

AFFIDAVIT OF RICHARD A. MUENCH

COMMONWEALTH OF PENNSYLVANIA:

SS

COUNTY OF ALLEGHENY:

Before me, the undersigned authority, personally appeared Richard A. Muench, who being by me duly sworn according to law, deposes and says that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information and belief:

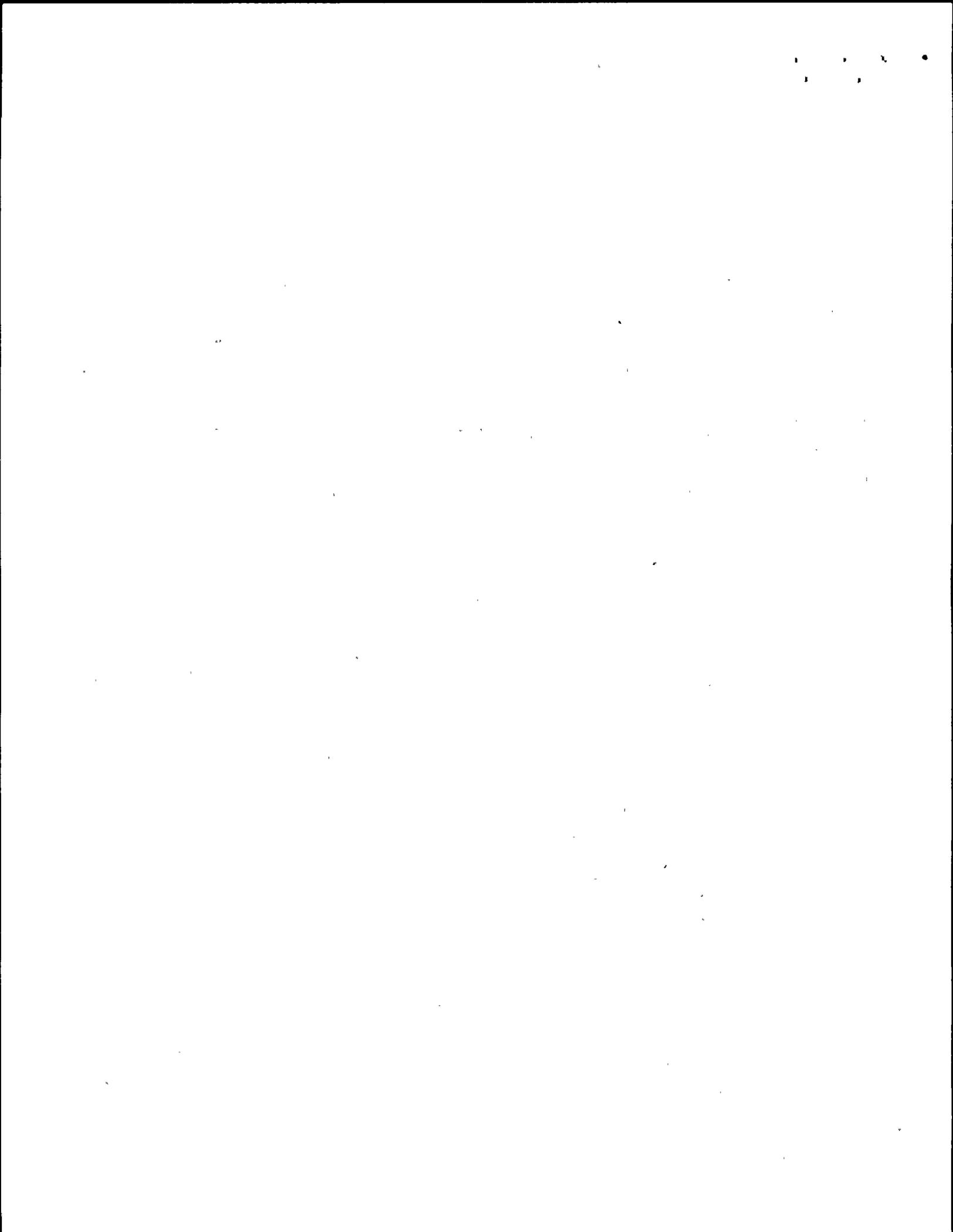
- (1) I am Manager, Safeguard Analysis, Nuclear Safety Department for the Nuclear Technology Division, Westinghouse Power Systems Company, Westinghouse Electric Corporation, ("Westinghouse") and as such I am authorized to execute this Affidavit. A statement of my Professional Qualifications is attached.
- (2) Westinghouse has performed analyses of the Diablo Canyon Nuclear Plant including postulated accidents which documented in the FSAR. On the basis of that work, the following information is provided which is relevant to Joint Intervenors' Contention 13 for Low Power Testing as accepted by the Atomic Safety and Licensing Board in its Prehearing Conference Order of February 13, 1981.
- (3) The requirements for detection of Inadequate Core Cooling (ICCC) originates with NUREG-0737. NUREG-0737 requires instrumentation and procedures be provided for "an unambiguous indication of ICC." To meet this requirement "may require new measurements or a synthesis of existing measurements." PG&E has provided the necessary means to determine ICC with a combination of instrumentation, procedures and operator training.
- (4) ICC is a high temperature condition in the core such that operator action is required to preclude core damage.

