VALIDATION EFFORTS

FOR

CPSES UNIT 2

APRIL 1992

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ABSTRACT

The purpose of this report is to describe the design and hardware validation programs for Comanche Peak Steam Electric Station Unit 2. These programs are similar to the design and hardware validations programs conducted under the Corrective Action Program (CAP) for Comanche Peak Steam Electric Station Unit 1 and the areas common to Units 1 and 2, as modified to account for the results and lessons learned from CAP. This report also identifies the substantive differences between the Unit 2 programs and the descriptions of the CAP contained in the NRC's Supplemental Safety Evaluation Reports 13 through 20, to the extent that such differences were not previously described in Significant Deficiency Analysis Reports (10 CFR 50.55e) submitted to the NRC.

ABBREVIATIONS

ADC	Advance Design Change
A/E	architect/engineer
ASLB	Atomic Safety and Licensing Board
ASME	American Society of Mechanical Engineers
BOP	Balance of Plant
B&R	Brown & Root
CAD	Computer Aided Drawing
CAP	Corrective Action Program
CAR	Corrective Action Request
CASE	Citizens Association for Sound Energy
CAT	Construction Appraisal Team
CE	Construction Engineerings
CER	Collective Evaluation Report
CPE	Comanche Peak Engineering organization
CPRT	Comanche Peak Response Team
CPSES	Comanche Peak Steam Electric Station
CSR	Collective Significance Report
CTH	Cable Tray Hanger
CYGNA	CYGNA Energy Services
DAP	Design Adequacy Program
DBD	design-basis document
DCA	design change authorization
DR	deficiency report
DSAP	discipline-specific resolution report
DVP	design validation package
EA	engineering assurance
EBASCO	Ebasco Services Incorporated
ECCS	Emergency Core Cooling Systems
EDG	Emergency Diesel Generator
EFE	engineering functional evaluation
FSAR	Final Safety Analysis Report
FSSA	Fire Safe Shutdown Analysis
FVM	field verification method
G&H	Gibbs & Hill, Incorporated
HELB	High Energy Line Break
HVAC	heating, ventilation, and air conditioning system
IE	Office of Inspection and Enforcement
ISAP	issue-specific action plan
ISEG	Independent Safety Engineering Group
IMPELL	Impell Corporation
KDD	Key Design Documents
N/A	not applicable
NCR	nonconformance report
NDE	non-destructive examination
NEO	Nuclear Engineering and Operations
NRC	U. S. Nuclear Regulatory Commission
NSSS	nuclear steam supply system
OBE	Operating Basis Earthquake
PCHVP	Post-Construction Hardware Validation Program
PESD	Pre-Engineered Standard Design
PSR	project status report
PSAS	Pipe Stress and Support

QA	quality assurance
QC	quality control
SAP	startup administrative procedure
SDAR	significant deficiency analysis report
SER	safety evaluation report
SRP	Standard Review Plan
SSE	safe shutdown earthquake
SSER	supplemental safety evaluation report
SSII	Safety System Inoperable Indication
SSW	Station Service Water
STIR	specific technical issue reports
SWEC	Stone & Webster Engineering Corporation
SWO	Stop Work Order
TAP	Technical Audit Program
TDAFWP	Turbine Driven Auxiliary Feedwater Pump
TRT	Technical Review Team
TUE Form	TU Electric Evaluation form
TU Electric	TU Electric Company (formerly TUGCO)

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VALIDATION EFFORTS FOR COMANCHE PEAK STEAM ELECTRIC STATION, UNIT 2

1.0 Introduction

1.1 Purpose

The purpose of this report is to describe the design and hardware validation programs that are being utilized for the Comanche Peak Steam Electric Station (CPSES), Unit 2. These programs are based upon and utilize the results of the Corrective Action Program (CAP) for CPSES Unit 1 and Common (i.e., the areas common to Units 1 and 2).

1.2 Organization of this Report

Section 2.0 provides the background necessary to understand the scope of the validation programs for CPSES, Unit 2. This section includes a description of the history of the project and the CAP programs for Unit 1 and Common.

Section 3.0 provides an overview of the validation activities for Unit 2. More detailed descriptions of the design and hardware validation activities for Unit 2 are described in sections 4.0 and 5.0, respectively.

Section 6.0 discusses the Quality Assurance (QA) and Overview activities for the design and hardware validation of Unit 2. This section also contains a discussion of the self-assessment activities being performed during the Unit 2 design and hardware validation.

Section 7.0 discusses special aspects of the Unit 2 validation activities for the various CAP disciplines.

Section 8.0 presents the overall conclusions regarding the design and hardware validation activities for Unit 2.

2.0 Background

2.1 Early History of the Project

A Limited Work Authorization was issued on October 17, 1974 allowing TU Electric to begin construction of CPSES. On December 19, 1974, the construction permits were issued for CPSES.

The principal contractors for the construction of CPSES were as follows: the Nuclear Steam Supply System (NSSS) vendor was Westinghouse, the architect/engineer (A/E) was Gibbs and Hill, Inc., and the primary construction contractor was Brown & Root, Inc. (Brown & Root). By 1983, the construction of Unit 1 was almost complete.

On December 28, 1983, the Atomic Safety and Licensing Board (ASLB) in the CPSES operating license (OL) hearings issued an order which identified concerns regarding quality assurance (QA) for the design of piping and pipe supports at CPSES. As a result, the ASLB suggested that TU Electric consider performing an independent design review. In response to the ASLB decision, TU Electric contracted Cygna Energy Services (Cygna) to perform an independent assessment of the adequacy of CPSES design work.

Beginning in early 1984, the NRC formed a special Technical Review Team (TRT) to provide a coordinated and integrated evaluation of the technical concerns related to the construction and the design of CPSES. The results of the TRT evaluations and

inspections were reported in Supplements 7 through 11 of NUREG-0797 "Safety Evaluation Report Related to the Operation of Comanche Peak Steam Electric Station, Units 1 and 2" (SSERs 7 to 11).

2.2 Establishment of CPRT

In response to early TRT findings, TU Electric formed the Comanche Peak Response Team (CPRT) to investigate and respond to the issues raised by the TRT. The CPRT program was subsequently revised on several occasions to include an examination of issues raised by additional sources, including: the ASLB in the CPSES OL hearings; Citizens Association for Sound Energy (CASE) - the intervenor in those hearings; a number of additional reports issued by the NRC staff; as well as several self-initiated reviews of the adequacy of the design and construction of CPSES.

The CPRT program plan consisted of 46 Issue Specific Action Plans (ISAPs) that responded to the NRC's TRT issues and external source issues; a self-initiated ISAP VII.c, "Construction Reinspection/Documentation Review," to evaluate the quality of construction of CPSES; and a self-initiated Design Adequacy Program (DAP) consisting of several Discipline-Specific Action Plans (DSAPs). As a result of the implementation of these plans, the CPRT identified a number of findings which required corrective action.

Additionally, the CPRT performed an evaluation of the collective results of the implementation of the ISAPs. This evaluation is contained in the Collective Evaluation Report (CER), which includes an evaluation of the overall quality of construction; of the QA programs, as they pertain to construction; and of the testing program for CPSES. The CER concluded that upon completion of the corrective actions recommended by the CPRT, there would be reasonable assurance that CPSES systems, structures, and components would meet the safety related requirements of the October 1985 design (or applicable latter design).

