ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

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Licensee:	TU Electric
Facility:	Comanche Peak Steam Electric Station, Units 1 and 2
Location:	FM-56 Glen Rose, Texas
Dates:	November 2-6, 1998
Inspector:	J. Blair Nicholas, Ph.D., Senior Radiation Specialist Plant Support Branch
Approved By:	Blaine Murray, Chief, Plant Support Branch Division of Reactor Safety
Attachment:	Supplemental Information

EXECUTIVE SUMMARY

Comanche Peak Steam Electric Station, Units 1 and 2
NRC Inspection Report 50-445/98-15; 50-446/98-15

This announced routine inspection reviewed radiation protection program activities. Areas reviewed included: external and internal exposure controls, controls of radioactive material and contamination, surveying and monitoring, and quality assurance of radiation protection activities.

Plant Support

- The external exposure control program was effectively implemented. Proper dosimetry was worn by radiation workers. Radiation areas and high radiation areas were properly posted and controlled. Visual aids were used to identify ALARA low dose waiting areas. Keys for locked high radiation areas were maintained and controlled properly. General access permits and radiation work permits were clearly written. A good pre-job ALARA briefing for the transfer of spent resin was conducted. Radiation protection job coverage was appropriate for radiological work observed. Proper thermoluminescent dosimeters were used for measuring neutron doses (Section R1.1).

- Radiation workers did not know the function or meaning of the electronic dosimeter alarms (Section R1.1).

- An effective internal exposure program was implemented. Good air sampling and respiratory protection programs were maintained. Whole-body counting systems were properly calibrated. Internal dose assessments were properly performed (Section R1.2).

- Radioactive material, laundry, and trash containers were properly labeled and controlled. The personnel contamination program was implemented properly. Good radioactive source inventory and leak testing programs were in place. The calibration and source response check programs for neutron and portable radiation survey instruments were implemented properly (Section R1.3).

- Housekeeping throughout the radiological controlled area was very good (Section R1.3).

- An effective radiation protection nuclear overview evaluation program was maintained. The nuclear overview evaluations and radiation protection department self-assessments provided management with a good assessment of the radiation protection program. Timely, effective corrective actions were implemented in response to assessment findings. No negative trends were identified during the review of radiological ONE Form reports written since January 1997 (Section R7.1).

Report Details

Summary of Plant Status

Both units operated at 100 percent power during the inspection.

IV. Plant Support

R1 Radiological Protection and Chemistry Controls

R1.1 External Exposure Controls

a. Inspection Scope (83750)

Selected radiation workers and radiation protection personnel involved in the external exposure control program were interviewed. Several tours of the radiological controlled area were performed. The following items were reviewed:

- Radiological controlled area access controls
- Control of high radiation areas and high radiation area keys
- General access permits and radiation work permits
- Job coverage by radiation protection personnel
- Personnel dosimetry

b. Observations and Findings

The inspector observed activities at the radiological controlled area access/egress control point and noted that station workers used the computerized log-in/out and personnel contamination monitoring equipment properly. Radiation protection personnel present in this area provided timely response and direction to station workers who alarmed the personnel contamination monitors or needed assistance using the computerized log-in/out equipment. All radiation workers observed wore their dosimetry properly.

The inspector conducted several tours of the radiological controlled area and performed independent radiation measurements to confirm the appropriateness of radiological postings. The inspector observed that radiation areas and high radiation areas were properly controlled and posted. All Technical Specification required locked high radiation area doors were locked and posted properly. Radiological postings and survey maps displayed at the entry to rooms correctly specified radiological conditions in the room. All radiological postings were clearly and conspicuously posted.

ALARA low dose waiting areas throughout the plant were clearly identified with yellow signs. The licensee informed the inspector that in the near future, these ALARA low dose waiting areas will be more conspicuously identified by large bright fluorescent green signs.

