



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION II  
101 MARIETTA STREET, N.W.  
ATLANTA, GEORGIA 30323

Report Nos.: 50-327/88-14 and 50-328/88-14

Licensee: Tennessee Valley Authority  
6N38 A Lookout Place  
1101 Market Street  
Chattanooga, TN 37402-2801

Docket Nos.: 50-327 and 50-328

License Nos.: DPR-77 and DPR-79

Facility Name: Sequoyah 1 and 2

Inspection Conducted: February 8-12, 1988

Inspector: M. Lewis 3/16/88  
M. Lewis, Team Leader Date Signed

Team Members: W. Dean  
P. Moore

Approved by: M. Shymlock 3/23/88  
M. Shymlock, Chief Date Signed  
Operational Programs Section  
Division of Reactor Safety

SUMMARY

Scope: This special announced inspection was conducted to evaluate licensee resolutions of inspector followup items related to emergency operating procedures.

Results: No violations or deviations were identified.

## REPORT DETAILS

## 1. Persons Contacted

## Licensee Employees

- C. Benton, Simulator Training Section Supervisor
- \*T. Howard, Quality Services Supervisor
- \*G. Kirk, Compliance Licensing Manager
- \*A. Rosenberg, Engineering Assurance Engineer
- \*E. Slinger, Projects Manager
- \*S. Spencer, Nuclear Engineer
- \*G. Strickland, Nuclear Engineer
- \*J. Sullivan, PORS Supervisor
- \*G. Terpstra, Program Coordinator
- \*J. Walker, Operations Support Group Manager
- \*B. Willis, Operations Superintendent

Other licensee employees contacted included engineers, technicians, operators, and office personnel.

## OSP Attendees

- \*F. McCoy, Section Chief, Sequoyah

## NRC Resident Inspectors

- \*K. Jenison

\*Attended exit interview on February 12, 1988

## 2. Exit Interview

The inspection scope and findings were summarized on February 12, 1988, with those persons indicated in paragraph 1 above. The inspectors described the areas inspected and discussed in detail the inspection findings. In addition, the inspectors discussed the commitments made by the licensee as noted in paragraphs 4b, g, and h. No dissenting comments were received from the licensee. The item identified to the licensee as requiring completion prior to Unit 2 restart (Mode 2) is indicated below by the word "Restart."

<u>Item Number</u>	<u>Status</u>	<u>Description/Reference Paragraph</u>
327, 328/88-14-01	Open	IFI - Resolution of items identified during review of the ECAs (paragraph 4b and Appendix A)

- |                   |        |  |
|-------------------|--------|--|
| 327, 328/88-14-02 | Open   | IFI - Operator training on ECAs, PAM instrumentation, and head vent system (paragraphs 4b, g, and h) Restart                                     |
| 327, 328/87-61-02 | Closed | IFI - PGP revisions relating to EOP writers' guide, V&V, and operator training (paragraph 4a)  |
| 327, 328/87-61-03 | Closed | IFI - Review of implementation, or justification for not implementing, ECA and ES procedures, including V&V and operator training (paragraph 4b) |
| 327, 328/87-61-04 | Closed | IFI - Review of resolutions of findings identified during the technical adequacy review of EOPs (paragraph 4c and Appendix B)                    |
| 327, 328/87-61-05 | Closed | IFI - Review of resolution of EOP items identified as variances from the writers' guide (paragraph 4d and Appendix C)                            |
| 327, 328/87-61-06 | Closed | IFI - Review of resolutions for inspector findings with regard to V&V of the EOPs (paragraph 4e and Appendix D)                                  |
| 327, 328/87-61-07 | Closed | IFI - Review of EOP setpoint calculations, and associated EOP revisions, V&V, and operator training (paragraph 4f)                               |
| 327, 328/87-61-08 | Closed | IFI - Revision of EOP lesson plans and simulator training to emphasize use of qualified instrumentation (paragraph 4g)                           |
| 327, 328/87-61-10 | Closed | IFI- Revision of EOPs to reflect head vent system deficiencies (paragraph 4h)  |
3. Licensee Action on Previous Enforcement Matters  
This subject was not addressed in the inspection.
  4. Licensee Actions on Previously Identified Inspection Findings (92701) Units 1 and 2

- a. (Closed) Inspector Followup Item 327, 328/87-61-02, Procedures Generation Package (PGP) Revisions.

The licensee's PGP was submitted to the NRC for approval on January 13, 1986. This PGP contained descriptions of programs and methods used to develop and maintain emergency operating procedures (EOP), and conduct operator training on the EOPs. The NRC reviewed the licensee's PGP and identified several outstanding issues which are documented in inspection report number 327, 328/87-61 dated February 1, 1988. The licensee then revised the PGP, and by letters dated January 15 and February 26, 1988, resubmitted the revised PGP to the NRC for review. The revisions to the PGP addressed specific concerns regarding the design differences between the Sequoyah units and the generic Westinghouse plant; the emergency contingency action (ECA) and event specific (ES) procedure development and/or upgrade; EOP setpoint selection and control; EOP maintenance measures; and the EOP writers' guide, validation and verification (V&V) program, and training program. The NRC completed its review of the revised PGP, and will be transmitting an SER to the licensee approving the revised PGP. The submittal of the acceptable PGP effectively resolves inspector followup item 327, 328/87-61-02.

