UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
TEXAS UTILITIES GENERATING COMPANY ET AL.	)	Docket Nos. 50-445 50-446
	)	
(Comanche Peak Steam Electric Station, Units 1 and 2)	)	

AFFIDAVIT OF DAVID W. PYATT

I, David W. Pyatt, being duly sworn, do depose and state the following:

Q.1. By whom are you employed, and what is the nature of your work?

A.1. I am a Risk Assessment Engineer in the Reactor Risk Branch, Division of Risk Analysis, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission. I have nine years of experience in the safety analysis and licensing of light water reactor nuclear power plants. I have been employed by the U.S. Nuclear Regulatory Commission since February of 1980. Prior to that I was employed by the NUS Corporation, performing consulting studies in the area of containment design, subcompartment analysis, radiological dose calculations and offsite hazards for nuclear power plants. I have a Bachelor's degree in Aerospace Engineering from the Pennsylvania State University (1964) and a master's degree in Mechanical Engineering from Drexel University (1967). I have taken additional courses in probability and statistics from Johns

Hopkins University as well as non-accredited, or short courses, in the area of risk assessment and nuclear engineering. I am a Registered Professional Engineer in the State of Maryland.

Q.2. What is the nature of your responsibilities regarding the Anticipated Transients Without Scram ("ATWS") rulemaking proceeding?

A.2. I have been working almost full time on the ATWS rulemaking for the past year, starting in April 1981. Prior to that I was involved on a limited basis. I am familiar with the rulemaking on ATWS, since I am the NRC Staff ("Staff") Task Leader for the current ATWS rulemaking proceeding. I prepared, with the assistance of other NRC staff personnel, the Federal Register notice which presented the two alternative rules proposed by the Staff.

Q.3. Would you describe the subject matter of your affidavit?

A.3. My affidavit addresses Board Question 3, which states:

> Describe the status of Safety Issue TAP A-9 (ATWS) as it relates to CPSES 1 and 2.

In particular, I will describe the history and current status of the rulemaking on ATWS.

Q.4. What is an Anticipated Transient without Scram, and why is this issue the subject of a rulemaking proceeding?

A.4. Nuclear Plants have safety and control systems to limit the consequences of abnormal operating conditions. During the life of a nuclear power unit, "anti-operating conditions likely to occur one or more times. These are conditions such as a loss of power to recirculation pumps. the loss of off-site power, the tripping

of the turbine genrator set, and the like. In some such cases, a rapid shutdown of the nuclear reaction-initiating a "scram" -is an important safety measure. If there were a potentially severe transient, and the reactor shutdown system did not function as designed, then as "anticipated-transient-without-scram," or ATWS, would have occurred. ATWS accidents are a cause for concern because a mismatch can develop between the power generated in the reactor and the power dissipated if the scram system fails to shut down the reactor following a fault in the normal heat dissipation functions (transient events). The power mismatch can threaten the integrity of the barriers that confine the fission products. A core meltdown accident, in some cases accompanied by a failure of containment and a very large release of radioactivity, is a possible outcome of some ATWS accident sequences. Thus, the consequences of some postulated ATWS accidents are unacceptable.

There have been roughly one thousand reactor years of experience accumulated in foreign and domestic commercial light-water-cooled reactors without an ATWS accident. This experience suggests that the frequency of ATWS accidents is equal to or less than an order of once in a thousand reactors years. There have been several precursor events, i.e., faults detected that could have given rise to ATWS events. This suggests that the frequency of ATWS accidents, though less than once in a thousand reactor years, may not be very much less. Thus the NRC has determined that reductions must be made in the frequency and/or the severity of ATWS accidents.

Q.5. When was the issue of ATWS first raised and addressed by a federal regulatory agency?

A.5. The issue of ATWS goes back to approximately 1969 when the former U.S. Atomic Energy Commission ("AEC") first aired its concern regarding the ability of a nuclear power plant to safely respond to transients when a scram could not be initiated. When the nuclear reactor regulatory functions of the AEC were transferred to the newly-organized U.S. Nuclear Regulatory Commission ("NRC"), the ATWS issue continued to be of concern to NRC.

In September, 1973, "Technical Report on Anticipated Transients Without Scram for Water-Cooled Power Reactors", WASH-1270, was published which requested reactor manufacturers to perform design studies to improve safety from an ATWS. It also contained the Staff's licensing position on ATWS. The Reactor Safety Study (WASH-1400) also did extensive analyses of the risk due to ATWS. The reactor vendors performed studies as requested by WASH-1270 but felt that implementation of the Staff's proposed ATWS requirements would not be cost beneficial. The industry maintained that the probability of an ATWS is acceptably low such that further protection against ATWS was not necessary.

