COMANCHE PEAK
STEAM ELECTRIC STATION

UNIT 1 and COMMON

CORRECTIVE ACTION PROGRAM

PROJECT STATUS REPORT

INSTRUMENTATION AND CONTROLS

TU ELECTRIC

Generating Division

Revision 0

TU ELECTRIC
COMANCHE PEAK STEAM ELECTRIC STATION
UNIT 1 AND COMMON

STONE & WEBSTER ENGINEERING CORPORATION

PROJECT STATUS REPORT

INSTRUMENTATION AND CONTROLS

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EXECUTIVE SUMMARY

This Project Status Report (PSR) summarizes the systematic validation process implemented by Stone & Webster Engineering Corporation (SWEC) for safety-related instrumentation and controls at Comanche Peak Steam Electric Station (CPSES) Unit 1 and Common[1]. This Project Status Report (PSR) presents the results of the design validation and describes the Post Construction Hardware Validation Program (PCHVP). SWEC's activities were governed by the TU Electric Corrective Action Program (CAP) which required SWEC to:

1. Establish a consistent set of CPSES safety-related instrumentation and controls design criteria that comply with the CPSES licensing commitments.

2. Produce a set of design control procedures that assures compliance with the design criteria.

3. Evaluate safety-related instrumentation and controls, and direct the corrective actions recommended by the Comanche Peak Response Team (CPRT) and those determined by the Corrective Action Program (CAP) investigations to be necessary to demonstrate that safety-related instrumentation and controls are in conformance with the design criteria.

4. Assure that the validation resolves the safety-related instrumentation and controls related design issues identified by the Comanche Peak Response Team (CPRT), external sources[2] and the Corrective Action Program (CAP).

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[1]Common refers to areas in CPSES that contain both Unit 1 and Unit 2 systems, structures and components

[2]External source issues are identified by the following:

- NRC Staff Special Review Team (SRT-NRC)
- NRC Staff Special Inspection Team (SIT)
- NRC Staff Construction Appraisal Team (CAT)
- Citizens Association for Sound Energy (CASE)
- Atomic Safety and Licensing Board (ASLB)
- NRC Region IV Inspection Reports
- NRC Staff Technical Review Team (TRT) [SSERs 7-11]
- CYGNA Independent Assessment Program (IAP)

Comanche Peak Response Team (CPRT) issues are identified by the following:

- Design Adequacy Program (DAP)
- Quality of Construction (QOC) Program

5. Validate that the safety-related instrumentation and controls are in conformance with the licensing commitments and that the installed hardware is in conformance with the validated design.

6. Produce a set of consistent and validated design documentation.

A consistent set of design criteria for CPSES Unit 1 and Common safety-related instrumentation and controls has been developed and used by SWEC for the design validation process. This set of design criteria is in conformance with the CPSES licensing commitments. It has been independently overviewed by the Comanche Peak Response Team (CPRT). CYGNA Energy Services (CYGNA) independently reviewed the design criteria for safety-related instrumentation and controls for those issues identified during the Independent Assessment Program (IAP).

SWEC established design control procedures to govern the work flow and technical interfaces with other disciplines for both the design and hardware validation processes. These procedures specify the processes (such as the validation of design inputs, documentation control, and final reconciliation) that have been implemented throughout the instrumentation and controls portion of the Corrective Action Program (CAP).

SWEC has performed analyses and reviewed design documentation to validate the design of CPSES Unit 1 and Common safety-related instrumentation and controls. The as-built conditions for safety-related instrumentation and controls are being validated to the design by the Post Construction Hardware Validation Program (PCHVP).

The Post Construction Hardware Validation Program (PCHVP) assures that the safety-related instrumentation and controls are installed in conformance with the validated design. SWEC has reviewed, revised and validated the CPSES installation specifications and reviewed the revised construction procedures and Quality Control (QC) inspection procedures for consistency with the validated design and hardware requirements of the Corrective Action Program (CAP). The Post Construction Hardware Validation Program (PCHVP) for safety-related instrumentation and controls, including inspections, engineering walkdowns and evaluations, implements the corrective actions recommended by the Comanche Peak Response Team (CPRT), as well as those required by Corrective Action Program (CAP) investigations.

SWEC will provide TU Electric a complete set of validated design documentation for CPSES safety-related instrumentation and controls, including calculations, drawings, specifications and design changes. This documentation can provide the basis for CPSES configuration control[3] to facilitate maintenance and operation throughout the life of the plant.

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[3]Configuration control is a system to assure that the design and hardware remain in compliance with the licensing commitments throughout the life of the plant.

In-depth quality and technical audits have been performed by SWEC Quality Assurance (QA), TU Electric Quality Assurance (QA) and the independent Engineering Functional Evaluation (EFE). These audits assure that SWEC procedures, design criteria and design comply with the licensing commitments. The SWEC Quality Assurance (QA) audits verify that the implementation of the Corrective Action Program (CAP) is in conformance with the applicable 10CFR50, Appendix B requirements.

The CPSES Unit 1 and Common instrumentation and controls portion of the Corrective Action Program (CAP) validates that:

- The design of safety-related instrumentation and controls complies with the CPSES licensing commitments.
- The as-built conditions of instrumentation and controls comply with the validated design.
- The safety-related instrumentation and controls comply with the CPSES licensing commitments and will perform their safety-related functions.

INSTRUMENTATION AND CONTROLS
ABBREVIATIONS AND ACRONYMS

AC	Alternating Current
ANI	Authorized Nuclear Inspector
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASLB	Atomic Safety and Licensing Board
CAP	Corrective Action Program (TU Electric)
CAR	Corrective Action Request
CASE	Citizens Association for Sound Energy
CAT	Construction Appraisal Team (NRC)
CFR	Code of Federal Regulations
CPE	Comanche Peak Engineering
CPRT	Comanche Peak Response Team
CPSES	Comanche Peak Steam Electric Station
CYGNA	CYGNA Energy Services
DAP	Design Adequacy Program
DBCP	Design Basis Consolidation Program
DBD	Design Basis Document
DC	Direct Current
DIR	Discrepancy Issue Report (CPRT)
DR	Deficiency Report
DVP	Design Validation Package
EA	Engineering Assurance (SWEC)
Ebasco	Ebasco Services Incorporated
EFE	Engineering Functional Evaluation
FSAR	Final Safety Analysis Report
FVM	Field Verification Method
GIR	Generic Issue Report
HVAC	Heating, Ventilation and Air Conditioning
IAP	Independent Assessment Program (CYGNA)
ICD	Instrumentation and Control Diagram
IE	Inspection and Enforcement (NRC)
kV	kilo Volt
Impell	Impell Corporation
IRR	Issue Resolution Report
ISAP	Issue Specific Action Plan
JTG	Joint Test Group (CPSES)
NCR	Nonconformance Report
NRC	United States Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
NUREG	NRC Document
PCHVP	Post Construction Hardware Validation Program
OSP	Office of Special Projects (NRC)

INSTRUMENTATION AND CONTROLS
ABBREVIATIONS AND ACRONYMS
(cont'd)

QA	Quality Assurance
QAAD	Quality Assurance Auditing Division (SWEC)
QC	Quality Control
QOC	Quality of Construction and QA/QC Adequacy Program (CPRT)
RIL	Review Issues List (CYGNA/IAP)
SDAR	Significant Deficiency Analysis Report (TU Electric)
SER	Safety Evaluation Report (NRC, NUREG-0797)
SET	Special Evaluation Team
SIT	Special Inspection Team (NRC)
SRT	Senior Review Team (CPRT)
SRT-NRC	Special Review Team (NRC)
SSER	Supplemental Safety Evaluation Report (NRC, NUREG-0797)
SWEC	Stone & Webster Engineering Corporation
SWEC-PSAS	Stone & Webster Engineering Corporation - Pipe Stress and Support Project
TAP	Technical Audit Program (TU Electric)
TDR	Test Deficiency Report
TERA	Tenera, L.P.
TRT	Technical Review Team (NRC)
V	Volt

1.0 INTRODUCTION

In October 1984, TU Electric established the Comanche Peak Response Team (CPRT) to evaluate issues that have been raised at CPSES, and to prepare a plan for resolving those issues. The Comanche Peak Response Team (CPRT) program plan was developed and submitted to the NRC.

In mid-1986, TU Electric performed a qualitative and quantitative review of the preliminary results of the Comanche Peak Response Team (CPRT). This review identified that the Comanche Peak Response Team (CPRT) issues were broad in scope and included each discipline. TU Electric decided that the appropriate method to correct the issues raised and to identify and correct any other issues that potentially existed at CPSES would be through one integrated program rather than a separate program for each issue. TU Electric decided to initiate a comprehensive Corrective Action Program (CAP) (References 1, 2, and 3) to validate the CPSES safety-related designs[1,2]. The Corrective Action Program (CAP) has the following objectives:

- Demonstrate that the design of safety-related systems, structures and components complies with licensing commitments.
- Demonstrate that the existing systems, structures, and components are in compliance with the design; or develop modifications which will bring systems, structures and components into compliance with design.
- Develop procedures, an organizational plan, and documentation to maintain compliance with licensing commitments throughout the life of CPSES.

The Corrective Action Program (CAP) is thus a comprehensive program to validate both the design and the hardware at CPSES, including resolution of specific Comanche Peak Response Team (CPRT) and external issues.

TU Electric contracted and provided overall management to Stone & Webster Engineering Corporation (SWEC), Ebasco Services Incorporated (Ebasco), and Impell Corporation (Impell) to implement the Corrective Action Program (CAP), and divided the CAP into eleven disciplines as follows:

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[1] Nuclear Steam Supply System (NSSS) design and vendor hardware design and their respective QA/QC programs are reviewed by the NRC independently of CPSES, as noted in SSER 13, and are not included in the Corrective Action Program (CAP); however, the design interface is validated by the CAP.

[2] Portions of selected non-safety-related systems, structures and components are included in the Corrective Action Program (CAP). These are Seismic Category II (Reference 4) systems, structures and components, and fire protection systems.

Discipline	Responsible Contractor
Mechanical	SWEC
-Systems Interaction	Ebasco
-Fire Protection	Impell
Civil/Structural	SWEC
Electrical	SWEC
Instrumentation & Controls	SWEC
Large Bore Piping and Pipe Supports	SWEC-PSAS
Cable Tray and Cable Tray Hangers	Ebasco/Impell
Conduit Supports Trains A,B & C >2"	Ebasco
Conduit Supports Train C $\leq$ 2"	Impell
Small Bore Piping and Pipe Supports	SWEC-PSAS
Heating, Ventilation and Air Conditioning (HVAC)	Ebasco
Equipment Qualification	Impell

A Design Basis Consolidation Program (DBCP) Plan (Reference 5) was developed to define the methodology for SWEC performance of the design and hardware validation. The approach of this Design Basis Consolidation Program (DBCP) is consistent with other contractors' efforts and products.

The design validation portion of the Corrective Action Program (CAP) identified the design-related licensing commitments. The design criteria were established from the licensing commitments and consolidated in the Design Basis Documents (DBDs). The DBDs identify the design criteria for the design validation effort. If the existing design did not satisfy the design criteria, it was modified to satisfy the design criteria. The design validation efforts for each of the eleven Corrective Action Program (CAP) disciplines are documented in Design Validation Packages (DVPs). The Design Validation Packages (DVPs) provide documented assurance (e.g., calculations and drawings) that the validated design meets licensing commitments, including resolution of all related Comanche Peak Response Team (CPRT) and external issues.

The design validation effort resulted in issuance of a new instrumentation installation specification to reflect the validated design requirements. The instrumentation installation specification contains the inspection requirements necessary to assure that the as-built hardware complies with the validated design.

The hardware validation portion of the Corrective Action Program (CAP) is implemented by the Post Construction Hardware Validation Program (PCHVP) which demonstrates that existing safety-related systems, structures and components are in compliance with the instrumentation installation specification and design drawings (validated design), including the modifications that are necessary to bring the hardware into compliance with the validated design.

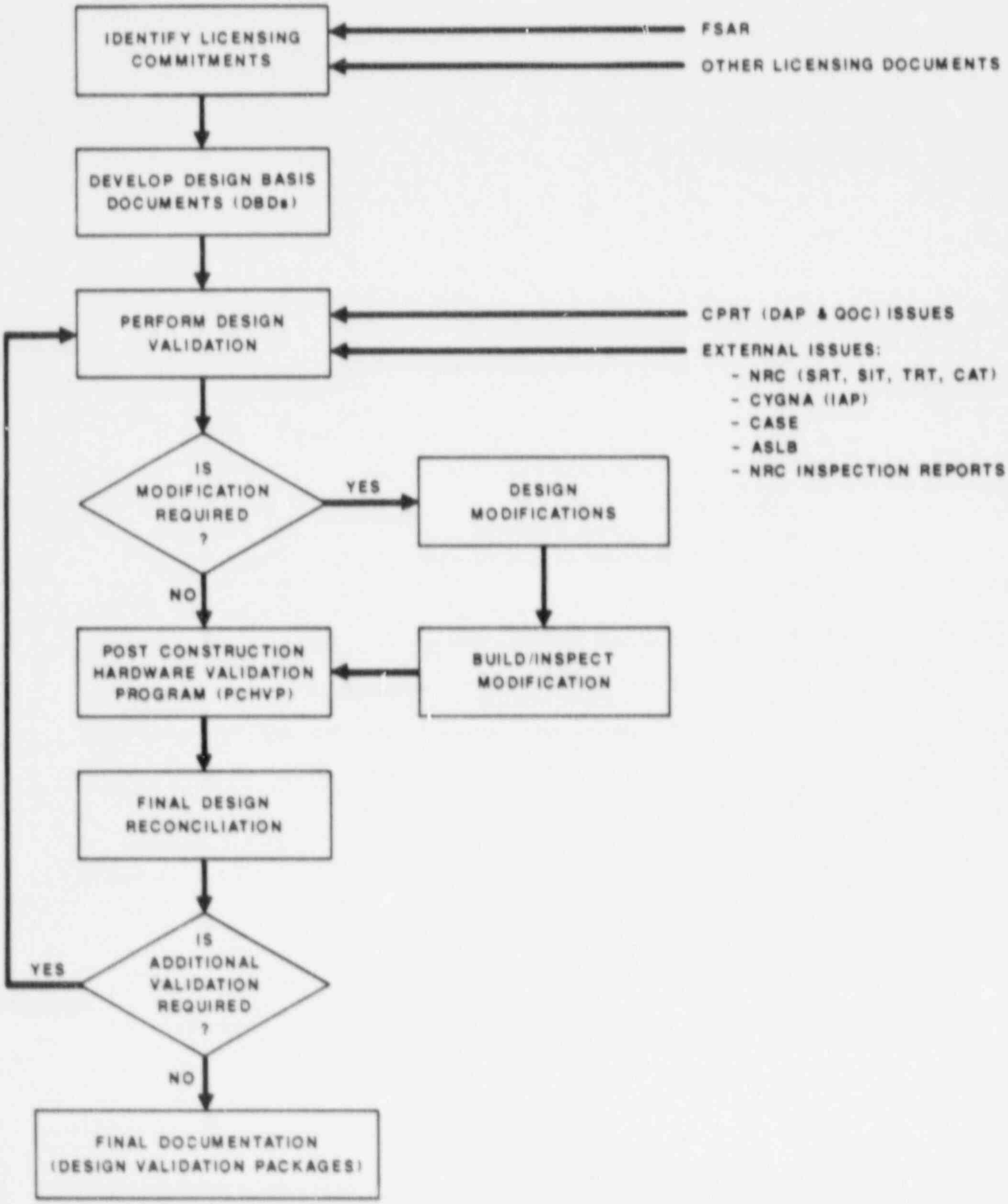
The results of the performance of the Corrective Action Program (CAP) for each discipline are described in a Project Status Report (PSR). This Project Status Report (PSR) describes the results for the instrumentation and controls portion of the Corrective Action Program (CAP).

SWEC has performed a comprehensive design validation of safety-related instrumentation and controls for CPSES Unit 1 and Common in order to demonstrate that the design of safety-related instrumentation and controls complies with licensing commitments. SWEC is performing the Post Construction Hardware Validation Program (PCHVP) to demonstrate that the as-built safety-related instrumentation and controls comply with the validated design. The validation process is conducted in accordance with the Design Basis Consolidation Program (DBCP) which controls implementation of the SWEC portion of the TU Electric Corrective Action Program (CAP), shown schematically in Figure 1-1. The design bases for the safety-related instrumentation and controls are contained within a consolidated set of CPSES Design Basis Documents (DBDs).

The methodologies used in implementing both the design and hardware-related validations for CPSES Unit 1 and Common safety-related instrumentation and controls and the results of the validation effort are presented in this Project Status Report (PSR).

This instrumentation and controls Project Status Report (PSR) describes the validation effort from the early stages of design criteria development through the implementation of the Post Construction Hardware Validation Program (PCHVP). This report addresses the development of the instrumentation installation specification; updating of construction procedures and Quality Control (QC) inspection procedures; the development of the Post Construction Hardware Validation Program (PCHVP) used to validate the as-built safety-related instrumentation and controls to the validated design; and the completion of the CPSES Unit 1 and Common Design Validation Packages (DVPs).

FIGURE 1-1
CORRECTIVE ACTION PROGRAM (CAP) INSTRUMENTATION & CONTROLS



2.0 PURPOSE

The purpose of this Project Status Report (PSR) is to demonstrate that the safety-related instrumentation and controls of CPSES Unit 1 and Common are in conformance with the CPSES licensing commitments, satisfy the design criteria, and that the instrumentation and controls will satisfactorily perform their safety-related functions.

3.0 SCOPE

The scope of the instrumentation and controls portion of the Corrective Action Program (CAP) implemented for CPSES Unit 1 and Common included the validation of the safety-related[1] instrumentation and controls for the following systems:

- Containment Spray
- Auxiliary Feedwater
- Component Cooling Water
- Service Water
- Safety Chilled Water
- Reactor Vessel Head Vent
- Containment Isolation
- Combustible Gas Control
- Radiation Monitoring
- Emergency Diesel Generator
- Diesel Generator Fuel Oil
- Main Steam/Steam Dump
- Feedwater
- Fuel Pool Cooling and Purification
- Demineralized/Reactor Water Makeup
- Primary Sampling
- Containment HVAC
- Containment Air Cleanup
- Safeguards Building Supply and Exhaust
- Diesel Generator Building Ventilation
- Electrical Area HVAC
- Main Steam and Feedwater Area Ventilation
- Auxiliary Building HVAC
- Fuel Handling Building Ventilation
- Control Room Air Conditioning
- Uncontrolled Access Area Ventilation
- Primary Plant Ventilation
- Service Water Intake Structure Ventilation
- Uninterruptible Power Supply Area Air Conditioning
- 6.9 kV Electrical Power System
- 480 V and 120 V Electrical Power Systems
- Uninterruptible Power Supply System
- DC System

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[1]This also includes post-accident monitoring instrumentation as discussed in CPSES FSAR Section 7.5.

