EMPLOYEE CONCERNS

SPECIAL PROGRAM

VOLUME 3
OPERATIONS CATEGORY

SUBCATEGORY REPORT 30200
ELECTRICAL AND COMMUNICATIONS

UPDATED

TVA

NUCLEAR POWER

TVA EMPLOYEE CONCERNS
SPECIAL PROGRAM

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REPORT TYPE: Subcategory

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TITLE: Electrical and Communications

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Reformat to conform with revision 4 of ECTG Program Manual and to incorporate SRP comments and include final corrective action plans | R1

To incorporate TAS comments | R2

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*SRP Secretary's signature denotes SRP concurrences are in files.

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HISTORY OF REVISION

REV NUMBER	PAGES REVISED	REASON FOR CURRENT REVISION
3	i	To clarify that one or more attachments will help the reader find where a particular concern is evaluated

Preface

This subcategory report is one of a series of reports prepared for the Employee Concerns Special Program (ECSP) of the Tennessee Valley Authority (TVA). The ECSP and the organization which carried out the program, the Employee Concerns Task Group (ECTG), were established by TVA's Manager of Nuclear Power to evaluate and report on those Office of Nuclear Power (ONP) employee concerns filed before February 1, 1986. Concerns filed after that date are handled by the ongoing ONP Employee Concerns Program (ECP).

The ECSP addressed over 5800 employee concerns. Each of the concerns was a formal, written description of a circumstance or circumstances that an employee thought was unsafe, unjust, inefficient, or inappropriate. The mission of the Employee Concerns Special Program was to thoroughly investigate all issues presented in the concerns and to report the results of those investigations in a form accessible to ONP employees, the NRC, and the general public. The results of these investigations are communicated by four levels of ECSP reports: element, subcategory, category, and final.

Element reports, the lowest reporting level, will be published only for those concerns directly affecting the restart of Sequoyah Nuclear Plant's reactor unit 2. An element consists of one or more closely related issues. An issue is a potential problem identified by ECTG during the evaluation process as having been raised in one or more concerns. For efficient handling, what appeared to be similar concerns were grouped into elements early in the program, but issue definitions emerged from the evaluation process itself. Consequently, some elements did include only one issue, but often the ECTG evaluation found more than one issue per element.

Subcategory reports summarize the evaluation of a number of elements. However, the subcategory report does more than collect element level evaluations. The subcategory level overview of element findings leads to an integration of information that cannot take place at the element level. This integration of information reveals the extent to which problems overlap more than one element and will therefore require corrective action for underlying causes not fully apparent at the element level.

To make the subcategory reports easier to understand, three items have been placed at the front of each report: a preface, a glossary of the terminology unique to ECSP reports, and a list of acronyms.

Additionally, at the end of each subcategory report will be a Subcategory Summary Table that includes the concern numbers; identifies other subcategories that share a concern; designates nuclear safety-related, safety significant, or non-safety related concerns; designates generic applicability; and briefly states each concern.

Either the Subcategory Summary Table or another attachment or a combination of the two will enable the reader to find the report section or sections in which the issue raised by the concern is evaluated.

The subcategories are themselves summarized in a series of eight category reports. Each category report reviews the major findings and collective significance of the subcategory reports in one of the following areas:

- management and personnel relations
- industrial safety
- construction
- material control
- operations
- quality assurance/quality control
- welding
- engineering

A separate report on employee concerns dealing with specific contentions of intimidation, harassment, and wrongdoing will be released by the TVA Office of the Inspector General.

Just as the subcategory reports integrate the information collected at the element level, the category reports integrate the information assembled in all the subcategory reports within the category, addressing particularly the underlying causes of those problems that run across more than one subcategory.

A final report will integrate and assess the information collected by all of the lower level reports prepared for the ECSP, including the Inspector General's report.

For more detail on the methods by which ECTG employee concerns were evaluated and reported, consult the Tennessee Valley Authority Employee Concerns Task Group Program Manual. The Manual spells out the program's objectives, scope, organization, and responsibilities. It also specifies the procedures that were followed in the investigation, reporting, and closeout of the issues raised by employee concerns.

ECSP GLOSSARY OF REPORT TERMS*

classification of evaluated issues the evaluation of an issue leads to one of the following determinations:

Class A: Issue cannot be verified as factual

Class B: Issue is factually accurate, but what is described is not a problem (i.e., not a condition requiring corrective action)

Class C: Issue is factual and identifies a problem, but corrective action for the problem was initiated before the evaluation of the issue was undertaken

Class D: Issue is factual and presents a problem for which corrective action has been, or is being, taken as a result of an evaluation

Class E: A problem, requiring corrective action, which was not identified by an employee concern, but was revealed during the ECTG evaluation of an issue raised by an employee concern.

collective significance an analysis which determines the importance and consequences of the findings in a particular ECSP report by putting those findings in the proper perspective.

concern (see "employee concern")

corrective action steps taken to fix specific deficiencies or discrepancies revealed by a negative finding and, when necessary, to correct causes in order to prevent recurrence.

criterion (plural: criteria) a basis for defining a performance, behavior, or quality which ONP imposes on itself (see also "requirement").

element or element report an optional level of ECSP report, below the subcategory level, that deals with one or more issues.

employee concern a formal, written description of a circumstance or circumstances that an employee thinks unsafe, unjust, inefficient or inappropriate; usually documented on a K-form or a form equivalent to the K-form.

evaluator(s) the individual(s) assigned the responsibility to assess a specific grouping of employee concerns.

findings includes both statements of fact and the judgments made about those facts during the evaluation process; negative findings require corrective action.

issue a potential problem, as interpreted by the ECTG during the evaluation process, raised in one or more concerns.

K-form (see "employee concern")

requirement a standard of performance, behavior, or quality on which an evaluation judgment or decision may be based.

root cause the underlying reason for a problem.

*Terms essential to the program but which require detailed definition have been defined in the ECTG Procedure Manual (e.g., generic, specific, nuclear safety-related, unreviewed safety-significant question).

Acronyms

AI	Administrative Instruction
AISC	American Institute of Steel Construction
ALARA	As Low As Reasonably Achievable
ANS	American Nuclear Society
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
BFN	Browns Ferry Nuclear Plant
BLN	Bellefonte Nuclear Plant
CAQ	Condition Adverse to Quality
CAR	Corrective Action Report
CATD	Corrective Action Tracking Document
CCTS	Corporate Commitment Tracking System
CEG-H	Category Evaluation Group Head
CFR	Code of Federal Regulations
CI	Concerned Individual
CMTR	Certified Material Test Report
COC	Certificate of Conformance/Compliance
DCR	Design Change Request
DNC	Division of Nuclear Construction (see also NU CON)

DNE	Division of Nuclear Engineering
DNQA	Division of Nuclear Quality Assurance
DNT	Division of Nuclear Training
DOE	Department of Energy
DPO	Division Personnel Officer
DR	Discrepancy Report or Deviation Report
ECN	Engineering Change Notice
ECP	Employee Concerns Program
ECP-SR	Employee Concerns Program-Site Representative
ECSP	Employee Concerns Special Program
ECTG	Employee Concerns Task Group
EEOC	Equal Employment Opportunity Commission
EQ	Environmental Qualification
EMRT	Emergency Medical Response Team
EN DES	Engineering Design
ERT	Employee Response Team or Emergency Response Team
FCR	Field Change Request
FSAR	Final Safety Analysis Report
FY	Fiscal Year
GET	General Employee Training
HCI	Hazard Control Instruction
HVAC	Heating, Ventilating, Air Conditioning
II	Installation Instruction
INPO	Institute of Nuclear Power Operations
IRN	Inspection Rejection Notice

L/R	Labor Relations Staff
M&AI	Modifications and Additions Instruction
MI	Maintenance Instruction
MSPB	Merit Systems Protection Board
MT	Magnetic Particle Testing
NCR	Nonconforming Condition Report
NDE	Nondestructive Examination
NPP	Nuclear Performance Plan
NPS	Non-plant Specific or Nuclear Procedures System
NQAM	Nuclear Quality Assurance Manual
NRC	Nuclear Regulatory Commission
NSB	Nuclear Services Branch
NSRS	Nuclear Safety Review Staff
NU CON	Division of Nuclear Construction (obsolete abbreviation, see DNC)
NUMARC	Nuclear Utility Management and Resources Committee
OSHA	Occupational Safety and Health Administration (or Act)
ONP	Office of Nuclear Power
OWCP	Office of Workers Compensation Program
PHR	Personal History Record
PT	Liquid Penetrant Testing
QA	Quality Assurance
QAP	Quality Assurance Procedures
QC	Quality Control
QCI	Quality Control Instruction

QCP	Quality Control Procedure
QTC	Quality Technology Company
RIF	Reduction in Force
RT	Radiographic Testing
SQN	Sequoyah Nuclear Plant
SI	Surveillance Instruction
SOP	Standard Operating Procedure
SRP	Senior Review Panel
SWEC	Stone and Webster Engineering Corporation
TAS	Technical Assistance Staff
T&L	Trades and Labor
TVA	Tennessee Valley Authority
TVTLC	Tennessee Valley Trades and Labor Council
UT	Ultrasonic Testing
VT	Visual Testing
WBECSP	Watts Bar Employee Concern Special Program
WBN	Watts Bar Nuclear Plant
WR	Work Request or Work Rules
WP	Workplans

ELECTRICAL AND COMMUNICATIONS

Subcategory Report 30200

Executive Summary

I. SUMMARY OF ISSUES

The Electrical and Communications Subcategory is comprised of 20 employee concerns addressing eleven issues relating to the design, construction, operation, and maintenance of electrical and communications equipment.

Five issues were found to be not factually accurate. Two issues were factually accurate but did not require corrective action. One issue was factually accurate but the problem was being addressed before the the employee concerns program. Three issues were factual and presented problems for which corrective action either has been or is being taken as a result of the employee concerns program.

II. SUMMARY OF FINDINGS

Several conditions were found to exist in violation of design, construction, or operating requirements. Each of these conditions, called specific deficiencies, were noted as requiring short-term corrective measures. At WBN the Final Safety Analysis Report (FSAR) was found not to be in agreement with a TVA division procedure and found to contain some illegible pages. Deficiencies were noted with respect to Raychem instructions at SQN, BFN, and BLN and with respect to specific applications of Raychem at SQN and BFN. Numerous deficiencies were noted at each of TVA's nuclear sites relating to the improper regulation and operation of plant auxiliary power systems. At SQN and WBN there were potential deficiencies regarding false ground indications. Corrective Action Tracking Documents (CATDs) were submitted to responsible line management on these deficiencies as they were found.

III. SUMMARY OF COLLECTIVE SIGNIFICANCE

Two significant problem areas were identified as having the potential to seriously degrade the technical adequacy of major plant components:

- Lack of corporate control over vendor supplied materials and instructions; design, modification, and maintenance practices; and proper application of Raychem products.

- Lack of corporate and plant control over bus operating voltages, design requirements, and implementation of design standards through operating procedures.

IV. SUMMARY OF ROOT CAUSES

Five potential root causes were identified:

- Various electrical procedures lack specifics to perform the task, are incomplete, or fail to incorporate all technical requirements (all sites).

- There are inadequate acceptance criteria defined in various electrical procedures to ensure satisfactory task completion (all sites).

- Adequate systems, processes, or administrative controls are lacking in electrical activities to ensure that commitments are reflected in procedures and processes (all sites).

- Controls for review of results related to electrical activities are inadequate to ensure compliance with commitments (WBN, SQN, BFN).

- Personnel lack understanding of regulatory requirements and commitments (WBN, SQN, BLN).

V. SUMMARY OF CORRECTIVE ACTION

WBN line management reported that problems noted with the FSAR would be resolved as part of a comprehensive FSAR revision being submitted to NRC by March, 1987.

With respect to Raychem instruction deficiencies, SQN, BFN, and BLN line managers committed to performing procedural reviews and revisions as appropriate. SQN line managers also committed to re-evaluating Raychem applications as part of the Environmental Qualification Program. At BFN, additional corrective action was initiated to verify the adequacy of currently installed splices, improve control of plant documents, and upgrade training on the Raychem procedures. At WBN, managers committed to making a study of the data systems used to track maintenance work activities.

For problems dealing with improper regulation and operation of electrical buses, SQN line managers initiated a Significant Condition Report and developed a corrective action plan to accomplish the following: (a) determine if equipment actually has been unacceptably degraded, (b) determine why undervoltage starts of the diesel generator have not occurred, and (c) correct and update applicable procedures. At WBN, line managers committed to revising the applicable Design Criteria, FSAR, Technical Specifications, and Surveillance Instructions. These actions will be taken under Problem Identification Reports (PIRs). Additionally, DNE will take steps to determine any deleterious effect of operation of plant equipment at excessive voltages in the past. A final preventive measure will include testing of possibly affected equipment and establishment of defined transformer tap settings. At BFN, line managers initiated a Condition Adverse to Quality report and developed a corrective action plan to accomplish the following: (a) revise the appropriate BFN Area Plan, (b) revise the BFN

FSAR to clarify commitments, and (c) review and reissue illegible drawings. At BLN, line managers commited to adoption of a formalized voltage monitoring program.

As an enhancement to the existing ground detectors, SQN and WBN line managers had plastic tags installed to provide instructions for operating and maintaining the equipment.

1.0 CHARACTERIZATION OF ISSUES

The Electrical and Communications Subcategory is comprised of 20 employee concerns, which raised eleven issues pertaining to the design, construction, operation, and maintenance of electrical and communications equipment. Related issues were combined into six higher-order groups, called elements, to aid in the investigation and evaluation process.

To locate the issue and element in which a particular concern is evaluated, consult the following attachments:

Attachment A, Subcategory Summary Table

Attachment B, List of Concerns by Element/Issue

1.1 Element 302.01 - Possible Lack of Watertight Conduit and Connections

The issues in this element address the use of Raychem. Raychem is a brand of heat-shrink material used to insulate and waterproof electrical connections.

Issue 302.01-1 - Possible Lack of Watertight Connections on Watts Bar Nuclear Plant (WBN) Unit 1 Residual Heat Removal (RHR) Pump Motors

The CI was concerned that modifications made to the RHR pump motors in WBN unit 2 (i.e., waterproofing of electrical connections) may not have been made to the unit 1 RHR pump motors.

Issue 302.01-2 - Inadequate Raychem Application Procedures and Practices at Sequoyah Nuclear Plant (SQN)

One CI stated that guidelines for use of Raychem on Class 1E work are unclear and instructions are not consistent. Two others questioned the adequacy of Raychem application on a particular valve at SQN.

Issue 302.01-3- Inadequate Mounting of Electrical Motor Boxes on Essential Raw Cooling Water (ERCW) Pump Motors at Bellefonte Nuclear Plant (BLN)

A CI thought the mounting of electrical motor boxes on ERCW pump motors was inadequate.

1.2 Element 302.02 - Five Percent Low Voltage Problem

Issue 302.02-1 - Improper Operation and Regulation of Electrical Buses at SQN and Browns Ferry Nuclear Plant (BFN)

A CI stated that a five percent degradation in line voltage at SQN and BFN caused unnecessary cycling of diesel generators.

To prevent the cycling of the diesel generators during unanticipated occurrences of voltage reduction, electrical buses allegedly were operated at higher than normal voltage ratings. This practice was allegedly stressing equipment powered by these buses and was reducing component life and reliability. The CI's concern was that WBN's electrical buses not be operated at higher than normal voltage ratings. Another CI thought the equipment at SQN could be potentially damaged because of operation at high voltage.

1.3 Element 302.03 - Disconnected Paging Speaker at Security Post Number 3

Issue 302.03-1 - Disconnected Paging Speaker at WBN Security Post Number 3

One CI believed that security personnel at WBN's Security Post Number 3 cannot hear paging over the plant loudspeaker system because of a disconnected speaker at the post. It was feared that this would compromise the response time of personnel at post number 3 in an emergency.

1.4 Element 302.04 - Ground and Electrical Shock Problems

Issue 302.04-1 - Electrical Shock Hazard in WBN Gas Treatment Room

One CI reported having received a shock in touching a hanger in the WBN emergency gas treatment room on elevation 757.

Issue 302.04-2 - Erroneous Ground Indications on Electrical Boards at SQN

CI stated that changing the bulbs in ground detectors causes false ground indications that overshadow an actual ground.

Issue 302.04-3 - Removal of Flammastic from Energized Cables

The CI alleged that Management stressed schedule over quality and cited an example in which a supervisor instructed a crew to remove flammastic from a 6.9kV cable which was energized despite the supervisor's assertion that it was not.

1.5 Element 302.05 - Communications Problems/Inadequacies

Issue 302.05-1 - Inadequate Number of Telephones at WBN

This issue was raised by six concerns that expressed a need for additional telephones throughout WBN. One CI believed that there were not enough telephones in various remote plant locations to enable personnel to report problems to the shift engineer in the control room.

Another CI thought there was a need for additional phones, particularly in the annulus area of unit 1. Other CIs believed that telephones should be placed outside of Gate G-5, between air lock doors A56 and A57, and between air lock doors C19 and C20. Another CI desired to see additional telephone lines in the vital area access portal because of the required volume of communications there.

Issue 302.05-2 - Inadequate Telephone Maintenance at WBN

A CI stated that many telephones throughout the power block (i.e., Reactor Building, Turbine Building, and Auxiliary Building) do not work. The person went on to say that telephones throughout the plant generally are not checked often enough to verify working order.

1.6 Element 302.06 - Transfer Canal Electrical Equipment

Issue 302.06-1 - Discrepancy Between Drawings and Configuration of Electrical Equipment in Fuel Transfer Canal at SQN

One CI stated that the configuration of the electrical equipment in SQN's Fuel Transfer Canal is not according to the drawing. Another CI believed that the Fuel Transfer System had been upgraded to a Quality Assurance (QA) Level II system without there being any "as-constructed" drawings.

2.0 EVALUATION PROCESS

2.1 General Methodology

Evaluations for the elements in this subcategory were performed and documented in accordance with an approved Operations Category Evaluation Plan by personnel who had been trained and qualified by TVA as evaluators. The evaluations were made for the specific circumstances and environment identified in the concerns, as well as for implications or applicability beyond the identified circumstances. Those elements identified for a particular plant were examined for generic implication/applicability to additional structures, components, systems, features or processes at that plant or at other TVA nuclear plants.

2.2 Specific Methodology

Applicable sections from the following baseline requirements documents were reviewed: Title 10 Code of Federal Regulations, Part 50 (10 CFR 50); TVA Division Procedure DPM N7701; TVA Nuclear Quality Assurance Manual (NQAM); applicable TVA General Construction Specifications; FSARs for WBN, SQN, BFN, and BLN; Technical Specifications for SQN, BFN, and BLN; applicable General Operating Instructions for SQN, BFN, and BLN; Area Plans for SQN and BLN; and applicable standard practices at WBN and SQN. To ensure consistency and implementation of the requirements found in these documents, the evaluators reviewed applicable Administrative Instructions (AI), Maintenance Instructions (MI), Surveillance Instructions (SI), Modifications and Additions Instructions (M&AI), Maintenance Requests (MR), Field Change Requests (FCR), Engineering Change Notices (ECN), preoperational test data, modifications workplans, and TVA drawings. Evaluators reviewed files which had been expurgated by NRC, as well as applicable Licensee Event Reports (LER), vendor manuals, and reports of evaluations conducted previously by the Nuclear Safety Review Staff (NSRS).

Informal interviews were conducted with cognizant personnel when required, either to verify document-based findings or to provide nondocument-based evaluation input. Interviews were conducted at the corporate level with personnel in the Division of Nuclear Engineering (DNE). Interviews also were conducted at the various plant sites with personnel from Public Safety, Construction, Operations, Electrical Maintenance, Electrical Modifications, Quality Control, Training, Post Modifications Testing, and Design Services. Additionally, physical walkdowns were performed on installed splices at BFN and SQN, RHR pumps at WBN, ERCW pump motor junction boxes at BLN, and electrical switchgear at SQN.

3.0 FINDINGS

Generic applicability statements are included only for concerns which are classified as being potentially safety-related or safety-significant as denoted on Attachment A.

3.1 Element 302.01 - Possible Lack of Watertight Conduit and Connections

Issue 302.01-1 - Possible Lack of Watertight Connections on WBN Unit 1 RHR Pump Motors

The concern regarding possible lack of watertight conduit and connections on the WBN unit 1 RHR pump motors had been substantiated in a previous evaluation conducted by NSRS (I-85-338-WBN). A nonconforming condition report (NCR 6224) had been written to correct the deficiencies in the unit 1 pump motors. However, the current evaluation determined that, before the NCR was performed, a modification was approved that requires all RHR pump motors to be removed and modified by Westinghouse. It was determined through field inspection that the spare RHR pump motors have been modified and installed in unit 1 with proper Raychem sleeves to preclude entry of water. The RHR pump motors removed from unit 1 are being modified and will be installed in unit 2 in accordance with M&AI-4, "Installation and Inspection of Cable Terminations." The current evaluation found that the concern was no longer substantiated.

Conclusion

The issue is factual, but corrective action was completed before the employee concerns evaluation.

Generic Applicability

This issue was determined to be specific and isolated to WBN. No other site evaluations are necessary.

Issue 302.01-2 - Inadequate Raychem Application Procedures and Practices at SQN

SQN

The three concerns regarding procedures and practices in the use of Raychem products for covering cable terminations and splices at SQN were substantiated, and one safety-related issue was identified. The evaluation of the Raychem applications on a particular valve of concern showed that the adequacy of the installation had already been addressed by work request WR 102031 and had been corrected. However, visual inspection of a representative sample of recently performed terminations and splices determined the Raychem application on an environmentally qualified motor operator to be deficient. This finding was determined to constitute a nuclear safety-related issue since it could not be proven to be an isolated case. During the evaluation, M&AI-7, "Cable Termination, Splicing, and Repairing of Damaged Cable," was found to be very complex and unclear. Also, documentation of material control for 10 CFR 50.49 equipment was found to be weak. Nineteen of 26 work packages reviewed did not have the material form 575 attached, and no waivers of use of the form by section supervisors as permitted by SQM-2 had been documented. Six of the work packages had referenced the wrong original purchase order number, thus making material traceability difficult.

WBN

The concern regarding procedural inconsistencies and inadequacies for selection and use of Raychem cable sleeves at SQN (TAK-85-001) was evaluated for generic applicability to WBN. The concern was not substantiated, and no safety-related issues were identified. The applicable plant instructions (MI 57.14, MI 57.15, MI 57.99 ST-7, and ESL 5.21) were found to provide sufficient direction for engineers and craftsmen to select and install Raychem applications properly. The instructions were found to provide a good example for the other TVA plants to use in revising their respective procedures.