The CPRT also issued a Collective Significance Report (CSR) to provide an integrated perspective of the results of the CPRT investigative and overview activities, and an evaluation of the adequacy of CPSES design, in particular. The CSR concluded that the Corrective Action Program provided an adequate means for validating design and hardware at CPSES and provided reasonable assurance that structures, systems and components would be capable of performing their intended functions.

2.3 Establishment of the Corrective Action Program

TU Electric decided to implement a comprehensive Corrective Action Progr~m (CAP) to validate the safety-related design and construction of CPSES, Unit 1 and the common areas between the

two units.1/ TU Electric decided that the appropriate method for dealing with the broad issues raised by the CPRT and for correcting any other issues that potentially existed at CPSES was through an integrated program rather than a separate program for each issue. The purposes of the CAP were to:

- Demonstrate that the design of safety-related systems, structures and components complied with the licensing commitments.
- Demonstrate that the existing systems, structures and components were in compliance with the design; or develop modifications which brought the 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 CAP was a comprehensive program that validated both the design and hardware at CPSES, including resolution of specific CPRT and external issues.

TU Electric contracted with Stone & Webster Engineering Company (SWEC), Ebasco Services Incorporated (Ebasco) and Impell Corporation (Impell) to perform the CAP. As part of the CAP, safety systems were divided into the following eleven disciplines

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1/ Portions of selected nonsafety-related systems, structures and components were included in the CAP. These non-safety-related systems included seismic Category II systems structures and components as well as fire protection systems. However, the NSSS design and vendor hardware design and their respective QA/QC programs were not included in the CAP. The interface between NSSS vendor designs and that of the disciplines listed below were also included in the CAP.

and the responsibility for their validation was awarded to the following contractors:

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

2.4 Design Validation Program

The design validation portion of the CAP identified the design-related licensing requirements and commitments for CPSES Unit 1 and Common areas. These requirements and commitments formed the bases for the design validation effort and were assembled in Design Basis Documents (DBDs). As the DBDs were developed, the design documentation, and identified design problems, were reviewed against the design bases (contained in the DBDs) to ensure that the design satisfied the licensing requirements and commitments.

The design calculations, drawings, and specifications were reconciled with the DBDs and licensing commitments. The design

validation effort also resulted in revisions to the installation specifications to bring them in line with current industry standards. The validated installation specifications also contained the field verification requirements necessary to assure that the as-built hardware complied with the validated design.

The design validation effort within the eleven CAP disciplines was accomplished and documented in smaller workable packages called design validation packages (DVPs). The hardware validation of the pre-existing Unit 1 design was performed using the field verification requirements in the installation specifications and is described in Section 2.5 below. Any discrepancies identified during the hardware validation were reconciled by either correcting the hardware or modifying the design. Thus, the design validation portion of CAP was structured to provide reasonable assurance that the Unit 1 and Common design and hardware met licensing requirements and commitments.

2.5 Post-Construction Hardware Validation Program

The hardware validation portion of the CAP was implemented by the Post Construction Hardware Validation Program (PCHVP). The purpose of the PCHVP was to demonstrate that as-built systems, structures, and components were in compliance with the installation specifications (validated design), or to identify

modifications that were necessary to bring the hardware into compliance with the validated design.

As discussed above, the Unit 1 validated installation specifications included the hardware inspection requirements for new and modified installations. These requirements (inspection attributes) formed the basis for the PCHVP Attribute Matrix. This matrix was a complete set of final acceptance attributes for installed commodities. The final acceptance attributes were verified by either physical validation or engineering evaluation.

Physical validation of an attribute by quality control (QC) inspection or engineering walkdowns was performed if any one of the following criteria was satisfied:

- CPRT recommended reinspecting;
- Design validation resulted in a change to the design or acceptance criteria; or
- Design validation resulted in new work, including modification of existing hardware.

If the CPRT had no recommendation, and the latter two conditions did not apply, then the attribute was accepted through an engineering evaluation based on the results of the CPRT investigation as well as other available documentation. Additionally, if an attribute was inaccessible, an engineering evaluation was performed to validate the acceptability of the attribute.

TU Electric procedures permitted physical validation of an attribute to be curtailed if sufficient confirmatory evidence had been collected to provide a well-documented basis for determining the acceptability of the attribute. Justification for curtailment was documented in an engineering evaluation.

The initial evaluation and the QC inspection or engineering evaluation of selected attributes were procedurally controlled. This process was structured to provide reasonable assurance that the final configuration of the Unit 1 and Common hardware met the validated design.

2.6 Assurance Activities for CAP

In 1987, TU Electric created a Technical Audit Program (TAP) to evaluate the adequacy of the engineering products (e.g. DBDs, calculations, drawings and specifications) and the implementation of QA programs under the CAP. Deficiencies identified in the TAP audits were subject to corrective actions.

Stone and Webster also performed an Engineering Functional Evaluation (EFE) which consisted, in part, of a "vertical slice" evaluation of the design and hardware validation activities within several of the CAP disciplines using qualified and experienced engineers.

Finally, the Engineering Assurance (EA) section of TU Electric's Comanche Peak Engineering (CPE) conducted technical evaluations and surveillance of engineering activities to assure

technical adequacy and compliance with quality control procedures and licensing commitments.

2.7 NRC Approval of CAP

The NRC Staff approved the revised CPRT program and CAP on January 22, 1988. The results of the design validation program and a description of the PCHVP were transmitted to the NRC in the form of a Project Status Report (PSR) for each of the CAP disciplines. The NRC evaluated the CPRT and CAP activities for Unit 1 and Common in each of the eleven design disciplines and prepared Supplemental Safety Evaluation Reports (SSERs) No. 13 through 20. These SSERs concluded that the CPRT and CAP programs were acceptable.

3.0 Overview of Unit 2 Activities

At the time the CAP was established, Unit 1 was closer to being completed than Unit 2. Additionally, in the Spring of 1988, TU Electric temporarily stopped substantial design and construction activities for Unit 2. These and other factors led TU Electric to apply the CAP to Unit 1 and Common areas only and to develop validation strategies for Unit 2 that took into account the results of the CAP for Unit 1 and Common.

In an attachment to an April 14, 1988 letter (TXX-88373) to the NRC staff, TU Electric described its approach for validation on Unit 2. In a May 19, 1989, letter (TXX-89271) to the NRC staff, TU Electric provided further information on the approach and program enhancements for completing Unit 2 commodities in the common areas. TU Electric further described the methods for Unit 2 validation activities during meetings on May 9 and 11, 1989 and July 17, 1990 with the NRC staff.

The scope of validation programs for Unit 2 is the same as that for Unit 1 and Common. Thus, the validation programs for Unit 2 apply to the same scope of activities and the same disciplines identified previously in Section 2.3. The Unit 2 programs do not apply to those systems and structures common to Units 1 and 2 that were previously validated under CAP.

As described in TXX-88373, the same basic approach is being taken to the validation of Unit 2 as was utilized under the CAP.

In general, the review and completion of the Unit 2 design are being performed using the same relevant technical methods, technical procedures and design control procedures used for Unit 1 and Common. The resolution of CPRT findings, as well as the resulting corrective and preventive actions taken or committed to by TU Electric under the CAP, are being addressed in the validation activities for CPSES Unit 2.