- b. (Closed) Inspector Followup Item 327, 328/87-61-03, Implementation, or Justifications for Not Implementing, ECA and ES Procedures.

During a previous inspection of the licensee's EOPs, the licensee made commitments regarding the development of additional ECA procedures and the modification of an ES procedure prior to Unit 2 restart (Mode 2). Specifically, the licensee committed to modify ES-0.3, Natural Circulation Cooldown, to provide an acceptable strategy to address vessel voiding; provide justifications for not writing ECA-3.3, SGTR Without Pressurizer Pressure Control, due to an upgrade of the pressurizer power operated relief valves (PORVs) to safety grade; and write and implement the following ECA procedures:

- ECA-1.1, Loss of Emergency Coolant Recirculation,
- ECA-1.2, LOCA Outside Containment,
- ECA-2.1, Uncontrolled Depressurization of All Steam Generators,
- ECA-3.1, Steam Generator Tube Rupture (SGTR) With Loss of Reactor Coolant - Subcooled Recovery Desired, and
- ECA-3.2, SGTR With Loss of Reactor Coolant - Saturated Recovery Desired.

The licensee also committed to complete prior to Unit 2 restart (Mode 2), the V&V process and operator training for each new procedure implemented.

As noted in inspection report number 327, 328/87-61, the NRC has determined that controlled voiding into the reactor vessel upper head (UH) is an acceptable strategy provided it can be done using safety grade equipment with NRC approved procedures and licensed operators trained in the use of these procedures. The Westinghouse Owner's Group (WOG) ES procedures, ES-0.3, Natural Circulation Cooldown with Steam Void in the Vessel (with Reactor Vessel Level Indication System (RVLIS)) and ES-0.4, Natural Circulation Cooldown

with Steam Void in the Vessel (without RVLIS) constitute such a procedure.

The inspectors reviewed the licensee's revisions to ES-0.3, revision 3, and determined that the procedure provides the operator with an acceptable strategy for natural circulation cooldown while controlling voiding in the reactor vessel UH. This strategy is equivalent to the use of the WOG guidelines. The inspectors concluded that the revisions to ES-0.3 resolve the licensee's commitments in this area.

With regards to the licensee's commitment to provide justification for not writing ECA-3.3, the inspectors noted that the licensee submitted the justification to the NRC by letter dated January 15, 1988. The justification is currently under review by the NRC.

The inspectors also verified that the licensee developed and implemented the ECAs consistent with their commitment by reviewing each newly developed ECA, including its associated V&V. The procedures were determined to be technically adequate, and the V&V was found to be conducted in accordance with the licensee's PGP. Several inspector concerns were identified during the technical review of the ECAs, as listed in Appendix A to this report. The licensee committed to resolve these concerns by incorporating these changes with revisions made to resolve operator feedback comments generated during week 1 of their 1988 requalification program. Resolution of the items listed in Appendix A will be inspector followup item 327, 328/88-14-01.

The inspectors reviewed licensed operator training on the newly developed ECAs. This review consisted of observations of classroom and simulator training, an evaluation of lesson plans and a review of examination items developed for testing operator comprehension of the materials presented in class.

Observations of classroom and simulator training indicated that the training on ECAs was adequate. The lesson plans were well developed and adequately covered the intent and basis for the procedures, including individual steps. The only deficiency noted was that there was not an enabling objective for understanding the basis for the procedural actions although the bulk of the lesson plan addressed this area. Understanding the basis for procedural steps is an enabling objective in the other lesson plans associated with SQNP EOPs. The inspectors noted that this enabling objective should be included in examinations to ensure operator comprehension.

In conclusion, the training provided on the ECAs was determined to be adequate. However, at the time of this inspection, all operators scheduled for Unit 2 restart (Mode 2) had not yet completed the required training. The licensee reaffirmed its commitment to complete ECA training prior to Unit 2 restart. The inspectors stated that completion of ECA training for operators involved in restart would be inspector followup item 327, 328/88-14-02.

The adequate implementation and V&V of the ECAs, revisions to ES-0.3, and the submittal of justification for not implementing ECA-3.3 resolves inspector followup item 327, 328/87-61-03.

- c. (Closed) Inspector Followup Item 327, 328/87-61-04, Resolutions of Technical Adequacy Review Findings.

The licensee committed to resolve prior to Unit 2 restart (Mode 2), specific inspector concerns relating to the technical adequacy of EOPs and their associated step deviation documents. These concerns were designated as IFI 327, 328/87-61-04, and were documented in an inspection report dated February 1, 1988.

The inspectors reviewed the licensee's resolutions of each of the concerns identified during the technical adequacy review of the EOPs. The specific resolutions are described in Appendix B to this report. In general, the inspectors determined that the licensee effectively resolved the concerns identified as IFI 327, 328/87-61-04.

- d. (Closed) Inspector Followup Item 327, 328/87-61-05, Resolution of Writers' Guide and Human Factors Review Findings.