It was determined that retrieval of data from the WBN computerized historical file is difficult and inefficient. It was not possible to retrieve work packages by specific work subjects or to retrieve specific work package attachments. Since some data fields on work package records (hard copy) are left blank or incorrectly completed, entries into the computer records are poorly categorized. Further, unique identifying numbers are not assigned to procedure attachments, thus complicating the recall of attachments from the data base. R2

BFN

The concern regarding procedural inconsistencies and inadequacies for selection and use of Raychem cable sleeves at SQN was evaluated for generic applicability to BFN. The concern was substantiated, and safety-related issues were identified. Numerous deficient applications of Raychem were found during the evaluation, and numerous deficiencies were identified in applicable construction specifications, standard drawings, and implementing instructions. The magnitude and extent of these deficiencies did not provide sufficient assurance that all applications of Raychem in the plant were adequate.

It was determined that applicable Raychem requirements from General Construction Specifications G-4 and G-38, and the BFN Electrical Standard Drawings had not been adequately incorporated into modifications and electrical maintenance instructions. These deficiencies were determined to stem from an inadequate source document implementation program between DNE and BFN. General Construction Specification G-4 did not reference the Electrical Standard Drawings. The Electrical Standard Drawings were found to contain a confusing assortment of Raychem and TVA requirements. Updated vendor information from Raychem had been partially incorporated into drawings by DNE, but BFN line managers had not been informed that these drawings applied to their plant and that they had been revised.

Specific deficiencies were found with the modifications and electrical maintenance instructions. First, numerous errors and inconsistencies were found in the instructions which had not yet been addressed by the Site Procedures Upgrade Program.

Second, it was found that requirements in these instructions for environmentally qualified work were not easily distinguished from instructions for nonqualified work. Third, the guidance from Raychem's Application Guide had never been incorporated into modifications and electrical maintenance instructions. This had been due primarily to the fact that Raychem had been sending only its Product Installation and Inspection Guide with its shipped materials but had not been sending the Application Guide. This had created a wrong impression that only one vendor manual had existed.

It was determined that BFN's vendor manual control program has been inadequate in issuing updated information from revisions to the Raychem manuals. Updated information from Raychem had been partially incorporated into Electrical Standard Drawings by DNE but had not been periodically incorporated into upper-tier documents, modifications instructions, and electrical maintenance instructions. Also, site control of design output documents was found to be inadequate. In particular, manuals of Electrical Standard Drawing were found to have missing or outdated drawings.

A qualification training program for splicing and terminating cables was found in place which contained updated Raychem information. This program appeared to be the only means by which personnel could obtain and understand all Raychem requirements.

At the time of the evaluation, the Environmental Qualification (EQ) staff was found to be inspecting junction boxes, conduits, and panels and to be photographing splices and terminations. It was determined that the EQ staff's photographs have identified several inadequate splices and terminations. Formulation of acceptance criteria for splices and terminations is in progress by the EQ staff.

BLN

The concern regarding procedural inconsistencies and inadequacies for selection and use of Raychem cable sleeves at SQN was evaluated for generic applicability to BLN. The concern was substantiated, but since no Raychem seals have been installed by NUC PR personnel, there is no impact on safety. The evaluator found that Electrical Standard Drawings and the applicable electrical maintenance instruction (EMI-2704) direct personnel to install Raychem seals in accordance with vendor instructions. These vendor instructions and their subsequent changes are not routinely reviewed by plant personnel before use. R2

There is no program in place at BLN to review changes to vendor installation instructions. Therefore, it was determined that the current applicable TVA drawings and plant instructions permit use of vendor instructions which have not been reviewed for adequacy and for impact on safety before use.

Conclusion

For the two concerns related to a specific Raychem installation at SQN, this evaluation determined that the issue was factual and identifies a problem for which corrective action is being taken. For the general concern regarding the Raychem installation procedures, this evaluation concluded that at SQN, BFN and BLN the issue is valid and represents a problem for which corrective action has been or is being taken. At WBN, the issue itself does not represent a problem, but as a result of the employee concerns evaluation a problem was discovered for which corrective action was initiated.

Generic Applicability

Concerns MAS-85-002 and MRS-85-005 described a condition which was unique to Sequoyah, thus no evaluation was required at other sites. Concern TAK-85-001 described a generic issue which was evaluated at all sites.

Issue 302.01-3 - Inadequate Mounting of Electrical Motor Boxes on Essential Raw Cooling Water (ERCW) Pump Motors at BLN

BLN

The concern regarding the adequacy of the mounting of electrical motor boxes on ERCW pump motors was not substantiated. Inspection of the motors and review of a memo from DNE Mechanical to BLN Engineering (RIMS B44 850906 020) revealed that the boxes in question were the motor terminal boxes which monitor bearing temperatures. The memo and its backup information (RIMS B44 850723 502) relate that the Mechanical Engineering Section and General Electric Company had not considered these terminal boxes in the ERCW seismic analysis because failure of the terminal boxes would not affect operation of the motors. Therefore, the electrical motor terminal boxes had not required seismic supports, and their current mounting was found adequate.

Conclusion

The issue cannot be verified as factual.

Generic Applicability

The concern was evaluated at the site of concern (BLN) and found to be not valid. No other site evaluations are necessary.

3.2 Element 302.02 - Five Percent Low Voltage Problems

Issue 302.02-1 - Improper Operation and Regulation of Electrical Buses at SQN and BFN

SQN

The concerns regarding improper electrical bus operation and regulation at SQN and potential equipment damage as a result of station overvoltage were substantiated, and safety-related issues were identified. Deficiencies noted during the evaluation involved varying degrees of inadequate implementation of design requirements, inadequate operational controls, and inadequate equipment performance.

Inadequate implementation of design requirements was evidenced by conflicting information in upper-tier documents and by changes in upper-tier documents not being reflected in implementing procedures. The SQN FSAR was found to conflict with Division Procedure DPM N7701 in the SQN Area Plan with respect to the setpoint at which there is an automatic transfer of power from the 6.9-kV switchboard to an alternate source of AC power. The FSAR reflects the actual design, while the DPM does not. References in DPM N7701 to ANSI Standard C.84-1, "American National Standard Voltage Rating for Electric Power Systems and Equipment ($60h_z$)," are out of date. Also, data in SQN General Operating Instruction GOI-6G, "Apparatus Operations," conflict with information in DPM N7701 and Standard Practice SQO 39, "SQN - AC Auxiliary Power System Operating Instructions and Transformer Voltage Tap Settings."

With respect to inadequate operational controls, a review of Surveillance Instruction SI-3, "Daily, Weekly, and Monthly Logs," documented numerous instances where the 6.9-kV and 480-volt shutdown boards had been operated at excessively high voltage. There was a lack of adequate acceptance criteria written into SI-3 to alert the persons conducting the surveillance concerning these high voltages. There were also numerous administrative errors found in the SI-3 data packages, such as blank or missing data sheets, missing dates and check marks, or initials substituted for data. There was no evidence that corrective action as detailed in SQN GOI-6G had ever been taken when safety-related board voltage limits had been exceeded. Operators should have lowered bus voltage in response to high bus voltage readings. Finally with respect to operational controls, no SQN instruction was found to define and identify responsibilities for assigning transformer taps.

With respect to inadequate equipment performance, SI-3 data showed that degraded voltage conditions of sufficient magnitude had occurred on the 6.9-kV shutdown boards which should have caused the diesel generators to start automatically and to commence powering the shutdown boards. However, a review of LER data did not reveal any automatic diesel generator startups coinciding with the degraded voltage conditions on the 6.9-kV shutdown boards. Discussion with cognizant DPSO personnel confirmed correct operation and calibration of the degraded voltage relays in the Shutdown Boards.

Several conclusions were drawn as a result of the evaluation of this concern. First, the SQN FSAR, DPM N7701, SQO-39, GOI-6G, and SI-3 need to be updated and made consistent with each other. Second, severe voltage deviations from normal on both the 6.9-kV and the 480-volt shutdown boards may have caused degradation in the equipment powered from these boards. Third, there may be a deficiency in the diesel generators' circuity preventing them from automatically starting when degraded voltage conditions exist on the 6.9-kV shutdown boards.

BFN

The concern regarding improper electrical bus operation and regulation at BFN was substantiated, and safety-related issues were identified. The concern regarding potential equipment damage as a result of station overvoltage at SQN was evaluated for generic applicability to BFN and was substantiated also.

It was determined that shutdown boards had been operated at BFN at voltages higher than normal ratings. However, it was not substantiated that BFN personnel had been intentionally operating electrical buses at higher than normal ratings in order to compensate for anticipated five-percent voltage drops. A random inspection of voltage readings taken on the 4-kV shutdown boards between November 1980 and August 1986 showed some voltages to be in excess of 4.4-kV, which is the upper limit prescribed by industry standard ANSI C.84-1 and endorsed by the BFN Area Plan N7701 and the BFN FSAR. The magnitude of these overvoltage conditions had not been great enough to cause any equipment failures. Engineering judgement cautions, however, that some degree of degradation of equipment reliability and shortening of equipment useful life may have occurred because of the operation at high voltages.

During the evaluation several specific deficiencies were noted in BFN upper-tier documents. First, the BFN Area Plan N7701 was found to conflict with the BFN FSAR with respect to the description of how transfers to alternate power sources occur during degraded voltage conditions. Second, the BFN Area Plan N7701 contradicts ANSI C84.1 with respect to minimum voltage limits for emergency operation in the 4-kV shutdown boards.

Third, the degraded voltage setpoint presented in the BFN Area Plan N7701, the BFN FSAR, and the BFN Technical Specifications is lower than the minimum voltage limit of ANSI C84.1. Fourth, the BFN FSAR was found to contain illegible drawings. Finally, it was determined that the BFN FSAR neither commits to nor takes exception to ANSI C84.1. There was no documented justification for not completely endorsing ANSI C84.1 voltage limits in the FSAR.

With respect to instructions reviewed during the evaluation, SI-2, "Instrument Checks and Observations," was found not to provide for recording either the 480-volt shutdown board voltages or breaker alignments. However, the BFN Alarm Response Procedure was found to be a well-prepared and useful instruction.

WBN

The concerns regarding improper electrical bus operation and regulation at SQN and BFN, and potential equipment damage as a result of station overvoltage at SQN were evaluated for generic applicability to WBN. The concerns were substantiated, and safety-related issues were identified. Review of SI-3 data sheets revealed that 480-volt shutdown board voltages periodically have been in excess of the safe operating voltage limits prescribed by ANSI C84.1-1970, "American National Standard Voltage Ratings for Electrical Power Systems and Equipment ($60H_Z$)," and by Supplement ANSI C84.1a-1973. These periodic excessive voltages have been occurring for two main reasons. First, various safety-related transformer taps at WBN are set to step up bus voltage by as much as five percent. Therefore, when the 161-kV and 500-kV grids which supply the shutdown boards have been operated above nominal voltage values, excessive voltages on the 480-volt shutdown boards have resulted. Second, SI-3 does not list any acceptance criteria for voltage levels on the shutdown boards. Because of this, no action has been taken to reduce 480-volt shutdown board voltage when it has been high during conduct of the SI.

During the course of the evaluation, two TVA upper-tier documents--Division Procedure TVA DPM N7701 and the WBN FSAR--were found not to be in agreement with respect to the voltage setpoint at which automatic transfer to alternate power sources occurs. Also, three copies of the WBN FSAR schematic describing the degraded voltage circuitry logic were found to be illegible on the right side of the page. These two specific deficiencies were referred to subcategory 307 within the Operations Category for evaluations.

BLN

The concerns regarding improper electrical bus operation and regulation at SQN and BFN, and potential equipment damage as a result of station overvoltage at SQN were evaluated for generic applicability to BLN.

The concerns were substantiated, and safety-related issues were identified. The evaluator observed voltages on the 6.9-kV shutdown boards which are in excess of ANSI C84.1 limits and which could cause equipment failure and degradation of equipment reliability in the long term. It was determined that the 6.9-kV and 480-volt shutdown board voltages are not routinely monitored and that no automatic bus transfers are initiated on an overvoltage condition. The automatic transformer tap changer was documented to have regulated voltage above the overvoltage alarm setpoint, resulting in overvoltage alarm problems.

During the evaluation several problem areas were noted in BLN upper-tier documents and implementing instructions. The BLN Area Plan 1403 (DPM N7701), the BLN General Operating Instruction BLGOI-01-11, PSO Setting Sheet 5929, and the BLN FSAR were found to conflict with the BLN Technical Specifications with respect to degraded voltage setpoints. The FSAR does not state a position with respect to ANSI C84.1. The Technical Specifications do not provide for 6.9-kV and 480-volt bus voltage record keeping to be performed at regular intervals. Also needs for editorial corrections were identified in the FSAR, in BLGOI-01-11, and in a BLN PSO maintenance instruction.

Conclusion

The issue is factual and presents a problem for which corrective action has been or is being taken for all plants.

3.3 Element 302.03 - Disconnected Paging Speaker at Security Post Number 3

Issue 302.03-1 - Disconnected Paging Speaker at WBN Security Post Number 3

The concern regarding a disconnected paging speaker at WBN Security Post Number 3 was determined to be a statement of fact but no specific deficiencies were identified. Neither hazard control instruction HCI G-12 nor TVA paging drawing 55N13001 establishes a requirement for loudspeakers at post number 3. Discussion with the cognizant Public Safety Security Chief revealed that the plant general paging system is not used for security purposes and that communication with post number 3 is established by radio or by telephone.

Conclusion

The issue is factually accurate, but what it describes is not a condition requiring corrective action.

3.4 Element 302.04 - Ground and Electrical Shock Problems

Issue 302.04-1 - Electrical Shock Hazard in WBN Gas Treatment Room

The concern regarding an electrical shock hazard in the WBN emergency gas treatment room was not substantiated. The evaluator and a WBN electrician checked conduit and hangers in the room for electrical potential, and none was found.

Conclusion

The issue cannot be verified as factual.

Generic Applicability

This concern was evaluated at the site of concern (WBN) and found to be not valid. No other site evaluations are necessary.

Issue 302.04-2 - Erroneous Ground Indications on Electrical Boards at SQN

SQN

The concern regarding erroneous ground indications on electrical boards at SQN was substantiated, but no safety-related issues were identified. Discussions with cognizant operations personnel revealed that the potential for partial false ground indications on the 480-volt electrical boards have existed because of bulbs of different types being installed in the ground detector. This finding was determined not to be safety-related for two reasons. First, the ground detectors are able to distinguish between partial grounds and full grounds. Second, the 480-volt boards are equipped with overcurrent protective relays.

During the evaluation no procedures were found to exist for replacing the ground detector bulbs or for conducting corrective maintenance on board grounds.

WBN

The concern regarding erroneous ground indications on electrical boards at SQN was evaluated for generic applicability to WBN and was substantiated; however, no safety-related issues were identified. Ground detectors on the WBN 480-volt boards were satisfactorily inspected and tested by a WBN electrician. During the evaluation a cognizant maintenance foreman agreed that replacement of ground detector bulbs in sets of three from the same box could eliminate the possibility of problems with false ground indications. A recommendation to establish this practice was forwarded in a CATD for WBN line management to evaluate.

Conclusion

For SQN, the issue was factual and represented a problem for which corrective action has been, or is being, taken as a result of the employee concerns evaluation. For WBN, the issue is not currently a problem, but due to the potential for false ground indications, corrective action was initiated.

Generic Applicability

Although there were findings relative to the concern, the findings were not of a safety-related nature. As no significant issues were identified, no evaluations were performed at BFN or BLN.

Issue 302.04-3 - Removal of Flammastic from Energized Cables

WBN

The concern regarding a maintenance crew being assigned to cut flammastic off of energized 6.9kV cables was not substantiated. A maintenance supervisor stated that procedures require a workplan and a hold order on the cables whenever flammastic is removed. Further, he stated that, to his knowledge, no breakdown of procedures resulting in a situation like that described by the CI had ever occurred.

The Construction Category Report 10900 evaluated a concern on removal of flammastic coating using sharp instruments. The concern did not allege that the procedure had been used on energized cables. The evaluation determined that the NRC had identified a problem with cable damage related to flammastic removal in 1984. DNC revised procedures MAI-14 and WBN-QCP-1.55 to ensure cables were not damaged by knives. Management and Personnel Subcategory Report 70600 provides assurance that the issue of management lack of attention to quality was "not factual."

Conclusion

The issue cannot be verified as factual

Generic Applicability

The concern was evaluated at the site of concern (WBN) and found to be not valid. No other site evaluations are necessary.

3.5 Element 302.05 - Communications Problems/Inadequacies (WBN)

Issue 302.05-1 - Inadequate Number of Telephones at WBN

The six concerns relating to the adequacy of inplant telephone communications capabilities at WBN either were not substantiated or were found to be true and to present no problem. No safety-related issues were identified, and no corrective action was required.

The concern regarding inadequate communication capabilities from remote plant areas was not substantiated. Personnel from Operations Construction, and Maintenance agreed that adequate numbers of operating telephones are provided in the plant to report problems to the control room and to the shift engineer's office. It was found that individuals may offer suggestions for areas in the plant requiring telephones by submitting a maintenance request or Telephone Request Form.

The concern that additional telephones are needed in the vital access portal to prevent overload of radio frequencies in emergency situations was not substantiated. Public Safety Personnel reported that radios are the primary means of communications in an emergency situation and that personnel are ordered to clear the frequencies, except for emergency communication, during times of emergency. Because telephones were found to be used only as a backup to radios during emergencies, it was concluded that additional telephones in the vital access portal would be a convenience rather than a requirement.

The concern regarding inadequate telephones in the annulus was not substantiated. In a previous evaluation of this concern, WBN line management had conducted a walkdown to identify the communication equipment in the annulus. Telephones had been found installed in four of seven annulus platforms and telephone jacks had been located on each platform. Even though line management had considered these provisions to be adequate, as an enhancement additional telephones had been added to the three platforms that had no telephones.

The concern stating that a telephone is required at gate G-5 in case of an accident was not substantiated. Two telephones near gate G-5 were found, and there was an alternate gate for entering back into the site area in case of an accident.

The concern that telephones should be placed within two sets of air lock doors in case employees become trapped between the doors was not substantiated. The evaluator verified that personnel cannot be trapped between these doors during a power failure because manual means of escape are provided for each set of doors. It was concluded that the addition of a telephone within either set of doors would be only for convenience.

Conclusion

The issue could not be verified as factual.

Issue 302.05-2 - Inadequate Telephone Maintenance at WBN

The concern that many telephones in the plant do not work was found to be true but did not present a problem. It was determined that the Electrical Maintenance Communications Group is working to correct telephone problems as they are identified. Plant personnel may request maintenance work on telephones by using a Standard Maintenance Request form or a Telephone Service Request form (WB 2.1.3, Attachment B).

It was noted that most telephone problems throughout the plant result from vandalism rather than from equipment failure. A statement in this concern that telephones are not checked enough to verify working order was not substantiated. The evaluator verified that the plant housekeeping instruction (AI 1.8) checking for operability of plant telephones is performed monthly as required.

Conclusion

The issue is factually accurate, but what it describes is not a problem.

3.6 Element 302.06 - Transfer Canal Electrical Equipment (SQN)

Issue 302-06-1 - Discrepancy Between Drawings and Configuration of Electrical Equipment in Fuel Transfer Canal at SQN

SQN

The two concerns relating to the configuration of equipment in the fuel transfer system at SQN were not substantiated, and no safety related issues were identified. Post-modification testing, per PMT-48, verified the proper configuration of the fuel transfer equipment. The affected drawings had been updated per workplans 10341, 10646, 10664, 10994, and 11041 to reflect the "as-constructed" configuration.

WBN

The concern regarding the configuration of electrical equipment in the fuel transfer canal (SQP-85-004-002) was evaluated for generic applicability at WBN. Like SQN, the only electrical device in the canal is a limit switch. No configuration discrepancies were found with the existing as-constructed Westinghouse drawing (1607E85).

Conclusion

The issue cannot be verified as factual.

Generic Applicability

Concern SQP-85-004-002 was evaluated at WBN and SQN because of the similarity of fuel transfer system design. Concern SQP-86-011-001 was evaluated at SQN only and found not valid. No other site evaluations are necessary.

4.0 COLLECTIVE SIGNIFICANCE

Analysis of the specific deficiencies and their immediate causes revealed two significant problem areas with the potential to seriously degrade the technical adequacy of major plant components:

- Lack of corporate control over vendor supplied materials and instructions; design, modification, and maintenance practices; and proper application of Raychem products.

- Lack of corporate and plant control over bus operating voltages, design requirements, and implementation of design standards through operating procedures.

The first area of deficiency cited above is evident in the numerous specific deficiencies and inconsistencies found in specifications, instructions, drawings, and work packages. There is no effective control mechanism to ensure that vendor information and product usage guides are integrated with design, construction, and maintenance processes. The issue of experience review and exchange of information between plants is discussed in subcategory report OP 30700.

The problems surrounding the bus overvoltage situation are symptomatic of an overall failure to control design, operating, and maintenance processes. Even though overvoltages had been recorded during normal surveillance processes, no action was taken. No controls were in place to ensure that technical requirements were clearly indicated in instructions, nor were their controls to initiate corrective action for deficient conditions found during surveillance.

5.0 ROOT CAUSE, PRELIMINARY ANALYSIS

Sections 3.0 and 4.0 discussed the specific findings for each of the element evaluations of this subcategory and their collective significance. This section presents the results of the independent review and analysis done on these specific element-level findings to identify the most frequently occurring and widespread root causes at the subcategory level. Patterns of recurring findings called symptoms were derived from elements.

These symptoms were tested for root causes, and the root causes for all elements were then analyzed collectively to identify which occurred most frequently and at the most sites. Details of the symptoms and root causes derived for each element are presented in Attachment D, "Summary of Symptoms and Root Causes."

The review and analysis of the symptoms and root causes taken collectively points to five significant root causes in the subcategory:

a. Various electrical procedures lack specifics to perform the task, are incomplete, or fail to incorporate all technical requirements (WBN, SQN, BFN, BLN)

b. There are inadequate acceptance criteria defined in various electrical procedures to ensure satisfactory task completion (WBN, SQN, BFN, BLN)

c. Adequate systems, processes, or administrative controls are lacking in electrical activities to ensure that commitments are reflected in procedures and processes (WBN, SQN, BFN, BLN)

d. Controls for review of results related to electrical activities are inadequate to ensure compliance with commitments related to electrical activities (WBN, SQN, BFN)

e. Personnel lack understanding of regulatory requirements or commitments (WBN, SQN, BLN)

These five subcategory-level negative findings derived from root cause analysis are supported by various element-level findings at all TVA nuclear plants. The first negative finding is supported by (a) the complexity of M&AI-7 at SQN (section 3.1), (b) SI-3 at SQN lacking adequate acceptance criteria and containing numerous administrative errors (section 3.2), and (c) the existence of Raychem procedures at BLN that simply reference vendor instructions (section 3.1). For the second negative finding, there were (a) inadequate acceptance criteria in the applicable SI at WBN for voltage levels on shutdown boards (section 3.2), and (b) inadequate acceptance criteria defined at BFN for performing cable splices and terminations (section 3.1). Examples supporting the third negative finding include (a) the inadequate source document implementation program between DNE and BFN (section 3.1), and (b) changes in upper-tier documents dealing with electrical bus voltage regulation not being reflected in lower-tier documents at SQN (section 3.2). For the fourth negative finding, there was (a) a deficient application of Raychem coating found on an environmentally qualified motor operator at SQN (section 3.1), and (b) evidence of insufficient reviews of SI-3 data at SQN to identify out of specification voltage readings (section 3.2). With respect to the fifth negative findings, (a) transformer taps at WBN were set such that voltages on 480-volt shutdown boards exceeded maximum limits (section 3.2), and (b) transformer taps at BLN were designed such that overvoltage conditions exist on 6.9-kV shutdown boards (section 3.2).

