

PER

* 02-986 Lev B program probs

* 00-8209 50.59

00-8655 prot. w/ fire pb

00-11570 oily substance from cable in fire det. panel

* 01-589 components not in Fire Safe Shutdown Calk

01-911 App R and w guidance differ on RCP seal cooling.

* 01-2588 Probs w/ MCR abandonment procedure and indication

01-6631 both fire pb insp.

01-7169 emerg lts in 110°F
- 10231

→ 02-550 spurious ops / manual actions ^{Various FAs in aux Bldg}

→ { 01-9670 SG ARVs and manual actions FAA-31, 39
Use non-credited Loops 2 & 3 because credited loops 1 & 4 do not meet III.G.2

III.G.2 deficiencies → 02-575 Level D Programmatic prob. FAA-080

→ 02-576 FHA problem FAA-29 Unit 2

* 02-822 manual action

00-7928

01-6963

BBB-11
ALL

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SELF ASSESSMENT REPORT

Assessment Number: SQN-OPS-00-001

Dates of Assessment: 12/6/1999 to 12/17/1999.

Topic of Assessment: Fire Protection - Fire Safe Shutdown Operator Actions.

Lead Assessor: Dan C. Johnson (SQN) **Other Assessors:** James Young (WBN), David Porter (SQN), Roy Ramsey (SQN), Brenda Simril (SQN), Calvin Burrell (SQN), I. M. Heatherly (CORP).

OBJECTIVES AND SCOPE

The purpose of this assessment is to evaluate the Fire Protection Program as it relates to Appendix R/Fire Safe Shutdown operator actions. The evaluation will be based on the existing program documents, procedures, and licensing requirements, and will utilize the draft NEI 99-05, "*NEI Guidance for Fire Protection Self-Assessments*" as a guide. The self-assessment outline is included as Attachment A.

The assessment tasks and objectives were:

1. Review the Fire Protection Report and Licensing Basis requirements to determine the overall compliance in the area(s) of procedures for manual operator actions for post fire safe shutdown.
2. Examine a sample of plant areas and the adequacy of the post fire safe shutdown manual operator actions specified for those areas.
3. Review the effectiveness and interface of the Design Control program with the Fire Protection program by reviewing a sample of DCN's to ensure impacts on the Fire Protection Program, as it relates to manual operator actions, have been appropriately identified and addressed.

The criteria for this assessment was as follows:

1. The design basis documentation, including the Fire Protection Report and the Fire Hazards Analysis, should clearly document the design basis for the manual operator actions necessary to achieve fire safe shutdown in the event a fire.
2. The plant manual action procedure should be consistent with design basis calculation(s), Fire Hazards Analysis, and the Fire Protection Report.
3. The Fire Safe Shutdown Procedure should be clear and consistent, including restrictions and limitations.

The assessment was a multi-organizational review of the manual operator action portion of the Fire Protection Program. The review was performed by personnel technically qualified for the areas being reviewed.

SUMMARY

The self assessment review concluded that the manual operator action portion of the SQN Fire Protection Program could achieve safe shutdown conditions of both units in the event of a worst-case fire (Appendix

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R fire) in any of the plant safety related areas. Based on this, the program meets the basic regulatory and TVAN requirements. Two (2) conditions adverse to quality were identified and PER's were written to address the issues.

The assessment also concluded that the procedures and documentation describing the methodology and actions for achieving safe shutdown conditions in the event of an "Appendix R fire" do not meet current TVAN expectations and industry standards as outlined in applicable sections of the draft NEI 99-05, *"NEI Guidance for Fire Protection Self-Assessments"*. This conclusion is based on the results of a sample review of plant procedures, design calculations, and design output associated with several areas. Twenty (20) areas for improvement were identified.

STRENGTHS

No strengths were identified.

FINDINGS

1. 0-GO-8 Sect. 5.0 Step 6 directs isolating non-essential air to containment as a contingency action for isolating normal and excess letdown to control RCS inventory. However, the valves referenced in this step (1-FCV-32-110, 2-FCV-32-111, 0-32-718, -724, -725, and -731) are not listed in calculation SQN-SQS4-0127 nor in Fire Protection Report Table III-2, which specify equipment required for fire safe shutdown. Also, it appears that that routing of the cables for 1-FCV-32-110 and 2-FCV-32-111 may need to be analyzed for potential interactions, since non-essential air to containment is required for normal and excess letdown capability. PER 00-000072-000 written.
2. Steps in 0-GO-8 Appendix F for 480V Transformer Rooms 2A and 2B appear to be swapped. PER 99-011809-000 written.

AREAS FOR IMPROVEMENT

1. It appears that, in some cases, there is a lack of correlation between the actions specified in 0-GO-8 and the mitigative strategies specified in the FHA. A comprehensive review should be performed of 0-GO-8 and the Fire Hazards Analysis to identify, evaluate, and resolve the inconsistencies between the two.

PER 99-0011809 will track completion of this AFI.

2. 0-GO-8 does not clearly direct removing power from MOVs to prevent spurious actuations. Section 3.0 precaution E addresses removing power prior to local operation and Section 5.0 (note prior to step 2) suggests that power should be removed to prevent spurious operation, but the procedure does not clearly specify which valves should have power removed and relies on the operator to determine the appropriate breaker. For example, App. M Key 4 states that FCV-62-135/136 must be prevented from spurious closure; Appendix C Step A1-1 lists the valves as having potential interactions but does not clearly address removing power.

PER 99-0011809 will track completion of this AFI.

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3. 0-GO-8 does not address all potential interactions identified in the FHA for each fire area. Except for failed components which require specific manual actions to satisfy Appendix R, the procedure relies on operators monitoring control boards to recognize all failed/unreliable indications. Additional equipment impacts identified in the engineering documents should be included in 0-GO-8 as an enhancement.

PER 99-0011809 will track completion of this AFI.

4. Revise 0-GO-8 to resolve the following identified issues: (This AFI is loaded in TROI as SQN-OPS-00-001 seq. Number 4)

Responsible Organization: Operations Due Date: 05/12/2000. Coordinated with J. Dvorak.

- 0-GO-8 does not address the need for SCBAs and does not address the likelihood of reduced visibility when dispatching AUOs to perform manual actions during a fire in the Auxiliary Building.
 - 0-GO-8 Section 3.0 Precaution H requires closure of FCV-63-1 to prevent loss of RWST inventory if a containment sump isolation valve (FCV-63-72 or 73) spuriously opens. It appears that closure of FCV-74-3 or 21 would be more appropriate in this scenario since these valves are normally energized and only impact one ECCS train. The RHR pump on the affected train should be placed in PULL TO LOCK prior to isolating the pump suction.
 - 0-GO-8 Appendices M and N contain manual actions which are not referenced in the body of the procedure nor in the individual appendices used for various fire areas. These appendices contain primarily background information which may not be referred to in a timely manner during a fire event.
 - 0-GO-8 App. C step A1-4 says that cables for MDAFW pumps and TDAFW pump interact and directs referring to 1,2-SO-3-2 for local manual control. This step does not provide sufficient information on what the potential failures are and what specific actions are required.
 - 0-GO-8 App. C step A1-7 directs closing 2-FCV-63-72 & 73 if they spuriously open. Manual closure of these valves will require Maintenance unbolting the valve vault cover (a time-consuming task) and entry into a confined space. A step should be added directing removal of power from the valves prior to their spurious opening. Once power is removed with the valves in the closed position, unbolting the valve vault door should be unnecessary.
 - 0-GO-8 Sect. 5.0 step [6] should be a sub-step of step [5] since, logically, the operator will not know whether the letdown valves have failed to close unless letdown isolation is required. Similarly, step [11] should be a sub-step of step [10].
 - Once an Appendix R fire is declared and 0-GO-8 is entered, it is recommended that a direct approach be used to direct the operators immediately to specific actions for the area involved and potentially preclude greater problems which may result from delay. Potentially some actions may be prudent before fire damage forces local manual effort. Verification of some valve positions and removal of power could be an example. Containment sump valves alignment or guaranteeing CCP suction are particular areas of concern for some areas.
5. AOP-N-01 should contain more specific guidance regarding determination of Appendix R fire and/or whether or not safe operations of the units can be maintained (i.e. FSSD equipment potential involvement by plant area). Additionally, FSSD actions should be considered a priority. Once a fire grows to Appendix R proportions, the priority for Operators is FSSD. AOP-N.01 should be revised for the Unit SRO(s) or the SM to recall Operators that have responded to the fire fighting or to other

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stations in support of the fire alarm (e.g. the AUO at the fire pump house). (This AFI is loaded in TROI as SQN-OPS-00-001 seq. Number 5)

Responsible Organization: Operations **Due Date:** 06/30/2000. Coordinated with J. Dvorak.

6. Operator training on 0-GO-8 should be evaluated for needed improvement and presented to the Operations Curriculum Review Committee. Specifically, previous training on this procedure appears to have been limited to classroom discussions. Since simulator scenarios have not been developed for major fires in safety-related areas, operators have not been adequately evaluated on their ability to carry out this procedure, including concurrent performance with EOPs (if the fire has caused a reactor trip or safety injection). Also, the lack of simulator scenarios has contributed to the deficiencies in 0-GO-8 due to the inability to validate the procedure through usage on the simulator. Additionally, training on 0-GO-8 has not emphasized considerations associated with entering a smoke-filled environment to perform manual actions during an Auxiliary Building fire (such as planning entry/exit routes, rotation of personnel with fresh SCBA bottles). (This AFI is loaded in TROI as SQN-OPS-00-001 seq. number 6 and 8)

Responsible Organization: Operations Superintendent **Due Date:** 05/12/2000 Coordinated with K. Wilkes

Responsible Organization: Operations Support **Due Date:** 05/12/2000 Coordinated with O. D. Hayes

7. Calculation SQN-SQS4-0127 Key 1 (p.A2) incorrectly states that CCS is required for Centrifugal Charging Pump cooling. This statement should say that ERCW is required for cooling. The need for ERCW cooling is identified correctly in the calculation on page A4 (This AFI is loaded in TROI as SQN-OPS-00-001 seq. Number 7)

Responsible Organization: Engineering **Due Date:** 08/25/2000. Coordinated with W.M. Justice

8. 0-GO-8 Appendix M incorrectly states that CCS is required for Centrifugal Charging Pump cooling. This statement should say that ERCW is required for cooling. (This AFI is loaded in TROI as SQN-OPS-00-001 seq. Number 9)

Responsible Organization: Operations **Due Date:** 12/22/2000. Coordinated with J. Dvorak.

9. 0-GO-8 Appendix M and calculation SQN-SQA4-0127 Key 28 (RCS pressure control) do not address the potential for a spurious SI signal. An evaluation is needed to determine whether the impact of a spurious SI signal on the RCS pressure control strategies has been adequately considered. (This AFI is loaded in TROI as SQN-OPS-00-001 seq. Number 10)

Responsible Organization: Engineering **Due Date:** 08/25/2000. Coordinated with W.M. Justice

10. Operations should evaluate whether 0-GO-8 should be converted to an abnormal operating procedure. Since this procedure is used to mitigate an abnormal plant condition which could degrade into an emergency condition, it appears to meet the definition of an abnormal operating procedure (see FSAR 13.5.1.2.2). Also, reclassification as an AOP would ensure that this procedure is subject to the verification, validation, and training requirements consistent with other procedures used to mitigate abnormal plant conditions. (This AFI is loaded in TROI as SQN-OPS-00-001 seq. Number 11)

Responsible Organization: Operations **Due Date:** 05/12/2000. Coordinated with J. Dvorak

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11. 0-GO-8 contains steps to install temporary ventilation in the 2B 480 V Transformer Room to prevent over heating of the room due to cable damage to the installed ventilation system for fires in the 2A 480 V Transformer Room and the Unit 2 Reactor Building Annulus. The FHA for the 2A 480 V Transformer Room and the Unit 2 Reactor Building Annulus does not identify the potential for cable damage to the ventilation system for the 2B 480 V Transformer Room and the need to install temporary ventilation. This represents a lack of correlation between 0-GO-8 and the FHA. (This AFI is loaded in TROI as SQN-OPS-00-001 seq. Number 12)

Responsible Organization: Engineering **Due Date:** 08/25/2000. Coordinated with W.M. Justice

12. Appendix O of 0-GO-8 provides the instructions to install temporary ventilation in the 480 V Transformer Rooms. Installation of this temporary ventilation system is a "repair procedure" as opposed to a "manual operator action" and would more appropriately be contained in the Appendix R Casualty Procedure, SMI-0-317-18. Revise SMI-0-317-18 to include the instructions in Appendix O of 0-GO-8. (This AFI is loaded in TROI as SQN-OPS-00-001 seq. Number 21)

Responsible Organization: Maintenance **Due Date:** 09/28/2000. Coordinated with S. Glickman

13. Revise 0-GO-8 to delete Appendix O, which provides instructions to install a temporary ventilation system in the 480 V Transformer Rooms. Installation of this temporary ventilation system is a "repair procedure" as opposed to a "manual operator action" and would more appropriately be contained in the Appendix R Casualty Procedure, SMI-0-317-18. (This AFI is loaded in TROI as SQN-OPS-00-001 seq. Number 13)

Responsible Organization: Operations **Due Date:** 12/22/2000. Coordinated with J. Dvorak.

14. A number of fires in the Auxiliary Building (i.e., large general areas) could result in required operator actions in a smoke filled environment. Battery pack lights have been installed for operator actions and the access/egress paths for these actions, however these light units may not provide adequate visibility in a smoke environment. Portable hand held lights/lanterns designed to penetrate smoke should be provided to assist the operators in performance of manual actions in smoke environments. (This AFI is loaded in TROI as SQN-OPS-00-001 seq. Number 14)

Responsible Organization: Fire Operations **Due Date:** 05/12/2000. Coordinated with D. Johnson

15. During review of manual operator actions specified for a fire in the general area on elevation 690 of the Auxiliary Building (Room 690-A1), the necessity for manual actions specified in 0-GO-8 to switch the CCP suction from the VCT to the RWST were questioned. The bases for this question was DCN M1893A, which provided interlocks to prevent the VCT suction to the CCP from isolating prior to the supply from the RWST to the CCP from opening. The circuits for this interlock function are protected with THERMOLAG except in the VCT Rooms. A fire in the VCT Room could cause an isolation of the VCT concurrently with a failure of the interlock to open the RWST valves, which would destroy an operating charging pump. Manual actions to open the RWST valves and start the remaining charging pump are available. 0-GO-8 and the FHA identify the need to realign the CCP suction to the RWST but do not address the potential interaction (loss of suction to the CCP and potential to destroy an operating CCP) and the need to start the remaining available CCP after realigning suction. Based on a review of the SQN-SQS4-0127, Appendix B, the FHA, and 0-GO-8, there appears to be areas of clarification needed in one or more of these documents. While no conflicts were identified between the reviewed documents, for long-term programmatic health of the program, a more detailed review of this area should be performed. (This AFI is loaded in TROI as SQN-OPS-00-001 seq. Number 15)

Responsible Organization: Engineering **Due Date:** 08/25/2000. Coordinated with W.M. Justice

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16. Revise 0-GO-8 to incorporate improvements identified by "Area For Improvement" number 15 above. (This AFI is loaded in TROI as SQN-OPS-00-001 seq. Number 16)

Responsible Organization: Operations **Due Date:** 12/22/2000. Coordinated with J. Dvorak.

17. Calculation SQN-SQS4-0127, Page B3, Key 5 path 1 => The second reference to LCV-62-135, -136 does not appear to be grouped appropriately. Review of a previous version of the calculation does not group the actions the same way. The calculation should be revised to correct this item. (This AFI is loaded in TROI as SQN-OPS-00-001 seq. Number 17)

Responsible Organization: Engineering **Due Date:** 08/25/2000. Coordinated with W.M. Justice

18. Calculation SQN-SQS4-0127 is currently treated as design output. The FHA, which also is considered design output, contains the credited manual operator actions, included in the calculation and is more appropriate as the source of design output for the manual operator actions. In light of the fact that the Fire Hazards Analysis (FHA) contains "Compliance Strategies" for the various fire areas and is also classified as design output, calculation SQN-SQS4-0127 should be treated as an input to the FHA and removed from the listing of approved design output calculations. (This AFI is loaded in TROI as SQN-OPS-00-001 seq. Number 18)

Responsible Organization: Engineering **Due Date:** 08/25/2000. Coordinated with W.M. Justice

19. 0-GO-8 should be reviewed to identify the minimum staffing level required to support the worst case Appendix R fire. (This AFI is loaded in TROI as SQN-OPS-00-001 seq. Number 19)

Responsible Organization: Operations **Due Date:** 12/22/2000. Coordinated with J. Dvorak.