During the previous EOP inspection, the inspectors reviewed selected EOPs for compliance to the plant specific writers' guide, and observed the usability of the EOPs by operators in the training simulator for human factors considerations. The inspectors identified several inconsistencies between the EOPs and writer's guide. The licensee committed to resolve those inconsistencies prior to Unit 2 restart (Mode 2), as documented in IFI 327, 328/87-61-05.

The inspectors reviewed the licensee's resolutions of each of the concerns. The specific items, along with a description of the corrective measures, are included in Appendix C to this report. The licensee adequately resolved the inspector concerns.

- e. (Closed) Inspector Followup Item 327, 328/87-61-06, Resolutions of Validation and Verification Program Review Findings.

Several specific concerns were identified during the inspectors' review of the EOP validation and verification program, and during the conduct of control room walkdowns. IFI 327, 328/87-61-06 documents the licensee's commitment to resolve these concerns prior to Unit 2 restart (Mode 2).

The inspectors' review of the licensee's resolutions indicated that the licensee adequately addressed the inspector concerns. The specific resolutions are described in Appendix D to this report.

- f. (Closed) Inspector Followup Item 327, 328/87-61-07, Plant Specific EOP Values.

This item delineated the concern that the licensee did not have a central document for controlling EOP setpoints. At the time of the inspection, the licensee documented and controlled setpoints

associated with the EOPs through a variety of existing programs and documents including the Precautions, Limitations, and Setpoint (PLS) manual, the technical specifications, computer programs, the procedure revision and review process, the surveillance testing program, and instrumentation setpoint manuals. These various programs and documents were not cross-referenced to the EOPs to ensure that the EOP setpoint bases, commitments, and requirements are considered when the setpoints are revised.

The licensee has established an EOP setpoint document in the form of a table titled Emergency Operating Procedure Setpoint Table, drawing number 47E250-1, revision 0. The table lists 104 WOG instrumentation requirements, along with their EOP trigger setpoint, reference document number, and instrumentation loops.

Many of the reference documents (58) were recently generated by the Department of Nuclear Engineering (DNE) in response to post-accident environmental conditions. The inspectors performed a review of the accuracy of calculations contained in the reference documents, and noted no discrepancies.

In addition, the inspectors performed a review of the licensee's Precautions, Limitations and Setpoints document, SQN-PLS, revision 9, against those EOP setpoints reference to this document. No referenced discrepancies were noted.

A 100 percent review of EOP procedures against the setpoint table was performed. The inspectors found no inconsistencies or discrepancies between them.

- g. (Closed) Inspector Followup Item 327, 328/87-61-08, Revision of EOP Lesson Plans and Simulator Training.

During the previous EOP inspection, the inspectors expressed concern over the lack of procedure guidance and training on the use of qualified instrumentation while utilizing the EOPs. The licensee committed to revise EOP lesson plans and simulator training to emphasize the use of qualified instrumentation for EOP trigger setpoints, as documented in IFI 327, 328/87-61-08.

A review of the lesson plan for E-0, Reactor Trip or Safety Injection, revealed that it has been adequately revised to emphasize the use of Post Accident Monitoring (PAM) instrumentation. Procedure E-0 is an entry procedure for the EOP network, and thus is used when the emergency procedures are exercised. Additionally, during the conduct of simulator training exercises, it was noted that the operators made a concerted effort to use PAM instrumentation, and that instructors emphasized its use.

The inspectors' review of the licensee's resolutions indicated that the licensee adequately addressed the inspector concerns.

The inspectors noted that the licensee had not completed the actual training on the use of PAM instrumentation for operators involved in restart. The licensee committed to complete this training prior to Unit 2 restart (Mode 2), and this commitment will be tracked as a part of inspector followup item 327, 328/88-14-02.

- h. (Closed) Inspector Followup Item 327, 328/87-61-10, Revisions of EOPs to Reflect Head Vent Deficiencies.

This item involved two EOPs: FR-I.3, Response to Voids in Reactor Vessel; and FR-H.1, Response to Loss of Secondary Heat Sink. The head vent on the reactor vessel has been identified as having deficiencies that, while not being of the type that would render the system inoperable, would nonetheless behave in such a way as to mislead the operator in determining the functional status of the head vent.

The head vent system utilizes two Target Rock solenoid valves in series; one valve acts as a block valve and the other as a throttle valve. In addition, each of the valves has a bypass line and a second solenoid valve for redundant capability. As designed, the licensee would first open the block valve and then slowly open the second solenoid valve to throttle and control the head venting. The licensee has found that upon opening the block valve, the corresponding throttle valve opens to 60 percent and then recloses. The concern was that the operator may not be aware of this intermittent release when the block valve is opened and that the valve could stick 60 percent open, resulting in continuous venting.

In addition, the licensee was experiencing problems with instrumentation that rendered a positive indication of head vent position in the control room as required by item II.B.1 of NUREG 0737.

The inspectors reviewed FR-I.3, revision 2, dated January 18, 1988, to determine whether the licensee had addressed this deficiency in the head vent system. The following caution statement was placed prior to step 19: "When the reactor head vent block valve is opened, the throttle valve will cycle open and close. If the throttle valve does not close, then close both block valves." The following caution statement was placed prior to step 20: "The reactor head vent throttle valve position indication may not be accurate. The PRT level, press, and temp should be monitored to verify throttle valve position." The inspectors found these added caution statements to adequately address the head vent deficiencies with regard to FR-I.3.