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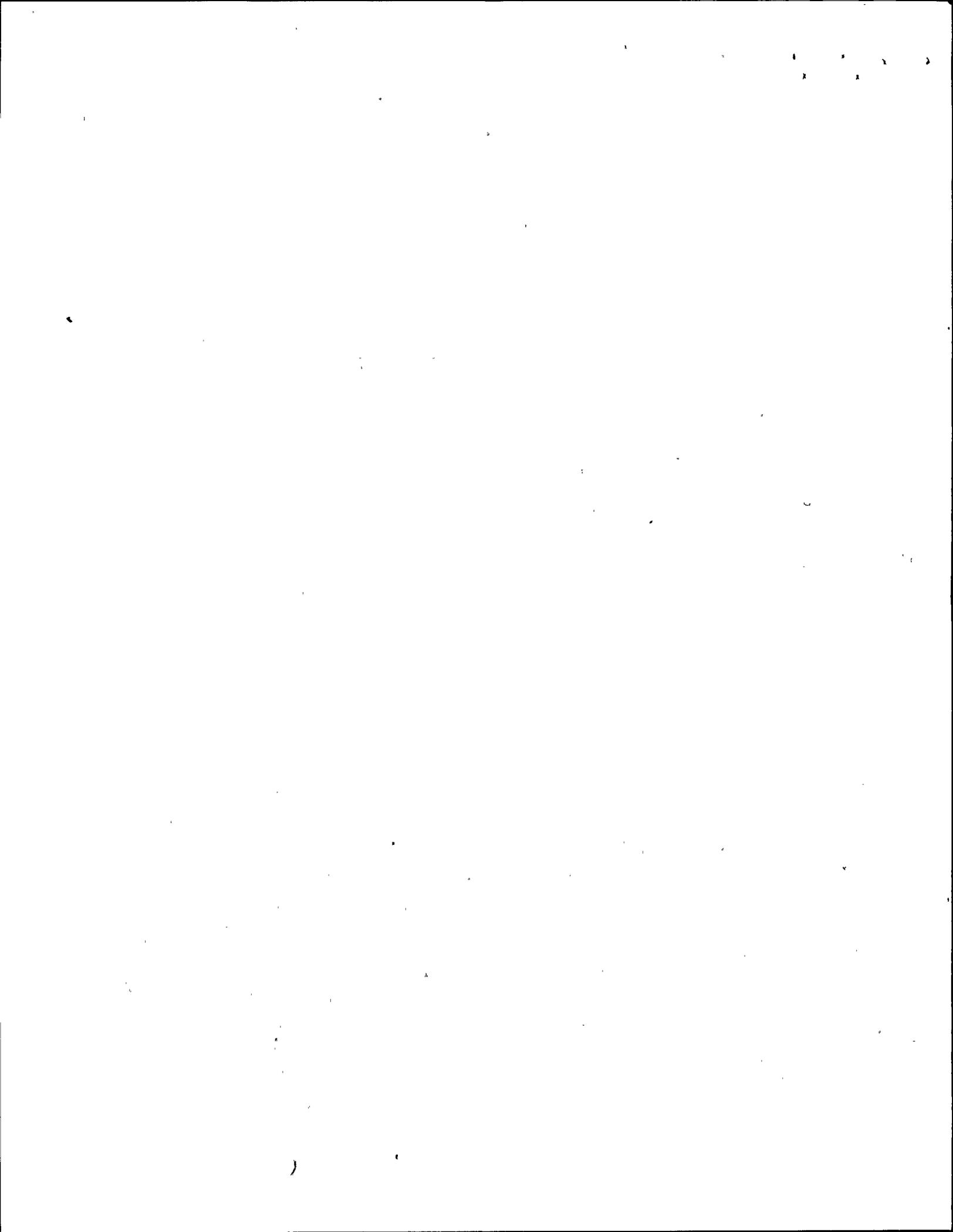
Adequate instrumentation will be available in the Diablo Canyon plant to diagnose the onset of ICC and to determine the effectiveness of the mitigation actions taken. The following instrumentation is used to determine the extent of core cooling:

