D4.3-6 (Deficiency) TORSIONAL SHEAR STRESS EFFECTS ON WELD DESIGN

DESCRIPTION: Certain cable tray supports will be effected by torsional shear stresses during an earthquake due to their asymmetrical geometry. TVA drawing 48N1334 (reference 1) shows that cable tray supports MK4 through MK4G are loaded on one side of the support. This configuration will lead to the twisting of the vertical structural member, inducing torsional stresses into the weld between this member and the embedded plate.

Team review of TVA calculation (reference 2) revealed that the additional stresses due to torsion on the welds were not considered in the cable tray support design.

BASIS: An incomplete analysis was performed for the design of the welds by not considering the torsional shear stresses. Such consideration is required by the AISC Specification that TVA invokes in Section 3.0 of Design Criteria SQN-DC-V-a.3.4 (reference 3).

REFERENCES:

1. TVA Drawing 48N1334, Miscellaneous Steel Cable Tray Supports EL. 714.0' - Sheet 6, Rev. 15, 4/13/77
2. TVA Calculation 48N1332, 48N1333, Auxiliary Building Cable Tray Supports EL. 714.0', Rev 2, 2/6/80
3. TVA Design Criteria for Category I Cable Tray Support Systems, SQN-DC-V-1.3.4, Rev. 0, 8/20/75

SQN ITEM: D4.3-6 (Deficiency) TORSIONAL SHEAR STRESS EFFECTS ON WELD DESIGN

I. APPLICABLE TO WBN: YES X NO ____

II. ANALYSIS OF APPLICABILITY

This item does apply to WBN.

WBN cable tray supports are generally of the same type configurations as used for SQN. The type of SQN support identified by D4.3-6 (i.e., vertical cantilever tubes with tray support arms attached to only one side of the tube) is used throughout all WBN Category I structures. It is far from being one of the predominant types used, however, as an estimate, it accounts for approximately five percent of all supports.

The WBN design of the attachment of this type of support to its embedded or bolted plate, as for SQN, did not include the effects of the potential torsional shear stresses.

This item was resolved for SQN through SCR SQNCEB8622. The resolution involved performing calculations for torsional shear stress in the "worst-case" supports described above. The result of these calculations was to show that the torsional shear stesses, even in worst-case conditions, were negligible.

Given the following facts:

a. SQN and WBN cable tray supports are of the same types of designs and configuration; and

b. Although WBN seismic accelerations are higher than SQN, the WBN support sizes and stiffnesses are correspondingly larger, thus leaving in effect no net difference between WBN and SQN; and

c. The calculations done for SQN can be taken generally as proof of the negligibility of the type of stress addressed rather than as a unique case.

The SQN resolution of this deficiency can be cited as sufficient justification for the resolution of the corresponding WBN deficiency.

III. EXTENT TO WHICH THE CONDITION COULD OR DOES EXIST

N/A

SQN ITEM: D4.3-6 (Deficiency) TORSIONAL SHEAR STRESS EFFECTS ON WELD DESIGN (Continued)

IV. CORRECTIVE ACTION REQUIRED

A memorandum will be issued by November 15, 1986 instructing all cable tray support designers to reference SCR SQNCEB8622 in the calculation package for new or revised support calculations as justification for neglecting the effect of torsional shear stresses at support/baseplate walls.

V. ACTION TO PREVENT RECURRENCE

N/A

VI. RESOURCE REQUIREMENT AND SCHEDULE

See Part IV. Issue memorandum by November 15, 1986.

U4.3-7 (Unresolved Item) CABLE TRAY SUPPORT BASEPLATE ANALYSIS

DESCRIPTION: TVA drawing 48N1333 (reference 1) shows that a surface base plate with threaded bolt anchors was used for certain cable tray supports. TVA calculation (reference 2) shows that the design of the base plate and the anchor bolts used the rigid base plate analysis. TVA design standard (reference 3) requires that plate flexibility be considered to determine the anchor tensile loads.

BASIS: Although the design of this particular base plate was performed before the issuance of the design standard, there is a possibility that cable tray support base plates designed recently might still be using the rigid base plate approach. A nonconformance report (reference 4) written on the base plate design for pipe support states that the requirements of the design standard have not been followed since the issuance of the standard.

REFERENCE:

1. TVA Drawing 48N1333, Miscellaneous Steel Cable Tray Supports EL 714.0' - Sheet 5, 7/16/75
2. TVA Calculation 48N1330, Auxiliary Building Cable Tray Supports Below El. 734.0', 2/23/79
3. TVA Design Standard DS-C1.7.1, General Anchorage to Concrete, Rev 3, 11/16/84
4. TVA Nonconformance Report SQN Civil Engineering Branch 8404, 5/10/84

SQN ITEM: U4.3-7 (Unresolved Item) CABLE TRAY SUPPORT BASEPLATE ANALYSIS

I. APPLICABLE TO WBN: YES X NO ____

II. ANALYSIS OF APPLICABILITY

The situation described in this item, along with a number of other related baseplate design items, is being addressed under WBN SCR WBNCEB8623. This SCR was reportable and is being tracked as a 50.55(e) item. The corrective action and action required to prevent recurrence is scheduled to be submitted in a final report to NRC by January 28, 1987.

III. EXTENT TO WHICH THE CONDITION COULD OR DOES EXIST

Based on current knowledge of embedded plate design for cable tray supports, it is likely that instances of the application of rigid plate design techniques will be found to exist as well for surface-mounted plates for cable tray supports. However, there are no cases identified to have occurred after issuance of the design standard. The extent of this presumed problem will be evaluated in the course of the resolution of SCR WBNCEB8623. The text quoted below is from the corrective action statement of SCR WBNCEB8623:

"b. Cable Tray Supports of Surface Mounted Baseplates

Review the design for cable tray supports which use expansion anchored plates to determine if baseplate flexibility and construction tolerances were adequately considered in the design. Perform review based on the anchorage allowables in effect for the original design. If errors are found, identify a condition adverse to quality unless the deficiency is covered by an existing condition."

IV. CORRECTIVE ACTION REQUIRED

Will be addressed during the resolution of SCR WBNCEB8623 by fuel load. See III above.

V. ACTION TO PREVENT RECURRENCE

Will be addressed during the resolution of SCR WBNCEB8623 by fuel load. See III above.

VI. RESOURCE REQUIREMENT AND SCHEDULE

Will be addressed during the resolution of SCR WBNCEB8623 by fuel load. See III above.

04.3-8 (Observation) BASEPLATE DESIGN CRITERIA

DESCRIPTION: TVA pipe support design manual (Reference 1) section 7.18.2 states that base plates are analyzed as rigid plates for Sequoyah. This is in contradiction to TVA civil design standard (Reference 2) where it states that flexible plate analysis will be performed to determine the anchor tensile loads. The team determined that TVA engineers currently use the flexible plate analysis for base plate design. The pipe support manual should be revised to reflect the actual methodology used and eliminate inconsistencies in the design guidance.

REFERENCES

1. TVA Pipe support Design Manual, Rev, 4/22/83.

2. TVA Civil Design Standard DS-C1.7.1, General Anchorage to Concrete, Rev 3, 11/16/84.

SQN ITEM: 04.3-8 (Observation) BASEPLATE DESIGN CRITERIA

I. APPLICABLE TO WBN: YES X NO ____

II. ANALYSIS OF APPLICABILITY

It was recognized some time ago that WBN pipe support designs must consider baseplate flexibility. The WBN approach involved incorporating baseplate flexibility into future designs and evaluating past designs through the completion of the NRC Bulletin 79-02 effort. Section 7.18 of the WBN PSDM addresses flexible baseplate design. Section 7.21 includes two methods of flexible design (BASEPLATE II & FLXPLT). The PSDM was made fully compatible with the TVA Civil Design Standard DS-C1.7.1 under Revision 3 of the PSDM dated July 23, 1984. All subsequent support designs have been to these standards, including the unit 2 Review Program that updated all unit 2 engineered pipe support and 47A053 series typical designs. The Unit 1 Hanger and Analysis Update Program will review and update all unit 1 engineered pipe support designs.

WBN's response to NRC Bulletin 79-02 involved a sampling program for 496 engineered pipe supports and was performed to determine the expansion anchor factor of safety and evaluate the effects of items such as baseplate flexibility. The result showed with 95-percent confidence that no more than three-percent of the supports had factors-of-safety less than five and none had factors-of-safety less than four. NRC initially agreed that the sampling program was adequate for licensing, but included an agreement to review and update all unit 1 engineered supports to Bulletin 79-02 requirements before the first refueling outage.

II. EXTENT TO WHICH THIS CONDITION COULD OR DOES EXIST

N/A

IV. CORRECTIVE ACITON REQUIRED

The Unit 1 Hanger and Analysis Update Program will lead to the resolution of this commitment before unit 1 fuel loading.

V. ACTION TO PREVENT RECURRENCE

The Unit 1 Hanger and Analysis Update Program will lead to the resolution of this commitment before unit 1 fuel loading.

