UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
TEXAS UTILITIES ELECTRIC COMPANY, *et al*.	)	Docket Nos. 50-445 and 50-446
	)	
(Comanche Peak Steam Electric Station, Units 1 and 2)	)	(Application for Operating Licenses)

AFFIDAVIT OF EDWARD ALARCON REGARDING
FUEL LOADING AND PRECRITICALITY TESTING

My name is Edward Alarcon. My business address is Comanche Peak Steam Electric Station, P.O. Box 2300, Glen Rose, Texas 76043. I am the section head of Results Engineering for Comanche Peak Steam Electric Station ("CPSES"). In that capacity I am responsible for initial fuel loading activities, precriticality testing, and other initial startup testing. A statement of my educational and professional qualifications is attached to this affidavit.

The purpose of this Affidavit is to support Applicants' motion that the Atomic Safety and Licensing Board authorize the Director of Nuclear Reactor Regulation of the NRC Staff to issue a license to Applicants to load fuel and conduct certain precritical testing activities for Comanche Peak Unit 1. Fuel loading is presently scheduled to commence in late September 1984, although critical path activities are running about three weeks behind that schedule. I estimate that completion of fuel loading and the precritical testing for which authorization is sought will take approximately 117 days.

I describe below the technical aspects of initial fuel loading, the precritical testing to be undertaken, the safeguards in place to assure that inadvertent criticality does not occur, and the risk to public health and safety from the proposed activities.

I. Initial Fuel Loading

Initial fuel loading at Comanche Peak will be conducted in a manner that meets the criteria in NRC Regulatory Guide 1.68, as described in Chapter 14 of the FSAR. Initial fuel loading involves the transfer of 193 unirradiated fuel assemblies from the Fuel Storage Areas in the Fuel Building to the reactor vessel in the Reactor Building for Unit 1. This transfer is accomplished through the Fuel Transfer System, which I describe below.

First, each fuel assembly is moved from the Fuel Storage Areas to the New Fuel Elevator. It is moved while in the vertical position. Next, it is lowered to an area where the Spent Fuel Pool Bridge Crane can lift it for placement in an upender, where it is lowered to the horizontal position for transfer into the Reactor Building through the Fuel Transfer Tube. The fuel assembly is then rolled through the Fuel Transfer Tube on the Transfer Cart. (FSAR §§9.1.1.2, 9.1.4.2.)

Once inside the Reactor Building, the fuel assembly is lifted to the vertical position by another upender. The assembly is removed from the upender by the Refueling Machine. The assembly can then be inserted into a prescribed location in the reactor vessel by the Refueling Machine. The Refueling Machine is designed for the precision movements and slow speeds required for fuel handling. This process will be repeated until the 193 fuel assemblies are loaded into their prescribed locations in the vessel. It is anticipated that the entire fuel loading process will take approximately one week. (FSAR §§9.1.1.2, 9.1.4.2.) Numerous safeguards are utilized during initial fuel loading to assure that the activities are performed in a safe and controlled manner. These safeguards are discussed in Part III of my Affidavit.

II. Precritical Testing

Precritical testing activities at Comanche Peak will be conducted in a manner that meets the criteria in NRC Regulatory Guide 1.68, as described in Chapter 14 of the FSAR. Upon completion of core loading, the core is mapped utilizing a closed circuit video system to provide independent verification that each fuel assembly is in its pre-scribed location. At this time, the reactor upper internals, including the control rod drive shafts, are installed in the vessel and the drive shafts latched to their respective rod cluster control assembly ("RCCA"). Each RCCA is then "drag" tested within its fuel assembly to ensure freedom of movement. Finally, the reactor vessel head is installed and bolted to the vessel flange, and electrical power is connected to the control rod drive mechanisms. (FSAR §14.2.10.2.)

Upon completion of the reactor head and vessel reassembly, the reactor coolant system is filled and vented in preparation for precritical testing. Primary plant pressure and temperature conditions are achieved utilizing non-nuclear heat sources from reactor coolant pumps and pressurizer heaters. These conditions are established and maintained by licensed operators to support the initial startup test program. Certain deferred preoperational tests will be performed, as will certain mechanical and electrical tests as required by Chapter 14 of the FSAR including the following:

A. <u>Reactor Coolant System Flow Test (FSAR Table 14.2-3, Sheet 2)</u>

The purpose of this test is to measure Reactor Coolant System ("RCS") cold leg volumetric flow rates at normal operating temperature and pressure with all reactor coolant pumps running. The individual RCS loop elbow differential pressures are measured and recorded. These values are used to determine adequacy of loop flows based on vendor supplied, plant specific graphs. The reactor coolant system flow transmitters are aligned for 100 percent flow at normal operating conditions and for zero output for zero flow conditions.