- A. Subcooling Meter - provides an indication of normal core cooling in a pressurized water reactor and in this manner is used to detect the departure from the normal method of cooling the core. However, adequate core cooling can be maintained by the safeguards systems without a return to the normal method of cooling the core.
  - B. Core Exit Thermocouples - provides a direct indication of the existence of ICC, the trends of recovery actions, and the restoration of adequate core cooling.
  - C. Reactor Vessel Level Instrumentation System (RVLIS) - provides a supplemental indication of the approach to ICC and confirms the achievement of adequate core cooling when level in the reactor vessel is restored.
- (5) The Emergency Operating Instructions utilize the instrumentation for core cooling in a simple manner. If core exit thermocouple readings are above a predetermined value, the operator performs a set of actions that are directed at the restoration of adequate core cooling. During these recovery actions, he monitors the core exit thermocouples to determine the effectiveness of his recovery actions and the restoration of adequate core cooling. RVLIS is used as an additional indication of the approach to ICC and to confirm the achievement of adequate core cooling when level in the reactor vessel is restored.
- (6) The instrumentation and emergency operating procedure guidelines used to detect the onset of ICC will provide adequate information for the entire range of accident conditions. A prerequisite for ICC to exist is an accident condition for which there is removal of primary coolant mass from the system.



That is to say, some type of Loss-of-Coolant Accident, LOCA, must be postulated. As long as the core remains covered it will remain adequately cooled. Therefore, instrumentation necessary to detect ICC should measure the decreased water inventory in the vessel caused by the LOCA and/or the elevated fluid temperatures indicative of the decreased water inventory. There are the parameters measured by the core exit T/C and RVLIS installed at Diablo Canyon. The Subcooling Meter using the wide range coolant temperature and pressure parameters provides early warning of the approach to ICC.

- (7) The Diablo Canyon FSAR indicates that for break sizes equivalent to approximately 6 inches or longer, the primary coolant system will depressurize to allow all of the ECCS equipment to deliver flow to the core without any operator action. Therefore, it is useful to divide the following discussions into two parts:
- A. For a LOCA of an equivalent size equal to approximately 6 inches or less, inadequate core cooling can only occur if two or more failures occur in the ECCS. Manual action to depressurize the primary coolant systems to increase ECCS flow delivery could be helpful in recovering from ICC. The first indication of a possible ICC situation is indication that some ECCS pumps have not started or if started are not delivering flow to the core. The second indication of a possible ICC situation is the occurrence of saturation conditions in the primary coolant system. Shortly after the second indication, the RVLIS would start indicating the presence of steam void in the vessel. At some point in time, the top of the core will become uncovered and the core exit thermocouples T/C's will begin measuring increasing superheated steam temperatures. At the time the core uncovers, the RVLIS will indicate a collapsed liquid level below.