Reactor Coolant[2]
Safety Injection[2]
Chemical and Volume Control[2]
Residual Heat Removal[2]
Boron Recycle[2]
Liquid Waste[2]
Gaseous Waste[2]
Reactor Trip[2]
Engineered Safety Features Actuation[3]

The instrumentation and controls portion of the CPSES Corrective Action Program (CAP) is shown schematically in Figure 1-1 and discussed below. The program required:

1. Establishment of instrumentation and controls design criteria which comply with licensing commitments.

2. Development of the instrumentation and controls Design Basis Documents (DBDs), which contain the design criteria.

3. Implementation of design and hardware validations, consisting of analysis, identification and implementation of necessary modifications, and field verifications as identified in the Post Construction Hardware Validation Program (PCHVP). The instrumentation and controls hardware as-built configuration is validated to the instrumentation and controls design by Quality Control (QC) inspections, engineering walkdowns and engineering evaluations.

4. Resolution of the design and hardware-related CPSES instrumentation and controls issues and implementation of a Corrective Action Program (CAP) for closure of these issues. These issues include external issues, Comanche Peak Response Team (CPRT) issues, and issues identified during the performance of the Corrective Action Program (CAP) (see Section 4.0).

5. Development of validated design documentation to form the basis for CPSES instrumentation and controls configuration control. The validated design documentation (calculations, design drawings, and specifications) and Design Basis Documents (DBDs) can be utilized by TU Electric to facilitate operation, maintenance, and future modifications following issuance of an operating license.

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[2]This is an NSSS designed system. SWEC instrumentation and controls has validated the design interface and is validating the as-built configuration of instrumentation and controls as part of the Post Construction Hardware Validation Program (PCHVP).

[3]This is an NSSS designed and supplied system. The instrumentation and controls portion of the Corrective Action Program (CAP) has validated the design interfaces.

Section 5.1 of this instrumentation and controls Project Status Report (PSR) describes the methodology and work performed in the instrumentation and controls portion of the Corrective Action Program (CAP).

Section 5.1.1 describes the methodology by which CPSES licensing commitments were identified, the design criteria were established, and the Design Basis Documents (DBDs) were developed.

Section 5.1.2 describes the design validation process including the basis of validating the parameters for such items as calculation reviews and interface requirements with other disciplines. The subsection also describes interfaces among participants in the Corrective Action Program (CAP) and the final reconciliation process.

Section 5.1.3 describes the Post Construction Hardware Validation Program (PCHVP) and the procedures for field validations (Quality Control inspections, engineering walkdowns, and engineering evaluations) required to be implemented to validate that the as-built instrumentation and controls are in compliance with the design documentation.

Section 5.2 presents a summary of the design validation results and the Post Construction Hardware Validation Program (PCHVP) results, including the hardware modifications resulting from the instrumentation and controls portion of the Corrective Action Program (CAP).

Section 5.3 describes the Quality Assurance (QA) Program implemented for the validation process, including SWEC Engineering Assurance (EA) audits, the Engineering Functional Evaluation (EFE) audits and TU Electric Quality Assurance (QA) audits.

Section 5.4 describes SWEC instrumentation and controls inputs to the TU Electric preventive actions, including the transfer of a complete set of validated design documentation and procedures to Comanche Peak Engineering (CPE). This set of documentation and procedures can provide the basis for CPSES configuration control throughout the life of the plant.

Appendix A of this Project Status Report (PSR) describes the details of the Corrective Action Program (CAP) resolutions of the instrumentation and controls related Comanche Peak Response Team (CPRT) and external issues.

Appendix B of this Project Status Report (PSR) describes the details of resolutions of issues identified during the instrumentation and controls portion of the Corrective Action Program (CAP). These are issues that have been determined to be reportable under the provisions of 10CFR50.55(e). These issues are identified in Significant Deficiency Analysis Reports (SDARs) initiated by TU Electric.

4.0 SPECIFIC ISSUES

The instrumentation and controls portion of the Corrective Action Program (CAP) resolved all the related Comanche Peak Response Team (CPRT) issues, external issues, and issues identified during the performance of the CAP. This section presents a listing of instrumentation and controls related issues addressed in this Project Status Report (PSR). Technical review, resolution, and corrective and preventive actions of all external and Comanche Peak Response Team (CPRT) issues are described in Appendix A. Technical review, resolution and corrective and preventive actions for all issues identified during the performance of the Corrective Action Program (CAP) are described in Appendix B. The issues contained in Appendix B are those which have been determined to be reportable under the provisions of 10CFR50.55(e).

Comanche Peak Response Team (CPRT) and external issues are listed below with issue numbers corresponding to the subappendix number in Appendix A. Issues A1 through A3 were identified in Issue Resolution Reports (IRRs), A4 and A5 were identified in the Issue Specific Action Plan (ISAP), and issues A6 through A10 were Independent Assessment Program (IAP) issues raised by CYGNA.

Issue No.	Issue Title
A1	Instrument Setpoint Calculations
A2	Electrical Separation - Inadequate Sensor/Tap Separation Requirements
A3	Support/Anchorage Design Methods and Criteria - Tube and Instrument Supports
A4	Instrumentation Equipment Installation
A5	Instrument Tube Supports
A6	Instrumentation Pressure/Temperature Ratings
A7	Flow Transmitter/Flow Indicator Mismatch
A8	Instrument Tubing Installation
A9	Specification Data Sheet/Calibration Card Mismatch
A10	Instrument Calibration Cards Disagree with Instrument Setpoint Calculations

Issues identified during the performance of the instrumentation and controls portion of the Corrective Action Program (CAP) which have been determined to be reportable under the provisions of 10CFR50.55(e) are listed below with issue numbers corresponding to the subappendix number in Appendix B which addresses the issue.

Issue No.	Issue Title
B1	SDAR CP-87-16, Limit Switch Wiring
B2	SDAR CP-87-44, Unistrut Tubing Support Bolting
B3	SDAR CP-87-54, Class 1E MOV Motor Starters

Issue No.	Issue Title
B4	SDAR CP-87-104, Safety System Setpoint Calculation Errors
B5	SDAR CP-87-128, Loss of Control Power Indication
B6	SDAR CP-87-135, Control Room Air Conditioning and Primary Plant Ventilation System
B7	SDAR CP-88-05, Auxiliary Feedwater System Instrumentation Electrical Separation
B8	SDAR CP-88-13, Auxiliary Feedwater System Air Accumulators
B9	SDAR CP-88-18, Post Accident Monitoring Instrumentation
B10	SDAR CP-88-21, Instrument Tubing Clamps
B11	SDAR CP-88-20, High Energy Line Break (HELB) Detection and Mitigation
B12	SDAR CP-88-19, Cable Insulation Resistance - Loop Accuracy
B13	SDAR-CP-88-25, Auxiliary Feedwater Pump Turbine Control Panel

5.0 CORRECTIVE ACTION PROGRAM (CAP) METHODOLOGY AND RESULTS

5.1 METHODOLOGY AND WORK PERFORMED

5.1.1 Licensing Commitments, Design Criteria, and Design Basis Documentation

SWEC reviewed the licensing documentation in order to identify licensing commitments related to CPSES instrumentation and controls. Documentation reviewed included the FSAR, SER, SSERs, NRC Regulatory Guides, IE Bulletins, and TU Electric/NRC licensing correspondence.

SWEC then established the design criteria based on the identified licensing commitments. The design criteria, which assure compliance with the licensing commitments, were consolidated and documented in Design Basis Documents (DBDs). The design criteria served as the basis for the validation effort.

Instrumentation and controls Design Basis Documents (DBDs) listed in Table 5-1 include design criteria which cover the CPSES Unit 1 and Common instrumentation and controls design. Mechanical; electrical; and heating, ventilation and air conditioning (HVAC) Design Basis Documents (DBDs) (References 6 through 40) also include instrumentation and controls design criteria related to the specific mechanical; heating, ventilation and air conditioning (HVAC); and/or electrical system design. In addition, civil/structural Design Basis Documents (DBDs) (References 82, 83 and 84) include design criteria related to instrument tubing supports and instrument mountings. These Design Basis Documents (DBDs), in addition to instrumentation and controls Desgin Basis Documents (DBDs), were used in the instrumentation and controls design validation.

5.1.1.1 Verification of Design Criteria and Resolution of Issues

Technical audits have been performed to provide additional assurance that the design criteria are technically correct and embody the instrumentation and controls licensing commitments, and that all related Comanche Peak Response Team (CPRT), external, and instrumentation and controls Corrective Action Program (CAP) identified issues have been resolved. To assure that the licensing commitments related to instrumentation and controls design have been identified, and appropriate design criteria have been established, the SWEC Quality Assurance (QA) and the Comanche Peak Response Team (CPRT) conducted overviews. SWEC Quality Assurance (QA) audits were performed as described in Section 5.3. The Comanche Peak Response Team (CPRT) overview is being performed by the Engineering Functional Evaluation (EFE) and TU Electric Quality Assurance (QA) as described in Section 5.3.

TU Electric Quality Assurance (QA) Technical Audit Program (TAP) is auditing the Corrective Action Program (CAP) to assure that the design criteria are reconciled with the licensing commitments. In addition, CYGNA Energy Services (CYGNA) is reviewing SWEC's resolutions of instrumentation and controls issues (Issue Numbers A6 through A10, as identified in Section 4.0) that were identified by the CYGNA Independent Assessment Program (IAP).

SWEC's resolutions of the Comanche Peak Response Team (CPRT) and external issues are described in Appendix A of this Project Status Report (PSR).

SWEC's resolutions of issues identified during the performance of the instrumentation and controls portion of the Corrective Action Program (CAP) are described in Appendix B of this Project Status Report (PSR).

5.1.2 Design Validation Process

The CPSES Unit 1 and Common instrumentation and controls design was validated by comparison of the design documentation (calculations, drawings and specifications) to the criteria embodied in the Design Basis Documents (DBDs). Where the existing design did not satisfy the design criteria, it was modified to satisfy the design criteria.

The instrumentation and controls portion of the Corrective Action Program (CAP) validation process was performed in accordance with comprehensive design control procedures. The key design control procedures implementing the instrumentation and controls portion of the Corrective Action Program (CAP) are listed in Table 5-2. These design control procedures assure compliance with the design criteria and the resolutions of the Comanche Peak Response Team (CPRT) and external issues and issues identified during the performance of the Corrective Action Program (CAP).

Design documents were reviewed to assure that (1) they were in conformance with Design Basis Documents (DBDs), and (2) they were correct and consistent with interfacing design documents. In order to provide an efficient approach to the organization of design data, the instrumentation and controls design validation was documented in 7 instrumentation and controls Design Validation Packages (DVPs). In addition, instrumentation and controls reviewed and validated documentation in support of 18 mechanical DVPs, 7 electrical DVPs, and 3 civil/structural DVPs. Each Design Validation Package (DVP) identifies or contains the following items:

- Design Basis Documents (DBDs) which serve as the primary basis for design validation
- Design Documents (e.g., calculations, drawings and specifications)
- Other related documents (e.g., NSSS interface requirements, Significant Deficiency Analysis Reports (SDARs), and Comanche Peak Response Team (CPRT) and external issues resolution documents).

5.1.2.1 Instrumentation and Controls Validation

The design validation process of the CPSES Unit 1 and Common instrumentation and controls included the following:

- Calculations
- Drawings
- Procurement Specifications
- Instrumentation Installation Specification
- Instrumentation and Controls Components

- Control Boards and Panels

- Post-Accident Monitoring Instrumentation

- NSSS Design Interface

Calculations

The SWEC instrumentation and controls design validation is based on the review of original calculations and on SWEC calculations which validated the design. Validation of the original calculations was performed by validating correctness of one original calculation and by developing replacement calculations which superseded the other original calculations. In addition, new calculations were developed, when required to provide complete documentation of the instrumentation and controls design validation.

The review of the original calculation and the development of replacement and new calculations validated that design inputs are correct and current, and that the assumptions, methodology, and criteria used in the calculations were consistent with the design criteria established and documented in the Design Basis Documents (DBDs) (References 41 and 82 through 84). The replacement and new calculations were developed in accordance with SWEC design control Project Procedure PP-009 (Reference 42), which requires that each safety-related calculation be checked and independently reviewed to assure its accuracy.

Types of safety-related calculations which were developed included:

- Instrument setpoint calculations for process parameters such as temperature, pressure, level, and flow, based on validated mechanical setpoint calculations

- Instrument scaling calculations which determine appropriate electrical output signals corresponding to measured process parameters

- Instrument tubing wall thickness

- Air accumulator sizing for safety-related air-operated valves.

- Instrument tubing stress analysis

- Instrument tubing supports

- Instrument mountings

Results of the SWEC-developed calculations were used to develop the instrumentation installation specification, and were used in the review of tubing supports design, tubing configuration, instrument mountings, instrument calibration cards and instrumentation and controls procurement specifications.

Drawings

Instrumentation and Control Diagrams (ICDs), which show the required instrumentation and controls and their functional requirements; electrical schematic diagrams, which transpose functional requirements from the Instrumentation and Control Diagrams (ICDs) into electrical circuits; and instrumentation installation drawings, which show instrumentation installation details, tubing supports, tubing configuration and instrument mountings, were validated.

The validation of the Instrumentation and Control Diagrams (ICDs) and electrical schematic diagrams assured compliance with the design criteria as specified in the instrumentation and controls; mechanical; electrical; and heating, ventilation and air conditioning (HVAC) Design Basis Documents (DBDs) (References 6 through 40).

The validation of instrumentation installation drawings was based on the design criteria specified in the Design Basis Documents (DBDs) (References 43 and 85). The scope included review of safety-related instrumentation and non-safety-related instrumentation connected to ASME Section III Code Class 1, 2 or 3 fluid system piping, as well as air-pilot valves for safety-related air-operated valves and dampers.

The following items were considered in the validation of Instrumentation and Control Diagrams (ICDs), electrical schematic diagrams and instrumentation installation drawings:

- Nuclear safety classification
- Component identification
- Single failure criterion
- Consistency of safety-related train designation with flow and electrical diagrams
- Consistency with mechanical; electrical; and heating, ventilation and air conditioning (HVAC) system functional and operational requirements
- Automatic actuation of safety-related components upon loss-of-offsite power signal and/or accident signal
- Component and/or control circuit fail-safe mode
- System status indication in accordance with the guidance of NRC Regulatory Guide 1.47 (Reference 44)
- Separation between safety-related redundant components and between safety-related and non-safety-related components, in accordance with the guidance of NRC Regulatory Guide 1.75 (Reference 45)
- Emergency diesel generator load sequencing

- Motor overload bypass for Class 1E motor operated valve circuits, in accordance with the guidance of NRC Regulatory Guide 1.106 (Reference 46)

- Control circuit electrical protection

- Power supply requirements

- Component and system parameter monitoring

- Provisions for testing

- Use of capillary tubing and diaphragm seals

- Isolation of tubing penetrating the containment

- Compliance with tubing slope requirements

- Instrument installation in steam service

- Compliance of tubing, fitting and valve materials with ASME Section III requirements

- Piping design/operating pressures and temperatures

- Tubing ambient conditions

- Tubing wall thickness, insulation and heat tracing requirements

- Tubing and flexible metal instrument hose assemblies configuration

- Tubing support type, function and load capacity

- Instrument/tubing installation and supports bolt type, spacing and materials

- Instrument mounting configuration

- NSSS and vendor requirements

Procurement Specifications

Procurement specifications were reviewed to validate that procured instrumentation and controls components meet mechanical; electrical; and/or heating, ventilation and air conditioning (HVAC) systems functional requirements specified in the respective system Design Basis Documents (DBDs), system flow diagrams, and instrument setpoint calculations. A comprehensive review of the technical content of procurement specifications was performed to validate that instrument ranges and power supplies are correctly specified; temperature, pressure and voltage ratings meet system design requirements; materials are suitable for their applications; and instrumentation and controls comply with the design criteria as specified in the Design Basis Documents (DBDs).

In addition, procurement specifications were validated for interface consistency with other documents such as Instrumentation and Control Diagrams, (ICDs), electrical schematic diagrams, vendor manuals, and vendor drawings.

Instrumentation Installation Specification

The original installation specifications for instrumentation were reviewed and revised and a new instrumentation installation specification was developed to be consistent with the validated design, to resolve Comanche Peak Response Team (CPRT) - Quality of Construction (QOC) issues, and to identify the required inspection attributes and acceptance criteria. The new instrumentation installation specification was based on the design criteria as specified in the Design Basis Document (DBD) (Reference 43). SWEC then identified revisions to the construction procedures and the Quality Control (QC) inspection procedures to make them consistent with the instrumentation installation specification. The construction procedures and the Quality Control (QC) inspection procedures were subsequently revised and issued. After issue, they were used for construction and inspection activities. The instrumentation installation specification received interdisciplinary and interorganizational review for design interface consistency.

Instrumentation and Control Components

The vendor documentation for instrumentation and control components was reviewed to validate component compliance with the design interface requirements of the instrumentation and controls; mechanical; heating, ventilation and air conditioning (HVAC); and electrical systems. Design validation of instrumentation and control components included the following:

- Instruments and Control Components - Nuclear safety classification, temperature/pressure rating, fluid/steam/air service conditions, range, scale, electrical rating, power requirements and fail-safe position
- Air-operated valves - Nuclear safety classification, operator/valve type and size, inlet and outlet pressure, valve closure time, fail-safe position, pressure/ temperature/voltage rating, limit switch electrical rating and power requirements
- Solenoid in-line valves - Nuclear safety classification, inlet and outlet pressure, valve type and size, voltage rating, fail-safe position and power requirements
- Analog control system - Interface between input/output signals, isolation devices, separation between redundant channels, grounding, electrical shielding, power supply and testing and calibration provisions

Control Boards and Panels

The validation of control boards and panels was based on the design criteria as specified in the Design Basis Documents (DBDs) (References 47 and 48). The scope of the validation included safety-related control boards and panels containing instrumentation and controls required for CPSES Unit 1 and Common operation and monitoring during all operating conditions. The review covered safety-related portions of the following:

- Main Control Board
- Ventilation Panels
- Solid State Diesel Generator Sequencer Panel
- Auxiliary Relay Panels
- Radiation Monitoring Panels
- Seismic Instrumentation Panel
- Analog Control System Panels
- Hot Shutdown Panel
- Shutdown Transfer Panel
- Fire Detection Panel
- Motor Control Center Status Light Panel.

The validation of control boards and panels included items such as component electrical rating, power supplies, grounding, electrical shielding, component identification, nuclear safety classification, separation of redundant components and input/output signal interfaces.

Post-Accident Monitoring Instrumentation

The validation of the post-accident monitoring instrumentation was based on the design criteria as specified in the Design Basis Document (DBD) (Reference 49). The design criteria are based on systems safety functions, CPSES Emergency Response Guidelines, CPSES Optimal Recovery Guidelines, CPSES Functional Restoration Guidelines, CPSES FSAR Section 7.5, CPSES FSAR Chapter 15 and the guidance of the NRC Regulatory Guide 1.97 (Reference 50).

The validation included items such as: instrument range; unique identification of indicators in the control room; recording and trending; diversity of selected monitored variables; redundancy of selected monitored variables; power supplies; qualification requirements; provisions for periodic testing and calibration; electrical separation and independence; and display of selected monitored variables in the Emergency Operating Facility and/or the Technical Support Center.