VI. RESOURCE REQUIREMENT AND SCHEDULE

N/A

04.3-9 (Observation) DESIGN CRITERIA FOR TANKS

DESCRIPTION: The design criteria for seismically qualifying tanks (Reference 1) states in paragraph 2.3 that the natural frequency of a tank when considered to be full of fluid should not be less than 33 hertz.
A review of the seismic analysis of the refueling water storage tank (Reference 2) showed that the fundamental frequency of this tank is about 6.5 hertz.

The seismic analysis performed showed that the 33 hertz criteria could not be met. The seismic loads were calculated for a flexible tank and the tank was designed to withstand such loads. Although the team does not question the structural adequacy of the tank, the design criteria does not include analysis methods for flexible tanks and should be so revised.

REFERENCES

1. TVA Design Criteria SQN-DC-V-13.6, Design Criteria for Seismically Qualifying Tanks and Reservoirs and their supports, 2/23/73.

2. TVA Calculation Modifications to Correct Design Deficiency and Increase Capacity Refueling Water Storage Tanks, 8/22/75.

SQN ITEM: 04.3-9 (Observation) DESIGN CRITERIA FOR TANKS

I. APPLICABLE TO WBN: YES ____ NO X

II. ANALYSIS OF APPLICABILITY

The WBN design criteria for seismically qualifying tanks (reference 1) states in section 1.0, "Where there is a conflict between these criteria and the detailed specifications, the detail specifications will govern." The contract for the WBN refueling water storage tank (RWST) is 76K70-820613 and the specification is WBNP-DS-1935-2726-R00. Section 10 of the specification details the seismic requirements for the RWST. This section specifies "These tanks shall be designed by the rules of Appendix C and this specification." Reference 2 is Appendix C of the specification. Reference 2 is applicable to soil supported tanks. Section 2.14.1 of states, "Such tanks may be within building structures depending upon liquid to be contained or they may be above grade exposed to atmospheric conditions." Reference 2 allows for the analysis of rigid or flexible tanks (section 3.2.3 of the reference 2). Therefore, based on the above, the design of the RWST at WBN does meet the requirements of reference 1 and reference 1 does not need to be revised.

Confirmation of the seismic loads used for design of the RWST and its foundation was provided by an advanced finite element analysis which accounted for soil-structure and fluid structure interactions (Reference 3).

III. EXTENT TO WHICH THE CONDITION COULD OR DOES EXIST

N/A

IV. CORRECTIVE ACTION REQUIRED

N/A

V. ACTION TO PREVENT RECURRENCE

N/A

VI. RESOURCE REQUIREMENT AND SCHEDULE

N/A

REFERENCES

1. TVA Design Criteria WB-DC-40-31.6, "Design Criteria for Seismically Qualifying Tanks and Reservoirs and Their Supports," January 29, 1973.

2. TVA Design Criteria BLN-50-D714, "Design Criteria for Category I ASME Code Class 2 and 3 Pressure Vessels and Storage Tanks and Their Supports Watts Bar Nuclear Plant."

3. TVA CEB Report CEB 81-41, "Watts Bar Nuclear Plant Seismic Analysis of Refueling Water Storage Tank."

U5.3-2 (Unresolved Item) SIZING CALCULATIONS

DESCRIPTIONS: The team reviewed the operation of the steam driven AFW system during a loss of ac power. The steam throttle valve and the vent fan for this system operate continuously during operation of the system and are supplied from the 125 V dc station battery system. The team reviewed the battery sizing calculations to verify that the battery systems capacity is adequate to meet the system demand.

The team determined that TVA does not have proper calculations for the sizing of the station batteries. The existing calculations (Reference 3) do not address the correction factors for the operating ambient temperature and for aging. The calculations were performed before initial operation of the plant, and have never been reviewed or revised; although, the loading profile of the dc system has undergone changes.

In the absence of analysis and/or calculations the team could not verify that the installed equipment has adequate capacity to meet the design demands. Although the battery calculation was performed before the issuance of IEEE-485 (Reference 2), it is necessary to use temperature correction and aging factors for assessment of the battery's performance. Changes to the loading must be evaluated to prove that the battery system will have a sufficient capacity to meet the design commitment per FSAR Section 8.3.2.1.

The team examined the system to determine if a similar problem exists with the sizing calculations for the battery charger and the 12 V vital ac inverter. TVA informed us that sizing calculations for these components do not exist. These calculations were performed before procurement of these components but were not documented.

BASIS: TVA has committed to implement the guidance of ANSI N45.2.11. Section 3 of this standard states that:

"3.1 General

> Applicable design inputs, such as design bases, regulatory requirements, codes and standards, shall be identified, documented and their selection reviewed and approved. Changes from specified design inputs, including the reasons for the changes, shall be identified, approved, documented and controlled.
>
> The design input shall be specified on a timely basis and to the level of detail necessary to permit the design activity to be carried out in a correct manner and to provide a consistent basis for making design decisions, accomplishing design verification measures, and evaluating design changes.

3.2 Requirements

The design input shall include but is not limited to the following, where applicable:

1. Basic functions of each structure, system and component.
2. Performance requirements such as capacity, rating, system output.
3. Codes, standards, and regulatory requirements including the applicable issue and/or addenda.
4. Design conditions such as pressure, temperature fluid chemistry and voltage.
6. Environmental conditions anticipated during storage, construction and operation such as pressure temperature, humidity, corrosiveness, site elevation, wind direction, nuclear radiation, electromagnetic radiation and duration of exposure...."

REFERENCES

1. Sequoyah Unit 1 FSAR Section 8.3.2.1.1.
2. IEEE-Standard 485-1978-IEEE Recommended Practice for Sizing Large Lead Storage Batteries for Generating Stations and Substations.
3. Battery contract #73C8-83800 Calculation for Battery Sizing.

SQN ITEM: U5.3-2 (Unresolved Item) SIZING CALCULATIONS

I. APPLICABLE TO WBN: YES X NO _____

II. ANALYSIS OF APPLICABILITY

The original sizing calculation for the vital inverters has not been maintained. SCR WBMEEB8571 addresses the deficiencies related to the minimum set of electrical calculations required.

Calculation WBPE2368604002-125-V dc vital dc Power System Design verification was issued on May 13, 1986 to verify that the 125-V vital batteries and associated battery chargers are properly sized and capable of performing their safety function.

III. EXTENT TO WHICH THE CONDITION COULD OR DOES EXIST

As stated above, calculations are complete and adequate to cover the 125-V vital batteries and chargers; however, no current calculation exists that demonstrates the acceptability of the 120-V ac vital inverter ratings.

IV. CORRECTIVE ACTION REQUIRED

A calculation to verify that the 120-V ac vital inverter is properly sized and capable of performing its safety function will be scheduled for completion before fuel loading.

V. ACTION TO PREVENT RECURRENCE

EEB Policy Memorandum (PM) 86-02 has been issued identifying the set of calculations that must be performed before fuel loading and calculations that can be performed after fuel loading.

EEB PM 86-15 has also been issued identifying the requirement to prepare detailed checklists of all calculations listed in PM 86-92 and any additional plant-specific calculations identified per the requirements of PM 86-02. These checklists will give the Lead Engineer the capability to monitor the resolution of calculations deficiencies and performance of required calculations. Once the checklists are prepared an assignment of responsibility for each calculation will be made to the WBEP Principal Engineers. This assignment of responsibility will involve an acknowledgement of the calculations to support the electrical design and a commitment to ensure the calculations are kept current. This will be accomplished by ensuring that the calculations are maintained in accordance with NEP Procedures NEP-3.1, "Calculations," and NEP-6.1, "Change Control."

VI. RESOURCE REQUIREMENT AND SCHEDULE

Issue calculation to verify the 120-V ac vital inverter before fuel loading of unit 1.

U5.3-3 (Unresolved Item) MOTOR OPERATED VALVE THERMAL OVERLOAD TRIP SETTING

DESCRIPTION: The team reviewed elementary diagrams (Reference 4) for motor operated valves and noted that the thermal overload trip for the ESF motor operated valves is not bypassed by an accident signal. The team noticed that the overload trip settings of these thermal overload relays were set by the TVA construction staff, in accordance with the Procedure SNP-INSP-INSTR #17 (Reference 1). This procedure directs the technician to set the relays based on a range of 16-30 seconds of locked rotor current. The team found that some motor operated valves take up to 60 seconds to complete their travel under the degraded voltage conditions; therefore, the arbitrary setting of 16-30 seconds may result in a trip by the overloads during valve travel. The team found that the setting duration of 16-30 was transmitted to the #315-LB-K(2) dated May 8,1974 (Reference 2). However, the Office of Engineering did not perform analyses on a case-by-case basis to verify that a spurious trip of the thermal overload during the travel will not prevent the valve from completing its intended safety function.

BASIS: Incomplete travel of the motor operated valves may defeat the engineered safety system's purpose of safe shutdown by preventing the safety systems to initiate or complete the required safety functions on demand.

REFERENCES

1. SNP-INSP. INSTR. #17-Overload Relay Heater Inspection
2. Memo-315-LB-K(2), 5/8/74 - Selecting and Testing of MCC Overload Elements. Stations.
3. 45N779-SH.1 through 16 - Wiring diagrams, 480 V Shutdown Auxiliary Power Schematic Diagrams.

