U. S. NUCLEAR REGULATORY COMMISSION

OFFICE OF NUCLEAR REACTOR REGULATION

NRC Inspection Report: 50-445/89-44 Permits: CPPR-126
50-446/89-44 CPPR-127

Dockets: 50-445
50-446

Category: A2

Construction Permit
Expiration Dates:
Unit 1: August 1, 1991
Unit 2: August 1, 1992

Applicant: TU Electric
Skyway Tower
400 North Olive Street
Lock Box 81
Dallas, Texas 75201

Facility Name: Comanche Peak Steam Electric Station (CPSES), Units 1 & 2

Inspection At: Comanche Peak Site, Glen Rose, Texas

Inspection Conducted: June 7 through July 5, 1989

Inspector: H. S. Phillips 7-12-89
H. S. Phillips, Senior Resident Inspector Construction — Date

Reviewed by: Joel B. Wiebe, for 7/12/89
H. H. Livermore, Lead Senior Inspector — Date

Inspection Summary:

Inspection Conducted: June 7 through July 5, 1989 (Report 50-445/89-44; 50-446/89-44)

Areas Inspected: Unannounced, resident safety inspection included: (1) applicant action on previous findings, (2) follow-up on violations, (3) applicant action 50.55(e) deficiencies, (4) applicant action on NRC Bulletins, (5) inservice inspection, (6) pipe wall thinning, and (7) plant tours.

Results: Within the areas inspected, no violations or deviations were identified. No unresolved or open items were identified. A clear report is a positive reflection of adequate actions or corrective actions only concerning those specific actions that were inspected.

DETAILS

1. Persons Contacted

*J. L. Barker, Manager, ISEG, TU Electric
*R. A. Berry, Licensing Manager CECO
*O. Bhatty, Issue Interface Coordinator, TU Electric
*M. R. Blevins, Manager of Nuclear Operations Support, TU Electric
*H. D. Bruner, Senior Vice President, TU Electric
*W. J. Cahill, Executive Vice President, Nuclear, TU Electric
*H. M. Carmichael, Senior QA Program Manager, CECO
*D. J. Chamberlain, Licensing Lead Engineer, Unit 2, CECO
*J. T. Conly, APE-Licensing, SWEC
*W. G. Counsil, Vice Chairman, Nuclear, TU Electric
*G. G. Davis, Nuclear Operations Inspection Report Item Coordinator, TU Electric
*D. E. Deviney, Deputy Director, Quality Assurance (QA), TU Electric
*J. C. Finneran, Jr., Manager, Civil Engineering, TU Electric
*J. L. French, Independent Advisory Group
*E. H. Gant, Executive Assistant, TU Electric
*J. Greene, Site Licensing, TU Electric
*W. G. Guldemond, Manager of Site Licensing, TU Electric
*T. L. Heatherly, Licensing Compliance Engineer, TU Electric
*J. C. Hicks, Licensing Compliance Manager, TU Electric
*C. B. Hogg, Chief Manager, TU Electric
*J. J. LaMarca, Electrical Engineering Manager, TU Electric
*F. W. Madden, Mechanical Engineering Manager, TU Electric
*D. M. McAfee, Manager, QA, TU Electric
*S. G. McBee, NRC Interface, TU Electric
*E. F. Ottney, Program Manager, CASE
*S. S. Palmer, Project Manager, TU Electric
*W. J. Parker, Project Engineering Manager, SWEC/CECO
*P. Raysircar, Deputy Director/Senior Engineer Manager, CECO
*H. C. Schmidt, Director of Nuclear Services, General Division, TU Electric
*A. B. Scott, Vice President, Nuclear Operations, TU Electric
*J. C. Smith, Plant Operations Staff, TU Electric
*R. L. Spence, TU/QA Senior Advisor, TU Electric
*W. L. Stendelbach, Executive Assistant, TU Electric
*J. F. Streeter, Director, QA, TU Electric
*C. L. Terry, Unit 1 Project Manager, TU Electric
*T. G. Tyler, Director of Projects, TU Electric

The NRC inspectors also interviewed other applicant employees during this inspection period.