Corrective Action Tracking Documents (CATDs) were not issued specifically on these subcategory-level root causes. It was believed that corrective actions being taken already by line management as part of the commitments made in the Nuclear Performance Plan were helping to address these root causes. However, line management was expected to use the subcategory-level root cause information as an aid in preparing corrective action responses to subcategory-level CATDs that would preclude recurrence of the deficiency noted. The ECTG's process for judging the adequacy of line corrective action responses to subcategory-level CATDs included a determination of how well the applicable root causes were addressed by the response.

The significant root causes for all subcategories in the operations category provided part of the input for determining programmatic areas of weakness at the category level and the associated causes. In the operations category report, these programmatic weaknesses and associated causes are presented along with a discussion of how they are being corrected through implementation of the Nuclear Performance Plan and other corrective action programs.

6.0 CORRECTIVE ACTION

6.1 Corrective Action at the Element Level

6.1.1 Element 302.01 - Possible Lack of Watertight Conduit and Connections

WBN

CATDs 30201-WBN-01 and 30201-WBN-02 were issued to WBN line management to identify enhancements for the computerized historical file. CATD 30201-WBN-01 noted that retrieval of work package data by specific subject is difficult. CATD 30201-WBN-02 stated that certain procedure attachments are not uniquely identified to allow for entry into the computerized historical file. Corrective action for these CATDs is as follows:

30201-WBN-02 ONLY

COMPLETED 3-30-88

"Watts Bar Nuclear Plant (WBN) Document Control (DCU) has not had a request to retrieve by the parameters indicated in the CATD 302.01. We can develop a code to enter a vendor such as RAYCHEM into the "Vendor" and/or "Keyword" fields that are now available. We can add additional information into the document reference field (DXREF) to facilitate retrieval.

"However, the sections developing the record must indicate who is the vendor, what the keyword is, and what procedure, document, etc., is involved for this information to be entered."

"A task group will be formed to evaluate the adequacy of the WBN computerized data systems pertaining to maintenance activities. This task group will make recommendations to modify the systems in the areas identified that would require enhancements and better utilize the system available. The following items will be considered as a minimum:

1. Data input and output formats

2. File identifiers (for entry/retrieval)

3. "Keyword" usefulness

4. Input/output procedures

5. System for assuring that needed files are computerized.

"This task group shall consist of at least members from the maintenance sections, and the Document Control Unit (DCU).

(Note - also see CAP 30904-WBN-01 for more information.) (T41 870216 878)"

"The Electrical Maintenance Section contacted Document Control Unit (DCU) personnel to identify the format they use for computer entry. At present only the procedure number is entered. The Electrical Maintenance Section recently changed these standard tests in MI-57.99.7. The attachments to these instructions are individually identified as selection guides or termination sheets.

SQN

In two CATDs sent to SQN line management, (30201-SQN-01 and 30201-SQN-02) several recommendations were made regarding Raychem procedures and practices. The acceptable response to these CATDs received from SQN line management was as follows:

"In response to IE Information Notice 86-53 and the Environmental Qualification program, Sequoyah will have an inspection program for Raychem applications. This work activity can be found in the unit 2 Project/2 network as zone 3144. The present duration is indeterminate until the program is defined by the Division of Nuclear Engineering."

"SQM-2 and AI-19 are quite specific in the requirements of material traceability, including 10 CFR 50.49 equipment. The procedures comply with the requirements of SQA-173, "Environmental Qualification Program." Training classes will be conducted to reemphasize the requirements of AI-19 and SQM-2 for material traceability. These classes should be completed by December 12, 1986."

"Section 7.0 of M&AI-7 describes Raychem installation instructions. M&AI-7 is indexed to describe splices and terminations of various sizes and types of cables. These sections reference applicable standard drawings to be followed. It is not practical to have one procedure to describe the splice or termination and another procedure to execute the splice or termination."

"Electrical Maintenance will review M&AI-7 and propose improvements to the procedure. The Electrical Maintenance Supervisor expects to complete this review by January 30, 1987. If revisions to the procedure are necessary, this should be completed by March 30, 1987."

BFN

CATD 30201-BFN-01 requested corrective action to improve the control of design output documents onsite. Response is as follows:

"Missing procedures from Document Control Station (Trailer Number 16) listed on the above CATD 30201-BFN-01 have been requested, received, and filed in appropriate books. An audit has been scheduled with a completion date of February 28, 1987 on all Controlled Manuals located in Trailer 16. A chain shall be installed by February 28, 1987 to rope off the Document Control Area."

"A letter has been initiated to all supervisors to inform their employees during working hours, (7:00 a.m. to 3:30 p.m.) all material must be checked out/in by a DCC employee. Material needed after 3:30 p.m. or on weekends must be requested from the technical library, A1B extension 2898. These actions should correct and prevent recurrence of the subject condition."

Additional corrective action was requested to improve the plant procedures related to Raychem. Twelve specific deficiencies were outlined by CATD 30201-BFN-02:

1. Requested revision of various procedures to resolve inconsistencies. Response is as follows:

   "The control copy of the Raychem Vendor data shall be maintained by DNE-EEB-Central Staff and the information contained therein be disseminated to the projects by design output document, General Construction Specification G-38 and Standard Drawings SD-E12.5.3 through SD-E12.5.9. These documents should be the only documents used for input of Raychem splice related information into Browns Ferry Specific procedures MAI-45 and EMI-58. MTE-129 should be used for training and shall reference MAI-45, EMI-58, standard drawings 1 SD-E12.5.3 through SD-E12.5.9 G-38 and the Raychem application guide. All modification and maintenance personnel shall be trained by MTE-129 and retrained for any revision to any of these documents. MAI-13 has been cancelled and removed from all document control stations, MAI-18, and BF-17R are no longer applicable and shall either be cancelled or shall have any reference to the application of Raychem materials deleted and replaced by references to either MAI-45 or EMI-58. G4 should refer to the use of G-38 for BFNP."

2. Requested clarification of procedures which describe the use of scotch 70 tape with Raychem - Response is as follows:

   "General Construction Specification G-38 Section 3.4.3.1.1 allows the use of Scotch 70 tape for non-class 1E cable applications with an overall Raychem WCSF-N Sleeve, unless otherwise noted on Design Drawings. Class 1E Standard Drawings do not allow the use of Scotch 70 tape. The Scotch 70 tape is rated for use up to 180 degrees C and the overall Raychem Sleeve is to provide protection against moisture. Non-class 1E splices would not be qualified for a loss of coolant accident (LOCA) or main steam line break (MSLB), harsh

environment. EMI 58.2 is in error, an outer jacket of Raychem WCSF-N material is required as specified in G-38. The EMI-13 series of procedures shall be revised, as stated in the CA for CATD-30201-BFN-05 items 6-10. MAI-13 has been cancelled and superceded by MAI-45.

3. Requested DNE approval for the Raychem Vendor Manual. Response is as follows:

   "The Raychem manual was approved by DNE November 10, 1986 (B22 861112 005, B22 861112 006), however it shall not be used to install Raychem materials, or referenced by BFNP plant procedures, after the revision to G-38, as stated in item 1 above."

4. Requested incorporation of the Raychem manual into the DNE vendor manual control program response is as follows:

   "Vendor Manual approval was implemented November 1, 1986, by issue of PI-86-27. All Raychem manuals, literature and updates or revisions to these documents shall be reviewed by DNE and incorporated into G-38 which shall be TVA's controlling document as stated in item 1 above. This manual has been reviewed and approved by DNE as stated in item 3 above."

5. Requested revision of a standard drawing to resolve a conflict with the Raychem Manual. Response is as follows:

   "Standard drawing SD-E12.5.3 was generated as an instruction for applying 3M splice kits, not Raychem kits. (Note 2) The application of Raychem products does not qualify this splice for a harsh environment, HELB or LOCA. Note 7 on this drawing allows the use of a Raychem kit as an alternative to the 3M kit shown on the drawing and refers to manufacturers instructions for installation. If an "N" type Raychem kit was purchased and the instructions included in the kit were followed a HELB qualifiable splice could be made, however this was not the intent of this drawing. Each cable splicing standard drawing shall be annotated with its applicable environmental conditions."

6. Requested revision of a Standard Drawing to resolve a conflict with the Raychem manual. Response is as follows:

   "The requirement for 1/4 inch overlap on SD-ER.5.6 may be relaxed per note F on the same drawing. These are two separate drawings which address different voltage levels."

7. Requested revision to a Standard Drawing to clarify splice requirements. Response is as follows:

   "Yes, see response to item 5."

8. Requested revision to a Standard Drawing to clarify requirements. Response is as follows:

   "The termination shown on SD-E12.5.4 is representative of a medium voltage termination in a mild environment. If qualified termination is required, it should be accomplished in accordance with SD-E12.5.5-1. Terminal lugs should not be exposed to free air in a harsh environment."

9. Requested revision to a Standard Drawing to clarify requirements. Response is as follows:

   "Concur with comment. It should be noted that medium voltage terminations are not qualified for a LOCA. Details A and B are not qualified for a LOCA/HELB. Standard Drawings are scheduled for a general revision to incorporate the resolution of Raychem problems. This revision will be issued by October 5, 1987."

10. Requested DNE action to address splicing of rubber insulated cable. Response is as follows:

    "G-38, Section 3.4.3.1.1 states that class 1E Cable Splices and terminations shall be made in accordance with SD-E12.5.6, SD-E12.5.7-1, and SD-E12.5.7-2.

    "Multi-conductor Cable Splices for class 1E cables shall be installed in accordance with SD-E12.5.8 according to G-38, Section 3.4.1.2."

11. Requested revision to a Standard Drawing to clarify requirements. Response is as follows:

    "Concur, the 1/4-inch overlap requirement was removed from note 7F by revision 8 on 9-19-86."

12. Requested clarification of general requirements. Response is as follows:

    "See response to Number 1 and 5."

CATD 30201-BFN-03 requested various improvements in the training program related to the use of Raychem and other splicing procedures. Seven specific areas were identified.

1. Requested resolution of inconsistencies tabulated in the report. Response is as follows:

   "See corrective action for CATD 30201-BFN-02 item 1."

2. Requested revision of lessons to describe a method of measuring cable diameter. Resolution is as follows:

   "See corrective action for CATD 30201-BFN-04 item 8."

3. Requested revision to an instruction to resolve a conflict with the Raychem Manual. Response is as follows:

   "The requirement to abrade cable is not addressed by Raychem Corporation and will be deleted from the training materials."

4. Requests revision of an instruction to incorporate a new G-spec. Response is as follows:

   "See corrective action for CATD 30201-BFN-02 item 1."

5. Requests revision of an instruction to correct errors. Response is as follows:

   "Agree, these typographical errors will be corrected with the revision which is required by the implementation of CATD 30201-02 item 1."

6. Requested revision to an instruction to clarify splicing requirements. Response is as follows:

   "Raychem products are used for harsh and "balance of plant" environments. Both applications are discussed in class so craftsmen might learn to differentiate between the two, however this is the ultimate responsibility of the engineer writing the workplan. Clear separation of application requirements will be stressed in lesson plans."

7. Requests revision to an instruction to clarify tape selection requirements. Response is as follows:

   "Current tape requirements shall be discussed in the training course."

CATD 30201-BFN-04 requested the BFN Modifications group to revise procedures related to Raychem and splicing. Twelve instances requiring action were cited:

1. Requested general revisions to resolve discrepancies identified in the report. Response is as follows:

   "See corrective action for CATD 30201-BFN-02 item 1."

2. Requested revisions to several procedures to incorporate the Application Guide requirements. Response is as follows:

   "This item is also included in the corrective action described in CATD 30201-BFN-02 item 1."

3. Requested revisions to several procedures to require craft qualification. Response is as follows:

   "We agree and recommend that QC verify the qualification of each electrician prior to the application of Raychem products by using a maintained list of qualified personnel which shall be provided by training. Implementing this corrective action should correct and prevent recurrence of this condition."

4. Requested deletion of an obsolete Raychem drawing from a procedure. Response is as follows:

"We recommend deleting any splicing instructions contained in MAI-18, this is addressed in CATD 30201-BFN-02 item 1."

5. Requested revision of procedures to comply with Design Standards. Response is as follows:

   "See corrective action for CATD 30201-BFN-02 item 1."

6. Requested revision to a procedure to clarify a definition. Response is as follows:

   "The Raychem portion of MAI-13 has been superceded by MAI-45, this has also been addressed by CATD 30201-BFN-02 item 1."

7. Requested revision of an instruction to correct a conflict. Response is as follows:

   "We agree, MAI-13 has been deleted and is no longer located in document control stations, it is superceded by MAI-44 and MAI-45."

8. Requested revision to instructions to describe a method for measuring cable diameter. Response is as follows:

   "Micrometers are presently specified by MAI-45 and should be specified by EMI-58 as the tool which is required for measuring the diameters of the cable for selection of the tubing size. Training on the use of micrometers shall be provided under MTE-129. Implementing these changes to EMI-58 and MTE-129 should correct and prevent recurrence this condition."

9. Requested revision of an instruction to clarify requirements. Response is as follows:

   "We feel that MAI-45 incorporates the content of the existing standard drawings with adequate detail and clarity."

10. Requested that modifications and maintenance review and approve a Training Lesson Plan. Response is as follows:

"MTE-129 shall be written and updated by a qualified Raychem instructor in accordance with G-38 and the standard drawings. MTE-129 should also provide training on completing the forms contained in MAI-45 and EMI-58, an opportunity for critique of MTE-129 should be provided at the end of each training session. All training shall be conducted by a qualified Raychem instructor.

"Implementation of this corrective action should correct this condition and prevent recurrence."

11. Requested that modifications examine the splicing procedures to assure completeness. Response is as follows:

    "All information required to perform any work including inspection and signoff shall be provided at the time and location when and where the Raychem material is applied by using MAI-45 or EMI-58. This should be included in all applicable workplans."

12. Requested revision of procedures to better distinguish between qualified and nonqualified applications of Raychem. Response is as follows:

    "See corrective action for CATD 30201-BFN-02 item 12."

CATD 30201-BFN-05 was issued to BFN Maintenance to provide action on thirteen specific issues:

1. Requested revision to procedures to resolve inconsistencies as identified in the report. Response is as follows:

   "See corrective action for CATD 30201-BFN-02 item 1."

2. Requested revision of instructions to incorporate vendor requirements. Response is as follows:

   "See corrective action for CATD 30201-BFN-04 item 2."

3. Requested revision of procedures to require specific craft training. Response is as follows:

   "See corrective action for CATD 30201-BFN-04 item 3."

4. Requested revision of instructions to describe methods for using Raychem on rubber insulated cables. Response is as follows:

"See corrective action for CATD 30201-BFN-02 item 2."

5. Requested revision of instructions to describe acceptable methods to measure cable diameters. Response is as follows:

"See corrective action for CATD 30201-BFN-04 item 8."

6-10. Requested various revisions to EMI-58 to improve usability, clarify requirements, and reduce repetition. Response is as follows:

"The corrective action plan shall require the Electrical Technical Section to revise the EMI-58 series of procedures to ensure that the salient requirements of Raychem are included. Completion of this activity should correct and prevent recurrence of the conditions identified by items 6-10 of this CATD. The expected completion date is 3-15-87, see ETS assignment 6022, however contrary to the present priority of this ETS assignment we feel that this is a restart item."

11. Requested that Maintenance review and approve a lesson plan to assure acceptability. Response is as follows:

"See corrective action for CATD 30201-BFN-04 item 10."

12. Requested that Maintenance management determine the extent of craft training needed. Response is as follows:

"See corrective action for CATD 30201-BFN-04 item 11."

13. Requested general update of Raychem procedures and standards to improve clarity and usability. Response is as follows:

"See corrective action for CATD 30201-BFN-02 item 12."

BFN additionally provide a summary of all corrective action related to this issue:

"The corrective actions for CATD 30201-BFN-02 item 2, CATD 30201-BFN-04 items 3, 8 and 11 and CATD 30201-BFN-05 items 6 through 10, shall be completed before the installation of Raychem materials by the procedures involved in these corrective actions. These corrective actions have been annotated in the text of this document with an *. The corrective action for CATD 30201-BFN-01 is presently scheduled for completion on February 28, 1987.

"The following list of corrective actions are not required for U2 restart, and will be completed by 10-5-87.

CATD 30201-BFN-02 items 1, 5, 6, and 9

CATD 30201-BFN-03 items 3, 5, 6, and 7

CATD 30201-BFN-04 items 4 and 10

The following list of corrective actions are complete.

CATD 30201-BFN-02 item 3, 4, and 11

CATD 30201-BFN-04 items 6 and 7

"All remaining corrective actions, which do not reference one of the actions listed above, do not require any work."

BLN

CATD 30201-BLN-01 was issued to BLN line management identifying specific problems with the plant's Raychem instructions, as well as noting the lack of an overall program to review changes to vendor installation instructions. Corrective action responses received from BLN Construction and Operations management were as follows:

Construction:

"Our review of this concern shows no validation of a field installation problem. Since the initiation of the Raychem program at BLN, Division of Nuclear Construction (DNC) engineering has been constantly involved with site review of vendor material and vendor instructions. These reviews have resulted in many interfaces with Division of Nuclear Engineering (DNE) and Raychem to insure our DNC procedures and DNE standard drawings interfaced with the vendor instructions. All new vendor instructions are routed in house through DNC engineers for review and all new products (i.e., medium voltage kits which are just procured) are thoughly reviewed and any questions are clarified through DNE and Raychem before any installations are begun.

"We find that this concern is applicable to us in the fact that we do not have a procedural tie to review vendor instructions, changes, etc., but we have in-house kept a tight review on these documents and adhere to them in our field installations, through training of engineers and craftsmen."

Operations:

THIS ITEM COMPLETED
DATE 3-4-88

"Discrepancy Report BLN-DR-9-R, has been issued to document this problem. BLEMI-2704 will be revised to ensure that the detailed vendor instructions used to install Raychem seals will receive the appropriate review and approval prior to use."

6.1.2 Element 302.02 - Five-Percent Low Voltage Problems

CATD 30202-NPS-01 was issued to ONP to request revision of NPP N7701 to agree with the FSARs and actual plant designs. Corrective Action proposed is as follows:

"Update DPM N7701 to reflect the operating guidelines necessary to maintain the auxiliary power system voltage within recommended operating limits. Update the description of the relays which monitor the safety-related boards. Provide a requirement to operate the shutdown boards below the maximum and above the minimum recommended voltage. A requirement previously existed for the minimum but there was no requirement to operate below the maximum recommended voltage."

WBN

CATD 30202-WBN-01, 30202-WBN-02, 30202-WBN-03, 30202-WBN-05, 30202-WBN-06, and 30202-WBN-07 were issued to WBN line management and corporate management for deficiencies found during the evaluation of the concern relating to improper electrical bus operation and regulation. These deficiencies included numerous inconsistencies between the WBN FSAR, WBN Standard Practice 5.2.6, and Division Procedure TVA DPM N7701 with respect to the voltage setpoint at which automatic transfer to alternate power sources occurs. Also, it was stated that three copies of the WBN FSAR schematic describing the degraded voltage circuity logic are illegible on the right side of the page. The 5-percent boost tap setting on the 6.9-kV to 480-volt shutdown board transformer was identified as the cause for 480-volt shutdown board voltage periodically being in excess of FSAR and ANSI C84.1 upper limits. The CATD also requested corrective action to add shutdown board voltage acceptance criteria to the existing Surveillance Instruction. Response to the CATD is as follows:

30202-WBN-05

THIS ITEM COMPLETED
DATE 6-1-88

30202-WBN-07

THIS ITEM COMPLETED
DATE 3-4-88

"The individual resolution of immediate action . . . will be accomplished by FSAR revision which will be submitted to the NRC by March 16, 1987. Numerous inaccuracies in the Watts Bar FSAR have been documented under SCR GEN NEB 8602 and will be generically resolved by a comprehensive FSAR verification plan. The objective of the FSAR verification is both an updating to achieve accuracy and the development of an interface with the change control programs for design and operations. That plan is part of the Design Baseline and Licensing Verification Program which is clearly identified on the Watts Bar Integrated Schedule and is a prerequisite to fuel loading."

The corrective action response regarding revision of WBN Standard Practice 5.2.6 was as follows:

"WB-5.2.6 has been revised. Revision 1 of WB-5.2.6 was issued on August 7, 1986 and satisfies this item."

Corrective action was also provided to determine the effects of past voltage variations and to initiate measures to prevent recurrence:

"Revise Watts Bar Design Criteria WB-DC-30-1 to reflect the voltage rating requirements described in ANSI C84.1 and C92.2. Also, revise the FSAR to commit to the same ANSI standards and requirements. These ANSI standards should be utilized to establish acceptance criteria for voltage limits. This acceptance criteria will be reflected into WBN Technical Specifications and appropriate Surveillance Instructions Acceptance Criteria will address voltage limits for normal operation as well as voltage limits for safe operation. DPM N7701, and subsequently GOI-7G and Standard Practice WB-5.2.6, will be revised to include maximum voltage limits for safe operation. The above discrepancies will be identified in PIRWBNEEB86103 (unit 1) and PIRWBNEEB86104 (unit 2). Corrective action will be accomplished under these PIRs.

"The following steps will be taken to determine if any auxiliary shutdown board equipment was unacceptably degraded due to overvoltage conditions:

1. "Determine the maximum voltages that could have occurred in auxiliary power system. This effort will pinpoint the boards that have seen the highest voltages and determine if equipment rated 8kV or 600V ac will need any further consideration.

a. "OES will review the locally available past recorded voltages for the incoming sources to determine the maximum voltage that has occurred.

b. "WBEP will use the maximum switchyard voltage to determine maximum voltages in the auxiliary power system.

"WBEP will develop an impedance diagram based on the minimum board loading and by using the maximum switchyard voltages at the source voltages will calculate the maximum voltages of the boards. Operations will provide EEB with a history of tap changes for the Common Station Service transformers and 6900/480V Shutdown transformers and the existing tap settings.

2. "Review all Class 1E ac electrical equipment for susceptibility to overvoltage. This will narrow the scope of the investigation to only the devices that are susceptible to overvoltage.

a. "WBEP will provide a list of types of equipment that may have been subjected to overvoltage.

b. "EEB technical specialist will determine which devices are most susceptible to overvoltage and also which devices may have been degraded.