SQN ITEM: U5.3-3 (Unresolved Item) MOTOR-OPERATED VALVE THERMAL OVERLOAD TRIP SETTING

I. APPLICABLE TO WBN: YES X NO _____

II. ANALYSIS OF APPLICABILITY

WBN has always had the requirement for motor thermal overloads to be bypassed by an accident signal for all active valves. An SCR (WBNNEB 8630) was recently identified that stated certain active valves did not have their thermal overloads bypassed.

III. EXTENT TO WHICH THE CONDITION COULD OR DOES EXIST

All active valves required to perform safety functions are not presently bypassed because 18 valves which have been added to the WBN active valve list as identified in the resolution of the SCR.

IV. CORRECTIVE ACTION REQUIRED

Thermal overloads for the identified valves will be bypassed by an accident signal. Calculations identifying these valves will be revised.

V. ACTION TO PREVENT RECURRENCE

The bases for identifying which valves are active has been developed and is currently being used in determining those valves which are designated active. Calculations identifying valves will be kept current in accordance to the Nuclear Engineering Procedures. In addition, criteria has been developed and issued defining the requirements that must be met when bypassing thermal overloads.

VI. RESOURCE REQUIREMENT AND SCHEDULE

All corrective actions will be completed before fuel loading.

U5.3-4 (Unresolved Item) DIESEL GENERATOR LOADING CALCULATIONS

DESCRIPTION: The team reviewed the diesel generator load analysis (Reference 1) and 6.9 kv one-line drawings (Reference 2) and noticed the following items:

The diesel generator loading analysis was carried out using a 540 hp load lumped on the 25 second step of the sequencer for the AFW pump motor. However, in reality the load gradually increases from 486 hp to 540 hp in seven seconds. This seven second ramp overlaps the 30 second step, which is the critical step for diesel loading. TVA did not perform an analysis to examine the effects of this situation on the voltage and frequency response and recovery limits to verify that the response is within the values given in Regulatory Guide 1.9 (Reference 3).

The diesel generator loading analysis assumes that all the pressurizer heaters are turned "off" by the accident signal; however, the loading table correctly shows heaters which are energized. The 6.9 kv bus-one line drawing (Reference 2) has a drafting error in note No.6 in which tripping of the pressurizer heaters was omitted. These are considered documentation items in that the calculation used the correct configuration.

One assumption of the analysis states that the transformer nameplate rating was used for the load analysis; however, the loading table indicates that the actual connected loads ratings were used. The load table shows that the transformer load on the 6.9 kv bus consists of two-1500 kva and one-300 kva transformers. However, design drawings (Reference 2) show that there are three 1500 kva and one 300 kva transformers. The team found that TVA did not analyze the effects of the third 1500 kva transformer, which remains connected to the 6.9 kv bus during the zero block loading along with the other two 1500 kva and one 300 kva transformers. This will affect the frequency and voltage recovery of the diesel generator in the two second interval between closing of the diesel breaker and application of the first block load.

BASIS: TVA has committed to implement guidance of Regulatory Guide 1.9 (Reference 3). Section C-4 of this guide states that "The diesel generator unit design should be such that at no time during the loading sequence should the frequency and voltage decrease to less than 95% of nominal and 75% of nominal respectively (a larger decrease in voltage and frequency may be justified for a diesel generator unit that carries only one large connected load). Frequency should be restored to within 2% of nominal and voltage should be restored to within 10% of nominal within 60% of each load sequence time interval." ANSI-N45.2.11 (Reference 4) Section 4, stipulates use of correct design inputs for the design analysis.

U5.3-4 (Unresolved Item) DIESEL GENERATOR LOADING CALCULATIONS (continued)

REFERENCES

1. Diesel Generator Load Analysis #B25-86-0204-300.
2. TVA Drawing #45N-724-1,2,3,4 - 6.9 kv One Line Diagram TVA Drawing #45N-765 Sh.1 through Sh.18, and .69 kv shutdown Aux Power Schematic Diagram.
3. U.S. NRC-RG-.9, Rev 2, - Selection, Design and Qualification of Diesel-Generator Units used as Standby (on site) Electric Power Systems at Nuclear Power Plants.
4. ANSI-N45.2.11, 1975 - Quality Assurance Requirements for the Design of Nuclear Power Plants.

SQN ITEM: U5.3-4 DIESEL GENERATOR LOADING CALCULATIONS

I. APPLICABLE TO WBN: YES X NO _____

II. ANALYSIS OF APPLICABILITY

Problems with WBN's diesel generator loading has been documented by a SCR WBNEEB8538. This SCR has been determined reportable and is being tracked as a 50.55(e) item.

III. EXTENT TO WHICH THE CONDITION COULD OR DOES EXIST

Condition exists for all WBN diesel generators.

IV. CORRECTIVE ACTION REQUIRED

The reanalysis of diesel generator (DG) loading sequence for blackout condition, for blackout concurrent with an SI, and for blackout with a delayed SI has been completed. Specific corrective action has been identified as: 1) Removal of all non safety-related loads from the DG loading, 2) manually control by administrative procedures all loads in 1 after the DG sequence is complete. Extensive rewiring of the shutdown logic relay panels is required to implement the new relay logic.

V. ACTION TO PREVENT RECURRENCE

TVA is developing detailed procedures for the preparation of DG loading sequence calculations as well as other electrical calculations. This procedure is a portion of TVA's long term program for upgrade of electrical calculations due to identified deficiencies in this area.

VI. RESOURCE REQUIREMENT AND SCHEDULE

Dedicated resources are being applied to correct these deficiencies with engineering completion scheduled for late November 1986. Any required field modifications will be completed before fuel loading.

U5.3-5 (UNRESOLVED ITEM) LOSS OF CONTROL POWER ANNUNCIATION

DESCRIPTION: The team reviewed TVA drawings (References 1 and 2) for the 6.9 kv feeder breaker control circuit for the AFW pump motor and noticed that the breaker control circuit does not have a provision to detect and annunciate the loss of control power. In the event of loss of control of power, the circuit breaker will not be able to close when required. This will prevent automatic operation of the AFW pump, a required function important to the safety of the plant. TVA informed the team that the control room operators monitor the breaker status indicator lights. The "off" status of these lights (neither opened nor closed indication) can be taken as an indication of the loss of control power. TVA further informed the team that at the end of each shift, a documented record is prepared by the operator for those lights which have changed their status (from "ON" to "OFF" or from "OFF to "ON"). The team acknowledged these comments; however, noted that it is possible that a change in status of these lights could go unnoticed by the operators for some time.

Regulatory Guide 1.47 states that, "A practical indicating system covering a wide range of commonly expected conditions, however could be designed if it included provisions for automatic indication of each bypass or deliberately induced inoperable condition that meets all three of the following guidelines.

1. The bypass or inoperable condition affects a system that is designed to perform automatically a function that is important to the safety of the public,

2. The bypass will be utilized by plant personnel or the inoperable condition can reasonably be expected to occur more frequently than once per year, and

3. The bypass or inoperable condition is expected to occur when the affected system is normally required to be operable.

The team feels that AFW system meets the three conditions stated above. The AFW system is important to the safety of the public; plant operators use removal of control power to maintain equipment; and the inoperable condition is expected to occur when the AFW system is required such as during accident conditions. In addition, it is possible that loss of control power may occur due to blown fuses, short circuits, and open circuits.

RG 1.47 further states that "Bypass indication should aid the operator in recognizing the effects on plant safety of seemingly unrelated or insignificant events. Therefore, the indication of bypass conditions should be at the system level, whether or not it is also at the component or channel level. For example, in a design which utilizes a dc power system to

U5.3-5 (Unresolved Item) LOSS OF CONTROL POWER ANNUNCIATION (continued)

control circuit breakers, de-energizing during maintenance should result in an indication for each safety system whose operation is dependent on that power system that the safety system is inoperable." The team feels that the above guidance also applies when de-energizing of dc control power occurs automatically due to system fault.

BASIS: TVA has committed to implement the guidance of Regulatory Guide 1.47, Bypassed and Inoperable Status Indication (reference 3). Loss of control power for the breaker control circuit will prevent the auxiliary feedwater pump from being able to respond to system demand, yet this condition is not indicated as an inoperability at the system level.

REFERENCES

1. TVA Drawing #45N-724-1, 2, 3, and 4, 6.9kv One Line Diagram.

2. TVA Drawing #45N-765 SH. 1 through 18, 6.9kv Shutdown Auxiliary Power Schematic Diagram.

3. USNRC RG 1.47 - Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems.

SQN ITEM: U5.3-5 (UNRESOLVED) LOSS OF CONTROL POWER ANNUNCIATION

I. APPLICABLE TO WBN: YES _____ NO X

II. ANALYSIS OF APPLICABILITY

The item addresses TVA's compliance with Regulatory Guide (RG) 1.47, Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems. TVA presently has an NRC commitment to implement RG 1.47 and has developed a Functional Requirements Document (FRD) which details conceptually the requirements to be met. The FRD was developed on TVA's interpretation of the RG requirements, as well as a review of industry implementation of RG 1.47. The FRD is being used to develop the detailed engineering requirements that implement the hardware and software requirements. TVA will submit the FRD for NRC comment and will follow with a meeting to discuss implementation methods.