To the extent that corrective actions were taken with respect to hardware on Unit 1, equivalent actions are being taken on the corresponding hardware of Unit 2. However, the corrective actions for Unit 2 also utilize the lessons learned from the Unit 1 program. TU Electric reviewed the Unit 1 program upon completion to evaluate and document the lessons learned to be applied to Unit 2. To the extent that corrective or preventive actions relating to hardware for Unit 1 were of a programmatic nature, such as changes in installation specifications, construction procedures or QC inspection procedures, such enhancements of TU Electric's programs are being applied to the completion of Unit 2.

In some cases (e.g., cable tray and pipe supports), validation activities for Unit 2 were performed under CAP prior to the resumption of substantial Unit 2 design activities in 1990. These validation activities were reviewed to assure their continued applicability to Unit 2.

TU Electric's Nuclear Engineering Organization (NEO) provides a unified approach to the management and control of all Unit 2 activities including validation. The TU Electric Unit 2 Project Manager provides overall direction for validation activities. The Unit 2 project organization is discipline oriented, with the discipline leads responsible for the activities within each discipline. The discipline oriented organization is conducive to performance in several areas: teamwork; consistency and continuity in decisionmaking; accountability; and involvement of high-level managers in solving major problems. This organization also allows appropriate technical resources to bear on issues as they are identified in the Unit 2 validation program.

Unit 2 activities are divided into the following major work areas and were awarded to the corresponding contractors:

Unit 2 Activities	Engineering Contractors	Design and Construction Disciplines 2/
Scope A - Pipe and Pipe Support	Bechtel	Large and Small Bore Piping and Supports (less ASME Class 1)

2/This is a general breakdown of responsibilities and minor differences may exist.

Scope B - System Design	SWEC	Mechanical - Systems Interaction (Flooding (Analysis) - Fire Protection Electrical Instrumentation and Control Heating Ventilation and Air Conditioning Environmental Qualification
Scope C - Suspended Systems & Civil/Structure	ABB Impell	Cable Trays and Cable Tray Hangars Conduit Supports HVAC Supports Civil/structural Seismic Qualification Systems Interaction (less Flooding Analysis)
Scope D - NSSS	Westinghouse	ASME Class 1 Piping and Supports NSSS related activity
Scope E - Computer Aided Drawing (CAD) and Miscellaneous	TU Electric	Electrical (6.9 kV) Plant Computer Nuclear Engineering

Brown & Root continues to be the construction contractor and the ASME certificate holder for Unit 2. SWEC is providing non-ASME QC services during the completion of Unit 2 construction.

4.0 Design Validation Activities

In reviewing and completing the design validation for Unit 2, full use is being made of the completed design for Unit 1 and Common. In general, the same technical methods, procedures and TU Electric design control measures used in the CAP for Unit 1 are being applied in the validation of Unit 2. As indicated above, corrective or preventive actions taken for Unit 1 are being applied to Unit 2.

4.1 Design Validation Process

As discussed in TU Electric letter TXX-91337 dated September 20, 1991, the Unit 2 design validation program has been structured around the concept of Key Design Documents. The Key Design Documents are those design documents which establish design criteria, approach, methodology, or otherwise define the design. Key Design Documents include safety-related Design Basis Documents (DBDs), flow diagrams, Instrument and Control Diagrams, one-line diagrams, calculations, and specifications.

Because of the similarity between Units 1 and 2, a complete review of the existing Unit 2 design documents was unnecessary. The DBDs developed during the Unit 1 CAP are applicable to Unit 2 also. Thus, the same technical methods and design criteria used to validate Unit 1 are equally applicable to Unit 2. Consequently, the primary validation effort for Unit 2 involves incorporating the results of the Unit 1 CAP (hardware

modifications, additional analyses) into the Unit 2 design, making allowances for any differences between the two units. Unit differences identified during Unit 2 validation are evaluated for acceptability and included in the applicable DBDs. In addition to incorporating the CAP results, the Unit 2 validation effort involves a continual review of approved Unit 1 design modifications for applicability to and incorporation in the Unit 2 design.

Unit 2 calculations use, to the extent practicable, the calculations developed for Unit 1. Unit 2 personnel evaluate the applicability of the inputs and assumptions in the Unit 1 calculations and either accept the Unit 1 calculations as applicable for Unit 2, or perform any additional analyses to confirm the acceptability of the Unit 2 design. In some disciplines, such as pipe stress and supports, where comparisons to the Unit 1 calculations are inappropriate, a unique analysis is performed to validate the Unit 2 design.

As in the CAP, there are also circumstances where a single analysis is being used to verify that design criteria for a series of similar installations are satisfied. For example, during the design validation of Unit 2, boundary analyses (where the most restrictive configuration is used to validate a series of similar designs) and similarity analyses (where validation of a single analysis is used to validate a like set of analyses) are

being used. However, there are circumstances, such as ASME stress reconciliations, where it is necessary to perform a unique analysis to validate the Unit 2 design.

In general, unique installation specifications have been developed for Unit 2. These specifications were developed from the Unit 1 installation specifications, incorporating the lessons learned from the CAP effort. These Unit 2 specifications conform to the DBD requirements and incorporate applicable commitments. Unit 2 specifications define technical and inspection requirements. Construction and inspection requirements are extracted from these specifications and incorporated in the contractor's integrated work procedures, which are subject to engineering concurrence.

An important part of the Unit 2 design validation is the review of Key Design Drawings (KDDs) (e.g., flow diagrams, interconnection diagrams, electrical one-line diagrams, and other drawings that are necessary to establish the Unit 2 design). Since Unit 1 and Unit 2 are not duplicate plants, the specific differences in the design of Unit 1 and 2 will be identified through a review of KDDs, and these differences will be validated by comparison against the DBDs.

In the absence of unique features (and in the case of identical vendor supplied components), the information in the Unit 1 drawings is being used for Unit 2. However, separate (or

unitized) drawings and specifications are being created for each unit.

Particular attention is being paid to ensure consistent operation of the two units (even though their configuration may be somewhat different). In order to maintain consistency between the function of the two units, Unit 1 design modifications are being reviewed for inclusion in the Unit 2 design. The Unit 2 changes are also being reviewed for their impact on Unit 1.

As discussed in TXX-91337 of September 20, 1991, reviews and checks are being utilized in lieu of design verification for the transfer of information from the Key Design Documents to other documents such as production drawings that do not include any design requirements not already contained in the verified Key Design Documents.

The results of the engineering validation and completion efforts for Unit 2 are reflected in the design documents (drawings, specifications, calculations and changes thereto) which are prepared in accordance with TU Electric design control procedures. Design Validation Packages (DVPs) or Project Status Reports (PSRs) are not necessary and are not being developed for Unit 2.

4.2 Program Enha' ments

The lessons learnea om the CAP are being applied to the design validation activities for Unit 2. Enhancements made to the design validation process include:

- For selected commodities (such as piping and supports, instrumentation tubing and supports, HVAC duct and supports, and electrical raceway and supports), outstanding design change documents were incorporated into revised drawings prior to construction and inspection activities.

- Pre-Engineered Standard Design (PESD) configurations (rather than numerous individual designs) are being used to the extent possible for specific instal.ations, such as conduit and I&C tubing supports.

- An Advance Design Change (ADC) Program was established under which an authorized field engineer can approve the implementation of design changes subject to final approval by engineering with minimal risk of rework. The ADC program is limited to activities that can be reworked, activities which are in direct support of ongoing field actions, and commodities which are

bounded by a single drawing (such as pipe supports, etc.). The ADC program is not being used for changes that affect generic drawings, design basis documents, licensing documents, key design documents, specifications or vendor supplied "N" documents.