20. Revise the Fire Protection Report to capture the minimum operator staffing level to support the worst case Appendix R fire. (This AFI is loaded in TROI as SQN-OPS-00-001 seq. Number 20)

Responsible Organization: Engineering **Due Date:** 01/26/2001. Coordinated with W.M. Justice

AREAS FOUND ACCEPTABLE

1. Although battery pack emergency lighting have been installed in areas containing manual operator actions and the access/egress paths thereto, it is recognized that poor visibility may present additional challenges to operators in the performance of these actions. Battery powered hand held lanterns are available to assist operators with manual actions in the plant in addition to the battery powered emergency lights. These lanterns are maintained and inventoried by the Operations Department in procedure 0-PI-OPS-000-708.0, 10CFR50 Appendix R Compliance Verification.
2. A thorough review of manual operator actions specified in 0-GO-8 for a fire occurring in the Auxiliary Building, elevation 690 general area (room 690-A1) was performed to determine adequacy of the procedure and the specified actions. This review also determined the number of operators that would be required to successfully complete the specified actions. This review concluded that the specified actions were acceptable and that adequate staffing (4 AUO's) was available to complete the specified actions.
3. An evaluation was performed to determine if correct decisions are being made in determining if components should be incorporated or deleted from the Appendix R shutdown logic calculation SQN-SQS4-0127 as plant modifications occur. The evaluation utilized an approved random sampling

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process described in SPP-4.2 and the sample size selected provides a 98.5% accuracy. Of the DCN's and plant components evaluated there were no identified errors in determining if components should be incorporated or deleted from the Appendix R shutdown logic calculation. It can be concluded that modifications to the plant are being appropriately reviewed for impact on the Appendix R Fire Safe Shutdown program.

KEY PERSONNEL CONTACTED

See "Survey of Licensed Operators on App. R Requirements" in Attachment C to this report.

REVIEW AND APPROVAL

Original signed by Dan C. Johnson 01/14/2000
Lead Assessor Date

Original signed by H. H. Butterworth 01/14/2000
Department Manager Date

Distribution: L. D. Clift, PSB 3A - SQN
Masoud Bajestani, OPS 4A - SQN

03/01/02

Workorder: 01-000589-000

Status: CD

Entry Date: 01/29/2001 09:49

Planner/Supv: WALTER JUSTICE

Requested By: BRENDA F. SIMRIL 843-8515

***** SUPERVISOR *****

PER Level Rev Level 00

Identified By LINE ORGANIZATION

Self Revealing N

Problem Description Fire Interaction Manual, 0-GO-8, has a generic step in

Section 5.0 to isolate non-essential air to containment

in the event that letdown isolation valves fail open.

The step directs operators to close one of the

following valves: 1-FCV-32-110, 2-FCV-32-111,

0-32-718, -724, -725, or -731. PER 00-000072-000 was

written during Fire Ops Self-Assessment, SA-OPS-00-01,

to document that the above valves were not listed as

Appendix R valves in the Fire Safe Shutdown (FSSD)

Calculation, SQN-SQS4-0127, or the Fire Hazards

Analysis Calculation, SQN-26-D054/EPM-ABB-IMPFA.

The original PER was closed based on the determination that if letdown must be isolated following a fire, closure of either FCV-62-69, FCV-62-70, or all three of the letdown orifice isolation valves (FCV-62-72, -73, -74) would accomplish this function (Ref. Key 7 of SQN-SQS4-127). All five of the System 62 valves are air-operated and can be isolated by closing the subject System 32 valves. The primary means for operating the System 62 valves is via the electrical controls to the valves. The valves are designed to fail closed upon loss of electrical current or control air to the solenoids. Based on this design feature, it was previously determined that isolation of non-essential air to containment was provided as an alternate means for isolating the CVCS letdown line, and was not a required Appendix R strategy. However, upon further review of the FHA calculation, cases have been discovered where isolation of control air has been credited for Appendix R compliance (e.g., FAA-081 and -84 in FHA calc credit control air isolation to justify the fire rated barrier between the two fire areas, and Key 7 of FSSD calc notes that isolation of control air

to containment can be utilized to fail close the
letdown valves for RCS pressure boundary isolation).

Plt Process Equip Y

Potential Oper Issue Y

Potential Reportable N

Potential Degrad/Noncon(91-18)

ASME N

Systems Affected N/A

Systems Affected

Systems Affected

Systems Affected

Units Affected 1&2

Recommendation Process PER

No action, Justify

If Process,PER Level C

If Utilize ACP, No

Immed Action Taken One of the above listed System 32 valves per unit is

required to be closed in order to isolate Control Air.
It appears that FCV-32-110 and -111 cannot be used for
App. R compliance since the associated cabling has not
been analyzed for potential interactions. The 32-718
and -731 valves are located high off of the floor and
are not easily accessible. The 32-724 valves and -725
valves are located in the Unit 1 El. 690 pipe chase and
are equipped with pull chains to allow timely operator
actions. However, emergency lighting is not currently
provided in the area, which is required by the Fire
Protection Report (FPR) for operator actions required
within 8 hours of an Appendix R event. As an
compensatory action until Appendix R emergency lighting
can be installed, an alternate lighting means must be
provided. Hand held lighting units, which are
described as an acceptable backup to 8-hr battery packs
in Part II, Section 14.7 and Part V, Section 2.0 of the
FPR, are available. Procedure O-PI-OPS-000-708.0
maintains operability of portable lanterns credited as
the alternate lighting compensatory measures, which
will ensure their availability. This has been
coordinated with Dave Porter, Operations representative
on the Appendix R team. A standing order will be
issued by Operations which will document the
compensatory action for this condition as well as other
emergency lighting deficiencies. Based on the

availability of backup lighting, it is determined that
this PER does not constitute a plant operability issue.

Recommended Resp Org ENG/MECH

Coordinated With wmjustice

Init Sup-First Last wmjustice

Init Sup Phone 8340

Init Department ENG/MECH

Init Sup Review Date 01/30/2001

***** LEVEL D INFORMATION *****

Lvl D Causing Org

Lvl D Causing Crew

Human Perf Proc Code

Apparent Cause

Lvl D Process/Proced

Hardware Disposition

Technical Justify

Init Supv-First Last

Init Supv Phone

Init Sup Review Date

***** OPS *****

Functional Eval (FE) N

FE Due Date

Affect Operability Y

If Yes, Units/Actions Sequoyah is in FOR 3.7.14 Action "A". We are in
compliance with action "A" by use of the hand held
lighting units.

Offsite OP Review Y

Op Review BFN Y

Op Review BLN

Op Review SQN

Op Review WBN Y

Reportable N

If Yes, List Basis

Ops SRO/STA-Fst Last Loyd Hodges

Ops SRO/STA Rev Date 02/02/2001

***** FE *****

Functional Maint

Potential Degrad/Noncon(91-18)

FE/Eval Due Date

Initial Evaluation

91-18 Degrad Nonconf N

Functional/Eval Basis

Immed/Comp Measures

List Action/Measures

Engineer
Date
Supervisor
Date
OPS SRO/STA-Fst Last
OPS SRO/STA Rev Date

***** MRC *****

Process PER Level C
Interim Action Req'd N
If YES, Specify
RCA Required N
Site Qual Conc/Ver N
Assigned Resp Org ENG/MECH
CA Develop Due Date 03/05/2001
MRC Directions 91-18 Issue
MRC CAP Review N
MRC-First Last Shirley Smith
MRC Review Date 02/02/2001

***** Resp Org *****

CA Develop Due Date 03/05/2001
Section ENG/MECH
POC-First Last
POC Phone
Reactivity Mgt Issue N
A/B-LER N
LER No.
Control of NonConfor N
If Yes, Scope
Hardware Disposition
Disposition RIM/EDMS
Offsite Generic Rev Y
Generic Rev BFN Y
Generic Rev BLN N
Generic Rev Corp N
Generic Rev SQN
Generic Rev WBN Y
Process/Procedures

***** CAUSE DATA *****

Apparent Cause The documentation involved with the Appendix R program at SQN is voluminous and complicated. The Fire Operating Procedure (O-GO-8), Fire Hazards Analysis (SQN-26-D054/EPM-AB-IMPFA), Fire Safe Shutdown

calculation (SQN-SQS4-0127), Appendix R drawing series, and cable block diagrams all contain Appendix R analysis and compliance information that must be used collectively in order to fully interpret all issues and conditions that were used in the original development of the program. Since the program was developed in the mid-80's timeframe, none of the originally involved personnel are still involved in the program. Hence, due to the complexity of the program, assumptions and methodologies are not clearly evident in all instances.

For the subject of this PER, the original evaluation was that either FCV-62-69 or -70, or all three of the letdown orifice isolation valves, could be closed to isolate letdown in an Appendix R event via electric controls, as opposed to isolation of control air. However, upon in-depth review of all Appendix R documentation during self-evaluation processes, it was discovered that revisions of the FHA subsequent to the original development had taken credit for control air isolation in justification of a derated fire barrier, as well as a note in the FSSD calculation that allows isolation of control air to fail close the letdown valves for RCS pressure boundary isolation.

The apparent cause of this PER is that inexperience of personnel combined with the inherent complexity of the program led to notes not being detected that contradicted the basis of the original PER justification.

Root Cause

Causing Org ENG/MECH

Causing Crew

Human Perf Proc Code

HP Perf Second Code

Prev/Similar Event N/A

Specify Search Basis

Extent of Condition

***** PER HUMAN PERF *****

Human Perform Issue: Y

Key Processes: ENG04

Key Processes: ENG07

Event Precursors

Task Demands: COMPLEX INFORM

Individual Capability LACK OF PROFICIENCY

Work Environment: CONFUSING PROCEDURE

Human Nature:

Barrier Evaluation: FAILED BARRIER

Error Mode: KNOWLEDGE BASED

Latent Org Weakness: DESIGN/MODIFICATION

***** PER CA/RC ITEMS *****

1 Action Item Evaluate adequacy of existing Appendix R emergency lighting for operator actions to manually operate VLV-32-724 and -725.

1 Action Type CORRECTIVE ACTION

1 Assigned Org OPS

1 CA Due Date 03/30/2001

1 AO Concur-Fst Last JIM DVORAK

1 AO POC Fst Last DAVE PORTER

1 CA Performed Performed walkdown and determined that existing App. R lighting is NOT adequate.

1 Date Completed 03/13/2001

2 Action Item Revise calculation SQN-SQS4-0127 (FSSD Calc) to incorporate manual actions involving VLV-32-724, -725.

2 Action Type CORRECTIVE ACTION

2 Assigned Org ENG/MECH

2 CA Due Date 07/27/2001

2 AO Concur-Fst Last BRENDA SIMRIL

2 AO POC-Fst Last BRENDA SIMRIL

2 CA Performed This action is being closed to Rev. 4 of PER 00-7928 and will be resolved by Corrective Action #14. Also, CA #14 will ensure documentation is revised to address repositioning of one head of Appendix R lighting unit (0-LGT-247-R155).

2 Date Completed 07/23/2001

3 Action Item Revise 0-GO-8 to incorporate new manual actions for VLV-32-724, -725.

3 Action Type CORRECTIVE ACTION

3 Assigned Org OPS

3 CA Due Date 07/27/2001

3 AO Concur-Fst Last DAVE PORTER

3 AO POC Fst Last DAVE PORTER
3 CA Performed Incorporated manual actions in AOP-N.01 App. C, which
replaced O-GO-8.
3 Date Completed 07/23/2001
4 Action Item Revise Part V of the Fire Protection Report to include
VLV-32-724 and -725 as equipment illuminated by the
associated emergency lighting unit.
4 Action Type CORRECTIVE ACTION
4 Assigned Org ENG/MECH
4 CA Due Date 07/27/2001
4 AO Concur-Fst Last BRENDA SIMRIL
4 AO POC-Fst Last BRENDA SIMRIL
4 CA Performed This action is being closed to Rev. 4 of PER 00-7928
and will be resolved by Corrective Action #14. Also,
CA #14 will ensure documentation is revised to address
repositioning of one head of Appendix R lighting unit
(O-LGT-247-R155).
4 Date Completed 07/27/2001
***** CLOSURE COMMENTS FROM CA *****
***** CAP CONCUR *****

PER Completion Date 07/27/2001
Prep-First Last Brenda Simril
Preparer Date 03/05/2001
Telephone No
(C) Supv-First Last John Thomas
(C) Supv Ext 8224
(C) Supv Date 03/05/2001
(B) DptMgr-First Last
(B) DptMgr Date
MRC Reqd N
MRC Concurrence
Reason for N
MRC-First Last
MRC Date
(A) SiteSr-Fst Last
(A) SiteSr Date
(A) PltMgr-Fst Lst
(A) PltMgr Date
React Eng-Fst Lst
React Eng Date
Site Qual Conc Reqd N
Site Qual Concur
Reason for N

Site Qual First Last
Site Qual Date

***** VERIFICATION *****

Final Rev Level 00
Tags Rem-First Last
Tags Date
RO Verify Comp BRENDA SIMRIL
RO Verify Date 07/27/2001
ANI/ANII Required N
ANI/ANII Concurrence
Reason for N
ANI/ANII-First Last
ANI/ANII Date
Site Qual Concur
Reason for N
Site Qual First Last
Site Qual Date
RO Supv Clos-Fst Lst JOHN THOMAS
Closure Date 07/27/2001

***** EXTENSIONS *****

***** REVISIONS *****

***** GENERIC REVIEWS *****

BFN Resp Org ENG/MECHANICAL
BFN Due Date 03/13/2001
BFN Gen Rev Results Information only copies distributed to
Engineering/Design/Mechanical and
Engineering/Design/Electrical
BFN Review-Fst Lst DP WALKER
BFN Review Date 03/13/2001
BLN Resp Org
BLN Due Date
BLN Gen Rev Results
BLN Review-Fst Lst
BLN Review Date
CORP Resp Org
CORP Due Date
CORP Gen Rev Result
CORP Review-Fst Lst
CORP Review Date
SQN Resp Org

Comp. Measure

Workorder: 01-009670-000
Status: RO
Entry Date: 10/26/2001 14:04
Planner/Supv: JOHN THOMAS
Requested By: BRENDA F. SIMRIL 843-8515

***** SUPERVISOR *****

PER Level Rev Level 00
Identified By LINE ORGANIZATION
Self Revealing N

Problem Description The current SQN Appendix R program does not credit the use of control air for Appendix R compliance. Therefore, manual actions are required for operation of the Steam Generator (SG) Atmospheric Relief Valves (ARVs). Also, one of the three associated pressure indicators is required for the SGs being used for cooldown. The ARVs are located in the West Valve Vaults (PCV-1-5 and -30 for SGs 1 and 4, respectively) and the East Valve Vaults (PCV-1-12 and -23 for SGs 2 and 3, respectively). Remote valve actuators and associated emergency lights have been installed for SGs 1 and 4, but not for SGs 2 and 3. Subsequently, SGs 1 and 4 are the only steam generators credited in the analysis. In two plant fire areas, FAA-31 and -39 (U1 and U2 El. 690 Pipe Gallery), all three pressure indicators for SGs 1 and 4 have essential cables terminating in panels located within the fire areas. Twenty foot separation between the redundant trains of indication does not exist for these areas. However, it has been verified on the Appendix R drawings (1-45E890-304-2 and 2-45E890-314-4) that these cables are in fact located in the subject rooms. This cable routing information was also verified on the conduit and grounding drawings. For additional details see attached writeup in Curator.

Plt Process Equip Y
Potential Oper Issue Y
Potential Reportable N
Potential Degrad/Noncon(91-18) Y

ASME N
Systems Affected 001
Systems Affected
Systems Affected

03/01/02

Systems Affected

Units Affected 1&2

Recommendation Process PER

No action, Justify

If Process, PER Level C

If Utilize ACP, No

Immed Action Taken Established fire watches in accordance with the SQN

Fire Protection Report (FPR), Part II, FOR 3.7.12.

Recommended Resp Org ENG/MECH

Coordinated With John Thomas

Init Sup-First Last John Thomas

Init Sup Phone 8224

Init Department ENG/MECH

Init Sup Review Date 10/26/2001

***** LEVEL D INFORMATION *****

Lvl D Causing Org ENG/NSS

Lvl D Causing Crew

Human Perf Proc Code WMK

Apparent Cause Miscommunication between Mechanical and Electrical

Engineering during the development of the Appendix R
program in late 1980's. Due to age of issue, apparent
cause could not be fully established.

Lvl D Process/Proced

Hardware Disposition Other

Technical Justify This issue is identified as an extent of condition to
PER 00-7928-000 and resolution of the condition will be
rolled into that PER. See Revision 6 of 00-7928-000.

Init Supv-First Last John Thomas

Init Supv Phone 8224

Init Sup Review Date 10/28/2001

***** OPS *****

Functional Eval (FE) Y

FE Due Date 02/28/2002

Affect Operability Y

If Yes, Units/Actions Roving fire watch established on both units 1 and 2.