III. EXTENT TO WHICH THE CONDITION COULD OR DOES EXIST

N/A

IV. CORRECTIVE ACTION REQUIRED

N/A

V. ACTION TO PREVENT RECURRENCE

N/A

VI. RESOURCE REQUIREMENT AND SCHEDULE

N/A

05.3-6 (Observation) VOLTAGE DROP CALCULATIONS

DESCRIPTION: The team examined calculation B43-86-0210-924 (Reference 1) and a draft calculation (Reference 2) to verify that the input terminal voltages at the AFW pump motor feed breaker control circuit, at the steam throttle valve and at the vent fan of the steam driven AFW pump system are adequate.

The team noted that calculation B43-86-0210-924 (Reference 1) has many unverified assumptions. Since the validity of the results of this calculation depend on the correctness of these assumptions, the team feels that assumptions 3.5 and 3.9, explained below, should be verified before restart. Assumption 3.5 states that drawings used are of the latest revision and all equipment has been installed. The calculation indicates that this assumption is unverified. The team feels that this should be verified because the installed length of cables and wires can be different and thus can change the value of the actual voltage drop. Similarly, the latest revision of the drawings may show changes in the loading of the circuit, which in turn will change the calculated values of the voltage drop. Assumption 3.9 states that the minimum pickup voltage for the Westinghouse AR Series relay is approximately 85 VDC. The calculation indicates that this value is unverified. The team feels that in the absence of the correct value of pickup voltage, adequacy of the available voltage (after voltage drop) at the input terminals of the control circuit cannot be verified.

The draft calculation (Reference 2) for the voltage drop for the 125 VDC valve and the vent fan circuit was noted to have the following calculation errors.

The cable length for cable 2SG223 was taken as equal to the distance between junction box JB-3044 and the motor starter. The correct length should be twice this length since the actual circuit run is from the junction box to the motor starter and back. The team noticed that the temperatures used for cable resistance correction was not consistent between the two calculations. One calculation uses 90°C, and the other calculation uses 40°C. These errors and inconsistencies should be corrected and were provided to TVA.

REFERENCES

1. Calculation B43-86-0210-924 - 125 VDC Vital Instrument Power System Voltage Drop Study.

2. Calculation (Not assigned) Rough Draft-Voltage Drop Study for 125 VDC Steam Throttle Valve and Vent Fan for Steam Driven AFW Pump System.

3. ANSI-N45.2.11-1974 - Quality Assurance Requirements for the Design of Nuclear Power Plants.

SQN ITEM: 05.3-6 (OBSERVATION) VOLTAGE DROP CALCULATIONS

I. APPLICABLE TO WBN: YES X NO _____

II. ANALYSIS OF APPLICABILITY

1. WBN voltage drop calculations contain unverified assumptions whose correctness could determine the validity of calculation results. This condition is analyzed in Section III, IV, V, and VII. This condition is applicable to WBN and is being tracked by SCR WBNEEB 8571.

2. There is an effort under way to identify and evaluate all assumptions used in the set of calculations that must be performed before fuel loading per EEB PM 86-02. There is an NEP 3.1 requirement to identify on the Calculation's Cover Sheet if unverified assumptions exist. Calculations identified by EEB PM 86-02 that were created before this requirement will also be evaluated.

   The plant-specific calculations not in PM 86-02 will also be addressed.

III. EXTENT TO WHICH THE CONDITION COULD OR DOES EXIST

All WBN voltage drop calculations contain unverified assumptions which require evaluation.

IV. CORRECTIVE ACTION REQUIRED

The lead engineer is responsible for determining the unverified assumptions requiring resolution before fuel loading. After this is accomplished these assumption must be refined or justified and their respective studies updated.

V. ACTION TO PREVENT RECURRENCE

A system is in existence and defined in Engineering Procedure NEP 3.1 for clearing unverified assumptions, no further action is required.

VI. RESOURCE REQUIREMENT AND SCHEDULE

All corrective actions to be completed before fuel load.

D6.1-1 (Deficiency) AFW PUMP DISCHARGE PRESSURE SWITCH RATINGS

DESCRIPTION: Auxiliary feedwater pump discharge pressure switches 1-PS--148, -156, -164, and -171 provide a safety-related interlock for positioning of bypass control valves. Gilbert/Commonwealth (G/C) reviewed two Engineering Change Notices (ECNs) where existing pressure switches were replaced with environmentally qualified devices (References 1 through 4). The team noted that G/C had not compared the technical requirements for the replacement instruments with the original procurement instrument data sheet to assure that design basis requirements remained satisfied. G/C stated that such a comparison was not in their assigned scope of review. The instrument data sheet is used to specify technical requirements for procurement of the pressure switches from equipment vendors. Consequently, the team performed this design basis comparison and determined that an intermediate replacement had also been made for these pressure switches. Results of this comparison are provided below:

Technical Characteristic	Original (Ref. 5)	Interim (Ref.6)	Current (Ref. 7)
Proof Pressure	4500 psi	*2000 psig or 150% des.pr.	2000 psig or 150% des.pr
Maximum Pressure	1200 psig	1650 psig	*1085 psig
Process Connection	0.5 inch	0.25 inch	0.25 inch
Contact Rating	0.4 ampere	0.5 ampere	0.5 ampere
Contact Voltage	140 VDC	*125 VDC 140 VDC	
Contact Action	Close-decr.	*Open-decr.	Open-decr.
Trip Setpoint	500 psig *485.3 psig	*400 psig	
Adjustment Range	285 to 660 psi	*5 to 200 psig	45 to 550 psig
Manufacturer	Custom Comp.	Asco	Static-O-Ring

The team found no indication that those changes denoted by an asterisk (*) to the original design basis for the interim or current replacements had been technically documented. TVA stated that existing plant documentation was not revised when these modifications were initiated; rather, a new instrument data sheet was prepared in each instance.

For the interim modification, the voltage specification of 125 volts dc was in error since it did not accommodate a battery recharging condition. The trip setpoint change to 485.3 psig was not supported by a calculation and implied an unrealistic setpoint accuracy for this instrument.

The current modification has a design basis impact for maximum pressure and trip setpoint characteristics. The 1085 psig maximum design pressure did not provide for additional margin above the maximum system operating pressure, and the trip setpoint change to 400 psig was not supported by an appropriate calculation.

D6.1-1 (Deficiency) AFW PUMP DISCHARGE PRESSURE SWITCH RATINGS (continued)

The team noted that Gilbert/Commonwealth's (G/C's) review had not identified that the TVA instrument data sheets and Static-O-Ring vendor drawing were not labelled as a safety-related for the end user. A minor catalog number transposition error between the vendor drawing (5N6-B45-NX-CIA-JJTTX6) and the TVA instrument data sheet (5N6-B45-NX-CIA-JJTTX6) was noted by the team.

BASIS: For the design modifications involving both interim and current replacement pressure switches, a number of changes were made in the design basis without a documented engineering justification when the modification was prepared, approved, and implemented. The team did not find evidence that the reduction in proof pressure and changes in maximum operating pressure values was satisfactory from a system perspective as required by IEEE Standard 279-1971 Section 3(7). Setpoint changes for these safety-related instruments were not supported by calculations as required by Sections 3(4), 3(5), and 3(9) of IEEE Standard 179-1971. One change in the direct current voltage rating of the switch contacts did not conform with IEEE Standard 279-1971 Section 3(7).

Instrument data sheets and vendor drawings were not labelled as safety-related, even though other TVA drawings have been marked in accordance with IEEE Standard 494-1974. This aspect was not identified in the G/C review.

REFERENCES

1. ECN-L-5823, AFW Pump Discharge Pressure Switch Replacement, Rev 0, 10/5/83
2. ECN-L-5883, AFW Pump Discharge Pressure Switch Replacement, Rev 0, 10/20/83
3. Gilbert/Commonwealth Technical Issue Data Sheet 5, Rev. 0, 1/24/86
4. Gilbert/Commonwealth Technical Issue Data Sheet 16, Rev. 0, 1/24/86
5. TVA Instrument Data Sheet Specification 1596, Rev. 0, 6/11/75
6. TVA Instrument Data Sheet PR-W-3098 (Watts Bar), Rev. 2, 8/3/82
7. TVA Instrument Data Sheet PR, SE-0307, Rev. 0, 10/1/84

SQN ITEM: D6.1-1 (DEFICIENCY) AFW PUMP DISCHARGE SWITCH RATINGS

I. APPLICABLE TO WBN: YES ____ NO X

II. ANALYSIS OF APPLICABILITY

AFW pump discharge pressure switches PS-3-148, -156, -164, and -171 provide cavitation protection to the four-inch level control valves similar to SQN.