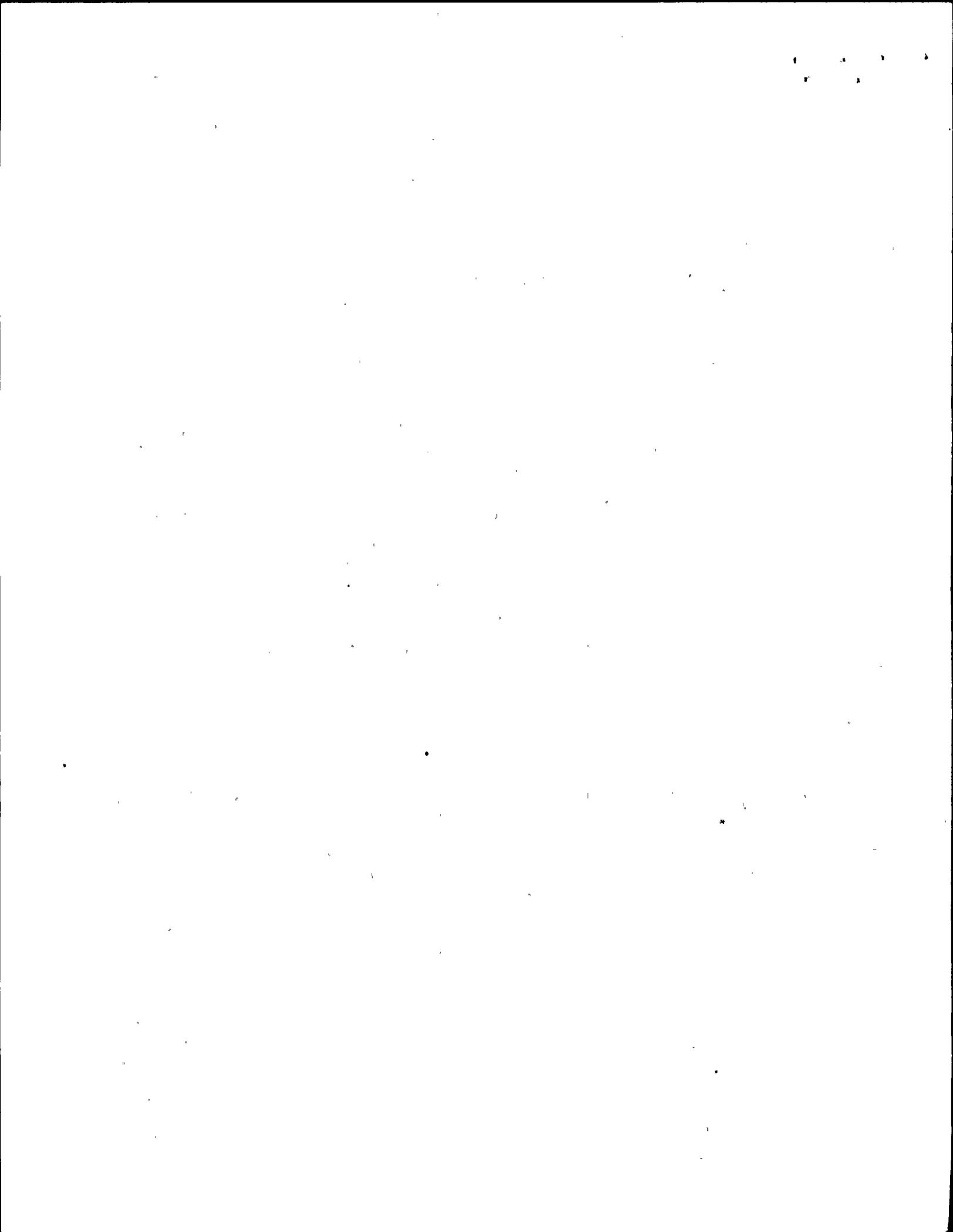


the top of the core. Even later in the postulated event, the core exit T/C's and/or the RVLIS will indicate ICC as discussed earlier. Westinghouse has performed detailed analyses of various small LOCAs in this range and concludes that the core exit T/C's and the RVLIS will provide unambiguous indications of ICC as used in the ICC Procedure Guidelines.