Enter FOR 3.7.12

Offsite OP Review Y

Op Review BFN

Op Review BLN

Op Review SQN

Op Review WBN Y

Reportable N

If Yes, List Basis

SQN Due Date
SQN Gen Rev Results
SQN Review-Fst Lst
SQN Review Date
WBN Resp Org ENG/MECH
WBN Due Date 03/05/2001
WBN Gen Rev Results Copy to BG Briody 03/05/01 for information only review.
WBN Review-Fst Lst TERESA WILSON
WBN Review Date 03/05/2001

***** OPERABILITY REVIEWS *****

BFN Notified-Fst Lst
BFN Notified Date
BFN Op Rev Results
BFN Review-Fst Lst
BFN Review Date
SQN Notified-Fst Lst
SQN Notified Date
SQN Op Rev Results
SQN Review-Fst Lst
SQN Review Date
WBN Notified-Fst Lst DUNCAN BENNETT
WBN Notified Date 02/08/2001
WBN Op Rev Results Isolation of control air was not credited for letdown isolation at WBN. At WBN letdown isolation is via two separate and independent methods. Each Fire Safe Shutdown section of AOI-30.2 directs letdown isolation via HSs in the control room. Also a local FSSD HS has been added (at the Train B entrance to the ACR) to provide dedicated App R circuitry for closure of 1-FCV-62-69. Manipulation of this local FSSD HS is dictated by AOI-30.2 for each case that warrants its use.

Control air isolation is not credited for any Fire Safe Shutdown Function at WBN.

WBN Review-Fst Lst DUNCAN BENNETT
WBN Review Date 02/08/2001

***** TRENDS *****

Program Code FP
Program Code
Program Code

INPO Code FP1
INPO Code
NRC Code
NRC Code
Category PROCESS
Short Term Code
Impact 6.0
Behavior Code
Org / Prog Code
GEMS
Other
CAUSE CODES
B2D Inadequate documentation provisions

Total records selected: 1

*** END OF REPORT ***

Disposition RIM/EDMS
Offsite Generic Rev N
Generic Rev BFN
Generic Rev BLN
Generic Rev Corp
Generic Rev SQN
Generic Rev WBN
Process/Procedures

***** CAUSE DATA *****

Apparent Cause This issue identified as extent of condition from PER
00-7928-000.

Root Cause
Causing Org ENG/MECH
Causing Crew
Human Perf Proc Code
HP Perf Second Code
Prev/Similar Event N/A
Specify Search Basis
Extent of Condition

***** PER HUMAN PERF *****

***** PER CA/RC ITEMS *****

1 Action Item Develop functional evaluation and add corrective
actions to PER 00-7928-000 to resolve issue.

1 Action Type CORRECTIVE ACTION

1 Assigned Org ENG/MECH

1 CA Due Date 02/28/2002

1 AO Concur-Fst Last JOHN THOMAS

1 AO POC Fst Last BRENDA SIMRIL

1 CA Performed Prepared functional evaluation (see attached writeup)
and added corrective action # 22 to PER 00-7928-000.

1 Date Completed 02/27/2002

***** CLOSURE COMMENTS FROM CA *****

***** CAP CONCUR *****

PER Completion Date 02/28/2002

Prep-First Last John Thomas

Preparer Date 02/28/2002

Telephone No 8224

(C) Supv-First Last John Thomas

(C) Supv Ext 8224

(C) Supv Date 02/28/2002

(B) DptMgr-First Last

(B) DptMgr Date

MRC Req'd N

Ops SRO/STA-Fst Last David Moore
Ops SRO/STA Rev Date 10/26/2001
***** FE *****

Functional Maint
Potential Degrad/Noncon(91-18) Y

FE/Eval Due Date
Initial Evaluation
91-18 Degrad Nonconf Y
Functional/Eval Basis See attached writeup
Immed/Comp Measures
List Action/Measures
Engineer Brenda Simril
Date 02/27/2002
Supervisor John Thomas
Date 02/27/2002
OPS SRO/STA-Fst Last WILLIAM ROSS
OPS SRO/STA Rev Date 02/27/2002
***** MRC *****

Process PER Level C
Interim Action Req'd N
If YES, Specify
RCA Required N
Site Qual Conc/Ver N
Assigned Resp Org ENG/MECH
CA Develop Due Date 03/27/2002
MRC Directions Close to Level B PER 00-7928 under extent of condition.
NOTE: This PER was upgraded to a Level C per telecon
with John Thomas-shs-02/27/2002.

MRC CAP Review N
MRC-First Last Beverly Bishop
MRC Review Date 10/27/2001
***** Resp Org *****

CA Develop Due Date 03/27/2002
Section ENG/MECH
POC-First Last John Thomas
POC Phone 8224
Reactivity Mgt Issue N
A/B-LER N
LER No.
Control of NonConfor N
If Yes, Scope
Hardware Disposition

MRC Concurrence
Reason for N
MRC-First Last
MRC Date
(A) SiteSr-Fst Last
(A) SiteSr Date
(A) PltMgr-Fst Lst
(A) PltMgr Date
React Eng-Fst Lst
React Eng Date
Site Qual Conc Reqd N
Site Qual Concur
Reason for N
Site Qual First Last
Site Qual Date

***** VERIFICATION *****

Final Rev Level
Tags Rem-First Last
Tags Date
RO Verify Comp
RO Verify Date
ANI/ANII Required N
ANI/ANII Concurrence
Reason for N
ANI/ANII-First Last
ANI/ANII Date
Site Qual Concur
Reason for N
Site Qual First Last
Site Qual Date
RO Supv Clos-Fst Lst
Closure Date

***** EXTENSIONS *****

***** REVISIONS *****

***** GENERIC REVIEWS *****

***** OPERABILITY REVIEWS *****

***** TRENDS *****

Program Code FP
Program Code

03/01/02

Program Code

INPO Code FP1

INPO Code

NRC Code

NRC Code

Category PROCESS

Short Term Code

Impact 4.0

Behavior Code

Org / Prog Code P2

GEMS

Other

CAUSE CODES

M1E Analysis deficiency (calculations: stress, hydraulic, thermal, electri

Total records selected: 1

*** END OF REPORT ***

Appendix R - Steam Generator Pressure Control Insufficient Separation in U1 and U2 El. 690 Penetration Rooms

Description

In order to meet Appendix R safe shutdown requirements for decay heat removal, one Auxiliary Feedwater (AFW) pump is required to supply two Steam Generators (SG) to make up for inventory discharged as steam by the safety valves or SG Atmospheric Relief Valves (ARV). The continued removal of heat is achieved by the controlled operation of the ARVs and the continued operation of the AFW system. Also, one of the three associated pressure indicators is required for the SGs being used for cooldown. The ARVs are air-operated valves which require the availability of the Control Air system for normal operation. The current SQN Appendix R program does not credit the use of control air for Appendix R compliance (Ref. NRC Inspection Report 50-327/88-24 and 50-328/88-24, p. 9). Therefore, manual actions are required for operation of the ARVs.

The ARVs are located in the West Valve Vaults (PCV-1-5 and -30 for SGs 1 and 4, respectively) and the East Valve Vaults (PCV-1-12 and -23 for SGs 2 and 3, respectively). Remote valve actuators and associated emergency lights have been installed for SGs 1 and 4. In two plant fire areas, FAA-31 and -39 (U1 and U2 El. 690 Pipe Gallery), all three pressure indicators for SGs 1 and 4 have essential cables terminating in panels located within the fire areas. Twenty foot separation between the redundant trains of indication does not exist for these areas. In the original Appendix R analysis ("Steam Generator Inventory Control" Safety Function Position Statement, RIMS #S56871222985 and #S01850827954) it was evaluated that PAM II indication was available for SGs 1 and 4. However, it has been verified on the Appendix R drawings (1-45E890-304-2 and 2-45E890-314-4) that these cables are in fact located in the subject rooms, along with the ARV indication and the PAM I indication. This cable routing information was also verified on the conduit and grounding drawings.

Due to the unavailability of pressure indication for SGs 1 and 4 in the two El. 690' pipe galleries, the only available steam generators for cooldown are SGs 2 and 3. But, since control air is not credited in the Appendix R program, and thus cannot be assumed to be available, manual operation of PCV-1-12 and -23 is required. Since there is currently no emergency lighting in the East Valve Vault and local operation would present a significant personnel hazard, local operator actions in the East Valve Vault is not plausible.

Contrary to the requirements of SPP-9.4, a technical basis document /evaluation was not provided or referenced in the SR/SE for FPR Revision 8 to justify extending the fire detection test frequency from 6 months to 18 months. The Fire Safe Shutdown Evaluation portion of the 50.59 Evaluation provide a qualitative discussion to support the subject matter however, no referenced document was provided to support the conclusion of this position. This is an inappropriate use to the 50.59 process as described in SQ951557PER Corrective Action # 39. See the letter from Mark Burzynski to J. Valente dated June 13, 1997; RIMS # B45 970612 001 which states the following. It is concluded that the inclusion of calculations or other technical information in a 50.59 document for the propose of providing a technical basis for the change is an improper use of these evaluations. The technical basis supporting a change, be it a physical change to the facility or a procedure change, must be documented in appropriate input or output such that a 50.59 qualified individual can perform evaluation required by SPP 9.4. Given below are two concerns that must be addressed to resolve the above issue.

The first concern is, the SR/SE should have referenced the NFPA 72E standards on Automatic Fire Detectors or the appropriate NFPA standard to assure the industry standard test frequencies are satisfied. For example, NFPA 72E Section 8-3.3.2 states each heat detectors should be tested within five years and NFPA 72E Section 8-3.4.2 states smoke detectors shall be checked one year after installation and every alternate year thereafter. These requirements, if applicable, would bound the proposed increased test frequency from 6 months to 18 months. Referencing these industry standards should be a portion of the technical basis for increasing the test frequencies rather than simply increasing the fire detectors test frequencies in SI-234.2, 234.5, and 234.6 to be consistent with the host equipment test frequencies. These revisions were addressed as action items in SQN 00-006637-000 PER without further required analyses or documentation, which leads to the next concern.

The second concern is, no retrievable analyses or documentation is available to support the technical conclusion of increasing the fire detector's test frequency from 6 months to 18 months is acceptable. In order to independently reach this conclusion, a 50.59 qualified individual or auditor would have to recollect, reevaluate, and document for the first time test data and histories summarized in the Fire Safe Shutdown Evaluation portion of the 50.59 Evaluation. The assurance of reacquiring this conclusion is subject to question since the documentation supporting this position does not exist.

Calvin W. Burrell Jr.
SQN 10CFR50.59 Coordinator

FUNCTIONAL EVALUATION

Page 1 of 2

PER Number _____ Revision DATE _____

1.0 INITIATOR INFORMATION AND DESCRIPTION

Initiator: (Print Name) _____ Phone Number 8515
Describe the affected system, structure or component using UNIDs as appropriate: _____
S/Gs 1 & 4 ARV pressure indication: 1,2-P-001-2A, -2B, -5, -27A, -27B, -30

Describe the degraded condition or operability concern _____
Loops 1 & 4 are required for cooldown in Fire Areas FAA-031 & -039, however, cables for all pressure indicators (see above) are routed through these fire areas (Unit 1 cables only in FAA-031, Unit 2 cables only in FAA-039).

This operability determination is written to evaluate (check all that apply):

- ☒ A past operability concern for reportability purposes.
☒ A present operability concern.
☐ A future operability concern in anticipation of an upcoming plant evolution/condition.

Date condition was found or could potentially exist in the future: 10/26/2001

Technical Specification (T/S) Review: (check one)

- ☐ This component/system IS NOT covered by T/S.
☒ This component/system IS covered by T/S Section: U1/U2 Tech Spec Licensing Cond 16

State the initiating document(s) [that is PER, WO] that prompted the need for this FE. If none exists mark NA. PER 01-09670-000

2.0 TECHNICAL EVALUATION

Describe the component's/system's function: SG ARV Pressure Indication for Appendix R Fire

List the specific references used: Fire Safe Shutdown (FSSD) Analysis, SQN-SQS4-127; SQN FPR

Describe the effects of the condition on the ability of the component/system to perform its intended function:
(See Attached)

If the degraded condition of the component/system causes any loss of functional capability, evaluate whether system operability can be justified using compensatory actions or by taking credit for alternate functional capabilities (such as manual operation or diverse automatic actions):
(See Attached)

FUNCTIONAL EVALUATION

Page 2 of 2

PER Number _____ Revision _____ DATE _____

Describe an alternate means of meeting the designed functions, limitations or any required compensatory actions to make the component/system operable. Describe why the alternative, limitations, or compensatory actions do not create new or different concerns:
(See Attached)

Describe the actions required to implement the alternate functional capability, limitations, and/or compensatory actions. Include required procedures, procedure changes, temporary modifications, if known. N/A for components/systems that can perform their intended designed function(s) without limitations, credit for alternate capabilities, or compensatory actions:
(See Attached; Use of Loops 2 and 3 for cooldown utilizing Control Air per AOP-N.01)

State definitively in the first sentence whether the component/system will or will not perform its designed function or it will with limitations. Include or reference any required limits, Compensatory Actions, or credit taken for alternate functional capability
(See Attached)

List what actions must occur for the operability question to no longer exist?

Identifier (e.g., WO, PER)

DCN F-21102-A (FAA-031)

Responsible

NE - M/N

DCN F-21103-A (FAA-039)

Org.

3.0 REVIEW AND APPROVAL

(Approval Signatures on Functional Evaluation Template)

Appendix R Evaluation for FAA-031 and -039

In order to meet Appendix R safe shutdown requirements for decay heat removal, one Auxiliary Feedwater (AFW) pump is required to supply two Steam Generators (SG) to make up for inventory discharged as steam by the safety valves or SG Atmospheric Relief Valves (ARV).

The continued removal of heat is achieved by the controlled operation of the ARVs and the continued operation of the AFW system. Also, one of the three associated pressure indicators is required for the SGs being used for cooldown. The ARVs are air-operated valves which require the availability of the control air system (supplied by Auxiliary Air) for normal operation. The SQN Appendix R program does not credit the use of control air for Appendix R compliance (Ref. NRC Inspection Report 50-327/88-24 and 50-328/88-24, p. 9), but allows the use of the components if they remain available during the event. Since the control air system has not been evaluated in every fire area for end devices and/or headers which could contain non-fire resistant materials such as copper tubing, rubber gaskets, etc., control air supplied components are only credited for specific areas. As a result, for all other plant fire areas, manual actions are required for operation of the ARVs, as well as any other air supplied components required for safe shutdown.

The ARVs are located in the West Valve Vaults (PCV-1-5 and -30 for SGs 1 and 4, respectively) and the East Valve Vaults (PCV-1-12 and -23 for SGs 2 and 3, respectively). Remote valve actuators and associated emergency lights have been installed for SG #1 and #4. In both FAA-031 and -039 (U1 and U2 El. 690 Pipe Gallery, respectively), all three pressure indicators for SGs 1 and 4 have essential cables terminating in panels located within this fire area, and the 20 foot separation requirement is not met.

DCN F-21102-A (U1) and F-21103-A (U2) are currently in progress to add Thermo-Lag ERFBS to the PAM II instrumentation for Loops 1 and 4 in these fire areas, which will provide the minimum required pressure indication for these loops. Until this modification is complete, the compliance strategies include crediting the use of SGs 2 and 3. No cables for SGs 2 and 3 pressure indication (P-001-09A, -09B, -12, and 1-P-001-20A, -20B, -23) are routed in these fire areas.

Due to the inaccessibility of the PCV-1-12 and -23 valve actuators, no manual actions are available to operate the valves. Therefore, in order to credit these valves, control air must be available to operate the valves from the MCR. Plant walkdowns have been conducted and determined that end devices for control air with the potential to breach the air header are not located within the area of concern. Also, a review of the control air flow diagrams confirmed that the end devices located in the fire areas come from the Station Air headers, and that Auxiliary Air would not be impacted. Therefore, SGs 2 and 3 would be available for cooldown using the SG ARVs from the MCR.

Until field implementation of the DCNs F-21102-A and F-21103-A is complete, Loops 2 and 3 are credited for plant cooldown by implementing the following two additional MCR operator actions:

Main Control Room Operator Actions:			
KEY	CONTROL COMPONENT	FUNCTION PERFORMED	REQUIRED TIME (min)
FAA-031:			
26	1-PCV-1-12	OPERATE	60
26	1-PCV-1-23	OPERATE	60
FAA-039:			
26	2-PCV-1-12	OPERATE	60
26	2-PCV-1-23	OPERATE	60

Workorder: 02-000575-000
Status: RO
Entry Date: 01/21/2002 12:51
Planner/Supv: JOHN THOMAS
Requested By: BRENDA F. SIMRIL 843-8515

***** SUPERVISOR *****

PER Level Rev Level 00
Identified By LINE ORGANIZATION
Self Revealing Y

Problem Description In order to meet Appendix R safe shutdown requirements

for RCS Letdown, one of three available paths must be available: Normal Letdown, Excess Letdown, Alternate Letdown. The Alternate Letdown path utilizes the Pressurizer PORVs and Block Valves, and the Reactor Vessel Head Vent Valves to alternately decrease and increase RCS pressure during plant cooldown. The Fire Safe Shutdown (FSSD) Analysis, SQN-SQS4-0127, currently describes the three methods in Key 48 of the calculation. In order to guarantee availability of the components required for Normal and Excess Letdown, Control Air (Key 13) must be available. The current SQN Appendix R program does not credit the use of control air for Appendix R compliance (Ref. NRC Inspection Report 50-327/88-24 and 50-328/88-24, p. 9).

Therefore, the Alternate Letdown path must be guaranteed for each FSSD fire area. Within the Alternate Letdown path, there are four combinations of valve operation which will achieve the required safety function. The EGTS room (FAA-80, 734.0-A16) contains cables for all four acceptable combinations of PORVs, Block Valves, and RVHV Valves in such a manner that safe shutdown cannot be guaranteed using the Alternate Letdown Path.