The inspector performed an inventory of the locked high radiation area keys. Based on the inventory of high radiation area keys and review of the high radiation area key log, the inspector determined that all keys for locked radiation areas were properly controlled. The inspector verified that a high radiation area key inventory was performed by the shift lead radiation protection technician at the close of each shift and documented in the radiation protection shift log. The inspector determined that a good high radiation area key control program was implemented.

The inspector reviewed randomly selected general access permits (GAPs) and radiation work permits (RWPs) and noted that the permits were written in a clear, consistent manner and contained appropriate radiological control information. The GAPs and RWPs were subdivided into specific tasks that helped workers clearly understand the radiological controls and monitoring requirements for each task. Additionally, the numbering system used for the GAPs and RWPs made it easier to review job history information. The same number was used for similar work with the exception of the year designator.

The inspector observed the removal of a spent fuel pool filter from the filter housing and its transfer to a shielded container for storage until shipment for disposal. Good ALARA practices were employed using remote handling equipment and appropriate shielding. The work area was properly posted during changing radiological conditions. An air sampler was properly placed in the work area to assess radiological airborne conditions. Radiation protection job coverage was appropriate for the radiological work observed.

On November 4, 1998, the inspector attended the pre-job ALARA briefing for the transfer of spent resin from the spent resin storage tank to a high integrity container located in the fuel handling building. The briefing was conducted in a professional manner. During the pre-job briefing, the sequence of job activities was discussed and personnel assignments were made. Questions concerning the job sequence and work process were discussed and resolved during the briefing. The inspector observed that experienced personnel were used for the task. During the briefing, the radiation work permit for the job was distributed to the workers for review, and the measured and anticipated radiological conditions were presented and discussed. Additionally, the inspector observed a majority of the resin transfer activities. Radiation protection technicians provided continuous radiation protection coverage during the resin transfer and properly monitored both personnel dose and radiological conditions. The spent resin transfer was performed according to station procedures with minimal radiation exposure to the workers.

The inspector conducted field interviews with six radiation workers from various crafts. The interviews revealed that the workers were generally knowledgeable of the radiological conditions specified on their general access permit but had limited knowledge of their electronic dosimeter alarm settings and the meanings of the two alarm settings. Fifty percent of the workers interviewed knew the correct values for the alarm settings specified on their general access permit. However, they stated that the electronic dosimeter alarm settings were low and high alarms, and they did not know that one alarm setting was for accumulated dose and that the other was for dose rate. However, everyone interviewed knew to leave the area and contact radiation protection

personnel if their electronic dosimeter alarmed. The lack of knowledge concerning the electronic dosimeter alarm settings by radiation workers was discussed with the radiation protection manager, and he further discussed this issue with other station managers. The radiation protection manager also discussed this issue with his staff and assigned radiation protection personnel at the radiological controlled access point to question station workers concerning their general access permit requirements to ensure that each worker knew and understood the radiological conditions specified on the general access permit and the meanings of the electronic dosimeter alarm settings to heighten awareness and understanding of the general access permit requirements. A review of radiation worker training revealed that the electronic dosimeter alarm settings and their meanings were described and explained in the radiation worker training. The inspector's observation was discussed with training department personnel, who stated that the electronic dosimeter alarm settings and their meanings will be reemphasized in future radiation worker training presentations.

The inspector determined that personnel entries into the two reactor containment buildings during reactor operations had remained relatively constant, approximately 30 containment entries per unit per year, during the past 2 years. The inspector reviewed neutron doses for workers that entered containment at power between January 1997 and October 1998. The inspector noted that the highest individual neutron dose was 40 millirems in 1997 and 221 millirems in 1998. This high individual neutron dose in 1998 resulted from in-core thimble tube work performed in Unit-1 during power operation.

In 1990, a vendor, with the assistance of the licensee conducted a spectral analysis study to determine the neutron energies inside the Unit-1 reactor containment building during reactor operations. The analysis determined that the neutron energies ranged from approximately 85 to 200 kilo-electron volts (keV). A similar study was conducted in 1993 inside the Unit-2 reactor containment building. The neutron energies ranged from 86 to 358 keV.