3. "Watts Bar Electrical Maintenance will determine if there is evidence of overvoltage induced failures in the maintenance record.

"Once the most susceptible equipment has been identified, the maintenance record will be reviewed to determine if an excessive number of these components has required maintenance.

4. "Watts Bar Electrical Maintenance will field test the equipment that is most likely to have been degraded.

"In addition to reviewing the maintenance record, a representative sample of susceptible components will be tested to determine if their insulation has been unacceptably degraded.

5. "Operations will revise SI-3 to reflect acceptance criteria of the revised WBN Technical Specifications.

6. "WBEP will perform load flow studies and coordinate with PSO to determine the optimum transformer taps and switchyard voltages. Minimum load conditions in conjunction with maximum grid voltages will be used to establish transformer tap settings for maximum voltages. Maximum load conditions (LOCA and full load rejection) in conjunction with minimum grid voltages will be used to establish transformer tap settings for minimum voltages. The minimum and maximum voltages and the transformer tap settings will be released on a drawing by WBEP."

SQN

SQN line management was briefed concerning the findings of the evaluation of improper electrical bus operation and regulation. In addition, CATD 30202-SQN-01 was issued noting that: (a) voltage deviations with the potential to damage or degrade the reliability of equipment have occurred on both the 6.9-kV and 480-V Shutdown boards, (b) the procedures lack effective instructions on controlling voltages, and (c) although the surveillance record of voltages indicates that undervoltage starts of the diesel generator should have occurred, there have been no diesel generator starts due to undervoltage. SQN line management's corrective action plan for this CATD is presented below:

A. "To determine if equipment has really been unacceptably degraded the following steps will be taken:

   1. "Determine the maximum voltages that could have occurred in the auxiliary power system. This effort will pinpoint the boards that have seen the highest voltages and determine if equipment rated 8-kV or 600-V and will need any further consideration.

      a. "OES will review the recorded voltages for the 161-kV switchyard for the past year to determine the maximum voltage that has occurred. This will establish the highest voltages for a two-unit shutdown. EEB and OES will review historical data to determine highest voltages for a one-unit shutdown.

      b. "EEB will use the maximum switchyard voltage to determine maximum voltages in the auxiliary power system. EEB will develop an impedance diagram based on the minimum board loading and, by using the maximum switchyard voltages as the source voltages, will calculate the maximum voltages of the boards. Operations will provide EEB with a history of tap changes for the Common Station Service transformers and 6900/480-V Shutdown transformers and the existing tap settings.

THIS ACTION SUBSTANTIALLY COMPLETED
SQN DATE 1-2-87

2. "Review all Class 1E ac electrical equipment for susceptibility to overvoltage. This will narrow the scope of the investigation to only the devices that are susceptible to overvoltage.

   a. "SQEP will provide a list of types of equipment that have been subjected to overvoltage.

   b. "EEB technical specialist will determine which devices are most susceptible to overvoltage and also which devices may have been degraded.

3. "Sequoyah Electrical Maintenance will determine if there is evidence of overvoltage induced failures in the maintenance record.

   "Once the most susceptible equipment has been identified, the maintenance record will be reviewed to determine if an excessive number of these components has required maintenance.

4. "Sequoyah Electrical Maintenance will field test the equipment that is most likely to have been degraded.

   "In addition to reviewing the maintenance record, a representative sample of susceptible components will be tested to determine if their insulation has been unacceptably degraded.

B. "To correct and update the procedures the following steps will be taken.

1. "Operations will immediately revise SI-3 by a temporary change to reflect acceptance criteria of ANSI C84.1, and to notify lead electrical engineer, DNE, if voltage cannot be maintained within these limits. Previously, voltage readings were only taken to demonstrate board operability.

2. "EEB will perform load flow studies and coordinate with PSO to determine the optimum transformer taps and switchyard voltages. Minimum load conditions (modes 5 and 6), in conjunction with maximum grid voltages, will be used to establish transformer tap settings for maximum voltages. Maximum load conditions (LOCA and full load rejection) in conjunction with minimum grid voltages will be used to establish transformer tap settings for minimum voltages. The minimum and maximum voltages and the transformer tap settings will be given to SQEP to release on a drawing. Revisions to procedures will be based on the information provided by the drawing.

C. "To determine why undervoltage starts of the diesel generator have not occurred the following steps will be followed:

   1. "SQEP will perform a comprehensive review of the voltage relaying and indication circuits. Relay and potential transformer accuracy, burden, human factors, and calibration will be considered to determine if the circuits have the required accuracy.

   2. "If no problems are found in the design, then SQEP will determine if testing or tracing the circuits is needed to ensure the circuits are performing as intended.

D. "If no problems are found in the voltage indicating circuits, then operations will determine why some of the voltage readings do not meet QA requirements.

E. "Action to Prevent Recurrence

   "The root cause of this employee concern was determined to be inadequate procedures. The actions outlined in section B will prevent recurrence of this problem."

BFN

BFN line management was briefed concerning the findings of the evaluation for improper electrical bus operation and regulation. It was recommended that an assessment of potential future equipment reliability be made for equipment that had been operated at voltages higher than normal ratings. Also, CATD 30202-BFN-01 was sent to line management requesting specific corrective action. BFN line management responded by providing corrective action for each of the conclusions drawn from the evaluation. The conclusions are listed below, followed by the appropriate corrective action statement.

Conclusion

1. The BFN Area Plan N7701 is conflict with the BFN FSAR as it describes degraded voltage transfers and in conflict with ANSI C84.1 as it specifies range B (safe) voltage limits.

Corrective Action

1. "The Nuclear Central Office, Component Engineering Section, has submitted a revision to BFN Area Plan N7701 which will bring N7701 into agreement with the BFN Final Safety Analysis Report (FSAR)."

Conclusion

2. The BFN FSAR and Technical Specifications are in conflict with ANSI C84.1 as regards the degraded voltage setpoint. The FSAR and Technical specifications both reference the degraded voltage setpoint of 3.92-kv given in N7701. This setpoint is not conservative and is not supported by adequate documentation.

Corrective Action

2. "The Design of the BFN auxiliary power system was based upon American National Standards Institute (ANSI) Standard C84.1. BFN site does not recognize this as a commitment to the ANSI standard but as an explanation of our design. Our degraded voltage setpoint of 3.92KV and shutdown board voltage limits are based on design calculations. We believe that values based on these calculations are more accurate for BFN than the general industry standards set forth in ANSI C84.1. Division of Nuclear Engineering shall revise DS-E2.3.2 to properly reflect BFN's commitments to requirements of ANSI C84.1-82. DNE should initiate a revision to the FSAR if necessary to properly reflect BFN's configuration and commitments."

Conclusion

3. The BFN Surveillance Instruction, SI-2, does not provide for recording the 480 volt Shutdown Board voltages or provide for recording breaker alignments, therefore, voltage deviations could not be determined for these boards.

Corrective Action

3. "No specific corrective action required for report conclusion #3. Surveillance Instruction-2 was written to satisfy the technical specifications surveillance requirements. Surveillance requirement 4.9.A.4.d requires that the 4KV shutdown board voltages be recorded every 12 hours. There is no such requirement for the 480V shutdown boards but the 4KV board voltages should give a reasonably good indication of what the 480V board voltages are (i.e., high or low). Bechtel calculations will justify the power systems transformer tap settings. Administrative controls ensure operation at the justified tap settings and voltage levels thus assuring acceptable voltage levels for operation of all safety components."

Conclusion

4. No calculations or other reason could be found that would prevent complete endorsement of ANSI C84.1 voltage limts.

Corrective Action

4. "See action 2."

Conclusion

5. The BFN FSAR Section 8.4 contains drawings that are illegible.

Corrective Action

5. "A memorandum has been written to our Site Licensing Section to review and reissue as necessary the drawings identified as illegible in Employee Concern Report 302.02-BFN."

Conclusion

6. Based on the findings, for XX-85-122-005:

   a. The issue of cycling Diesel Generators unnecessarily was not validated because no evidence of such starts could be located in the LER history.

   b. The concern of high voltage on buses is found to be valid. Ample evidence exists to demonstrate that Shutdown Boards have been operated at slightly high voltages (based on ANSI C84.1 and TVA requirements), however, the issue that TVA intentionally compensates for anticipated 5% voltage drops by operating buses at higher than normal voltage ratings cannot be verified.

   c. The issue of inadequate bus voltage regulation is found to be valid because 4-KV Shutdown Board voltages are higher than those specified in the FSAR. The magnitude of the higher tha normal voltages were not high enough to cause equipment failures, although possible degradation of equipment reliability and shortening of equipment useful life may have occurred and should be evaluated and should include an assessment of potential future equipment reliability.

Corrective Action

6. "The affect of the high voltages seen on the BFN 480V system has been evaluated on two seperate occassions and is documented in memorandum EEB840820924 and B22870514028. Both evaluations concluded that the voltages applied to the motors supplied by the 480V system would not be detrimental to motor life. The evaluation documented in

EEB840820924 further concluded that because of higher equipment ratings and manufacturers tolerances, these voltages would not be damaging to the 480V switch gear or motor control centers (MCC). The MCCS are rated at 600V. The components which are being fed from control control power transformers (CPT), such as relays, are normally rated for 120/125 AC + 10% (132/137 maximum voltage) Even if the primary side of CPT is 530 V and assuming no voltage drop from CPT to relay, the maximum secondary voltage will be 132.5 v which is within the normal rating of the components. The evaluation for the MCCs included control power transformers and control equipment. Voltage is regulated on the lower voltage vital power systems therefore, they will not be adversely effected by high voltages on the 480 V system. Therefore, elevated voltages on the 480 V system at BFN has not been determined to be a problem. The above referenced evaluations may not apply to all of BFN's electrical equipment. Therefore, the evaluations presented in EEB840820924 and B22870514028 shall be reevaluated. In addition the Bechtel calculations and the results from the Sequoyah overvoltage studies shall be considered. Based on the referenced evaluations and the results of the evaluation for Sequoyah Employee Concern 302.02 this is not a restart item, as no specific deficiency has been identified which has a significant probability of leading to the inoperability of a safety system.

BLN

BLN line management was briefed concerning the findings of the evaluation for improper electrical bus operation and regulation. In addition, CATD 30202-BLN-01 was sent to line management identifying high voltage conditions on safety-related AC power supply boards and the lack of provision to monitor these voltages. BLN line management's corrective action plan is as follows:

"Provisions exist through relaying to monitor and alarm high voltage conditions. The observation of high voltage conditions were made using board voltmeters that are designed to give 5 percent accuracy. "

"Accurate voltage readings were taken on June 19, 1987, and one of the four 6.9 kV safety-related boards was above the safe operating limits recommended by DPM N7701. A voltage monitoring program will be placed into effect August 1, 1987. DNE will be sent voltage data on a periodic basis for evaluations of voltage readings that exceed recommended levels in DPM N7701. If corrective action is required, the action will be completed prior to fuel loading or as needed to prevent equipment damage."

6.1.3 Element 302.04 - Ground and Electrical Shock Problems

WBN

Although the concern regarding erroneous ground indicators on electrical boards was not substantiated at WBN, CATD 30204-WBN-01 was sent to line management to eliminate the possibility of problems with false ground indications in the future. In its corrective action response, WBN line management stated: "To prevent an erroneous ground fault indication, we will be installing nametags on the 480-volt boards to use only six-watt bulbs and specifying the TIIC number AMT-074L."

SQN

In the same concern regarding erroneous ground indicators at SQN, CATD 30204-SQN-01 was sent to line management noting substantiated problems with false ground indications. Line management's corrective action plan for the CATD was as follows:

"Work Request B201214 (initiated 08-28-86) was prepared to manufacture two sets of tags to be placed at each ground detector stating, "Replace Ground Lights as a Set of 3-SYL 120V Bulbs Only", and "Verify All Ground Lights Good Prior to Searching For Grounds on Equipment."

6.2 Corrective Action at Subcategory Level

CATD 30200-NPS-01 was issued to TVA Corporate Management to address the two negative findings of the subcategory as discussed in section 4 of this report. The issues are Raychem control and Shutdown Board voltage control. The Corporate Corrective Action Plan is as follows:

"DNE has initiated the Specification Improvement Program (SIP), which will provide ONP with generic master specifications to cover construction, modifications and additions, and maintenance of TVA's nuclear plants. The main scope of SIP (67 master specifications) will be complete by December 1987, but will be added to as user needs are identified. The effectiveness of SIP will be monitored by EA. EEB has addressed both issues identified above, and will assure their compliance with SIP (when completed). EEB completed revision of Raychem instructions, guidelines, and drawings for the first issue as of May 1987. For the second issue, Calculations will be maintained for each project to establish range of operation. The pilot program within SIP will ensure the success of the total program."

8.0 ATTACHMENTS

Attachment A - Subcategory Summary Table

Attachment B - Listing of Concerns by Issue

Attachment C - Checklist for Root Cause Analysis

Attachment D - Summary of Symptoms and Root Causes

Attachment E - Graph of Symptoms versus Root Cause

Attachment F - Bar Charts of Symptoms

Attachment G - Bar Charts of Root Causes

Attachment H - Corrective Action Tracking Documents (CATDs)

Attachment I - List of Evaluators by Element/Plant

ATTACHMENT A

SUBCATEGORY SUMMARY TABLE

REFERENCE - ECPS132J-ECPS132C
FREQUENCY - REQUEST
ONP - ISSS - RWM

TENNESSEE VALLEY AUTHORITY
OFFICE OF NUCLEAR POWER
EMPLOYEE CONCERN PROGRAM SYSTEM (ECPS)
EMPLOYEE CONCERN INFORMATION BY CATEGORY/SUBCATEGORY

CATEGORY: OP PLANT OPER. SUPPORT
SUBCATEGORY: 302 POSSIBLE LACK OF WATERTIGHT CONDUIT AND CONNECTION

CONCERN NUMBER	CAT	SUB CAT	S H R D	PLT LOC	1 REPORT APPL 2 SAF RELATED BF BL SQ WB	HISTORICAL REPORT	CONCERN ORIGIN	CONCERN DESCRIPTION	REF. SECT CAT - SUBCAT - Section/Issu
BNPQCP10.35-5 01	OP	30201	N	BLN	1 N Y N N 2 NA SR NA NA		OECP	CI FEELS THAT THE MOUNTING OF ELECTRICAL MOTOR BOXES ON ERCW PUMP MOTORS IS INADEQUATE.	3.1 302.01-3
IN -85-068-00301 T50186	OP	30205	N	WBN	1 N N N Y 2 NA NA NA NO	IN-85-068-003	QTC	INADEQUATE COMMUICATION EQUIPMENT WITH CONTROL ROOM FROM REMOTE PLANT LOCATIONS. GENERIC TO SEVERAL AREAS IN EACH BUILDING. CI STATES THERE ARE NOT ENOUGH TELEPHONES TO CALL THE SHIFT ENGINEER TO REPORT PROBLEMS. CONSTRUCTION DEPT. CONCERN. CI COULD NOT PROVIDE ANY SPECIFICS/DETAILS.	3.5 302.05-1
IN -85-311-00601 T50021	OP	30203	N	WBN	1 N N N Y 2 NA NA NA NO	IN-85-311-006	QTC	SECURITY PERSONNEL STATIONED WITHIN THE POST #3 BADGING ENCLOSURE CANNOT HEAR WARNINGS, ANNOUNCEMENTS OR SIRENS OVER THE PLANT LOUDSPEAKER SYSTEM BECAUSE THE SPEAKER HAS BEEN DISCONNECTED DUE TO EXCESSIVE VOLUME. THIS COULD POTENTIALLY COMPROMISE POST #3 RESPONSE TIME IN AN EMERGENCY SITUATION	3.3 302.03-1
IN -85-311-00701 T50220	OP	30205	N	WBN	1 N N N Y 2 NA NA NA NO	IN-85-311-007	QTC	ADDITIONAL TELEPHONE LINES ARE NEEDED IN THE VITAL AREA ACCESS PORTAL AREA DUE TO THE VOLUME OF COMMUNICATIONS REQUIRED. CURRENT PRACTICE OVERLOADS AVAILABLE RADIO FREQUENCIES, WHICH MAY IMPEDE RADIO EFFECTIVENESS IN AN EMERGENCY RESPONSE SITUATION. NO FURTHER DETAILS AVAILABLE FROM CI. NUC.POWER CONCERN. UNIT 1.	3.5 302.05-1
IN -85-409-00301 T50175	OP	30204	N	WBN	1 N N N Y 2 NA NA NA SR		QTC	MANAGEMENT PUSHES SCHEDULE AHEAD OF QUALITY AND SAFETY. UNIT 1 AND 2. EXAMPLE: CREW WAS SENT TO CUT FLAMASTIC OFF OF ENERGIZED 6.9KV CABLES BY A SUPT. THE SUPT. FALSELY TOLD THE CREW THAT THE CABLES WERE DE-ENERGIZED. DETAILS KNOWN TO QTC, WITHHELD DUE TO CONFIDENTIALITY. C/I DECLINED TO PROVIDE FURTHER INFORMATION. CONST. DEPT. CONCERN.	3.4 302.04-3

CONCERNS ARE GROUPED BY FIRST 3 DIGITS OF SUBCATEGORY NUMBER.

REFERENCE - ECPS132J-ECPS132C
FREQUENCY - REQUEST
ONP - ISSS - RHM

TENNESSEE VALLEY AUTHORITY
OFFICE OF NUCLEAR POWER
EMPLOYEE CONCERN PROGRAM SYSTEM (ECPS)
EMPLOYEE CONCERN INFORMATION BY CATEGORY/SUBCATEGORY

RUN TIME - 13:
RUN DATE - 04/

CATEGORY: OP PLANT OPER. SUPPORT
SUBCATEGORY: 302 COMMUNICATIONS EQUIP OF INADEQUATE QNTY AND QLTY

CONCERN NUMBER	CAT	SUB CAT	SHRD	PLT LOC	1 REPORT APPL 2 SAF RELATED BF BL SQ WB	HISTORICAL REPORT	CONCERN ORIGIN	CONCERN DESCRIPTION	REF. SE CAT SUBCAT Section/Is
IN -85-509-00201 T50043	OP	30205	N	WBN	1 N N N Y 2 NA NA NA NO	IN-85-509-002	QTC	MANY TELEPHONES THROUGHOUT THE POWER BLOCK DO NOT WORK (REACTOR BUILDING , TURBINE BUILDING, AUX BUILDING). THERE IS AN INADEQUATE NUMBER OF TEL EPHONES IN THE PLANT AND THE ONES TH EY HAVE ARE NOT CHECKED OFTEN ENOUGH TO VERIFY WORKING ORDER.	3.5 302.05-
IN -85-523-00101 T50046	OP	30204	N	WBN	1 N N N Y 2 NA NA NA SR		QTC	CI TOUCHED A HANGER NEAR A 4500V CON DUIT LINE IN THIS GAS TREATMENT ROOM AT ELEV 757 BEHIND SECURITY AND REC EIVED AN ELECTRICAL SHOCK.	3.4 302.04-
IN -85-864-00201 T50090	OP	30201	N	WBN	1 N N N Y 2 NA NA NA SR	I-85-338-WBN	QTC	MODIFICATIONS WERE MADE TO THE RHR P UMP MOTORS IN UNIT #2 (IE ELECTRICAL CONNECTIONS WERE CONVERTED TO WATER TIGHT) WHICH MAY NOT HAVE BEEN MADE IN UNIT #1.	3.1 302,01-
IN -86-083-00201 T50117	OP	30205	N	WBN	1 N N N Y 2 NA NA NA NO	IN-86-083-002	QTC	ADDITIONAL TELEPHONES ARE NEEDED IN THE ANNULUS AREA OF UNIT 1 (AND POSS IBLY UNIT 2), TO PROVIDE ADEQUATE CO MMUNICATION IN THE EVENT OF AN ACCID ENT. THIS CONCERN WAS BROUGHT BY CI TO COGNIZANT SUPERVISOR'S ATTENTION (KNOWN) BUT NO ACTION WAS TAKEN. N UCLEAR POWER CONCERN. CI HAS NO FUR THER INFORMATION. NO FOLLOW UP REQU IRED.	3.5 302.05-
MAS-85-002	01	OP 30201	N	SQN	1 N N Y N 2 NA NA SR NA		OECP	ADEQUACY OF RAYCHEM ON 2-FCV-43-77	3.1 302.01-
MAS-86-004	01	OP 30202	N	SQN	1 Y Y Y Y 2 SR SR SR SR		OECP	POTENTIAL EQUPMENT DAMAGE AS A RESUL T OF STATION OVER VOLTAGE	3.2 302.02-
MRS-85-005	01	OP 30201	N	SQN	1 N N Y N 2 NA NA SS NA		OECP	2-FSV-43-77 DID NOT HAVE THE PROPER RAYCHEM APPLICATION	3.1 302.01-

CONCERNS ARE GROUPED BY FIRST 3 DIGITS OF SUBCATEGORY NUMBER.