Reliance on control air for an Appendix R event is an industry anomaly. Also, the necessity to credit control air the subject fire area would require including the Control Air System and the Normal Letdown path in the FSSD analysis for one fire area only, which would be in contrast to the compliance strategies for the remaining fire areas. This PER is a result of extent of condition from PER 00-7928-000. For operability discussions, see "Immediate Actions Taken".

Plt Process Equip Y
Potential Oper Issue N
Potential Reportable N
Potential Degrad/Noncon(91-18) Y

ASME N

Systems Affected 068

Systems Affected

Systems Affected

Systems Affected

Units Affected 2

Recommendation Process PER

No action, Justify

If Process, PER Level D

If Utilize ACP, No

Immed Action Taken For current operability, a letdown path can be achieved for this area. Per Note 2 on Dwg. 2-45E890-042, the EGTS room does not contain any cables or components required for the Normal Letdown path. Also, field walkdowns confirmed that the only control air end devices in the room are located in the far northeast corner of the room. These components are greater than 200 from the cables for 2-FCV-68-332, which would make the Alternate Letdown path using 2-FCV-68-332 and 2-PCV-68-340A (cables for this valve are not located in the subject fire area) available. Therefore, the same fire could not render this path and the Normal Letdown path inoperable and therefore current operability is guaranteed.

PER re-opened to indicate potentially 91-18 issue and to upgrade to level C.

Recommended Resp Org ENG/MECH

Coordinated With John Thomas

Init Sup-First Last John Thomas

Init Sup Phone 8224

Init Department ENG/MECH

Init Sup Review Date 01/22/2002

***** LEVEL D INFORMATION *****

Lvl D Causing Org ENG/MECH

Lvl D Causing Crew

Human Perf Proc Code OTH

Apparent Cause Identified by extent of condition of PER 00-7928-000.

See apparent cause of 00-7928-000.

Lvl D Process/Proced

Hardware Disposition Rework

Technical Justify A design change will be processed in accordance with
corrective action 23 for PER 00-7928-000.

Init Supv-First Last John Thomas

Init Supv Phone 8224

Init Sup Review Date 01/31/2002

***** OPS *****

Functional Eval (FE) Y

FE Due Date 02/28/2002

Affect Operability N

If Yes, Units/Actions

Offsite OP Review N

Op Review BFN

Op Review BLN

Op Review SQN

Op Review WBN

Reportable N

If Yes, List Basis

Ops SRO/STA-Fst Last WILLIAM ROSS

Ops SRO/STA Rev Date 02/27/2002

***** FE *****

Functional Maint

Potential Degrad/Noncon(91-18) Y

FE/Eval Due Date

Initial Evaluation

91-18 Degrad Nonconf Y

Functional/Eval Basis See attached writeup.

Immed/Comp Measures

List Action/Measures

Engineer Brenda Simril

Date 02/27/2002

Supervisor John Thomas

Date 02/27/2002

OPS SRO/STA-Fst Last WILLIAM ROSS

OPS SRO/STA Rev Date 02/27/2002

***** MRC *****

Process PER Level C

Interim Action Req'd N

If YES, Specify

RCA Required N

Site Qual Conc/Ver N
Assigned Resp Org ENG/MECH
CA Develop Due Date 03/27/2002
MRC Directions NOTE: This PER was upgraded to a Level C per telecon
with John Thomas--shs--02/27/2002.

MRC CAP Review N
MRC-First Last Renee McKaig
MRC Review Date 01/23/2002
***** Resp Org *****

CA Develop Due Date 03/27/2002

Section ENG/MECH
POC-First Last John Thomas
POC Phone 8224

Reactivity Mgt Issue N

A/B-LER N

LER No.

Control of NonConfor N

If Yes, Scope

Hardware Disposition

Disposition RIM/EDMS

Offsite Generic Rev N

Generic Rev BFN

Generic Rev BLN

Generic Rev Corp

Generic Rev SQN

Generic Rev WBN

Process/Procedures

***** CAUSE DATA *****

Apparent Cause Condition determined to from extent of condition from
PER 00-7928-000

Root Cause

Causing Org ENG/MECH

Causing Crew

Human Perf Proc Code

HP Perf Second Code

Prev/Similar Event N/A

Specify Search Basis

Extent of Condition

***** PER HUMAN PERF *****

***** PER CA/RC ITEMS *****

1 Action Item A design change will be processed in accordance with
corrective action 23 for PER 00-7928-000.

1 Action Type CORRECTIVE ACTION

1 Assigned Org ENG/MECH
1 CA Due Date 02/28/2002
1 AO Concur-Fst Last JOHN THOMAS
1 AO POC Fst Last BRENDA SIMRIL
1 CA Performed Corrective action transferred to 00-7928-000
1 Date Completed 02/25/2002

***** CLOSURE COMMENTS FROM CA *****

***** CAP CONCUR *****

PER Completion Date 02/28/2002

Prep-First Last John Thomas

Preparer Date 02/25/2002

Telephone No 8224

(C) Supv-First Last John Thomas

(C) Supv Ext 8224

(C) Supv Date 02/25/2002

(B) DptMgr-First Last

(B) DptMgr Date

MRC Reqd N

MRC Concurrence

Reason for N

MRC-First Last

MRC Date

(A) SiteSr-Fst Last

(A) SiteSr Date

(A) PltMgr-Fst Lst

(A) PltMgr Date

React Eng-Fst Lst

React Eng Date

Site Qual Conc Reqd N

Site Qual Concur

Reason for N

Site Qual First Last

Site Qual Date

***** VERIFICATION *****

Final Rev Level

Tags Rem-First Last

Tags Date

RO Verify Comp

RO Verify Date

ANI/ANII Required N

ANI/ANII Concurrence

Reason for N

ANI/ANII-First Last

ANI/ANII Date
Site Qual Concur
Reason for N
Site Qual First Last
Site Qual Date
RO Supv Clos-Fst Lst
Closure Date

***** EXTENSIONS *****

***** REVISIONS *****

***** GENERIC REVIEWS *****

***** OPERABILITY REVIEWS *****

***** TRENDS *****

Program Code FP

Program Code

Program Code

INPO Code FP1

INPO Code

NRC Code

NRC Code

Category PROCESS

Short Term Code

Impact 2.5

Behavior Code

Org / Prog Code PP3

GEMS

Other

CAUSE CODES

M1A Misapplication or interpretation of design inputs (engineering codes a

Total records selected: 1

*** END OF REPORT ***

FUNCTIONAL EVALUATION

Page 1 of 2

PER Number _____

Revision DATE _____

1.0 INITIATOR INFORMATION AND DESCRIPTION

Initiator: (Print Name) _____

Phone Number 8515

Describe the affected system, structure or component using UNIDs as appropriate: RCS Letdown
path for Appendix R safe shutdown requirements; this includes normal letdown, excess letdown and
alternate letdown which utilizes the Pressurizer PORVs and Block valves and the RV Head Vent valves

Describe the degraded condition or operability concern _____

The EGTS room (FAA-80, 734.0-A16) contains cables for all four acceptable combinations of PORVs,
Block Valves, and RVHV Valves in such a manner that safe shutdown cannot be guaranteed using the
alternate letdown path.

This operability determination is written to evaluate (check all that apply):

☒ A past operability concern for reportability purposes.

☒ A present operability concern.

☐ A future operability concern in anticipation of an upcoming plant evolution/condition.

Date condition was found or could potentially exist in the future: Jan 21, 2001

Technical Specification (T/S) Review: (check one)

☐ This component/system IS NOT covered by T/S.

☒ This component/system IS covered by T/S Section: Unit 1 and 2 Tech Spec Licensing Cond 16

State the initiating document(s) [that is PER, WOJ] that prompted the need for this FE. If none
exists mark NA. PER 02-00575-000

2.0 TECHNICAL EVALUATION

Describe the component's/system's function: Providing RCS letdown for Appendix R fire

List the specific references used: Fire Protection Report, Fire Hazard Analysis

Describe the effects of the condition on the ability of the component/system to perform its intended
function:

(See Attached)

If the degraded condition of the component/system causes any loss of functional capability, evaluate
whether system operability can be justified using compensatory actions or by taking credit for
alternate functional capabilities (such as manual operation or diverse automatic actions):

(See Attached)

FUNCTIONAL EVALUATION

Page 2 of 2

PER Number _____ Revision _____ DATE _____

Describe an alternate means of meeting the designed functions, limitations or any required compensatory actions to make the component/system operable. Describe why the alternative, limitations, or compensatory actions do not create new or different concerns:
(See Attached)

Describe the actions required to implement the alternate functional capability, limitations, and/or compensatory actions. Include required procedures, procedure changes, temporary modifications, if known. N/A for components/systems that can perform their intended designed function(s) without limitations, credit for alternate capabilities, or compensatory actions:
(See Attached; use of alternate letdown is used if available in accordance with AOP N.01)

State definitively in the first sentence whether the component/system will or will not perform its designed function or it will with limitations. Include or reference any required limits, Compensatory Actions, or credit taken for alternate functional capability
(See Attached)

List what actions must occur for the operability question to no longer exist?

Identifier (e.g., WO, PER)

DCN M-12743

Responsible
Org.

Design Mech

3.0 REVIEW AND APPROVAL

(Approval Signatures on Functional Evaluation Template)

In order to meet Appendix R safe shutdown requirements for RCS Letdown, one of three available paths must be available: Normal Letdown, Excess Letdown, Alternate Letdown. The alternate letdown path utilizes the Pressurizer PORVs and Block Valves, and the Reactor Vessel Head Vent Valves to alternately decrease and increase RCS pressure during plant cooldown. The Fire Safe Shutdown (FSSD) Analysis, SQN-SQS4-0127, currently describes the three methods in Key 48 of the calculation. In order to guarantee availability of the components required for normal and excess letdown, control air (Key 13) must be available. The SQN Appendix R program does not credit the use of control air for Appendix R compliance (Ref. NRC Inspection Report 50-327/88-24 and 50-328/88-24, p. 9). Therefore, the alternate letdown path must be guaranteed for each FSSD fire area. Within the alternate letdown path, there are four combinations of valve operation which will achieve the required safety function. The EGTS room (FAA-80, 734.0-A16) contains cables for all four acceptable combinations of PORVs, Block Valves, and RVHV Valves in such a manner that safe shutdown cannot be guaranteed using the alternate letdown path.

For current operability, a letdown path can be achieved for this area using either normal letdown or alternate letdown components. Note 2 on Dwg. 2-45E890-042 states that the EGTS room does not contain any cables or components required for the normal letdown path. Cable analysis has also verified that the only component related to the normal letdown and normal charging paths affected in this fire area is 2-FCV-62-85. This valve is normally closed to isolate the alternate charging path. Spurious opening of this valve would require closure of 2-FCV-62-86, which is available from the MCR.

This fire area has a low combustible loading, and is equipped with full area automatic suppression and detection. Field walkdowns confirmed that the only control air end devices in the room are located northeast of the column near V-line and the Rx Bldg. Shield Wall. These components are greater than 20' from the cables for 2-FCV-68-332, which would make the alternate letdown path, using 2-FCV-68-332 and 2-PCV-68-340A available from the MCR (cables for PORV 2-PCV-68-340A are not located in this fire area). A fire which could render both this path and the normal letdown path inoperable is not credible. Therefore, for a fire south of Column A13, control air will be available to be utilized for normal letdown and charging. For a fire north of A13, 2-FCV-68-332 is available for letdown.

To accomplish Key 28 (RCS Pressure Boundary Isolation) requirements for either letdown path used, a manual action to pull the fuses for the Reactor Vessel Head Vents (RVHV) is required. If normal letdown is employed, Main Control Room operator actions to close 2-PCV-68-340A and 2-FCV-68-333 are required. Conversely, if alternate letdown via the PORVs is employed, a MCR operator action to close 2-FCV-68-333 is required.

03/01/02

Comp. Measure
Timeline
+ 3 min
manua

Workorder: 02-000576-000

Status: RO

Entry Date: 01/21/2002 12:56

Planner/Supv: JOHN THOMAS

Requested By: BRENDA F. SIMRIL 843-8515

***** SUPERVISOR *****

PER Level Rev Level 00

Identified By LINE ORGANIZATION

Self Revealing Y

Problem Description In order to meet Appendix R safe shutdown requirements

for RCS inventory control and RCP seal cooling, CCP suction supply from either the VCT or RWST must be ensured. Control logic for the VCT outlet isolation valves (LCV-62-132 and -133) and RWST outlet isolation valves (LCV-62-135, -136) is interlocked such that prior to closing either LCV-62-132 or -133 valve, LCV-62-135 or -136 will open.

In the southeast corner of FAA-29 (690-A01), cables exist for all four Unit 2 LCVs as well as CCP 2A-A and 2B-B. Thermo-Lag protects the control cables for the -135 and -136 valves, but not the power cables. Also, CCP 2A-A is protected by Thermo-Lag in this area. Subsequent to an Appendix R fire, a spurious closure signal could be generated through cables controlling valves LCV-62-132 and -133. If a low level VCT tank level signal were to occur, valves LCV-62-132 and 133 would close. Since the power cables for -135 and -136 are not protected, automatic opening can not be guaranteed. Therefore, an interaction exists such that suction to both the VCT and RWST could be lost. If CCP 2A-A is running at the time of the valve closure, it could be destroyed due to loss of suction, and at the same time, CCP 2B-B could be unavailable due to the fire.

The current Fire Hazards Analysis credits manual actions to ensure suction for the CCPs. During the development of a manual action timeline analysis for the recent Appendix R re-verification effort, it was identified that this is a time-critical action (i.e., less than 10 minutes). However, due to the availability of normal charging and letdown

03/01/02

(availability of Control Air has been verified), additional time for the manual action is available. The reliance on time-critical operator actions increases the risks associated with mitigation of an Appendix R event in the subject fire area. This PER is a result of extent of condition of PER 00-007928-000. For operability discussions, see "Immediate Actions Taken".

Plt Process Equip Y
Potential Oper Issue N
Potential Reportable N
Potential Degrad/Noncon(91-18) Y

ASME N
Systems Affected 062
Systems Affected 063
Systems Affected
Systems Affected
Units Affected 2
Recommendation Process PER
No action, Justify
If Process, PER Level D
If Utilize ACP, No
Immed Action Taken See attached functional evaluation.

PER re-opened to document potential GL 91-18 issue.

PER upgraded to level C. 2/27/02

Recommended Resp Org ENG/MECH
Coordinated With John Thomas
Init Sup-First Last John Thomas
Init Sup Phone 8224
Init Department ENG/MECH
Init Sup Review Date

***** LEVEL D INFORMATION *****

Lvl D Causing Org ENG/MECH
Lvl D Causing Crew
Human Perf Proc Code WMK
Apparent Cause See apparent cause for PER 00-7928-000
Lvl D Process/Proced
Hardware Disposition Rework
Technical Justify A design change will be prepared in accordance with
corrective action number 24 for PER 00-7928-000
Init Supv-First Last John Thomas

03/01/02

Init Supv Phone 8224

Init Sup Review Date 02/05/2002

***** OPS *****

Functional Eval (FE) Y

FE Due Date 02/28/2002

Affect Operability N

If Yes, Units/Actions

Offsite OP Review N

Op Review BFN

Op Review BLN

Op Review SQN

Op Review WBN

Reportable N

If Yes, List Basis

Ops SRO/STA-Fst Last WILLIAM ROSS

Ops SRO/STA Rev Date 02/27/2002

***** FE *****

Functional Maint

Potential Degrad/Noncon(91-18) Y

FE/Eval Due Date

Initial Evaluation

91-18 Degrad Nonconf Y

Functional/Eval Basis See attached functional evaluation.

Immed/Comp Measures

List Action/Measures

Engineer Brenda Simril

Date 02/27/2002

Supervisor John Thomas

Date 02/27/2002

OPS SRO/STA-Fst Last WILLIAM ROSS

OPS SRO/STA Rev Date 02/27/2002

***** MRC *****

Process PER Level C

Interim Action Req'd N

If YES, Specify

RCA Required N

Site Qual Conc/Ver N

Assigned Resp Org ENG/MECH

CA Develop Due Date 03/27/2002

MRC Directions NOTE: This PER was upgraded to a Level C per telecon
with John Thomas--shs--02/27/2002.

MRC CAP Review N

03/01/02

MRC-First Last Renee McKaig

MRC Review Date 01/23/2002

***** Resp Org *****

CA Develop Due Date 03/27/2002

Section ENG/MECH

POC-First Last John Thomas

POC Phone 8224

Reactivity Mgt Issue N

A/B-LER N

LER No.

Control of NonConfor N

If Yes, Scope

Hardware Disposition Other

Disposition RIM/EDMS

Offsite Generic Rev N

Generic Rev BFN

Generic Rev BLN

Generic Rev Corp

Generic Rev SQN

Generic Rev WBN

Process/Procedures

***** CAUSE DATA *****

Apparent Cause This issue identified as extent of condition of PER
00-7928-000.