*Denotes personnel present at the July 5, 1989, exit meeting.

2. Applicant Action on Previous Inspection Findings (92701)

a. (Closed) Open Item (445/8847-O-02): Minimum wall violation on outside of Unit 1 service water system (SWS) piping was not evaluated in conjunction with corrosion defects and spinblaster damage inside the piping. In June 1988, TU Electric returned Train A piping (10, 24, 30-inch inside diameter) to service even though the NRC stated that there was an apparent lack of quality assurance/control required by 10 CFR 50, Appendix B, QA Program criteria. TU Electric Project Manager informed the NRC that they were placing Train A back into service because they believed they had met all the requirements and all activities were completely and adequately controlled. In addition, NRC was informed that they could look at Train B which was more severely corroded.

In July 1988, the NRC inspector asked how Stone and Webster Engineering Corporation had evaluated minimum wall violations that occurred during construction versus corrosion and spinblaster damage that occurred after these minimum wall violations. That is, were the corrosion/spinblaster defects inside the piping identified, was the location described on a grid and were defects measured? In addition were these defects compared with previous violations of the manufacturer's specified minimum wall that randomly occurred during the entire construction period. The specified minimum wall thickness was 0.319 and 0.328 inches for 10-inch diameter Schedule 40, and 24/30-inch diameter, Schedule 20, respectively.

TU Electric did not know whether or not the minimum wall violations dispositioned "use-as-is" during construction lined up with other defects caused by corrosion/spinblasting (during service or blasting). Since the aggregate depth of defects could exceed the specified manufacturer's minimum wall thickness (required by ASME Section III) and the minimum stress wall thickness (allowed by ASME XI), this determination should have been made before returning to service. The NRC asked for documentation which showed this as an outstanding deficiency and a conditional release to return to service. The conditional release, a mechanism to allow nonconforming item to be returned to service, of Train A or B was not issued.

In March 1989, TU Electric made a presentation to the NRC. They stated that they still had not assured that the subject defects had not lined up. Instead they took a statistical approach. That is, they made assumptions and calculated the probability that such defects would line

up. Their conclusion was that the probability was very low.

The NRC inspector reviewed the validity of this approach and there are a number of problems with this approach as follows:

(1) Special Technical Issue Report (STIR)-CPE-M-003 states that corrosion damage was identified by crawling through the 24 and 30-inch piping (NRC witnessed the inspection of Train B). This technique was acceptable, however, TU Electric assumed worst case for Train A. That is, defects in Train B would envelope Train A by measuring all indications over 0.040 inch for 30-inch piping and 0.050-inch for 24-inch. This technique did not address if other defects on the outside diameter surface lined up with those measured on the inside surface. In the case of Train B the exact location was not determined and this evidently led to the statistical approach.

(2) The STIR stated that corrosion defects inside the 10-inch piping (that was remotely cleaned) was identified by viewing a video tape made with a camera that was pulled through to monitor coating removal. This technique was never intended for the inspection of corrosion defects or spinblast marks. That is, other cameras were available to view the surface from the perpendicular but the one used was directed obliquely down the middle of the piping. The latter technique caused distortion/shadows and would not accurately identify the depth of all defects.

Three NRC inspectors viewed these tapes and were unable to see how meaningful inspections were made to identify the depth at defects.

(3) The STIR does not address the 10-inch piping that was directly cleaned in the yard and was inspected from the ends of the 20 foot spool pieces. Visual inspection from this distance was not acceptable.

(4) The STIR basically concludes that Section XI Code stress wall would tolerate a reduction of wall thickness from 0.365 to 0.054 inches for 10-inch piping. A corrosion and sandblasting allowance of 0.125 and 0.012 inches respectively was used to determine that 0.129 inches margin existed before code stress wall was violated. Similar calculations were made for the 24 and 30-inch piping and it was generally concluded that the defects did not violate code stress minimum wall thickness except in one case

that was identified in Table 4. The NRC found that manufacturers minimum wall violations were not repaired, but would be included in the corrosion monitoring program.