NSSS Design Interface

Westinghouse is the NSSS supplier for CPSES. SWEC validated that the interface design criteria for the NSSS were properly applied and implemented for the CPSES Unit 1 and Common instrumentation and controls design.

The NSSS supplier provided Design Basis Documents (DBDs) for fluid systems (References 51 through 54) and interfacing documentation (References 55 through 64) which identify control functions for NSSS components and installation requirements for safety-related instrumentation. SWEC reviewed these interface requirements and validated that the interfaces were properly implemented. Westinghouse NSSS electrical schematic diagrams were compared with the corresponding CPSES Unit 1 and Common electrical schematic diagrams for consistency of nuclear safety classification, safety-related train designation, power supply requirements, functional and operational requirements, fail-safe modes and status monitoring. Consistency of the CPSES Unit 1 and Common instrumentation installation specification and drawings with the NSSS requirements was also validated.

The NSSS supplier also provided a Design Basis Document (DBD) (Reference 65) for the Reactor Trip System and Engineered Safety Features Actuation System which describes plant inputs to and automatic actuation outputs from these systems. SWEC reviewed interfacing requirements for these systems and validated that the interfaces were properly implemented in the CPSES Unit 1 and Common design documents.

The following interfaces were reviewed and validated:

- Main turbine trip interface with reactor trip
- Reactor coolant pump motor trip interface with reactor trip
- Manual reactor trip requirements
- Manual actuation requirements for Engineered Safety Features Actuation System
- Automatic actuation of safety-related components on Engineered Safety Features Actuation System signals
- Automatic signals for containment isolation
- Automatic signal for the start and load sequencing of emergency diesel generators
- Power supply requirements

5.1.2.2 Interfaces

The instrumentation and controls validation process involved internal interfaces among SWEC design disciplines, as well as external interfaces with TU Electric and other organizations involved in the Corrective Action Program (CAP). Organizational interfaces as shown in Figure 5-1 include those with other SWEC disciplines, TU Electric, SWEC-PSAS, Westinghouse, Ebasco, and Impell. Interfaces with these organizations are procedurally controlled to assure:

- Consistency of design criteria
- Completeness of the information incorporated in each Design Validation Package (DVP)
- Proper transfer of design data between interfacing organizations
- Uniform application of design control procedures
- Coordination of corrective and preventive actions

5.1.2.3 Final Reconciliation Process

The purpose of the final reconciliation process is to consolidate the design validation results, hardware modifications, preoperational test results, and inspection documentation to assure consistency of the instrumentation and controls design. The final reconciliation of instrumentation and controls design incorporates the following:

- The Post Construction Hardware Validation Program (PCHVP) results
- Resolution of the instrumentation and controls hardware related Comanche Peak Response Team (CPRT) and external issues.

Final reconciliation also includes confirmation that the interfacing organizations have accepted the instrumentation and controls results as compatible with their validated designs. Interfacing organizations are depicted on Figure 5-1.

In addition, open items, observations, and deviations related to the instrumentation and controls portion of the Corrective Action Program (CAP) that were identified by the TU Electric Quality Assurance (QA) Technical Audit Program (TAP) and Engineering Functional Evaluation (EFE) are resolved prior to the completion of the final reconciliation. Open items from TU Electric Significant Deficiency Analysis Reports (SDARs) (10CFR50.55(e)) are also resolved during the final reconciliation. At the conclusion of final reconciliation, the CPSES Unit 1 and Common Design Validation Packages (DVPs) are compiled.

5.1.3 Post Construction Hardware Validation Program (PCHVP)

The Post Construction Hardware Validation Program (PCHVP) (Reference 66) is the portion of TU Electric's Corrective Action Program (CAP) which validates the final acceptance attributes for safety-related hardware. The Post Construction Hardware Validation Program (PCHVP) process is shown diagrammatically in Figure 5-2.

The input to the Post Construction Hardware Validation Program (PCHVP) is contained in the installation specifications. The installation specifications implement the licensing commitments and design criteria of the Design

Basis Documents (DBDs), which were developed during the Corrective Action Program (CAP) design validation process.

Final acceptance inspection requirements identified in the validated installation specifications were used to develop the Post Construction Hardware Validation Program (PCHVP) attribute matrix. This matrix is a complete set of final acceptance attributes identified for installed hardware. The Post Construction Hardware Validation Program (PCHVP), by either physical validations or through an engineering evaluation methodology, assures that each of the attributes defined in the attribute matrix is validated.

Physical validation of an attribute is performed by Quality Control (QC) inspection or engineering walkdown, for accessible components. Quality Control (QC) inspections and engineering walkdowns are controlled by appropriate Field Verification Method (FVM) procedures.

The Post Construction Hardware Validation Program (PCHVP) engineering evaluation depicted in Figure 5-2, is procedurally controlled to guide the Corrective Action Program (CAP) responsible engineer through the evaluation of each item on the attribute matrix to be dispositioned by the engineering evaluation method. Dispositions of each attribute will be clearly documented. If the technical disposition of the final acceptance attribute is "not acceptable" or the attribute cannot be dispositioned based on available information, an alternate plan consisting of additional evaluations, testing, inspections/walkdowns or modifications, as necessary, will be developed to demonstrate and document the acceptability of the attribute.

Recommendations from the Comanche Peak Response Team (CPRT) effort comprise a significant portion of the evaluation. A major component of the Comanche Peak Response Team (CPRT) program has been the inspection of a comprehensive, random sample of existing hardware using an independently derived set of inspection attributes. The inspection was performed and the results were evaluated by Third Party personnel in accordance with Appendix E to the Comanche Peak Response Team (CPRT) Program Plan (Reference 67). The scope of the inspection covered the installed safety-related hardware by segregating the hardware into homogeneous populations (by virtue of the work activities which produced the finished product). Samples of these populations were inspected to provide reasonable assurance of hardware acceptability in accordance with Appendix D to the Comanche Peak Response Team (CPRT) Program Plan.

Corrective action recommendations were made to TU Electric based on the evaluated findings when a Construction Deficiency existed, an Adverse Trend existed, or an Unclassified Trend existed, as defined in accordance with Appendix E to the Comanche Peak Response Team (CPRT) Program Plan.

The Post Construction Hardware Validation Program (PCHVP) assures that all related Comanche Peak Response Team (CPRT) recommendations are properly dispositioned.

Figure 5-2 illustrates that during the evaluation of a given attribute from the Post Construction Hardware Validation Program (PCHVP) attribute matrix, the initial task of the Corrective Action Program (CAP) responsible engineer is to determine if any of the following statements are true:

a. The attribute was recommended for reinspection by the Comanche Peak Response Team (CPRT)

b. Design validation resulted in a change to design or to a hardware final acceptance attribute that is more stringent than the original acceptance attribute or the Comanche Peak Response Team (CPRT) did not inspect the attribute

c. Design validation resulted in new work, including modification to existing hardware

If the Comanche Peak Response Team (CPRT) had no recommendations and Items b. or c. above do not apply, the attribute under consideration is accepted. This conclusion is justified by the comprehensive coverage of the Comanche Peak Response Team (CPRT) reinspection and the consistently conservative evaluation of each finding from both a statistical and adverse trend perspective. The attribute matrix is then updated to indicate that neither the engineering walkdown nor Quality Control (QC) inspection of the attribute is necessary. A completed evaluation package is prepared and forwarded to the Comanche Peak Engineering (CPE) organization for concurrence. The evaluation package becomes part of the Design Validation Package (DVP) after Comanche Peak Engineering (CPE) concurrence is obtained.

If any of the three statements above is true, it is assumed that the final acceptance attribute must be further evaluated as follows:

Determine Attribute Accessibility

The Corrective Action Program (CAP) responsible engineer determines if the attribute is accessible. If the attribute is accessible, a field validation of the item's acceptability is performed and documented in accordance with an approved Field Verification Method (FVM).

If the Corrective Action Program (CAP) responsible engineer reaches the conclusion that the attribute is inaccessible, an engineering evaluation is conducted by technical disposition of available information.

After completing the attribute accessibility review, the Corrective Action Program (CAP) responsible engineer updates the attribute matrix, as necessary, to reflect the results of that review.

Technical Disposition

The Corrective Action Program (CAP) responsible engineer identifies the data to be considered during the subsequent technical disposition process. Examples of such items used in this disposition may include, but are not limited to:

- Historical documents (e.g., specifications, procedures and inspection results)
- Comanche Peak Response Team (CPRT) and external issues
- Construction practices
- Quality records

- Test results
- Audit reports
- Authorized Nuclear Inspector (ANI) records
- Surveillance reports
- NCRs, DRs, SDARs and CARs
- Inspections conducted to date
- Results of Third Party reviews
- Purchasing documents
- Construction packages
- Hardware receipt inspections

After compiling the data identified as pertinent to the attribute, the technical disposition is performed. The actual steps and sequence of actions required for each technical disposition differs; however, the tangible results from each technical disposition are consistent. These results include as a minimum:

- A written description of the attribute;

- A written justification by the Corrective Action Program (CAP) responsible engineer for acceptance of the attribute;

- A written explanation of the logic utilized to conclude that the attribute need not be field validated;

- A chronology demonstrating that the attribute has not been significantly altered by redesign;

- All documents viewed to support the disposition;

- Concurrence of the acceptance of the attribute's validity by Comanche Peak Engineering (CPE).

If the Corrective Action Program (CAP) responsible engineer concludes that the data evaluated represent evidence of the attribute's acceptability, the conclusion is documented. The documentation is reviewed and approved by Comanche Peak Engineering (CPE) and filed in the Design Validation Package (DVP). If the Corrective Action Program (CAP) responsible engineer determines that the data reviewed do not provide evidence of the attribute's acceptability, the documentation explains why the attribute cannot be accepted and recommends an alternate course of action. The alternate course of action may take various forms such as making the attribute accessible and inspecting it, or testing to support the attribute's acceptability. This alternate plan, after approval by Comanche Peak Engineering (CPE), is implemented to validate the attribute.

In summary, the Post Construction Hardware Validation Program (PCHVP) is a comprehensive process by which each attribute in the PCHVP attribute matrix is validated to the validated design. The TU Electric Quality Assurance (QA) Technical Audit Program (TAP) will audit the Post Construction Hardware Validation Program (PCHVP). This audit program is complemented by the Engineering Functional Evaluation (EFE) being performed by an independent team comprised of Stone & Webster, Impell and Ebasco engineering personnel working under the Stone & Webster Quality Assurance (QA) Program and subject to oversight directed by the Comanche Peak Response Team's (CPRT) Senior Review Team (SRT). The Post Construction Hardware Validation Program (PCHVP) will provide reasonable assurance that the validated design has been implemented for safety-related hardware.

SWEC prepared Post Construction Hardware Validation Program (PCHVP) implementation procedures (References 68 through 73) for the instrumentation and controls portion of the Corrective Action Program (CAP). The hardware validation process includes modifications, whenever necessary, to bring the instrumentation and controls related hardware into compliance with the validated design. The attributes contained within the Post Construction Hardware Validation Program (PCHVP) attribute matrix for instrumentation and controls related hardware incorporate the Comanche Peak Response Team (CPRT) - Quality of Construction (QOC) recommended corrective actions. A summary of instrumentation and controls final acceptance attributes is presented in Table 5-3. The specific acceptance attributes are contained in the Commodity Attribute Matrix (Reference 86).

5.2 RESULTS

5.2.1 Design Validation Results

The validation of the CPSES Unit 1 and Common instrumentation and controls design has been completed as described in this Project Status Report (PSR). This effort included:

- Review of 200 original calculations[1]
- Review of more than 1500 design drawings
- Review of 27 procurement specifications
- Review of 3 installation specifications
- Development of 171 replacement and new calculations[1]
- Development of a new instrumentation installation specification
- Resolution of 138 Tenera, L. P. (TERA) Discrepancy Issue Reports (DIRs)

The instrumentation and controls validation developed the following hardware modifications which are being implemented:

- Addition of 94 monitoring lights to meet surveillance requirements for control circuit power supply monitoring.
- Modification of 4 control circuits to improve their reliability.
- Addition of 6 valve position switches to the existing auxiliary feedwater system for status indication in accordance with the guidance of NRC Regulatory Guide 1.47 (Reference 44).
- Addition of an isolation device to separate a non-safety-related instrument from a safety-related power supply in accordance with the guidance of NRC Regulatory Guide 1.75 (Reference 45).
- Addition of sleeves and gaskets to flanged connections of 4 instruments to prevent corrosion.
- Addition of 2 flow measuring instruments to provide automatic start of the auxiliary building equipment room exhaust backup fan.
- Relocation of 8 differential pressure indicating switches to a location downstream of the dampers to automatically start backup battery room fans.

[1] Includes calculations reviewed and preparation of the replacement and new calculations to support the mechanical systems review.

- Addition of 4 temperature indicating recorders in the control room, in accordance with the guidance of NRC Regulatory Guide 1.97 (Reference 50).

- Addition of a pressure transmitter and an indicating recorder in the control room, in accordance with the guidance of NRC Regulatory Guide 1.97 (Reference 50).

- Capacity increase of eight air accumulators for eight air operated control valves in the auxiliary feedwater system to provide sufficient air supply.

- Replacement of face plates for a total of eight control switches on the Hot Shutdown Panel and Shutdown Transfer Panel for clarity purposes.

- Modification of a detection circuit by separating it into two detection circuits each connected to a separate power supply to meet the requirements for high energy line break in the auxiliary steam system.

- Addition of a pressure switch and an alarm circuit to meet the requirements for high energy line break in the chemical and volume control system.

- Modification of two control and related power circuits to assure initiation and proper functioning of the emergency recirculation mode of the control room air conditioning system.

- Modification of two types of standard instrument tube supports to meet the design criteria.

- Modification of two control circuits and addition of two alarm circuits to meet the requirements for motor-operated valve controls and alarms of the Design Basis Document (DBD) (Reference 88).

- Addition of 41 cables to provide inputs from the existing instrument circuits to the Emergency Response Facility computer to meet the post accident monitoring requirements of the Design Basis Document (DBD) (Reference 49).

- Modification of a control circuit to disconnect the auxiliary feedwater pump turbine manual speed control station on safety injection signal.

- Modification of four control circuits for drain valves in the main steam line penetrations to assure positive valve position indication.

5.2.2 Post Construction Hardware Validation Program (PCHVP) Results

The Post Construction Hardware Validation Program (PCHVP) is being implemented through the validation of final acceptance attributes for instrumentation and controls for CPSES Unit 1 and Common as discussed in Section 5.1.3

5.3 QUALITY ASSURANCE (QA) PROGRAM

All SWEC activities of the CPSES Unit 1 and Common instrumentation and controls portion of the Corrective Action Program (CAP) were performed in accordance with SWEC's Quality Assurance (QA) Program. This program implements applicable requirements of SWEC's Topical Report SWSQAP 1-74A (Reference 74), "Stone & Webster Standard Nuclear Quality Assurance Program", which has been approved by the NRC.

In accordance with the SWEC Quality Assurance (QA) Program a project-specific QA Program[1], covering the essentials of the SWEC Corrective Action Program (CAP) was developed, including detailed procedures (Reference 75). These procedures were distributed to all supervisory engineers and were readily available to instrumentation and controls Corrective Action Program (CAP) personnel. The issuance of design criteria, validation procedures and major revisions was followed up with detailed training programs for the applicable personnel. In particular, engineers on the project received training in the procedure for prepration, review and approval of Design Basis Documents (DBDs) (Reference 76) and in the design validation procedures for calculations, drawings/diagrams and specifications (References 77, 78, and 79).

A project Quality Assurance (QA) manager, who is directly responsible to the SWEC Vice President of QA and has management experience in auditing and QA Program procedures development for engineering activities, was assigned to the project in its earliest stages of the project. This reporting responsibility assures independence of the Quality Assurance (QA) functions. The SWEC QA manager has a staff assigned to assist him in his duties. These individuals provide assurance that the Quality Assurance (QA) Program properly addresses project activities and assist SWEC personnel to implement the QA Program properly.

To date, more than 45,000 man-hours have been expended by SWEC in activities directly attributable to the overall Project Quality Assurance (QA) Program (i.e., training, procedure development, auditing and the project QA Manager's staff).

[1]The overall SWEC Quality Assurance (QA) Program encompasses the mechanical, electrical, instrumentation & controls and civil/structural portions of the overall Corrective Action Program (CAP).

The adequacy and implementation of this Quality Assurance (QA) Program and the adequacy of the work performed under the QA Program was extensively audited by SWEC's Engineering Assurance (EA) Division[2], SWEC's Quality Assurance Auditing Division (QAAD), and TU Electric's Quality Assurance (QA) Program. A total of 17 audits of the instrumentation and controls discipline was performed by these organizations to date for CPSES Unit 1 and Common as follows:

SWEC - EA	6
SWEC - QAAD	1
TU Electric - QA	10

Collectively these audits evaluated the technical adequacy of the engineering product (e.g., Design Basis Documents (DBDs), validation activities, calculations, drawings, and specifications) and assessed the adequacy and implementation of the SWEC Quality Assurance Program. These audits have resulted in enhancements to the procedures and methods and, thus, contributed to the overall quality of the CPSES instrumentation and controls design. A summary of these audits is presented in Sections 5.3.1 and 5.3.2.

In addition to the audits described above, TU Electric has initiated the Engineering Functional Evaluation (EFE) (Reference 80). The EFE began auditing the instrumentation and controls portion of the Corrective Action Program (CAP) in June 1987. The Engineering Functional Evaluation (EFE) is an overview program which is performing an independent, in-depth technical evaluation of the Corrective Action Program (CAP) to provide additional assurance that the CAP is effectively implemented. The Engineering Functional Evaluation (EFE) is conducted under the SWEC Quality Assurance (QA) Program and is directed by a Program Manager who reports to the SWEC Chief Engineer, Engineering Assurance. The Engineering Functional Evaluation (EFE) is performed by highly qualified and experienced engineers from SWEC, Impell and Ebasco who have not been involved with previous engineering and design work at CPSES. The Engineering Functional Evaluation (EFE) is performed in a formal, preplanned and fully documented manner to provide objective evidence of completion of the planned scope of the evaluation and to provide documentation of its results and conclusions. The Engineering Functional Evaluation (EFE) is comparable in scope, level of effort and personnel qualifications to integrated, independent design inspections and verifications conducted at other nuclear plants.

The NRC - Office of Special Projects (OSP) also conducted inspections of the project in SWEC offices beginning in August 1987. The inspections involved technical evaluations of the design validation process and focused primarily on the review of calculations and Design Basis Documents (DBDs), and their compliance with licensing commitments. In addition, the NRC-OSP inspections included a review of activities performed under the Engineering Functional Evaluation (EFE).

[2]The SWEC Engineering Assurance (EA) Division is an integral part of SWEC's Corporate Quality Assurance (QA) Program (Reference 74).

Surveillance activities have been conducted by SWEC Engineering Assurance (EA) to assure conformance to procedures and standards.