B. Reactor Coolant System Flow Coastdown Test (FSAR Table 14.2-3, Sheet 3)

The purpose of this test is to measure the reactor coolant system flow rate decrease subsequent to a simultaneous trip of all four reactor coolant pumps and to measure the delay times associated with the assumptions used in the loss of flow accident analysis. With the reactor coolant system in the hot standby condition, all four reactor coolant pumps are tripped simultaneously. During the ensuing flow transient, elbow tap differential pressures, reactor coolant pump breaker status, reactor trip breaker status and reactor coolant low flow relay status are recorded on strip chart recorders. The reactor coolant flow coastdown rate and delay times associated with the reactor trip circuitry are determined.

C. Control Rod Drive Tests (FSAR Table 14.2-3, Sheet 4)

The purpose of these tests is to verify control rod bank start and stop setpoints, verify proper slave cycler timing and drive mechanism operation, check rod speeds, and demonstrate the capability of the control rod drive mechanisms to respond to signals from the Reactor Control System. Using actual control rod withdrawal and insertion, each rod bank start and stop position, bank-overlap setpoint and rod speed is determined and verified to be in accordance with design. Visicorder traces of the actual rod drive coil voltages are made to verify proper slave cycler timing.

D. Rod Position Indication (FSAR Table 14.2-3, Sheet 5)

The purpose of this test is to verify that the Digital Rod Position Indication system provides proper rod position indication and alarms based on simulated and/or actual inputs over the entire length of travel of each rod cluster control assembly. Each rod cluster control assembly is pulled to its fully withdrawn position and inserted into its fully inserted position in small increments. Position indication and alarms are observed for proper operation.

E. Reactor Trip System Test (FSAR Table 14.2-3, Sheet 6)

The purpose of this test is to demonstrate proper functioning of the Reactor Trip System, including the capability to test the operation of the reactor trip breakers and bypass breakers. The reactor trip breakers and bypass breakers, including interlocks, are verified to function in accordance with design requirements. Each control rod drive mechanism is verified to unlatch upon opening of the trip breakers.

F. Calibration of Process Temperature and Nuclear Instrumentation (FSAR Table 14.2-3, Sheet 8)

The purpose of this test is to calibrate and adjust the operational settings of the source, intermediate, and power range neutron detectors and to calibrate and adjust the operational settings of the N-16 power detectors and the reactor coolant average temperature instrumentation system. The source range detector voltage versus detector output is measured to determine and adjust, as necessary, the operating voltage setting. The intermediate and power range channels are calibrated. An isothermal alignment of the N-16 power and T_{ave} instrumentation is performed.

G. Reactor Coolant Leak Test (FSAR Table 14.2-3, Sheet 24)

The purpose of this test is to determine the leak tightness of the Reactor Coolant System pressure boundary, the reactor vessel flange after the system has been closed following fuel load, the leak rates for primary to secondary leakage, the Reactor Coolant Pump seal leakage, and other identified and unidentified leakage. The Reactor Coolant System integrity is verified by visual inspection. The vessel flange leakage is verified to be zero by visual inspection and leakoff collection. The primary to secondary leak rate is determined by sampling the steam generators for boron. The Reactor Coolant pump seal leakage rate is also measured. Finally, the identified and unidentified leak rates are determined by conducting a mass balance of the primary system.

H. Chemical Tests (FSAR Table 14.2-3, Sheet 9)

The purpose of these tests is to verify that proper initial reactor coolant system water chemistry has been established and to verify the capability to maintain proper water chemistry during each mode of operation. Proper reactor coolant chemistry is established by operators and monitored by chemistry technicians to support the current operational mode. The normal, ongoing sampling program is used to verify that the various chemistry parameters are being properly maintained within the guidelines established by the plant Technical Specifications.

J. Rod Control System Test (FSAR Table 14.2-3, Sheet 25)

The purpose of this test is to demonstrate the proper operation and indication of the Rod Control System. Each bank of control and shutdown rods is withdrawn and inserted in manual and automatic modes as applicable. The proper operation of status lights, step counter indications, rod position and rod speed indication is verified. Rod speeds, direction of motion and bank overlap are verified to be in accordance with manufacturer's specifications.

K. Incore Nuclear Instrumentation (FSAR Table 14.2-3, Sheet 27)

The purpose of this test is to demonstrate the capability of the Incore Nuclear Instrumentation to remotely position the incore neutron detectors for the purpose of core flux mapping, and to supply the appropriate digital and analog signals to the plant computer. The system is operated in all modes after setting the indexing and limit switches. Leak detection and gas purge systems are verified to operate properly. It is verified that each detector/cable combination can be inserted to the top limit switches, will automatically stop, and can be withdrawn, and that appropriate outputs are supplied to the plant computer.