- Prior to performing design analyses, as-built information is being collected and used in the Unit 2 design calculations. This once through design process reduces the number of design iterations, the amount of confirmation, and the number of confirmatory inspections required during the hardware validation process. Additionally, the design process is sequenced to minimize the number of inputs requiring future confirmation.

- Engineering and Construction perform "constructability reviews" after validated design drawings and specifications have been developed to ensure that these documents are usable in the field.

- The procedure hierarchy for Unit 2 was structured to minimize the number of procedures dealing with a particular process. In Unit 2, the organizations involved in a particular process work to one common procedure.

4.3 NRC Staff Inspections

As demonstrated in Table 4-1 below, the NRC has performed several inspections of the design validation and oversight activities for Unit 2.

4.4 Conclusion

The design validation program for Unit 2 is structured to provide reasonable assurance that the design meets licensing commitments and NRC requirements. The results to date indicate that the design validation program is being properly implemented, and corrective action is being taken for identified conditions.

TABLE 4-1

NRC REVIEW OF UNIT 2 DESIGN VALIDATI'N

Inspection Reports (Date)	Scope of Inspection
90-22, at p. 21 (Aug. 23, 1990)	Selected aspects of the Unit 2 implementation of lessons learned from the CAP and PCHVP programs.
90-26, at p. 18 (Aug. 21, 1^90)	ASMF Code controls
90-35, at pp. 2-10 (Oct. 21, 1990)	Design validation; CAP program; qualifications of engineering walkdown personnel; design changes; and the scope of authority, procedural and quality controls for Bechtel, ABB Impell, and SWEC.
91-202/91-201, at pp. 1-16 (Jan. 27, 1992)	Mechanical systems and components, ac and dc electrical systems, instrumentation and control systems, civil and structure areas, and the Independent Design Assessment (configuration management inspection).

5.0 Hardware Validation Activities

TU Electric is also validating the as-built hardware for Unit 2. The validation is similar to and uses the lessons learned from the Unit 1 Post Construction Hardware Validation Program (PCHVP).

5.1 Hardware Validation

The validation for Unit 2 hardware is being performed by either engineering evaluation or physical validation of the hardware as was done in the Unit 1 PCHVP. Physical validation of an attribute is performed through inspections by certified QC inspectors or engineering walkdowns by qualified and trained engineers as was done for CAP on Unit 1 and common. In some cases, attributes that were validated by QC inspection for Unit 1 are being validated by engineering walkdown for Unit 2 and vice versa. Since either option is acceptable, the option selected, QC inspection or engineering walkdown, is based on the nature of the attribute and optimum use of resources. QC inspections and engineering walkdowns are controlled by appropriate procedures.

The final acceptance requirements for the Unit 2 hardware validation are referenced in the Unit 2 attribute matrix. The Unit 2 attribute matrix was developed from the Unit 1 PCHVP attribute matrix. Each attribute was evaluated for its applicability Unit 2. Corrective actions that relate to individual design criteria were addressed in the Unit 1 PCHVP

matrix and are thus addressed for Unit 2. Programmatic corrective actions are reflected in the Unit 2 installation specifications and the integrated construction/inspection procedures written for Unit 2. Thus, the Unit 2 hardware validation effort reflects corrective actions taken as a result of CPRT and CAP findings and activities.

As was the case on Unit 1, engineering evaluations are performed when hardware attributes are inaccessible. Engineering evaluations of Unit 2 attributes may also be performed when the PCHVP demonstrated the adequacy of the hardware for Unit 2. Engineering evaluations may also be used when the results of physical validations for a portion of the Unit 2 hardware demonstrates that the hardware is acceptable and that a 100% reinspection effort is not necessary for Unit 2. Thus, some attributes that were physically validated for Unit 1 are being validated by engineering evaluation for Unit 2. As a result, fewer field validations are being performed on Unit 2 than were performed for Unit 1.

New work and modifications for Unit 2 are being completed in accordance with the new design and the related QC inspections are being performed under current practices and procedures. Therefore, no additional validation inspections are necessary or performed for new work and modifications. Similarly, in instances where construction was complete but had not been QC

inspected, QC inspections of construction are performed under current practices and procedures, and additional validation inspections are not required as part of the Unit 2 hardware validation.

5.2 Hardware Reconciliation

During the field validation, non-conformances with the validated design are documented. These non-conformances are resolved either by changing the hardware or by modifying the design or both. A number of improvements have been made to the process of correcting nonconforming hardware.

TU Electric has combined the Nonconformance Report (NCR), Deficiency Report (DR), Corrective Action Request (CAR), and audit/surveillance deficiencies into a single reporting system called the TU Electric Evaluation (TUE) form. The issuance and control of the TUE forms are maintained by QC. TUE forms are tracked through disposition, resolution, and closure. Conditions identified in TUE forms are evaluated for reportability to the NRC and are evaluated to determine whether the condition in question represents a programmatic/repetitive concern. Such conditions are subject to actions to preclude recurrence.

TU Electric has a "Trend System" where TUE forms are sent to the trending analysis group for review and input into a trending data base. TUE forms are reviewed by this group to ensure that the causes of nonconforming conditions are correctly classified

and that corrective actions are effective in eliminating recurring violations.

In addition, a TUE form committee has been formed to review TUE forms upon initiation to alert management of those items that may require increased management attention.

A "Quality Accountability" Program has also been established to focus Project attention on quality related issues and to identify and implement corrective actions in areas where improvement in quality can be achieved. Construction and Engineering groups attend separate Quality Accountability Meetings weekly. The Construction meeting investigates unsatisfactory inspection reports and TUE forms to identify areas where training or program enhancements are warranted. The Engineering meeting, in addition to evaluating TUE forms, reviews design changes, audit/surveillance results, procedural changes, and training opportunities. Quality trends are evaluated in both meetings. Special Quality Accountability Meetings are held when special attention on a particular issues is warranted. The Quality Accountability process allows for early identification and resolution of problems and for the investigation of issues before reaching the threshold of a programmatic/repetitive issue.

5.3 Program Enhancements

The work method procedures for Construction, Engineering and QC have been integrated and revised to reflect criteria from

Unit 2 installation specifications, inspection requirements and acceptance criteria. These procedures were developed jointly by Construction, Engineering and QC and approved by each of these organizations. An integrated training program was also developed to provide consistency in training and understanding of construction activities between these three organizations. This program addresses the generic training requirements for the personnel within each of these organizations. Joint facilities for Construction, QC and Field Engineering are also utilized. These integration efforts maximize communications and consistency while still allowing the appropriate independence of QC.

As discussed in TU Electric letter TXX-91164 dated April 23, 1991, Construction Engineers (CE) are verifying the adequacy of new or modified Seismic Category II installations for Unit 2. These engineers are qualified by a combination of education, experience and training in their specific areas of responsibility. After CE verifies the adequacy of these installations, QC performs an inspection of a representative set of commodities for these installations prior to full QC acceptance. The entire process was subject to surveillance and/or audits by the TU Electric QA Department and the results have been satisfactory. Additionally, the QC inspection results for safety related applications have shown that CE verification,

prior to turnover to QC, provides a high degree of confidence in the adequacy of installed hardware.