Root Cause

Causing Org ENG/MECH

Causing Crew

Human Perf Proc Code

HP Perf Second Code

Prev/Similar Event N/A

Specify Search Basis

Extent of Condition

***** PER HUMAN PERF *****

***** PER CA/RC ITEMS *****

1 Action Item Perform functional evaluation and document corrective
appropriate corrective actions in PER 00-7928-000.

1 Action Type CORRECTIVE ACTION

1 Assigned Org ENG/MECH

1 CA Due Date 02/28/2002

1 AO Concur-Fst Last JOHN THOMAS

1 AO POC Fst Last BRENDA SIMRIL

1 CA Performed Functional evaluation completed. See attached writeup.

Corrective action # 24 has been entered into PER

03/01/02

00-7928-000.

1 Date Completed 02/28/2002

***** CLOSURE COMMENTS FROM CA *****

***** CAP CONCUR *****

PER Completion Date 02/28/2002

Prep-First Last John Thomas

Preparer Date 02/27/2002

Telephone No 8224

(C) Supv-First Last John Thomas

(C) Supv Ext 8224

(C) Supv Date 02/27/2002

(B) DptMgr-First Last

(B) DptMgr Date

MRC Reqd N

MRC Concurrence

Reason for N

MRC-First Last

MRC Date

(A) SiteSr-Fst Last

(A) SiteSr Date

(A) PltMgr-Fst Lst

(A) PltMgr Date

React Eng-Fst Lst

React Eng Date

Site Qual Conc Reqd N

Site Qual Concur

Reason for N

Site Qual First Last

Site Qual Date

***** VERIFICATION *****

Final Rev Level

Tags Rem-First Last

Tags Date

RO Verify Comp

RO Verify Date

ANI/ANII Required N

ANI/ANII Concurrence

Reason for N

ANI/ANII-First Last

ANI/ANII Date

Site Qual Concur

Reason for N

Site Qual First Last

03/01/02

Site Qual Date
RO Supv Clos-Fst Lst
Closure Date

***** EXTENSIONS *****

***** REVISIONS *****

***** GENERIC REVIEWS *****

***** OPERABILITY REVIEWS *****

***** TRENDS *****

Program Code FP

Program Code

Program Code

INPO Code FP1

INPO Code

NRC Code

NRC Code

Category PROCESS

Short Term Code

Impact 2.5

Behavior Code

Org / Prog Code PP3

GEMS

Other

CAUSE CODES

M1A Misapplication or interpretation of design inputs (engineering codes a

Total records selected: 1

*** END OF REPORT ***

FUNCTIONAL EVALUATION

Page 1 of 2

PER Number _____ Revision DATE _____

1.0 INITIATOR INFORMATION AND DESCRIPTION

Initiator: (Print Name) _____ Phone Number 8515
Describe the affected system, structure or component using UNIDs as appropriate: _____
VCT/RWST Suction Valves: 2-LCV-62-132, -133, -135, -136; CCPs 2A-A, 2B-B

Describe the degraded condition or operability concern _____
Between Column Lines A12-A15/S-U, cable interactions exist between 2-LCV-62-132, -133, -135, -136.
Cables also exist for both U2 CCPs (CCP 2A-A is protected by Thermo-Lag), U2 SI Initiation, U2 VCT
level indication, and U2 Thermal Barrier Cooling.

This operability determination is written to evaluate (check all that apply):

- ☒ A past operability concern for reportability purposes.
- ☒ A present operability concern.
- ☐ A future operability concern in anticipation of an upcoming plant evolution/condition.

Date condition was found or could potentially exist in the future: 01/21/2001

Technical Specification (T/S) Review: (check one)
☐ This component/system IS NOT covered by T/S.

☒ This component/system IS covered by T/S Section: U1/U2 Tech Spec Licensing Cond 16

State the initiating document(s) [that is PER, WO] that prompted the need for this FE. If none exists mark NA. PER 02-00576-000

2.0 TECHNICAL EVALUATION

Describe the component's/system's function: Suction to CCP for Appendix R Fire

List the specific references used: Fire Safe Shutdown (FSSD) Analysis, SQN-SQS4-127; SQN FPR

Describe the effects of the condition on the ability of the component/system to perform its intended function:
(See Attached)

If the degraded condition of the component/system causes any loss of functional capability, evaluate whether system operability can be justified using compensatory actions or by taking credit for alternate functional capabilities (such as manual operation or diverse automatic actions):
(See Attached)

FUNCTIONAL EVALUATION

Page 2 of 2

PER Number _____ Revision _____ DATE _____

Describe an alternate means of meeting the designed functions, limitations or any required compensatory actions to make the component/system operable. Describe why the alternative, limitations, or compensatory actions do not create new or different concerns:
(See Attached)

Describe the actions required to implement the alternate functional capability, limitations, and/or compensatory actions. Include required procedures, procedure changes, temporary modifications, if known. N/A for components/systems that can perform their intended designed function(s) without limitations, credit for alternate capabilities, or compensatory actions:
(See Attached)

State definitively in the first sentence whether the component/system will or will not perform its designed function or it will with limitations. Include or reference any required limits, Compensatory Actions, or credit taken for alternate functional capability
(See Attached)

List what actions must occur for the operability question to no longer exist?		
Identifier (e.g., WO, PER)	DCN F-21103-A	Responsible
		Org.
		NE - M/N

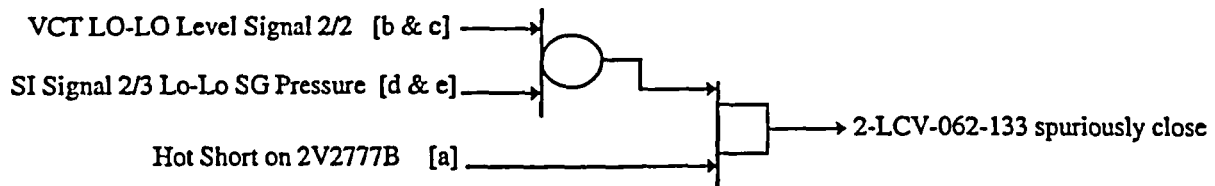
3.0 REVIEW AND APPROVAL

(Approval Signatures on Functional Evaluation Template)

Appendix R Compliance Strategies for FAA-029 (A12-A15 / S-U)

In FAA-029, from A12-A15 / S-U, interactions exist between control cables for VCT Outlet Valves 2-FCV-62-132 and -133 and the power cables for RWST Outlet Valves 2-FCV-62-135, -136. This interaction causes a potential loss of suction to the operating CCP. This loss of suction could be generated by a spurious close signal for 2-FCV-62-132 or -133, while the power supply is lost for valves 2-FCV-62-135 and -136. The logic associated with the subject control cables for 2-FCV-62-132 and -133 requires that in addition to the control cable hot short, a low level signal for the VCT or SI signal must be present to complete the valve closure logic.

In this area of concern the following combination of cable damage must all occur to prevent continued suction to the operating CCP and cause damage to the non-operating CCP. Spurious closure of 2-LCV-062-132 can be mitigated by opening 2-LCV-62-135 or -136 prior to a start of the 2B CCP since neither the pump cable or the spurious SI initiation cables are within 20 feet of the 2V2767A (control) and 2PM461, 2PM466 or 2PM75 level indication cables.



- a) 2V2777B (control) must Hot Short and therefore makeup ½ of the logic to close the VCT Outlet Isolation Valve 2-LCV-062-133
- b) 2PM461 or 2PM466 must open to makeup ½ of the Lo-Lo VCT Level Signal
- c) 2PM75 must open to makeup ½ of the Lo-Lo VCT Level Signal
- d) 2PM1360IV or 2PM1729IV must open with their associated channel I cable to makeup ½ of the SI Signal
- e) 2PM1335I or 2PM1715I must open with their associated channel IV cable to makeup ½ of the SI Signal
- f) 2V2070A (power supply) must open or short to prevent automatic opening of the interlocked RWST Outlet Isolation Valve 2-LCV-062-135
- g) 2V2100B (power supply) or 2V2101B (control) must open or short to prevent MCR opening of the RWST Outlet Isolation Valve 2-LCV-062-136
- h) 2PP562B (power) must open or short or 2PP564B (control) must open or short to prevent starting CCP 2B after either RWST Outlet Isolation Valve has been manually opened

If any one of items (a) - (h) above does not occur, seal injection and makeup to the RCS will not be lost. Though the above cables are within 20 feet, some separation does exist. The 2B CCP cables are approximately 17 ft 3 in from the level indicator cables and approximately 19 ft 8 in from the intersection of the SG pressure indicator cables

Thermo-Lag ERFBS has been installed on the cables for CCP 2A-A in the subject area. However, the loss of a suction source as discussed above (and subsequent loss of CCP 2A-A) would be significant since the cables for CCP 2B-B could be damaged by the same postulated fire.

With the requirement for a local manual action to open 2-LCV-062-135 or -136 within 10 minutes, the current configuration is acceptable based on the following justification:

- The combustible loading in the subject area is low and is composed primarily of cable insulation. No large ignition sources are located in the immediate area.
- Automatic suppression and detection is provided in the area of concern.
- The temperature rating of the detectors is 165 °F, which would activate the suppression system prior to significant cable damage occurring.
- Large scale fire tests, such as NUREG/CR-0381 SAND78-1456, "A Preliminary Report on Fire Protection Research Program Fire Barriers and Fire Retardant Coating Test", and various other tests conducted by Sandia Laboratories for the NRC, indicate that the type of fires that could be reasonably expected to occur will not cause damage to multiple circuits in less than ten minutes. All of these tests have been conducted without automatic suppression. In tests where response time of sprinkler heads were obtained, they showed the sprinklers would fuse before the cables short circuited. Some of the same tests also show that large rooms and high ceilings (as in the case of the subject area) increase the time it takes a fire to cause cable damage.
- The stated fire brigade response time for all Auxiliary and Control Building fires is 5 minutes. This time period includes response to the alarm and verification of the location of the fire.
- Annunciator responses are specified for VCT low and high levels, as well as charging flow irregularities. This would ensure that damage to either the VCT outlet valve cables or the CCP cables was immediately recognized. Also, operator training reinforces the importance of continuous monitoring of VCT volume.

Based on the above evaluation, it is determined that the local manual action to establish suction to the RWST within 10 minutes is acceptable due to the lack of combustibles, the existence of suppression and detection, the large room volume with high ceilings, and the high level of operator awareness to the status of CCP flow.

Therefore, the manual action to locally open 2-LCV-62-135 or -136 within 10 minutes is required until the implementation of DCN F-21103-A.

Workorder: 02-000822-000

Status: CD

Entry Date: 01/28/2002 17:11

Planner/Supv: O. D. HAYES

Requested By: JAMES DVORAK 843-7691

***** SUPERVISOR *****

PER Level Rev Level 00

Identified By LINE ORGANIZATION

Self Revealing N

Problem Description The current Appendix - R program requires the Reactor Vessel Head Vent Valve fuses to be removed as a pre-emptive manual action for any declared Appendix-R fire. For fires in the 6.9 kv Shutdown Board Rooms, the accomplishment of this action may require the use of fire fighter 'turn-out' gear. Operations shift personnel are no longer qualified to utilize 'turn-out' gear nor does Operations maintain 'turn-out' gear for Operations shift personnel.

Plt Process Equip N

Potential Oper Issue N

Potential Reportable N

Potential Degrad/Noncon(91-18) N

ASME N

Systems Affected N/A

Systems Affected

Systems Affected

Systems Affected

Units Affected 1&2

Recommendation Process PER

No action, Justify

If Process,PER Level D

If Utilize ACP, No

Immed Action Taken The fire areas that require Operations to use turnout gear (6.9 KV Shutdown Board rooms; FAA-067 and FAA-081) have been evaluated during the recent Appendix R verification program. During this evaluation engineering identified that no spurious opening of the modulating head vent valves would occur. Therefore, there is no requirement to pull the fuses associated with the head vent valves for a fire in these fire areas. Subsequently, there would have been no adverse impact to mitigation of the fire for the above listed

fire areas.

If the fire prevented access to the fuse panel, no impact to safe shutdown capability would have occurred if this action was not performed. The condition identified by this PER does not have to be performed to mitigate an Appendix R fire in the 6.9 KV Shutdown Board rooms (FAA-067 and FAA-081).

Ronald Gladney

John Thomas

Recommended Resp Org OPS

Coordinated With O.D. Hayes

Init Sup-First Last O.D. Hayes

Init Sup Phone 7452

Init Department OPS

Init Sup Review Date 01/30/2002

***** LEVEL D INFORMATION *****

Lvl D Causing Org ENG/ELECT

Lvl D Causing Crew

Human Perf Proc Code OTH

Apparent Cause Inadequate evaluation of fire area interactions in the 6.9kv Shutdown Board Rooms during development of the Appendix R Fire Hazards Analysis.

Lvl D Process/Proced Appendix R Fire Hazards Analysis

Hardware Disposition N/A

Technical Justify

Init Supv-First Last O.D. Hayes

Init Supv Phone 7452

Init Sup Review Date 01/30/2002

***** OPS *****

Functional Eval (FE)

FE Due Date

Affect Operability

If Yes, Units/Actions

Offsite OP Review

Op Review BFN

Op Review BLN

Op Review SQN

Op Review WBN

Reportable

If Yes, List Basis

Ops SRO/STA-Fst Last

Ops SRO/STA Rev Date
***** FE *****

Functional Maint
Potential Degrad/Noncon(91-18) N

FE/Eval Due Date
Initial Evaluation
91-18 Degrad Nonconf
Functional/Eval Basis
Immed/Comp Measures
List Action/Measures
Engineer
Date
Supervisor
Date
OPS SRO/STA-Fst Last
OPS SRO/STA Rev Date
***** MRC *****

Process PER Level D
Interim Action Req'd N
If YES, Specify
RCA Required N
Site Qual Conc/Ver N
Assigned Resp Org OPS
CA Develop Due Date
MRC Directions
MRC CAP Review N
MRC-First Last Shirley Smith
MRC Review Date 01/31/2002
***** Resp Org *****

CA Develop Due Date
Section
POC-First Last
POC Phone
Reactivity Mgt Issue
A/B-LER
LER No.
Control of NonConfor
If Yes, Scope
Hardware Disposition
Disposition RIM/EDMS
Offsite Generic Rev
Generic Rev BFN

03/01/02

Generic Rev BLN
Generic Rev Corp
Generic Rev SQN
Generic Rev WBN
Process/Procedures

***** CAUSE DATA *****

Apparent Cause
Root Cause
Causing Org
Causing Crew
Human Perf Proc Code
HP Perf Second Code
Prev/Similar Event
Specify Search Basis
Extent of Condition

***** PER HUMAN PERF *****

***** PER CA/RC ITEMS *****

***** CLOSURE COMMENTS FROM CA *****

***** CAP CONCLUS*****

PER Completion Date
Prep-First Last
Preparer Date
Telephone No
(C) Supv-First Last
(C) Supv Ext
(C) Supv Date
(B) DptMgr-First Last
(B) DptMgr Date
MRC Reqd N
MRC Concurrence
Reason for N
MRC-First Last
MRC Date
(A) SiteSr-Fst Last
(A) SiteSr Date
(A) PltMgr-Fst Lst
(A) PltMgr Date
React Eng-Fst Lst
React Eng Date
Site Qual Conc Reqd N
Site Qual Concur
Reason for N
Site Qual First Last

Site Qual Date

***** VERIFICATION *****

Final Rev Level
Tags Rem-First Last
Tags Date
RO Verify Comp
RO Verify Date
ANI/ANII Required N
ANI/ANII Concurrence
Reason for N
ANI/ANII-First Last
ANI/ANII Date
Site Qual Concur
Reason for N
Site Qual First Last
Site Qual Date
RO Supv Clos-Fst Lst
Closure Date

***** EXTENSIONS *****

***** REVISIONS *****

***** GENERIC REVIEWS *****

***** OPERABILITY REVIEWS *****

***** TRENDS *****

Program Code FP

Program Code

Program Code

INPO Code FP1

INPO Code

NRC Code

NRC Code

Category PROCESS

Short Term Code

Impact 2.1

Behavior Code

Org / Prog Code P1

GEMS KNOWLEDGE BASED

Other

CAUSE CODES

B2F Information is too generic (not equipment-specific)

Total records selected: 1

*** END OF REPORT ***

Workorder: 00-007928-000

Status: H2

Entry Date: 08/31/2000 16:20

Planner/Supv: DENNIS LUNDY

Requested By: Ira M Heatherly 751-4393

***** SUPERVISOR *****

PER Level Rev Level 00

Identified By SELF ASSESSMENT

Self Revealing N

Problem Description Some inconsistencies between Appendix R safe shutdown data sources such as calculations, procedures, cable routing programs, and design output were identified and noted in the Safe Shutdown Corporate self-assessment. The apparent cause appears to be the multi-discipline nature of the analysis, the complexity of the analysis, the multiple documents required to understand the analysis, and the multi-organization impacts of changes.

