July 20, 1981

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	§	
	§	
HOUSTON LIGHTING & POWER COMPANY	§	Docket No. 50-466
	§	
(Allens Creek Nuclear Generating Station, Unit 1)	§ §	

DIRECT TESTIMONY OF MILTON R. LANE ON DOHERTY CONTENTION 41, - REACTOR WATER LEVEL INDICATORS

Q. Please state your name and place of employment.

A. My name is Milton R. Lane and I am employed by General Electric Company as a Principal Engineer. My business address is 175 Curtner Avenue, San Jose, California 95125.

Q. Please describe your professional qualifications.

A. My professional qualifications are set forth in Attachment MRL-1 to this testimony.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to address the consolidation of Mr. Doherty's Contention #41 and TexPirg's Additional Contention #54 which states that Applicant's reactor water level indicators are unreliable, as indicated by events at Three Mile Island and Oyster Creek. Intervenor contends that the Applicant should develop a system whereby the reactor water level is sensed by redundant to type and redundant to function water level indicators.

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Q. Has the reactor water level instrumentation been recently reviewed?

A. Yes. As indicated in Appendix O, Page O-94 of the ACNGS PSAR, the water level instrumentation has been reviewed in response to Item II.K.3.23 of NUREG-0718, "Licensing Requirements for Pending Applications for Construction Permits and Manufacturing License."

Q. As background information please give the purpose of the reactor water level indication system?

A. The purpose of the reactor water level indicator system is to provide the reactor operator and various safety systems with information regarding vessel water level. The BWR water level instrumentation provides multiple level indications displayed on the reactor control console or nearby panels in full view of the operator. In addition, multiple indicating trip units provide wide range and narrow range reactor level safety related trip signals and related alarms. Safety control and information functions provided by the level instruments include scram, containment isolation, ECCS initiation, RCIC initiation, ADS initiation (contribution), feedwater control, recirculation pump shutoff, MSIV closure, level readout, level recording, and level alarm functions in the control room for normal, transient, and post-accident conditions.

Q. Describe the present BWR reactor water level indicator system which will be used on ACNGS.

A. Reactor vessel water level is measured by differential pressure transmitters which measure the difference in static head between two columns of water. One column is a "cold" (ambient temperature) reference leg outside the reactor vessel; the other is the reactor water in the annulus area inside the reactor vessel. The measured differential pressure is a function of reactor water level.

The cold reference leg is filled and maintained full of condensate by a condensing chamber at its top which continuously condenses reactor steam and drains excess condensate back to the reactor vessel through the upper level tap connection to the condensing chamber. The upper vessel level tap connection is located in the steam zone above the normal water level inside the vessel. Thus the reference leg presents a constant reference static head of water to one side of the differential pressure (d/p) transmitter. The other side of the transmitter is piped to a lower-level tap on the reactor vessel which is located below the normal water level in the vessel. The low-pressure side of the transmitter thus senses the static head of water/steam inside the vessel above the lower vessel level instrument tap. This head varies as a function of reactor water level above the tap and is the "variable leg" in the differential

pressure measured by the transmitter. Lower taps for various instruments are located at various levels to accommodate both narrow and wide range level measurements.

Q. Describe the redundancy of function of the level indicator system.

A. The Allens Creek reactor vessel water level indication system is shown schematically in Attachment MRL-2. This system provides redundant channels of level indication of overlapping ranges of instrumentation which are calibrated for specific plant conditions. Four redundant and separate instrumentation channels are provided for the normal operating range. Three redundant and separate channels are provided for transients which can be postulated during reactor operation and LOCA and post-LOCA conditions. One shutdown range channel is provided for cold shutdown and maintenance conditions when the reactor is depressurized and flooded. One upset range channel is provided for monitoring high water level transients. The shutdown and upset range instruments are effectively redundant for monitoring water levels up to the main steam lines. Two redundant and separate fuel zone channels provide water level recording/indication for accident monitoring when the reactor is hot and depressurized. Also, in response to the recent review of water level instrumentation mentioned earlier, water level is to be recorded continuously from the bottom of the core support plate to the centerline

of the main steam line for post-accident monitoring.