The inspectors also reviewed FR-H.1, revision 2, dated January 12, 1988. The licensee had deleted reference to the head vent from step 15 which relates to the RCS bleed path. The bleed path is now designated as being through the pressurizer relief lines. The licensee conducted an evaluation that demonstrated that the required

amount of bleed could be achieved by this path and that the head vent line was not significant in its contribution to the bleed.

The inspectors agreed with these changes to the procedure in that they adequately addressed the concern of the head vent deficiency by removing it from the procedure altogether.

The licensee committed to provide training on FR-I.3 to all licensed operators involved in Unit 2 restart (Mode 2). This will be another part of inspector followup item 327, 328/88-14-02.

i. Other

The development of a lesson plan discussing the bases behind and the usage of the Foldout Page for the EOPs was recommended in the inspection report number 327, 328/87-61 dated February 1, 1988. The inspector observed that, due to the creation of specialized Foldout Pages for the ECAs, training on Foldout Page usage and understanding is even more desirable. The licensee indicated that they are currently in the process of developing such a lesson plan and will implement it during the 1988 requalification cycle.

## Appendix A

## Technical Review Comments

The following provides descriptions of concerns resulting from technical reviews of the licensee's newly implemented ECAs and their associated step deviation documents. Resolution of these items will be inspector followup item 327, 328/88-14-01.

1. SQNP ECA-1.1, Loss of Emergency Coolant Recirculation

Step 17d requires further guidance in informing the operators to bring the RCS to atmospheric conditions. The licensee indicated that they would add a phrase directing the operators to "cooldown to Cold Shutdown" to provide the necessary guidance.

2. SQNP ECA-1.2, LOCA Outside Containment

Step 3e should identify which RHR cross-tie valves are intended to be operated. The licensee indicated that the specific valves to be operated will be included in this step.

3. SQNP E-2, Faulted Steam Generator Isolation

The guidance to transition to ECA-2.1, Uncontrolled Depressurization of All Steam Generators, is contained within a caution instead of a procedural step. The writer's guide recommends that actions be written into procedural steps, instead of cautions and notes. It was also noted by several operators while reviewing the procedure, that placing this direction in a procedural step would better facilitate the necessary transition to ECA-1.2. The licensee indicated that they would include this procedural guidance in a step.

4. SQNP ECA-2.1, Uncontrolled Depressurization of All Steam Generators

Steps 17 and 18 of ECA-2.1 instructs the operator to reset Phase A and B, and restore instrument air to containment. The WOG version of this procedure has these actions taken immediately after SI is reset, which occurs much earlier in the procedure. The possibility exists that a Phase B signal will occur, requiring valves to be locally operated to restore instrument air. These steps would be more logically placed after the step where SI is reset, to give time for the auxiliary operators to complete the local actions. The licensee indicated that relocation of steps 17 and 18 to coincide with the WOG procedure would be done.

5. SQNP ECA-3.1, Steam Generator Tube Rupture With Loss of Reactor Coolant-Subcooled Recovery Required

- a. Steps 14b and c of ECA-3.1 do not provide the operators guidance on whether to use narrow or wide range steam generator (SG) level indication. The licensee indicated that they will clarify this step by adding "narrow range" to the S/G level indication required.
- b. Step 22c of ECA-3.1 does not provide adequate guidance to the operators on the parameters that are to be monitored while stopping the Emergency Core Cooling System (ECCS) pumps. These parameters are listed in a substep following the step where the pumps are secured. The licensee indicated they will reorder the appropriate steps so that the operators are made aware of parameters to monitor before securing an ECCS pump.
- c. Step 27 of ECA-3.1 does not provide adequate guidance to the operators in determining what constitutes proper operating conditions for the reactor coolant pumps. The licensee indicated that the procedure will be revised to instruct the operator to refer to SOI-68.2 for proper operating parameters.
- d. The foldout page for the ECA-3.1/3.2 series has the operator "Go To" E-2, Faulted S/G Isolation, if a SG has low pressure or if pressure is decreasing in an uncontrolled manner. E-2 does not have a procedural step that directs the operator to return to either of the ECA-3 series procedures. The licensee indicated that the wording "Go To" will be revised to "Refer To" on the appropriate foldout pages.
- e. Step 11b of ECA-3.1 instructs the operator to check if SG pressure is "Stable or Increasing". The Response Not Obtained (RNO) for this step has the operators isolate the affected SGs per E-2, if the pressure in a S/G is low or decreasing. This step combination can be confusing to the operators, particularly when S/G pressure is decreasing as a result of operator actions or as a result of normal system behavior due to injection of colder auxiliary feedwater. This step combination also exists in other procedures, such as E-1. The licensee indicated they will review all of EOPs, and revise the RNO for this generic step to indicate usage of E-2 for SG isolation is only required if the decrease in pressure is "Uncontrolled".

## Appendix B

## Resolution of Concerns Resulting From Technical Reviews of EOPs

The following provides brief descriptions of specific concerns resulting from technical reviews of the licensee's EOPs and associated step deviation documents, as well as the licensee's resolutions of those concerns. The inspectors determined that the licensee effectively resolved each concern identified below.