The activities described above collectively represent a very detailed and complete assessment of the following:

1. Adequacy of the Quality Assurance (QA) Program.

2. Implementation of the Quality Assurance (QA) Program.

3. Technical adequacy of the design criteria and procedures.

4. Implementation of the design criteria and procedures.

These activities identify instances in which action was required to clarify or to modify procedures to define some activities more clearly; revise calculations to provide clarifying statements; or more properly address a situation and provide additional training. A complete response was developed for every item identified throughout the audit process. For each audit item identified, the cause, extent of conditions, and any required corrective/preventive actions are determined, properly documented, and implemented. Subsequent audits verify that appropriate actions are taken to address previously identified items.

In addition to the audits and surveillances, a rigorous Quality Control (QC) inspection program is in place on the CPSES site. Quality Control (QC) personnel are responsible for inspections of attributes, as delineated in the inspection procedures, prior to acceptance of any installation.

In summary, an appropriate level of attention has been given to the quality of activities; the Quality Assurance (QA) program is appropriate for the scope of work; project performance has been demonstrated to be in compliance with the (QA) program, and appropriate corrective and preventive actions were taken whenever they were required.

5.3.1 Summary of SWEC Engineering Assurance (EA) Audits

To date, SWEC Engineering Assurance (EA) has performed 6 audits of the Corrective Action Program (CAP). Audits were conducted at the Boston office and at the CPSES site. An average of seven subjects was reviewed during each of these audits. The following list of audit subjects describes the depth of auditing that has been performed:

1. Adequacy of project procedures

2. Calculations - technical adequacy and documentation

3. Nonconformance Reports (NCRs)/Test Deficiency Reports (TDRs)

4. Specification validation

5. Drawing/diagram validation

6. Calculation validation

7. Record maintenance

8. Generic Issue Reports (GIRs)

9. Discrepancy Issue Report (DIR) Resolution Reports

10. Design Basis Documents (DBDs)

11. Indoctrination and training

12. Licensing activities

13. Corrective Action Requests (CARs)

14. Personnel qualification and experience verification

15. Design modifications

A chronological tabulation of SWEC Engineering Assurance (EA) audits is presented in Table 5-4.

5.3.2 Summary of Audits by TU Electric Quality Assurance (QA) Inspections by NRC-OSP, and Audits By SWEC-QAAD

To date, TU Electric Quality Assurance (QA) has performed 10 audits of the project. A chronological tabulation of the TU Electric audits is presented in Table 5-5.

TU Electric Quality Assurance (QA) performs programmatic audits under its vendor compliance and internal audit program and technical audits under it Technical Audit Program (TAP).

The TU Electric Technical Audit Program (TAP)[3] evaluates the technical adequacy of the design activities at CPSES through audits of the development and implementation of Design Basis Documents (DBDs), calculations, drawings, specifications, and compliance to the procedures governing these technical activities.

The SWEC Quality Assurance Auditing Division (QAAD) performed one audit of SWEC. This audit was performed to assess the project Quality Assurance (QA) manager's adherence to Corporate QA Program requirements and the adequacy of the Project's QA Program, Management Plan for Project Quality, PP-001. (Reference 75).

The NRC-Office of Special Projects (OSP) conducted an inspection of the project in August 1987 and reported its results in October, 1987. These results have been evaluated and appropriate corrective action initiated.

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[3]The TU Electric Technical Audit Program (TAP) has been in effect since January 1987. Prior to January 1987, the TU Electric Quality Assurance (QA) Department performed audits of selected engineering service contractors using technical specialists as part of its vendor audit program.

5.4 CORRECTIVE AND PREVENTIVE ACTION

SWEC has developed Design Basis Documents (DBDs) and issued the instrumentation installation specification to implement the corrective actions resulting from the instrumentation and controls portion of the Corrective Action Program (CAP). These Design Basis Documents (DBDs) contain the design criteria for validating the instrumentation and controls design of CPSES Unit 1 and Common. As a result of the instrumentation and controls portion of the Corrective Action Program (CAP) design validation, the CPSES Unit 1 and Common instrumentation and controls are validated as being capable of performing their safety-related functions.

This validation is documented in the drawings, calculations and specifications which are contained in the Design Validation Packages (DVPs). This validated design documentation will be provided to TU Electric at the completion of the Corrective Action Program (CAP). The Design Basis Documents (DBDs) used for validation will also be provided to Comanche Peak Engineering (CPE). The validated design documentation and Design Basis Documents (DBDs) can provide the basis for configuration control of CPSES instrumentation and controls design and can be utilized by TU Electric to facilitate operation, maintenance and future modifications in accordance with licensing commitments following issuance of an operating license.

Interfaces between organizations have been identified and addressed in detail within project procedures. Those instrumentation and controls interfaces are discussed in Section 5.1.2.2.

Practical experience has been provided to Comanche Peak Engineering (CPE) engineers who have worked alongside SWEC engineers during the ongoing validation process. Experience gained by CPE engineers included changes in design documents, familiarization with procedures and familiarization with regulatory requirements.

TU Electric Comanche Peak Engineering (CPE) is developing a program to assure a complete and orderly transfer of the engineering and design function from SWEC to CPE. The program provides for the identification of those tasks presently being performed by SWEC which are to be transferred to Comanche Peak Engineering (CPE) and the identification of all procedures, programs, training, and staffing requirements. The program is based upon three prerequisites: (a) the Corrective Action Program (CAP) effort to support plant completion is finished for the particular task; (b) the instrumentation and controls Design Validation Packages (DVPs) are complete; and (c) any required preventive actions taken, as discussed in Appendices A and B, are complete.

FIGURE 5-1

CORRECTIVE ACTION PROGRAM (CAP) TECHNICAL INTERFACES INSTRUMENTATION & CONTROLS (I & C)

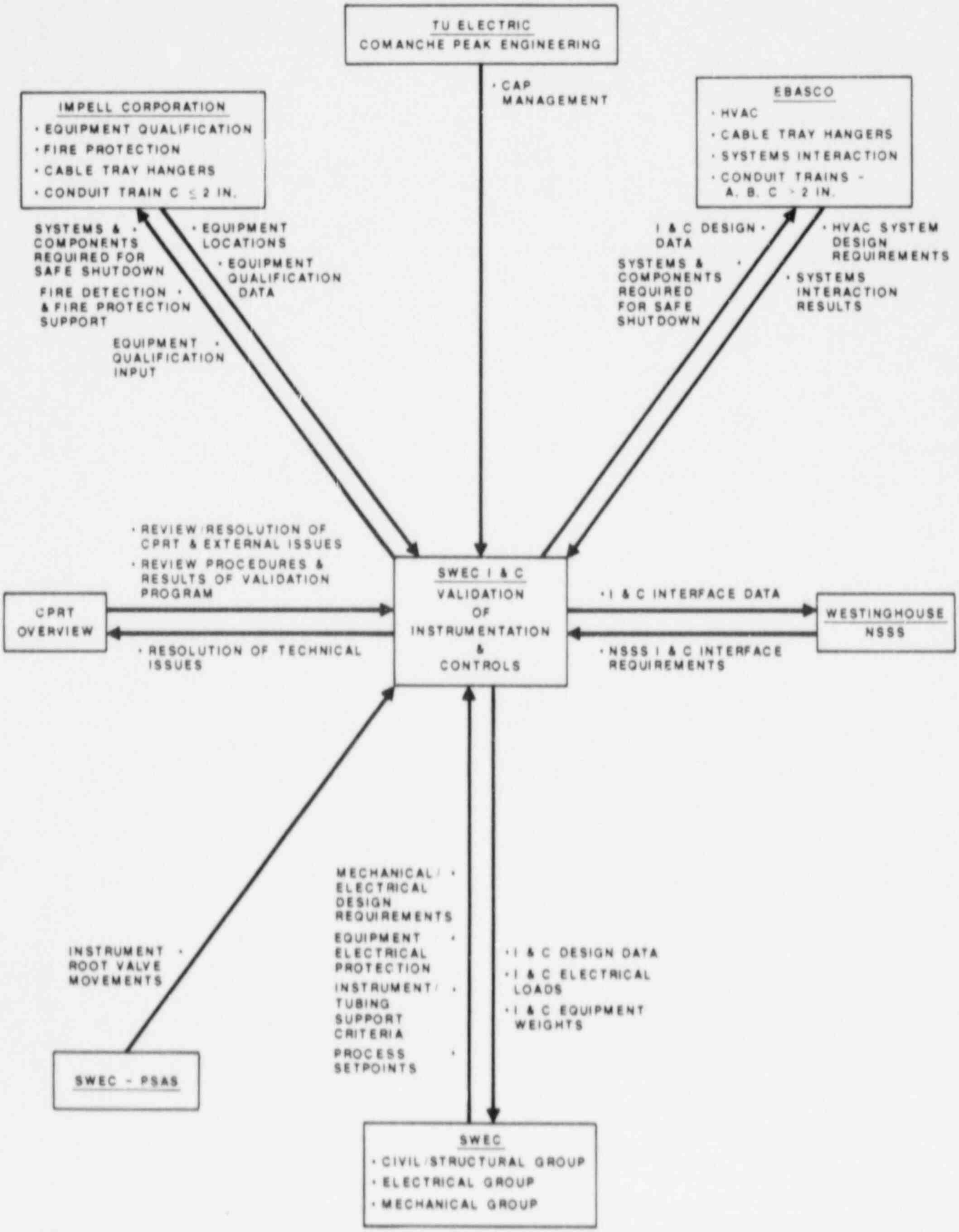

FIGURE 5-2
POST CONSTRUCTION HARDWARE VALIDATION PROGRAM (PCHVP)

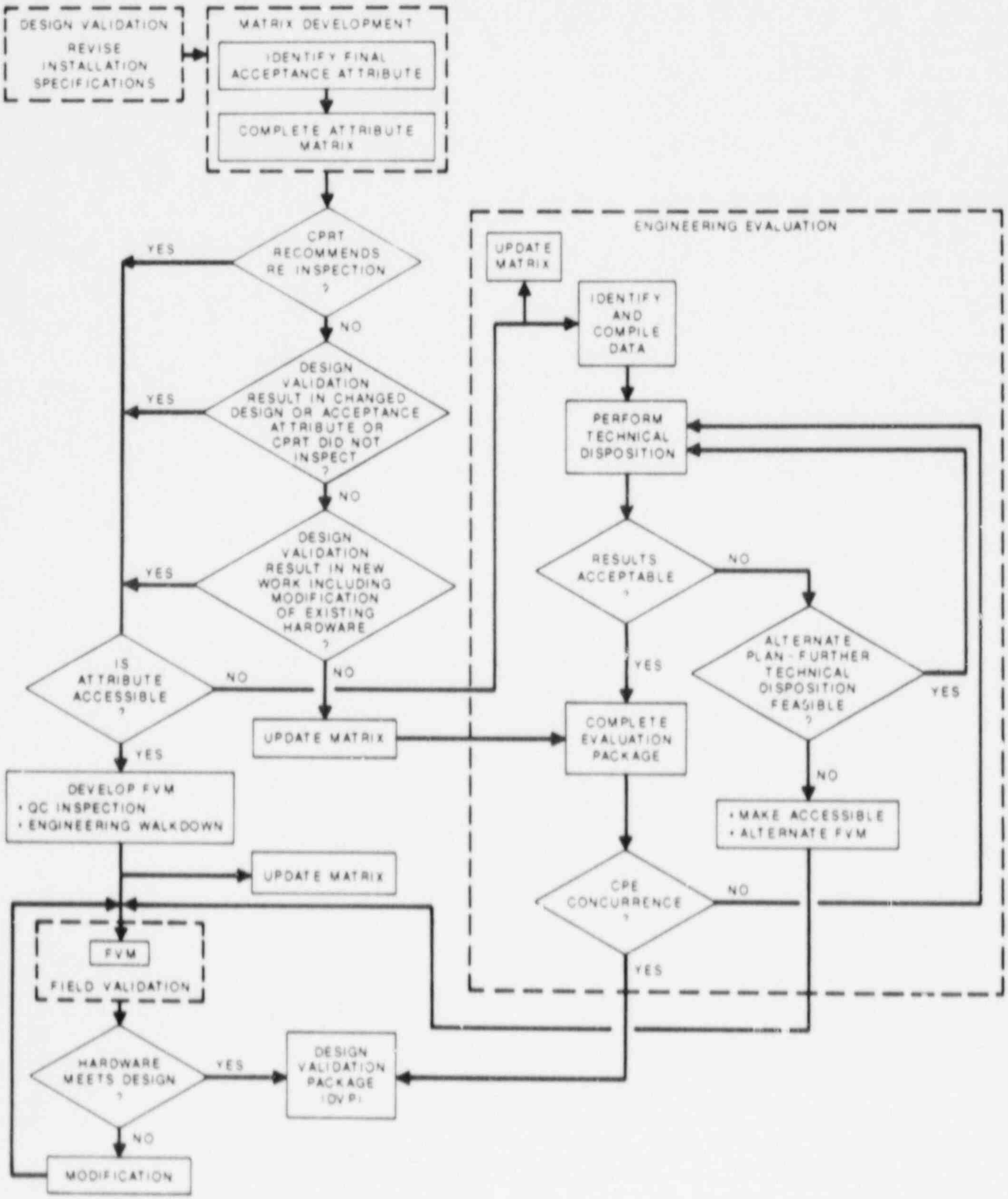

TABLE 5-1

INSTRUMENTATION AND CONTROLS
DESIGN BASIS DOCUMENTS (DBDs)

DBD No.	Title
DBD-EE-004 Revision 1	Accident Monitoring Instrumentation
DBD-EE-032 Revision 1	Analog Controls and Scaling
DBD-EE-033 Revision 1	Detailed Control Room Design
DBD-EE-035 Revision 1	Instrument Installation and Separation
DBD-EE-037 Revision 1	Balance-of-Plant (BOP)[1] Safety Related Setpoints
DBD-CS-89 Revision 1	Instrument Tubing Support Design

[1]Balance-of-Plant (BOP) consists of all systems, structures and components not designed or supplied as part of the NSSS.

TABLE 5-2

SWEC PROJECT PROCEDURES
APPLICABLE TO THE INSTRUMENTATION AND CONTROLS PORTION OF THE
CORRECTIVE ACTION PROGRAM (CAP)

Procedure No.	Title
PP-001, Revision 2	Management Plan for Project Quality
PP-003, Revision 0	Preparation, Review, and Approval of Generic Issue Reports (GIRs)
PP-006, Revision 2	Procedure for Processing Corrective Action Requests (CARs)
PP-008, Revision 2	Preparation and Approval of Task Descriptions
PP-009, Revision 3	Preparation and Control of Manual and Computerized Calculations
PP-011, Revision 1	SWEC-CAP/TU Electric Interface
PP-012, Revision 1	Westinghouse Interface
PP-014, Revision 2	SWEC-CAP/Ebasco Interface
PP-015, Revision 2	SWEC-CAP/Impell Interface
PP-019, Revision 2	Change Controls for Licensing Documents
PP-020, Revision 2	Control of Design Related Project Documents
PP-022, Revision 1	Performing Project Surveillances
PP-023, Revision 5	Processing of Design Change Authorizations (DCAs) and Change Verification Checklists (CVCs)
PP-024, Revision 1	Review of Construction, Quality Control, Start-up, and Pre-Operational Procedures
PP-026, Revision 5	Processing of Nonconformance Reports (NCRs), Conditional Release Requests, and Test Deficiency Reports (TDRs)
PP-027, Revision 0	System for Processing Items of Reportability
PP-030, Revision 1	Preparation, Review and Approval of Design Engineering Packages (DEPs)
PP-031, Revision 0	Preparation and Issuance of Design Modifications (DMs)

TABLE 5-2
(cont'd)

Procedure No.	Title
PP-032, Revision 3	Preparation, Review, and Approval of SWEC Project Drawings
PP-033, Revision 1	Review of Contractor Specifications
PP-035, Revision 0	Project Training Program
PP-036, Revision 1	Procedure for Computer-Aided Design (CAD) Drawing Conversion
PP-037, Revision 0	Definition of Design Document Classification and Marking of Design Documents
PP-041, Revision 2	Nonconformance Evaluation Procedure
PP-042, Revision 1	SWEC-CAP/PSAS Interface
PP-048, Revision 1	Maintenance of the TU Electric Calculation File
PP-049, Revision 0	Control of Engineering Sketches
PP-050, Revision 2	Preparation of Field Verification Method (FVM) Procedures
PP-053, Revision 2	Review and Approval of Vendor Documents
PP-056, Revision 3	Preparation, Approval, and Issue of Specific Technical Issue Reports (STIRs)
PP-058, Revision 1	Processing of Licensing Correspondence
PP-059, Revision 0	Procedure for Processing of Deficiency Reports (DRs)
PP-063, Revision 0	Specification Procedure and Drawing Update (SPADU) Program
PP-064, Revision 1	Preparing and Documenting Safety Evaluations on Pre-operating License Design Modifications
PP-065, Revision 0	Control of Computerized Equipment Lists
PP-066, Revision 1	Initiation of Design Modification Requests (DMRs)
PP-067, Revision 1	Resolutions of Discrepancy/Issue Resolution Reports
PP-072, Revision 0	Design Modification ALARA Review
PP-074, Revision 0	Engineering and Design Requirements for ASMEXI Repairs and Replacements/Modifications

TABLE 5-2
(cont'd)

Procedure No.	Title
PP-078, Revision 1	Procedure for Engineering Review of CPSES Equipment /Materials Storage and Maintenance Requirements
PP-200, Revision 1	CPSES Design Basis Consolidation Program Plan
PP-201, Revision 2	Preparation, Review and Approval of Design Basis Documents
PP-202, Revision 0	Design Validation Packages (DVPs)
PP-203, Revision 1	Calculation Validation Procedure
PP-204, Revision 2	Drawing/Diagram Validation Procedure
PP-205, Revision 3	Specification Validation Procedure
PP-208, Revision 0	Post Construction Hardware Validation Program Engineering Evaluations
PP-209, Revision 0	Technical Specification Validation
PP-212, Revision 1	Design Validation Related Documents
PP-214, Revision 1	Component Validation Procedure
PP-215, Revision 0	Preparation, Review, Approval, and Control of Project Status Reports
PP-219, Revision 0	Validation of Instrument Setpoints on the I&C Equipment List and Calibration Cards
PP-220, Revision 1	Commodity Attribute Matrix