L. Rod Drop Tests (FSAR Table 14.2-3, Sheet 17)

The purpose of this test is to determine the rod drop time of each rod cluster control assembly under cold no flow, cold full flow, and hot full flow conditions. Each rod cluster control assembly is withdrawn, the electrical power to the rod drive mechanism interrupted, and the drop time measured utilizing the rod position indication signals. Additional measurements will be performed on rods whose drop times deviate from the average by more than a prescribed amount. All rods are tested at each of the three specified conditions.

Again, numerous safeguards are utilized during the precritical testing to assure that the activities are performed in a safe and controlled manner. These safeguards are discussed in Part III, below.

III. Safeguards to Prevent Inadvertent Criticality

During initial fuel loading, 193 unirradiated fuel assemblies, some containing control rods and others containing burnable poison assemblies, are loaded in a prescribed sequence into the reactor vessel. At all times during fuel loading activities, source range nuclear instrumentation is utilized to monitor the neutron count-rate. For this monitoring the two permanent plant instrument channels are supplemented by two additional temporary monitoring channels supplied by the fuel vendor (FSAR §14.2.10.1). These provide accurate indications of the reactivity conditions during the core loading sequence. The first two fuel assemblies loaded contain the neutron sources. As each additional assembly is loaded, the neutron count-rate is monitored to ensure that inadvertent criticality is not approached. Once eight fuel assemblies are loaded, meaningful inverse count-rate data for additional fuel insertions can and will be recorded and analyzed. This monitoring will continue until the core is fully loaded. If unanticipated increases occur in the neutron count-rate, fuel loading operations will cease and the cause determined. This careful monitoring process will assure that fuel loading will be conducted in a safe and controlled manner. (FSAR §14.2.10.1.)

During fuel loading, the concentration of boron in the Reactor Coolant System will be maintained between 2000 and 2150 ppm. This will insure that K_{eff} will be maintained at or below 0.95. Boron concentration of 2000 ppm has been conservatively determined by calculation and previous experience at similar power reactors to assure subcritical conditions. During fuel loading, boron concentration will be checked by chemical analysis at least every four hours. If boron concentration falls below 2000 ppm, fueling operations will cease and additional boron will be injected until the prescribed concentration level is restored. Further, if an incremental decrease in boron concentration of over 20 ppm is detected from one sample analysis to the next, then fueling operation will cease whether or not the concentration falls below 2000 ppm and the cause of the decrease will be determined. (FSAR §14.2.10.1.)

During precritical testing, the concentration of boron likewise will be maintained between 2000 and 2150 ppm. This will assure that sub-criticality is maintained, even in the unlikely event that all control rods are inadvertently fully withdrawn from the core. During precriticality testing, boron concentration will be checked by chemical analysis at least once during every eight hour shift. If boron concentration falls below 2000 ppm, additional boron will be injected.

The alarms and reactor trip functions associated with the Source Range ("SR") Nuclear instrumentation will be in operation in accordance with the Technical Specifications during this entire period of fuel loading and precritical testing (Technical Specifications Table 3.3-1). This SR instrumentation monitors neutron multiplication while fuel assemblies are loaded into the core and while testing is performed following fuel loading. High SR levels will initiate an alarm and the operator will take appropriate action. If the neutron flux level exceeds 10^5 counts per second, then the reactor will trip automatically (Technical Specifications Table 2.2-1). On doubling of neutron counts within a short increment of time, the flux doubling monitor will also automatically isolate potential boron dilution paths (FSAR §7.6.11). This instrumentation provides an additional safeguard to insure that inadvertent criticality is not achieved.

Fuel loading activities that directly affect the reactor core will be conducted by licensed operators under the direction and supervision of a licensed senior reactor operator ("SRO") trained in fuel transfer. The SRO will have no other concurrent responsibilities. This SRO will direct core loading from the operating floor of the Reactor Building. (FSAR §14.2.10.1.) Another SRO will be on site at all times during fuel loading, and a licensed reactor operator will be in the Control Room at all times during and following core loading (FSAR §13.1.2.3).

Fuel loading activities and precritical testing will be directed by the Initial Startup ("ISU") group. The ISU group consists of an ISU Coordinator and qualified test engineers who have been specifically trained for this function. The ISU group also possesses significant experience in initial startup of nuclear power reactors. (FSAR §14.2.2.7.) The test engineers will provide continuous on-shift direction of the fuel loading and precritical testing activities (FSAR §14.2.4.3). The ISU Coordinator is responsible to the Results Engineer for the implementation of fuel loading and precritical testing.