The NRC inspector found it necessary to review the corrosion program for SWS. At the same time the program was reviewed and evaluated for other safety-related systems. This review is documented in paragraph 7 below. This item is closed based on the information discussed in that review.

b. (Closed) Unresolved Item (445/8848-U-02): Shop weld number on drawing was opposite that on the installed spool piece. TU Electric engineering reviewed this item and determined that the NRC inspector finding was correct, however, it was also determined that this condition will not affect the function of the piping. A drawing change was made to make the drawing consistent with the as-built configuration. The inspector has no further question.

3. Follow-up on Violations (92702)

a. (Closed) Violation (445/8727-V-01D): Ingersoll Rand Company Letter 031-036281 and Brown and Root (B&R) speed letter dated June 22, 1978, discussed the direction of rotation of the pump and motor shafts as being incorrect. Several organizations were aware of the deficient conditions, but failed to take corrective action or assure that the direction of the unidirectional fans were correct.

The NRC inspector reviewed TU Electric's subsequent corrective actions which consisted of reviewing the controls for vendor correspondence and needed actions. Since the subject violation occurred, the program for controlling of vendors was revised. Current Procedures ECE 1.05, ECE 5.19-03, and NEO-3.05/3.06 required such correspondence to be routed to the proper personnel and deficiency reports, if appropriate. This item is closed.

b. (Closed) Violation (445/8727-V-04A, 446/8720-V-03A): Electrical motor and mechanical pump specifications contained conflicting information relative to the motor and pump rotations. That is, requirements were not properly translated into specifications.

The NRC inspector found that the specific specifications contained conflicting information relative to the motor and pump rotations. That is, requirements were not properly translated into specifications.

The NRC inspector found that the specific specifications were corrected. Generic corrective action included a review of all safety-related specifications. No other components had unidirectional fans that were reversed. This item is closed.

4. Action on 10 CFR Part 50.55(e) Deficiencies

a. (Closed) Construction Deficiency (CP-87-33): This deficiency concerned the rotational direction of fans in the auxiliary feedwater pump motors. That is, the motors were deficient because the fans were installed backwards on Unit 1 motors.

The NRC inspector reviewed TU Electric file, SDAR-CP-87-33 for Units 1 and 2. The file contained 20 correspondence and corrective action documents which describe the identification, evaluation, notification and reporting to NRC and corrective action concerning the subject deficiency. Based on this review, the inspector determined that the deficiency was properly identified, evaluated, and reported to the NRC. The NRC inspector reviewed work documents and verified that the deficient conditions were corrected (documented in Operations Report 50-445/89-35; 50-446/89-35). The corrective action was extensive in that TU Electric examined all pump used in safety-related applications to assure that similar problems did not exist. The NRC inspector has no further questions.

5. Applicant Action on NRC Bulletin (92701)

a. (Closed) NRC Bulletin 79-15, "Deep Draft Pump Deficiencies." This Bulletin was issued ter manufacturing deficiencies were found in w high pressure core spray, low pressure core spray, and residual heat removal pumps manufactured by the Ingersoll Rand Company, Cameron Pump Division.

The NRC inspector reopened this bulletin in NRC Inspection Report 50-445/87-36; 50-446/87-27 to obtain additional information or clarification concerning the actions described in TU Electric's letter (TXX-3430) dated October 26, 1981. The original action included (1) procedures to ensure proper alignment and concentricity during maintenance, (2) monitor radial vibration, and (3) include SWS pumps in the Inservice Inspection Program (for Class 3 pumps). One of four of the deep draft pumps (Hayward Tyler, Model 24VSN, vertical two stage for the SWS) was disassembled and inspected because a tool was dropped into the pump discharge flange during construction. The tool which was dropped caused superficial damage to the bearing

support spider. The tool was retrieved and at the same time the pump was inspected for general condition and damage.