The licensee processed its thermoluminescent dosimeters on site and was certified by the National Voluntary Laboratory Accreditation Program for all categories with the exception of category 1 which pertains to accident low energy photons. Neutron doses were based on the use of a correction factor that was developed using a tissue equivalent proportional counter to determine the neutron fluence and energy spectra encountered in both reactor containment buildings during reactor operations. A two-chip lithium-6 dosimeter was used by the licensee for evaluating neutron doses to personnel. The inspector determined that the licensee used proper thermoluminescent dosimeters for establishing personnel neutron doses.

c. Conclusions

The external exposure control program was effectively implemented. Radiation protection personnel at the radiological controlled area access/egress control point provided timely response and direction to station workers who alarmed the personnel contamination monitor or needed assistance using the computerized log-in/out equipment. Proper dosimetry was worn by radiation workers. Radiation areas and high radiation areas were conspicuously and clearly posted. Visual aids were used to

identify ALARA low dose waiting areas. Keys for locked high radiation areas were maintained and controlled properly. General access permits and radiation work permits were clearly written. A good pre-job ALARA briefing for the transfer of spent resin was conducted. Radiation protection job coverage was appropriate for radiological work observed. Radiation workers did not know the function or meaning of the electronic dosimeter alarms. Neutron personnel dosimeters provided an accurate response to the neutron energies workers would encounter during containment entries.

R1.2 Internal Exposure Controls

a. Inspection Scope (83750)

Selected radiation protection personnel involved with the internal exposure control program were interviewed. The following items were reviewed:

- Air sampling program
- Respiratory protection program
- Whole-body counting program, including the calibration and quality control of the counting systems
- Internal dose assessment program

b. Observations and Findings

During tours of the radiological controlled area, the inspector observed the use and placement of continuous air monitors. The continuous air monitors were placed appropriately and properly monitored radiological airborne conditions in specific work areas throughout the radiological controlled area. The inspector observed that all air monitoring equipment located in the radiological controlled area had current calibration dates and documented operational checks.

Five full-faced, negative-pressure respirators were issued for radiological work during 1997 and 1998. From a review of the respirator issue log, the inspector determined that respirators were properly issued to qualified individuals, and proper total effective dose equivalent/as low as is reasonably achievable (TEDE/ALARA) evaluations were completed to justify respirator use. No problems were noted with the respirator issue and control program.

Whole-body counters were calibrated using standards traceable to the National Institute of Standards and Technology. The inspector noted that an acceptable phantom was used along with radiation standard sources that covered energy ranges between 88 - 1836 keV. The whole-body counters were calibrated annually, and quality control (source) checks were properly performed prior to use each day. The inspector concluded that proper whole-body counter calibration and quality control programs were established.

Internal dose assessments were reviewed. There were no whole body counts performed between January 1997 and October 1998 which exceeded the licensee's action level of 50 millirem for recording a committed effective dose equivalent. However, during an investigation of a contamination event conducted in 1998, the licensee determined by successive whole body counts that an individual had ingested measurable quantities of cobalt-58 and cobalt-60. As a result of the investigation, the worker was assigned a committed effective dose equivalent of 23 millirems. No problems were noted by the inspector during the review of the methodologies used to determine internal dose.

c. Conclusions

An effective internal exposure program was implemented. Good air sampling and respiratory protection programs were maintained. Whole-body counting systems were properly calibrated and performance checked. Internal dose assessments were properly performed.

R1.3 Control of Radioactive Materials and Contamination; Surveying and Monitoring

a. Inspection Scope (83750)

Areas reviewed included:

- Control of radioactive material
- Housekeeping in the radiological controlled area
- Radioactive source control and leak testing programs
- Portable instrumentation calibration and performance check programs

b. Observations and Findings

During tours of the radiological controlled area, the inspector noted that all radioactive material containers were properly labeled and controlled. All laundry and trash containers were properly maintained. Contaminated areas were properly posted and clearly marked with tape and rope.

The inspector observed that housekeeping throughout the radiological controlled area was very good.