In addition, the quality assurance department has developed a "BOP (Balance of Plant) Overview" program to provide additional assurance as to the quality of the BOP installation activities.

5.4 NRC Inspections

The NRC has performed extensive inspections of the hardware validation activities for Unit 2. (See Table 5-1 below).

5.5 Conclusion

The hardware validation program for Unit 2 is structured to provide assurance that the as-built hardware satisfies the validated design and, thus, licensing commitments and NRC requirements. The results to date indicate that the hardware validation program is being properly implemented, and corrective actions are being taken for identified deficiencies.

TABLE 5-1

NRC REVIEW OF UNIT 2 HARDWARE VALIDATION ACTIVITIES

Inspection Report (Date)	Scope of the Inspections
90-22, at p. 21 (Aug. 3, 1990)	Selected aspects of the Unit 2 implementation of lessons learned from the CAP and PHVP program.
90-35, at p. 5 (Oct. 21, 1990)	Unit 2 attribute matrix
91-07, at pp. 6-10 (Apr. 1, 1991)	Verification of the as-built design, QA audits of the as-built design verification, and corrective actions
91-19, at p. 6 (May 21, 1991)	Pipe supports and restraints
91-27, at p. 1 (June 17, 1991)	Pipe supports and restraints
91-20, at pp. 1-3 (June 28, 1991)	Structural steel components
91-33, at pp. 1-4 (Aug. 2, 1991)	Instrument components and systems
91-35, at p. 1-3 (July 31, 1991)	Electrical components
91-38, at pp. 2, 12-13 (Sept. 6, 1991)	Corrective Actions
91-202/91-201, at pp. 16-35 (Jan. 27, 1992)	Mechanical, electrical, instrumentation and control aspects, and corrective action programs (configuration management inspection).

6.0 Quality Assurance and Overview Activities

TU Electric has enhanced the Quality Assurance (QA) and Overview activities that govern the Unit 2 design and hardware validation process.

6.1 Quality Assurance and Overview Activities of Design Validation

Enhancements that relate to the Unit 2 design validation process included:

- Utilizing the same QA personnel to perform procedure reviews, surveillances, and audits for a functional area.
- Transferring the Engineering Surveillance function to the QA organization.
- Holding weekly interface meetings between TU Electric QA and the QA management for each of the engineering contractors.

Procedures, preselected by TU Electric QA for review, are routed to TU Electric QA for review by the same personnel (or personnel with similar qualifications) as those who are assigned to perform audits and surveillances of the activity addressed by the procedure. This not only assures procedures are reviewed by QA personnel with appropriate qualifications, but also provides the QA personnel advance information for performance of subsequent audits and surveillances.

The Technical Audit Program (TAP) applied to Unit 1 and common; however, similar functions are being performed for Unit 2 by the Construction QA organization. Technical audits of the Unit 2 design validation activities of each of the five separate design organizations (Scopes A-E) are being performed by TU Electric Quality Engineering which is part of the Construction QA organization. Since the restart of substantial design activities for Unit 2, approximately 30 audits have been performed addressing Bechtel Pipe Support and Stress Analyses (PSAS), SWEC Systems Design Validation, ABB Impell Civil/Structural design validation activities, Westinghouse NSSS design validation activities, and TU Electric electrical design validation activities. Technical audits of subcontractors and design contractor interfaces have also been performed.

For Unit 2, the technical surveillance functions of the Engineering Assurance organization have been transferred to the Quality Engineering area reporting to the TU Electric Construction QA Manager. The technical activities of these two organizations were combined into one in June of 1990 to provide more efficient utilization of technical overview personnel. The technical surveillances performed by the Quality Engineering group are of smaller scope than technical audits but are performed using the same criteria by technical personnel with similar education and experience as those performing technical

audits. Examples of the subjects addressed by these surviellances include but are not limited to the Advance Design Change Program, Electrical Calculations, Pipe Support and Stress Calculations, Raceway Supports, and Setpoint Calculations.

Overall the results of the TU QA Audits and Surveillances indicate that the design validation activities are being carried out in a technically adequate manner and in accordance with the TU Electric program requirements. Deficient conditions identified during an audit or surveillances are evaluated by the audited organization for cause, impact, and generic implications. Based on this evaluation, corrective and preventative actions, concurred with by TU Electric QA, are implemented. TU Electric QA verifies these actions, and when warranted, performs followup audits or surveillances in the same area to evaluate the effectiveness of the actions.

Audits are generally planned soon after an activity starts, but normally after the contractor has audited the activity. This allows for early problem identification while, at the same time, allowing TU Electric QA to evaluate the effectiveness of the contractor's QA program. Followup audits occur for activities which are of sufficient scope or complexity to warrant an evauation after a significant portion of the work has progressed.

6.2 Quality Assurance and Overview Activities of Hardware Validation

QA surveillance activities for the Unit 2 hardware validation have focused on the adequacy of the attribute matrix, collection of as-built data, and physical validation. Over 100 "Y" attributes (those requiring walkdown or QC inspection) were reviewed by surveillance to assure that "Y" attributes were incorporated into Unit 2 specifications and, subsequently, into appropriate reverification documents (e.g., walkdown procedures). Additionally, QA evaluated the differences between Unit 1 and Unit 2 attribute matrices and assured that satisfactory technical justification was documented for attributes not to be reverified for Unit 2.

Throughout the early stages of Unit 2 construction, surveillances performed by QA verified the accuracy of field data gathering activities and compliance of related walkdown activities with the applicable procedures. The accuracy of recorded data, accuracy of transfer of data, and adequacy of procedure implementation were verified by QA Surveillance personnel. Electrical separation, pipe supports, mechanical separation, piping/tubing installation, instrumentation, cable tray hangers, and structural steel have been among the activities addressed by QA field surveillances which consistently documented satisfactory results.

6.3 Independent Assessments of Unit 2 Activities

The TU Electric Independent Safety Engineering Group (ISEG) coordinated an Independent Design Assessment (IDA) in 1991. The IDA was a self-assessment of CPSES Unit 2 design validation activities being performed by Bechtel, Stone and Webster Engineering Corporation, ABB Impell, Westinghouse, and TU Electric. The scope of the IDA focused primarily on the Unit 2 Emergency Diesel Generator (EDG) system and also included portions of the associated electrical load systems; Station Service Water (SSW) system; Heating, Ventilation, and Air Conditioning (HVAC) system; and Emergency Core Cooling System (ECCS). The assessment, in general, followed the NRC inspection module for IDAs. The IDA identified a number of specific findings associated with certain analyses. Most dealt with the level of documentation presented in analyses. Appropriate actions have been initiated to resolve these issues, including the evaluation of generic implications. Overall, the IDA Team concluded that the designs of the EDG and its associated support systems as included in the assessment were adequate, and that the EDGs would accomplish their intended safety functions. The IDA Team also identified a weakness in the attention to detail being applied to analyses, and a strength in the strong interface between the various Engineering contractors. Specialized

training and management attention has been focused on addressing this weakness.

