-2 of the VY PSTG specifies that the direction in the T/T guideline takes precedence over the direction in the RC/P guideline. This results in a direct conflict with step RC/P-3 of the VY PSTG which specifies RPV depressurization when it can be determined that the reactor will remain shutdown.

Additionally, including actions to control RPV pressure in the T/T guideline is not consistent with the BWROG EPG philosophy of separation of parameter control. Mixing parameter control without thorough evaluation can result in conflicting or potentially conflicting direction.

2. Primary Containment Pressure Control (PC/P)

a. Defeating Isolation Interlocks - The VY PSTGs allow defeating of interlocks to use drywell coolers (RRUs) and the Standby Gas Treatment system (SBGT) to control primary containment pressure. The BWROG EPGs do not authorize defeating interlocks for primary containment pressure control except to vent the containment before the Primary Containment Pressure Limit (62 psig) is reached. The justification for this deviation describes how the isolation interlocks would be defeated, but does not describe the analysis that was performed to justify defeating the safety function of the interlocks.

3. Suppression Pool Level Control (SP/L)

a. Termination of Injection at Vacuum Breaker Elevation - The BWROG EPGs specify termination of injection into the primary containment if suppression pool water level cannot be maintained below the elevation of the suppression chamber to drywell vacuum breakers. The VY PSTGs do not specify this action. The justification for this deviation indicates that direction to terminate injection is already contained in VY PSTG step T/L-3.1. VY PSTG step T/L-3.1 directs termination of

injection if torus water level and RPV pressure cannot be maintained in the safe region of the Safety Relief Valve (SRV) Tailpipe Level Limit Curve. It is possible for torus level to be above 22.8' (the elevation of the torus to drywell vacuum breakers) and within the safe region of the SRV Tailpipe Level Limit Curve. As a result of this deviation, it is not assured that injection into the primary containment will be terminated if torus water level cannot be maintained below the elevation of the torus to drywell vacuum breakers.

b. Termination of Injection for Primary Containment Water Level Limit - The BWROG EPGs specify termination of injection into the primary containment if primary containment water level cannot be maintained below the Primary Containment (PC) Water Level Limit. The VY PSTGs specify termination of injection with the exception of CRD and boron injection. The justification for this deviation is that CRD and boron may be required to shutdown the reactor and that the capacity of the systems is minimal. The licensee's justification does not address why it is acceptable to place priority on shutting down the reactor over maintaining primary containment integrity. The licensee's justification does not consider that the BWROG EPG action allows for operation of lower capacity systems or systems that are needed to shutdown the reactor as long as water level can be maintained below the PC Water Level Limit. Injection from these systems would only have to be terminated if primary containment integrity was in jeopardy.

4. Primary Containment Hydrogen Control (PC/H)

a. Override Statement - The BWROG EPGs contain an override in the PC/H guideline that specifies emergency RPV depressurization and vent and purge of the primary containment irrespective of offsite radioactivity release rates if primary containment hydrogen and oxygen levels cannot be determined to be below the levels required to support a deflagration. VY has deleted this override from their PSTG. The justification for deletion of direction to emergency depressurize the RPV is that the action is already included in the PC/H guidelines and that the prior steps in the guideline will "rapidly" bring the operator to this step. The prior steps in the guideline direct venting and purging of the containment. There is no way to ensure that the direction to emergency depressurize the RPV will be reached "rapidly."

The justification for deletion of the direction to vent and purge the primary containment irrespective of offsite radioactivity release rates as an override statement is based on an override that provides conditions for discontinuing venting. The justification assumes that venting and

purging of the containment would continue irrespective of offsite release rates if hydrogen and oxygen concentrations were above the deflagration limits. The justification does not address actions if hydrogen and oxygen concentrations cannot be determined. If hydrogen concentration cannot be determined, the VY PSTGs direct vent and purge of the primary containment only if offsite release radioactivity release rates are expected to remain below the Technical Specification (T/S) limits. The justification for this is that hydrogen concentration is assumed to be above the minimum detectable concentration if it cannot be determined. This is not consistent with the bases of the BWROG EPGs which state that if hydrogen and oxygen concentrations cannot be determined, they must be assumed to be above the deflagration limits.

b. Air Purge - The BWROG EPGs specify air purge of the drywell to supplement containment venting for hydrogen control if oxygen concentration is not below 5%. The VY PSTG does not specify air purge because nitrogen purge flow is not less than air purge flow. No justification is provided for deletion of air purge as an option if nitrogen purge is not available. Directions for air purge of the containment are included in the operating procedure for the Containment Atmosphere Dilution (CAD) system and could be used with the concurrence of the TSC. The justification for deletion of an air purge for PC/H is not technically adequate.