The deficiency appears to be minor discrepancies between the various SQN procurement specifications and the system design. SQN determined that this deficiency is not a problem. WBN reviewed the procurement request (W-2098 R0) for the subject instruments and determined that the specification meets or exceeds design requirements. Additionally, on August 28, 1986, DNE site personnel obtained specification data directly from the instrument nameplate. This data reveals that the instrument's maximum pressure rating is 2300 psig (system design press is 1975 psig) with switch rating of 0.5A at 125V dc/0.25A at 250V dc (this exceeds the system requirement of 0.1A at 140V dc). Based on the above information, WBN concludes that the switches meet system design requirements.

DNE Design Standard DS-E18.3.5 controls the preparation of the procurement specification. Procurement Request Form, TVA 10606 (DNE 6-86) requires the identification of Quality Assurance Required, IEEE Class, ASME, ANS, etc. This form provides adequate notification as to the QA requirement.

III. EXTENT TO WHICH THE CONDITION COULD OR DOES EXIST

N/A

IV. CORRECTIVE ACTION REQUIRED

N/A

V. ACTION TO PREVENT RECURRENCE

N/A

VI. RESOURCE REQUIREMENT AND SCHEDULE

N/A

D6.1-2 (Deficiency) FEEDWATER BYPASS CONTROL VALVE SOLENOID REPLACEMENT

DESCRIPTION: Replacement solenoid valves 1-FSV--35A, -48A, -90A, and -103A were installed to improve the response time of the main feedwater bypass control valves (Reference 1). Similar replacement solenoid for Sequoyah Unit 2 were designated as non-quality assurance material (reference 2). A subsequent unreviewed safety question determination for this modification stated that Class 1E solenoid valves were provided; however, this requirement was not satisfied (Reference 3).

Gilbert/Commonwealth's review of this modification identified documentation inconsistencies in the safety-related versus non-safety-related designation for these replacement solenoid valves, and recommended that the solenoid valve and its electrical circuits be made safety-related to provide redundancy for main feedwater isolation from the steam generators (Reference 4 through 6). During the Gilbert/Commonwealth plant walkdown, the non-Category I seismic mounting of the replacement solenoid valve was identified as a deficiency.

The team held a number of discussions with TVA personnel regarding the feedwater isolation safety function required of these solenoid valves. TVA's reasons for using non-Class 1E replacement solenoid valves were based on the valve's location in the non-Category I turbine building, the desire to avoid use of Class 1E cables in this building, and the fail-safe characteristics of the solenoid. However, this analysis failed to address the need to satisfy the isolation safety function requirement. TVA should have recognized this safety function requirement when the solenoid valves were replaced and should have upgraded the original non-Class 1E solenoid valves at that time, consistent with the USQD.

In response to the recent Gilbert/Commonwealth review of completed design modifications, TVA has indicated that a Class 1E solenoid qualified for service conditions that exclude 10CFR50.49 environmental considerations will be specified and that detailed solenoid mounting requirements will be developed to limit seismic responses.

BASIS: A feedwater isolation safety function has been required of the solenoid valves associated with the feedwater bypass control valves. Replacement solenoid valves did not meet the Class 1E requirements needed to ensure accomplishment of this safety function. TVA's reasons for providing non-Class 1E solenoid valves did not adequately address the need to satisfy the feedwater isolation safety function. The installation of non-Class 1E solenoid valve violates the unreviewed safety question determination.

D6.1-3 (Deficiency) AFW PUMP SUCTION PRESSURE SWITCH SETPOINT CALCULATION

DESCRIPTION: Automatic transfer of auxiliary feedwater pump suction from the condensate storage tank to the essential raw cooling water system is accomplished by safety-related instruments monitoring for auxiliary feedwater pump low suction pressure. Gilbert/Commonwealth could not determine whether setpoint values and time delay requirements were adequately reevaluated as required after system testing and stated that existing calculations did not take into consideration the Technical Specification limiting safety setting requirement.

Gilbert/Commonwealth recommended that a new calculation for these setpoints be performed, but did not identify that the existing calculation of record (Reference 5) should have been updated or superseded when the pressure switch modifications were made. The team noted that this calculation had not been referenced, updated, or superseded as a result of setpoint changes listed in a 1981 memorandum (Reference 6) and three subsequent change notices (References 1, 2, and 3).

In their review, Gilbert/Commonwealth did not state that this calculation had not been marked as a safety-related calculation, and that numeric changes made in input values were not carried through to calculational results.

BASIS: The adequacy and control of existing design basis documentation was not addressed in that the original setpoint calculation should have been referenced in subsequent TVA design documents and then either corrected or superseded. Such controls are required by ANSI N45.2.11, section 4.2, Design Analyses, and section 8, Design Change Control.

REFERENCES

1. ECN-L-721, AFW Pump Suction Setpoints, Time Delays, Rev. 0, 4/3/84.
2. ECN-L-124, AFW Pump Suction Press. Sw. Setpoints. Rev. 0, 4/25/84.
3. ECN-L-254, AFW Pump Suction Press. Sw. Setpoints, Rev 0, 11/19/84.
4. Gilbert/Commonwealth Technical Issue Data Sheet 15, Rev. 1, 1/28/86.
5. TVA Calculation, SQN-Ca-D053, AFW Setpoints, Rev. 0, 4/6/79.
6. TVA Memorandum, MEB-180519-022, AFW Time Delays, Rev. 0, 5/19/81.

SQN ITEM: D6.1-3 (DEFICIENCY) AFW PUMP SUCTION PRESSURE SWITCH SETPOINT CALCULATION

I. APPLICABLE TO WBN: YES X NO _____

II. ANALYSIS OF APPLICABILITY

The AFW preop test acceptance criteria was reviewed and found to reference the Instrument Tabs for setpoint acceptance criteria and the logic diagrams for time delays. These documents were reviewed and found to be in agreement with the current calculation. The latest draft technical specification was reviewed and the current setpoints meet the requirements in the technical specifications. The WBN calculation is current and has been kept up to date, thus the SQN deficiency is not applicable to WBN.

During testing of the AFW pump two problems were discovered:

1. The setpoints were not correct.

2. The pressure transmitter was out of calibration.

The transmitters were recalibrated. On ECN 5231 setpoints were reestablished, the pumps were retested, and the new (actual) setpoints were approved by DNE in May 1986 and tested to demonstrate acceptability.

III. EXTENT TO WHICH THE CONDITION COULD OR DOES EXIST

In the case of the AFW pump pressure switch, the problem was found to not exist at WBN. In general, it is not yet known whether this same type of problem may exist elsewhere in the plant. The potential problem is being addressed, see IV below.

IV. CORRECTIVE ACTION REQUIRED

A program/plan has been developed and is in progress to determine which calculations are essential and which are desirable. Actual calculations will then be reviewed against the list to determine if any calculations are missing or need to be reviewed. Setpoint data will be included in the review.

V. ACTION TO PREVENT RECURRENCE

It is a DNE requirement that design input documents (calculations, etc.) be revised as applicable before the associated output documents are issued.

VI. RESOURCE REQUIREMENT AND SCHEDULE

End date for the essential calculation program will not be scheduled until the calculations have been reviewed to determine which calculations need to be made or reviewed. The review and essential calculations will be completed by fuel loading.

D6.2-1 (Deficiency) REACTOR COOLANT SYSTEM NARROW RANGE RESISTANCE TEMPERATURE DETECTOR QUALIFICATIONS CATEGORY CHANGE

DESCRIPTION: Reactor coolant system temperature detectors are used in the reactor protection system for the determination of the reactor coolant system average temperature which is used to compute reactor trip parameters such as Overpower and Overtemperature Delta T. These detectors were originally designated as TVA qualification category A (References 1 and 2), but were changed to category C. Category A components are those that are subject to mitigate the consequences. Category C components are those that are subject to harsh environmental conditions of design basis accidents but are not required for mitigation of that accident and whose failure in any mode would not be detrimental to plant safety. The stated basis for this change was their use as back-up rather than primary trip signals as described in FSAR transient and accident analyses (Reference 3). Westinghouse had provided a similar basis for the elimination of environmental and seismic qualification for ex-core neutron detectors in late 1983 (Reference 4).

The team did not agree with this change in qualification category. The instrument sensors connected to the reactor protection system must be environmentally qualified for their intended service conditions. During the inspection, the team was advised that the Office of Engineering had initiated a revision to the engineering change notice to restore these sensors to qualification category A.

BASIS: The change from qualification category A to C violated a requirement that reactor protection system sensors be qualified for their intended service conditions as stated by Section 4.4 of IEEE Std. 279-1971. All reactor trips should de designed to meet the requirements of IEEE Std. 279 in order to prevent a possible degradation of the reactor protection system (Reference 5).

REFERENCES:

1. ECN-L-449, Narrow Range RCS Class 1E RTD's, rev. 0, 7/24/85.
2. TVA Unrevised Safety Question Determination for ECN-L-449, B25 850918 509, Rev. 1, 9/18/85.
3. TVA Quality Information Release, B45 851231 268, 10CFR50.49 Category and Operating Times Calculation Change for Reactor Coolant System Resistance Temperature Detectors.
4. Westinghouse Letter, WAT-D-709, NEB 830930 637, Seismic and Environmental Qualifications of Ex-Core Neutron Detectors, 9/22/83.
5. NUREG 0800, Branch Technical Position ICSB 26, Requirements for Reactor Protection System Anticipatory Trips, pg. 7A-18, Rev. 2, 7/81.