Q. Describe the reliability of differential pressure cells for water level measurement.

A. The differential pressure detectors currently used for water level measurement are recognized in the industry as among the best quality available and have a history of being highly reliable. These sensors are rugged, contain few moving parts, are very accurate and have been fully qualified to recognized IEEE standards and NRC regulatory guides. The complete redundancy in function of the water level detection instruments which is provided is sufficient to accommodate any anticipated failure of the differential pressure detectors.

Q. Describe the Oyster Creek incident referenced in the contention.

A. A loss of feedwater transients at the Oyster Creek facility on May 2, 1979 resulted in a significant reduction in water inventory above the reactor core areas as measured by one set of water level instruments (triple-low level), while the remaining two sets of level instrumentation in the reactor annulus indicated water levels above the scram setpoint.

The initiating event was a false high reactor pressure scram. The signal resulted in a simultaneous reactor scram and the tripping of all operating recirculation

pumps. Operator error led to the closure of all recirculation discharge valves. Oyster Creek is a non-jet pump BWR, and, as such water from the reactor annulus area must pass through the recirculation piping in order to reach the reactor vessel lower plenum and the core shroud area. With the recirculation pump discharge valves closed (discharge piping is over 2 feet in diameter), the only flow path back to the core region was via the 2-inch bypass lines around the discharge valves. The effect of this flow restriction was to reduce the water level in the core region and to increase the level in the reactor annulus area.

Q. Did "spurious water level indication" at Oyster Creek cause the operator to fail to take action as indicated by the Intervenor?

A. No. There was no spurious water level indication. The water level instrumentation gave accurate indications of water level in the reactor annulus and the core shroud area. The problem was operator error, as I explained above.

Q. Could this event scenario happen at ACNGS?

A. No. ACNGS is a jet-pump plant, and as such, there is no way of restricting the flow from the reactor annulus to the core shroud area for this type of event. Thus, the water in the reactor annulus will accurately reflect the water level in the core shroud area in a similar condition.

Q. Is the design of ACNGS comparable to TMI as

alleged in the contention?

A. No. The water level in the reactor vessel at TMI was not directly measured, but was inferred from water level instruments on the pressurizer. The pressurizer is a separate vessel connected to the primary system of PWR plants which normally contains both steam and water and is used to maintain system pressure such that boiling does not occur in the reactor. On BWR/6 plants such as ACNGS the reactor vessel water level is measured <u>directly</u> and continuously. Thus the Intervenor's reference to TMI is not applicable to ACNGS.

Q. What are your conclusions?

A. The reactor water level instrumentation at ACNGS provides a direct measurement of reactor water level within the vessel using reliable sensors which are redundant as to function.