After further evaluation the NRC Staff published "Anticipated Transients Without Scram For Light Water Reactors" Volumes 1-4, NUREG-0460. In this report the Staff did extensive evaluations of various levels of design modifications to reactors. Volumes 1 and

in NUREG-0460 eventually resulted in the current NRC rulemaking proceeding on ATWS.

Q.6. Describe the history of the ATWS rulemaking proceeding at the NRC.

A.6. In the fall of 1980, the Staff presented to the Commission their recommended ATWS Rule in SECY-80-409. The proposed rule would require certain design modifications on all reactors. During this same period, a group of public utilities petitioned for a proposed ATWS rule which was substantially different from the Staff's proposed rule. Commissioner Joseph Hendrie, who had been deeply involved with ATWS for many years, felt that an alternative rule which would allow flexibility on the part of the applicants to deal with ATWS would be preferable to the Staff proposed rule. An alternative rule ("Hendrie rule") was drafted by Frank Rowsome, Deputy Director, Division of Risk Analysis, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission. In a Commission meeting on June 16, 1981, the Commission voted 4-0 to publish both of the proposed rules for public comment. The first alternative rule would be essentially the same as that presented in SECY-80-409. The second alternative rule would be the alternative which was presented at the June 16, 1981 Commission meeting by Frank Rowsome.

The two NRC-proposed rules were published in a Notice of Rulemaking in the Federal Register on November 24, 1981. The November, 1981 Notice of Rulemaking requested public comments on the NRC-proposed

ATWS rules. Reference was made in that Notice to the November, 1980 utilities' petition for rulemaking and the public was invited to submit additional comments on the utilities' November 1980 proposed ATWS rule. The public comment period for all three alternatives ended on April 23, 1982.

Q.7. Please summarize the proposed requirements that would be imposed on the Comanche Peak Steam Electric Station ("CPSES") by each of the three alternative ATWS rules.

A.7. I will summarize the requirements that would be imposed on CPSES, which is a Westinghouse pressurized water reactor ("PWR").

The First NRC-Proposed Rule (Staff Rule)

The required design changes would be:

1. A diverse and independent ATWS mitigation circuitry system separate from the reactor protection system that would actuate turbine trip and initiate the auxiliary feedwater system.

2. A containment isolation system initiated by early detection of fuel failures.

3. Although not specified by the rule, instrumentation necessary for shutdown that can withstand ATWS conditions is implied.

In addition, an analysis with acceptable evaluation models of the plant performance allowing ATWS events must be performed.

The Second NRC-Proposed Rule (Hendrie Rule)

The required design changes would be:

1. A device to provide automatic initiation of the auxiliary feedwater system if an ATWS occurs.

2. Provide instrumentation that would diagnose the initiation of and recovery of an ATWS.

3. Ensure that reactor coolant system pressure boundary valves through which high pressure injection can reach the reactor remain functional after limiting ATWS transients occur.

4. Provide an initial reliability assurance program that would involve operator training to diagnose ATWS accident sequences, analysis of test and maintenance procedures to determine their adequacy, analysis of the blindspots in the experience base with systems important to ATWS prevention or mitigation and analysis of the susceptibility of the plant to common cause failure.

5. Provide a continuing reliability assurance program that would involve configuration control for designs, procedures, and technical specifications to assure consistency with the initial reliability program, procedures for updating affected portions and a feedback system to review operational and test data on relevant systems in the licensed plant and the relevant experience at plants having a similar design.

The Utilities' Proposed Rule

The required design changes would be:

1. Provide automatic initiation of turbine trip and auxiliary feedwater initiation independent of the reactor protection system.

Q.8. What is the current status of the ATWS rulemaking proceeding?

Q.8. As I stated in my answer to Question 6 above, the public comment period for the three alternative rules closed on April 23, 1982. I have received numerous and extensive comments on the alternative rules. Comments are still being received beyond the April 23, 1982 deadline and, presumably, will still be considered. When all of the comments are received, it will take some time to collate them. Therefore, it is impossible at this time to determine which direction the final rule will take.

Q.9. Is the licensing and operation of nuclear reactors, including CPSES, acceptable prior to final resolution of the ATWS rulemaking proceeding, utility implementation of those rules.

A.9. Yes, the licensing and operation of nuclear reactors such as CPSES prior to final resolution and implementation of the ATWS rules is acceptable and will not present a serious public safety hazard. The Commission has stated that the likelihood of severe consequences arising from an ATWS event during the two to four year period required to implement a final ATWS rule is acceptably small. 46 Fed. Reg. 57522 (Nov. 24, 1981). This judgment is based on (a) the favorable experience with the operating reactors, (b) the limited number of operating nuclear power reactors, (c) the inherent capability of some of the operating PWRs to partially or fully mitigate the consequences of ATWS events, the interim stops taken to develop procedures and train operators to further reduce the risk from ATWS events.

The above statements and opinions are true and correct to the best of my personal knowledge and belief.