Stone and Webster Engineering Corporation (SWEC) performed an engineering review to determine if further actions were necessary concerning this bulletin and the results are documented in SWEC's letter (SWTU-7913) dated May 9, 1988. This included a review of the operating and maintenance history (several years) which demonstrated no significant design, assembly, installation operation or maintenance problems. This adequately addressed the concerns of Bulletin 79-15 and in addition addressed the issues in Bulletin 83-05 which concerned the manufacturer's quality assurance program and potential compromise of pump reliability.

The NRC reviewed the bulletin for 79-15 which included TU Electric responses, Inspection Procedure MM1-310, Revision 1; Predictive Maintenance Program, STA-679, Revision 0; Predictive Maintenance Vibration Program, REI-508, Revision 0; Inservice Testing Program for Pumps and Valves, Revision 2; Daily Service Register; travelers; and alignment and torquing measurements. These procedures and documentation showed that maintenance steps were prescribed and followed. This bulletin is closed as the inspector has no further questions about the bulletin.

b. (Closed) NRC Bulletin 83-05, "ASME Nuclear Code Pumps and Spare Parts Manufactured by the Hayward Tyler Pump Company": This bulletin was issued as a result of an NRC investigation of the manufacturer and findings concerning the QA program.

The NRC previously reviewed this bulletin during routine and reactive (NRC Technical Review Team) inspections. NRC Inspection Report 50-445/87-36; 50-446/87-27 reopened this bulletin pending the receipt of additional information.

During this inspection, additional information was reviewed while reviewing the file for Bulletin 83-05 and closing Bulletin 79-15 (deep draft pumps manufactured by Hayward Tyler) described in paragraph 5.a. This included a review of TU Electric's revised response (TXX-89250). This matter is closed based on that review.

c. (Closed) NRC Bulletin 87-01, "Thinning of Pipe Walls in Nuclear Power Plants": This Bulletin was issued as a result of catastropic failure of a main feedwater pipe that caused fatal injuries to four workers.

This bulletin is closed on the basis of NRC letter dated March 21, 1988, from Mr. Grimes to Mr. Counsil, TU Electric Executive Vice President (which address pipe wall thinning) and the review in Section 7 of this inspection report.

6. Inservice Inspections (73051, 73052, 73053, 73055)

This area was previously inspected by several NRC inspectors. Inspection results were documented in NRC Inspection Reports 50-445/79-28, 50-446/79-27; 50-445/79-30; 50-445/82-13, 50-446/82-07; 50-445/82-19; and 50-445/88-05, 50-446/88-04.

During this inspection the NRC inspector reviewed selected areas that relate to inservice inspection. This included the review of procedures, work and data related to nondestructive examination and evaluation of data. Specially, the corrosion monitoring program and repairs to Service Water System (SWS) piping are reviewed as relates to ASME Section XI NDE and repairs. The results of this inspection are described in paragraph 5. A final NRC inspection of this area by the NDE Van personnel is scheduled in July 1989. No violations or deviations were identified.

7. Review of Thinning of Pipe Walls in Nuclear Power Plants (92701)

The NRC inspector became involved with this subject as a result of corrosion/erosion in the SWS piping (See Open Item 445/8847-O-02 above). TU Electric made a technical presentation to the NRC to explain their program for monitoring corrosion in all piping included in the program. NRC Bulletin 87-01, "Thinning of Pipe Walls in Nuclear Plants", dated July 9, 1987, was also addressed. This bulletin was issued after an 18-inch feedwater pump suction line at Surry ruptured and killed four workers and erosion/corrosion was the cause.

TU Electric letter (TXX-6705) dated September 8, 1987, addressed each item in the bulletin: (1) applicable codes, (2) program to detect/predict pipe wall thinning, (3) criteria such as pipe material/configuration and ph/temperature/velocity/oxygen content of the water, (4) wall thinning inspection results, and (5) plans for developing wall thinning programs. Commitments were made to (1) establish procedures for selecting inspection points, inspecting site selected, and analyzing/trending results prior to Unit 1 fuel load, and (2) baseline data should be available by the end of the first refueling outage.