C. Secondary Containment Control

1. Entry Conditions - The VY PSTG entry conditions for Secondary Containment Control on area radiation levels, floor drain sump levels, and area water levels are not consistent with the BWROG EPG bases for entry conditions. The bases for the BWROG EPGs states that entry conditions should be symptomatic of conditions which could degrade into an emergency.

The maximum normal operating radiation level should be the highest radiation level expected to occur during normal plant operating conditions in accordance with the BWROG EPGs. The VY maximum normal operating radiation levels were chosen as easily recognizable values above the area radiation monitor (ARM) setpoints and below the maximum safe operating radiation levels. The justification for selection of these values indicates that the combination of ARM alarms and maximum normal operating radiation levels provide the operator with sufficient indication and time to perform required actions. This justification does not address why it would not be appropriate for the accident mitigation strategy to be implemented upon receipt of an ARM alarm rather than waiting until the higher maximum normal operating radiation level is

reached. The methodology for selection of maximum normal operating radiation levels does not meet the BWROG EPG definition of maximum normal operating level.

The VY PSTG justification for specifying a continuous Reactor Building (RB) floor drain sump high high level as an entry condition for Secondary Containment Control states that intermittent sump high high level would be an "off-normal condition" that would not constitute an emergency condition. This off-normal condition meets the BWROG EPG definition for floor drain sump water level above the maximum normal operating water level, the specified entry condition for Secondary Containment Control. This condition is not normal and is symptomatic of a condition which could degrade into an emergency.

The justification for limiting the area water level entry condition to unexpected RB area water level above the maximum normal operating water level is based on the assumption that there may be times when this level is exceeded that do not constitute emergency conditions. This justification is not consistent with the BWROG.

EPG bases that entry conditions be symptomatic of conditions which could degrade into an emergency.

2. Secondary Containment Ventilation Override - The BWROG EPGs contain an override at the beginning of the Secondary Containment Control guideline that directs restart of secondary containment (SC) ventilation if it is isolated and SC ventilation exhaust radiation levels are below the isolation setpoint. The BWROG EPGs allow defeating high drywell pressure and low RPV water level interlocks once assurance is provided that excessive release of radioactivity will not occur. VY has moved this override to the beginning of the Secondary Containment Radiation Control (SC/R) guideline in order to group actions related to area radiation levels. The bases for restarting SC ventilation is to control SC temperature and pressure. Restarting SC ventilation is related to SC temperature and pressure along with radiation levels and it is important that the override statement be clearly applied to the entire Secondary Containment Control guideline.

Additionally, movement of this override is inconsistent with the VY initiative to move overrides to the beginning of the guideline to provide a consistent location for overrides statements and assure operator awareness.

VY also removed the conditional statement "if secondary containment HVAC isolates" from the BWROG EPG override statement that directs restart of SC ventilation. The justification for this deviation is that it is redundant because

RB HVAC will already be isolated. There is no way to predict whether RB ventilation will be isolated on every entry into Secondary Containment Control.

3. Secondary Containment Temperature Control (SC/T)

   a. Operation of Available RB Ventilation - The BWROG EPGs specify operation of available SC HVAC in the Secondary Containment Temperature Control (SC/T) guideline. VY has deleted this direction in their PSTG because it is redundant to the direction provided in the override statement to restart RB HVAC. ON 3158, "Reactor Building High Area Temperature/Water Level," which would be implemented concurrently with the Secondary Containment Control EOP for high SC area temperatures, directs operation of RB HVAC. This direction is referenced as part of the VY tracking system for EOPs, implying that it is part of the EOP accident mitigation strategy. The justification for this deviation is not appropriate in that it references a plant specific procedure as justification for deletion of the action from the PSTG.