TABLE 5-3

POST CONSTRUCTION HARDWARE VALIDATION PROGRAM (PCHVP)
INSTRUMENTATION AND CONTROLS

Construction Work Category	Final Acceptance Attribute	PCHVP Attribute Validation Method
Control Valves	Configuration of accessories for tornado effects	ECE 9.04-05 (Reference 81)
	Valve actuator free of pipe insulation	CPE-SWEC-FVM-EE/ME/IC/CS-089
	Limit switch configuration, conduit opening, wiring and terminal blocks identification; Model number, cover gasket and torque	CPE-SWEC-FVM-EE/ME/IC/CS-089
Instrument Analysers	Instrument identification number, model number and location; support configuration; presence of physical damage	CPE-SWEC-FVM-EE/ME/IC/CS-089 (Reference 69)
Instrument and Tubing Supports	Support type, size, location and configuration; material, presence of weep holes	CPE-SWEC-FVM-IC-069 (Reference 68)
	Support bolt size, type, material/grade, spring nut alignment, thread engagement and tightness	CPE-SWEC-FVM-EE/ME/IC/CS-086 (Reference 72)
	Support base plate Hilti Bolts spacing	CPE-SWEC-FVM-IC-069
	Support base plate weld location, profile, size, undercut, overlap, fusion, cracks, craters, arc strikes, porosity and surface slag	ECE 9.04-05
Instrument Tubing, Valves, Fittings	Separation distance between redundant instruments and tubing, adequate tubing slope, tubing bend radius, presence of the heat tracing, no kinks and dents on tubing	CPE-SWEC-FVM-IC-069

TABLE 5-3
(cont'd)

Construction Work Category	Final Acceptance Attribute	PCHVP Attribute Validation Method
Instrument Tubing, Valves, Fittings (cont'd)	Identification, configuration and presence of protective covers	CPE-SWEC-FVM-IC-069
	Location of valves for venting and draining of instrument lines	CPE-SWEC-FVM-IC-069
	Instrument root valve identification	CPE-SWEC-FVM-IC-069
	Tubing wall thickness	CPE-SWEC-FVM-EE/ME/IC/CS-086
	Instrument valve manifold mounting: bolt size, type, material/grade, thread engagement of nut, nut in full contact with mating surface, nut tightness	CPE-SWEC-FVM-EE/ME/IC/CS-086
	Presence of Teflon tape	CPE-SWEC-FVM-IC-069
	Tubing size and material; clearance from structures/components	ECE 9.04-05
	Weld location, size, profile and undercut, cracks, arc strikes, surface slag; required NDE performed; welding surface suitable for NDE; presence of seal weld; presence of nicks and gouges	ECE 9.04-05
Instrument Racks	Separation of safety and non-safety instruments within the rack; rack clearances; location, dimension and tolerance; presence of weep holes	CPE-SWEC-FVM-IC-069
	Instruments mounted on rack: bolt size, type, material/grade, spring nut alignment, thread engagement and tightness	CPE-SWEC-FVM-EE/ME/IC/CS-086

TABLE 5-3
(cont'd)

Construction Work Category	Final Acceptance Attribute	PCHVP Attribute Validation Method
Instrument Racks (cont'd)	Rack base plate mounting: Hilti Bolt size, type, material, thread engagement of nut, nut in full contact with mating surface, nut tightness	CPE-SWEC-FVM-EE/ME/IC/CS-090 (Reference 73)
	Spacing between Hilti Bolts	CPE-SWEC-FVM-CS-075 (Reference 71)
	Diameter of bolt holes	ECE 9.04-05
Instrument Flexible Hoses	Presence of ASME/NPT Stamp	CPE-SWEC-FVM-IC-069
	Flexible hose aligned and welded to the instrument root valve; presence of arc strikes; spacial configuration	CPE-SWEC-FVM-IC-069
	Braiding is not frayed or bulging; housing is not crimped	CPE-SWEC-FVM-IC-069
	Clearance from structures/components	CPE-SWEC-FVM-CS-068 (Reference 70)
Instrument Control Valves Accessory Supports	Solenoid pilot valves and instrument air regulating valves mounting: base plate bolt size, type, material/grade, thread engagement of nut, nut in full contact with mating surface, nut tightness	CPE-SWEC-FVM-EE/ME/IC/CS-086
	Base plate hole center-line distance from the edge; support location	ECE 9.04-05
	Clearance from structures/components	CPE-SWEC-FVM-CS-068
	Base plate identification; support configuration; presence of weep holes	CPE-SWEC-FVM-EE/ME/IC/CS-089

TABLE 5-3
(cont'd)

Construction Work Category	Final Acceptance Attribute	PCHVP Attribute Validation Method
Instrument BOP Analog Control Panel	Cabinet mounting configuration	CPE-SWEC-FVM-EE/ME/IC/CS-086
	Panel identification and location; bolting configuration; presence of damage	ECE 9.04-05
Main Control Board and Panels	Identification number	CPE-SWEC-FVM-EE/ME/IC/CS-089
	Control Equipment Location and Mounting	CPE-SWEC-FVM-EE/ME/IC/CS-089
	Control equipment range; control switch model; lamp color	CPE-SWEC-FVM-EE/ME/IC/CS-089
	Post-accident monitoring instrumentation unique identification	CPE-SWEC-FVM-EE/ME/IC/CS-089
Instruments	Instrument identification, location, separation distance between redundant counterparts	CPE-SWEC-FVM-IC-069
	Configuration of instrument root valves, vent and drain valves, test connections and high/low pressure taps	CPE-SWEC-FVM-IC-069
	Instrument mounting: bolt size, type, material/grade thread engagement of nut, nut in full contact with mating surface, nut tightness	CPE-SWEC-FVM-EE/ME/IC/CS-086
	Cable length for selected instruments in containment and main steamline compartments in safeguards building	ECE 9.04-05
	Cable installation for non-1E instruments in containment for post accident monitoring	ECE 9.04-05

TABLE 5-3
(cont'd)

Construction Work Category	Final Acceptance Attribute	PCHVP Attribute Validation Method
Instruments (cont'd)	Location/configuration for tornado effects (selected instruments)	ECE 9.04-05
	Storage conditions	ECE 9.04-05

TABLE 5-4

SUMMARY OF SWEC ENGINEERING ASSURANCE (EA) AUDITS

Audit No.	Location*	Dates of Audits	Audit Report Transmittal	Audit Response Transmittal
Project 1	BOS	01/26/87-03/04/87	IOM-87/077	04/10/87
Site 1	CP	03/02/87-03/06/87	IOM-87/82	04/24/87
Project 2	BOS/CH	04/27/87-05/22/87	IOM-87/183	07/06/87
Site 2	CP	05/18/87-05/22/87	IOM-87/204	07/13/87
Project 3	BOS	07/20/87-08/28/87	IOM-87/313	10/13/87
Stie 3	CP	11/16/87-11/20/87	IOM-87/521	In progress

*BOS - Boston Office
CP - Comanche Peak Site
CH - Cherry Hill Office

TABLE 5-5

SUMMARY OF TU ELECTRIC QUALITY ASSURANCE (QA) AUDITS

Audit No.	Location*	Dates of Audits	Audit Report Transmittal	Audit Response Transmittal
TCP 87-04	CP	02/02/87-03/03/87	QIA-7096	SWTU-1542/2580
TCP 87-07	CP	03/09/87-04/22/87	QIA-7159	SWTU-3025
TUG-87-10	CP	05/04/87-05/15/87	QIA-7256	Resp not Req'd
ATP 87-17	BOS	06/01/87-06/05/87	ATP-7112	SWTU-2485
ATP 87-30	BOS	07/13/87-07/17/87	ATP-7212	SWTU-3487
TCP 87-24	CP	07/22/87-08/14/87	NE-14415	In progress
TCP-87-27	CP	08/04/87-08/11/87	QIA-7291	SWTU-4102
ATP 87-42	BOS	08/31/87-09/04/87	ATP-7350	SWTU-4618
TCP-87-37	CP	10/12/87-10/21/87	QIA-7394	In progress
ATP-87-73	BOS	11/09/87-11/13/87	ATP-7573	SWTU-5794

*BOS - Boston Office
CP - Comanche Peak Site

6.0 REFERENCES

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4. CPSES Final Safety Analysis Report, Section 3.2

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7. CPSES Design Basis Document DBD-ME-011, Diesel Generator Sets, Revision 1

8. CPSES Design Basis Document DBD-ME-013, Containment Isolation System, Revision 1

9. CPSES Design Basis Document DBD-EE-23, Radiation Monitoring System, Revision 1

10. CPSES Design Basis Document, DBD-EE-041, 480 V and 120 V ac Electrical Power System, Revision 1

11. CPSES Design Basis Document DBD-EE-043, 118 V ac Uninterruptible Power Supply System, Revision 1

12. CPSES Design Basis Document DBD-EE-044, DC Power Systems, Revision 1

13. CPSES Design Basis Document DBD-EE-038, Offsite Power System, Revision 1

14. CPSES Design Basis Document DBD-EE-039, Onsite Power System, Revision 1

15. CPSES Design Basis Document DBD-EE-040, 6.9 kV Electrical Power System, Revision 1

16. CPSES Design Basis Document DBD-ME-079, Combustible Gas Control System, Revision 1

17. CPSES Design Basis Document DBD-ME-202, Main Steam, Reheat, and Steam Dump System, Revision 1

18. CPSES Design Basis Document DBD-ME-203, Feedwater System, Revision 1

19. CPSES Design Basis Document DBD-ME-206, Auxiliary Feedwater System, Revision 1

20. CPSES Design Basis Document, DBD-ME-215, Diesel Generator Fuel Oil Storage and Transfer System, Revision 1

21. CPSES Design Basis Document DBD-ME-228-01, Post Accident Sampling System, Revision 0

22. CPSES Design Basis Document DBD-ME-229, Component Cooling Water System, Revision 1

23. CPSES Design Basis Document DBD-ME-232, Containment Spray System, Revision 1

24. CPSES Design Basis Document DBD-ME-233, Station Service Water System, Revision 1

25. CPSES Design Basis Document DBD-ME-235, Spent Fuel Pool Cooling and Cleanup System, Revision 1

26. CPSES Design Basis Document DBD-ME-241, Demineralized and Reactor Makeup Water System, Revision 1

27. CPSES Design Basis Document DBD-ME-300, Containment Ventilation Systems, Revision 1

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29. CPSES Design Basis Document DBD-ME-302, Safeguards Building Ventilation Systems, Revision 1

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33. CPSES Design Basis Document DBD-ME-303-01, Fuel Handling Building Ventilation System, Revision 1

34. CPSES Design Basis Document DBD-ME-304, Control Room Air Conditioning System, Revision 1

35. CPSES Design Basis Document DBD-ME-305, Uncontrolled Access Area Ventilation System, Revision 1

36. CPSES Design Basis Document DBD-ME-302C, Main Steam and Feedwater Area HVAC System, Revision 1

37. CPSES Design Basis Document DBD-ME-309, Primary Plant Ventilation System, Revision 1

38. CPSES Design Basis Document DBD-ME-311, Safety Chiller Water System, Revision 1

39. CPSES Design Basis Document DBD-ME-312, Service Water Intake Structure Ventilation System, Revision 1

40. CPSES Design Basis Document DBD-ME-313, Uninterruptible Power Supply Area Air Conditioning System, Revision 1

41. CPSES Design Basis Document DBD-EE-037, BOP Safety-Related Setpoints, Revision 1

42. SWEC Comanche Peak Project Procedure, PP-009, Preparation and Control of Manual and Computerized Calculations, Revision 3

43. CPSES Design Basis Document DBD-EE-035, Instrument Installation and Separation, Revision 1

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46. NRC Regulatory Guide 1.106, Thermal Overload Protection for Electric Motors on Motor-Operated Valves, Revision 1

47. CPSES Design Basis Document DBD-EE-033, Detailed Control Room Design, Revision 1

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51. CPSES Design Basis Document DBD-ME-250, Reactor Coolant System, Revision 0

52. CPSES Design Basis Document DBD-ME-255, Chemical and Volume Control System, Revision 0

53. CPSES Design Basis Document DBD-ME-260, Residual Heat Removal System, Revision 0

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60. Comanche Peak, Significant Interface Identification Package, Boron Recycle System, July 1987

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62. Comanche Peak, Significant Interface Identification Package, Fuel Handling System, August 1987

63. Comanche Peak, Significant Interface Identification Package, Liquid Waste Processing System, August 1987

64. Comanche Peak, Significant Interface Identification Package, Gaseous Waste Processing System, September 1987

65. CPSES Design Basis Document DBD-EE-021, Reactor Control and Protection System, Revision 0

66. TU Electric Engineering and Construction Procedure EC 9.04, Post Construction Hardware Validation Program, Revision 2

67. Comanche Peak Response Team Program Plan and Issue-Specific Action Plans, Appendix D, CPRT Sampling Policy, Applications and Guidelines, Revision 1, January 31, 1986, and Appendix E, Resolution of Discrepancies Identified by the CPRT, Revision 3, June 18, 1987.

68. Field Verification Method, Safety/Non-Safety-Related Instrumentation and Tubing Connected to ASME III Fluid Systems and ANSI Safety Class Installations, CPE-SWEC-FVM-IC-069, Revision 2

69. Field Verification Method, Post Construction Hardware Validation (PCHV) Program, Engineering Walkdowns, CPE-SWEC-FVM-EE/ME/IC/CS-089, Revision 2

70. Field Verification Method, Commodity Clearance, CPE-SWEC-FVM-CS-068, Revision 0

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APPENDIX A

COMANCHE PEAK RESPONSE TEAM (CPRT) AND EXTERNAL ISSUES

This appendix contains a comprehensive summary of the SWEC evaluation, resolution and corrective and preventive action for all Comanche Peak Response Team (CPRT) and external issues which are related to the instrumentation and controls design. Specific references to the design criteria and procedures which have resolved the issues are provided.

To report the resolution of the Comanche Peak Response Team (CPRT) and external issues, an individual subappendix was developed for each issue. Each subappendix includes: a definition of the issue; issue resolution; and corrective and preventive action.

The issues contained in Subappendices A1 through A5 were initially raised by the Comanche Peak Response Team (CPRT)[1,2]. The issues contained in Subappendices A6 through A10 are included in the CYGNA Energy Services (CYGNA) Review Issue List (RIL).[3]

The preventive actions are embodied in the procedures, the specifications and the Design Basis Documents (DBDs) developed and used in the instrumentation and controls portion of Corrective Action Program (CAP). These procedures, specifications and the Design Basis Documents (DBDs) resolve all related Comanche Peak Response Team (CPRT) and external issues. Implementation of these preventive actions can assure that the instrumentation and controls portion of design and hardware for CPSES Unit 1 and Common will continue to comply with the licensing commitments throughout the life of the plant as described in Section 5.4.

Comanche Peak Response Team (CPRT) and external issues contained in Appendix A are listed below:

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[1]Tenera, L. P. (TERA) Instrumentation and Controls Issue Resolution Reports (IRRs) DAP-E-EIC-502 and 504; and DAP-E-C/S-508

[2]TU Electric Comanche Peak Response Team (CPRT) Issue Specific Action Plan (ISAP) VII.c, Appendices 7 and 28

[3]CYGNA, "Electrical Review Issues List (RIL) Comanche Peak Steam Electric Station (CPSES) Independent Assessment Program - All Phases", Revision 3, transmitted to TU Electric by CYGNA Energy Services in letter No. 84056.010, dated July 30, 1984 and Electrical Systems Review Questions, transmitted to TU Electric by CYGNA Energy Services in letter No. 84056.090, dated October 16, 1985.

Issue No.	Issue Title
A1	Instrument Setpoint Calculations
A2	Electrical Separation - Inadequate Sensor/Tap Separation Requirements
A3	Support/Anchorage Design Methods and Criteria - Tube and Instrument Supports
A4	Instrumentation Equipment Installation
A5	Instrument Tube Supports
A6	Instrumentation Pressure/Temperature Ratings
A7	Flow Transmitter/Flow Indicator Mismatch
A8	Instrument Tubing Installation
A9	Specification Data Sheet/Calibration Card Mismatch
A10	Instrument Calibration Cards Disagree with Instrument Setpoint Calculations

SUBAPPENDIX A1

INSTRUMENT SETPOINT CALCULATIONS (IRR DAP-E-EIC-502)

1.0 Definition of the Issue

The issue was that safety-related instrument setpoint calculations had input data that were not traceable to source documents, assumptions were not adequately specified, the method used in the preparation of instrument setpoint calculations was not clearly defined, and the design review documentation was inadequate.

2.0 Issue Resolution

SWEC resolved this issue by reviewing the original instrument setpoint calculations and developing replacement instrument setpoint calculations, based on the methodology and design criteria specified in the Design Basis Document (DBD) (Reference 4.1). SWEC validated and documented the input data and the assumptions used in the calculations.

3.0 Corrective and Preventive Action

A related issue was identified during the review and resolution of this issue. The related issue is that Westinghouse - Nuclear Steam Supply System Supplier, in the preparation of instrument setpoint calculations for six safety-related instruments, did not consider inaccuracies of the calibration equipment. This issue is addressed in Subappendix B4.

This issue was determined not to be reportable under the provisions of 10CFR50.55(e).

3.1 Corrective Action

Replacement instrument setpoint calculations have been developed in accordance with the design criteria specified in the Design Basis Document (DBD) (Reference 4.1). These calculations replace the original calculations, and validate the setpoints for the respective safety-related instruments.

3.2 Preventive Action

The design criteria have been documented in the Design Basis Document (DBD) (Reference 4.1). SWEC design control Project Procedure PP-009 (Reference 4.2) requires that all calculations be checked and independently reviewed to assure accuracy and that the calculation documentation is properly controlled.

4.0 References

4.1 CPSES Design Basis Document, DBD-EE-037, BOP Safety Related Setpoints, Revision 1

4.7 SWEC CPSES Project Procedure PP-009, Preparation and Control of Manual and Computerized Calculations, Revision 3

SUBAPPENDIX A2

ELECTRICAL SEPARATION - INADEQUATE SENSOR/TAP SEPARATION REQUIREMENTS (IRR DAP-E-EIC-504)

1.0 Definition of the Issue

The issue was that the separation requirements for redundant sensors and sensor taps were not consolidated in a single installation specification.

2.0 Issue Resolution

SWEC resolved this issue by issuing a new instrumentation installation specification (Reference 4.1) which contains consolidated requirements for instrument separation, including that for sensors and sensor taps. The installation requirements are consistent with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.6). During the Post Construction Hardware Validation Program (PCHVP), engineering walkdowns are being performed in accordance with a Field Verification Method (FVM) (Reference 4.2) to validate physical separation of redundant sensors and sensor taps.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of this issue.

This issue was determined not to be reportable under the provisions of 10CFR50.55(e).

3.1 Corrective Action

The installation specifications (References 4.3 through 4.5) have been revised and a new instrumentation installation specification (Reference 4.1) has been issued. During the Post Construction Hardware Validation Program (PCHVP), engineering walkdowns are being performed in accordance with a Field Verification Method (FVM) (Reference 4.2) to validate physical separation of redundant sensors and sensor taps.

3.2 Preventive Action

The Design Basis Document (DBD) (Reference 4.6) and the instrumentation installation specification (Reference 4.1) consolidate the separation requirements related to instrument installation, including that for sensors and sensor taps.