In response to the NRC Bulletin question about inspection results, Item 4 response, Table 3 described wall thinning in

the SWS piping and referenced significant deficiency reports made concerning significant Deficiency Analysis Report (SDAR) CP-86-07. At Train B Valve ISW-023 the wall had thinned to 0.142 inches compared with a required minimum wall thickness of 0.328 inches for 24-inch diameter carbon steel piping (24-SW-1-004-150-3). Two pinhole leaks were also identified in Train A (1-SW-1-021-150-3 and 24-SW-1-003-150-3). The reports for CP-86-07 described corrective action for various forms of corrosion and the site specific erosion around Valve 1SW-023.

The NRC inspector reviewed Nuclear Engineering and Operations Procedure NEO 2.18, Revision 0, Engineering and Construction Procedure ECE 2.18, Revision 0, and changes EDCN-01. The inspection requirements and instructions were described to detect and monitor wall thinning due to erosion/corrosion, uniform corrosion, and localized attack caused by crevice and microbiologically-induced corrosion. The monitoring program developed by Chexal-Horowitz for Erosion-Corrosion (CHEC) is an EPRI developed computer code program that uses plant specific data to predict metal loss due to single phase erosion-corrosion. The CHECMATE program is to be used for two phase erosion-corrosion prediction. The programs address all of the criteria described in the response to Item 3 in the Bulletin. Eleven systems (including feedwater, mainsteam, and vent/drains which are Code Class 2 and 3) are included in the program. The remaining systems were ANSI B31.1 systems.

ECE 2.18 also described the monitoring programs for fire protection (FP) and SWS piping and miscellaneous tanks (recycle holdup, boric acid, diesel fuel oil, chemical, and boron recycle feedwater system, waste processing, and vent/drain tanks). Appendix B of the erosion corrosion plan eliminated the FP and SWS piping as candidates for CHEC/CHECMATE because of the low operating temperature of the water. In the case of the SWS piping, the water has a high oxygen content, a criteria for eliminating it from the CHEC computer program.

The Corrosion Monitoring Plan, Service Water Subsection, Revision 0, dated November 30, 1988, described site selection, nondestructive examination, and evaluation of data to monitor: (1) disc shaped depressions and pitting inside the piping, (2) corrosion at high stress points, (3) denting/indications caused by spinblasting, and (4) generic corrosion at elbows, cavitation sites, branch connection, low flow areas, and carbon steel valves. Additional examination is mandatory when more than 25% of the available wall thickness (manufacturer's nominal wall thickness less the minimum design stress wall thickness) is lost (appreciable degradation).

The current status of all corrosion monitoring programs were discussed with TU Electric. To date sites to be monitored (under the CHEC/CHECMATE computer program) have been selected

in the feedwater and condensate systems. The remaining sites will be selected by August 1989. For the selected SWS sites, sites and examination tables were listed. Walkdowns were made by QC prior to examination of the sites.

The NRC concluded that TU Electric has developed a comprehensive approach to potential wall thinning described in the bulletin and erosion/corrosion problems in the SWS piping/components. The NRC inspector expressed concerns that inspection techniques used to examine corrosion defects in the 10-inch SWS may not have identified worst case defects and alignment with other minimum wall violations (See paragraph 2.a). However, this is the risk that arises from using engineering judgement versus 100% inspection and measurement of each defect. In all probability the worst cases have been identified and selected for corrosion-erosion monitoring. The major consequences would be small holes or pinhole leaks in the piping and this will be more of a commercial concern than a safety concern.

8. Plant Tours (92701)

The NRC inspector made tours of Unit 1, Unit 2, and common areas of the facility to observe items such as housekeeping, equipment protection, and in-process work activities. No violations or deviations were identified and no items of significance were observed.

9. Exit Meeting (30703)

An exit meeting was conducted July 5, 1989, with the applicant's representatives identified in paragraph 1 of this report. No written material was provided to the applicant by the inspector during this reporting period. The applicant did not identify as proprietary any of the materials provided to or reviewed by the inspector during this inspection. During this meeting, the NRC inspector summarized the scope and findings of the inspection.