REFERENCE - ECPS132J-ECPS132C
FREQUENCY - REQUEST
ONP - ISSS - RWM

TENNESSEE VALLEY AUTHORITY
OFFICE OF NUCLEAR POWER
EMPLOYEE CONCERN PROGRAM SYSTEM (ECPS)
EMPLOYEE CONCERN INFORMATION BY CATEGORY/SUBCATEGORY

RUN TIME - 13:36
RUN DATE - 04/24

CATEGORY: OP PLANT OPER. SUPPORT
SUBCATEGORY: 302 GROUND AND ELECTRICAL SHOCK PROBLEMS

CONCERN NUMBER	CAT	SUB CAT	SHR D	PLT LOC	1 REPORT APPL 2 SAF RELATED BF BL SQ WB	HISTORICAL REPORT	CONCERN ORIGIN	CONCERN DESCRIPTION	REF. SECT CAT - SUBCAT - Section/Issu
SQM-86-013-00101 T50268	OP	30204	N	SQN	1 N N Y Y 2 NA NA SR SR		QTC	CHANGING OUT THE SYLVANNIA BULBS IN VARIOUS GROUND DETECTORS CAUSES A RESISTANCE CHANGE WHICH SHOWS A GROUND BETWEEN ALL THREE PHASES ON THE BOARD WHEN THE TEST BUTTON IS PUSHED. THIS FALSE GROUND SIGNAL OVERSHADOWS AN ACTUAL GROUND ON THE BOARD SINCE THE BULB LIGHTS UP BRIGHTER THAN THE OTHER BULBS INDICATING A GROUND ALTHOUGH AN ACTUAL GROUND MAY BE ON ONE OF THE OTHER PHASES. NUCLEAR POWER DEPARTMENT CONCERN. ANONYMOUS CONCERN.	3.4 302.04-2
SQP-85-004-00201 T50229	OP	30206	N	SQN	1 N N Y Y 2 NA NA SR SR		QTC	THE CONFIRGURATION OF THE ELECTRICAL EQUIPMENT IN THE TRANSFER CANAL IS NOT PER THE DRAWING. DETAILS KNOWN TO QTC AND WITHHELD TO MAINTAIN CONFIDENTIALITY. NUCLEAR POWER CONCERN. NO FURTHER INFORMATION MAY BE RELEASED. CI HAS NO FURTHER INFORMATION. NO FOLLOW UP REQUIRED.	3.6 302.06-1
SQP-86-011-00101 T50277	OP	30206	N	SQN	1 N N Y N 2 NA NA SR NA		QTC	THE FUEL TRANSFER SYSTEM WAS UPGRADED FROM NON-QA TO A QA LEVEL II, HOWEVER THERE ARE NO "AS CONSTRUCTED DRAWINGS".	3.6 302.06-1
TAK-85-001 01	OP	30201	N	SQN	1 Y Y Y Y 2 SR NO SR NO		OECP	GUIDELINES FOR USE OF RAYCHEM (COATING) ON CLASS 1E WORK ARE UNCLEAR AND INSTRUCTIONS NOT CONSISTENT.	3.1 302.01-2
WBN-231 01	OP	30205	N	WBN	1 N N N Y 2 NA NA NA NO		OECP	CONCERN HAS BEEN EXPRESSED THAT A TELEPHONE SHOULD BE LOCATED OUTSIDE OF GATE G-5. PSS HAS TO OPEN THIS GATE AND CLOSE IT AFTER ENTRANCE. AFTER ENTERING, PSS LEAVES AND INDIVIDUALS NEED TO WAIT UNTIL PSS RETURNS. CI CONSIDERS THIS A SAFETY HAZARD IN CASE OF AN ACCIDENT.	3.5 302.05-1

; CONCERNS ARE GROUPED BY FIRST 3 DIGITS OF SUBCATEGORY NUMBER.

REFERENCE - ECPS132J-ECPS132C
FREQUENCY - REQUEST
ONP - ISSS - RHM

TENNESSEE VALLEY AUTHORITY
OFFICE OF NUCLEAR POWER
EMPLOYEE CONCERN PROGRAM SYSTEM (ECPS)
EMPLOYEE CONCERN INFORMATION BY CATEGORY/SUBCATEGORY

CATEGORY: OP PLANT OPER. SUPPORT
SUBCATEGORY: 302 COMMUNICATIONS EQUIP OF INADEQUATE QNTY AND QLTY

CONCERN NUMBER	CAT	SUB CAT	SHRD	PLT LOC	1 REPORT APPL 2 SAF RELATED BF BL SQ WB	HISTORICAL REPORT	CONCERN ORIGIN	CONCERN DESCRIPTION	REF. S CAT SUBCAT Section/Is
WBN-236AHP	01	OP	30205	N WBN	1 N N N Y 2 NA NA NA NO		OECP	CI IS CONCERNED THAT PERSONNEL CAN G ET TRAPPED BETWEEN DOORS A56 & A57 A ND C19 & C20 AND CANNOT CALL FOR HEL P SINCE THERE AREN'T ANY PHONES LOCA TED BETWEEN THESE DOORS.	3.5 302.05-
XX -85-122-00401 T50217	OP	30202	N	SQN	1 Y Y Y Y 2 SR SR SR SR		QTC	SEQUOYAH - A 5% VOLTAGE DROP AT EACH PLANT CAUSES PROBLEMS BY CYCLING DI ESEL GENERATORS UNNECESSARILY (WHICH DEGRADES RELIABILITY) AND CAUSES TO O MANY PLANT SHUTDOWNS. TVA COMPENS ATES BY OPERATING BUSSES AT HIGHER T HAN NORMAL VOLTAGE RATINGS,ANTICIPAT ING VOLTAGE REDUCTIONS, STRESSING EQ UIPMENT AND COMPONENTS UNNECESSARILY , AND REDUCING COMPONENT LIFE AND RE LIABILITY. CI STATED THAT THERE WAS INADEQUATE VOLTAGE REGULATIONS FOR BUSSES. CI HAS NO FURTHER INFORMATI ON. ANONYMOUS CONCERN VIA LETTE	3.2 302,02-
XX -85-122-00501 T50217	OP	30202	N	BFN	1 Y Y Y Y 2 SR SR SR SR		QTC	BROWN'S FERRY - A 5% VOLTAGE DROP AT EACH PLANT CAUSES PROBLEMS BY CYCLI NG DIESEL GENERATORS UNNECESSARILY (WHICH DEGRADES RELIABILITY) AND CAUS ES TOO MANY PLANT SHUTDOWNS. TVA CO MPENSATES BY OPERATING BUSSES AT HIG HER THAN NORMAL VOLTAGE RATINGS. AN TICIPATING VOLTAGE REDUCTIONS, STRES SING EQUIPMENT AND COMPONENTS UNNECE SSARILY, AND REDUCING COMPONENT LIFE AND RELIABILITY. CI STATED THAT TH ERE WAS INADEQUATE VOLTAGE REGULATIO N FOR BUSSES. CI HAS NO FURTHER INF ORMATION. ANONYMOUS CONCERN VIA	3.2 302.02-

20 CONCERNS FOR CATEGORY OP SUBCATEGORY 302

CONCERNS ARE GROUPED BY FIRST 3 DIGITS OF SUBCATEGORY NUMBER.

ATTACHMENT B

ELECTRICAL AND COMMUNICATIONS

Listing Of Concerns By Element/Issue

The Electrical and Communications Subcategory (30200) is comprised of 20 concerns grouped into six elements addressing 11 issues.

Element 302.01 - Possible Lack of Watertight Conduit and Connections

Issue 302.01-1 - Possible Lack of Watertight Connections on Watts Bar Nuclear Plant (WBN) Unit 1 Residual Heat Removal (RHR) Pump Motors

IN-85-864-002

Issue 302.01-2 - Inadequate Raychem Application Procedures and Practices at Sequoyah Nuclear Plant (SQN)

MAS-85-002
MRS-85-005
TAK-85-001

Issue 302.01-3 - Inadequate Mounting of Electrical Motor Boxes on Essential Raw Cooling Water (ERCW) Pump Motors at Bellefonte Nuclear Plant (BLN)

BNP QCP 10.35-5

Element 302.02 - Five Percent Low Voltage Problem

Issue 302.02-1 - Improper Operation and Regulation of Electrical Buses at SQN and Browns Ferry Nuclear Plant (BFN)

MAS-86-004
XX-85-122-004
XX-85-122-005

Element 302.03 - Disconnected Paging Speaker at Security Post Number 3

Issue 302.03-1 - Disconnected Paging Speaker at WBN Security Post Number 3

IN-85-311-006

Element 302.04 - Ground and Electrical Shock Problems

Issue 302.04-1 - Electrical Shock Hazard in WBN Gas Treatment Room

IN-85-523-001

Issue 302.04-2 - Erroneous Ground Indications on Electrical Boards at SQN

SQM-86-013-001

Issue 302.04-3 - Removal of Flammastic from Energized Cables

IN-85-409-003

Element 302.05 - Communication Problems/Inadequacies

Issue 302.05-1 - Inadequate Number of Telephones at WBN

IN-85-068-003
IN-85-311-007
*IN-85-509-002
IN-86-083-002
WBN-231
WBN-236AHP

Issue 302.05-2 - Inadequate Telephone Maintenance at WBN

*IN-85-509-002

Element 302.06 - Transfer Canal Electrical Equipment

Issue 302.06-1 - Discrepancy Between Drawings and Configuration of Electrical Equipment in Fuel Transfer Canal at SQN

SQP-85-004-002
SQP-86-011-001

* Concern included in more than one issue.

CHECKLIST FOR ROOT CAUSE ANALYSIS

1. Procedure lacks specifics to perform task.
2. Personnel lack sufficient training in the applicability/use of procedure.
3. Lack of understanding regulatory requirements or commitments.
4. Lack of adequate system, process, or administrative controls to ensure commitments are reflected in procedures or processes.
5. Inadequate communication within functional group.
6. Inadequate communication between functional groups.
7. Management Assumed Risk.
8. Procedures incomplete or failed to incorporate all technical requirements.
9. Error in judgement by qualified individual.
10. Unqualified individual performing the task.
11. Insufficient time to perform task.
12. Inadequate prerequisites defined to ensure satisfactory completion of task.
13. Personnel performed task knowingly in violation of procedure/process.
14. Personnel error in following procedures.
15. Failed to identify root cause of previous deficiencies.
16. Failed to take appropriate action to preclude reoccurrence.
17. Inadequate process to detect adverse trends.
18. Inadequate acceptance criteria defined to ensure satisfactory task completion.
19. Management attentiveness to trends.
20. Lack of accessibility to documentation.
21. Inadequate controls for review of results to ensure compliance with commitments.
22. Timeliness of changes to commitments or changes to licensing/regulatory requirements.
23. Isolated incident.
24. Random error.
25. Other - i.e., equipment related failure.

Summary of Symptoms and Root Causes

For Element 302.01, Possible Lack of Watertight Conduit and Connections, there was the potential for negative findings at the subcategory level exhibited by the following symptoms: (a) inadequate work control (workplan implementation), (b) inadequate materials control (traceability), (c) inadequate work control (quality control inspection by craftsmen, foremen, and the QC organization), (d) uncontrolled use of vendor instructions for maintenance activities (Raychem seal kits), and (e) inadequate design control (updating vendor manuals and prints). The first three symptoms were identified for SQN; the first, third, and fifth symptoms appeared at BFN; and the fourth was identified for BLN. As these symptoms were tested for root cause, the appropriate root causes and applicable plant sites were judged to be as follows:

a. Procedure lacks specifics to perform task (SQN, BFN, BLN)

b. Lack of adequate system, process or administrative controls to ensure commitments are reflected in procedures or processes (BFN)

c. Procedures incomplete or failed to incorporate all technical requirements (SQN, BFN, BLN)

d. Personnel error in following procedures (SQN)

e. Inadequate acceptance criteria defined to ensure satisfactory task completion (BFN)

f. Management attentiveness to trends (BFN)

g. Lack of accessibility to documentation (SQN)

h. Inadequate controls for review of results to ensure compliance with commitments (SQN, BFN)

For Element 302.02, Five-Percent Low Voltage Problem, there was the potential for negative findings at the subcategory level exhibited by the following symptoms: (a) inadequate implementation of design requirements (upper-tier documents changing but not being reflected in lower-tier documents), (b) inadequate operations control (operational audits not identifying problems with SI data), (c) inadequate equipment performance (diesel generator not starting on degraded voltage), (d) inadequate initial design (transformer taps), and (e) inadequate operational controls (no procedures established to ensure adequate equipment performance). The first two symptoms appeared in the evaluation for WBN while each of the first three symptoms appeared in the evaluation for SQN. The fourth and fifth symptoms occurred for BLN. As these symptoms were tested for root cause, the appropriate root causes and applicable plant sites were judged to be as follows:

a. Lack of understanding regulatory requirements or commitments (WBN, SQN, BLN)

b. Lack of adequate system, process, or administrative controls to ensure commitments are reflected in procedures or processes (WBN, SQN, BLN)

c. Inadequate communication between functional groups (DNE and ONP at WBN and SQN)

d. Procedures incomplete or failed to incorporate all technical requirements (WBN, SQN, BLN)

e. Failure to take appropriate action to preclude recurrence (SQN)

f. Inadequate acceptance criteria defined to ensure satisfactory task completion (WBN, SQN, BLN)

g. Inadequate controls for review of results to ensure compliance with commitments (WBN, SQN)

h. Equipment-related failures requiring detailed technical evaluation (SQN)

No analyses for root cause were required in the remaining elements of the subcategory because no symptoms of problems were readily apparent.

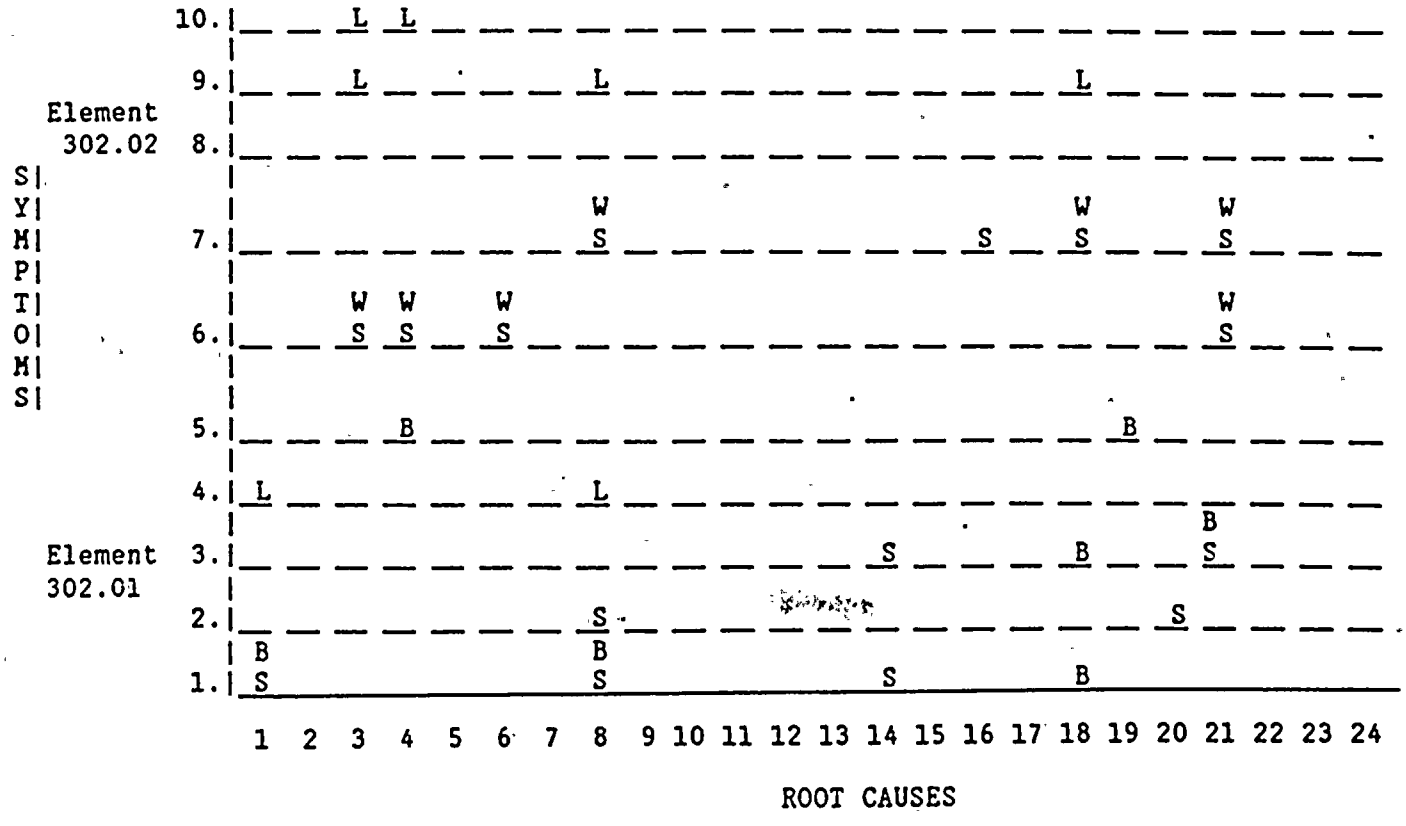
The analysis of the symptoms and root causes of the subcategory is depicted graphically in Attachments E, F, and G. Attachment E is a plot of each element's symptoms versus the root cause pointed out by the symptom. Root cause numbers on the horizontal axis correspond to the 25 items on the "Checklist for Root Cause Analysis" found in Attachment C. Attachment F contains bar graphs showing the number of times each of the symptoms identified for the subcategory occurs for the various plants. Symptom numbers on the horizontal axis in this attachment correspond to the symptoms as listed in attachment E. Attachment G contains bar graphs showing the number of times each root cause appears in the subcategory for the various plants.

Several observations can be made in studying these attachments. First, it can be seen from attachments E and F that BFN and SQN share two symptoms in common with respect to work control--one symptom dealing with workplan implementation and the other dealing with QC inspections. Also, it can be seen that WBN and SQN share symptoms regarding inadequate implementation of design requirements and inadequate operational controls. Next, attachments E and G show that there were three root causes that occurred at all TVA nuclear plants: (a) lack of adequate system, process, or administrative controls to ensure commitments are reflected in procedures or processes, (b) procedures incomplete or failed to incorporate all technical requirements, and (c) inadequate acceptance criteria defined to ensure satisfactory task completion. Finally, root cause "b" listed above appeared more frequently overall than any other root cause, as shown in attachment G.

Symptoms

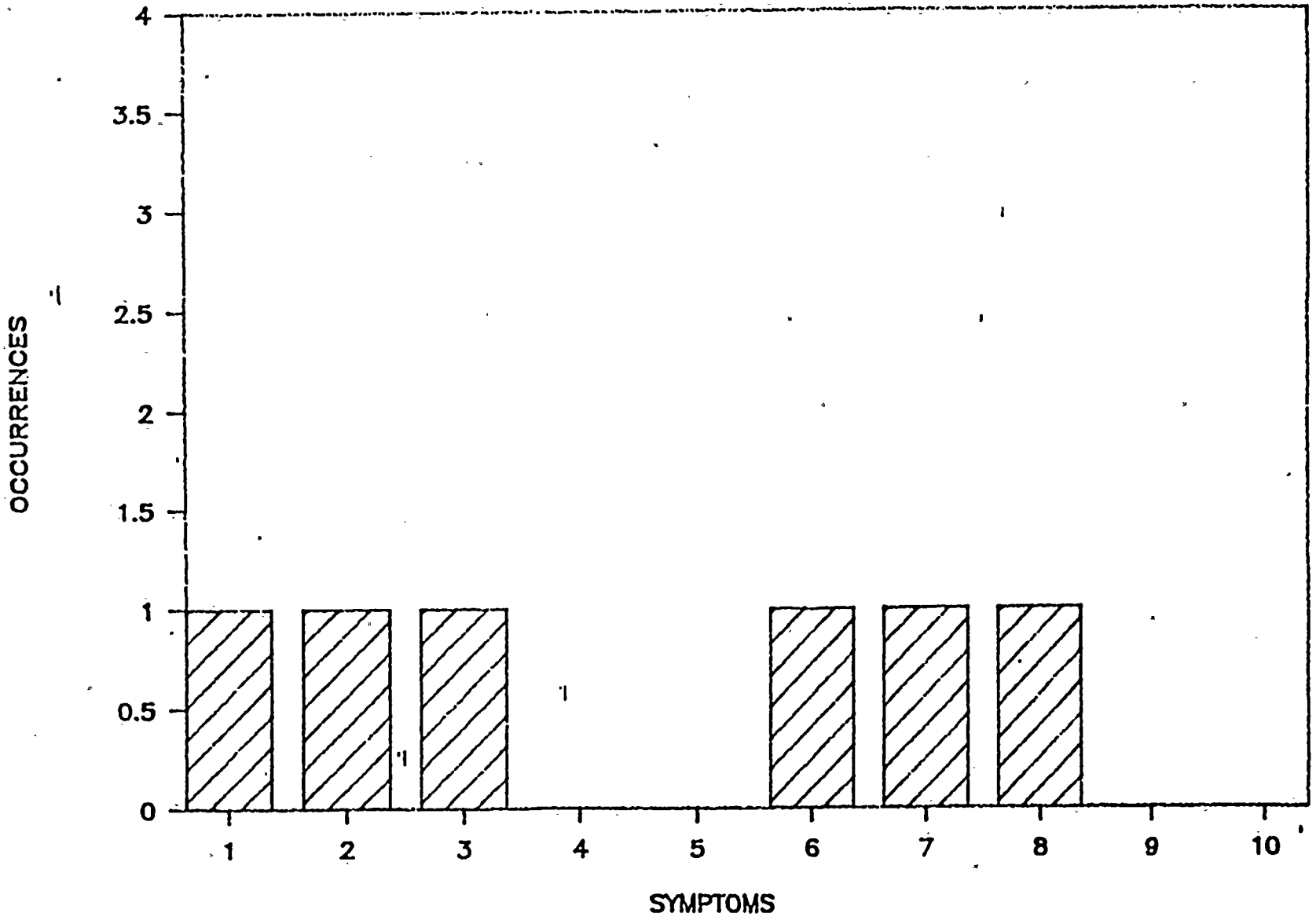
1. Inadequate work control (workplan implementation)
2. Inadequate materials control (traceability)
3. Inadequate work control (QC inspections)
4. Uncontrolled use of vendor instructions for maintenance activities (Raychem seal kits)
5. Inadequate design control (updating vendor manuals and prints)
6. Inadequate implementation of design requirements (upper/lower-tier document inconsistencies)
7. Inadequate operational controls (operational audits not identifying problems with SI data)
8. Inadequate equipment performance (diesel generators not starting on degraded bus voltage)
9. Inadequate initial design (transformer taps)
10. Inadequate operational controls (no procedures established to ensure adequate equipment performance)