4.0 References

4.1 Specification CPES-I-1018, Installation of Piping/Tubing and Instrumentation, Revision 1

4.2 Field Verification Method, Safety/Non-Safety Related Instrumentation and Tubing Connected to ASME III Fluid Systems and ANSI Safety Class Installations, CPE-SWEC-FVM-IC-069, Revision 2

4.3 CPSES Specification 2323-MS-625A, Field Instrument Relocation Criteria, dated February 12, 1979

4.4 CPSES Specification 2323-ES-100, Electrical Installation - Class I, II, and Non-Safety, Revision 4

4.5 CPSES Specification 2323-MS-625, Procurement of Nuclear Safety Related Tubing, Fittings, and Valves, Revision 4

4.6 CPSES Design Basis Document DBD-EE-035, Instrument Installation and Separation, Revision 1

SUBAPPENDIX A3

SUPPORT/ANCHORAGE DESIGN METHODS AND CRITERIA-
TUBE AND INSTRUMENT SUPPORTS (IRR DAP-E-C/S 508)

1.0 Definition of the Issue

The issues were:

1.1 The instrument and tube support calculations used inappropriate load combinations and friction connections, inadequately documented design criteria and inputs, and contained computational errors.

1.2 The instrument tube support installation drawings did not specify installation torque requirements for Unistrut spring nuts.

2.0 Issue Resolution

2.1 SWEC resolved this issue by reviewing and validating the original instrument and tube support calculations and by developing supplemental, replacement or new calculations in compliance with the design criteria specified in the Design Basis Document (DBD) (Reference 4.1) to address and correct the use of inappropriate load combinations and friction connections, inadequately documented design criteria and computational errors. SWEC validated and documented input data for original, supplemental, replacement and new instrument and tube support calculations. Based on the validated original and on SWEC developed supplemental, replacement and new calculations, SWEC revised the instrumentation installation specification (Reference 4.2) and instrumentation installation drawings (References 4.3 and 4.4) to incorporate instrument and tube supports requirements. Utilizing the instrument and tube supports requirements in the instrumentation installation specification, (Reference 4.2) and on the instrumentation installation drawings (References 4.3 and 4.4) SWEC identified changes to the construction procedure (Reference 4.5) to provide installation requirements for the instrument and tube supports and to the Quality Control (QC) inspection procedure (Reference 4.6) to incorporate the required inspection attributes. During the Post Construction Hardware Validation Program (PCHVP), engineering walkdowns are being performed in accordance with the Field Verification Methods (FVMs) (References 4.7 and 4.8) to validate that instrument and tube supports type and installations comply with the instrumentation installation specification (Reference 4.2) and the installation drawings (References 4.3 and 4.4).

2.2 The issue resolution for issue 1.2 is described in Subappendix A5.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of these issues.

Issue 1.1 was determined not to be reportable under the provisions of 10CFR50.55(e). Issue 1.2 was determined to be reportable under the provisions of 10CFR50.55(e), as described in Subappendix A5.

3.1 Corrective Action

3.1.1 SWEC validated the original and developed supplemental, replacement and new instrument and tube support calculations to address and correct the use of inappropriate load combinations and friction connections, inadequately documented design criteria and computational errors. SWEC validated and documented input data for original, supplemental, replacement and new instrument and tube support calculations. Based on the validated original, and on SWEC developed supplemental, replacement and new calculations, SWEC revised the instrumentation installation specification (Reference 4.2) and instrumentation installation drawings (References 4.3 and 4.4) to incorporate instrument and tube supports requirements. Utilizing the instrument and tube supports requirements in the instrumentation installation specification (Reference 4.2) and on the instrumentation installation drawings (References 4.3 and 4.4) SWEC identified changes to the construction procedure (Reference 4.5) to provide installation requirements for the instruments and tube supports and to the Quality Control (QC) inspection procedure (Reference 4.6) to incorporate the required inspection attributes. During the Post Construction Hardware Validation Program (PCHVP), engineering walkdowns are being performed in accordance with the Field Verification Methods (FVMs) (References 4.7 and 4.8) to validate that instrument and tube supports type and installations comply with the instrumentation installation specification (Reference 4.2) and the instrumentation installation drawings (References 4.3 and 4.4).

3.1.2 The corrective action for issue 1.2 is described in Subappendix A5.

3.2 Preventive Action

3.2.1 The Design Basis Document (DBD) (Reference 4.1) and the revised instrumentation installation specification (Reference 4.2), instrumentation installation drawings (References 4.3 and 4.4), construction procedure (Reference 4.5) and Quality Control (QC) inspection procedure (Reference 4.6) assure proper instrument and tube support type, installation and inspection. SWEC design control Project Procedure PP-009 (Reference 4.9) requires that all calculations be checked and independently reviewed to assure accuracy and that calculation documentation is properly controlled.

3.2.2 The preventive action for issue 1.2 is described in Subappendix A5.

4.0 References

4.1 Design Basis Document DBD-CS-089, Instrument Tubing Support Design, Revision 1

4.2 Specification CPES-I-1018, Installation of Piping/Tubing and Instrumentation, Revision 1

4.3 Instrumentation Installation Details Drawing 2323-M1-2100 series

4.4 Instrumentation Installation Drawings 2323-I-001 and ECE-I-001 Series

4.5 CPSES Installation Procedure ICP-4, Installation and Inspection of Instrumentation and Associated Tubing/Piping, Revision 9

4.6 CPSES NEO Quality Assurance Department Procedure NQA 3.09-5.01, Inspection of Instrumentation Components, Revision 1

4.7 Field Verification Method, Safety/Non-Safety-Related Instrumentation and Tubing Connected to ASME III Fluid Systems and ANSI Safety Class Installations, CPE-SWEC-FVM-IC-069, Revision 2

4.8 Field Verification Method, Post Construction Hardware Validation Program, Construction/Quality Control Reverifications, CPE-SWEC--FVM-EE/ME/IC/CS-086, Revision 2

4.9 SWEC CPSES Project Procedure PP-009, Preparation and Control of Manual and Computerized Calculations, Revision 3

SUBAPPENDIX A4

INSTRUMENT EQUIPMENT INSTALLATION (ISAP VII.c, APPENDIX 7)

1.0 Definition of the Issue

This issue was that potentially unsuitable thread sealants were used in some instrument installations and deficiencies existed in the installation of flexible metal instrument hose assemblies.

1.1 Teflon

Teflon tape was used on two instruments in the containment spray system and two instruments in the spent fuel pool cooling and cleanup system.

1.2 Rectorseal

Rectorseal No. 5, another thread sealant, had been used in the plant prior to January 30, 1981.

1.3 Flexible Metal Instrument Hose Assemblies

The issue was that flexible metal instrument hose assemblies had misaligned anti-torque markings.

2.0 Issue Resolution

2.1 Teflon

SWEC determined that the two instruments (Reference 4.1) with Teflon tape are not safety-related and that the Teflon tape on these instruments was applied by the same vendor prior to shipment. There is a diaphragm seal between the instrument and the pipe. The failure of the Teflon tape will not cause failure of the diaphragm seal, thus the pressure boundary will be maintained. During the Post Construction Hardware Validation Program (PCHVP), engineering walkdowns are being performed in accordance with a Field Verification Method (FVM) (Reference 4.3) for safety-related systems to identify and evaluate the use of Teflon tape in instrumentation installations.

2.2 Rectorseal

An evaluation (Reference 4.7) was performed of chemicals contained in Rectorseal No. 5. This evaluation determined that the previous use of Rectorseal No. 5 is acceptable.

2.3 Flexible Metal Instrument Hose Assemblies

SWEC, with vendor concurrence, has developed acceptance criteria for the installation of flexible metal instrument hose assemblies which are not based on anti-torque markings but rather on more reliable criteria which consider physical dimensions of the installation configuration. The instrumentation installation specification (Reference 4.2) and installation drawings (Reference 4.8) have been revised to reflect these installation acceptance criteria. A Field Verification Method (FVM) (Reference 4.3) has been developed to identify, during the Post Construction Hardware Validation Program (PCHVP), installed flexible metal instrument hose assemblies that do not meet requirements of the instrumentation installation specification (Reference 4.2). Those identified flexible metal instrument hose assemblies are being replaced.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of these issues.

Issues 1.1 and 1.2 were determined not to be reportable under the provisions of 10CFR50.55(e). Issue 1.3 was determined to be reportable under the provisions of 10CFR50.55(e). This issue was reported as Significant Deficiency Analysis Report (SDAR) CP-87-114, in letter number TXX-88129, dated January 29, 1988, from TU Electric to the NRC.

3.1 Corrective Action

3.1.1 During the Post Construction Hardware Validation Program (PCHVP), engineering walkdowns are being performed in accordance with a Field Verification Method (FVM) (Reference 4.3) for safety-related systems to identify and evaluate the use of Teflon tape in instrumentation installations.

3.1.2 An evaluation (Reference 4.7) was performed of chemicals contained in Rectorseal No. 5. This evaluation determined that previous use of Rectorseal No. 5 is acceptable.

3.1.3 SWEC revised instrumentation installation specification (Reference 4.2) and installation drawings (Reference 4.8) to include the vendor installation requirements for the flexible metal instrument hose assemblies. A Field Verification Method (FVM) (Reference 4.3) has been developed to identify, during the Post Construction Hardware Validation Program (PCHVP), installed flexible metal instrument hose assemblies that do not meet requirements of the instrumentation installation specification (Reference 4.2). Those identified flexible metal instrument hose assemblies are being replaced.

3.2 Preventive Action

SWEC developed an instrumentation installation specification (Reference 4.2) which prohibits the use of Teflon tape in all buildings, except in the Turbine Generator Building and the

Circulating Water Intake Structure, and prohibits the use of Rectorseal No. 5 in all buildings for any rework or new construction, and identifies several acceptable thread sealants. SWEC identified revisions to the construction procedure, the Quality Control (QC) inspection procedure and the maintenance procedures (References 4.4 through 4.6) to incorporate the requirements of the instrumentation installation specification. The procurement specifications have been revised to prohibit use of Teflon tape and Rectorseal No. 5 on instrumentation that is in contact with the process fluid and identifies acceptable thread sealants.

The revised instrumentation installation specification (Reference 4.2), the installation drawings (Reference 4.8), the construction procedure (Reference 4.4) and the Quality Control (QC) inspection procedure (Reference 4.5) assure proper installation of flexible metal instrument hose assemblies.

4.0 References

4.1 CPSES Specification 2323-MS-615, Pressure Switches, Revision 1

4.2 Specification CPES-I-1018, Installation of Piping/Tubing and Instrumentation, Revision 1

4.3 Field Verification Method, Safety/Non-Safety-Related Instrumentation and Tubing Connected to ASME III Fluid Systems and ANSI Safety Class Installations, CPE-SWEC-FVM-IC-069, Revision 2

4.4 CPSES Installation Procedure ICP-4, Installation and Inspection of Instrumentation and Associated Tubing/Piping, Revision 9

4.5 CPSES Quality Control Procedure QI.QP-11.8-5, Inspection of Instrument Tubing Fabrication, Installation, and Instrument Installation, Revision 17 (revised to NQA 3.09 - 5.01, Revision 1, Inspection of Instrumentation Components)

4.6 CPSES Maintenance Procedures INC-100 series

4.7 SWEC Letter SWTU-5177, dated December 10, 1987, Unidentified Sealant on NPT Threaded Joints in Instrumentation Systems

4.8 Instrument Installation Drawings Series ECE-I-002

SUBAPPENDIX A5

INSTRUMENT TUBE SUPPORTS (ISAP VII.c, APPENDIX 28)

1.0 Definition of the Issue

The issues were:

1.1 Some Unistrut spring nuts utilized for instrument mounting and instrument tube supports were observed to be improperly torqued and/or misaligned and full thread engagement for the spring nuts was not achieved.

1.2 Some inconsistencies related to instrument tube installations were identified. These inconsistencies were use of improper clamp types and components, and loose nuts of non-Unistrut tube supports utilizing incorrect hardware.

2.0 Issue Resolution

2.1 SWEC resolved this issue by revising the instrumentation installation specification (Reference 4.1) which contains consolidated requirements for bolt torque and Unistrut spring nut alignment and thread engagement. Additionally, instrumentation installation drawings (Reference 4.3), instrumentation installation details drawings (Reference 4.4), instrument support drawings (Reference 4.5) and instrument rack drawings (Reference 4.6) have been revised to include nut alignment, thread engagement and torque requirements for Unistrut spring nut installations. Utilizing the criteria in the instrumentation installation specification (Reference 4.1), SWEC identified changes to the construction procedure (Reference 4.7) to provide bolt torque and spring nut alignment and thread engagement requirements for Unistrut spring nut installations, and to the Quality Control (QC) inspection procedure (Reference 4.8) to incorporate the required inspection attributes. During the Post Construction Hardware Validation Program (PCHVP), engineering walkdowns are being performed in accordance with Field Verification Methods (FVMs) (References 4.2 and 4.9) to validate the nut alignment, thread engagement and bolt torque on Unistrut spring nuts. Improperly engaged, torqued and/or misaligned Unistrut spring nuts are being corrected.

2.2 SWEC resolved this issue by revising the instrumentation installation specification (Reference 4.1) and the instrumentation installation drawings (Reference 4.3) to clearly identify clamp types and components and correct hardware for non-Unistrut tube support installations. Utilizing the criteria in the instrumentation installation specification (Reference 4.1), SWEC identified changes to the construction procedure (Reference 4.7) to define clamp types and components and to identify correct hardware for non-Unistrut tube supports, and to the Quality Control (QC) inspection procedure (Reference 4.8) to incorporate the required inspection attributes. During the Post Construction Hardware Validation Program (PCHVP), engineering walkdowns are being performed in accordance with Field Verification Methods (FVMs) (References 4.2 and 4.9) to identify improper clamp types and components and incorrect hardware on non-Unistrut tube supports. Improper clamp types and components, and incorrect hardware on non-Unistrut tube supports are being replaced.

3.0 Corrective and Preventive Action

The related issue to issue 1.1 was identified during the review and resolution of issue 1.1. The related issue is that incorrect bolts may exist on Unistrut tube supports. This issue is addressed in Subappendix B2 of this Project Status Report (PSR).

Both issues were determined to be reportable under the provisions of 10CFR50.55(e). Issue 1.1 was reported as Significant Deficiency Analysis Report (SDAR) CP-86-50, in letter number TXX-88146, dated January 29, 1988, from TU Electric to the NRC. Issue 1.2 was reported as Significant Deficiency Analysis Report (SDAR) CP-88-024, in letter number TXX-88164, dated January 29, 1988, from TU Electric to the NRC.

3.1 Corrective Action

3.1.1 The instrumentation installation specification (Reference 4.1), the instrumentation installation drawings (Reference 4.3), the instrumentation installation details drawings (Reference 4.4), the instrument support drawings (Reference 4.5) and the instrument rack drawings (Reference 4.6) have been revised to include nut alignment, thread engagement and torque requirements for Unistrut spring nut installations. Utilizing the criteria in the instrumentation installation specification (Reference 4.1), SWEC identified changes to the construction procedure (Reference 4.7) to incorporate bolt torque and spring nut alignment and thread engagement requirements for Unistrut spring nut installations, and to the Quality Control (QC) inspection procedure (Reference 4.8) to incorporate the required inspection attributes. During the Post Construction Hardware Validation Program (PCHVP), engineering walkdowns are being performed in accordance with Field Verification Methods (FVMs) (References 4.2 and 4.9) to validate the nut alignment, thread engagement and bolt torque on Unistrut spring nuts. Improperly engaged, torqued and/or misaligned Unistrut spring nuts are being corrected.

The corrective action of this subappendix also applies to Subappendix B2.

3.1.2 The instrumentation installation specification (Reference 4.1) and the instrumentation installation drawings (Reference 4.3) were revised to clearly identify clamp types and components and correct hardware for non-Unistrut tube support installations. Utilizing the criteria in the instrumentation installation specification (Reference 4.1), SWEC identified changes to the construction procedure (Reference 4.7) to define clamp types and components and to identify correct hardware for non-Unistrut tube supports, and to the Quality Control (QC) inspection procedure (Reference 4.8) to incorporate the required inspection attributes. During the Post Construction Hardware Validation Program (PCHVP), engineering walkdowns are being performed in accordance with Field Verification Methods (FVMs) (References 4.2 and 4.9) to identify improper clamp types and components and incorrect hardware on non-Unistrut tube supports. Improper clamp types and components, and incorrect hardware on non-Unistrut tube supports are being replaced.

3.2 Preventive Action

3.2.1 The instrumentation installation specification (Reference 4.1), the instrumentation installation drawings (Reference 4.3), the instrumentation details drawings (Reference 4.4), the instrument support drawings (Reference 4.5) the instrument rack drawings (Reference 4.6) and the construction procedure (Reference 4.7) have been revised to incorporate Unistrut spring nut alignment, thread engagement and/or bolt torque requirements. The Quality Control (QC) inspection procedure (Reference 4.8) has been revised to incorporate required inspection attributes for Unistrut spring nut applications.

3.2.2 The instrumentation installation specification (Reference 4.1), the instrumentation installation drawings (Reference 4.3) and the construction procedure (Reference 4.7) have been revised to incorporate the correct clamp types and components and correct hardware for non-Unistrut tube supports. The Quality Control (QC) inspection procedure (Reference 4.8) has been revised to incorporate required inspection attributes for tube clamps and correct hardware for non-Unistrut tube support installations.

4.0 References

4.1 Specification CPES-I-1018, Installation of Piping/Tubing and Instrumentation, Revision 1

4.2 Field Verification Method (FVM), Post Construction Hardware Validation Program (PCHVP) Construction/Quality Control Reverifications, CPE-SWEC-FVM-EE/ME/IC/CS-086, Revision 2

4.3 Instrumentation Installation Drawings 2323-I-001 and ECE-I-001 series

4.4 Instrument Installation Details Drawings 2323-M1-2100 series

4.5 Instrument Support Drawings TNE-I1 series

4.6 Instrument Rack Drawings 2323-M1/M2-2800 series

4.7 CPSES Installation Procedure ICP-4, Installation and Inspection of Instrumentation and Associated Tubing/Piping, Revision 9

4.8 CPSES NEO Quality Assurance Department Procedure NQA 3.09-5.01, Inspection of Instrumentation Components, Revision 1

4.9 Field Verification Method (FVM), Safety/Non-Safety-Related Instrumentation and Tubing Connected to ASME III Fluid Systems and ANSI Safety Class Installations, CPE-SWEC-FVM-IC-069, Revision 2

SUBAPPENDIX A6

INSTRUMENTATION PRESSURE/TEMPERATURE RATINGS (CYGNA RIL NO. E-1)

1.0 Definition of the Issue

The issue was that apparent documentation inconsistencies existed between instrumentation pressure/temperature ratings and system design pressure/temperature for two instruments in the Component Cooling Water System.

2.0 Issue Resolution

SWEC resolved this issue by reviewing data sheets for all instruments in the Component Cooling Water System (References 4.1 through 4.6) with respect to their pressure/ temperature ratings versus the system design pressure/temperature (Reference 4.7). This review was conducted in accordance with SWEC design control Project Procedure PP-205 (Reference 4.8). The review validated that all existing instruments have adequate pressure/temperature ratings.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of this issue.

This issue was determined not to be reportable under the provisions of 10CFR50.55(e).

No corrective or preventive action is required, since all existing instruments have adequate pressure/temperature ratings.