A review of personnel contamination logs revealed that pertinent information was properly documented. The inspector noted that there were 507 personnel contamination events identified in 1997. 122 of these events were investigated based on procedural criteria. Between January 1 and September 30, 1998, there were 398 personnel contamination events of which 60 were investigated. During the investigations, follow-up contamination surveys were performed to locate the source of contamination.

The inspector reviewed the radioactive source inventory and leak testing records for the last 12 months. The inspector randomly selected ten radioactive sources from an

inventory list provided by the licensee. All ten radioactive sources were found in their designated locations as documented in the individual radioactive source files and on the inventory list. The radioactive sources were properly stored and labeled. From a review of the last two semi-annual radioactive source inventory lists and leak testing results, the inspector determined that the radioactive source inventory and leak testing programs were performed in accordance with station procedures.

The inspector reviewed the portable radiation survey instrument program, including the calibration and repair of instrumentation. All portable radiation survey instrumentation observed in use in the radiological controlled area was properly calibrated and source response checked in accordance with station procedures. The inspector determined that instrumentation calibration and maintenance records were well maintained. The portable radiation survey instrumentation was properly calibrated using standard sources traceable to the National Institute of Standards and Technology.

The licensee used a vendor to calibrate the portable neutron instrumentation. Calibration certificates documented that the neutron survey meters were calibrated using a plutonium-beryllium (PuBe) source, which was traceable to the National Institute of Standards and Technology. The neutron survey meters were calibrated to exposure rates that adequately covered the normal exposure rates of 5 - 300 millirem per hour encountered in the reactor containment buildings at 100 percent reactor power. Prior to use, portable neutron instrumentation was source response checked using a PuBe source. The inspector concluded that proper neutron survey instrument calibration and quality control programs were implemented.

c. Conclusions

Radioactive material, laundry, and trash containers were properly labeled and controlled. Housekeeping throughout the radiological controlled area was very good. The personnel contamination program was implemented properly. Good radioactive source inventory and leak testing programs were in place. The calibration and source response check programs for neutron and portable radiation survey instruments were implemented properly.

R7 Quality Assurance in Radiological Protection and Chemistry Activities

R7.1 Quality Assurance Evaluations, Radiation Department Self-Assessments, and Radiological ONE Form Reports

a. Inspection Scope (83750)

The following items were reviewed:

- Nuclear overview evaluations performed since January 1, 1997

- Radiation protection department self-assessments performed since January 1, 1997

- Radiological ONE Form reports written since January 1, 1997

b. Observations and Findings

Nuclear Overview Evaluation Reports

Eight nuclear overview radiation protection evaluations were performed since January 1997. These evaluations covered a broad range of radiation protection activities and provided management with a good assessment of the radiation protection program. Five unresolved items and nine deficiencies were identified by the licensee during the performance of the evaluations. The deficiencies were documented in ONE Form reports. The inspector determined that the corrective actions for the deficiencies were appropriate to prevent reoccurrence, and the deficiencies were closed in a timely manner. The radiation protection department and nuclear overview department management were appropriately involved in resolving program deficiencies.

Radiation Protection Department Self-Assessments

Since January 1997 five radiation protection department self-assessments were performed by radiation protection supervision. The self-assessments were well written and covered a number of radiation protection program activities. The inspector determined that the reports provided a good assessment of the radiation protection program areas reviewed.

Radiological ONE Form Reports

The inspector reviewed selected radiological ONE Form reports written since January 1, 1997, and determined that the licensee's threshold for documenting events was proper. Corrective actions to prevent a reoccurrence appeared to be effective to resolve the original problem and, in general, ONE Form reports were closed in a timely manner. The inspector identified no negative trends during this review.

c. Conclusions

An effective radiation protection nuclear overview evaluation program was maintained. The nuclear overview evaluations and radiation protection department self-assessments provided management with a good assessment of the radiation protection program. Timely, effective corrective actions were implemented in response to assessment findings. No negative trends were identified during the review of radiological ONE Form reports written since January 1997.