SQN ITEM: D6.2-1 (DEFICIENCY) REACTOR COOLANT SYSTEM NARROW RANGE RESISTANCE TEMPERATURE DETECTOR QUALIFICATION CATEGORY CHANGE

I. APPLICABLE TO WBN: YES X NO _____

II. ANALYSIS OF APPLICABILITY

The cause for this noted discrepancy is the lack of thoroughly documented and accessible design basis for reactor trip functions. A single design input document which details the assumptions Westinghouse has made in its accident analyses was not available. The primary reactor trips assumed to occur for various accidents are documented in the FSAR, in topical reports, and in correspondence, but there was insufficient detail and interface control to ensure that TVA used the correct and current source of information. In this situation, TVA initially misinterpreted a Westinghouse letter related to environmental qualification of instruments required to mitigate steamline breaks.

TVA's qualification categories, which are documented in the Category and Operating Times Calculations, are for the purpose of establishing the scope of equipment to be included in the 10 CFR 50.49 qualification program. 10 CFR 50.49 states that equipment covered by the rule is that relied upon to remain functional during and following a design basis event to ensure: (1) integrity of reactor coolant pressure boundary, (2) capability to shut down the reactor and maintain it in a safe shutdown condition, and (3) capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to 10 CFR 100 guidelines. The rule further limits its scope by excluding natural phenomena and external events and equipment in a mild environment. Thus, some Reactor Protection System (RPS) equipment, as specified by IEEE 279-1971, may not fall in the scope of the 10 CFR 50.49 qualification program since it may be located in a mild plant environment or may be required only for specific events which do not produce harsh environments. Even though some RPS features may not require inclusion in the 10 CFR 50.49 program, they are required to meet the intent of IEEE 279-1971 and related standards and are qualified for their intended service.

III. EXTENT TO WHICH THE CONDITION COULD OR DOES EXIST

This condition could potentially exist for other reactor trip functions.

IV. CORRECTIVE ACTION REQUIRED

For the Reactor Coolant System narrow-range resistance temperature detectors (RTDs), we have reevaluated their category and determined that they were Category A for the inside containment mainsteam line break event before issuance of the finding. (Reference Quality Information Release NEB86041, 10 CFR 50.49 Category and Operating Times.) Accordingly, the subject RTDs are included in the 10 CFR 50.49 program.

SQN ITEM: D6.2-1 (DEFICIENCY) REACTOR COOLANT SYSTEM NARROW RANGE RESISTANCE TEMPERATURE DETECTOR QUALIFICATION CATEGORY CHANGE (Continued)

V. ACTION TO PREVENT RECURRENCE

An updated list of required reactor trips has been requested from Westinghouse. Upon receipt, the trips will be reviewed against the existing category and operating times to ensure that the equipment associated with those required reactor trips is properly specified and qualified. DNE is working with Westinghouse to consolidate and maintain reactor trip design basis information in a more controlled and accessible fashion. This will be accomplished before unit 1 fuel loading.

VI. RESOURCE REQUIREMENT AND SCHEDULE

Review specification and qualification of equipment associated with required reactor trips upon receipt from Westinghouse. This activity is scheduled to be completed before unit 1 fuel loading.

D6.3-1 (Deficiency) SPECIFICATION OF HYDROSTATIC TEST TO DEMONSTRATE INSTRUMENT PRESSURE BOUNDARY INTEGRITY AFTER SEISMIC QUALIFICATION TESTING

DESCRIPTION: Process instruments connected directly into safety class piping must conform with seismic category I requirements and maintain the pressure boundary integrity of safety class piping. The demonstration of system pressure boundary integrity is ordinarily achieved by separate hydrostatic pressure tests performed immediately before and after a seismic qualification test.

During the team's review of specific process instruments used at Sequoyah, it was determined that procedural guidance existed for the specification of hydrostatic test requirements. For example, TVA procedure OEP-9, which has been applicable to instrument procurement since June 1985, stated that tests and acceptance criteria for hydrostatic pressure tests may be included in procurement specifications where applicable (Rererence 3). In addition, the Sequoyah Office of Engineering Project Manual specifically required that component test requirements include a consideration of hydrostatic pressure tests (reference 4).

However, the team determined that TVA had not specified a design performance test for instruments purchased for recent plant modifications (References 1 and 2). For one procurement contract, the instrument vendor successfully demonstrated hydrostatic pressure integrity before and after the seismic qualification test (Reference 5). However, for a second procurement contract, the vendor did not perform a hydrostatic test after the seismic qualification test (Reference 6).

BASIS: TVA procedural requirements with respect to the specification of a hydrostatic pressure test after seismic qualification have not been satisfied. The pressure boundary integrity of one set of instruments connected to the reactor coolant system has not been demonstrated after the seismic qualification test.

REFERENCES

1. ECN-L-380, RCP Bypass Line dp Switch Replacement, Rev. 0, 4/29/85
2. ECN-L-620, AFC Turbine Discharge Pressure Transmitter, Rev. 0, 3/14/83
3. TVA Procedure OEP-9, Attachment 9, General Content and Format Requirements for Procurement Specifications, section 8.2.2
4. TVA OE Sequoyah Project MANUAL, Section VII, Expansion to OEP-6, item 4.4, Test and Inspection Requirements, 1/10/86.
5. Foxboro N-E11DM Differential Pressure Transmitter Qualification Report, B70 851125 528, Rev. 0, 1/28/86.
6. Static-O-Ring 103AS-bb803-NX-JJTTX6, Differential Pressure Indicating Switch, Action Environmental Test Corp. Reports 18878-84N-1, Rev. 1, 8/30/84 and 18878-84N-3, Rev. 1, 9/25/84.

SQN ITEM: D6.3-1 (DEFICIENCY) SPECIFICATION OF HYDROSTATIC TEST TO DEMONSTRATE INSTRUMENT PRESSURE BOUNDARY INTEGRITY AFTER SEISMIC QUALIFICATION TESTING

I. APPLICABLE TO WBN: YES X NO _____

II. ANALYSIS OF APPLICABILITY

WBN initiated ECNs 6012 (U1) and 6013 (U2) to add RCP bypass line dp switches similar to SQN. These switches are seismic Category I(L) safety-related and have no IE function.

III. EXTENT TO WHICH THE CONDITION COULD OR DOES EXIST

The condition is interpreted as: "Failure of TVA to specify to a vendor that hydrostatic testing must be performed both before and after seismic testing." TVA relies on industry standards to provide guidance and requirements to manufacturers in acceptable testing and documentation methods. TVA Procurement Standard Specification SS-E18.7.42, PRESSURE AND DIFFERENTIAL PRESSURE SWITCHES, require qualification testing of Class IE devices to be in accordance with IEEE 323-1974 and 344-1975 and hydrostatic or pneumatic testing shall be in accordance with ANSI B31.1. IEEE Standard 323-1974, Section 6.3.2, "Test Sequence" requires equipment qualification testing to be performed in a specific order. Seismic testing is required to be performed before functional testing (simulation of operating conditions) and final inspection of the device. This testing sequence is considered adequate to detect any equipment defects caused by the seismic portion of the qualification test.

For seismic Category I(L) devices (non-IE), qualification may be performed experimentally, similar to IE requirements, or by analysis. This is specfied in TVA Procurement Standard Specification SS-E18-12.02, SEISMIC REQUIREMENTS FOR CATEGORY I(L) ELECTRICAL AND I&C EQUIPMENT. A survey of three leading instrument manufacturers was conducted to determine industry practices related to seismic and hydrostatic testing. The following information was obtained:

- IEEE Standard 323-1974 was followed and considered adequate for the qualification of Class IE devices.
- All pressure retaining devices (both Class IE and commercial) are individually hydrostatically tested to 150 percent of design pressure.
- Pressure retaining parts are typically designed to a four to one safety factor.
- Seismic forces exerted on the pressure retaining parts are determined to be negligible compared to static pressure forces.

It is TVA's position that the above standards provide adequate procurement specfications to instrument manufacturers.

SQN ITEM: D6.3-1 (DEFICIENCY) SPECIFICATION OF HYDROSTATIC TEST TO DEMONSTRATE INSTRUMENT PRESSURE BOUNDARY INTEGRITY AFTER SEISMIC QUALIFICATION TESTING
(Continued)

REFERENCES

1. ECNs 6012 (U1) and 6013 (U2)
2. Procurement Request No. W-5652 R0
3. TVA Standard Specifications: E18.7.42
   E18.11.04
   E18.12.02
4. IEEE Standard 323-1974

IV. CORRECTIVE ACTION REQUIRED

No corrective action will be taken. WBN agrees with the SQN evaluation that no known nuclear industry standard or NRC commitment exists that requires a hydrostatic test be performed following its seismic qualification testing.

V. ACTION TO PREVENT RECURRENCE

N/A

VI. RESOURCE REQUIREMENT AND SCHEDULE

N/A

U6.3-2 (Unresolved Item) ENGINEERING CHANGE NOTICE (ECN) QUALITY ASSURANCE AND SEISMIC ANALYSIS DESIGNATIONS

DESCRIPTION: During the preparation, review, and approval of an ECN, the application of quality assurance and seismic analysis requirements must be designated by yes or no entries on the form (references 1 through 3).