4.0 References

4.1 CPSES Specification 2323-MS-611A, Electronic Pressure and Differential Pressure Transmitters, Revision 2

4.2 CPSES Specification 2323-MS-614, Pressure Gauges, Revision 1

4.3 CPSES Specification 2323-MS-616, Differential Pressure Indicating Switches, Revision 1

4.4 CPSES Specification 2323-MS-618, Flow Indicators (Rotameters), Revision 1

4.5 CPSES Specification 2323-MS-617, Gauge Glasses, Revision 1

4.6 CPSES Specification 2323-MS-620, Level Switches, Revision 1

4.7 Specification CPES-M-1017, Pipeline Designation List, Revision 0

4.8 SWEC CPSES Project Procedure PP-205, Specification Validation Procedure, Revision 3

SUBAPPENDIX A7

FLOW TRANSMITTER/FLOW INDICATOR MISMATCH (CYGNA LETTER 84056.090, ITEM 14)

1.0 Definition of the Issue

The issue was that an apparent discrepancy existed between the ranges of a flow transmitter and its associated flow indicator in the Component Cooling Water System.

2.0 Issue Resolution

SWEC resolved this issue by reviewing design and vendor documents related to the flow transmitter and its associated flow indicator (References 4.1 through 4.5) in accordance with SWEC design control Project Procedure PP-203 (Reference 4.6). The review validated that no range mismatch existed between the flow transmitter and the associated flow indicator.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of this issue.

This issue was determined not to be reportable under the provisions of 10CFR50.55(e).

No corrective or preventive action is required, since there is no mismatch between the ranges of the flow transmitter and flow indicator.

4.0 References

4.1 CPSES Specification 2323-MS-62, Orifice Plates - Flow Restriction Type - Nuclear, June 9, 1978

4.2 CPSES Specification 2323-MS-611A, Electronic Pressure and Differential Pressure Transmitters, Revision 2

4.3 Permutit (Vendor) Dwg. 556-33110, Sheet 2, Revision 1

4.4 Rosemount (Vendor) Dwg. H34773-1104, Sheet 1, Revision D

4.5 CPSES Specification 2323-MS-605, Control Boards - Nuclear Safety-Related, Data Sheet 13.04, Revision 7

4.6 SWEC CPSES Project Procedure PP-203, Calculation Validation Procedure, Revision 1

SUBAPPENDIX A8

INSTRUMENT TUBING INSTALLATION
(CYGNA LETTER 84056.090, ITEM 15)

1.0 Definition of the Issue

The issue was that an inadequate instrument tubing slope for one pressure instrument and reverse tubing slopes for one level instrument and one flow instrument existed in the Component Cooling Water System.

2.0 Issue Resolution

For the pressure and flow instruments, instructions have been issued to rework the tubing to provide a proper slope. For the level instrument, SWEC has developed a design change which eliminated this tubing slope issue. These modifications and rework are being implemented. During the Post Construction Hardware Validation Program (PCHVP), engineering walkdowns are being performed in accordance with a Field Verification Method (FVM) (Reference 4.1) for validation of adequate tubing slopes on safety-related instrumentation installations.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of this issue.

This issue was determined not to be reportable under the provisions of 10CFR50.55(e).

3.1 Corrective Action

For the pressure and flow instruments, instructions have been issued to rework the tubing to provide a proper slope. For the level instrument, SWEC has developed a design change which eliminated this tubing slope issue. These modifications and rework are being implemented. During the Post Construction Hardware Validation Program (PCHVP), engineering walkdowns are being performed in accordance with a Field Verification Method (FVM) (Reference 4.1) for validation of adequate tubing slopes on safety-related instrumentation installations.

3.2 Preventive Action

SWEC developed an instrumentation installation specification (Reference 4.2), which is in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.3), that includes requirements for instrument tubing slope. SWEC also identified revisions to the construction procedure and the Quality Control (QC) inspection procedure (References 4.4 and 4.5). These procedures have been revised to be in compliance with the installation specification.

4.0 References

4.1 Field Verification Method (FVM), Safety/Non-Safety-Related Instrumentation and Tubing Connected to ASME III Fluid Systems and ANSI Safety Class Installations, CPE-SWEC-FVM-IC-069, Revision 2

4.2 Specification CPES-I-1018, Installation of Piping/ Tubing and Instrumentation, Revision 1

4.3 CPSES Design Basis Document DBD-EE-035, Instrument Installation and Separation, Revision 1

4.4 CPSES Installation Procedure ICP-4, Installation and Inspection of Instrumentation and Associated Tubing/Piping, Revision 9

4.5 CPSES Quality Control Procedure QI.QP-11.8-5, Inspection of Instrument Tubing Fabrication, Installation, and Instrument Installation , Revision 17 (Revised to NQA 3.09-5.01, Inspection of Instrumentation Components, Revision 1)

SUBAPPENDIX A9

SPECIFICATION DATA SHEET/CALIBRATION CARD MISMATCH (CYGNA LETTER 84056.090, ITEM 16)

1.0 Definition of the Issue

The issue was that apparent discrepancies existed between the range on the instrument calibration card and the range on the instrument specification data sheet for two component cooling water surge tank level transmitters.

2.0 Issue Resolution

SWEC has resolved this issue by reviewing the instrument specification data sheet (Reference 4.1), setpoint and scaling calculations, the instrument calibration card, the component cooling water surge tank drawing (Reference 4.2) and the vendor instruction manual (Reference 4.3). The review validated that the specified range on the instrument specification data sheet is consistent with the required calibration range on the instrument calibration card.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of this issue.

This issue was determined not to be reportable under the provisions of 10CFR50.55(e).

No corrective or preventive action is required, since the calibration card and specification data sheet are consistent.

4.0 References

4.1 CPSES Specification 2323-MS-611A, Data Sheet 06.11, Revision 2

4.2 Component Cooling Surge Tank Drawing N-2540-359, Sh. 01, Revision CP-1

4.3 Rosemount Instruction Manual 4302, "Model 1153 Series B Alphaline Pressure Transmitters for Nuclear Service," Page 1, Revision B

SUBAPPENDIX A10

INSTRUMENT CALIBRATION CARDS DISAGREE WITH INSTRUMENT SETPOINT CALCULATIONS (CYGNA LETTER 84056.090, ITEM 20)

1.0 Definition of the Issue

The issue was that an apparent discrepancy existed between instrument calibration cards and instrument setpoint calculations of two level bistables in the Component Cooling Water System and two pressure switches in the Service Water System.

2.0 Issue Resolution

SWEC resolved this issue by performing a review of the instrument setpoint calculations and the instrument calibration cards for the two pressure switches and validated that no discrepancy between the instrument setpoint calculation and the instrument calibration card existed for one of them. A minor inconsistency was identified for the other pressure switch. This minor inconsistency has been corrected.

SWEC also performed a review of instrument setpoint and scaling calculations and the instrument calibration card for the two level bistables and validated that no discrepancy exists between the instrument setpoint calculation and the instrument calibration card.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of this issue.

This issue was determined not to be reportable under the provisions of 10CFR50.55(e).

3.1 Corrective Action

The minor inconsistency between the instrument setpoint calculation and the instrument calibration card was corrected.

3.2 Preventive Action

SWEC design control Project Procedure PP-219 (Reference 4.1) and TU Electric procedures (References 4.2 and 4.3) assure the consistency between instrument calibration cards and instrument setpoint calculations.

4.0 References

4.1 SWEC CPSES Project Procedure PP-219, Validation of Instrument Setpoints on the I&C Equipment List and Calibration Cards, Revision 0

4.2 TU Electric-Generating Division, Nuclear Engineering and Operations Procedure NEO-3.03, Preparation, Review and Disposition of Plant Design Modifications, Revision 1

4.3 TU Electric-Generating Division, Nuclear Engineering and Operations Procedure NEO-9.18, Setpoint Change Control-Construction Phase, Revision 0

APPENDIX B

ISSUES IDENTIFIED DURING THE PERFORMANCE OF THE CORRECTIVE ACTION PROGRAM (CAP)

This appendix describes the details of the resolution of issues determined to be reportable under the provisions of 10CFR50.55(e) that were identified during the performance of the instrumentation and controls portion of the Corrective Action Program (CAP). Included in this appendix are instrumentation and controls related Significant Deficiency Analysis Reports (SDARs) initiated by TU Electric. Specific references to the criteria, procedures, engineering evaluations, and design changes which have resolved these issues are provided.

To report the resolution of issues identified during the performance of the Corrective Action Program (CAP), an individual subappendix was developed for each issue. Each subappendix includes: a definition of the issue; issue resolution; and corrective and preventive action.

The preventive actions are embodied in the procedures, the instrumentation installation specification and the Design Basis Documents (DBDs) developed and used in the instrumentation and controls portion of the Corrective Action Program (CAP). These procedures, the instrumentation installation specification and Design Basis Documents (DBDs) resolve the instrumentation and controls Corrective Action Program (CAP) issues. Implementation of these preventive actions can assure that the design and hardware for CPSES Unit 1 and Common will continue to comply with the licensing commitments throughout the life of the plant as described in Section 5.4.

Corrective Action Program (CAP) issues contained in Appendix B are listed below:

Issue No.	Issue Title
B1	SDAR CP-87-16, Limit Switch Wiring
B2	SDAR CP-87-44, Unistrut Tubing Support Bolting
B3	SDAR-CP-87-54, Class 1E MOV Motor Starters
B4	SDAR-CP-87-104, Safety System Setpoint Calculation Errors
B5	SDAR CP-87-128, Loss of Control Power Indication
B6	SDAR CP-87-135, Control Room Air Conditioning and Primary Plant Ventilation System
B7	SDAR CP-88-05, Auxiliary Feedwater System Instrumentation Electrical Separation
B8	SDAR CP-88-13, Auxiliary Feedwater System Air Accumulators
B9	SDAR CP-88-18, Post Accident Monitoring Instrumentation
B10	SDAR CP-88-21, Instrument Tubing Clamps
B11	SDAR CP-88-20, High Energy Line Break (HELB) Detection and Mitigation
B12	SDAR CP-88-19, Cable Insulation Resistance - Loop Accuracy
B13	SDAR-CP-88-25, Auxiliary Feedwater Pump Turbine Control Panel

SUBAPPENDIX B1

SDAR CP-87-16, LIMIT SWITCH WIRING

1.0 Definition of the Issue

The issue was that some cables of safety-related limit switches were terminated incorrectly and/or not in accordance with design requirements due to lack of detailed wiring requirements on wiring diagrams, which also affected cable routing documents.

2.0 Issue Resolution

SWEC resolved the issue by developing a Field Verification Method (FVM) (Reference 4.1) which is being used during the Post Construction Hardware Validation Program (PCHVP) engineering walkdowns to record the as-built configuration for each safety-related limit switch, consisting of its model number, assigned tag number for unique identification and terminal and field wiring designations. This as-built configuration is being reviewed against validated electrical schematic diagrams. During this review, the limit switch tag numbers and terminal and field wiring designations are being incorporated on electrical schematic and wiring diagrams. The discrepancies between validated electrical schematic diagrams, wiring diagrams and the as-built configuration from engineering walkdowns are corrected by revising the wiring diagrams, cable routing documents and/or by rewiring of the affected limit switches. In addition, the safety-related limit switch tag numbers are added on the cable routing documents. All safety-related limit switches are to be permanently tagged with their assigned tag number.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of this issue.

This issue was determined to be reportable under the provisions of 10CFR50.55(e). It was reported as Significant Deficiency Analysis Report (SDAR) CP-87-16 in letter number TXX 88156, dated January 29, 1988, from TU Electric to NRC.

3.1 Corrective Action

A Field Verification Method (FVM) (Reference 4.1) has been developed and is being used during the Post Construction Hardware Validation Program (PCHVP) engineering walkdowns to record the as-built configuration for each safety-related limit switch, consisting of its model number, assigned tag number for unique identification and terminal and field wiring designations. This as-built configuration is being reviewed against validated electrical schematic diagrams. During this reivew, the limit switch tag numbers and terminal and field wiring designation are being incorporated on electrical schematic and wiring diagrams.

The discrepancies between validated electrical schematic diagrams, wiring diagrams and the as-built configuration from engineering walkdowns are corrected by revising the wiring diagrams, cable routing documents and/or by rewiring of the affected limit switches. In addition, the safety-related limit switch tag numbers are added on the cable routing documents. All safety-related limit switches are to be permanently tagged with their assigned tag number.

3.2 Preventive Action

Electrical schematic and wiring diagrams and cable routing documents which are being revised by SWEC to show detailed wiring requirements by incorporating the model and tag numbers and terminal and field wiring designations for each safety-related limit switch and permanent tagging of safety-related limit switches assure correct wiring terminations.

In addition, the design criteria as specified in the Design Basis Document (DBD) (Reference 4.2) assure that terminal block and control components shown on the drawings are properly identified. TU Electric procedure (Reference 4.3) assures that non-conformances with the design drawing during start-up testing, if identified, are properly dispositioned and the affected drawings updated.

4.0 References

4.1 Field Verification Method, Post Construction Hardware Validation (PCHV) Program, Engineering Walkdowns, CPE-SWEC-FVM-EE/ME/IC/CS-089, Revision 2

4.2 CPSES Design Basis Document DBD-EE-054, Control Circuits Parameters/ Loading Requirements, Revision 1

4.3 TU Electric-Generating Division, Nuclear Engineering and Operations Procedure NEO 3.06, Reporting and Control of Deficiencies, Revision 1

SUBAPPENDIX B2

SDAR CP-87-44, UNISTRUT TUBING SUPPORT BOLTING

1.0 Definition of the Issue

The issue was that incorrect bolts may exist on Unistrut tubing supports due to lack of bolt material requirements in the installation specification.

2.0 Issue Resolution

SWEC resolved this issue by revising the instrumentation installation specification (Reference 4.1) and installation drawings (Reference 4.2) to require proper bolt material identification. A Field Verification Method (FVM) (Reference 4.3) has been developed to locate bolts without material identification during the Post Construction Hardware Validation Program (PCHVP). The affected bolts that do not comply with the requirements of the instrumentation installation specification (Reference 4.1) are being replaced with bolts made of the correct material.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of this issue.

This issue was determined to be reportable under the provisions of 10CFR50.55(e). It was reported as Significant Deficiency Analysis Report (SDAR) CP-87-44 in letter number TXX-88132, dated January 29, 1988, from TU Electric to NRC.

3.1 Corrective Action

The instrumentation installation specification (Reference 4.1) and installation drawings (Reference 4.2) have been revised to require proper bolt material identification. A Field Verification Method (FVM) (Reference 4.3) has been developed to locate bolts without material identification during the Post Construction Hardware Validation Program (PCHVP). The affected bolts that do not comply with the requirements of the instrumentation installation specification (Reference 4.1) are being replaced with bolts made of the correct material.

3.2 Preventive Action

The revised installation specification (Reference 4.1) and installation drawings (Reference 4.2) require proper bolt material identification. The construction procedure (Reference 4.4) and the Quality Control (QC) inspection procedure (Reference 4.5) are now consistent with the instrumentation installation specification (Reference 4.1).

4.0 References

4.1 Specification CPES-I-1018, Installation of Piping/Tubing and Instrumentation, Revision 1

4.2 Instrument Installation Drawings Series 2323-I-001-T02, T03, T05, T06, T09, T09B, T11, T12, and T13

4.3 Field Verification Method, Post-Construction Hardware Validation Program (PCHVP)-Construction/Quality Control Reverification, CPE-SWEC-FVM-EE/ME/IC/CS-086, Revision 2

4.4 CPSES Installation Procedure ICP-4, Installation and Inspection of Instrumentation and Associated Tubing/Piping, Revision 9

4.5 CPSES NEO Quality Assurance Department Procedure NQA 3.09-5.01, Inspection of Instrumentation Components, Revision 1

SUBAPPENDIX B3

SDAR CP-87-54, CLASS 1E MOV MOTOR STARTERS

1.0 Definition of the Issue

The issue was that two safety-related motor operated valves (MOVs) for containment isolation of a dry pipe fire protection supply line used thermal overloads in their motor starter control circuits which do not comply with licensing commitments.

2.0 Issue Resolution

SWEC resolved the issue by developing a design change in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1). The design change results in disconnecting the thermal overload from the motor starter control circuit and connecting it to an alarm circuit. The design change is being implemented.

3.0 Corrective and Preventive Action

No additional issue were identified during the review and resolution of this issue.

This issue was determined to be reportable under the provisions of 10CFR50.55(e). It was reported as Significant Deficiency Analysis Report (SDAR) CP-87-54, in letter number TXX-88137, dated January 28, 1988, from TU Electric to the NRC.

3.1 Corrective Action

A design change was developed in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1). The design change results in the disconnecting the thermal overload from the motor starter control circuit and connecting it to an alarm circuit. The design change is being implemented.

3.2 Preventive Action

The design criteria for the motor starter control circuit thermal overload for the safety-related motor operated valves are specified in the Design Basis Document (DBD) (Reference 4.1).

4.0 References

4.1 CPSES Design Basis Document DBD-EE-053, Starter Control Circuit Parameters/Requirements, Revision 1

SUBAPPENDIX B4

SDAR CP-87-104, SAFETY SYSTEM SETPOINT CALCULATION ERRORS

1.0 Definition of the Issue

The issue was that Westinghouse-Nuclear Steam Supply System Supplier, in the preparation of instrument setpoint calculations for six safety-related instruments, did not consider inaccuracies of the calibration equipment.

2.0 Issue Resolution

Westinghouse has been notified of the issue and is performing an evaluation of their instrument setpoint calculations for six affected safety-related instruments to include consideration of the calibration equipment accuracy.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of this issue.

This issue was determined to be reportable under the provisions of 10CFR50.55(e). It was reported as Significant Deficiency Analysis Report (SDAR) CP-87-104 in letter number TXX-88142, dated January 25, 1988, from TU Electric to the NRC.

3.1 Corrective Action

Westinghouse is performing an evaluation of instrument setpoint calculations for six affected safety-related instruments which includes consideration of the calibration equipment accuracy.

3.2 Preventive Action

SWEC design control Project Procedure PP-012 (Reference 4.1) specifies requirements for interfaces with Westinghouse to assure proper communication of design data. The existing CPSES calibration procedures (Reference 4.2) specify either the calibration equipment or the criteria for selection of the calibration equipment to be used for calibration of all safety-related instruments.

In addition, a Design Basis Document (DBD), which specifies design criteria for nuclear steam supply system instrument setpoint calculations using the methodology specified in the Westinghouse evaluation, is being prepared to assure consistent execution in performance of setpoint calculations.

4.0 References

4.1 SWEC CPSES Project Procedure PP-012, Westinghouse Interface, Revision 1

4.2 CPSES calibration procedures INC-4000A and X series and surveillance test procedures 7000A and X series

SUBAPPENDIX B5

SDAR CP-87-128, LOSS OF CONTROL POWER INDICATION

1.0 Definition of the Issue

The issue was that a lack of indicating lights existed for the surveillance monitoring of the power supply to the control circuit for some safety-related equipment.

2.0 Issue Resolution

SWEC resolved the issue by developing a design change in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1) to modify the affected control circuits. The modification results in addition of monitoring lights, easily accessible for surveillance, to each affected control circuit. The design change is being implemented.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of this issue.