V. Management Meetings

X1 Exit Meeting Summary

The inspector presented the inspection results to members of licensee management at an exit meeting on November 6, 1998. The licensee acknowledged the findings presented. No proprietary information was identified.

ATTACHMENT

PARTIAL LIST OF PERSONS CONTACTED

Licensee

A. Barnette, Supervisor, Radiation Protection
J. Blaikie, Health Physicist, Radiation Protection
S. Bradley, Supervisor, Radiation Protection
R. Carr, Supervisor, Radiation Protection
J. Curtis, Manager, Radiation Protection
D. Davis, Manager, Nuclear Overview Department
R. Fishencord, Supervisor, Radiation Protection
R. Garcia, Lead Technician, Radiation Protection
A. Hinkley, Lead Technician, Radiation Protection
T. Hope, Manager, Regulatory Affairs
D. Kay, Supervisor, Radiation Protection
D. Leigh, Supervisor, Nuclear Overview
D. McAfee, Programs Manager, Nuclear Overview
R. McGaughy, Nuclear Specialist, Nuclear Overview
D. Moore, Manager, Operations
D. O'Connor, Health Physicist, Radiation Protection
M. Oliver, Supervisor, Technical Training
C. Wilkerson, Senior Engineer, Regulatory Affairs

NRC

A. Gody, Jr., Senior Resident Inspector
S. Schwind, Resident Inspector

INSPECTION PROCEDURE USED

83750 Occupational Radiation Exposure

LIST OF DOCUMENTS REVIEWED

List of radiological ONE Form reports (01/01/97 - 10/31/98)

Nuclear Overview Department Evaluation Reports

NOE-EVAL-97-000004	"Radiation Protection," conducted January 6-9, 1997
NOE-EVAL-97-000029	"Control of Radioactive Material," conducted February 4-10, 1997
NOE-EVAL-97-000044	"Radiation Protection Dosimetry Program," conducted March 4-11, 1997
NOE-EVAL-97-000076	"Radioactive Work Permits," conducted May 5-30, 1997
NOE-EVAL-97-000082	"Radiation Protection Reorganization," conducted June 16-23, 1997

NOE-EVAL-97-000094	"ALARA: Internal and External Exposure Controls, Control of High Radiation Areas," conducted July 5-29, 1997
NOE-EVAL-97-000102	"Radiation Protection Program," conducted September 3-12, 1997
NOE-EVAL-98-000054	"Radiation Protection Program," conducted September 3-25, 1998

Radiation Protection Department Self-Assessments

"Source Inventory Program," conducted April 15, 1997

"Radiation Protection Document Retrieval," conducted April 21-25, 1997

"Radiation Protection Reorganization," conducted August 1997

"Respiratory Protection Program," conducted February 17-27, 1998

"Contamination Control," conducted March 3-9, 1998

Station Administrative Procedures

STA-652	"Radioactive Material Control," Revision 7
STA-653	"Contamination Control Program," Revision 6
STA-655	"Exposure Monitoring Program," Revision 6
STA-659	"Respiratory Protection Program," Revision 8
STA-660	"Control of High Radiation Areas," Revision 7

Radiation Protection Instructions

RPI-110	"Radiation Protection Shift Activities," Revision 6
RPI-212	"Radioactive Source Control," Revision 7
RPI-400	"Decontamination Program," Revision 7
RPI-402	Personnel Decontamination," Revision 12
RPI-507	"Internal Dose Calculation," Revision 3
RPI-508	"Calibration of the Stand-up Whole Body Counter," Revision 5
RPI-509	"Personnel Dosimetry Processing Program," Revision 5

RPI-515	""Neutron Dose Measurement and Recording," Revision 9
RPI-516	"Dose Determination," Revision 12
RPI-602	"Radiological Surveillance and Posting," Revision 7
RPI-606	"Radiation Work and General Access Permits," Revision 9
RPI-700	"Sealed Source Leak Testing," Revision 8
RPI-802	"Performance of Source Checks," Revision 4
RPI-902	"Issue and Control of Respiratory Protection Equipment," Revision 9