KEY: W=WBN
S=SQN
B-BFN
L=BLN



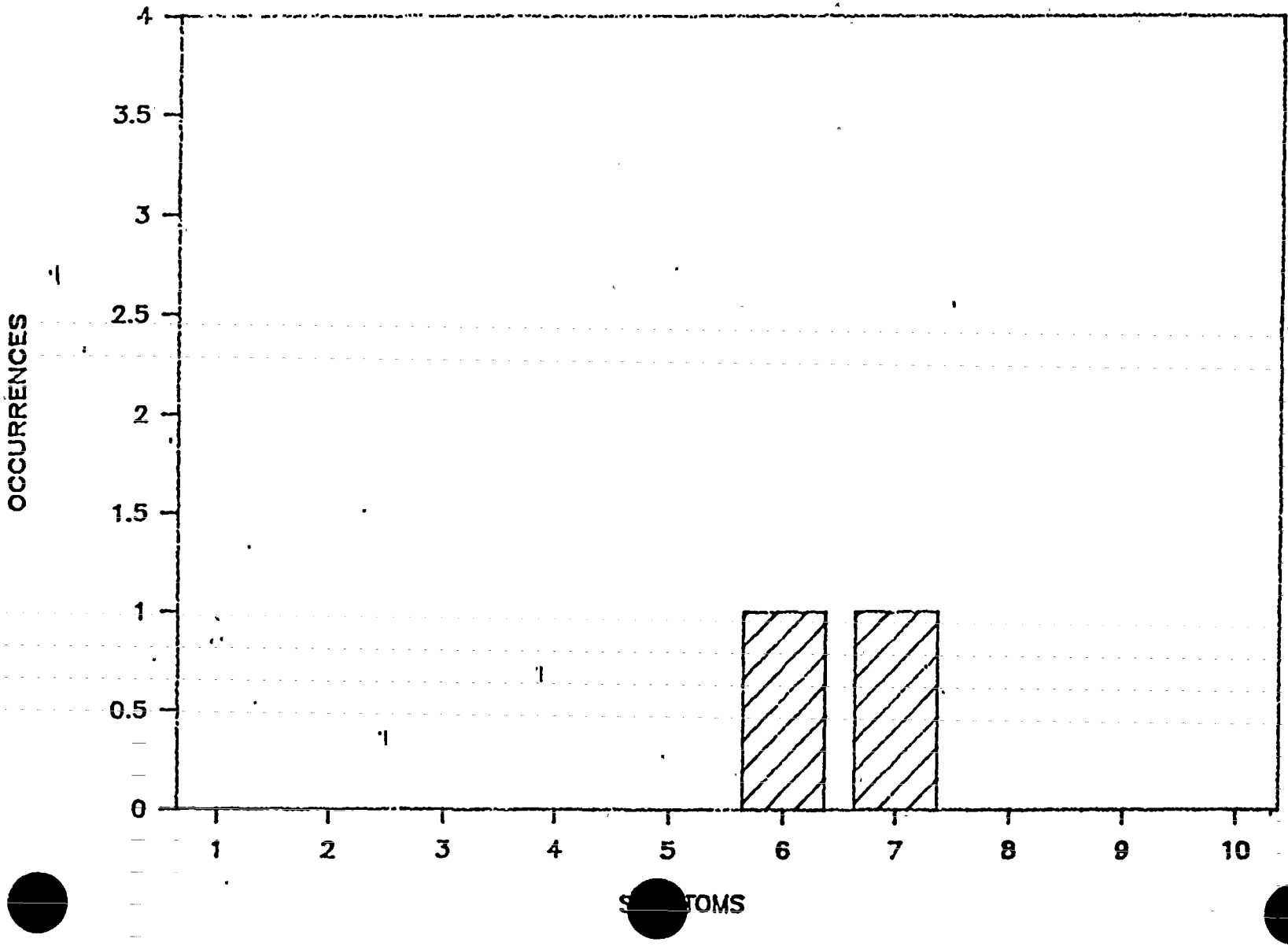
OCCURRENCES VS SYMPTOMS

SEQUOYAH NUCLEAR PLANT



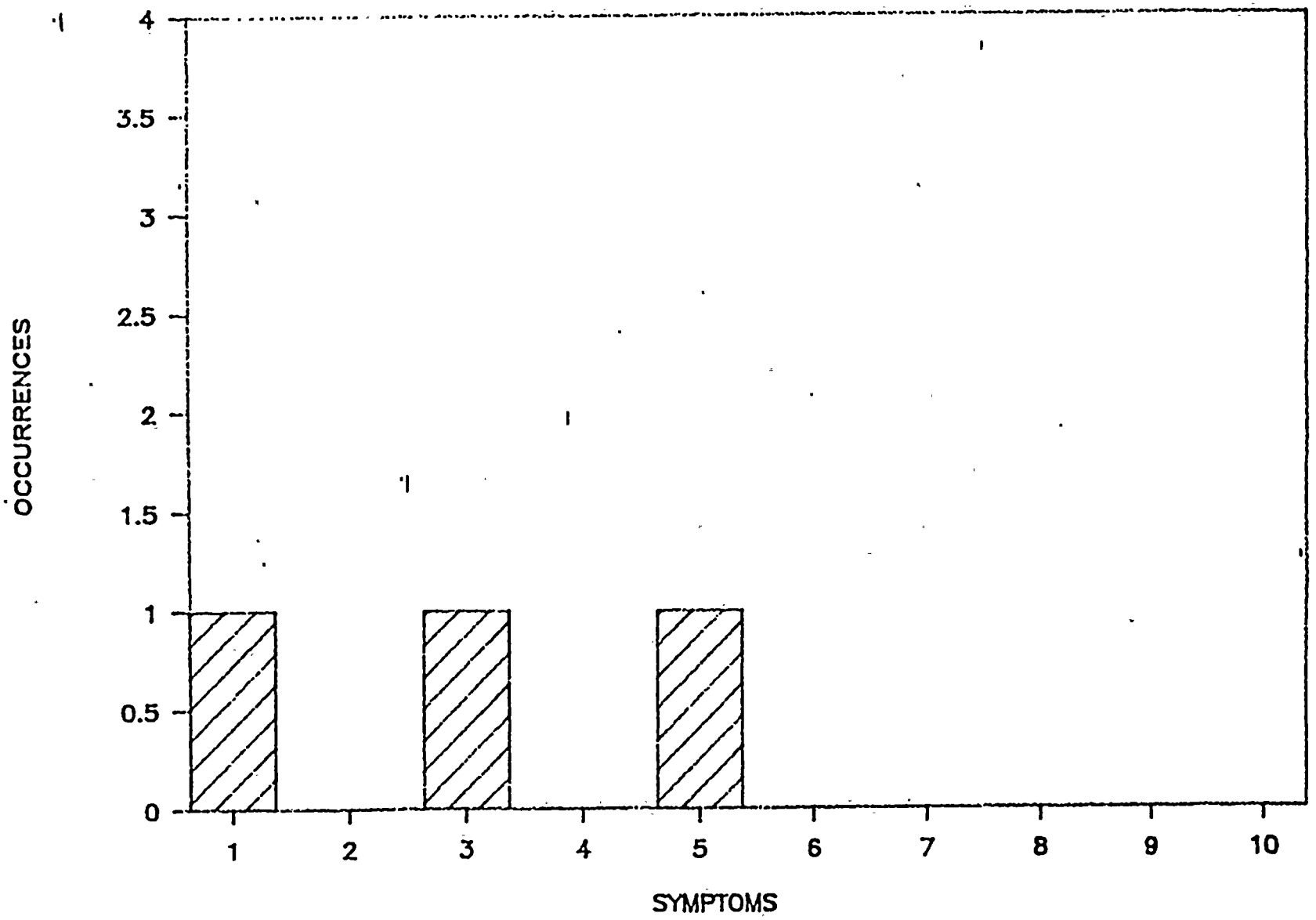
OCCURRENCES VS SYMPTOMS

WATTS BAR NUCLEAR PLANT



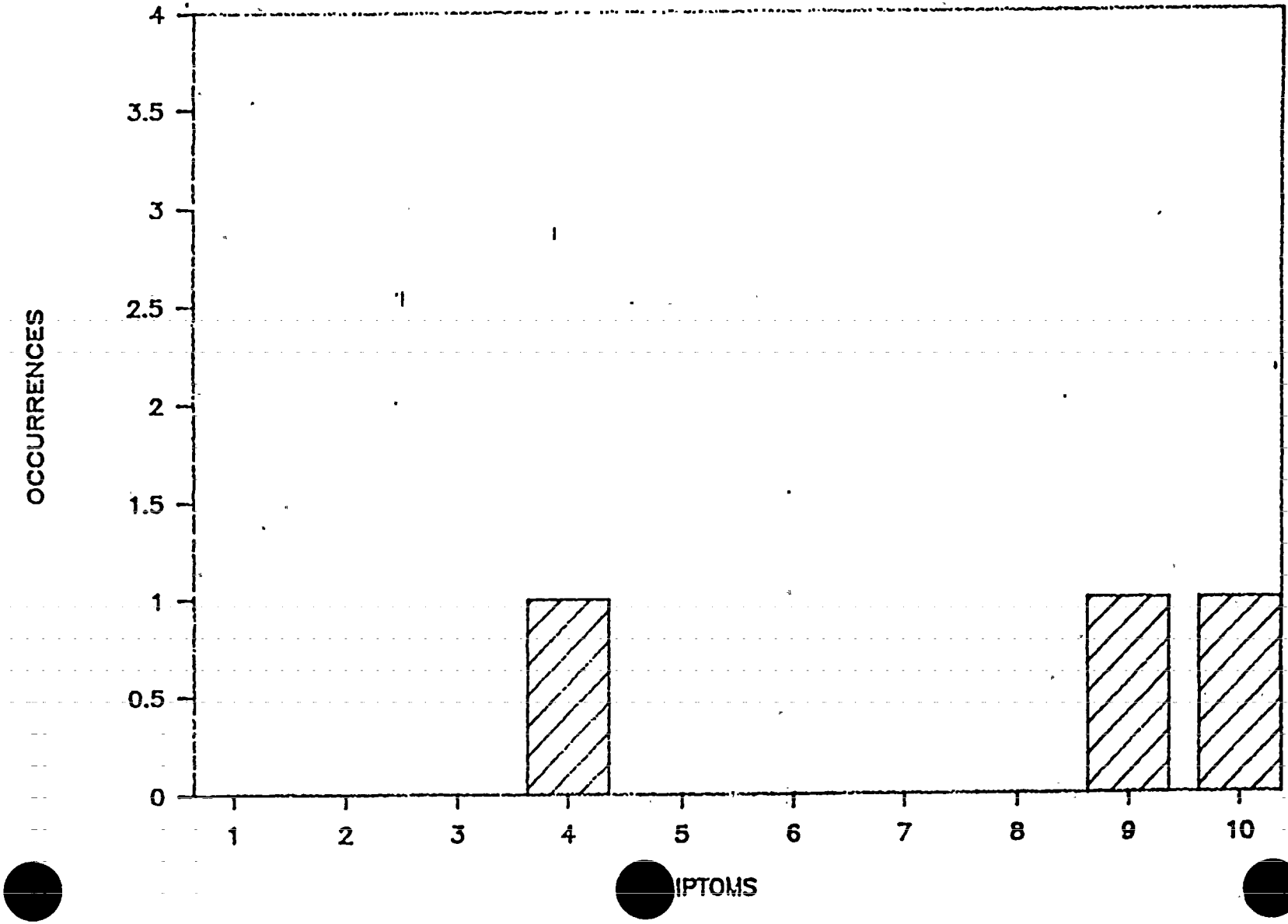
OCCURRENCES VS SYMPTOMS

BROWNS FERRY NUCLEAR PLANT



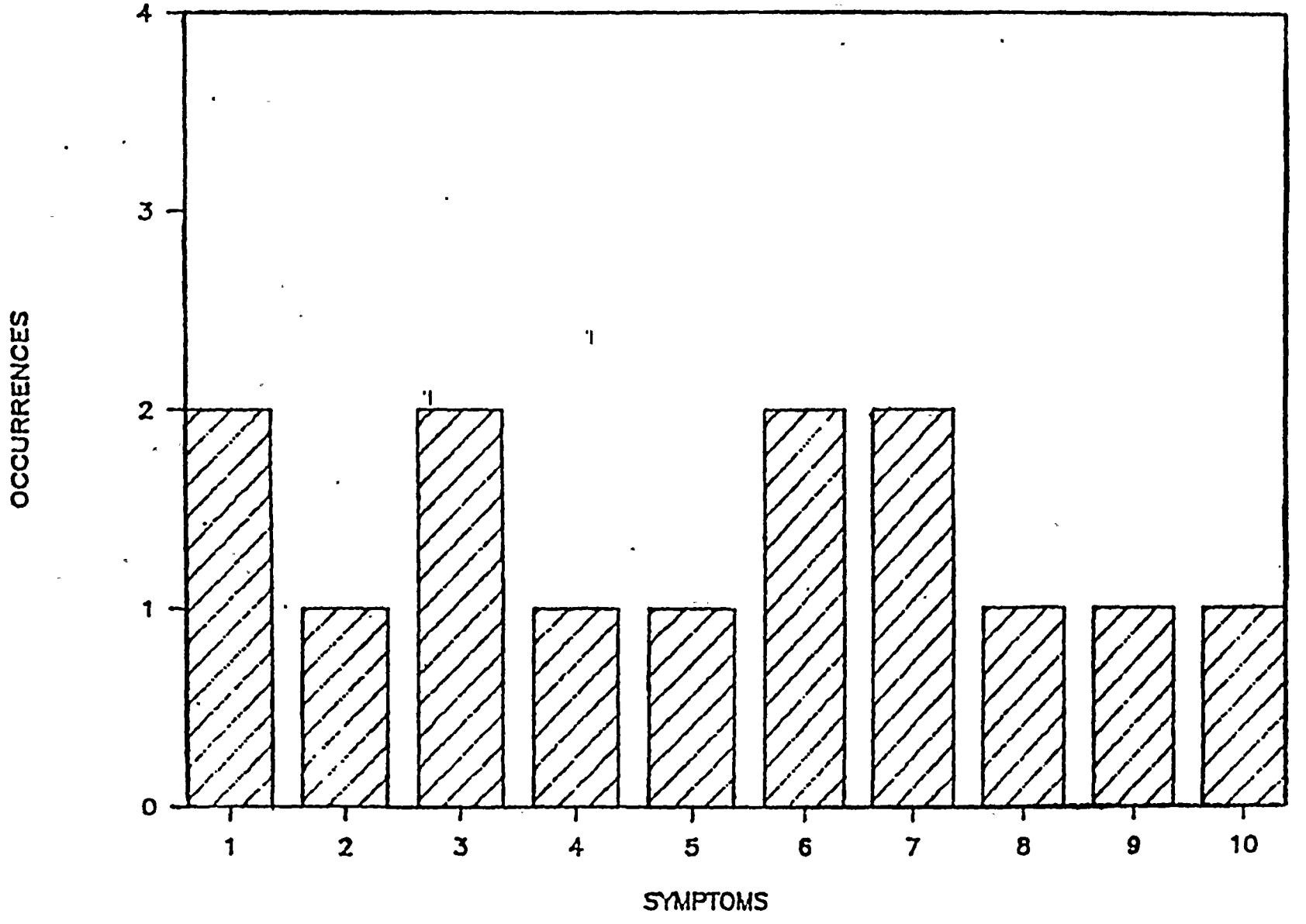
OCCURRENCES VS SYMPTOMS

BELLEFONTE NUCLEAR PLANT



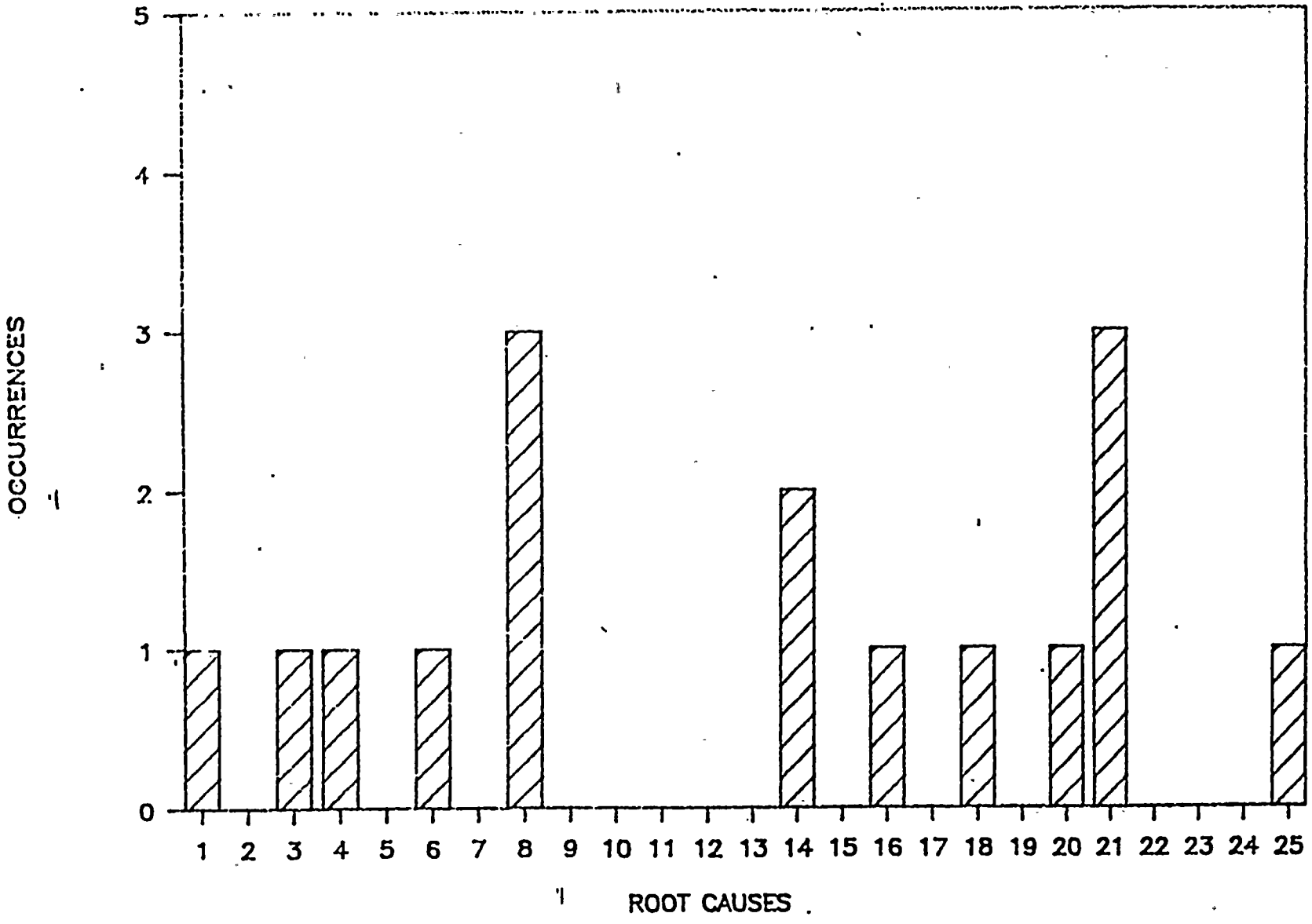
OCCURRENCES VS SYMPTOMS

SUBCAT 302



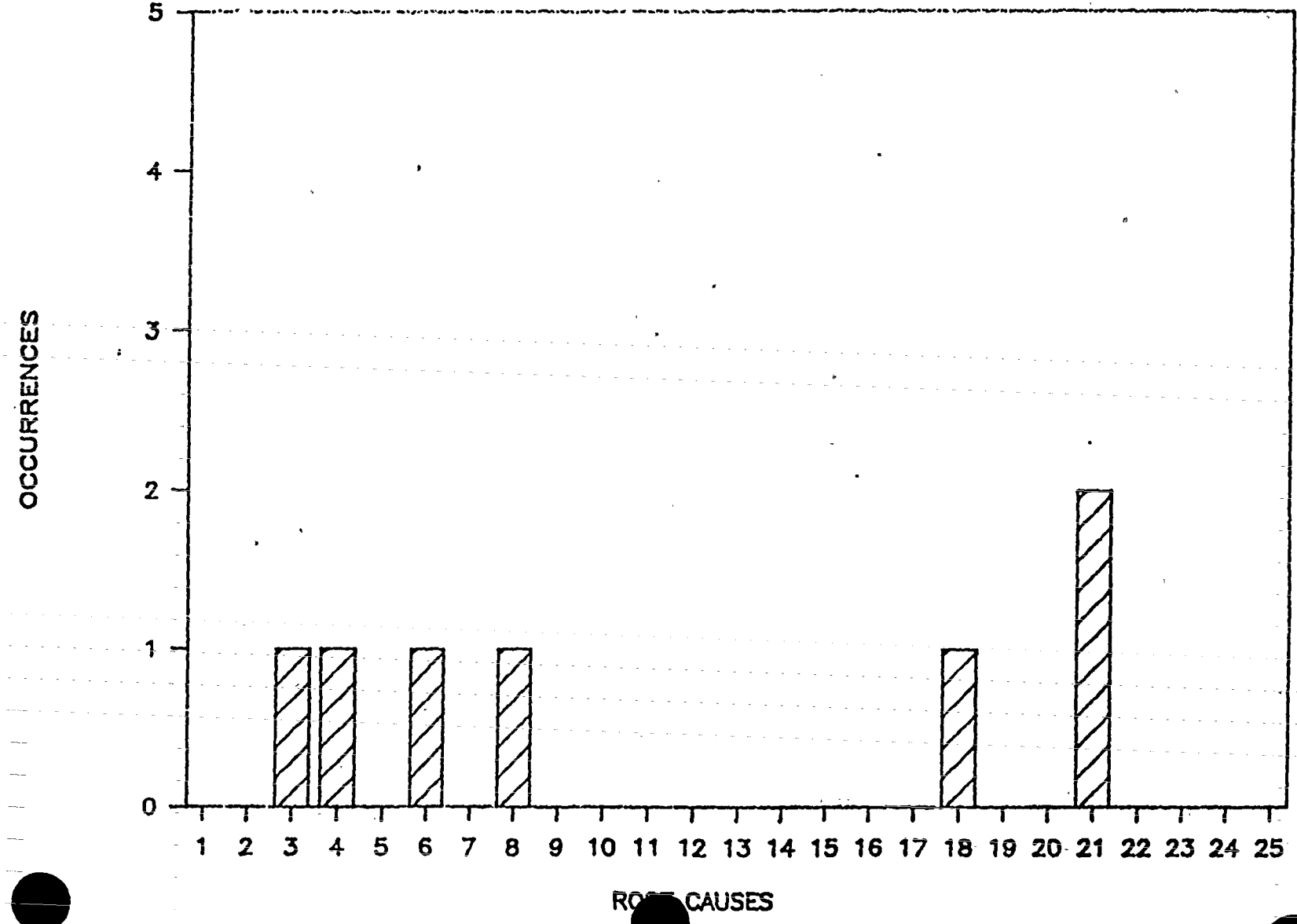
OCCURRENCES VS ROOT CAUSES

SEQUOYAH NUCLEAR PLANT



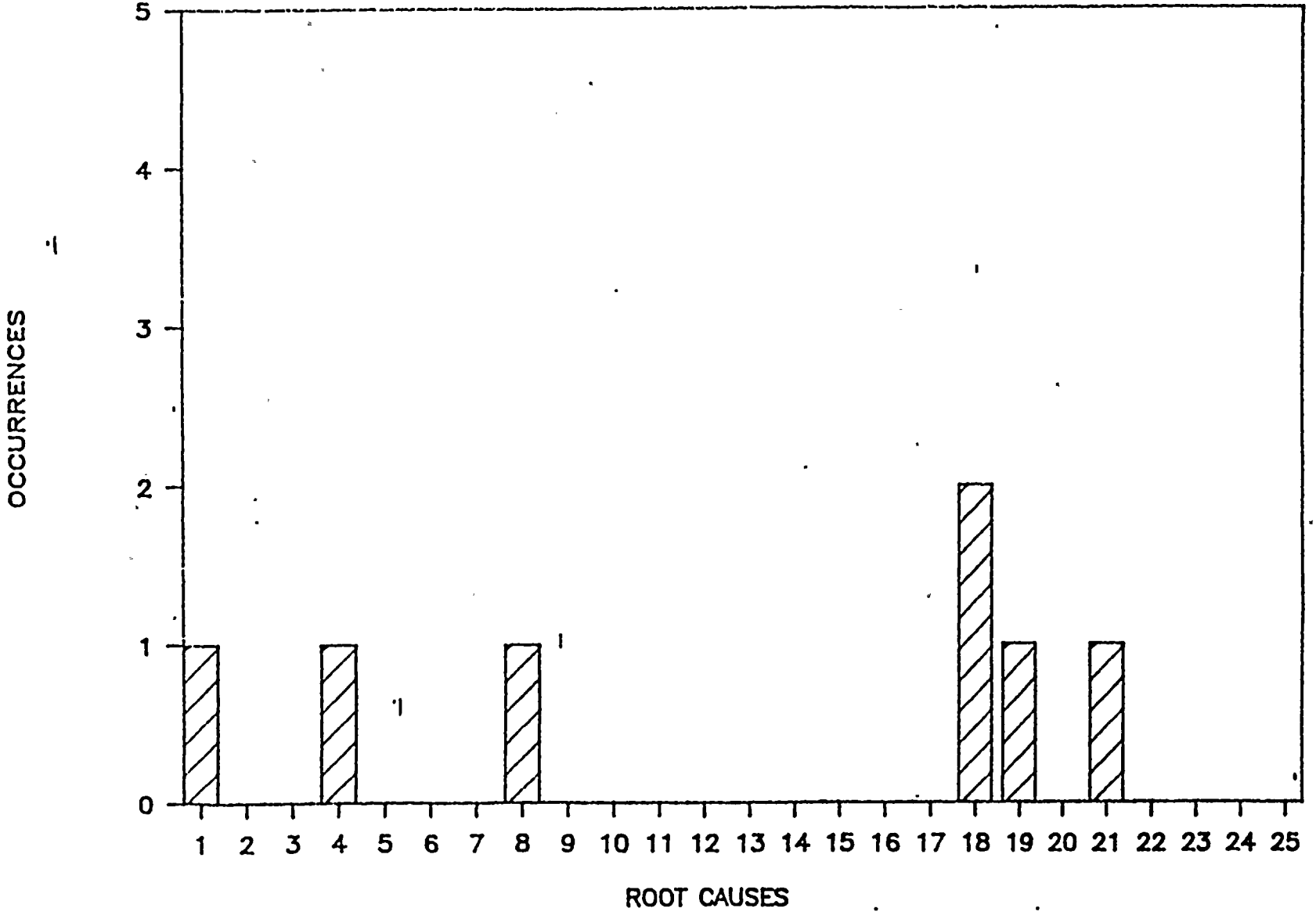
OCCURRENCES VS ROOT CAUSES

WATTS BAR NUCLEAR PLANT



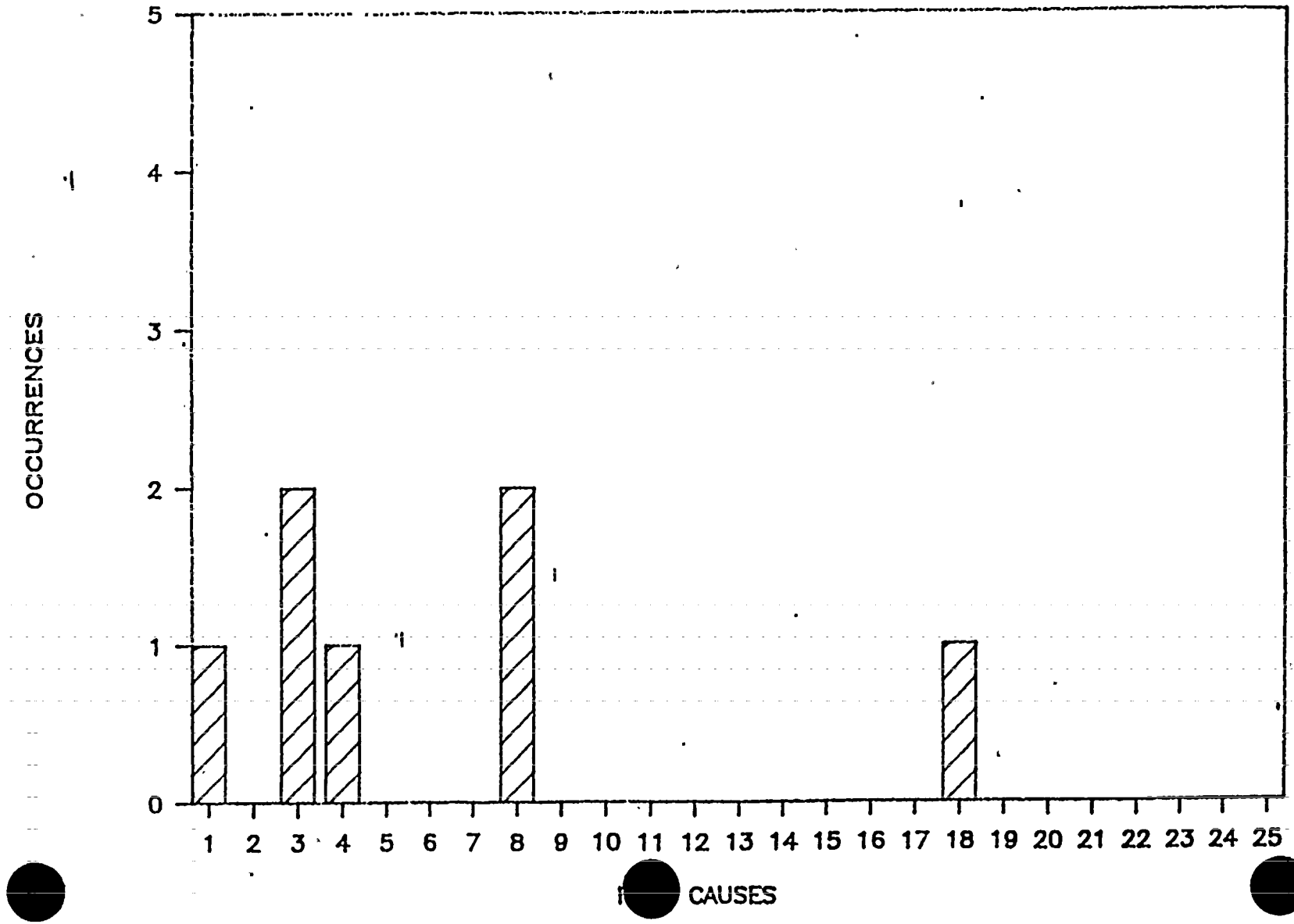
OCCURRENCES VS ROOT CAUSES

BROWNS FERRY NUCLEAR PLANT



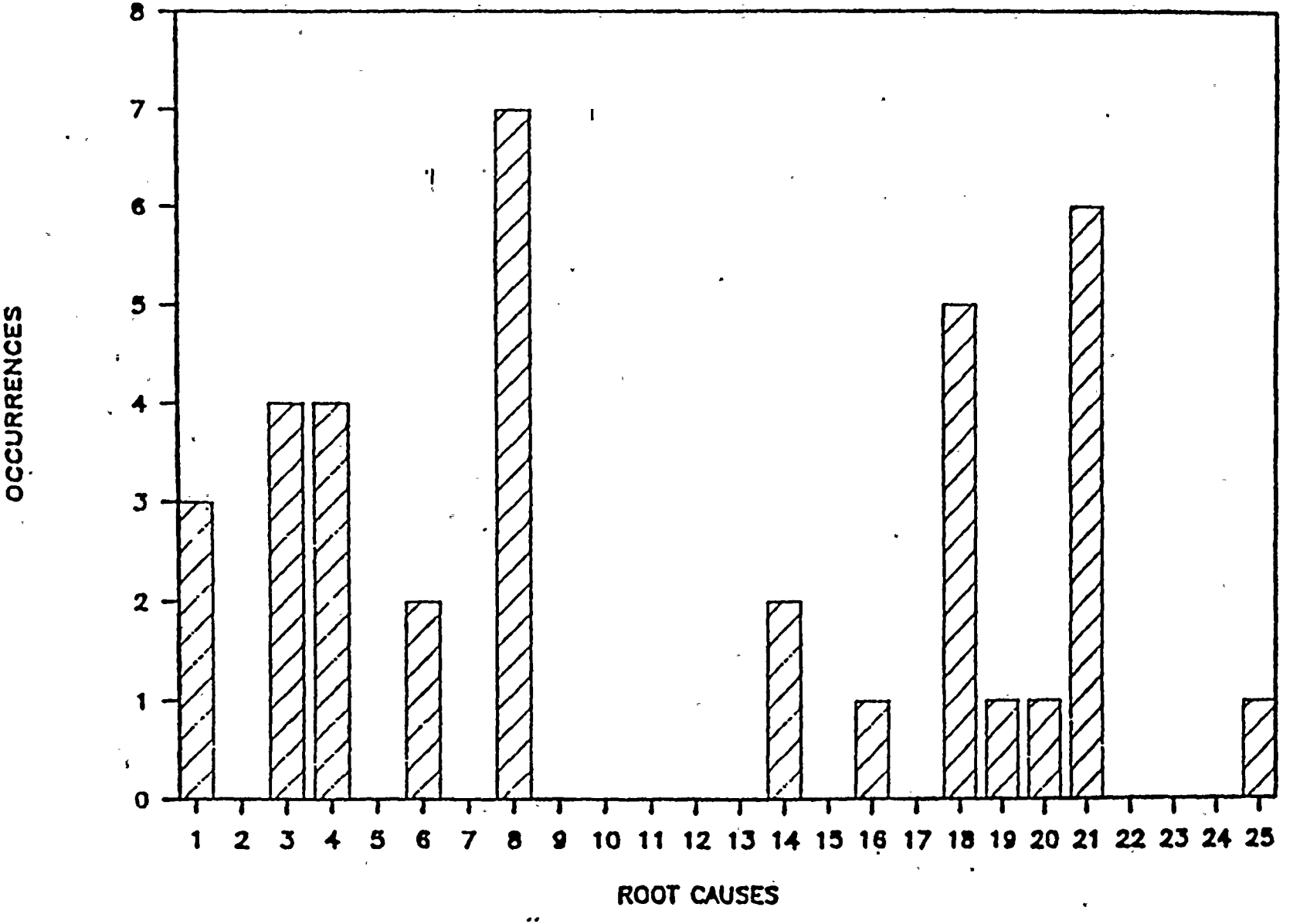
OCCURRENCES VS ROOT CAUSES

BELLEFONTE NUCLEAR PLANT



OCCURRENCES VS ROOT CAUSES

SUBCAT 302



CORRECTIVE ACTION TRACKING DOCUMENTS (CATDs)

CATD NUMBER	CORRECTIVE ACTION PLAN RECEIVED/APPROVED
30200-NPS-01	Yes
30201-WBN-01	Yes
30201-WBN-02	Yes
30201-SQN-01	Yes
30201-SQN-02	Yes
30201-BFN-01	Yes
30201-BFN-02	Yes
30201-BFN-03	Yes
30201-BFN-04	Yes
30201-BFN-05	Yes
30201-BLN-01	Yes
30202-NPS-01	Yes
30202-WBN-01	Yes
30202-WBN-02	Yes
30202-WBN-03	Yes
30202-WBN-05	Yes
30202-WBN-06	Yes
30202-WBN-07	Yes
30202-SQN-01	Yes
30202-BFN-01	Yes
30202-BLN-01	Yes
30204-WBN-01	Yes
30204-SQN-01	Yes

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No.: 30200

1. Immediate Corrective Action Required: ☐ Yes ☑ No
2. Stop Work Recommended: ☐ Yes ☑ No
3. CATD No. 30200-NPS-01 4. INITIATION DATE 02/05/87
5. RESPONSIBLE ORGANIZATION: TVA - Corporate
6. PROBLEM DESCRIPTION: ☐ QR ☑ NQR Under the Electrical and Communication Equipment Subcategory, twenty-two CATDs have been issued to date identifing specific deficiencies at all four nuclear sites. The two significant areas where problems were identified were in Raychem Control and Shutdown Board Bus voltage regulation. The specific deficiencies noted reflected upon questionable practices in the engineering, operating and quality assurance organizations and included procedural weaknesses, vague or nonexisting acceptance criteria and weaknesses in the control and auditing processes. Because the deficiencies crossed organizational and functional lines, TVA's corporate organization should ensure a programatic corrective action resolution for these two areas and consider applying any lessons learned to other major electrical programs. ☐ ATTACHMENTS
7. PREPARED BY: NAME [signature] DATE: 3/31/87
8. CONCURRENCE: CEG-H W. C. Kamm DATE: 3-31-87
9. APPROVAL: ECTG PROGRAM MGR. [signature] for DATE: 4/2/87

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN:

see attached

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: see attached DATE: —
12. CONCURRENCE: CEG-H: [signature] DATE: 5-6-87
SRP: [signature] DATE:
[signature] DATE:
[signature] DATE:
[signature] DATE:
ECTG PROGRAM MGR: [signature] for DATE: 9/11/87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE TITLE DATE

3563T

ECSP Corrective Action Tracking Document (CATD)

INITIATION — Applicable ECSP Report No.: 302.01 - WBN

1. Immediate Corrective Action Required: ☐ Yes ☒ No
2. Stop Work Recommended: ☐ Yes ☒ No
3. CATD No. 30201-WBN-01 / 4. INITIATION DATE 1-5-87
5. RESPONSIBLE ORGANIZATION: Document Control
6. PROBLEM DESCRIPTION: ☐ QR ☒ NQR
Data entry of work package into historical file does not allow for retrievability by specific subject matter (i.e., keywords, references).

☒ ATTACHMENTS

7. PREPARED BY: NAME Randy Sutt DATE: 12-3-86
8. CONCURRENCE: CEG-H [illegible] DATE: 1-30-87
9. APPROVAL: ECTG PROGRAM MGR. D.L. Stewart for DATE: 1-30-87

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN:

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: [signature] DATE: 2/13/87
12. CONCURRENCE: CEG-H: [signature] DATE: 2-20-87
SRP: [signature] DATE:
N/A DATE:
DATE:
DATE:
ECTG PROGRAM MGR: [signature] for DATE: 9/11/87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE | TITLE | DATE

2824T

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No.: 302.01 - WBN

1. Immediate Corrective Action Required: ☐ Yes ☒ No
2. Stop Work Recommended: ☐ Yes ☒ No
3. CATD No. 30201-WBN-02/ 4. INITIATION DATE 1-[illegible]-87
5. RESPONSIBLE ORGANIZATION: Plant Maintenance
6. PROBLEM DESCRIPTION: ☐ QR ☒ NQR
Attachments to procedure 57.99ST-7 are not uniquely identified to allow for computer entry into work historical file. Examples in same procedure:
a. HI 57.99ST-7 - Selection Guide H
b. HI 57.99ST-7 -Type "V" stub termination sheet H

☒ ATTACHMENTS

7. PREPARED BY: NAME Randy Sutt DATE: 12-2-86
8. CONCURRENCE: CEG-H [illegible] DATE: 1-29-87
9. APPROVAL: ECTG PROGRAM MGR. [illegible] DATE: 1-30-87

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: See Attachment A

COMPLETED 3-30-88

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: [illegible] DATE: 2/13/87
12. CONCURRENCE: CEG-H: [illegible] DATE: 2-20-87
SRP: [illegible] DATE:
N/A DATE:
DATE:
ECTG PROGRAM MGR: [illegible] DATE: 9/14/87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE TITLE DATE

2824T

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No: 302.01SQN

1. Immediate Corrective Action Required: ☐ Yes ☒ No
2. Stop Work Recommended: ☐ Yes ☒ No
3. CATD No. 302.01-SQN-01 4. INITIATION DATE 10/15/86
5. RESPONSIBLE ORGANIZATION: Electrical Maintenance
6. PROBLEM DESCRIPTION: ☒ QR ☐ NQR See attached IE Notice 86-53 cover page. The evaluator discovered an improper Raychem application during investigation of this concern. Additionally a number of work packages involving Raychem applications did not provide proper material traceability documentation. SQM-2 and SQA 45 are not clear as to responsibility for providing Raychem material control and traceability. Personnel are not following the procedure. Electrical Maintenance is having more problems than Electrical Modifications. Specific Raychem application training has not been given to all electrical craft personnel.

☐ ATTACHMENTS

7. PREPARED BY: NAME D. E. Smith DATE: 10-02-86
8. CONCURRENCE: CEG-H W. R. [signature] DATE: 10-17-86