4. Secondary Containment Level Control (SC/L)

   a. Floor Drain Sump Water Levels - The BWROG EPGs specify sump operation and isolation of systems when a floor drain sump water level cannot be maintained below its maximum normal operating water level. The VY PSTGs do not direct actions based on floor drain sump water levels. The justification for this deviation indicates that an increase in floor drain sump level may be due to sump pump failure which would not constitute an emergency. This is not consistent with the BWROG EPG philosophy that actions should be taken for conditions which could degrade into an emergency to preclude an emergency if possible. The justification for this deviation indicates that the off-normal condition would be addressed by alarm response procedures (ARPs). Inclusion of actions in plant procedures is not adequate justification for deletion of the action from the PSTG.

D. Radiation Release Control

   1. Emergency Depressurization - The BWROG EPGs require Emergency RPV Depressurization when offsite radioactivity release rates approach or exceed the General Emergency level. This allows action to be taken prior to reaching the General Emergency level, possibly preventing a General Emergency. The

VY PSTGs require Emergency RPV Depressurization when a General Emergency exists. This does not allow for preventive action to be taken in anticipation of a General Emergency. This deviation is not identified or justified in the differences document.

E. Contingencies

1. Alternate Level Control (C1)

a. Inhibit ADS - The BWROG EPGs require prevention of automatic initiation of ADS if water level drops below the ADS initiation setpoint. The VY PSTGs require prevention of automatic initiation of ADS if RPV water level cannot be restored and maintained above 82.5" (the ADS initiation setpoint). The justification for this deviation is to ensure that automatic initiation of ADS is prevented only during an actual low level condition, not during a level oscillation. This deviation does not maintain the logic of the BWROG EPGs because the determination that level cannot be restored and maintained above the ADS initiation setpoint may not be made as soon as level drops below 82.5". Additionally, the justification does not address why it is not appropriate to inhibit ADS during a level oscillation.

b. Spray Cooling - In the Alternate Level Control (C1) guideline, if less than two injection subsystems can be lined up, the BWROG EPGs direct lining up of alternate injection subsystems. If one Core Spray (CS) system can be lined up with the pump running, the VY PSTGs do not direct lining up alternate injection subsystems. Instead, the VY PSTG transition to a contingency guideline, titled Spray Cooling (C7). The C7 guideline follows the logic of the BWROG EPGs with two exceptions: 1) The VY PSTGs delay lining up alternate injection subsystems until water level drops below the top of active fuel (TAF) and 2) the VY PSTGs do not direct starting pumps in the alternate injection subsystems until it is determined that RPV level cannot be restored and maintained above TAF with CS. The Spray Cooling accident mitigation strategy results in delayed use of alternate injection sources to restore and maintain adequate core cooling. The justification for this deviation is not technically adequate in that it does not describe the benefit from the delays in lining up and starting pumps in alternate injection subsystems.

Additionally, the delay in starting pumps in alternate injection subsystems is not consistent with the VY PSTG accident mitigation strategy to line up and start pumps simultaneously in the alternate injection subsystems if no injection subsystems can be lined up with

pumps running. The BWROG EPGs do not direct starting pumps in the alternate injection subsystems until RPV pressure drops below the shutoff head of the alternate injection subsystems.

c. Transition from Spray Cooling to Steam Cooling - If water level cannot be restored and maintained above TAF, the VY PSTGs direct transition to PSTG step C1-4.2. This step does not exist in the VY PSTGs. From the justification documentation, it appears that the transition should have been to PSTG step C1-4. This results in a transition to a point where either Steam Cooling (C3) or Emergency Depressurization (C2) is required. At this point in the guideline, Emergency Depressurization is required (and has already been performed) as part of the Spray Cooling contingency. Therefore, Steam Cooling will not be effective in maintaining adequate core cooling and the C3 guideline must be exited. It appears that transition to C3 is unnecessary and that immediate transition to Primary Containment Flooding (C6) would be appropriate.

2. Emergency RPV Depressurization (C2)

a. Termination and Prevention of Injection - The BWROG EPGs require termination and prevention of injection into the RPV prior to emergency depressurization of the RPV. VY has changed the BWROG EPG conditional statement to an action statement. This modification does not preserve the logic of the BWROG EPGs in that it does not ensure that injection sources are terminated and prevented prior to depressurization. This deviation from the BWROG EPGs is not identified or justified in the differences document.

b. Defeating Interlocks - The BWROG EPGs allow isolation interlocks to be defeated to use alternate systems for emergency RPV depressurization if the minimum number of SRVs required for emergency depressurization cannot be opened. The VY PSTGs do not allow isolation interlocks to be defeated to use alternate system for emergency depressurization. The VY PSTGs also do not allow defeating MSIV isolation interlocks to allow use of the turbine bypass valves (BPVs) as intended by the BWROG EPGs.