The team reviewed eighty (80) individual ECNs for the 1980 through 1985 period, and noted an approximate 9 percent error rate and a 10 percent reversal rate forthe designation of quality assurance and seismic analysis requirements. Several variations in these designations were noted by the team; namely, the application of one requirement without the other, the application ofneither requirement for safety-related equpment modifications, and the reversal of an initial designation for one or both of these requirements.

The team believes that the final designation of the following ECNS were in error by specifying the application of quality assurance without requiring seismic analysis. Each modification involved one or more Class 1E components which are required tomeet both the quality assurance requirements of 10CFR50 Appendix B and the seismic requirements of IEE Standard 344-1975. A "no" entry for seismic analysis on the ECN would not provide confirmation of seismic adequacy for these Class 1E components:

ECN-L-5057, Reactor Coolang Pump UV and UF PPS Sensors
ECN-L-5092, AFW Turbine Resistor Box MOved to Wall Mount
ECN-L-5314, Pressure Switch Moved Outside Crane Wall
ECN-L-5339, AFW Flow Control Valve Replacement
ECN-L-5490, AFW Speed Control Moved to Wall Mount
ECN-L-5717, AFW Control Valve Solenoid Replaced
ECN-L-5758, Traveling Screen Bubbler dP Instrument Added

The team noted that the following ECNs had a reversal of the initial determination for one or both of these requirements:

ECN-L-5057, Reactor Coolant Pump UV and UF PPS Sensors,
QA changed from no to yes.
ECN-L-5620, AFW Turbine Pump Surveillance Point Added,
QA and seismic changed from no to yes.
ECN-L-5717, AFW Control Valve Solenoid Replaced,
QA changed from no to yes.
ECN-L-5426, Instrument Line Insulation and Re-Routing,
QA and seismic changed from no to yes.
ECN-L-5760, Venturi Flow Restrictors Added,
QA and seismic changed from no to yes.
ECN-L-5789, Main Feedwater Solenoid Valve Leakage,
QA and seismic changed from no to yes.
ECN-L-5884, AFW Flow Transmitter Changed,
seismic changed from no to yes.
ECN-L-6109, Reactor Coolant Pump Oil Reservoir Level Monitor,
seismic changed from no to yes.

U6.3-2 (Unresolved Item) ENGINEERING CHANGE NOTICE (ECN) QUALITY ASSURANCE AND SEISMIC ANALYSIS DESIGNATIONS (Continued)

Since approximately 20 percent of the initial determinations for ECNs reviewd by theteam were in error, the team's opinion is that individual engineers have had obvious difficulty in understanding how the written criterion was to be applied to a given design modification situation. This view appears to be supported by the additional ECNs identified by the team that remained in error following review and approval steps. The team's assessment is that while the criterion was technically correct, they lacked sufficient clarity necessary for a more uniform application.

BASIS: Criterion for making determinations regarding qualityassurance and seismic analysis was providedin superseded and current TVA design change procedures (references 1 and 3. Section 4.3.1 of TVA Procedure OEP-09 states that nuclear safety-related work includes the specification of quality assurance requirements and applicable industry codes. The seven ECNs identified by the team where quality assurance aspects and applied without corresponding seismic analysis requirements did not conform with these TVA procedures or provide a justification for the omission of seismic analysis.

REFERENCES

1. TVA Procedure EN DES-EP 4.52, ECNs After Licensing, Rev. 1, 4/24/84
2. TVA Procedure OEP-11, Change Control, Rev. 0, 4/26/85
3. TVA Procedure OEP-09, Procurement, Rev. 0, 4/26/86

SQN ITEM: U6.3-2 (UNRESOLVED ITEM) ENGINEERING CHANGE NOTICE (ECN) QUALITY ASSURANCE AND SEISMIC ANALYSIS DESIGNATION

I. APPLICABLE TO WBN: YES X NO _____

II. ANALYSIS OF APPLICABILITY

The unresolved item defined by U6.3-2 does apply to WBN.

The TVA design control program did lack a clear and consistent definition of when QA and seismic requirements would be designated on the ECN cover sheet. This existed until June 1985 when this information was no longer designated by a Yes or No entry on the cover sheet when the ECN was initiated, but was indicated on a checklist to identify potential effects on design documents. OEP 11, "Change Control," was issued in June 1985, that implemented this change and required that all discipline lead engineers review and approve each ECN. This ensured that appropriate coordination between disciplines occurred and that requirements such as seismic analysis were considered in this review. OEP 11 was superseded by NEP 6.1 on July 1, 1986 and carried forth the same requirements.

The reason the two questions were removed from the cover sheet is because there was no requirement in Engineering Procedure EP-4.02 that gave direction or definition to which drawings involved with the ECN required QA, or which components required seismic analysis. These determinations were made by the responsible section supervisor on a drawing-by-drawing basis. The question on the ECN cover sheet for QA or seismic analysis was added to EP-4.02 to give guidance to the involved sections making the change. The ECN cover sheet information as to whether QA or seismic was applicable or not did not affect the method of how the ECN was processed and issued or how the drawings implementing the change were processed.

WBN probably has ECN cover sheets marked erroneously as to whether QA or seismic applies, but this had no affect on the quality, design, and review of the drawings issued to implement the ECNs. The determination of when QA or seismic applied to a change in drawings, procurement document, etc., was made by the responsible section supervisor by following the applicable procedures covering his drawings and the supervisors knowledge of which systems, components, and structures were under the QA program.

III. EXTENT TO WHICH THE CONDITION COULD OR DOES EXIST

This condition could have existed until June 1985 when this information was no longer designated by Yes or No entry on the cover sheet when the ECN was initiated.

SQN ITEM: U6.3-2 (UNRESOLVED ITEM) ENGINEERING CHANGE NOTICE (ECN) QUALITY ASSURANCE AND SEISMIC ANALYSIS DESIGNATION

IV. CORRECTIVE ACTION REQUIRED

To address the adequancy of the seismic qualification of components at WBN, TVA is planning to perform a review of equipment requiring seismic qualification. A multidiscipline team is being established to develop a program review plan that:

- o Assesses TVA seismic qualification equipment program from design input to operations.
- o Assesses issues related to the program from employee concerns, CAQs and NRC audits.
- o Defines needed actions to ensure installed configuration of equipment is adequate for the seismic environment.

V. ACTION TO PREVENT RECURRENCE

To be determined upon completion of Step IV.

IV. RESOURCE REQUIRMENT AND SCHEDULE

All corrective actions will be completed before fuel loading of unit 1.

06.3-3 (Observation) ESSENTIAL RAW COOLING WATER SCREEN WASH PUMP CONTROL

DESCRIPTION: Redundant differential pressure switches connected across the ERCW traveling screens had been used to initiate operation of four screen wash pumps to remove debris. During preoperational tests, it was determined that pressure drop across the strainers exceeded design values and were causing improper operation of the backwash and backflush subsystems (Reference 1).

The pump motor circuit wiring for each switch was disconnected on a temporary basis because switch unreliability had caused constant operation of the screen wash pumps (Reference 2). The TACF identified this as an alteration to safety-related equipment, and stated that screen backwashing would be by means of an automatic timer or by operator manual action until such time as new sensors were installed. This design modification has been implemented on the basis of the TACF which has not been superseded by an authorizing ECN.

The engineering change notice (Reference 3) to implement a safety-related bubbler type differential pressure sensing measurement was initiated in 1982, yet remains unimplemented. The team considers the period of time during which this safety function has been disabled by a temporary modification to be excessive, and that the design change process would be enhanced if corrective actions were completed in a more timely fashion in such instances.

REFERENCES

1. ECN-L-5512, ERCW Strainer Preop Deficiencies, Rev. 0, 9/30/82.

2. TACF-82-258-67, Disconnection of dP Sensor Wiring, Rev. 0, 10/7/82.

3. ECN-L-5748, ERCW Screen Wash dP Sensor Change, Rev. 0, 12/8/82.

SQN ITEM: 03.2-1 (Observation) VALVE OPERATOR

3. UNIT 2 ECN 6007
(PIR WBNMEB8526)
(SCR WBNMEB8556)

PIR WBNMEB8526 was written on August 6, 1985 to address a condition on WBNuUnits 1 and 2 where drawings C-3522 and C-3538 of contract 74C38-83015 had shown motor-operated valves with identical TVA Mark Numbers, but had different weights and center of gravity locations. There was no indication of which weight and/or center of gravity was correct for the various valves affected. This could have invalidated the piping analysis results if unconservative weight or center of gravity data had been used in an analysis model.

The above PIR was upgraded and issued as SCR WBN MEB 8556 on December 19, 1985. ECN 6007 was issued on January 16. 1986, to cover the changes required by the SCR.

Problem N3-70-1A was identified as having three (3) valves that could be affected. Those valves were 2-FCV-70-139-A (Pt. 8), 2-FCV-70-140-B (Pt. 5), and 2-FCV-70-143-A (Pt.21). A review of the analysis showed that the weight and centers of gravity modeled in the analysis for these valves were conservative and no further evaluation was required. However, the analysis isometric and the DNE calculation did require revision to show the correct valve data and valve drawing numbers.