This issue was determined to be reportable under the provisions of 10CFR50.55(e). It was reported as Significant Deficiency Analysis Report (SDAR) CP-87-128 in letter number TXX-88032, dated January 6, 1988, from TU Electric to NRC.

3.1 Corrective Action

A design change was developed in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1) to modify the affected control circuits. The modification results in addition of monitoring lights, easily accessible for surveillance, to each affected control circuit. The design change is being implemented.

3.2 Preventive Action

The design criteria for monitoring of power supplies to safety-related control circuits are specified in the Design Basis Document (DBD) (Reference 4.1).

4.0 References

4.1 CPSES Design Basis Document DBD-EE-054, Control Circuit Parameters/Loading Requirements, Revision 1

SUBAPPENDIX B6

SDAR-CP-87-135, CONTROL ROOM AIR CONDITIONING AND PRIMARY PLANT VENTILATION SYSTEM

1.0 Definition of the Issue

The issues were:

1.1 Control Room Air Conditioning

A control circuit to initiate the emergency recirculation signal for the control room air conditioning was not designed in compliance with the single failure criterion.

1.2 Primary Plant Ventilation System

Non-safety-related instruments and non-safety-related electrical starters are used to terminate the operation of the primary plant ventilation supply fans. The primary plant ventilation supply fans are non-safety-related, however, timely termination of their operation is required following a Loss of Coolant Accident (LOCA) to assure that allowable radiological doses for the control room are not exceeded.

2.0 Issue Resolution

2.1 Control Room Air Conditioning

SWEC resolved the issue by developing a design change in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1) to modify the control circuit for initiation of the emergency recirculation signal for the control room air conditioning. The modification results in a control circuit design in compliance with the single failure criterion. The design change is being implemented.

2.2 Primary Plant Ventilation System

SWEC resolved the issue by preparing a calculation in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.2). This calculation shows that the the primary plant ventilation system supply fans can be terminated beyond the 30 minutes committed in the FSAR for operator action outside of the control room following a Loss of Coolant Accident (LOCA) without exceeding the allowable offsite and control room radiological doses. SWEC identified changes to station emergency operating procedures which are being revised to incorporate the requirement that the control room operator dispatch personnel to manually disconnect the power supply to the supply fans.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of this issue.

This issue was determined to be reportable under the provisions of 10CFR50.55(e). It was reported as Significant Deficiency Analysis Report (SDAR) CP-87-135 in letter number TXX 88170, dated January 29, 1988, from TU Electric to the NRC.

3.1 Corrective Action

3.1.1 Control Room Air Conditioning

A design change was developed in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1) to modify the control circuit for initiation of the emergency recirculation signal for the control room air conditioning. The modification results in a control circuit design in compliance with the single failure criterion. The design change is being implemented.

3.1.2 Primary Plant Ventilation System

A calculation was prepared in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.2). This calculation shows that the primary plant ventilation system supply fans can be terminated beyond the 30 minutes committed in the FSAR for operator action outside of the control room following a Loss of Coolant Accident (LOCA) without exceeding the allowable offsite and control room radiological doses. The primary plant ventilation supply fan is not terminated. SWEC identified changes to station emergency operating procedures which are being revised to incorporate the requirement that the control room operator dispatch personnel to manually disconnect the power supply to the supply fans.

3.2 Preventive Action

3.2.1 Control Room Air Conditioning

The design criteria for compliance with the single failure criterion for the safety-related control circuit designs are specified in the Design Basis Document (DBD) (Reference 4.1)

3.2.2 Primary Plant Ventilation System

The design criteria for instrumentation and control circuit designs to accomplish a safety function (Reference 4.1) combined with the design criteria for the functional requirements of the primary plant ventilation system

(Reference 4.3) and design criteria for classification of structures, systems and components (Reference 4.4) assure proper instrumentation and control system design.

4.0 References

4.1 CPSES Design Basis Document DBD-EE-054, Control Circuit Parameters/Loading Requirements, Revision 1

4.2 CPSES Design Basis Document DBD-ME-003, Control Room Habitability, Revision 1

4.3 CPSES Design Basis Document DBD-ME-309, Primary Plant Ventilation System, Revision 1

4.4 CPSES Design Basis Document DBD-ME-028, Classification of Structures, Systems and Components, Revision 1

SUBAPPENDIX B7

SDAR CP-88-05, AUXILIARY FEEDWATER SYSTEM INSTRUMENTATION ELECTRICAL SEPARATION

1.0 Definition of the Issue

The issue was that no electrical isolation was provided between safety-related power supply and the non-safety-related instrument in the auxiliary feedwater system.

2.0 Issue Resolution

SWEC resolved the issue by developing a design change in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1). The design change results in the addition of an isolation device which provides electrical isolation between the safety-related power supply and the non-safety-related instrument. The design change is being implemented.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of this issue.

This issue was determined to be reportable under the provisions of 10CFR50.55(e). It was reported as Significant Deficiency Analysis Report (SDAR) CP-88-05 in letter number TXX-88141, dated January 25, 1988, from TU Electric to the NRC.

3.1 Corrective Action

A design change was developed in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1). The design change results in the addition of an isolation device which provides electrical isolation between the safety-related power supply and the non-safety-related instrument. The design change is being implemented.

3.2 Preventive Action

The design criteria for electrical isolation between the safety-related power supply and the non-safety-related instrument are specified in the Design Basis Document (DBD) (Reference 4.1).

4.0 References

4.1 CPSES Design Basis Document DBD-EE-057, Separation Criteria, Revision 1

SUBAPPENDIX B8

SDAR CP-88-13, AUXILIARY FEEDWATER SYSTEM AIR ACCUMULATORS

1.0 Definition of the Issue

The issue was that the air accumulators for control valves in the auxiliary feedwater system were not properly sized.

2.0 Issue Resolution

SWEC resolved the issue by developing a design change to increase the capacity of the air accumulators in accordance with the results of a replacement calculation which is based on the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1). The design change is being implemented.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of this issue.

This issue was determined to be reportable under the provisions of 10CFR50.55(e). It was reported as Significant Deficiency Analysis Report (SDAR) CP-88-13 in letter number TXX-88138, dated January 25, 1988, from TU Electric to the NRC.

3.1 Corrective Action

A design change to increase the capacity of air accumulators was developed in accordance with the results of a replacement calculation which is based on the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1). The design change is being implemented.

3.2 Preventive Action

The design criteria for the sizing of air accumulators for control valves in the auxiliary feedwater system are specified in the Design Basis Document (DBD) (Reference 4.1). The design criteria for the sizing of air accumulators for control valves in other safety-related systems are specified in their respective Design Basis Documents (DBDs) (References 4.2 through 4.4).

4.0 References

4.1 CPSES Design Basis Document DBD-ME-206, Auxiliary Feedwater System, Revision 1

4.2 CPSES Design Basis Document DBD-ME-250, Reactor Coolant System, Revision 0

4.3 CPSES Design Basis Document DBD-ME-202, Main Steam, Reheat and Steam Dump System, Revision 1

4.4 CPSES Design Basis Document DBD-ME-304, Control Room Air Conditioning System, Revision 1

SUBAPPENDIX B9

SDAR CP-88-18, POST ACCIDENT MONITORING INSTRUMENTATION

1.0 Definition of the Issue

The issue was that insufficient indication was provided in the control room for the reactor coolant pressure and temperature variables required for post accident monitoring.

2.0 Issue Resolution

SWEC resolved the issue by developing a design change in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1). The design change results in addition of one pressure transmitter and one indicating recorder for reactor coolant pressure monitoring and four temperature indicating recorders for reactor coolant temperature monitoring. All five indicating recorders are located in the control room. The design change is being implemented.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of this issue.

This issue was determined to be reportable under the provisions of 10CFR50.55(e). It was reported as Significant Deficiency Analysis Report (SDAR) CP-88-18, in letter number TXX-88144, dated January 25, 1988, from TU Electric to the NRC.

3.1 Corrective Action

A design change was developed in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1). The design change results in addition of one pressure transmitter and one indicating recorder for reactor coolant pressure monitoring and four temperature indicating recorders for reactor coolant temperature monitoring. All five indicating recorders are located in the control room. The design change is being implemented.

3.2 Preventive Action

The design criteria for post accident monitoring are specified in the Design Basis Document (DBD) (Reference 4.1).

4.0 References

4.1 CPSES Design Basis Document DBD-EE-004, Accident Monitoring Instrumentation, Revision 1

SUBAPPENDIX B10

SDAR CP-88-21, INSTRUMENT TUBING CLAMPS

1.0 Definition of the Issue

The issue was that J. C. White three-directional tube clamps are functionally inadequate if attached directly to concrete or Unistrut channels.

2.0 Issue Resolution

SWEC, with vendor's concurrence, developed a new three-directional tube clamp design which remains functionally adequate when attached directly to concrete or Unistrut channels. The instrumentation installation drawings (Reference 4.1) and installation specification (Reference 4.2) have been revised to reflect the new three-directional tube clamp design and acceptance criteria for installations on concrete and Unistrut channels. Based on the revised installation drawings (Reference 4.1) and installation specification (Reference 4.2), SWEC identified changes to the construction procedure (Reference 4.3) to include the correct installation methods and the Quality Control (QC) inspection procedure (Reference 4.4) to incorporate required inspection attributes. During the Post Construction Hardware Validation Program (PCHVP), engineering walkdowns are being performed in accordance with a Field Verification Method (FVM) (Reference 4.5) to identify J. C. White three-directional tube clamps installed directly on concrete or Unistrut channel. Those identified J. C. White three-directional tube clamps are being replaced.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of this issue.

This issue was determined to be reportable under the provisions of 10CFR50.55(e). This issue was reported as Significant Deficiency Analysis Report (SDAR) CP-88-21 in letter number TXX-88140, dated January 29, 1988, from TU Electric to the NRC.

3.1 Corrective Action

The instrumentation installation specification (Reference 4.2) and the installation drawings (Reference 4.1) have been revised to include the new three-directional tube clamp design which remains functionally adequate when attached directly to concrete or Unistrut channels. Based on the revised instrumentation installation specification and installation drawings SWEC identified changes to the construction procedure (Reference 4.3) to include the correct installation methods and the Quality Control (QC) inspection procedure (Reference 4.4) to incorporate required inspection attributes. During the Post Construction Hardware Validation Program (PCHVP), engineering walkdowns are being performed in accordance with a Field Verification Method

(FVM) (Reference 4.5) to identify J. C. White three-directional tube clamps installed directly on concrete or Unistrut channels. Those identified J. C. White three-directional clamps are being replaced.

3.2 Preventive Action

The instrumentation installation specification (Reference 4.2), the instrumentation installation drawings (Reference 4.1), the construction procedure (Reference 4.3) and the Quality Control (QC) inspection procedure (Reference 4.4) have been revised to incorporate new three-directional tube clamp requirements for installations on concrete or Unistrut channels.

4.0 References

4.1 Instrumentation Installation Drawings 2323-I-001-series

4.2 Specification CPSES-I-1018, Installation of Piping/Tubing and Instrumentation, Revision 1

4.3 CPSES Installation Procedure ICP-4, Installation and Inspection of Instrumentation and Associated Tubing/Piping, Revision 9

4.4 CPSES Quality Control Procedure NQA 3.09-5.01, Inspection of Instrumentation Components, Revision 1

4.5 Field Verification Method (FVM), Safety/Non-Safety-Related Instrumentation and Tubing connected to ASME III Fluid Systems and ANSI Safety Class Installations, CPE-SWEC-FVM-IC-069, Revision 2

SUBAPPENDIX B11

SDAR CP-88-20, HIGH ENERGY LINE BREAK (HELB) DETECTION AND MITIGATION

1.0 Definition of the Issue

The issues were:

1.1 The redundant pressure switches for detection of high energy line breaks in the auxiliary steam system were connected to a common initiation circuit.

1.2 The lack of redundancy in the detection and alarm function for high energy line break in the chemical and volume control system.

2.0 Issue Resolution

2.1 SWEC resolved the issue by developing a design change in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1) to modify the initiation circuit. The modification results in redundant detection/initiation circuits, each connected to a separate power supply. The design change is being implemented.

2.2 SWEC resolved the issue by developing a design change in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1) to modify the detection circuit. The modification results in the addition of a pressure switch and an alarm circuit which is redundant to the existing pressure switch and alarm circuit. The design change is being implemented.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of this issue.

This issue was determined to be reportable under the provisions of 10CFR50.55(e). It was reported as Significant Deficiency Analysis Report (SDAR) CP-88-20 in letter number TXX-88157, dated January 28, 1988, from TU Electric to the NRC.

3.1 Corrective Action

For both issues the design changes were developed in accordance with the design basis criteria as specified in the Design Basis Document (DBD) (Reference 4.1) to modify the affected detection/initiation circuits. The modification for the auxiliary steam system initiation circuit results in redundant detection/initiation circuits, each connected to a separate power supply. The modification for the chemical and volume control system detection circuit results in the addition of a pressure switch and an alarm circuit which is redundant to the existing pressure switch and alarm circuit. Both design changes are being implemented.

3.2 Preventive Action

The design criteria for high energy line break detection and alarm function are specified in the Design Basis Document (DBD) (Reference 4.1).

4.0 References

4.1 CPSEC Design Basis Document DBD-ME-007, Pipe Break Postulation Effects, Revision 1

SUBAPPENDIX B12

SDAR CP-88-19, CABLE INSULATION RESISTANCE-LOOP ACCURACY

1.0 Definition of the Issue

The issue was that elevated temperatures in the containment and in selected areas of high energy line breaks outside the containment during postulated accidents decrease the instrument cable insulation resistance. This may affect the accuracy of safety-related instrument loops/circuits.

2.0 Issue Resolution

SWEC resolved the issue by developing a calculation in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1). This calculation establishes, for each instrument cable type and make, the insulation resistance per linear foot of cable at elevated temperatures. In addition, SWEC revised installation drawings (Reference 4.2) to indicate the requirement for short instrument cable runs in the containment and in selected areas of high energy line breaks outside the containment, and the Design Basis Document (DBD) (Reference 4.3) to require consideration of instrument cable insulation resistance in the determination of safety-related instrument circuits accuracies. During the Post Construction Hardware Validation Program (PCHVP), engineering evaluations (Reference 4.4) are being performed to identify instrument cable lengths, types and makes and to assess the effects of elevated temperatures for each safety-related instrument circuit in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.3). For those safety-related instruments whose circuit accuracy is affected by decreased instrument cable insulation resistance, the deficiency is being corrected by either replacement of the instrument or by rerouting or replacement of the cable. The calculated instrument cable insulation resistances, and cable lengths, types and makes related to Westinghouse-supplied safety-related instruments, are being submitted to Westinghouse as inputs to their engineering evaluation of this issue.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of this issue.

This issue was determined to be reportable under the provisions of 10CFR50.55(e). It was reported as Significant Deficiency Analysis Report (SDAR) CP-88-19 in letter number TXX-88143, dated January 29, 1988, from TU Electric to the NRC.

3.1 Corrective Action

A calculation which establishes, for each instrument cable type and make, the insulation resistance per linear foot of cable at elevated temperatures, was developed in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1). In addition, installation drawings (Reference 4.2) were revised to indicate the requirement for short instrument cable runs in the containment, and in selected areas of high energy line breaks outside the containment and the Design Basis Document (DBD) (Reference 4.3) was revised to require consideration of instrument cable insulation resistance in the determination of safety-related instrument circuits accuracies. During the Post Construction Hardware Validation Program (PCHVP), engineering evaluations (Reference 4.4) are being performed to identify instrument cable lengths, types and makes and to assess the effects of elevated temperatures for each safety-related instrument circuit, in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.3). For those safety-related instruments, whose circuit accuracy is affected by decreased instrument cable insulation resistance, the deficiency is being corrected by either replacement of the instrument or by rerouting or replacement of the cable.

The calculated instrument cable insulation resistances, and cable lengths, types and makes related to Westinghouse-supplied safety-related instruments, are being submitted to Westinghouse as inputs to their engineering evaluation of this issue.

3.2 Preventive Action

SWEC-developed calculation for instrument cable insulation resistance at elevated temperatures, the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1), the revised installation drawings (Reference 4.2) and the design criteria as specified in the revised Design Basis Document (DBD) (Reference 4.3) assure that lengths of instrument cables in the containment and in selected areas of high energy line breaks outside the containment are determined such that the decreased cable insulation resistance does not affect the safety-related instrument circuit accuracy.

In addition, a Design Basis Document (DBD) which specifies design criteria for nuclear steam supply system instrument setpoint calculations, using the methodology specified in the Westinghouse evaluation, is being prepared to assure consistent execution in performance of setpoint calculations.

4.0 <u>References</u>

4.1 CPSES Design Basis Document DBD-ME-076, Postulated Environments for Equipment Qualification, Revision 0

4.2 Penetration Connection Diagrams 2323-E1-0511, Sheet 0A, Revision CP-1 and Connection Diagrams 2323-E1-0118, Revision CP1, -0119, Revision CP1, -0120, Revision CP2, -0121, Revision CP1 and -0133, Revision CP3

4.3 CPSES Design Basis Document DBD-EE-37, Balance-of-Plant Safety Related Setpoints, Revision 1

4.4 TU Electric Engineering and Construction Procedure ECE 9.04-05, Post Construction Hardware Validation (PCHV) Program Engineering Evaluations, Revision 0

SUBAPPENDIX B13

SDAR CP-88-25, AUXILIARY FEEDWATER PUMP TURBINE CONTROL PANEL

1.0 Definition of the Issue

The issue was that the auxiliary feedwater pump turbine control panel was not seismically and environmentally qualified.

2.0 Issue Resolution

SWEC resolved the issue by developing a design change in accordance with the design criteria as specified in the Design Basis Documents (DBDs) (References 4.1, 4.2 and 4.3). The design change results in the requalification of the control panel to meet the seismic and environmental requirements. The design change is being implemented.

3.0 Corrective and Preventive Action

No additional issues were identified during the review and resolution of this issue.

This issue was determined to be reportable under the provisions of 10CFR50.55(e). It was reported as Significant Deficiency Analysis Report (SDAR) CP-88-25 in letter number TXX-88170, dated January 29, 1988, from TU Electric to the NRC.

3.1 Corrective Action

A design change was developed in accordance with the design criteria as specified in the Design Basis Documents (DBDs) (References 4.1, 4.2 and 4.3). The design change results in the requalification of the control panel to meet the seismic and environmental requirements. The design change is being implemented.

3.2 Preventive Action

The design criteria for seismic and environmental qualification for components required to perform a safety function are specified in the Design Basis Documents (DBDs) (References 4.1 and 4.2) and the design criteria for identification of components required to perform safety functions are specified in the Design Basis Document (DBD) (Reference 4.3).

4.0 References

4.1 CPSES Design Basis Document DBD-ME-028, Classification of Structures, Systems and Components, Revision 1

4.2 CPSES Design Basis Document DBD-ME-076, Postulated Environments for Equipment Qualification, Revision 0

4.3 CPSES Design Basis Document DBD-ME-029, Seismic Qualification of Equipment, Revision 0