Attachment MRL-1

MILTON R. LANE

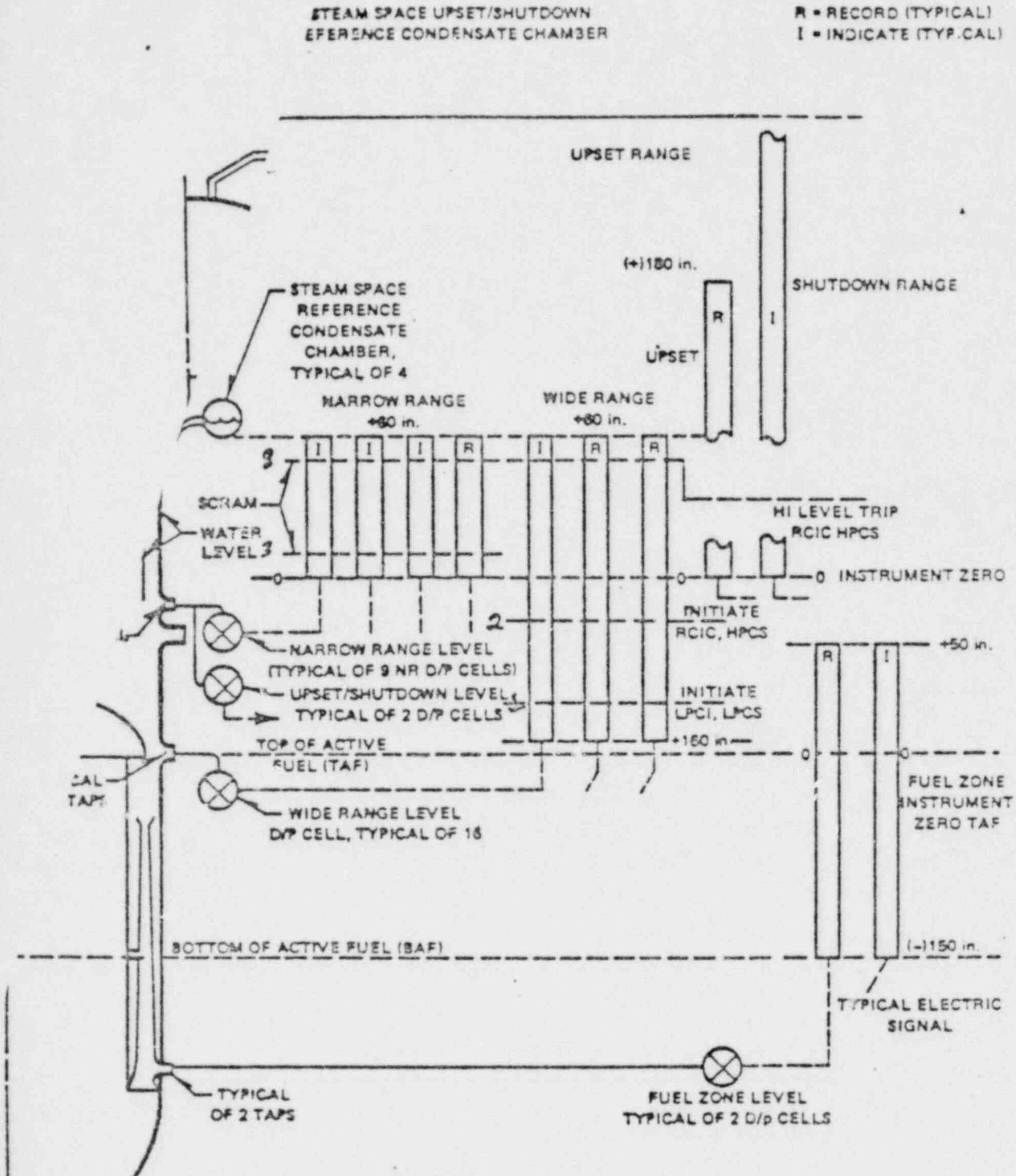
My name is Milton R. Lane. My business address is General Electric Company, 175 Curtner Avenue, San Jose, California, where I currently hold the position of Principal Engineer in the Nuclear Power Systems Engineering Department.

I was graduated from the University of Maine College of Engineering in 1953 with a Bachelor of Science Degree in Electrical Engineering, and with high distinction. During my junior year, I was elected to the engineering honor society, Tau Beta Pi, and during my senior year to Phi Kappa Phi, while also serving as student chairman of the Local Chapter of the American Institute of Electrical Engineers. During my last year at the University of Maine I took many graduate courses and completed nearly 50% of the hours necessary for a Masters Degree in Electrical Engineering.

My working career since receiving my B.S. degree in 1953 has been entirely with the General Electric Company and concerned with the Nuclear Plants Control, Instrumentation & Electrical Engineering. I spent three years at the Knolls Atomic Power Laboratory in Niskayuna, New York, and then three years at the Atomic Power Development Associates Engineering offices in Detroit, Michigan on the Fermi Project. In 1959 I moved to California with the Atomic Power Equipment Department and have been there since that time in various capacities involving control and instrumentation and electrical design of nuclear power plant systems. I have participated in the preparation of preliminary and final safety analysis reports for various plants and in the design and evaluation of instrumentation and control for safety systems. In my present capacity I provide technical leadership and individual contribution to develop systems design criteria and I work with systems engineers to resolve special control and instrument problems.

I serve on IEEE-NPEC working groups and I participate in the review and critique of Industry Codes and Standards and NRC Regulatory Guides.

During the last two years I have participated in review of the reactor vessel level instrumentation in response to concerns which were precipitated by the TMI event.



NOTES: 1. SEPARATE D/P CELLS ARE USED FOR NARROW RANGE INDICATION AND TRIP UNITS

2. INDICATION/RECORD AND TRIP UNITS FOR WIDE RANGE USE COMMON D/P CELLS