9. APPROVAL: ECTG PROGRAM MGR. [signature] DATE: 10-21-86

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: SEE THE CAR TRANSMITTED BY MEMORANDUM 502 861118 889
This Response was not accepted by OPS ECTG
SEE B[illegible] S03 861124 804 for REV 2 to C[illegible] from SQN Acceptable by OPS ECTG
Dated 12/[illegible]/86
*Before closing [illegible] issue CAQR initiated [illegible]

COMPLETED

Margin: J? 2/1[illegible]

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: H. B. Rankin / for DATE: 11-28-86
12. CONCURRENCE: CEG-H: Thomas F. Huth for WRL DATE: 2/11/87
SRP: DATE:
N A DATE:
DATE:
DATE:
ECTG PROGRAM MGR: [signature] for DATE: 8-13-87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

W. R. [signature]	OPS CEG-H	8-13-87
SIGNATURE	TITLE	DATE

1178T

ECTG C.3
Attachment A
Page 1 of 1
Revision 2

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No: 302.01 SQN

1. Immediate Corrective Action Required: ☒ Yes ☐ No
2. Stop Work Recommended: ☐ Yes ☒ No
3. CATD No. 30201-SQN-02 4. INITIATION DATE 10-27-86
5. RESPONSIBLE ORGANIZATION: SQN
6. PROBLEM DESCRIPTION: ☒ QR ☐ NQR Investigator's survey found Raychem's application which did not meet the acceptance criteria in M&AI-~~1~~.7
RHS 11-6-86

☐ ATTACHMENTS

7. PREPARED BY: NAME R. V. Sutt DATE: 10-27-86
8. CONCURRENCE: CEG-H W. L. Sagg DATE: 10-29-86
9. APPROVAL: ECTG PROGRAM MGR. T. B. Drane DATE: 3/31/87

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: In response to I E Information Notice 86-53 and the EQ program, SQN will have an inspection program for Raychem applications. This work activity can be found in the Unit 2 Project/2 network as zone 314. The present duration is indeterminate until the program is defined by the Division of Nuclear Engineering.

Living close out verify CAQR is initiated. NEL 3-30-87

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: S03 860922 803 DATE: 09-25-86
12. CONCURRENCE: CEG-H: W. L. Sagg DATE: 10-29-86
SRP: DATE:
DATE:
DATE:
DATE:
ECTG PROGRAM MGR: James R Russell DATE: 9-14-87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

W W Murphy for — Ops CEG-H — 9/14/8

SIGNATURE TITLE DATE

2246T

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No: 302.01-BFN

1. Immediate Corrective Action Required: ☒ Yes ☐ No
2. Stop Work Recommended: ☐ Yes ☒ No
3. CATD No. 30201-BFN-01 4. INITIATION DATE 11/12/86
5. RESPONSIBLE ORGANIZATION: Document Control - BFN
6. PROBLEM DESCRIPTION: ☒ QR ☐ NQR Document control of standard drawings is needed. (See Attached)

☒ ATTACHMENTS

7. PREPARED BY: NAME Dwight B. Thompson (3592) DATE: 11/12/86
8. CONCURRENCE: CEG-H Thomas [illegible] DATE: 12/3/86
9. APPROVAL: ECTG PROGRAM MGR. [illegible] DATE: 12/5/86

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: SEE ATTACHMENT A.

During closeout ensure CAQR initiated [illegible] 8/17/87

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: R53 870219 865 DATE: —
12. CONCURRENCE: CEG-H: [signature] DATE: 4-6-87
SRP: [signature] [illegible] DATE: 8-13-87
DATE:
DATE:
DATE:
ECTG PROGRAM MGR: James R Russell DATE: 8-14-87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE TITLE DATE

2421T

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No: 302.01-BFN

1. Immediate Corrective Action Required: ☒ Yes ☐ No
2. Stop Work Recommended: ☐ Yes ☒ No
3. CATD No. 30201-BFN-02 4. INITIATION DATE 11/12/86
5. RESPONSIBLE ORGANIZATION: Division of Nuclear Engineering BFN
6. PROBLEM DESCRIPTION: ☒ QR ☐ NQR The acceptance criteria for existing Raychem splices needs to be finalized soon to minimize the the need for reinspection by the EQ walkdown group. Procedural and standard drawing inadequacies and discrepancies should be resolved soon to ensure EQ splicing and terminations is performed properly. Raychem vendor manual control is needed. (See attached)

☒ ATTACHMENTS

7. PREPARED BY: NAME Dwight B. Thompson (3592) DATE: 11/12/86
8. CONCURRENCE: CEG-H [signature] DATE: 12/3/86
9. APPROVAL: ECTG PROGRAM MGR. [signature] DATE: 12/3/86

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: SEE ATTACHMENT A.

During closeout ensure PER initiated 12/17/87

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: [signature] 8702190865 DATE: —
12. CONCURRENCE: CEG-H: [signature] DATE: 4-6-87
SRP: [signature] DATE: 8-13-87
DATE:
DATE:
DATE:
ECTG PROGRAM MGR: James R Russell DATE: 8-14-87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE	TITLE	DATE

2421T

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No: 302.01-BFN

1. Immediate Corrective Action Required: ☐ Yes ☒ No
2. Stop Work Recommended: ☐ Yes ☒ No
3. CATD No. 30201-BFN-03 4. INITIATION DATE 11/12/86
5. RESPONSIBLE ORGANIZATION: Training - BFN
6. PROBLEM DESCRIPTION: ☐ QR ☒ NQR The training lesson plan needs to be made consistent with Raychem procedures and corrected TVA procedures. (See attached)

☒ ATTACHMENTS

7. PREPARED BY: NAME Dwight B. Thompson (3592) DATE: 11/12/86
8. CONCURRENCE: CEG-H Thomas F Hill for WRC DATE: 12/3/86
9. APPROVAL: ECTG PROGRAM MGR. [illegible] DATE: 12/3/86

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: SEE ATTACHMENT A.

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: [illegible] DATE: —
12. CONCURRENCE: CEG-H: W. R. [illegible] DATE: 4-8-87
SRP: _____ DATE: _____
_____ DATE: _____
_____ DATE: _____
_____ DATE: _____
ECTG PROGRAM MGR: James R Russell DATE: 8-14-87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE	TITLE	DATE

2421T

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No: 302.01-BFN

1. Immediate Corrective Action Required: ☒ Yes ☐ No
2. Stop Work Recommended: ☐ Yes ☒ No
3. CATD No. 30201-BFN-04 4. INITIATION DATE 11/12/86
5. RESPONSIBLE ORGANIZATION: Modifications - BFN
6. PROBLEM DESCRIPTION: ☐ QR ☒ NQR Procedural inadequacies and discrepancies in Raychem instructions should be resolved soon in order to ensure EQ splicing and termination is performed properly. (See attached)

☒ ATTACHMENTS

7. PREPARED BY: NAME Dwight B. Thompson (3592) DATE: 11/12/86
8. CONCURRENCE: CEG-H Thomas F Heath DATE: 12/3/86
9. APPROVAL: ECTG PROGRAM MGR. DW Stewart DATE: 12/3/86

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: SEE ATTACHMENT A.

