

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

In the Matter of)
SACRAMENTO MUNICIPAL UTILITY) Docket No. 50-312 (SP)
DISTRICT (SMUD))
(Rancho Seco Nuclear Generating)
Station))

AFFIDAVIT OF SHOU-NIEN HOU

I Shou-Nien Hou, being duly sworn, depose and state that:

1. I am an employee of the U. S. Nuclear Regulatory Commission (NRC). My present position is Principal Mechanical Engineer with the Office of Nuclear Reactor Regulation. I am currently responsible for reviewing design adequacy of mechanical components. My professional qualifications were provided with my August 18, 1982 testimony sent to the Board on August 18, 1982.
2. The purpose of this affidavit is to provide the results of the NRC staff's review of SMUD's July 2, 1982 response to Item No. 6 of the ASLAB Memorandum and Order dated October 7, 1981 (ALAB-655). Item No. 6 requests the following information:

"SMUD and staff schedules for HPI analysis";

3. High Pressure Injection (HPI) Nozzle Analysis

The ASLAB's Memorandum and Order, dated October 7, 1981, required that SMUD and the staff provide an analysis on the maximum allowable number of thermal cycles on the HPI nozzles.

SMUD's HPI nozzle analysis was submitted to the staff in a letter dated February 3, 1982. Mark L. Padovan's affidavit, transmitted to the ASLAB by Richard L. Black on January 6, 1982, indicated that our review of SMUD's initial HPI nozzle analysis submittal would be completed by February 8, 1982. Our review of SMUD's initial submittal identified questionable assumptions in SMUD's analysis.

Our February 3, 1982 letter requested SMUD to provide a revised analysis based on corrected flow rate assumptions. We received the revised licensee's HPI nozzle analysis on July 12, 1982, and I indicated to the Board in my August 17, 1982 testimony that the staff review would be completed by September 15, 1982.

The staff has reviewed the B&W reports (References 1 & 2) submitted by SMUD for the Rancho Seco plant, which include the licensee's response to our request for additional information (Reference 3). Our review covers the analytical techniques and acceptance criteria used, and analysis results obtained by the licensee for verifying HPI nozzle structural integrity. Our evaluation concluded that the HPI nozzles were adequately designed to sustain 70 manual actuation cycles in addition to the originally designed 1) 40 test cycles, 2) 40 rapid depressurization cycles, and 3) heat-up and cooldown cycles. Operating Basis Earthquake (OBE) cycles were also appropriately considered in the analysis. Our acceptance is based on the following:

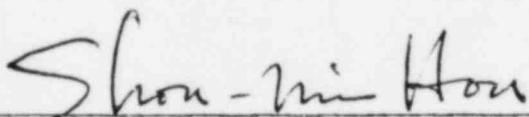
1. We have reviewed the analytical methods and procedures used by the licensee to evaluate the additional fatigue effects on the HPI nozzles caused by 70 additional manual actuation cycles. A simplified ratio method was utilized to extrapolate stresses calculated for the rapid depressurization transients as shown in the original stress reports, which was based on the nuclear power piping Code B31.7, 1968 draft. We concur that the ratio method provides a valid stress estimation, and the B31.7 piping code is acceptable for fatigue evaluation since these specific procedures, as well as the entire B31.7 document, have been incorporated into Section III of the ASME Code.
2. We have reviewed the load combinations used in the submittals. Pressure loads, thermal transients and earthquake cycling effects were considered and combined. The thermal stresses induced by the thermal transients include

expansion and gradients effects. The fatigue evaluation was based on the maximum primary plus secondary plus peak stress intensity range, including stress concentration effects at structural discontinuities. We find that such combinations are acceptable.

3. We have reviewed the results of the analysis. The fatigue usage factor after adding the 70 manual actuation cycles is 0.8, which is within the code allowable value of 1.0. The major contributor to the usage factor is the postulated low probability combination of the peak stresses induced by the individual thermal and OBE cycles events. Thus, adequate margin exists even if the HPI nozzles are subjected to an additional 70 manual actuation cycles.

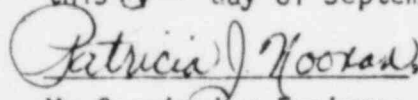
- References:
1. B&W Report, No. 32-1121811-00 & 32-1119808-01, "HPI Nozzle Usage Factor", 10/13/80.
 2. B&W Report, No. 32-1134218-00, "SMUD HPI Nozzle Usage Factor", 7/2/82.
 3. NRC letter to SMUD, "Request for Information", 2/3/82.

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



Shou-Nien Hou

Subscribed and sworn to before me
this ^{2nd} day of September 1982.

 Notary Public
My Commission Expires: July 1, 1986