In addition O-GO-8, Appendices L, M, and N contain generic manual actions credited in the SQN Appendix R Safe Shutdown Analysis. Some of these actions appear difficult to implement. (It is noted that the original approach in responding to an Appendix R fire was to utilize Operations "knowledge-based" response as opposed to a prescriptive "rule-based" approach. This approach was presented to and approved by the NRC before restart of SQN from the extended 1985-1988 shutdown). It is also noted in discussions with the Appendix R program development lead that operator staffing requirements for these generic actions was not individually or collectively analyzed since staffing needs were considered bounded by the MCR abandonment sequence. Since the MCR abandonment sequence (AOP-C.04) requires a minimum of four AUOs, the current AUO staffing level (minimum of seven per ODM-4.5) is believed to be adequate.

Plt Process Equip N

Potential Oper Issue N

Potential Reportable N

Potential Degrad/Noncon(91-18)

ASME N

Systems Affected N/A

03/01/02

Systems Affected

Systems Affected

Systems Affected

Units Affected 1&2

Recommendation Process PER

No action, Justify

If Process, PER Level C

If Utilize ACP, No

Immed Action Taken D. Porter and F. Roddy (OPS) have conservatively estimated the required AUO staffing to be 7 for the most limiting App. R fire. This agrees with the minimum staffing specified in ODM-4.5; therefore, current levels are adequate.

AOP-N.01, "Plant Fires," will be revised to incorporate the Fire Safe Shutdown procedure, O-GO-8. This will ensure that safe shutdown is encompassed by the general plant fire procedure, and that sufficient operator training is conducted. As an immediate action, operators are being briefed during shift turnover on the new procedure and the basic steps of how to enter and utilize the safe shutdown instructions.

Recommended Resp Org ENG/MECH

Coordinated With Dennis Lundy

Init Sup-First Last Dennis Lundy

Init Sup Phone 8214

Init Department ENG/MECH

Init Sup Review Date 09/01/2000

***** LEVEL D INFORMATION *****

Lvl D Causing Org

Lvl D Causing Crew

Human Perf Proc Code

Apparent Cause

Lvl D Process/Proced

Hardware Disposition

Technical Justify

Init Supv-First Last

Init Supv Phone

Init Sup Review Date

***** OPS *****

Functional Eval (FE)

FE Due Date

-Affect Operability
If Yes, Units/Actions
Offsite OP Review
Op Review BFN
Op Review BLN
Op Review SQN
Op Review WBN
Reportable
If Yes, List Basis
Ops SRO/STA-Fst Last
Ops SRO/STA Rev Date

***** FE *****

Functional Maint
Potential Degrad/Noncon(91-18)
FE/Eval Due Date
Initial Evaluation
91-18 Degrad Nonconf Y
Functional/Eval Basis
Immed/Comp Measures
List Action/Measures
Engineer
Date
Supervisor
Date
OPS SRO/STA-Fst Last
OPS SRO/STA Rev Date

***** MRC *****

Process PER Level B
Interim Action Req'd N
If YES, Specify
RCA Required Y
Site Qual Conc/Ver N
Assigned Resp Org ENG/MECH
CA Develop Due Date 04/27/2001

MRC Directions NOTE: This PER was brought back to MRC for upgrading to a Level B with a root cause required. COMMENTS from 03/01/2001 MRC Meeting: (1) Upgrade to a Level B with root cause required and Extent of Condition; (2) Look and understand the similarities between our Appendix R program and Security program and their systems, and see if we have other programs with similar vulnerabilities; (3) Investigation should include determining why we can't produce any engineering documents to help us

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understand this analysis; (4) New CAP due date of 03/28/2001; (5) Bring CAP back to MRC. **CAP due date changed due to extension request.**
*** COMMENTS from 05/04/2001 MRC CAP presentation: (1) Change ROOT CAUSE required to "No," Apparent cause was okay with MRC; (2) Add action to address the current training OPS is doing with AOP-N.01; (3) Add that briefing was conducted to address the lack of management monitoring (per Dennis Koehl--this will address the PII OP.2 cause; (4) Add that an effectiveness self-assessment review will be performed.

MRC CAP Review Y

MRC-First Last Shirley Smith

MRC Review Date 03/01/2001

***** Resp Org *****

CA Develop Due Date 04/27/2001

Section ENG/MECH

POC-First Last

POC Phone

Reactivity Mgt Issue N

A/B-LER N

LER No.

Control of NonConfor N

If Yes, Scope

Hardware Disposition N/A

Disposition RIM/EDMS

Offsite Generic Rev N

Generic Rev BFN

Generic Rev BLN

Generic Rev Corp

Generic Rev SQN

Generic Rev WBN

Process/Procedures

***** CAUSE DATA *****

Apparent Cause The apparent cause is that the SQN Appendix R procedures and design basis documentation have not been developed in accordance with changing regulatory and site expectations. A root cause could not be determined due to the historical nature of this issue.
See attached Cause Analysis.

Root Cause

Causing Org ENG/MECH

Causing Crew

Human Perf Proc Code

HP Perf Second Code

Prev/Similar Event N/A

Specify Search Basis

Extent of Condition During performance of corrective action # 9, the following condition was identified and documented on PER 01-9670.

The current SQN Appendix R program does not credit the use of control air for Appendix R compliance.

Therefore, manual actions are required for operation of the Steam Generator (SG) Atmospheric Relief Valves (ARVs). Also, one of the three associated pressure indicators is required for the SGs being used for cooldown. The ARVs are located in the West Valve Vaults (PCV-1-5 and -30 for SGs 1 and 4, respectively) and the East Valve Vaults (PCV-1-12 and -23 for SGs 2 and 3, respectively). Remote valve actuators and associated emergency lights have been installed for SGs 1 and 4, but not for SGs 2 and 3. Subsequently, SGs 1 and 4 are the only steam generators credited in the analysis. In two plant fire areas, FAA-31 and -39 (U1 and U2 El. 690 Pipe Gallery), all three pressure indicators for SGs 1 and 4 have essential cables terminating in panels located within the fire areas. Twenty foot separation between the redundant trains of indication does not exist for these areas. However, it has been verified on the Appendix R drawings (1-45E890-304-2 and 2-45E890-314-4) that these cables are in fact located in the subject rooms. This cable routing information was also verified on the conduit and grounding drawings.

Established fire watches in accordance with the SQN Fire Protection Report (FPR), Part II, FOR 3.7.12.

***** PER HUMAN PERF *****

Human Perform Issue: Y

Key Processes: ENG04

Key Processes: ENG05

Event Precursors

Task Demands: COMPLEX INFORM

Individual Capability UNFAMILIARITY

Work Environment:

Human Nature: SUGAR CYCLE

Barrier Evaluation: FAILED BARRIER

Error Mode: KNOWLEDGE BASED

Latent Org Weakness: DESIGN/MODIFICA

***** PER CA/RC ITEMS *****

1 Action Item Provide necessary time and resources for applicable training of personnel involved with ownership of the FSSD Program. This should include training and skill enhancing assignments which will further the knowledge for FSSD.

1 Action Type ENHANCEMENT

1 Assigned Org ENG/MECH

1 CA Due Date 04/28/2001

1 AO Concur-Fst Last WMJUSTICE

1 AO POC Fst Last BFSIMRIL

1 CA Performed After upgrade of this PER to Level B, this corrective action is superceded by corrective actions 7-14.

1 Date Completed 04/12/2001

2 Action Item Provide necessary time and resources for applicable training of personnel involved with ownership of the FSSD Program

2 Action Type ENHANCEMENT

2 Assigned Org ENG/ELECT

2 CA Due Date 04/28/2001

2 AO Concur-Fst Last JHRINNE

2 AO POC-Fst Last RTRAVIS

2 CA Performed After upgrade of this PER to Level B, this corrective action is superceded by corrective actions 7-14.

2 Date Completed 04/12/2001

3 Action Item Correct identified documentation discrepancies and resolve open items identified in Corporate Engineering Self-Assessments CRP-ENG-00-031 and CRP-ENG-00-014.

3 Action Type CORRECTIVE ACTION

3 Assigned Org ENG/MECH

3 CA Due Date 04/28/2001

3 AO Concur-Fst Last WMJUSTICE

3 AO POC Fst Last BFSIMRIL

3 CA Performed After upgrade of this PER to Level B, this corrective action is superceded by corrective actions 7-14.

03/01/02

3 Date Completed 04/12/2001

4 Action Item Correct identified documentation discrepancies and resolve open items identified in Corporate Engineering Self-Assessments CRP-ENG-00-031 and CRP-ENG-00-14.

4 Action Type CORRECTIVE ACTION

4 Assigned Org ENG/ELECT

4 CA Due Date 04/28/2001

4 AO Concur-Fst Last JHRINNE

4 AO POC-Fst Last RTRAVIS

4 CA Performed After upgrade of this PER to Level B, this corrective action is superceded by corrective actions 7-14.

4 Date Completed 04/12/2001

5 Action Item Develop program controls which ensure future integrity of FSSD Program documentation.

5 Action Type ENHANCEMENT

5 Assigned Org ENG/MECH

5 CA Due Date 04/28/2001

5 AO Concur-Fst Last WMJUSTICE

5 AO POC-Fst Last BFSIMRIL

5 CA Performed After upgrade of this PER to Level B, this corrective action is superceded by corrective actions 7-14.

5 Date Completed 04/12/2001

6 Action Item Interim Actions (See Supervisor Template for Immediate Actions regarding operability issues regarding staffing levels):

Revise AOP-N.01 (Plant Fires) to incorporate all fire safe shutdown actions and to eliminate need for MCR staff to use shutdown logic diagram. Also, conduct interim training on fire safe shutdown actions for all shift crews. This training will cover 0-GO-8 and the revision to AOP-N.01. A standing order will also be issued by 3/12/01.

6 Action Type ENHANCEMENT

6 Assigned Org OPS

6 CA Due Date 03/12/2001

6 AO Concur-Fst Last JIM DVORAK

6 AO POC-Fst Last DAVE PORTER

6 CA Performed AOP-N.01 and a standing order have been issued. Training was provided to all shift crews.

6 Date Completed 03/12/2001

7 Action Item Identify all potential FSSD paths by overlaying FSSD equipment set on flow diagrams.

7 Action Type CORRECTIVE ACTION

7 Assigned Org ENG/MECH

7 CA Due Date 03/30/2001

7 AO Concur-Fst Last JOHN THOMAS

7 AO POC-Fst Last BRENDA SIMRIL

7 CA Performed FSSD equipment from Appendix C of calculation SQN-SQS4-0127 has been identified and marked on respective flow diagrams.

7 Date Completed 03/30/2001

8 Action Item Screen for potential FSSD paths by overlaying 1987 to March 1988 changes for SOI-26.2, SQN-SQS4-0127, Cable Block Diagrams (CBD), Safety Function Position Statements (SFPS), and Cable Interaction documents.

8 Action Type CORRECTIVE ACTION

8 Assigned Org ENG/MECH

8 CA Due Date 04/13/2001

8 AO Concur-FST Last JOHN THOMAS

8 AO POC-Fst Last BRENDA SIMRIL

8 CA Performed Appendix R documents from the original program development (i.e., 1988) have been retrieved, researched, and organized to identify credited FSSD paths.

8 Date Completed 04/11/2001

9 Action Item Safety Function Review - Using SFPS documents, identify all credited Appendix R FSSD paths by safety function (e.g., Secondary side isolation, Steam Generator inventory control, etc.), key, and fire area. Review will include resolution of open items, review of DCN changes, calculation requirements, tracing of cables for FSSD components, and verification of cable interaction resolutions.

9 Action Type CORRECTIVE ACTION

9 Assigned Org ENG/MECH

9 CA Due Date 02/15/2002

9 AO Concur-Fst Last JOHN THOMAS

9 AO POC-Fst Last BRENDA SIMRIL

9 CA Performed

9 Date Completed

10 Action Item Safety Function Review - Using SFPS documents, identify all credited Appendix R FSSD paths by safety function (e.g., Secondary side isolation, Steam Generator inventory control, etc.), key, and fire area. Review will include resolution of open items, review of DCN

changes, calculation requirements, tracing of cables
for FSSD components, and verification of cable
interaction resolutions.

10 Action Type CORRECTIVE ACTION

10 Assigned Org ENG/ELECT

10 CA Due Date 02/27/2002

10 AO Concur-Fst Lst RON GLADNEY

10 AO POC-Fst Last REBECCA TRAVIS

10 CA Performed

10 Date Completed

11 Action Item Develop database to identify all FSSD components,
cables, and compliance strategies by fire area.

11 Action Type CORRECTIVE ACTION

11 Assigned Org ENG/ELECT

11 CA Due Date 02/27/2002

11 AO Concur-Fst Lst RON GLADNEY

11 AO POC-Fst Last REBECCA TRAVIS

11 CA Performed

11 Date Completed

12 Action Item Determine manual action time requirements to identify
the time-critical actions in order to verify adequacy
of minimum operator staffing levels.

12 Action Type CORRECTIVE ACTION

12 Assigned Org CORPENG

12 CA Due Date 02/28/2002

12 AO Concur-Fst Lst IRA M. HEATHERLY

12 AO POC-Fst Last IRA M. HEATHERLY

12 CA Performed SQN-SQS4-0127 appendix B has been prepared and checked
which develops the required operator action times
associated with Appendix R shutdown.

12 Date Completed 02/26/2002

13 Action Item Based on information provided by Engineering in the
comprehensive database, restructure AOP-N.01 to be a
prescriptive, room-by-room instruction for safe
shutdown in an Appendix R event.

13 Action Type CORRECTIVE ACTION

13 Assigned Org OPS

13 CA Due Date 03/15/2002

13 AO Concur-Fst Lst JAMES DVORAK

13 AO POC-Fst Last DAVE PORTER

13 CA Performed

13 Date Completed

14 Action Item Revise FSSD and FHA calculations, and other affected

Appendix R documentation (Design Criteria, Fire Protection Report, etc.).

14 Action Type CORRECTIVE ACTION

14 Assigned Org ENG/MECH

14 CA Due Date 02/28/2002

14 AO Concur-Fst Lst JOHN THOMAS

14 AO POC-Fst Lst BRENDA SIMRIL

14 CA Performed

14 Date Completed

15 Action Item Implement Operator Training on revised AOP-N.01

15 Action Type CORRECTIVE ACTION

15 Assigned Org OPS

15 CA Due Date 02/25/2002

15 AO Concur-Fst Lst JAMES DVORAK

15 AO POC-Fst Lst DAVE PORTER

15 CA Performed Initial Operation training completed during 1st cycle of requal, 2002.

15 Date Completed 02/21/2002

16 Action Item Develop Keys 38 and 39 for FSSD Calculation

16 Action Type CORRECTIVE ACTION

16 Assigned Org ENG/ELECT

16 CA Due Date 09/28/2001

16 AO Concur-Fst Lst RON GLADNEY

16 AO POC-Fst Lst REBECCA TRAVIS

16 CA Performed Keys 38 & 39 analysis was developed for FSSD Calculation, SQN-SQS4-127.

16 Date Completed 07/28/2001

17 Action Item Brief upper management on the importance of monitoring programs for changing regulatory/site expectations to preclude future OP-2 failures.

17 Action Type CORRECTIVE ACTION

17 Assigned Org ENG/MECH

17 CA Due Date 05/04/2001

17 AO Concur-Fst Lst DENNIS LUNDY

17 AO POC-Fst Lst BRENDA SIMRIL

17 CA Performed Management was briefed during MRC on 05/04/2001. All major site organizations were represented, management was advised to consider similar cases within their respective organizations.

17 Date Completed 05/04/2001

18 Action Item In addition to initial operator briefings (see CA Item #6), implement extensive training on current FSSD procedure (AOP-N.01) as part of operator

requalification training.

18 Action Type CORRECTIVE ACTION

18 Assigned Org OPS

18 CA Due Date 05/25/2001

18 AO Concur-Fst Lst KEVIN WILKES

18 AO POC-Fst Lst KEVIN WILKES

18 CA Performed Training has been completed for all groups during this
requal cycle on the new AOP-N.01.

18 Date Completed 05/23/2001

19 Action Item Conduct a follow-up self-assessment on the Appendix R
program prior to the NRC triennial fire protection
inspection tentatively scheduled for Spring 2002, to
ensure effectiveness of corrective action plan.

19 Action Type CORRECTIVE ACTION

19 Assigned Org ENG/MECH

19 CA Due Date 02/28/2002

19 AO Concur-Fst Lst JOHN THOMAS

19 AO POC-Fst Lst BRENDA SIMRIL

19 CA Performed

19 Date Completed

20 Action Item Add line item in Self Assessment Committee for
self-assessments to review programs for adherence to
changing regulatory guidance/expectations.

20 Action Type CORRECTIVE ACTION

20 Assigned Org PLTMGR

20 CA Due Date 08/30/2001

20 AO Concur-Fst Lst DENNIS KOEHL

20 AO POC-Fst Lst DON CLIFT

20 CA Performed When self-assessment outlines are presented to the
self-assessment committee for review and comment, the
committee will consider the need to assess programs for
adherence to changing regulatory guidance.