- B. For LOCAs which are significantly larger than an equivalent 6 inch break, the ECCS has the maximum potential for flow delivery since the primary coolant system is at a low pressure. No early manual action is useful in recovering from ICC. Analyses for LOCAs in this range indicate ambiguous behavior of core exit T/C's and the RVLIS early in the accident due to dynamic blowdown effects. This behavior is temporary and core exit T/C's and the RVLIS will indicate the progress being made by the ECCS in recovering the core. Conservative analyses of the fuel response during this type of LOCA demonstrate compliance with the ECCS acceptance criteria during this period. Thus, early in the transient, when the core exit T/C's and RVLIS may temporarily provide ambiguous indications, no manual actions are needed. Later in the accident when manual action may be useful, the core exit T/C's and RVLIS will provide unambiguous indication of ICC if it exists.
- (8) Since the scope of IEEE Std. 279-1971 covers protection systems that initiate automatic protective actions, the criteria in the standard do not necessarily apply to display systems such as RVLIS. Nevertheless, RVLIS design criteria include those IEEE 279 criteria that are applicable to monitoring instrumentation. Particularly inputs are "to the extent feasible and practicable derived from signals which are direct measures of the desired variables".

This principle has been met by providing direct measurement of what the guideline procedures require to be monitored including the following:

- A. With the RCP's tripped, the W RVLIS will provide in an underpredicted indication of "true" vessel water level while providing an



unambiguous indication of the mass in the vessel. The W RVLIS will also measure the vessel level trend.

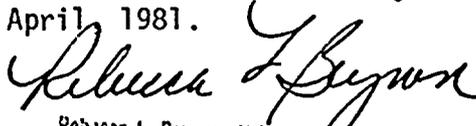
- B. With the RCP's tripped, a monitoring that indicates a setpoint limit on RVLIS will warn the operator that the system is approaching an uncovered core.
  - C. With the RCP's running, the RVLIS is an indication of the relative water mass.
- (9) Thus Diablo Canyon has met the requirements of NUREG-0737 by providing the necessary means to determine ICC with a combination of instrumentation, procedures, and operator training.

Further the deponent sayeth not.