CATD upgraded to QR. DFN will be notified 5-4-87
During closeout ensure CAQR initiated 8/17/87

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: B33 870219 865 DATE: —
12. CONCURRENCE: CEG-H: [signature] DATE: 4-6-87
SRP: [signature] — accept copy as original DATE: 8-13-87
DATE:
DATE:
DATE:
ECTG PROGRAM MGR: James R Russell DATE: 8-14-87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE TITLE DATE

2421T

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No: 302.01-BFN

1. Immediate Corrective Action Required: ☒ Yes ☐ No
2. Stop Work Recommended: ☐ Yes ☒ No
3. CATD No. 30201-BFN-05 4. INITIATION DATE 11/12/86
5. RESPONSIBLE ORGANIZATION: Maintenance - BFN
6. PROBLEM DESCRIPTION: ☒ QR ☐ NQR Resolve discrepancies in instructions for installation of Raychem cable sleeves soon in order to ensure EQ splicing and terminations are performed properly. (See attached)

☒ ATTACHMENTS

7. PREPARED BY: NAME Dwight B. Thompson (3592) DATE: 11/12/86
8. CONCURRENCE: CEG-H *Thomas J. Hatch [illegible]* DATE: *12/3/86*
9. APPROVAL: ECTG PROGRAM MGR. *[illegible]* DATE: *12/3/86*

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: SEE ATTACHMENT A

During closeout ensure CAQR initiated
[initials] [date]

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: *R33 870219 865* DATE: —
12. CONCURRENCE: CEG-H: *[signature]* DATE: *4-6-87*
SRP: *[signature] accept copy as original* DATE: *8-13-87*
DATE:
DATE:
DATE:
ECTG PROGRAM MGR: *James R Russell* DATE: *8-14-87*

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE	TITLE	DATE

2421T

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No: 302.01-BLN

1. Immediate Corrective Action Required: ☐ Yes ☒ No
2. Stop Work Recommended: ☐ Yes ☒ No
3. CATD No. 30201-BLN-01 4. INITIATION DATE 10/16/86
5. RESPONSIBLE ORGANIZATION: BLN
6. PROBLEM DESCRIPTION: ☐ QR ☒ NQR Electrical maintenance instruction directs installation of Raychem seals per vendor instructions. The vendor instructions are not reviewed by plant personnel for adequacy and possible safety impact. Also, there is no program to review vendor changes in their installation instructions.

☐ ATTACHMENTS

7. PREPARED BY: NAME R. E. Jones DATE: 10/16/86
8. CONCURRENCE: CEG-H W.R. Sanger DATE: 11-10-86
9. APPROVAL: ECTG PROGRAM MGR. [illegible] for DATE: 11-10-86

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: See attached.

☒ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: 8801 870122 801 DATE: —
12. CONCURRENCE: CEG-H: W.R. Sanger DATE: 5-8-87
SRP: N/A DATE:
DATE:
DATE:
DATE:
ECTG PROGRAM MGR: [illegible] for DATE: 7/13/87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE	TITLE	DATE

2100T

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No.: 302.02-WBN

1. Immediate Corrective Action Required: ☑ Yes ☐ No
2. Stop Work Recommended: ☐ Yes ☑ No
3. CATD No. 30202-WBN-01 4. INITIATION DATE 01-07-87
5. RESPONSIBLE ORGANIZATION: Operations
6. PROBLEM DESCRIPTION: ☑ QR ☐ NQR The shutdown board voltages are not monitored at the present time. However, when voltages were monitored under SI-3 during 1985, some 480 volt shutdown board voltages were recorded which were in excess of the limits stated in the FSAR and ANSI C84.1. No provisions are made in SI-3 or SOI-55-1M1 to correct shutdown board voltages that are in excess of the safe operating limits as stated in the FSAR and ANSI C84.1. No specifications of upper voltage limits for safe operation of safety -related power boards are given in GOI-7G. ☒ ATTACHMENTS
7. PREPARED BY: NAME R. Meers, Jr. DATE: 01-07-87
8. CONCURRENCE: CEG-H Thomas F. Hyatt for WRC DATE: 2/17/87
9. APPROVAL: ECTG PROGRAM MGR. [signature] DATE: 2/9/87

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN:

See Attached CAP for 30202-WBN-01
30202-WBN-02
30202-WBN-03

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: [signature] DATE: 2/17/87
12. CONCURRENCE: CEG-H: [signature] DATE: 2-24-87
SRP: [signature] DATE:
[signature] DATE:
N/A DATE:
[signature] DATE:
ECTG PROGRAM MGR: [signature] DATE: 7/11/87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE	TITLE	DATE

3161T

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No.: 302.02-WBN

1. Immediate Corrective Action Required: ☒ Yes ☐ No
2. Stop Work Recommended: ☐ Yes ☒ No
3. CATD No. 30202-NPS-01 4. INITIATION DATE 02-07-87
5. RESPONSIBLE ORGANIZATION: ONP
6. PROBLEM DESCRIPTION: ☒ QR ☐ NQR DPM N7701 states that relays that monitor safety-related auxiliary power system voltage have effective 0 volt setpoints. The description continues, ignoring the fact that automatic board transfers are initiated for degraded voltages. (e.g., 95% that last for 5 minutes at WBN) The description of voltage transfer events as appears in DPM N7701 is contrary to that given in the FSAR. All plants have 95% degraded voltage transfers.

☒ ATTACHMENTS

7. PREPARED BY: NAME B. Meers, Jr. DATE: 02-07-87
8. CONCURRENCE: CEG-H Thomas F. Hurst DATE: 2-8-87
9. APPROVAL: ECTG PROGRAM MGR. R R Gill DATE: 2/9/87

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN:

See attached CAP.

Using the close out process in CAQR initiated WKL 3-19-87

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: John R Lyon DATE: 3/18/87
12. CONCURRENCE: CEG-H: DATE: 3-19-87
SRP: DATE:
N/A DATE:
DATE:
ECTG PROGRAM MGR: R R Gill DATE: 9/16/87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE	TITLE	DATE

3161T

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No.: 302.02-WBN

1. Immediate Corrective Action Required: ☒ Yes ☐ No
2. Stop Work Recommended: ☐ Yes ☒ No
3. CATD No. 30202-WBN-02 4. INITIATION DATE 01-07-87
5. RESPONSIBLE ORGANIZATION: Protection and Analysis Group (DPSO)
6. PROBLEM DESCRIPTION: ☒ QR ☐ NQR The present 5% boost tap setting on the 6.9-kV to 480 volt shutdown board transformers cause the 480 volt shutdown board voltage to be in excess of the WBN FSAR and ANSI C84.1 Range B upper limit for several board power alignments and line voltages (both 161-kV and 500-kV lines).

☒ ATTACHMENTS

7. PREPARED BY: NAME B. Meers, Jr. [signature] DATE: 01-07-87
8. CONCURRENCE: CEG-H [signature] DATE: 2/7/87
9. APPROVAL: ECTG PROGRAM MGR. [signature] for DATE: 2/9/87

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN:

See attached CAP for 30202-WBN-01
30202-WBN-02
30202-WBN-03

☐ ATTACHMENTS 2/17/87

11. PROPOSED BY: DIRECTOR/MGR: [signature] DATE: 2/14/87
12. CONCURRENCE: CEG-H: [signature] DATE: 2-24-87
SRP: DATE:
[signature] DATE:
DATE:
DATE:
ECTG PROGRAM MGR: [signature] for DATE: 9/1/87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE	TITLE	DATE

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No.: 302.02-WBN

1. Immediate Corrective Action Required: ☐ Yes ☑ No
2. Stop Work Recommended: ☐ Yes ☑ No
3. CATD No. 30202-WBN-03 4. INITIATION DATE 02-07-87
5. RESPONSIBLE ORGANIZATION: ONP
6. PROBLEM DESCRIPTION: ☑ QR ☐ NQR The WBN FSAR neither endorses nor takes exception to ANSI C84.1 and ANSI C92.2.

☒ ATTACHMENTS

7. PREPARED BY: NAME B. Meers, Jr. DATE: 02-07-87
8. CONCURRENCE: CEG-H Thomas F Hutton for WRL DATE: 2/8/87
9. APPROVAL: ECTG PROGRAM MGR. R K Wilson for DATE: 2/9/87

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN:

See Attached CAF for 30202-WBN-01
30202-WBN-02
30202-WBN-03

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: John C Lyon DATE: 2/17/87
12. CONCURRENCE: CEG-H: W. L. Long DATE: 2-20-87
SRP: N/A DATE:
DATE:
DATE:
DATE:
ECTG PROGRAM MGR: R K Wilson for DATE: 9/14/87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE TITLE DATE

3161T

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No.: 302.02-WBN

1. Immediate Corrective Action Required: ☒ Yes ☐ No
2. Stop Work Recommended: ☐ Yes ☒ No
3. CATD No. OP-30202-WBN-05 (IAR 2-OP302) 4. INITIATION DATE 01/27/87
5. RESPONSIBLE ORGANIZATION: WBN Site Director
6. PROBLEM DESCRIPTION: ☒ QR ☐ NQR TVA Division of Nuclear Power DPM N7701 dated 04/07/82, attached, states that relays monitoring the voltage levels of safety-related equipment have an effective setpoint of 0 volts. This information is contrary to WBN FSAR FSAR Figure 8.3-5a, SI-3.2.21, Revision 2, SI-3.2.23 Revision 4, and SI-3.2.27 Revision 3. WBN Technical Specifications require the performance of the referenced SI's at regular intervals. Also, operator action described in DPM N7701 dated 04/07/82 is not appropriate in addition to the automatic sequencing initiated by degraded voltage.

☐ ATTACHMENTS

7. PREPARED BY: NAME B. J. Heers, Jr. DATE: 01/27/87
8. CONCURRENCE: CEG-H *for Thomas F. Huth* DATE: *1/27/87*
9. APPROVAL: ECTG PROGRAM MGR. *[signature]* DATE: *3/20/87*

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: Appears to be the responsibility of the Director of Nuclear Services.
Also see CATD No. 30202-WBN-03 *JFH 1/27/87*

COMPLETED *6-1-88*

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: T20 861217-953 DATE: —
12. CONCURRENCE: CEG-H: *W.P. [signature]* DATE: *3-19-87*
SRP: *N/A* DATE:
DATE:
DATE:
DATE:
ECTG PROGRAM MGR: *[signature]* DATE: *9/11/87*

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE	TITLE	DATE

3411T

ECSP Corrective Action Tracking Document (CATD)

INITIATION — Applicable ECSP Report No.: 302.02-WBN

1. Immediate Corrective Action Required: ☑ Yes ☐ No
2. Stop Work Recommended: ☐ Yes ☑ No
3. CATD No. OP 30202-WBN-06 (IAR 3-OP302) 4. INITIATION DATE 01/27/87
5. RESPONSIBLE ORGANIZATION: WBN Site Director
6. PROBLEM DESCRIPTION: ☑ QR ☐ NQR WBN FSAR Figure 8.3-5a added by Amendment 48 and attached does not specify the setpoint of the three degraded voltage relays. The correct setpoint of the relays (27DHT, 27DBT, and 27DCT) as specified and set by SI-3.2.21 Revision 2 is 95.07% (109.33 volts low referenced to 115 volts normal). Also, the right hand part of Figure 8.3-5a is missing on three "controlled" copies inspected. WBN DCU verified that the DCU copy at Chattanooga is also defective.

☐ ATTACHMENTS

7. PREPARED BY: NAME B. J. Meers, Jr. DATE: 01/27/87
8. CONCURRENCE: CEG-H [signature] for WRL DATE: 1/27/87
9. APPROVAL: ECTG PROGRAM MGR. [signature] DATE: 3/20/87

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: The individual resolution of immediate action for 3-OP302 will be accomplished by FSAR revision which will be submitted to the NRC by March 16, 1987. Numerous inaccuracies in the Watts Bar FSAR have been documented under SCR GEN NEB 8602 and will be generically resolved by a comprehensive FSAR verification plan. The objective of the FSAR verification plan. The objective of the FSAR verification is both an updating to achieve accuracy and the development of an interface with the change control programs for design and operations. That plan is part of the Design Baseline and and Licensing Verification Program which is clearly identified on the Watts Bar Integrated Schedule and is a prerequisite to fuel loading.

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: I20 861217 963 DATE: —
12. CONCURRENCE: CEG-H: W. K. Sanger DATE: 3-19-87
SRP: [signature] DATE:
N/A DATE:
DATE:
DATE:
ECTG PROGRAM MGR: [signature] for DATE: 9/11/87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE | TITLE | DATE

3411T

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No.: 302.02-WBN

1. Immediate Corrective Action Required: ☑ Yes ☐ No
2. Stop Work Recommended: ☐ Yes ☑ No
3. CATD No. OP 30202-WBN-07 (IAR 4-OP302) 4. INITIATION DATE 01/27/87
5. RESPONSIBLE ORGANIZATION: WBN Site Director
6. PROBLEM DESCRIPTION: ☑ QR ☐ NQR WBN Standard Practice WB 5.2.6 Revision 0, Attachment, states that relays monitoring the voltage levels of safety-related equipment have an effective setpoint of 0.0 volts. This information is contrary to WBN FSAR Figure 8.3.5a, SI-3.2.21 Revision 2, SI-3.2.23 Revision 4, and SI-3.2.27 Revision 3. WBN Technical Specifications require the performance of the referenced SI's at regular intervals. Also, operator action described in WB 5.2.6 Revision 0 is not appropriate in addition to the automatic sequencing initiated by degraded voltage. J71 3/4/87

☐ ATTACHMENTS

7. PREPARED BY: NAME B. J. Meers, Jr. DATE: 01/27/87
8. CONCURRENCE: CEG-H [signature] DATE: 1/27/87
9. APPROVAL: ECTG PROGRAM MGR. [signature] DATE: 3/20/87

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: WB-5.2.6 has been revised. Revision 1 of WB-5.2.6 was issued on August 6, 1986 and satisfies this item.

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: T20 861217-963 DATE: —
12. CONCURRENCE: CEG-H: [signature] DATE: 3-19-87
SRP: [signature] DATE:
[signature] DATE:
[signature] DATE:
DATE:
ECTG PROGRAM MGR: [signature] DATE: 7/11/87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE	TITLE	DATE

3421T

ECSP Corrective
Action Tracking Document
(CATD)

INITIATION Applicable ECSP Report No: 302.02 SQN Revision 1

1. Immediate Corrective Action Required: ☐ Yes ☒ No
2. Stop Work Recommended: ☐ Yes ☒ No
3. CATD No. 30202-SQN-01 4. INITIATION DATE 10-05-86
5. RESPONSIBLE ORGANIZATION: Division of Nuclear Engineering
6. PROBLEM DESCRIPTION: ☒ QR ~~☒~~ NQR Referenced Report 302.02-SQN five percent low voltage problems identified, (1) voltage deviations with the potential to damage equipment fed by the plant distribution power, (2) (DG) starts, (3) violations of procedure requiring DG status for indications of undervoltage conditions, (4) SI-3 procedure did not implement all upper-tier commitments in addition to not containing specific upper and lower limits for determining operability requirements and, (5) SI-3 data recorded over the 1980 to 1986 timeframe have numerous QA deficiencies ☐ ATTACHMENTS
7. PREPARED BY: NAME Ben Heers DATE: 10-13-86
8. CONCURRENCE: CEG-H W. K. [signature] DATE: 10-15-86
9. APPROVAL: ECTG PROGRAM MGR [signature] DATE: 10-17-86

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: SEE THE CAP TRANSMITTED BY B25 811114 009 AND MEMORANDUM (~~B25 811114 009~~) S03 861126 809 JJ 2/11
Revised CAP (S03 861126 809 Superceeded by S03 870317 802) JJH ?
☐ ATTACHMENTS
11. PROPOSED BY: DIRECTOR/MGR: S03 861126 809 DATE: 11/26/86
12. CONCURRENCE: CEG-H: [signature] for WRL DATE: 12/3/86
SRP: NA DATE: NA
DATE:
DATE:
DATE:
ECTG PROGRAM MGR: W.K. [signature] DATE: 7-6-87

THIS ITEM PARTIALLY COMPLETED AT ... DATE 7/6/87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

W.K. [signature]	OPS [illegible]	7-6-87
SIGNATURE	TITLE	DATE

Restart issues closed and all non restart issues except A.2.c. Actions are still underway to complete corrective actions to this issue.
W.K. [signature] 7-6-87

2049T

ECSP Corrective Action Tracking Document (CATD)

INITIATION   Applicable ECSP Report No: OP-302.02-BFN

1. Immediate Corrective Action Required: ☐ Yes ☒ No
2. Stop Work Recommended: ☐ Yes ☒ No
3. CATD No. OP30202-001-BFN 4. INITIATION DATE 10/15/86
5. RESPONSIBLE ORGANIZATION: Maintenance
6. PROBLEM DESCRIPTION: ☒ QR ☐ NQR Area Plan N7701, FSAR, and Technical Specifications does not conform to shutdown board voltage limits, specified in ANSI C84.1 as discussed in the referenced ECSP report. Voltages on the 400V shutdown board are not recorded such that an assessment of buss voltage regulations be indicated.

☐ ATTACHMENTS

7. PREPARED BY: NAME B. Meers, Jr. DATE: 10/15/86
8. CONCURRENCE: CEG-H W.K. [signature] DATE: 10/17/86
9. APPROVAL: ECTG PROGRAM MGR. [signature] DATE: 10-21-86

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN:

see attached

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: R33 870817 905 DATE: —
12. CONCURRENCE: CEG-H: W.R. [signature] DATE: 8-17-87
SRP: DATE:
DATE:
DATE:
DATE:
ECTG PROGRAM MGR: James R Russell DATE: 7-14-87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE	TITLE	DATE

2062T

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No.: 302.02-BLN

1. Immediate Corrective Action Required: ☑ Yes ☐ No
2. Stop Work Recommended: ☐ Yes ☑ No
3. CATD No. 30202-BLN-01 4. INITIATION DATE 01-06-87
5. RESPONSIBLE ORGANIZATION: Bellefonte ONP
6. PROBLEM DESCRIPTION: ☒ QR ☐ NQR Safety-related AC power supply board voltages have been observed to be in excess of safe operating limits recommended by DPM N7701 and no provisions have been made to monitor these voltages on a regular basis or reduce the magnitude of the voltages.

☒ ATTACHMENTS

7. PREPARED BY: NAME B. Z. Meers, Jr. DATE: 01-06-87
8. CONCURRENCE: CEG-H J. T. Huth DATE: 1/7/87
9. APPROVAL: ECTG PROGRAM MGR. [signature] for DATE: 1/20/87

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: "SEE ATTACHED R1"

During close out verify CAQR generated or adequate technical justification exist. WRL 7-10-87

☒ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: [signature] DATE: 7/10/87
12. CONCURRENCE: CEG-H: [signature] DATE: 7/10/87
SRP: N/A DATE: N/A
DATE:
DATE:
DATE:
ECTG PROGRAM MGR: [signature] for DATE: 7/10/87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE	TITLE	DATE

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No: OP 302.04

1. Immediate Corrective Action Required: ☐ Yes ☒ No
2. Stop Work Recommended: ☐ Yes ☒ No
3. CATD No. OP 302.04-WBN-01 4. INITIATION DATE 10-18-86
5. RESPONSIBLE ORGANIZATION: Operations, Electrical Maintenance
6. PROBLEM DESCRIPTION: ☐ QR ☒ NQR Erroneous ground fault indications on 480-V Boards was identified at SQN. This condition is caused by replacing the three bulbs with different types. Evaluate the potential for this condition at WBN.

☐ ATTACHMENTS

7. PREPARED BY: NAME G. D. Gardner DATE: 10-18-86
8. CONCURRENCE: CEG-H W. R. Longmire DATE: 10-23-86
9. APPROVAL: ECTG PROGRAM MGR. M. W. Russell DATE: 10-27-86

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: To prevent an erroneous ground fault indication, we will be installing nametags on the 480V boards to use only six-watt bulbs and specifying the TIIC number AMT-074L. All actions should be completed by January 1, 1987.

6-21-88

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: TOG 861120 890 DATE: 11/28/86
12. CONCURRENCE: CEG-H: J. Knox F. Huth DATE: 2/6/87
SRP: DATE:
DATE:
DATE:
DATE:
ECTG PROGRAM MGR: DATE: 9/11/87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE	TITLE	DATE

2138T

ECSP Corrective Action Tracking Document (CATD)

INITIATION Applicable ECSP Report No: 302.04 SQN

1. Immediate Corrective Action Required: ☐ Yes ☒ No
2. Stop Work Recommended: ☐ Yes ☒ No
3. CATD No. 30204-SQN-01 4. INITIATION DATE 11-08-86
5. RESPONSIBLE ORGANIZATION: Operations
6. PROBLEM DESCRIPTION: ☐ QR ☒ NQR Mixing types of light bulbs in ground detectors has caused false indications of grounded circuits.

☒ ATTACHMENTS

7. PREPARED BY: NAME T. W. White DATE: ~~11~~-08-86
8. CONCURRENCE: CEG-H [signature] DATE: [illegible]
9. APPROVAL: ECTG PROGRAM MGR. [signature] DATE: 4/7/87

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: Work Request B201214 (initiated 08-28-86) was prepared to manufacture tags to be placed at each ground detector stating, "Replace Ground Lights as a Set of 3-SYL 120V Bulbs Only" and (second tag), "Verify All Ground Lights Good Prior to Searching For Grounds on Equipment."

CAP was received from report review, this CATD was issued after the fact for completeness

☐ ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: S53 860905 883 DATE: 09/10/86
12. CONCURRENCE: CEG-H: [signature] DATE: 10/14/86
SRP: DATE:
DATE:
DATE:
DATE:
ECTG PROGRAM MGR: [signature] for DATE: 9/11/87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

* ______ SIGNATURE ______ TITLE ______ DATE

2048T During close out verify that POTC has updated NOTP lesson plan to mention the bulb types as a possible erroneous indication [illegible]

Element 302.01

WBN	SQN	BFN	BLN
R. Sutt	B. Meers R. Sutt	D. Thompson	Jones

Element 302.02

WBN	SQN	BFN	BLN
B. Meers	B. Meers	B. Meers	B. Meers

Element 302.03

WBN	SQN	BFN	BLN
NA	B. Meers	NA	NA

Element 302.04

WBN	SQN	BFN	BLN
B. Meers	B. Meers	NA	NA

Element 302.05

WBN	SQN	BFN	BLN
NA	B. Meers R. Gunnels	NA	NA

Element 302.06

WBN	SQN	BFN	BLN
B. Meers R. Gunnels	B. Meers	NA	NA