20 Date Completed 08/15/2001

21 Action Item UPDATE CALCULATIONS SQN-CSS-023 AND SQN-CSS-024 TO
PROVIDE CONSISTENCY WITH SQN FIRE PROTECTION REPORT.

21 Action Type CORRECTIVE ACTION

21 Assigned Org ENG/ELECT

21 CA Due Date 02/28/2002

21 AO Concur-Fst Lst JOHN CAMPBELL

21 AO POC-Fst Lst REBECCA TRAVIS

21 CA Performed

21 Date Completed

22 Action Item Revise design documentation to install thermolag

insulation on unit 1 and 2 SG pressure indication in
690 penetration room. Work orders to install themolag
to be written as part of the design change process.

22 Action Type CORRECTIVE ACTION

22 Assigned Org ENG/MECH

22 CA Due Date 02/28/2002

22 AO Concur-Fst Lst JOHN THOMAS

22 AO POC-Fst Lst BRENDA SIMRIL

22 CA Performed

22 Date Completed

23 Action Item Provide design change to resolve cable separation
issues identified in PER 02-00575-000 for the EGTS
room.

23 Action Type CORRECTIVE ACTION

23 Assigned Org ENG/MECH

23 CA Due Date 05/30/2002

23 AO Concur-Fst Lst JOHN THOMAS

23 AO POC-Fst Lst BRENDA SIMRIL

23 CA Performed

23 Date Completed

24 Action Item Provide design change to install themolag insulation on
power cables to resolve issue identified in PER
02-00576-000 for the 690' elevation general area.

24 Action Type CORRECTIVE ACTION

24 Assigned Org ENG/MECH

24 CA Due Date 05/30/2002

24 AO Concur-Fst Lst JOHN THOMAS

24 AO POC-Fst Lst BRENDA SIMRIL

24 CA Performed

24 Date Completed

***** CLOSURE COMMENTS FROM CA *****

***** CAP CONCUR *****

PER Completion Date 05/30/2002

Prep-First Last Brenda Simril

Preparer Date 04/26/2001

Telephone No 8515

(C) Supv-First Last John Thomas

(C) Supv Ext 8224

(C) Supv Date 04/26/2001

(B) DptMgr-First Last dennis lundy

(B) DptMgr Date 04/27/2001

MRC Reqd Y

MRC Concurrence Y

03/01/02

Reason for N

MRC-First Last SHIRLEY SMITH

MRC Date 05/04/2001

(A) SiteSr-Fst Last

(A) SiteSr Date

(A) PltMgr-Fst Lst

(A) PltMgr Date

React Eng-Fst Lst

React Eng Date

Site Qual Conc Reqd N

Site Qual Concur

Reason for N

Site Qual First Last

Site Qual Date

***** VERIFICATION *****

Final Rev Level

Tags Rem-First Last

Tags Date

RO Verify Comp

RO Verify Date

ANI/ANII Required N

ANI/ANII Concurrence

Reason for N

ANI/ANII-First Last

ANI/ANII Date

Site Qual Concur

Reason for N

Site Qual First Last

Site Qual Date

RO Supv Clos-Fst Lst

Closure Date

***** EXTENSIONS *****

Original Comp Date 03/28/2001

Current Comp Date 03/28/2001

Requested Comp Date 04/27/2001

Desc. of Actions Corrective Action Plan (Including Root Cause Analysis)

Justification A detailed resolution of the documentation issue for

the Appendix R program is being implemented by SQN NE
(MEB and EEB), with the guidance of Corp. Engineering.This plan will re-verify the existing Appendix R
compliance strategies and will establish a clear
documentation trail that will be translated into a

comprehensive (room-by-room) procedure for FSSD.

As an interim, OPS has evaluated current operator staffing levels and has determined them to be adequate for safe shutdown during an Appendix R event. Also, a new revision of AOP-N.01 was implemented which incorporates O-GO-8, to ensure that safe shutdown is included in the fire events procedure. Operators have been briefed on these changes.

The extension is requested due to the complexity of the corrective action plan, and the requirement to perform a root cause analysis. Based on the discussion presented above, this extension does not affect nuclear safety.

Interim Action Req'd N

Interim Actions Text

Sub by-First Last BRENDA SIMRIL

Date Submitted 03/19/2001

(C) Supv-First Last JOHN THOMAS

(C) Supv Date 03/19/2001

(B) Dept Mgr-Fst Lst HEYWARD R ROGERS

(B) Dept Mgr Date 03/26/2001

(A) Sitesr-First Last

(A) Sitesr Date

Site Qual Concur

Reason for N

Site Qual First Last

Site Qual Date

Site VP/Eng Support

Site VP/Eng Date

Original Comp Date

Current Comp Date

Requested Comp Date

Desc. of Actions

Justification

Interim Action Req'd N

Interim Actions Text

Sub by-First Last

Date Submitted

(C) Supv-First Last

(C) Supv Date

(B) Dept Mgr-Fst Lst

03/01/02

(B) Dept Mgr Date
(A) Sitesr-First Last
(A) Sitesr Date
Site Qual Concur
Reason for N
Site Qual First Last
Site Qual Date
Site VP/Eng Support
Site VP/Eng Date

***** REVISIONS *****

Items(s) to Revise Revise problem description to increase scope and to document additional discrepancies identified in the App. R program (See revised work description). Also request upgrade to level B.

Justification Recent self evaluation has led to further items identified within this program

Requested Revision See revised work description.

Potential Oper Issue N

Potential Reportable N

Sub By-First Last B. SIMRIL/J. THOMAS

Date Submitted 02/26/2001

(C) Supv-First Last JOHN THOMAS

(C) Supv Date 02/26/2001

(B) Dept Mgr-Fst Lst HRROGERS.

(B) Dept Mgr Date 05/14/2001

MRC-First Last SHIRLEY SMITH

MRC Date 05/14/2001

(A) SiteSr-First Last

(A) SiteSr Date

(A) PltMgr-Fst Lst

(A) Plt Mgr Date

React Eng-First Last

React Eng Date

Site Qual Concur

Reason for N

Site Qual First Last

Site Qual Date

Item(s) to Revise Corrective Action Plan

Justification Per MRC's comments on 05/04/2001

Requested Revision Add Corrective Actions #17-20 per MRC suggestions

Potential Oper Issue N

Potential Reportable N

03/01/02

Sub by-First Last BRENDA SIMRIL

Date Submitted 05/09/2001

(C) Supv First Last JOHN THOMAS

(C) Supv Date 05/14/2001

(B) Dept Mgr Fst Lst HRROGERS

(B) Dept Mgr Date 05/14/2001

MRC Frst Last SHIRLEY SMITH

MRC Date 05/14/2001

(A) SiteSr-First Last

(A) SiteSr Date

(A) PltMgr-Fst Lst

(A) Plt Mgr Date

React Eng-Fst Lst

React Eng Date

Site Qual Concur

Reason for N

Site Qual First Last

Site Qual Date

Item(s) to Revise Corrective Action #14

Justification. As directed by MRC for PER 01-5753-000

Requested Revision Ensure corrective action #14 addresses the following

issue identified by PER 1-005753-000: During performance of the SQN Fire Protection Self Assessment, it was noted that the Fire Hazard Analysis Calcs. AND the SQN Fire Protection Report did not agree with the TVA Prints and plant field installation. It is indicated in the FHA Calcs. for Fire Area FAA-070 (480V Shutdown Board Room 1B2) that the "cable tray thermal detectors provides alarm & actuates cable tray spray system". It is indicated in the SQN FPR, Part VII, Deviation 2.10, that the water spray systems for the cable trays in the Shutdown Board Rooms are actuated by line type thermal fire detection systems. Neither of these positions are entirely accurate. In actuality, as indicated on the TVA Prints (1,2-45W626-10), each spray system is actuated by a combination of line type heat detectors and ceiling mounted smoke detectors.

Potential Oper Issue N

Potential Reportable N

Sub by-First Last BRENDA SIMRIL

Date Submitted 07/03/2001

(C) Supv-First Last JOHN THOMAS

(C) Supv Date 07/03/2001

(B) Dept Mgr-Fst Lst DL LUNDY

(B) Dept Mgr Date 07/03/2001

MRC-First Last SHIRLEY SMITH

MRC Date 07/03/2001

(A) SiteSr-Frst Last

(A) SiteSr Date

(A) PltMgr-Frst Lst

(A) Plt Mgr Date

React Eng-Fst Lst

React Eng Date

Site Qual Concur

Siteqa N Reason 3:

Site Qual First Last

Site Qual Date

(C) Supv-First Last JOHN THOMAS

Item(s) to Revise Corrective Action #14.

Justification Issues identified by PER 01-000589-000 are bounded by the scope of the Appendix R upgrade project, which is the basis of this PER.

Requested Revision Ensure Corrective Action #14 addresses the following

issue, which was originally identified in PER

01-000589-000: Fire Interaction Manual, 0-GO-8, has a generic step in Section 5.0 to isolate non-essential air to containment in the event that letdown isolation valves fail open. The step directs operators to close one of the following valves: 1-FCV-32-110, 2-FCV-32-111, 0-32-718, -724, -725, or -731. The valves were not listed as Appendix R valves in the FSSD Calc, SQN-SQS4-0127, or the FHA Calc, SQN-26-D054/EPM-ABB-IMPFHA.

If letdown must be isolated following a fire, closure of either FCV-62-69, FCV-62-70, or all three of the letdown orifice isolation valves (FCV-62-72, -73, -74) would accomplish this function (Ref. Key 7 of SQN-SQS4-127). All five of the System 62 valves are air-operated and can be isolated by closing the subject System 32 valves. The primary means for operating the System 62 valves is via the electrical controls to the valves. The valves are designed to fail closed upon loss of electrical current or control air to the solenoids. It was previously determined that isolation of non-essential air to containment was provided as an

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alternate means for isolating the CVCS letdown line, and was not a required Appendix R strategy. However, upon further review of the FHA calculation, cases have been discovered where isolation of control air has been credited for Appendix R compliance (e.g., FAA-081 and -84 in FHA calc credit control air isolation to justify the fire rated barrier between the two fire areas, and Key 7 of FSSD calc notes that isolation of control air to containment can be utilized to fail close the letdown valves for RCS pressure boundary isolation).

CA #14 will ensure documentation is revised to address repositioning of one head of Appendix R lighting unit (0-LGT-247-R155).

Potential Oper Issue N

Potential Reportable

Sub by-First Last BRENDA SIMRIL

Date Submitted 07/23/2001

(C) Supv Date 07/27/2001

(B) Dept Mgr-Fst Lst HRROGERS

(B) Dept Mgr Date 07/27/2001

MRC-First Last SHIRLEY SMITH

MRC Date 07/27/2001

(A) SiteSr-First Lst

(A) Site Sr Date

(A) PltMgr-Fst Lst

(A) Plt Mgr Date

React Eng-Fst Lst

React Eng Date

Site Qual Concur

Reason for N

Site Qual First Last

Site Qual Date

Item(s) to Revise Corrective Actions #10 and #14

Justification Issues identified by PER 01-000911-000 are bounded by the scope of the Appendix R upgrade project, which is the basis of this PER.

Requested Revision Ensure Corrective Actions #10 and #14 address the following issue, which was originally identified in PER 01-000911-000:

SequoyahDs App. R Fire Safe Shutdown analysis appears

to conflict with current Westinghouse information/guidance regarding loss of RCP seal cooling. Specifically:

1. The SQN App. R analysis credits seal injection as an available RCS makeup path following an App. R fire and prescribes manual actions to restore seal injection flow if it is lost. However, fires in some areas in the Aux Bldg appear to have the potential to cause a loss of both seal injection flow and thermal barrier cooling. The manual operator actions required to restore seal injection or thermal barrier cooling probably would not be completed in time to prevent the RCP seals from overheating. (WOG DW 94-011 predicts 13 minutes for the seal to heat up to near RCS Tcold). Therefore, the Appendix R analysis appears to require restoration of seal injection flow to an overheated RCP seal, which is contrary to the guidance contained in WOG DW-94-011. (This DW directs NOT restoring seal injection or thermal barrier cooling and requires performing an RCS cooldown to cool the seal package. This guidance appears to be incompatible with the Appendix R analysis).

2. If all seal cooling is lost as a result of an App. R fire, the total expected RCP seal leakage (84 gpm) may exceed the available makeup capacity credited in the App. R analysis. This problem would be aggravated if thermal contraction due to RCS cooldown is considered.

Potential Oper Issue N

Potential Reportable

Sub by-First Last BRENDA SIMRIL

Date Submitted 09/10/2001

(C) Supv-First Last JOHN THOMAS

(C) Supv Date 09/12/2001

(B) Dept Mgr-Fst Lst HRROGERS

(B) Dept Mgr Date 09/12/2001

MRC-First Last SHIRLEY SMITH

MRC Date 09/12/2001

(A) SiteSr-First Last

(A) SiteSr Date

(A) PltMgr-Fst Lst

(A) Plt Mgr Date
React Eng-Fst Lst
React Eng Date
Site Qual Concur
Reason for N
Site Qual First Last
Site Qual Date

Items(s) to Revise Extent of condition template to include information contained in PER 01-9670. Add corrective actions to resolve identified problem.

Justification During the performance of corrective action #9, the following issue identified and documented in PER 01-9670:

The current SQN Appendix R program does not credit the use of control air for Appendix R compliance. Therefore, manual actions are required for operation of the Steam Generator (SG) Atmospheric Relief Valves (ARVs). Also, one of the three associated pressure indicators is required for the SGs being used for cooldown. The ARVs are located in the West Valve Vaults (PCV-1-5 and -30 for SGs 1 and 4, respectively) and the East Valve Vaults (PCV-1-12 and -23 for SGs 2 and 3, respectively). Remote valve actuators and associated emergency lights have been installed for SGs 1 and 4, but not for SGs 2 and 3. Subsequently, SGs 1 and 4 are the only steam generators credited in the analysis. In two plant fire areas, FAA-31 and -39 (U1 and U2 El. 690 Pipe Gallery), all three pressure indicators for SGs 1 and 4 have essential cables terminating in panels located within the fire areas. Twenty foot separation between the redundant trains of indication does not exist for these areas. However, it has been verified on the Appendix R drawings (1-45E890-304-2 and 2-45E890-314-4) that these cables are in fact located in the subject rooms. This cable routing information was also verified on the conduit and grounding drawings.

Requested Revision Add PER 01-9670 description to "extent of condition template" and add corrective action # 22 to resolve.

Potential Oper Issue N

Potential Reportable

Sub by-First Last JOHN THOMAS

Date Submitted 10/28/2001
(C) Supv-First Last JOHN THOMAS
(C) Supv Date 10/28/2001
(B) Dept Mgr-Fst Lst HRROGERS
(B) Dept Mgr Date 10/28/2001
MRC-First Last SHIRLEY SMITH
MRC Date 10/28/2001

(A) SiteSr-First Last
(A) SiteSr Date
(A) PltMgr-First Last
(A) Plt Mgr Date

React Eng-Fst Lst

React Eng Date

Site Qual Concur

Reason for N

Site Qual First Last

Site Qual Date

Item(s) to Revise Change 91-18 designation

Justification: Based on review of the work required for installation
of thermo-lag (PER 01-9670-000) this PER will be
consider 91-18 until the thermolag has been installed
or the separation requirements are met.

Requested Revision Change 91-18 designation note degraded/nonconforming
condition

Potential Oper Issue N

Potential Reportable

Sub by-First Last JOHN THOMAS

Date Submitted 11/16/2001

(C) Supv-First Last JOHN THOMAS

(C) Supv Date 11/16/2001

(B) Dept Mgr-Fst Lst DENNIS LUNDY

(B) Dept Mgr Date 11/16/2001

MRC-First Last SHIRLEY SMITH

MRC Date 11/16/2001

(A) SiteSr-First Last

(A) SiteSr Date

(A) PltMgr-Fst Lst

(A) Plt Mgr Date

React Eng-Fst Lst

React Eng Date

Site Qual Concur

Reason for N

Site Qual First Last

Site Qual Date

Item(s) to Revise Add corrective actions 23 and 24

Justification Corrective actions are needed to resolve issues
identified by PERs 02-575-000 and 02-576-000.

Requested Revision Revision required to address cable separation issues
for the EGTS room and elevation 690 general area.