## 1. SQNP E-0 Reactor Trip or Safety Injection, Rev. 3

- a. Step 17 of E-0, revision 2 does not appear to be appropriate for inclusion in an emergency procedure. The licensee indicated that Step 17, which addresses local monitoring of the emergency raw cooling water traveling screen wash and strainer operation, is to be deleted.

The licensee removed the step requiring monitoring of the ERCW traveling screen wash and strainer operation from E-0, and incorporated the requirement in a more appropriate procedure (procedure E-1, Loss of Reactor or Secondary Coolant).

- b. Step 18 of E-0, revision 2 directs the operator to verify natural circulation. The word "verify" means "to observe that an expected characteristic or condition exists and, if necessary, to take actions to make the condition occur." An operator interviewed on natural circulation was not aware of the time frame required to establish natural circulation. Because establishing natural circulation would take some period of time, the inspectors recommended that the step be changed to indicate that the appropriate parameters be monitored and actions taken until natural circulation was confirmed. The licensee is considering moving the natural circulation verification methods to the foldout page, and revising training to clarify time frames expected for establishing natural circulation. This comment is applicable to all SQNP EOPs that require similar verification of natural circulation, including E-1 and ES-3.1.

Step 18 of the SQNP E-0 procedure, revision 2, was appropriately revised such that operators are instructed to monitor natural circulation. The inspectors also verified that other emergency procedures, such as ES-1.1, ES-0.3, E-1, ES-3.1 were also revised accordingly. The licensee has incorporated the natural circulation parameters on the E-series procedure foldout page to provide the operators with additional guidance.

- c. This item was closed during the previous EOP inspection.

## 2. SQNP ES-0.3 Natural Circulation Cooldown, Rev. 3

- a. The procedural guidance in the caution preceding step 15 of revision 1 to ES-0.3 is inadequate in the event of a rapid void formation in the reactor head.
- b. The licensee committed to resolve this item in the PGP submittal as discussed in Section 5 and 6.

Items a. and b. above are one item, and were incorrectly numbered as separate items. The inspectors confirmed that revision 3 of ES-0.3 adequately provides the operators with additional guidance in the event of a rapid void formation. The licensee's PGP submittal contained additional information relating to ES-0.3. This additional information was also determined to be adequate.

- c. The 50°F subcooling in step 15 of revision 1 to ES-0.3 should be core exit thermocouple readings. Since all subcooling readings are core exit thermocouple readings, the procedure should either state this in the beginning of the procedure or each time reference is made to subcooling.

In revision 3 of ES-0.3, step 15a was revised to indicate that subcooling is based on core exit thermocouples. In addition, other similar steps in the procedure were also revised accordingly.

- d. Step 22 of revision 1 of ES-0.3 contains temperature and pressure values for placing the residual heat removal (RHR) system in service. These values do not agree with the Precautions, Limitations and Setpoint (PLS) Manual.

The temperature and pressure values were compared to the EOP setpoint document and were determined to be correct. The licensee will review the PLS values.

- e. Step 24 of ES-0.3, revision 1 should contain the value of 200°F instead of 212°F.

The inspector verified that the correct value has been included in revision 3 to ES-0.3.

- f. Step 25 of ES-0.3, revision 1 should state "entire RCS < 200°F".

ES-0.3, revision 3 effectively indicates that the entire RCS should be less than 200 F.

## 3. SQNP E-1 Loss of Reactor or Secondary Coolant, Rev. 4

Procedure E-1, revision 2, substep 9a, RNO failed to instruct the operator to proceed to step 10. Exclusion of this additional instruction could result in the operator incorrectly progressing from Substep 9a, RNO to substep 9b. The licensee committed to revise the procedure such that the operator would correctly proceed to step 10.

The inspectors reviewed revision 4 of E-1, and verified that substep 9a correctly instructs the operator to proceed to the next step.

4. SQNP ES-1.1 Post LOCA Cooldown, Rev. 1

- a. This item was closed during the previous EOP inspection.
- b. ES-1.1, revision 0, step 10a, RNO does not provide the operator with adequate guidance for proceeding in the procedure if RCS subcooling is not satisfied. The licensee committed to determine the appropriate progression and revise the procedure accordingly.

Revision 1 of the procedure was reviewed by the inspectors. The licensee revised step 10a, RNO to provide the operator with specific directions for progressing through the procedure.

- c. This item was closed during the previous EOP inspection.
- d. Step 12, RNO of ES-1.1, revision 0, also introduces confusion regarding operator progression through the procedure. The item is related to the concern described in step 10a, RNO, and will be resolved with resolution of 10a.

The inspectors verified that the confusion was removed from this step in revision 1 of ES-1.1.

- e. This item was closed during the previous EOP inspection.

5. SQNP E-3 Steam Generator Tube Rupture, Rev. 3

- a. The first caution preceding step 3 in the WOG guideline was not incorporated in E-3, revision 2. The WOG caution states that if the turbine-driven auxiliary feedwater (AFW) pump is the only source of feed flow, steam supply to the pump must be maintained from at least one SG. The licensee's justification for not duplicating this caution is that the caution is incorporated in step 4, RNO of E-3. A review of this procedure indicated that the presentation of this caution within the procedural step was not clear, and subsequent operator action during an emergency could result in isolation of the steam supply, hence resulting in a loss of secondary heat sink. The licensee committed to either include more guidance within the step or restate the caution.