The justification for this deviation is that previous use of MSIVs and SRVs provide sufficient choices for maintaining RPV integrity without the need to defeat interlocks. This justification is not valid. Emergency RPV depressurization is required to establish or maintain adequate core cooling; minimize the discharge from primary system leaks; reduce the energy within the RPV before reaching plant

conditions for which the primary containment may not be able to safely accommodate an SRV opening or loss of coolant accident (LOCA); or to minimize radioactivity release from the RPV, but not to maintain RPV integrity. The need to emergency depressurize justifies defeating isolation interlocks if normal means of depressurization are not available.

Use of alternate means for depressurization is only specified when enough SRVs (and BPVs at VY) cannot be opened to emergency depressurize the RPV. No previous direction has been given to defeat interlocks to open the MSIVs (unless an ATWS is in progress). There is no assurance that the combination of alternate methods of depressurization and previous use of BPVs and SRVs will be sufficient to depressurize the RPV without defeating isolation interlocks.

3. Level/Power Control (C5)

a. RPV Water Level Below the Minimum Steam Cooling Water Level - If RPV water level cannot be maintained above the Minimum Steam Cooling RPV Water Level (MSCWL) while implementing C5, the BWROG EPGs require Emergency RPV Depressurization and direct termination and prevention of injection until RPV pressure is below the Minimum Alternate RPV Flooding Pressure (MARFP). VY has added a transition to C2 that is not included in the BWROG EPGs. VY also takes credit for the direction in C2 to terminate and prevent injection. These deviations do not preserve the logic of the BWROG EPGs. If emergency depressurization had already been performed, the BWROG EPGs would not direct transition to C2. If RPV pressure was below the MARFP, termination and prevention of injection would not be directed by the BWROG EPGs. The VY PSTGs direct transition to C2 even if emergency depressurization has already been preformed and direct termination and prevention of injection even if RPV pressure is already below the MARFP.

The justification for the deviation to add a transition to C2 is that C2 provides the most appropriate means of performing emergency depressurization. The BWROG EPGs direct emergency depressurization in accordance with the C2 guideline. The addition of a transition is unnecessary and complicates the accident mitigation strategy.

Deletion of the BWROG EPG conditional direction for termination and prevention of injection from the C5 guideline requires a transition to C2 to accomplish the action. However, injection would be terminated and prevented unnecessarily if RPV pressure was already below the MARFP.

VY personnel were aware of the potential for unnecessary termination and prevention of injection; however, their justification for the deviations is that the benefit of simplification of direction overrides the potential for unnecessary termination of injection. It is not clear that addition of a transition simplifies the direction. If injection is terminated and prevented, there is no assurance that it can be restored. The justification for this deviation is not technically adequate.

b. Transition to Primary Containment Flooding - The BWROG EPGs contain an override that directs transition to Primary Containment Flooding (C6) if RPV water level cannot be restored and maintained above the MSCWL. The VY PSTGs include this direction as a decision step rather than as an override. The justification for this deviation is that it is not necessary for the action to be included as an override statement because there are no subsequent actions that would result in RPV water level not being able to be restored and maintained above the MSCWL if such restoration has been successful. The only step subsequent to the override statement in the BWROG EPGs directs transition to level control guidance that does not allow use of alternate systems or systems that inject inside the RPV shroud. If these systems were being used to maintain RPV water level above the MSCWL, securing them would result in not being able to maintain RPV water level above the MSCWL.

The transition to this level control guidance is not directed until RPV water level can be maintained above the MSCWL. This is a hold statement in both the BWROG EPGs and the VY PSTGs. It would not be appropriate to make this transition if RPV water level cannot be maintained above the MSCWL without the use of systems that inject inside the shroud or alternate injection systems. The combination of the hold statement and the override statement ensure that an incorrect transition is not made. Conversion of the override statement to a decision step does not preserve the intent of the BWROG EPG accident mitigation strategy.