Potential Oper Issue N

Potential Reportable N

Sub by-First Last JOHN THOMAS

Date Submitted 02/06/2002

(C) Supv-First Last JOHN THOMAS

(C) Supv Date 02/06/2002

(B) Dept Mgr-Fst Lst HRROGERS

(B) Dept Mgr Date 02/07/2002

MRC-First Last SHIRLEY SMITH

MRC Date 02/07/2002

(A) SiteSr-First Last

(A) SiteSr Date

(A) PltMgr-Fst Lst

(A) Plt Mgr Date

React Eng-Fst Lst

React Eng Date

Site Qual Concur

Reason for N

Site Qual First Last

Site Qual Date

***** GENERIC REVIEWS *****

***** OPERABILITY REVIEWS *****

***** TRENDS *****

Program Code DE

Program Code

Program Code

INPO Code EN2

INPO Code

NRC Code

NRC Code

Category PEOPLE

Short Term Code

Impact 9.0

Behavior Code

Org / Prog Code

GEMS

Other

CAUSE CODES

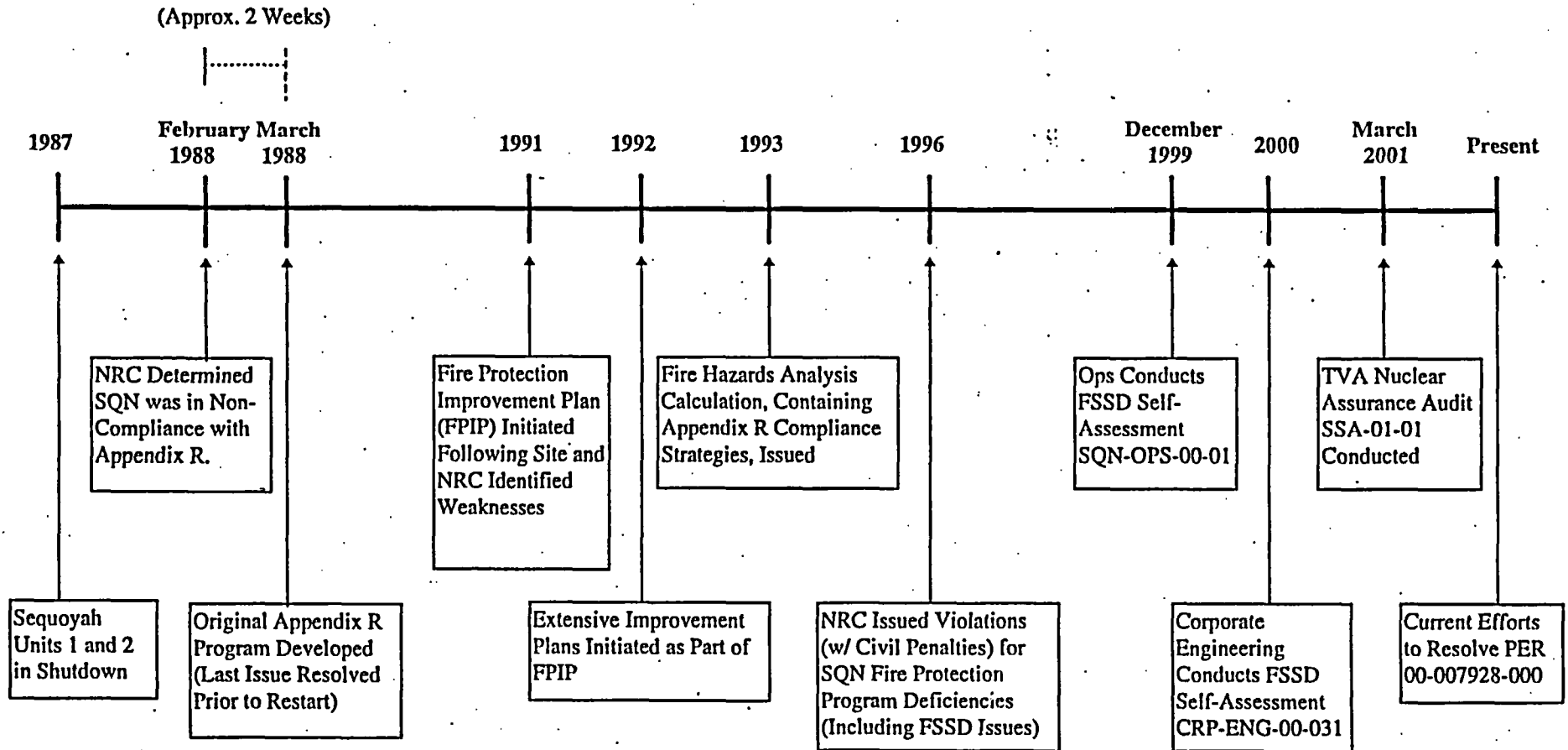
J1I Change-related training/retraining not performed or not adequate.

M1E Analysis deficiency (calculations: stress, hydraulic, thermal, electri

Total records selected: 1

*** END OF REPORT ***

EVENT TIMELINE PER 00-007928-000



Responsible Engineer:
Brenda Simril, NE - M/N

DESCRIPTION

An intensive self-evaluation process is currently being conducted to address the adequacy and ability to implement the Fire Safe Shutdown (FSSD) procedures in an Appendix R event. Self assessments conducted by SQN Fire Ops and Corporate Engineering (SQN-OPS-00-001 and CRP-ENG-00-031, respectively) identified weaknesses in the documentation of the Appendix R program. This PER was written after the Corporate Engineering self-assessment to address the apparent inconsistencies and/or discrepancies between the related documentation, and the lack of training and experience of the program owners in both Site Engineering and Operations. As the research effort into the design documentation and operations procedure progressed, it was determined that the scope of the original PER had increased significantly, and that the level of the PER should be increased to Level B. At this point, no operability impacts have been identified which could prevent the ability to place the plant in a safe shutdown condition.

IMMEDIATE ACTIONS

The following immediate actions were conducted to ensure no operability issues exist and that safe shutdown can be achieved during an Appendix R event:

- 1) Incorporate the fire safe shutdown procedure, 0-GO-8 into AOP-N.01, "Plant Fires", Rev 9. This will ensure that the procedure is incorporated into the regular requalification training.
Completed on: 03/12/2001
- 2) Conduct briefings for operators during shift turnovers prior to issuance of AOP-N.01 R9 on general usage and strategies in using the procedure.
Completed on: 03/12/2001

CURRENT DESIGN BASIS DEVELOPMENT

The SQN Appendix R program was developed just prior to plant restart in the 1987-88 timeframe. Appendix R was the last issue to be resolved prior to restart, and was accomplished in a very short duration with a team of individuals involved. Personnel from Nuclear Engineering (site and Corporate) and Operations worked concurrently to develop the Appendix R compliance strategies. The program was designed so that the procedures would be diagnostic in nature, rather than the prescriptive procedures that are required to meet current industry standards. The resulting procedure left the operators with a high level of freedom to accomplish safe shutdown via different paths for each required safety function. The methodology intended for the operators to observe the fire event developing, then react accordingly. This would allow operators to attempt to shut down using the most desirable paths first (e.g., normal letdown, normal makeup). Then, if the fire involved the components for the desirable paths, the guaranteed paths would be used (e.g., seal injection for letdown, etc.). This methodology relies upon operator skills and knowledge to effectively diagnose the problems, then react accordingly. This program was presented to the NRC prior to restart and was determined to be acceptable (Ref. NUREG-1232, Vol. 2, 05/1988, Section 3.1, "Fire Protection").

APPARENT CAUSE ANALYSIS

While the SQN Appendix R procedures and design basis documentation meet the existing licensing basis requirements, they have not been developed in accordance with changing regulatory and site expectations. The apparent cause is that once the philosophy shift to more prescriptive procedures occurred, the effort to bring the Appendix R program documentation to current regulatory compliance philosophy was not made.

The Fire Safe Shutdown procedure was originally issued as a System Operating Instruction, SOI-26.2, then was incorporated into a General Operating (GO) procedure, 0-GO-8. Training was conducted initially on the SOI, but once it became 0-GO-8, it was not incorporated into the normal operator requalification training. Per the SQN training records, the last training session on 0-GO-8 was conducted during the spring of 1997. The apparent cause of the lack of training was that the FSSD instructions relate to abnormal/emergency operating conditions, but were placed in a normal operating procedure, which are not typically included in the operator requalification training cycle. Therefore, the FSSD procedure was not given the proper priority in training, which lead to unfamiliarity of the operators with the required actions to safely shutdown the plant during an Appendix R event. As an immediate action, the procedure was incorporated into Abnormal Operating Procedure, AOP-N.01, which is part of the 2-year training cycle for operator requalification. The procedure will be revised again when the design documentation upgrade effort is complete (See Corrective Action #9). Therefore, no further corrective actions for training deficiencies associated with the FSSD procedure are required.

Due to the historical nature of this issue, a complete root cause analysis could not be performed. Therefore, the Performance Improvement International (PII) methodology to determine organizational and programmatic deficiencies was used. The failure mode was determined to be Organization-to-Program Interface Deficiency, OP-2, "Inadequate Program Monitoring or Management".

CONTRIBUTING FACTORS

- In the time since the original Appendix R program was developed, a change in the philosophy of what is adequate procedurally has occurred. The FSSD procedure was written such that operators would make diagnostic decisions and react to each situation accordingly. Since then, the NRC has shifted expectations of what acceptable operator instructions entail. Presently, the standard format for procedures are very prescriptive in nature, with specific instructions given for each scenario. These instructions are to be carried out completely and in the specific order in which they are listed. The SQN Appendix R procedure was not written in this manner, and had not been revised as industry standards evolved. The current regulatory expectations are outlined in detail in NRC Inspection Procedure 7111.05, "Fire Protection", which is the procedure utilized in the recently implemented NRC Triennial Fire Protection Inspections.
- The documentation associated with the Appendix R program is voluminous and complicated. The original Fire Operating Procedure (SOI-26.2), Fire Safe Shutdown calculation (SQN-SQS4-0127), Appendix R drawing series (ARSK drawings), Safety Function Position Statements (SFPS), Cable Interaction documents, and cable block diagrams all contain Appendix R analysis and compliance information that must be used collectively in order to fully interpret all issues and conditions that were used in the original program development. Because the program was based extensively on

personnel knowledge, and the personnel who were originally assigned to the project are no longer involved with the program, assumptions and methodologies are not clearly evident in all instances.

- A high turnover rate has occurred with the owners of the Appendix R program, combined with the absence of clear design basis documentation. Various Mechanical and Electrical engineers have been involved with the program, but no extensive turnover was conducted from the original to successive owners.

INAPPROPRIATE ACTIONS

- Much of the information requires re-validation and cohesive documentation in order to determine exactly which paths were the credited Appendix R paths. Through numerous interviews and discussions with personnel originally involved in the project, it was discovered that due to the extreme time constraints, not all paths were fully traced to determine the exact areas of concern for potential cable interactions. For instance, if the cables for a certain valve were determined to have an interaction in one fire area, and the operators agreed to take a manual action for that valve, the cables were not traced further, and a generic action was credited. As a result, there could be numerous other fire areas with the same interactions, but because the manual action was listed generically, it is unknown exactly which areas are affected without completely re-tracing the cables. The current procedure contains many of these "generic" manual actions that are to be taken regardless of where the fire originates. As a result, the required operator staffing levels are difficult to ascertain.
- The procedure contains abnormal operating conditions for bringing the plant to a safe shutdown condition during an Appendix R event. However, it was initially issued as SOI-26.2, then was incorporated into O-GO-8, which is not part of the requalification training cycle. The lack of regular training, in combination with the complexity and unique structure of the procedure led to limited operator knowledge of the Appendix R program.
- Resources were not provided to document all issues involved with the Appendix R program after NRC approval was obtained for restart. This was a management decision based on the structure of the program which relied heavily on personnel knowledge and skills. However, once the philosophy shift to more prescriptive procedures occurred, the effort to bring the Appendix R program documentation into full compliance was not made.
- Adequate training was not conducted for both Ops and Engineering personnel after the original program development. Due to the high turnover rate of employees associated with Appendix R, much time and effort has been spent trying to individually understand the methodologies and complexities of the documentation with little guidance.
- The current Fire Hazards Analysis (FHA) Calculation, SQN-26-D054/EPM-ABB-IMPFHA, was created by a contracted team of engineers several years after the original program development. The FHA contains a room-by-room listing of Appendix R compliance strategies. However, the scope of the project did not include re-analyzing the Appendix R paths to address the incomplete cable routing analysis and undocumented assumptions / methodologies discussed previously, and therefore contains some discrepancies with the original documentation.

CORRECTIVE ACTIONS

Additional corrective actions to address the apparent cause are not required due to the ongoing self-assessment program, and the designation of an Engineering Appendix R program owner. These processes will ensure that future regulatory changes are identified and translated into the SQN Appendix R program.

The objective for complete resolution of the current documentation weaknesses in the Appendix R program is to produce a procedure which specifies the manual actions required for each fire area, with no generic actions existing, and a complete FHA calculation which will be the direct input into the procedure. This will create a prescriptive type procedure, similar to the WBN and BFN Fire Safe Shutdown Procedures. Specific corrective actions are as follows:

- 1) Revise the Engineering design output calculations (FSSD and FHA calculations) to incorporate the Appendix R design basis information in a clear, concise, and understandable format.
Assigned Org: ENG/MECH; Due Date: 01/30/2002
- 2) Identify all potential FSSD paths by overlaying FSSD equipment set on flow diagrams.
Assigned Org: ENG/MECH; Due Date: 03/12/2001 (Complete)
- 3) Screen for potential FSSD paths by overlaying 1987 to March 1988 changes for SOI-26.2, SQN-SQS4-0127, Cable Block Diagrams (CBD), Safety Function Position Statements (SFPS), and Cable Interaction documents.
Assigned Org: ENG/MECH; Due Date: 04/13/2001 (Complete)
- 4) Brief upper management on the importance of monitoring programs for changing regulatory/site expectations to preclude future OP-2 failures.
Assigned Org: ENG/MECH; Due Date: 05/04/2001 (Complete)
- 5) In addition to initial operator briefings (see CA Item #6), implement extensive training on current FSSD procedure (AOP-N.01) as part of operator requalification training.
Assigned Org: OPS; Due Date: 05/25/2001
- 6) Safety Function Review - Using SFPS documents, identify all credited Appendix R FSSD paths by safety function (e.g., Secondary side isolation, Steam Generator inventory control, etc.), key, and fire area. Review will include resolution of open items, review of DCN changes, calculation requirements, verifying cable routing for FSSD components, and verification of cable interaction resolutions.
Assigned Org: ENG/MECH, ELECT; Due Date: 08/03/2001
- 7) Develop database to identify all FSSD components, cables, and compliance strategies by fire area.
Assigned Org: ENG/ELECT; Due Date: 08/03/2001
- 8) Determine manual action time requirements to identify the time-critical actions in order to verify adequacy of minimum operator staffing levels.
Assigned Org: CORPENG; Due Date: 08/17/2001
- 9) Based on information provided by Engineering in the comprehensive database, restructure AOP-N.01 to be a prescriptive, room-by-room instruction for safe shutdown in an Appendix R event.
Assigned Org: OPS; Due Date: 09/30/2001
- 10) Add line item in Self Assessment Committee to review programs for adherence to changing regulatory guidance/expectations.
Assigned Org: PLT.MGR; Due Date: 06/15/2001
- 11) Implement Operator training on revised AOP-N.01.
Assigned Org: OPS; Due Date: 01/30/2002

- 12) Conduct a follow-up self-assessment on the Appendix R program prior to the NRC triennial fire protection inspection tentatively scheduled for Spring 2002, to ensure effectiveness of corrective action plan.

Assigned Org: OPS; Due Date: 02/28/2002

EXTENT OF CONDITION

The extent of the condition for the SQN Appendix R program is that the design basis documentation was not thoroughly developed and documented when the program was originated. The program relies heavily upon the skills and knowledge of the operators to react appropriately during an Appendix R event, as opposed to having a prescribed shutdown procedure, which is not the standard compared to other operating procedures.

Per discussions with Kevin Wilkes (OPS), Jim Dvorak (OPS), and George Sanders (TRNG), no procedures for programs outside of the Appendix R program contain instructions for abnormal operating conditions in GO's, or other site procedures that are not included in the operator requalification training cycle. With the exception of 0-GO-8, the GO's contain startup and shutdown instructions for normal operation, while the EOP's and AOP's contain instructions for abnormal/emergency situations and are included in the 2-yr training cycle for operator requalification.

MRC comment (3) specified that an investigation should be conducted to determine why the engineering documents cannot be produced to aid in understanding of the analysis. The engineering design basis documentation for the Appendix R program does exist, but it is in various formats and levels of detail and is not cohesively bounded. Therefore, retrieval and reproduction of input parameters is difficult.

Comment (2) from MRC requested to examine if other programs exist with similar problems. This condition extends to and may be applicable to all major programs within SQN and TVA. However, a successful self-assessment program has been implemented throughout TVA, in which reviews are performed of all primary programs. The issues identified in this PER resulted originally from a self-assessment. A review of the recently completed and in-progress self-assessments show that all primary organizations within SQN are participating in the process. Therefore, no further corrective actions are required.

PREVIOUS SIMILAR EVENTS

This PER was written as a result of the Corporate Engineering Self-Assessment, CRP-ENG-00-031, "Fire Protection - Fire Safe Shutdown & NEI 99-05 Level 1 Assessment," conducted April - July 2000. Other self-assessments conducted by Ops and Engineering groups recognized similar weaknesses in the Appendix R program:

- 1) Corporate Engineering Self-Assessment, RIMS B45961007001, "TVA Nuclear Self-Assessment of the Sequoyah Nuclear Plant Fire Protection Program", September 1996.
- 2) SQN Operations Self-Assessment, SQN-OPS-00-001, "Fire Protection - Fire Safe Shutdown Operator Actions," December 1999.

The issues identified in these self-assessments were addressed on an item-by-item basis, which resolved only the specific examples cited in the self-assessment reports. The scope of the Appendix R documentation deficiencies was not appropriately expanded to examine the entire program for similar weaknesses.

A PER search was conducted for similar programmatic deficiencies at SQN dating back to 1985. No significant issues relative to the apparent cause of this PER were identified. The self-assessment programs will continue to identify significant weaknesses and will be addressed accordingly.