

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

BBB-S
ANA

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

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.

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 O-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

03/01/02

insulation on unit 1 and 2 SG pressure indication in
690 penetration room. Work orders to install thermolag
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 Req'd Y

MRC Concurrence Y

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-First Last 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-First Last

(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

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-Frst 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

03/01/02

• (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

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-Frst 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:

Sequoyah's 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

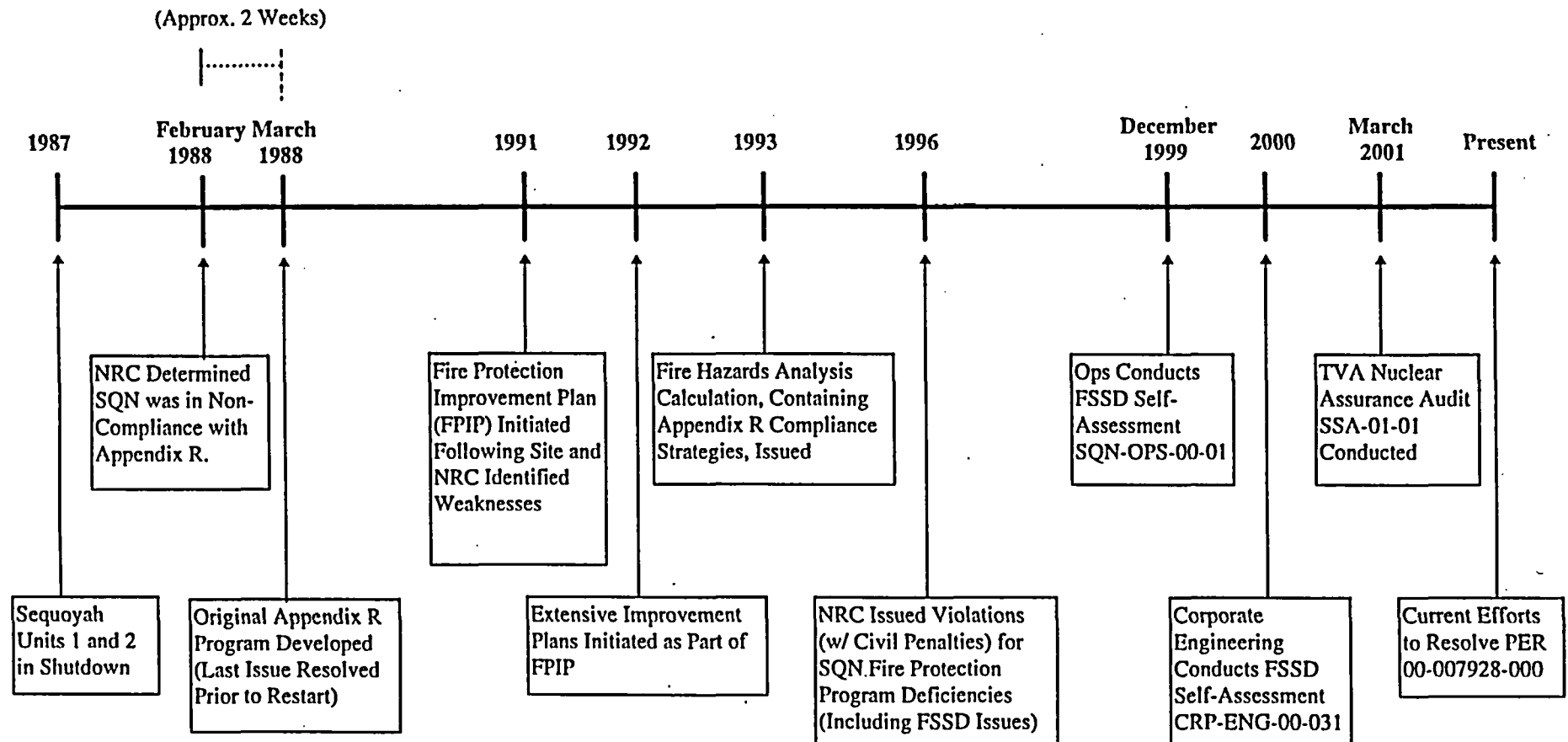
J1I Change-related training/retraining not performed or not adequate.

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

Total records selected: 1

*** END OF REPORT ***

EVENT TIMELINE PER 00-007928-000



PER 00-007928-000

Responsible Engineer:
Brenda Simril, NE - M/N

DESCRIPITON

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 71111.05, "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-IMPFA, 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.