Additionally, the justification for this deviation references PSTG steps C5-3.3 to C5-3.5. Steps C5-3.4 and C5-3.5 do not exist in the VY PSTGs.

4. Primary Containment Flooding (C6)

a. RPV Venting - The BWROG EPGs require venting of the RPV for primary containment flooding irrespective of offsite radioactivity release rates. The VY PSTGs do not specify that venting of the RPV should be performed irrespective of offsite release rates. The justification for this deviation is that venting the RPV irrespective of offsite radioactivity release rates is outside of the design basis for VY. The justification indicates that the TSC would provide assistance in determining the proper method for venting the RPV. The justification for this deviation is not appropriate in that it references the TSC as justification for deletion of the action from the PSTG.

The BWROG EPGs allow defeating isolation interlocks to vent the RPV. The VY PSTGs do not allow defeating interlocks to vent the RPV; however, direction is provided in the Accident Mitigation Guidelines to defeat interlocks when venting the RPV. This deviation is not identified in the differences documentation. Authorization to defeat interlocks must be included in the PSTG to preserve the intent of the BWROG EPG accident mitigation strategy.

The BWROG EPGs specify use of the MSIVs for venting the RPV. The VY PSTGs do not include the MSIVs as an option for venting the RPV. The justification for this deviation is that the Main Steam Line (MSL) drain valves, High Pressure Coolant Injection (HPCI), and Reactor Core Isolation Cooling (RCIC) provide a more controlled vent path with the required capacity. Licensee personnel indicated that the TSC would provide guidance to use the MSIVs to vent the RPV if the MSL drains, HPCI, and RCIC could not be used. Referencing TSC guidance is not adequate justification for deleting actions from the PSTG.

Section 2 : Comparison of VY PSTGs and VY EOPs

A. General

1. Shutdown Conditions - The VY PSTGs specify actions based on the determination that the reactor will remain shutdown. The EOPs specify these actions based on the determination that the reactor is shutdown. The EOP directions do not address the future condition of the reactor for which there is no assurance that the reactor will remain shutdown. The VY EOPs do not ensure that the PSTG accident mitigation strategy is implemented.

B. RPV Control

1. Entry Conditions - RPV Water Level Cannot Be Determined - The VY PSTG requires entry into RPV Control if RPV water level cannot be determined. The VY PSTGs require a reactor scram upon entry into RPV Control. Both OE 3100, "Scram Procedure," and OE 3101, "RPV Control Procedure," are used to implement the RPV Control guideline. RPV water level not determined is an entry condition into OE 3101, but OE 3101 does not direct a reactor scram. OE 3100 directs a reactor scram; however, RPV water level not determined is not an entry condition into OE 3100. If RPV water level cannot be determined and no scram condition exists, the VY EOPs do not direct a reactor scram as specified by the VY PSTG. This difference between the PSTGs and EOPs is not identified in the Linkage document.

2. Reactor Level Control (RC/L)

   a. Override - Transition to Level/Power Control - The VY PSTGs contain an override statement in the RC/L guideline that directs entry into C5 if it cannot be determined that the reactor will remain shutdown. OE 3100 does not contain this override. This difference between the PSTGs and the EOPs is not documented in the linkage document.

   b. Injection Through the RHR Heat Exchangers - The VY PSTGs do not specify injection through the heat exchangers when using LPCI which is a deviation from the BWROG EPGs. The justification for this deviation is that the operating procedure for the RHR system directs injection through the heat exchangers as soon as conditions permit. OP 2124, "Residual Heat Removal," does not provide direction to inject through the heat exchanger when injecting with LPCI.

c. Use of Alternate Injection Systems - The step RC/L-1 of the VY PSTG directs use of alternate systems to augment RPV water level control to restore and maintain RPV water level above TAF. OE 3101 does not direct use of alternate injection systems for RPV water level control until the operator has determined that RPV water level cannot be maintained above TAF. The EOP does not preserve the logic of the PSTGs.