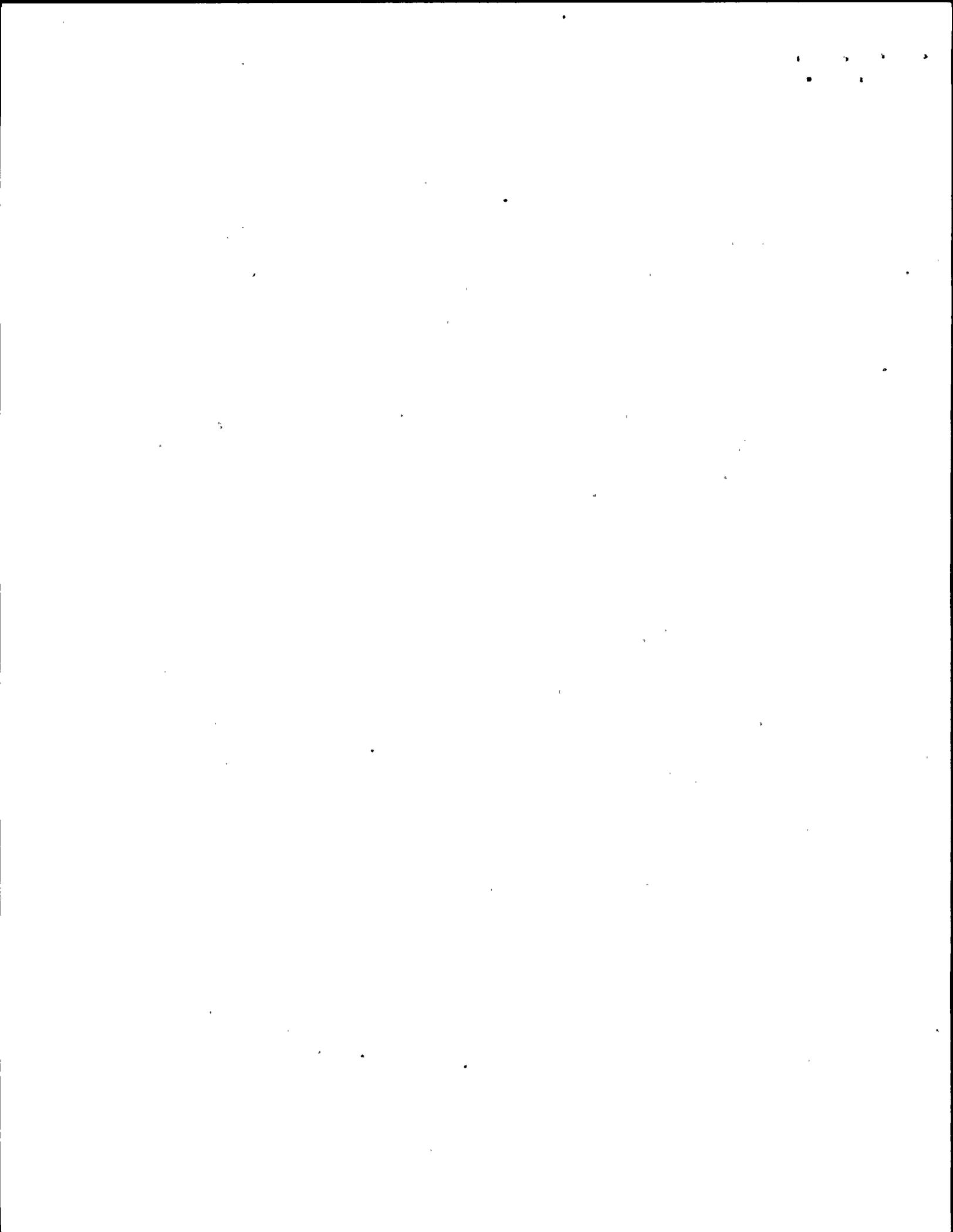


Richard A. Muench

Sworn to and subscribed  
before me this second day of  
April, 1981.



Rebecca L. Baynon, Notary Public  
Monroeville Borough, Alleghene County,  
My Commission Expires Apr. 12, 1982  
Member, Pennsylvania Association of Notaries



Professional Qualifications.

of

Richard A. Muench

Westinghouse Water Reactors Division

Westinghouse Power Systems Company

Westinghouse Electric Corporation

My name is Richard A. Muench. My business address is Westinghouse Electric Corporation, P.O. Box 355, Pittsburgh, Pennsylvania, 15230. I am employed by Westinghouse Electric Corporation as Manager of Safeguards Analysis within the Nuclear Safety Department of the Nuclear Technology Division. I am responsible for analyzing the thermal hydraulic behavior of the reactor coolant system following postulated loss-of-coolant accidents mainly to demonstrate the integrity of the reactor fuel. Such analysis includes the amount of zirconium which would react with the coolant in the event of a loss-of-coolant accident.

I attended the University of Kentucky from 1968 through 1972. I received a Bachelor of Science Degree in Mechanical Engineering.

In 1972, I joined Westinghouse Electric Corporation as an engineer in Safeguards Analysis/with responsibility for performing loss-of-coolant accident analyses. I have remained in this area, becoming Manager of Safeguards Analysis in 1978.

I was a member of the Industry Advisory Group responding to the Three-Mile Island accident and during the accident, worked on projects designed to provide input into plant recovery operations.