The design input drawings to the analysis that required changes were the valve drawings and the System 70 portion of the Master Valve Status Report. These drawings were revised and issued between February 12, 1986 and May 5, 1986, as shown on ECN 6007 data sheet No. 1.

The N3-70-1A analysis isometric and DNE calculation package was revised and issued between June 12, 1986 and June 16, 1986, as shown on ECN 6007 data sheet No. 2.

All ECN 6007 work was completed as required and the ECN was closed on August 25, 1986.

All conditions have been appropriately handled; therefore, there is adequate confidence that a condition similar to the described condition has not occurred on WBN.

III. EXTENT TO WHICH THE CONDITION COULD OR DOES EXIST

N/A

IV. CORRECTIVE ACTION REQUIRED

N/A

SQN ITEM: 03.2-1 (Observation) VALVE OPERATOR

3. UNIT 2 ECN 6007
(PIR WBNMEB8526)
(SCR WBNMEB8556)

V. ACTION TO PREVENT RECURRENCE

N/A

VI. RESOURCE REQUIREMENT AND SCHEDULE

N/A

D4.3-5 (Deficiency) LOADS ON CABLE TRAY SUPPORTS

DESCRIPTION: The TVA Design Criteria for Category I Cable Tray Support Systems (Reference 1) states that for an 18-inch tray, the loads on cable tray supports should be 75 pounds per linear foot for the top tray and 45 pounds per linear foot for the additional trays. TVA calculations for the cable tray supports MK 26B, MK 42, MK 18A, and MK 18B show that for the top trays only 45 pounds per linear foot were taken as the loading in the support design (Reference 2). These represent about 10 percent of the cable tray support calculations reviewed by the the team. The rest of the support calculations adhered to the loading requirements of the design crieria. Since a loading lower than required by the criteria was used in the design, the as-built cable tray supports might be overloaded.

BASIS: TVA Design Criteria SQN-DC-V-1.3.4 (Reference 1), Section 4.0, requires that for an 18-inch tray, the static maximum loading of the top tray in a tier should be 75 pounds per linear foot.

REFERENCES:

1. TVA Design Criteria for Category I Cable Tray Support Systems, SQN-DC-V-1.3.4, Rev 0, 8/20/75
2. TVA Calculation 48N1330, 34, 35, 74, Auxiliary Building Cable Tray Support Below El. 734.0', 2/2/79

SQN ITEM: D4.3-5 (Deficiency) LOADS ON CABLE TRAY SUPPORTS

I. APPLICABLE TO WBN: YES ____ NO X

II. ANALYSIS OF APPLICABILITY

This item does not apply to WBN.

As stated in WBN cable tray support design criteria WB-DC-20-21.1, Section 4.2.1 and Section 4.2.2 (and predecessor requirements - memorandum from F. W. Chandler to R. G. Domer dated January 18, 1974, subject - "Sequoyah and Watts Bar Nuclear Plants - Loading on 18 and 24 Inch Wide Electrical Cable Trays"), the seismic design of cable tray supports does not have to include the 30 lbs/ft personnel loading for the top tray in any tier.

Two loading cases apply:

1. Tray dead load (45 lbs/ft) plus seismic accelerations
2. Tray dead load (45 lbs/ft) plus personnel load (30 lbs/ft) in top tray only.

In a seismic design (1.above), the 45 lbs/ft of all tiers of a tray run are accelerated both vertically and horizontally; whereas in the nonseismic case (2. above) the top tray in a run has 75 lbs/ft (vertically only) with 45 lbs/ft (vertically only) being contributed by the remainder of the tiers. Given the significant seismic design accelerations at WBN (i.e., a normal minimum seismic acceleration being generally in the range of 1 g, or a doubling of the 45 lbs/ft dead load), design personnel are able to eliminate Case 2 as never controlling over Case 1; therefore, calculations are made based on Case 1 only.

III. EXTENT TO WHICH THE CONDITION COULD OR DOES EXIST

N/A

IV. CORRECTIVE ACTION REQUIRED

N/A

V. ACTION TO PREVENT RECURRENCE

N/A

VI. RESOURCE REQUIREMENT AND SCHEDULE

N/A

D6.1-2 (Deficiency) FEEDWATER BYPASS CONTROL VALVE SOLENOID REPLACEMENT
(continued)

REFERENCES

1. ECN-L-717, FW Bypass Control Valve Solenoid Change, Rev. 0, 5/14/80.
2. TVA Memorandum, SWP 801016 022, Transfer of Solenoid Valves from Watts Bar Nuclear Plant to Sequoyah Nuclear Plant, 10/15/80.
3. TVA Unreviewed Safety Question Determination for ECN-L-717, SWP 830217 802, 2/17/83.
4. Gilbert/Commonwealth Technical Issue Data Sheet 7, Rev. 0, 1/24/86.
5. Gilbert/Commonwealth Technical Issue Data Sheet 13, Rev. 1, 1/28/86.
6. Gilbert/Commonwealth Observation Sheet, Rev. 0, 1/24/86.

SQN ITEM: D6.1-2 (DEFICIENCY) FEEDWATER BYPASS CONTROL VALVE SOLENOID REPLACEMENT

I. APPLICABLE TO WBN: YES ____ NO X

II. ANALYSIS OF APPLICABILITY

Main Feedwater Bypass Control Valves (FCV-3-35A, -48A, -90A, and -103A) receive a main feedwater isolation signal which causes valve closure by deenergizing the associated solenoid valve (FSV-3-35, -48, -90, and -103). This control scheme is similar to SQN.

The deficiency is interpreted to be: SQN failure to specify and install Class IE solenoid valves consistent with the USQD for ECNL-5717. This deficiency does not exist on WBN. WBN design output drawings require the use of ASCO Model No. 206-381-3RVU for FSV-3-35, -48. -90, and -103. These solenoid valves were purchased on WBN contract 827551 as Class IE.

10 CFR 50.49 requires the use of electrical equipment which is environmentally qualified to the extent necessary to ensure the equipment performs its intended safety functions. This program will control the need for use of environmentally qualified equipment. Equipment located in a "mild environment" is outside the scope of 10 CFR 50.49 since the equipment is not subjected to an adverse, degraded environment and thus, no additional environmental qualification is necessary. Solenoid valves supplied and qualified by the control valve manufacturer which are used in an IE application and located in a "mild environment" do not have to be replaced. This is the case for IE solenoid valves located in the Turbine Building. It is WBEP practice to use environmentally qualified solenoid valve replacements for IE applications in the Turbine Building.

REFERENCE

47B601-3-Series R43
47W610-3-5 R12
47W611-3-6 R 9
TVA Contract 827551

III. EXTENT TO WHICH THE CONDITION COULD OR DOES EXIST

N/A

IV. CORRECTIVE ACTION REQUIRED

N/A

V. ACTION TO PREVENT RECURRENCE

N/A

VI. RESOURCE REQUIREMENT AND SCHEDULE

N/A

SQN ITEM: 06.3-3 (OBSERVATION) ESSENTIAL RAW COOLING WATER SCREEN WASH PUMP CONTROL

I. APPLICABLE TO WBN: YES X NO ____

II. ANALYSIS OF APPLICABILITY

WBN has installed an ERCW traveling screen level monitoring system similar to ECN L-5758 on SQN.

WBN interprets the condition to be SQN's failure to implement an ECN in a timely manner and having a Temporary Alteration Control Form (TACF) implement a design change without timely followup with an ECN to process the change through DNE. Refer to the response on items D2.3-1 and D5.3-1 for the applicability of temporary alterations using TACFs to WBN.

WBN has implemented a Change Control Board (CCB) to control plant modifications by reviewing proposed changes and approving only those required to achieve nuclear safety, meet licensing commitments, affect personnel safety or correct a system operating deficiency/condition. All approved plant modifications will be categorized for implementation to support a project milestone (i.e., fuel load, full power, refueling outages). All proposal changes and unimplemented changes in existence before forming the CCB which modified the plant's physical configuration were reviewed and dispositioned by the CCB as being approved to implement or disapproved.

The CCB is staffed by three voting members: (1) the Site Director, (2) the DNE Project Engineer, and (3) the Plant Manager. This process will ensure that when changes are approved by the CCB, they will be implemented in a timely manner and only changes necessary will be approved.

III. EXTENT TO WHICH THE CONDITION COULD OR DOES EXIST

Refer to the response on items D2.3-1 and D5.3-1 for the applicability of temporary alterations using TACFs to WBN.

IV. CORRECTIVE ACTION REQUIRED

Refer to the response on items D2.3-1 and D5.3-1 for the applicability of temporary alterations using TACFs to WBN.

V. ACTION TO PREVENT RECURRENCE

Refer to the response on items D2.3-1 and D5.3-1 for the applicability of temporary alterations using TACFs to WBN.

VI. RESOURCE REQUIREMENT AND SCHEDULE

Refer to the response on items D2.3-1 and D5.3-1 for the applicability of temporary alterations using TACFs to WBN.