Westinghouse, the supplier and designer of the nuclear fuel and the nuclear steam supply system, will provide personnel with relevant experience to the site organization during fuel loading and precritical testing. These personnel will provide technical guidance and advice during fuel loading and precritical testing activities. (FSAR §14.2.2.4.4.)

These controls and safeguards, and the levels of experience and qualifications that these operators and engineers possess, provide a high degree of assurance that fuel loading and precritical testing will be conducted safely and efficiently. (FSAR §14.2.2.7.)

IV. Risk to Public Health and Safety

The health and safety of the public is not at risk by these proposed operations. Fundamentally, risk to the public from nuclear power reactor activities is possible only when fission products can be released to the environment. Fission products are the by-products of the fission process which occurs in the core after criticality. These fission products are radioactive and generate heat as they decay. However, critical operation at significant power levels is required to generate enough fission products to be hazardous. Further, even when such fission products are generated in the future, the defense in depth barriers to the release of fission products and redundant safety systems of CPSES will serve to prevent release of the fission products to the environment.

As discussed in Part III above, Comanche Peak Unit 1 will not be allowed to become critical (in fact it will be shut down by a margin of at least 5%), much less develop any power history. No significant radioactive fission products will be contained in the reactor core or systems at CPSES during the contemplated activities. Thus, systems that prevent or mitigate the consequences of postulated accidents, while operable and available, need not be called upon to function.

In addition, decay heat removal is not required since there is no fission product to decay. In the unlikely event that all cooling is lost, plant safety and pressure boundary integrity will not be compromised. The non-nuclear heat input to the system can be stopped by merely turning off pumps and heaters. Therefore, initial fuel loading and precritical test activities clearly pose no threat to the health and safety of the public.

Edward Alarcon

Edward Alarcon

County of Hood)
) ss:
State of Texas)

Subscribed and sworn to before me this 3 day of August 1984.

Eva Ang

Notary Public

Attachment 1

EDWARD ALARCON

Business Address

Comanche Peak Steam Electric Station
Texas Utilities Generating Co.
P.O. Box 2300
Glen Rose, Texas 76043

Home Address

1820 Timbercreek
Ft. Worth, Texas 76126

Educational Background

Bachelor of Science Degree in Mechanical Engineering, with nuclear engineering option, from the University of Texas at Austin - August 1976.

Professional Experience

1976 Employed by the General Electric Company at Knolls Atomic Power Laboratory (KAPL) as an engineer.

1977 Completed the six month Nuclear Power Engineering School at KAPL; assigned as an operations engineer at the S7G naval reactors prototype at the KAPL West Milton site. Responsible for the safe, effective and efficient conduct of all plant operations, including training, testing, maintenance, and repairs in accordance with approved procedures.

1977 Qualified as Engineering Officer of the Watch at the S7G prototype.

1978 Qualified as Nuclear Plant Engineer and Staff Instructor at the S7G prototype.

1978 Employed by Texas Utilities Generating Company as an associate engineer in the results engineering section at Comanche Peak Steam Electric Station.

1979 Received on-the-job training at the D.C. Cook Nuclear Plant. Participated in the reactor startup and the low power physics testing of the Unit 1 plant following a refueling outage.

1979 Completed the sixteen-week cold license classroom training at Comanche Peak Steam Electric Station.

1980 Received on-the-job training at the North Anna Nuclear Plant. Participated in the reactor startup and the low power physics testing of the Unit 1 plant following a refueling outage.

1980 Completed the Westinghouse three-week training module on the Nuclear Training Reactor at Zion, Illinois.

1980 Assigned to the present position as the section head of Results Engineering at Comanche Peak Steam Electric Station. Responsible to the Engineering Superintendent for performing duties and providing support in the areas of: on-site technical support; performance and surveillance testing; and design modification implementation. As Results Engineer, supervise a staff of engineers who have experience and provide technical support in the areas of electrical, nuclear, and mechanical engineering.

1982 Completed nuclear plant simulator training at the Westinghouse Nuclear training center on normal plant operations and abnormal events.

1983 As the section head of Results Engineering at Comanche Peak Steam Electric Station, expanded responsibilities to include reactor engineering functions and direct responsibility for the initial startup test program.

Professional Affiliations

Member - American Society of Mechanical Engineers
Member - American Nuclear Society

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DOCKETING & SERVICE
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TEXAS UTILITIES ELECTRIC COMPANY, et al.	)	Docket Nos. 50-445 and 50-446
	)	
(Comanche Peak Steam Electric Station, Units 1 and 2)	)	(Application for Operating Licenses)

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing "Motion For Authorization To Issue A License To Load Fuel And Conduct Certain Precritical Testing," in the above-captioned matter were served upon the following persons by overnight delivery (*), or deposit in the United States mail, first class, postage prepaid, this 7th day of August 1984.

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