The inspectors verified that the licensee added a caution, consistent with the WOG guideline, prior to the applicable step in the E-3.

- b. Step 6 of E-3, revision 2, provides for depressurization of the RCS following identification and isolation of the ruptured SG. Once the requirement of step 6 has been satisfied (i.e., depressurization is begun), step 7 is entered. The inspectors' concern arises when, in step 7b, RCS pressure is checked for stable or increasing condition.

During simulator observations, the inspectors noted that the operators had difficulty in verifying RCS pressure as being stable or increasing while conducting a controlled depressurization. Conversations with licensee personnel indicated that since the ECAs are being implemented, this concern no longer poses a problem because the operators would be directed to ECA-3.1, Steam Generator Tube Rupture, Loss of Reactor Coolant, Subcooled Recovery Desired, when necessary.

The inspectors verified that revision 3 of E-3 was appropriately revised to direct the operator to ECA-3.1.

6. SQNP ES-3.1 Safety Injection Termination Following Steam Generator Tube Rupture, Rev. 1

Step 13c, RNO of ES-3.1, revision 0 does not contain a note concerning minimizing cycling of the power operated relief valve (PORV) as contained in the WOG guideline. The licensee committed to reinstate this note within the procedure to be consistent with other steps regarding the same condition.

ES-3.1 was appropriately revised to include the note to minimize cycling of the PORVs.

7. SQNP ECA-0.0 Loss of All AC Power, Rev. 2

Revision 1 of ECA-0.0, step 16, RNO gives the operator the option of either allowing the accumulators to inject or stopping the reactor coolant system (RCS) cooldown. The WOG guideline only allows for stopping the RCS cooldown. The Step Deviation Document does not provide sufficient justification for this deviation, and therefore should be revised.

ECA-0.0, revision 2, deleted the reference to the accumulator injection, and allowed for the RCS heatup consistent with the WOG guidelines.

8. SQNP FR-H.1 Response to Loss of Secondary Heat Sink, Rev. 2

- a. Step 5, RNO of the SQNP procedure does not provide adequate guidance with respect to the time frame secondary systems are unavailable before considering tripping the reactor coolant pumps.

Step 5 was revised. The step was separated into two steps, and information specifying the amount of time secondary systems are unavailable before considering tripping the pumps, is provided.

- b. Step 10 of FR-H.1, revision 1, is not structured to prevent continuation of the procedure into the bleed and feed actions before it is warranted.

FR-H.1 was revised to prevent continuation into the feed and bleed actions before it is warranted, by instructing the operators not to proceed until all SG levels are less than 25%.

- c. Substeps 13a and 13b of revision 1 to FR-H.1 are reversed from the order in which they occur in the corresponding WOG guideline. No step deviation documentation exists to support this change.

The procedure was revised to change the order of these steps such that they are consistent with the WOG guidelines. Specifically, feed and bleed is initiated, the RCPs are stopped, the block valves are opened, and then the PORVs are opened.

- d. Step 17 of the WOG guideline has been incorporated into step 12, RNO of FR-H.1, revision 1. This should also be included as either a step or a caution following step 13 of the SQNP procedure to meet the intent of the WOG guidelines.

The procedure was revised to include step 17 from the WOG guideline in the appropriate step of the SQNP procedure.

- e. Step 15a of revision 1 to FR-H.1 should clearly delineate the required parameters for bleed and feed termination.

The required parameters for feed and bleed were incorporated into FR-H.1, revision 2.

- f. Step 15e of FR-H.1, revision 1 should be clarified to indicate the order in which the components are operated.

The licensee clarified the procedure to indicate the order in which the components would be operated.

- g. Guidance in substep 15f of revision 1 to FR-H.1 should be presented prior to substep 15e.

FR-H.1 was revised to present the guidance in the correct location in the procedure.

9. SQNP FR-S.1 Response to Nuclear Power Generation/ATWS, Rev. 2

- a. In the SQNP FR-S.1 procedure, revision 1, the licensee elected not to trip the turbine within 30 seconds, as recommended in the WOG, but to delay the turbine trip until step 4, after normal and emergency boration. The licensee's justification provided for not tripping the turbine within 30 seconds of an ATWS included a TVA computer analysis for a postulated loss of feedwater/ATWS event. According to the licensee's analysis, the RCS ASME service level C pressure limit would not be exceeded. The Step Deviation Document also indicated that it would be difficult to train the operators to trip the turbine within the recommended 30 seconds.

In response to an NRC draft SER request for further information on this deviation, the licensee indicated on January 13, 1986, plans to implement an ATWS mitigation system circuitry (AMSAC). The AMSAC system includes a logic to actuate a turbine trip and auxiliary feedwater pump start upon sensing low-low steam generator water level. As indicated in a letter to the NRC dated October 11, 1985, the AMSAC system was scheduled for implementation for Unit 2 by the end of the cycle 3 refueling outage and for unit 1 by the end of cycle 4 refueling outage. In a letter dated October 31, 1986, the licensee revised the schedule for unit 2 to the end of the cycle 4 refueling outage.