In 1991, TU Electric also performed a Construction Appraisal Team (CAT) inspection. The CAT inspection was a self-assessment of the conformance of Unit 2 construction to implementing design documents, regulatory requirements, and industry practices. The CAT was a multi-disciplinary team, including experienced personnel from the ISEG and other departments. The inspection, in general, followed the NRC inspection module for CAT inspections. The CAT made a number of specific findings regarding Unit 2 construction and its documentation. Appropriate actions have been initiated by Unit 2 Management and the resolution of these findings is being tracked by the ISEG organization. Overall, the CAT concluded that CPSES Unit 2 systems, structures, and components are installed in accordance with the plant design, applicable regulations, and the construction permit. Welding and non-destructive examination (NDE), HVAC construction, and the advanced design change/master control drawing program were identified as strengths. Housekeeping/equipment protection was noted as a weakness and appropriate corrective actions were taken.

In addition to the assessments mentioned above, Unit 2 management is currently developing plans for other self-assessments of various programs to provide an additional level of

assurance that Unit 2 programs and activities are in accordance with regulatory requirements and commitments.

6.4 NRC Inspections

The NRC inspection of the quality controls and overview activities for Unit 2 are contained in Table 6-1 below.

6.5 Conclusion

The quality assurance activities, overview activities and self-assessments for Unit 2 provide assurance that the design and hardware validation programs are being properly implemented and that identified deficiencies are corrected.

TABLE 6-1

NRC REVIEW OF QUALITY AND OVERSIGHT ACTIVITIES

Inspection Report (Date)	Scope of Inspection
90-35, at pp. 14-15 (Oct. 21, 1990)	Licensee's oversight of engineering activities
90-43, at pp. 2-7 (Dec. 12, 1990)	QA programs for engineering contractors
90-45, at pp. 12-14 (Jan. 29, 1991)	Scope A piping stress reconciliation and the Bechtel Stop Work Order (SWO)
90-07, at p. 8 (Apr. 1, 1991)	QA audits of the as-built design verification
91-19, at p. 5 (May 21, 1991)	QA oversight and audits for pipe supports and restraint systems
91-24, at pp. 8-12 (June 6, 1991)	Licensee's surveillance of contractor QA/QC activities, including: licensee QA audits, the monitoring of SWEC QC, and the overview of ASME activities
91-46, at pp. 1, 11-12 (Oct. 21, 1991)	QA/QC oversight of balance of plant systems
91-49, at pp. 1-5 (Oct. 15, 1991)	QA and corrective action programs
91-202/91-201, at pp. 14-15, 31-33, 34-35 (Jan. 27, 1992)	Independent Design Appraisal, Construction Assessment Team and QA programs (configuration management inspection)

7.0 Special Considerations Related To The Eleven Disciplines

As discussed above, the validation activities for Unit 2 generally (1) apply the same corrective and preventive actions taken for Unit 1, and (2) use the same technical methods and proce. res as Unit 1.

The corrective and preventive actions implemented under CAP for significant issues identified by CPRT, Cygna and CAP were discussed in the appendices to the Project Status Reports (PSRs) for each discipline. In general, these issues were the subject of Significant Deficiency Analyses Reports (SDARs). TU Electric has kept the NRC informed of changes to the SDAR corrective and preventive actions through SDAR updates, which are being individually tracked and closed by the NRC. Thus, this report will not discuss changes associated with the SDAR updates.

In general, the Unit 1 technical methods and procedures associated with each discipline were also discussed both in the body of the PSRs and in the appendices to the PSRs. To the extent that they are discussed in the PSR appendices and are associated with the SDARs, this report will not discuss the changes to these methods and procedures for the reasons stated above.

The purpose of the remainder of this section is to discuss (1) the validation activities associated with each discipline that are significantly different than the general descriptions in

sections 4 and 5 above and (2) the substantive differences in corrective and preventive actions and technical methods as described in the SSERs, to the extent that such differences are not described elsewhere in this report and are not associated with the SDARs.3/

7.1 Large and Small Bore Pipe Supports

The large and small bore piping and pipe support designs for Unit 2 are validated by unique analysis. However, the criteria and methodologies applied to Unit 2 are essentially the same as used for Unit 1.

7.1.1 Methodology

The piping and pipe supports installed prior to Unit 2 restart are walked down by quality control and construction engineering departments to document the as-installed condition for key design input attributes.

The piping stress analysis is performed using the as-installed pipe geometry, support locations and other design inputs such as system information documents, pipe line designation list, fluid transient forcing functions and penetration sealant material. The analysis provides validated "hanger guidance" consisting of pipe support design parameters.

3/In some cases, changes were made toward the end of CAP for Unit 1 that are also being made for Unit 2 but are not reflected in the SSERs 13-20. Such changes are discussed in the remainder of this section unless associated with the SDARs, even though the Unit 2 approach does not represent a "change" from Unit 1.

The analysis also validates such items as pipe stresses, valve and in-line component accelerations, equipment nozzle loads and valve nozzle loads. The design information is incorporated into the piping isometric drawings and these drawings are issued as master controlled drawings (MCDs).

The new, modified and portions of piping and pipe supports not installed prior to issuance of the MCD are installed in accordance with the design drawings and installation specifications. Design changes, when required during the installation phase, may be initiated and approved in accordance with the "Advance Design Change" program. The pipe supports installed prior to resumption of significant design activities for Unit 2 (i.e., existing supports) have been placed in in-process status.

The piping systems are subject to field verification by quality control inspectors to implement the requirements in IE Bulletin 79-14. Deviations from drawing or specified tolerances are documented in accordance with the approved project procedures. Minor adjustments such as loose jam nuts are documented and reworked in accordance with TU Electric approved procedures.

The pipe stress analyses and pipe support design analyses are reconciled using the "79-14" data, outstanding design change

documents and other final design inputs in accordance with the approved procedures.

7.1.2 SSER Comparison

The Unit 2 validation activities for large and small bore pipe supports are substantively consistent with SSER 14 with the following exceptions:

a) SSER-14, Section 4.1.2.2, page 4-10 paragraph 3, states in part "In Appendix 3B, the applicant has provided a description of the computer codes and the verification methods used by SWEC in piping design validation ...."

The computer codes used in the design validation of Unit 2 are different from those used in Unit 1. The computer codes used in Unit 2 design validation have been described in the CPSES Final Safety Analysis Report. These codes have been verified and validated in accordance with Bechtel Corporation Quality Assurance Procedures.

b) SSER-14, Appendix A, Section 26.3 page 66 and 67 states in part, "Because of the SWEC use of embedment lengths from the design drawings in the support calculations, the staff finds that the issue identified by CYGNA has

been adequately addressed in the piping design validation."

For supports installed prior to the Unit 2 validation activities, the actual projection length of the hilti bolts from the concrete surface and bolt length codes were provided by construction engineering as part of design validation input. The actual embedment and the corresponding allowable loads were derived from this data. These actual allowable loads were then compared with the allowable loads based on the embedment specified on the drawing. The lower of the two allowable loads was used in the qualification of the anchor bolts. If the embedment specified on the drawing yielded lower allowable values and the anchor bolts could not be qualified using this, then the actual allowable load based on the installed embedment was used to qualify the anchor bolting. In such cases, the drawing was revised to reflect the as-installed embedment.

c) SSER-14, Appendix A, Sections 12.1 and 12.2, pages 33 through 36 states in part "...that piping system stresses and pipe support loads may be underpredicted

in long straight runs of pipe with a series of adjacent integrally welded dual trunion type supports ...modeled with moment restraining capability."

The concern related to underprediction of loads and stresses at interior supports in long runs of pipe with series of adjacent supports having moment restraining capability was assessed based on the current modelling methodology. It was determined that case by case evaluation is not necessary because the current modelling methodology would not underpredict stresses or loads. This assessment is documented in calculation number GENX-551 revision 0. This item is being tracked in the CPSES Commitment Tracking System.