3. Reactor Pressure Control

a. Heat Capacity Temperature Limit and SRV Tail Pipe Level Limit Overrides - The VY PSTG contains overrides in the RC/P guideline that permit RPV depressurization in excess of the T/S limits in order to stay in the safe regions of the Heat Capacity Temperature Limit (HCTL) and SRV Tail Pipe Level Limit (STPLL) curves. OE 3100 does not contain these overrides. The justification for not including these overrides in OE 3100 is that the combination of RPV and torus parameters that would result in entry into the unsafe regions of the curves could only occur during beyond-design-basis events and that OE 3101 will be entered if a beyond-design-basis event were to occur. There is no way to predict the conditions that will exist for all beyond-design-basis events; therefore, it cannot be assumed that OE 3101 will be entered for all events that are beyond the design basis.

b. RPV Depressurization - The VY PSTGs direct RPV depressurization when it can be determined that the reactor will remain shutdown. OE 3100, which implements the RPV Control guideline, does not direct RPV depressurization. OE 3100 directs entry into OP 0109, "Plant Restoration," for direction to depressurize the RPV. OP 0109 cannot be entered until RPV water level has been restored between 127" and 177". This conflicts with the PSTGs which do not require RPV water level to be restored to normal prior to RPV depressurization.

Additionally, OP 0109 does not direct RPV depressurization if the main condenser is available. The VY PSTGs direct RPV depressurization regardless of main condenser availability.

4. Reactor Power Control

a. Defeating RPS Logic Trips - The VY PSTGs specify defeating Reactor Protection System (RPS) logic trips if necessary to initiate a manual scram to insert control rods. OE 3101 and Appendix F, "Initiation of a Manual Scram," of OE 3107, "OE Appendices," do not contain direction to defeat RPS logic trips.

C. Primary Containment Control

1. Suppression Pool Temperature Control

a. RPV Depressurization - The VY PSTGs direct RPV depressurization if torus water temperature is above 120°F and the RPV is isolated from the main condenser. Step T/T-11 of OE 3104, "Torus Temperature and Level Control Procedure," directs the operator to continue depressurization as required. Step T/T-11 is applicable if torus temperature is above 120°F, but can be maintained in the safe region of the HCTL curve, independent of whether or not the RPV is isolated from the main condenser. This is not consistent with the VY PSTG which directs depressurization only if the RPV is isolated from the main condenser.

2. Primary Containment Pressure Control

a. Primary Containment Pressure - The VY PSTGs direct actions to spray the torus when primary containment pressure cannot be maintained below 2.5 psig. OE 3103, "Drywell Pressure, Temperature, and Hydrogen Control Procedure," directs actions to spray the torus when drywell pressure cannot be maintained below 2.5 psig. In symptom based procedures, it cannot be assumed that Drywell pressure will always be equal to or greater than primary containment pressure.

D. Secondary Containment Control

1. High Reactor Building Differential Pressure Entry Condition - Reactor Building (RB) differential pressure (DP) at or above 0 inches of water is an entry condition into the Secondary Containment Control guideline. High RB DP is not an entry condition for OE 3105, "Secondary Containment Control Procedure." Instead the actions of the Secondary Containment Control guideline are implemented in off-normal and operating procedures. The procedures referenced in the linkage document do not contain direction to restart RB HVAC, defeating isolation interlocks if necessary, if RB exhaust radiation levels are below 14 mr/hr as specified in the VY PSTGs.

2. Secondary Containment Level Control (SC/L)

a. Floor Drain Sump Water Levels - The VY PSTGs do not specify sump operation and isolation of systems when a floor drain sump water level cannot be maintained below its maximum normal operating water level. The justification for this deviation from the BWROG EPGs indicates that the condition would be addressed by the alarm response procedure

(ARP). ARP 4-M-6, "RX BLDG FLOOR DRN SUMP NORTH HI LVL," directs actions to check sump pump operability and to check for leakage, but does not direct operation of available sump pumps and isolation of the leakage.

E. Contingencies

1. Emergency RPV Depressurization

a. Transitions from Other Guidelines - When the VY PSTGs direct transition to C2 from the Primary Containment Control, Secondary Containment Control, and Radiation Release Control guidelines, they specify that C2 should be entered and executed concurrently with the guideline that directed the transition. In the DW/T, T/T, SC/T, SC/R, SC/L, and R/R legs of OE 3103, 3104, 3105, and 3106 the transitions to OE 3102, "Alternate Level Control," for Emergency RPV Depressurization are exit symbols. Use of an exit symbol requires exit from the procedure leg, precluding the concurrent execution specified in the PSTG.