The ATWS concern will be addressed in the safety evaluation report of the licensee's PGP.

- b. Step 4 of the WOG guideline recommends that if pressurizer pressure is in excess of the PORV setpoint, the operator should verify that the PORV opened, or manually open the PORV and decrease pressure 200 psi below the setpoint before closing it. The WOG indicates that the operator must verify closure of the PORV, utilizing the block valves if necessary. In revision 1 of FR-S.1, the licensee does not address the pressure at which the PORV should be reclosed or verified closed.

The licensee revised FR-S.1 to include the pressure at which the PORV should be verified closed.

- c. The WOG guideline recommends in step 6 that auxiliary feedwater (AFW) flow be verified to be adequate in gallons per minute. The bases for this flow verification is to ensure the maintenance of a secondary heat sink and adequate heat removal. The licensee does not incorporate a plant specific AFW flow value in revision 1 to FR-S.1, but substitutes verification of SG water level greater than 25 percent. The justification of this deviation indicates that the SQNP has included an automatic AFW level control system which is different from the WOG reference plant. The concern with the SG level verification versus AFW flow indication is that AFW flow may be inadequate to maintain the SG level initially observed under these ATWS conditions. The licensee committed to revise step 7 of FR-S.1 to require the operator to monitor SG water level versus checking one time.

The licensee revised the procedure by requiring that the operators monitor the SG levels.

- d. Step 10 of the WOG requires the operator to identify a faulted SG and step 11 provides the direction for isolation the faulted SG. Step 12 then requires the operator to verify subcriticality and the RNO requires the operator to continue to borate. If boration cannot be performed, the RNO requires the operator to allow the RCS to heat up. The basis for allowing the heatup is to allow the moderator

temperature coefficient and the doppler effect to add negative reactivity and reduce nuclear power. The licensee's FR-C.1 procedure does not cover the isolation of a faulted SG but directs the operator to go to E-2, Faulted Steam Generator Isolation. The concern is that the operator is directed to E-2 in step 8 prior to reaching step 9 which directs the operators to verify subcriticality. Since E-2 does not redirect the operator back to FR-S.1 following faulted SG isolation, a verification of the effectiveness of boration and subcriticality is not performed. The licensee committed to replace the direction "go to" E-2 with "refer to." This would require E-2 to be performed concurrently with FR-S.1 and ensure a verification of subcriticality and continued boration if required.

The procedure was appropriately revised to refer the operator to E-2.

10. SQNP FR-P.1 Response to Pressurized Thermal Shock, Rev. 2

- a. Step 3 of revision 0 to FR-P.1 instructs the operator to minimize RCS cooldown by controlling RHR if in service. The corresponding WOG guideline states if RHR is in service, then stop any cooldown for RHR. The difference in philosophy could be misleading to operations personnel. The licensee has committed to revise the step

Procedure FR-P.1 was revised to be consistent with the WOG philosophy for this step.

- b. Step 8 of the WOG guideline requires that instrument air be established to containment following reset of phase A and phase B containment isolations. The licensee has omitted, in revision 0 to their procedure, the action to establish instrument air to containment. The step should be present in the procedure in that instrument air does isolate on phase B, and failure to reestablish instrument air could impede the operation of safety grade equipment. The licensee has committed to reinstate the requirement to establish instrument air.

The procedure was revised to require operators to ensure that containment air supply is in service.

- c. Step 14 of revision 0 to FR-P.1, which established normal charging flow, is not consistent with the same step in other procedures. The portion of the step missing deals with seal water injection flow and maintaining pressurizer level constant. These items should be included in the step for consistency. The licensee has committed to revise the steps to be consistent.

This step was revised to include establishing seal water injection flow and stable pressurizer level, consistent with other SQNP procedures.

## Appendix C

Resolution of Concerns Resulting From  
Human Factors/Writers' Guide Review

The following are inspector comments of resolutions of inspector concerns resulting from human factor reviews of the SQNP EOPs. The inspectors determined that the licensee adequately resolved each concern identified below.

## 1. SQNP E-1 Loss of Reactor or Secondary Coolant, Rev. 4

The writers' guide states that "High-level steps are those steps that tell the user "what" to do. Substeps of the high level step may be used to tell the user "how" to accomplish the high-level step. Contrary to the above, high-level step 14 of E-1, revision 2, instructs the operator to terminate SI whereas the substep instructs the operator to balance ECCS injection with the break flow. This inconsistency could prove confusing to the operator. The licensee agreed to revise step 14 to assure consistency between the high level step and the associated substeps.

This step was revised such that the high level step is consistent with the substep.

## 2. SQNP ECA-0.0 Loss of All AC Power, Rev. 2

- a. The action for step 2 of revision 1 to E-1 is to check that RCS has isolated. Substeps b and c of this step are to verify this action. These actions are contradictory by the definition presented in the writer's guide.

Step 2 was revised, correctly using the term verifying and introducing consistency between the high level step and its associated substeps.