7.2 Cable Tray Hangers

7.2.1 Methodology

There are no substantive differences in methodology with regard to the cable tray hanger effort from that described earlier in Sections 3.0 through 5.0.

7.2.2 SSER Comparison

The Unit 2 cable tray hanger validation activities are substantively consistent with SSER 15, with the following exception:

a) SSER 15, Section 4.1.1.1 end of first paragraph states that "For Unit 2, the cable deadweight is based on 100-percent fill as required in Ebasco document SAP.CP3, Paragraph II.2." For Unit 2 in general, the cable deadweight is based on 100-percent fill as required in document 2-IM-5.03-CTH Section 6.2. However, actual as-built cable fill is used, when required, due to design limitations as required in document 2-IM-5.03-CTH Section 6.2.

7.3 Conduits

7.3.1 Methodology

There are no substantive differences in methodology with regard to the conduit validation activities from that described earlier in Section 3.0 through 5.0.

7.3.2 SSER Comparison

The Unit 2 conduit validation activities are substantively consistent with SSER 16, with the following exception:

a) The third paragraph in Appendix A, Section 21.1 of SSER-16 states:

"Ebasco addressed this concern [regarding the configuration of the thermolag] by performing a walkdown of all conduit systems, including the fire protection lines [conduits covered with thermolag], to obtain as-built information. The design of conduits

and supports was validated on the basis of the as-built configurations and conditions obtained from the walkdowns."

No fire protection material is currently installed on the Unit 2 conduit systems. Consequently, it is not possible to obtain as-built information for the fire protection material. Instead, the extent of the thermolag to be installed on the conduits will be identified through the Fire Safe Shutdown Analysis (FSSA). The extent of thermolag identified by the FSSA is used for design validation of conduits and supports for the thermolag weight.

7.4 Heating, Ventilation and Air Conditioning (HVAC)

7.4.1 Methodology

There are no substantive differences in methodology with regard to the HVAC validation activities from that described earlier in Section 3.0 through 5.0.

7.4.2 SSER Comparison

The Unit 2 HVAC validation activities are substantively consistent with SSERs 17 and 18, with the following exceptions:

a) In Section 4.1.1.2 of SSER 18, the second paragraph states in part, "The amplified response spectra curves

used in the HVAC design validation were the 2-percent curve for the OBE and the 4-percent curve for the SSE."

For Unit 2, the 4-percent curve for OBE and the 7-percent curve for SSE were used. The use of damping values other than 2-percent for the OBE and 4-percent (or 3-percent) for the SSE for evaluation of HVAC duct systems was described in TXX-89511 dated August 30, 1989. DBD-CS-086 allows the use of the 4-percent curve for the OBE and the 7-percent curve for the SSE.

b) Paragraph 3 on page 4-11 of SSER 18 states in part, "The welds between structural members were evaluated by an Ebasco program called ANGLEWELD. This program considers bending effects caused by eccentricities between the centroidal axes of the attached members and the centriod of the weld."

For Unit 2, the Ebasco program called ANGLEWELD is not used to evaluate welds between structural members. The weld evaluations are being performed using the capabilities of P-Delta STRUDL or in limited cases, simple hand calculations. P-Delta STRUDL considers the bending effects caused by eccentricities between the

centroidal axes of the attached members and the weld. Similarly, the hand calculations also consider the effects of eccentricities.

c) Paragraph 6 and the preceding paragraphs of Section 4.1.1.4 of SSER 18 indicate that the allowable normal tensile stress cannot exceed 0.9 F_y and the allowable shear stress cannot exceed 0.50 F_y for member evaluations for Seismic Category I HVAC duct support evaluations. It could be inferred that the same criteria is applicable for Seismic Category II HVAC duct support evaluations. However, the criteria for Seismic Category II duct supports are different than the criteria for Seismic Category I supports. Specifically, DBD-CS-086 limits normal tensile stress to 1.0 F_y and shear stress to 0.577 F_y for member evaluations for Seismic Category II HVAC duct supports. This is consistent with the requirements for Unit 1 Seismic Category II HVAC duct supports.

d) SSER 17 Section 4.7.2.1, page 4-82 describes "...Relocating one pressure tap for the differential pressure switch downstream of the gravity dampers."

Upon subsequent detailed review of the committed modifications, it was determined that these actions were not required. The NRC was notified via TU Electric letter TXX-91119 dated April 8, 1991.

e) SSER 18, Appendix A, page 15, paragraph (2) states, "For the HVAC design validation of Hilti expansion anchors, a factor of safety of 4 for SSE load conditions and a factor of safety of 5 for OBE load conditions are used."

It could be inferred that these criteria apply to Seismic Category II HVAC duct support evaluations. For Seismic Category II duct supports, however, only the SSE load case is evaluated (see SSER 18, Appendix A, page 12, Section 3.1, second paragraph) and a factor of safety of 3 is used.

7.5 Mechanical

7.5.1 Methodology

There are no substantive differences in methodology with regard to the mechanical systems validation activities from that described earlier in Sections 3.0 through 5.0.

7.5.2 SSER Comparison

The Unit 2 mechanical validation activities are substantively consistent with SSER 17, with the following exceptions:

a) SSER 17 paragraph 4.4.1.3 states that, "Two duplex strainers and two sampling connections were added in the diesel generator fuel oil transfer system design..."

   This modification was later determined to be unnecessary and the NRC was notified via TU Electric letter TXX-89604 dated August 28, 1989 and an amendment to the FSAR.

b) SSER 17, Appendix A, Item F-44 postulated a double ended guillotine pipe break in the non-safety portions of the component cooling water system and the effects it would have on the safety portion. The conclusion of the original analysis committed to positioning valve XCC-0080 "...based on flow requirements such that the flow required for chiller operation is obtained during system flow balancing."

Subsequent interpretations of NUREG-0800, Standard Review Plan (SRP) 3.6 determined that a double ended guillotine break need not be postulated. Since the Component Cooling Water system is a moderate energy system, only a crack need be postulated. Calculations MEB-0073 Rev. 3 (Unit 1) and 2-ME-0001 Rev. 1 (Unit 2) demonstrate that for a crack in this system no throttling of XCC-0080 is required.

7.6 Civil Structural

7.6.1 Methodology

There are no substantive differences in methodology with regard to the civil structural validation activities from that described earlier in Sections 3.0 through 5.0.

7.6.2 SSER Comparison

The Unit 2 civil structural validation activities are substantively consistent with SSER 17, with the following exceptions:

a) On SSER 17, page 4-14, the fourth paragraph states that the use of PP-210 and FVM-075 will result in the identification of the location of all adjacent attachments and the loadings on them. Unit 1 engineering evaluation of concrete attachment proximities was curtailed when sufficient confirmatory evidence was collected with adequate confidence level

as discussed in TU Electric letter TXX-89193 dated June 23, 1989, regarding SDAR CP-86-04.

For Unit 2, the same approach was used as described in TXX-89193. Additional samples of concrete surfaces were collected for evaluation and the same confidence level was achieved.

b) On SSER 17, page 4-17, the first paragraph reads in part, "The embedment plates are anchored to concrete walls using 16 steel reinforcement bars." For both units the embedment plates, to which the steam generator upper lateral beams are bolted, are anchored to concrete walls by 18 steel reinforcing bars.