2. Level Power Control

a. RPV Water Level Above the Minimum Steam Cooling RPV Water Level - If RPV water level cannot be maintained above the MSCWL, the VY PSTGs direct actions to emergency depressurize the RPV to allow level restoration with low pressure injection systems. When RPV water level can be maintained above the MSCWL, the VY PSTGs direct return to the previous guidance for RPV level control. This direction is a hold statement. OE 3102 does not contain this hold statement. Steps ALC/Q-28 and ALC/Q-30 of OE 3102 are decision steps which do not require the operator to wait until the specified conditions are met.

b. Exit from Level/Power Control - OE 3102, step ALC/Q-21 directs exit from the Level/Power Control procedure if RPV water level can be maintained between 127" and 177" after the Hot Shutdown Boron Weight (HSBW) has been injected into the RPV. This does not preserve the logic of the VY PSTGs. The VY PSTG does not direct exit from Level/Power Control until OP 0109 is entered from the RPV Control guideline. OP 0109 would not be entered until it had been determined that the reactor will remain shutdown.

Section 3 - Technical Adequacy of EOPs and Support Procedures

A. Primary Containment Water Level Indication - A number of steps in the VY EOPs cannot be implemented as intended due to limited primary containment water level indication available in the Control Room. The only indication of primary containment water level is a differential pressure alarm that comes in at 81 feet which corresponds to TAF. The alarm clears at 2/3 core height.

Step ALC/CF-6 of OE 3102 directs the operator to maintain primary containment water level between 81 feet (TAF) and 90 feet (the PC Water Level Limit). The intent of step ALC/CF-6 is to maintain water level above TAF to provide adequate core cooling by core submergence and below the PC Water Level Limit to maintain the structural integrity of the primary containment. With no way to determine PC water level above 81 feet, the operator must terminate injection as soon as the alarm comes in at 81 feet. Level may start to decrease as soon as injection is terminated, but the operator will not be alerted to the level decrease until the alarm clears at 2/3 core height. With the available level indication PC water level can only be maintained between 2/3 core height and TAF. It is not possible to maintain PC water level above TAF to provide adequate core cooling.

The TSC may be able to determine actual level based on the differential pressure readings from the instrumentation. However, the operators are trained to inject until the alarm is received, then to secure injection until the alarm clears. This method does not accomplish the action directed by OE 3102, step ALC/CF-6 and does not assure adequate core cooling.

Additionally, all of the VY EOPs that direct actions for RPV and primary containment water level control contain an override statement that directs termination of injection into the primary containment from external sources if primary containment water level cannot be maintained below the PC Water Level Limit (90 feet). The structural integrity of the containment is challenged when the PC Water Level Limit is exceeded. With the available level indication it is not possible to determine when PC water level exceeds 90 feet; therefore, injection must be terminated at 81 feet when the alarm is received. As soon as injection is terminated there is no assurance that PC water level is above TAF; therefore, adequate core cooling by core submergence is not assured.

B. Isolation of Systems Discharging Into Secondary Containment - OE 3105 directs isolation of all systems discharging into secondary containment except systems that are required to shutdown the reactor, assure adequate core cooling, suppress a fire, or maintain primary containment integrity. ON 3153, "Excessive Radiation Levels," and ON 3158, "Reactor Building High Area Temperature/Water Level," direct isolation of

leaks into secondary containment without restriction. This direction is not consistent with the direction for isolation provided in OE 3105. This conflicting direction could result in inappropriate isolation of systems, because these off-normal procedures would be implemented before or simultaneously with OE 3105.

C. Emergency RPV Depressurization with Alternate Systems - Step ALC/D-12 of OE 3102 directs the operator to rapidly depressurize the RPV using the MSL drains, HPCI, RCIC, or the RPV head vents. No procedural guidance exists for depressurizing the RPV using these systems.

D. Control Rod Insertion - OP 0109 can be entered when the reactor is shutdown and RPV water level is in the normal band. It is possible for the reactor to be shutdown without all control rods being inserted and without injection of boron using Standby Liquid Control (SLC). OP 0109 does not direct actions to insert control rods unless SLC injection was required.

E. Throttling Fire Water Injection - Step 6 of OE 3107, Appendix M, "Alternate Injection Using Fire System to RHR," directs use of the RHR-89A valve to control pressure when injecting into the RPV. RHR-89A is not in the injection flowpath and cannot be used to control system pressure.