- b. The action for Step 8 of E-1 is to check SG status while substep 8a has the operator perform manipulation of controls. To perform manipulation of controls is not in accordance with the writers' guide definition of "check".

Step 8 was revised to correctly use the term verify consistent with the writer's guide definition.

- c. Step 19 of revision 1 instructs the operator to check containment hydrogen control equipment, but the substeps instruct the operator to manipulate controls. This is an example of the improper usage of terms defined in the writer's guide.

Step 19 was revised to remove the inconsistency between the high level step and its associated substeps.

## 3. SQP FR-H.1 Response to Loss of Secondary Heat Sink, Rev. 2

- a. Step 13, RNO, of revision 1 of FR-H.1 does not conform to the writers' guide in that the action is not labelled consistent with its associated substep.

This step was revised such that the RNO column is consistent in addressing the high level step.

- b. Steps 15e and 15f should be separated into their own high level steps for procedure FR-H.1, revision 1.

Steps 15e and f were separated into their own high level steps.

## 4. SQNP FR-P.1 Response to Pressurized Thermal Shock, Rev. 2

Step 5, RNO of FR-P.1, revision 0, requires that if no RCP is running then attempt to start one RCP and reference SOI-68-2 if necessary. The word reference is not consistent with the writers' guide which states that when transiting to another procedure for guidance or direction, and remaining within the procedure in effect, that the words "refer to" shall be used. The licensee committed to change "reference" to "refer to." Additionally, the wording "if necessary" implies there is no requirement for the operator to use the procedure. System Operating Instruction (SOI) 68-2, revision 2, Reactor Coolant Pumps, is a category A procedure. According to Administrative Instruction (AI-4) revision 64 Preparation, Review, Approval, and Use of Site Procedures/Instructions, all category "A" procedures shall be present during task performance. Therefore, the words "if necessary" are not appropriate and the licensee committed to remove them from the procedure.

Step 5 was revised by removing the word "reference" and incorporating "per", consistent with the writers' guide. The phrase "if necessary" was deleted.

## 5. SQNP E-FOP Foldout Page, Rev. 1

The SQNP foldout page, revision 0, provides criteria for safety injection (SI) reinitiation. This foldout page is applicable to all SQNP emergency procedures. The WOG guidelines recommend criteria for both SI reinitiation and actuation. The criteria are identical for the two, but the operator actions are different. Actuation requires actuating the SI signal and reinitiation requires manipulation of SI equipment as necessary. The WOG guidelines specify different actions for different procedures. The licensee committed to define actuation and reinitiation in the writer's guide.

The term "SI Reinitiation/SI Actuation" was defined in the writers' guide, and is consistent in the procedure.

## Appendix D

Resolutions of Concerns Resulting From  
Verification/Validation Review of EOPs

Specific resolutions of the inspector comments resulting from the control room walkdowns and the review of the verification and validation programs are provided below. The inspectors determined that the licensee adequately resolved each concern identified below.

## 1. SQNP E-0 Reactor Trip or Safety Injection, Rev. 3

- a. Step 7 of revision 2 to E-0 directs the operator to verify main feedwater (MFW) isolation. A comment, designated as Step 7 of E-0 in the validation program, states that no position indication is available in the control room on the AFW bypass valves. The licensee's resolution indicated that the comment was true but implementation of the step, which listed all valves which receive MFW isolation, was included in training. The comment was therefore not included. The inspectors interviewed an operator who stated that an Auxiliary Unit Operator would be dispatched to verify position of the MFW bypass valves. After discussion of the procedure step, the licensee agreed to revise E-0 to provide the method of verification of the status of the MFW bypass valves.

The licensee revised Step 7 by adding the method of verification of the status of the MFW bypass valves. Specifically, this step was revised to require local verification that the MFW bypass valves are closed if MFW flow is indicated.

- b. Step 4 of revision 2 to E-0 directs the operator to "Check if SI Actuated." If the response is not obtained, the operator is to "Check if SI is required . . ." The operator interviewed indicated that he would check the "SI Actuated" annunciator and the reactor trip first out annunciators to determine if SI is required. The inspectors commented that it is more appropriate to check instrumentation for the specific parameters that cause SI actuation, for example, RCS pressure low, rather than rely on annunciator windows. The licensee agreed to provide training to assure that operators check the appropriate instrumentation.

This step was revised to provide specific parameters to be checked if SI is required, such as low pressurizer pressure.

- c. During control room walkdowns, the inspectors noted that instrumentation used to verify containment pressure in Step 12 had different scales among the four indicators. The licensee stated that this discrepancy had been identified during the control room design review (CRDR) and was to be corrected under that program.

The inspectors verified that the containment pressure indicator scale differences were identified by a CRDR human engineering discrepancy sheet (number 5143).

2. SQNP ES-0.2 Safety Injection Termination, Rev. 1

Step 9e of revision 2 to ES-0.2 directs the operator to "Open seal water return FCV-62-61 and -63." During control board walkdowns, the inspectors noted that valves FCV-62-9A and -22A are labeled seal water return valves. The licensee indicated that the appropriate label for FCV-62-61 and -63 would be include in the procedure, or that procedure step would be reworded.

Step 9 of the procedure was reworded to remove the confusion regarding the label of FCV-62-61 and 63.