7.7 Electrical

7.7.1 Methodology

There are no substantive differences in methodology with regard to the electrical validation activities from that described earlier in Sections 3.0 through 5.0.

7.7 2 SSER Comparison

The Unit 2 electrical validation activities are substantively consistent with SSER 17, with the following exceptions:

a) SSER 17, Paragraph 4.2.1.3 provides a list of hardware modifications. Several items on that list are addressed below:

1) In general, ac and dc control circuits for Unit 2 have been evaluated and adequate voltage is available to operate the control devices without modification or redesign of the control circuits.

2) The SSER states, "Cables for which Thermolag was used as a fire barrier were rerouted or replaced with larger cables or a combination of both if required to comply with ampacity design criteria." For Unit 2, either thermolag or one hour fire rated cable is being used. The adequacy of this fire rated cable has been demonstrated by tests, as described in Amendment 82 to FSAR Section 8.3.1.4.

b) SSER 17, Appendix A, Open Items E-25 and E-28 state that double enclosures are required for power cables whenever the normal separation criteria cannot be achieved. The CPSES separation criteria, as stated in the FSAR, allow certain power to power configurations where the minimum required separation is one inch and

one barrier. These criteria are in accordance with R.G. 1.75.

On Unit 2, this criteria was reviewed and, based on testing done for other utilities which had already been accepted by the NRC as being applicable to CPSES, was refined and simplified. The criteria in FSAR Amendment 79 state that for all configurations including power cable to power cable, the minimum separation required is one inch and one barrier. This is currently being reviewed by the NRC. Based on discussions with the NRC, the criteria in Amendment 79 is being revised such that two barriers and one inch separation will be required for certain configurations involving larger power cable. This revised criteria will be included in a future FSAR amendment.

c) SSER 17, Appendix B, DIR D2037 Item 2 indicated that the voltage available at invertor IV 1EC1 static transfer switch, when fed from the bypass panel board 1EC3, was not sufficient. The indicated resolution included replacement calculations and appropriate subsequent followup actions. Subsequent modifications were made in both units which dedicated the existing

startup transformer to the safety buses. Voltage profile calculation based on the new scheme showed that adequate voltage is available to the panel when the transfer static switch connects the panel to the alternate power supply from the bypass transformer.

7.8 Instrumentation and Control

7.8.1 Methodology

There are no substantive differences in methodology with regard to the Instrumentation and Control validation activities from that described earlier in Sections 3.0 through 5.0.

7.8.2 SSER Comparison

The Unit 2 Instrumentation and Control validation activities are substantively consistent with SSER 17, with the following exceptions:

a) SSER 17, Section 4.3.1.3, Page 4-49 describes "Relocation of eight differential-pressure-indicating switches to a location downstream of the dampers to automatically start backup battery room fans."

Upon subsequent detailed review of the committed modifications it was determined that these actions were not required based on the safety significance of the issue, the probability of damper failure, the

indications available of damper failure, and a periodic maintenance activity. The NRC was notified via TU Electric letter TXX-91119 dated April 8, 1991.

b) SSER 17, Section 4.3.1.3, Page 4-50 describes "Addition of 41 cables to provide inputs from the existing instrument circuits to the emergency response facility computer...."

Upon subsequent review of the modification, it was determined that only 12 of the additional inputs were required. The remaining variables are either already monitored or are not required to be monitored for post accident conditions per DBD-EE-004.

c) SSER 17, Section 4.3.1.3, Page 4-50 describes "Modification of control circuit to disconnect the auxiliary feedwater pump turbine manual speed control station on safety injection signal."

Upon detailed review of the TDAFWP control circuit, it was determined that disconnecting the manual speed control station on safety injection signal would not be necessary based on the following:

1) The speed control loop is fully qualified and is fail safe (i.e., loss of 1E power or instrument air will result in the turbine governor valve going to its full open position).

2) A safety injection signal does not start the TDAFWP and hence is not required to isolate the speed control signal.

3) Should speed indication be lost, pressure and flow indications are available to ensure sufficient flow to the steam generators during emergency initiation of the TDAFWP.

7.9 Environmental Equipment Qualification

7.9.1 Methodology

There are no substantive differences in methodology with regard to the Unit 2 environmental qualification validation activities from that described earlier in Sections 3.0 through 5.0.

7.9.2 SSER Comparison

The Unit 2 environmental qualification validation activities are substantively consistent with SSER 19, with the following exceptions:

a) SSER 19, Section 4.2.2, pages 4-3 and 4-4 describes the design validation process for environmental

qualification of class 1E equipment located in a mild environment.

The equipment qualification program was revised and equipment qualification of class 1E equipment located in a mild environment was deleted from the environmental EQ program, as described in TU Electric letter TXX-91102 dated March 6, 1991.

b) SSER 19, Section 4.2.2, page 4-4 references the general definition of harsh environment provided by 10CFR50.49.

The environmental EQ program as described in the FSAR was revised via Amendment 82 to include the following paragraph regarding Relative Humidity into the CPSES definition of harsh environment in FSAR Section 3.11B-3. "The equipment will be considered to be located in a mild environment if relative humidity is the only harsh environment parameter for an area and evaluation concludes that subject equipment can perform its safety related function(s) when exposed to the postulated relative humidity environment (FSAR Amendment 82)".

7.10 Seismic Equipment Qualification

7.10.1 Methodology

There are no substantive differences in methodology with regard to the seismic equipment qualification validation activities from that described in Sections 3.0 through 5.0.

7.10.2 SSER Comparison

The Seismic Equipment Qualification validation activities for Unit 2 are substantively consistent with SSER 19.

7.11 Fire Protection

7.11.1 Methodology

There are no substantive differences in methodology with regard to the fire protection validation activities from that described earlier in Sections 3.0 through 5.0.

7.11.2 SSER Comparison

The Unit 2 fire protection validation activities are substantively consistent with SSER 17.

7.12 Systems Interaction

7.12.1 Methodology

There are no substantive differences in methodology for the systems interaction validation activities from that described earlier in Section 3.0 through 5.0.

7.12.2 SSER Comparison

The Unit 2 systems interaction validation activities are substantively consistent with SSER 17.

7.13 Conclusions

The descriptions of the design and hardware validation activities in SSERs 13 through 20 are generally applicable to the design and hardware validation activities for CPSES Unit 2. Most of the substantive differences between the descriptions in the SSERs and the validation activities for Unit 2 either are generic program changes applicable across disciplines (which are discussed in Sections 3.0 to 5.0 above) or are described in SDAR reports which have been submitted to and are being tracked by the NRC (and therefore are not discussed in this report). The other substantive differences either have been described in TU Electric documents submitted to the NRC, or involve relatively minor matters (e.g., clarifications of statements in the SSERs, a correction of a misstatement in a SSER, and changes in the implementing details for certain components).

8.0 CONCLUSIONS

The design and hardware validation programs for CPSES Unit 2 are similar to CAP for Unit 1 and Common. The Unit 2 programs build upon and take advantage of the results of CAP, and the programs reflect the lessons learned from Unit 1. The results of the quality assurance activities to date indicate that the Unit 2 validation programs are, in general, being properly implemented, and corrective action is being taken for identified deficiencies. Upon completion of the validation programs and remaining work activities, there will be reasonable assurance that the design of Unit 2 complies with applicable licensing requirements and commitments and that the as-built hardware conforms with the design.