David W. Pyatt

Subscribed and sworn to before me this 7th day of May, 1982

Patricia A. Rilony
Notary Public

My Commission expires: 7/1/82

DAVID W. PYATT

EDUCATION

Drexel University, M. S., Mechanical Engineering, 1967
Pennsylvania State University (with Distinction), B.S., Aerospace Engineering, 1964
Additional graduate studies, Johns Hopkins, Operations Research
Short Course in Fault Tree Analysis, George Washington University, 1976

REGISTRATION

Professional Engineer, State of Maryland

EXPERIENCE

Nuclear Regulatory Commission, February 1980-Present
NUS Corporation, 1973-1980
Weiner Associates, Inc., 1968-1973
Hittman Corporation, 1966-1968
Martin Marietta Corporation, Aerospace Division, 1964-1966

Nuclear Regulatory Commission - Developed regulatory guide for post-accident plant shielding requirements in the event of a degraded core accident. Participated in peer review of "status of iodine" research summary. Developed draft regulation of engineered safety features as part of degraded core rulemaking. Prepared Federal Register notice for ATWS rulemaking. Reviewed probabilistic risk assessments (PRA) for several commercial power plants.

NUS - Performed data analysis to support an integrated leak rate test. Contributed to the evaluation of potential hazards to a nuclear plant resulting from nearby industrial, transportation, and military facilities. Performed calculations of gas pipeline break, toxic chemical release, explosion-generated missiles, and secondary effects of fires. Developed appropriate models and calculated accident radiation doses in the control room and at the site boundary. Investigated alternative means of reducing doses to acceptable values. Performed subcompartment analyses for BWR and large PWR containment, including asymmetric reactor vessel and equipment loads. Developed a hazards model of the engineered safety features for a proposed nuclear powered tanker.

Developed model and code for correction of spray removal coefficient for non-sprayed regions in primary containment. Performed analyses of downstream transient pressures, flows, and thrusts occurring after the initiation of a reactor depressurizati system. Utilized FLASH and a new program written for this purpose. Performed pipe whip analysis for main steam and feedwater line break effects analysis and thermal analysis of spent shipping casks for general use.

Weiner Associates, Inc. - Reviewed the risk assessment analysis for the launch of a PU-238 radioisotopic thermoelectric generator (RTG) for an earth-orbiting satellite. This involved a probability assessment of all phases of operation from fuel fabrication through launch of the Scout vehicle (four-stage solid propellant). All accident modes during the launch phase were modeled. This included blast overpressure, shrapnel generation, solid propellant fire, impact of the encapsulated fuel on land, and atmospheric reentry during launch and as a result of earth orbital decay. A fault tree analysis that included reliability data of approximately 50 Scout vehicle launches was made.

Performed safety studies for the SNAP-8, ZrH Reactor. Acted as project engineer, which entailed most of the technical analysis and customer interface with the USAEC Safety and Reliability Branch. Analyses were performed to assess the probability of a reactor excursion during launch, orbital operation, reentry, impact, and post-impact. Analyses performed included shielding, gamma and neutron adsorption, and heat transfer (computer modeling) in the core, in the NaK flow loop, and in the shield.

Prepared a safety analysis report of a nuclear reactor facility in Texas. Analyzed all accident modes, including the maximum credible accident of a liquid hydrogen explosion in the test cell.

Prepared significant portions of the hazards and safety analysis for a joint proposal for a space base reactor power supply. Prepared an environmental assessment report for the U.S. Navy Radioisotopic Power Generators (RPG's).

Hittman Corporation - Performed thermal analyses of space nuclear power systems (SNAP generators) utilizing numerical technique. Performed general aerospace nuclear safety analyses, i.e., launch pad explosion, reentry, land, and water impact for SNAP-19 radioisotope thermoelectric generator.

Martin Marietta Corporation - Performed thermal analyses on the PRIME reentry vehicle project to obtain component temperature transients during atmospheric entry.

MEMBERSHIPS

American Nuclear Society
Tau Beta Pi
Sigma Tau

PUBLICATIONS

"Mark I Containment Response to Intermediate Break Accident," (Co-author), NUS-3211, November 1978.

"Development of Accident Event Trees and Evaluation of Safety System Failure Modes for the Nuclear Ultra Large Crude Carrier (ULCC)," (Co-author), NUS-1845, February 1977.

"Navy Transit RTG Safety and Test Integration From Users' Viewpoint," (Co-author), presented at the 5th International Engineering Energy Conversion Conference, San Diego, California, September 25-29, 1972.

"A Survey of the Reentry Behavior of Plutonium Dioxide Microspheres," (Co-author), presented at the American Nuclear Society Annual Meeting, June 15-19, 1969.

"An Aerospace Nuclear Safety Analysis of a Pm_2O_3 Radioisojet Thruster," (Co-author), presented at the Second Symposium of Nucleonics in Aerospace, July 12-14, 1967.