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 No. 1))

AFFIDAVIT OF JOSEPH F. LESYNA

State of California
County of Santa Clara

I, Joseph F. Lesyna, Senior Controls Application Engineer, within the Domestic BWR Projects Department of the General Electric Company, of lawful age, being first duly sworn, upon my oath certify that the statements contained in the attached pages and accompanying exhibits are true and correct to the best of my knowledge and belief.

Executed at San Jose, California,
July 29, 1980.

Joseph F. Lesyna

Subscribed and sworn to before me this 29 day of July, 1980.

Ruthe M. Kinnamon
NOTARY PUBLIC IN AND FOR SAID
COUNTY AND STATE

My commission expires March 28 of 19 81

OFFICIAL SEAL
RUTHE M. KINNAMON
NOTARY PUBLIC - CALIFORNIA
SANTA CLARA COUNTY
My comm. expires MAR 28, 1981
175 Curtner Ave., San Jose, CA 95125

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Affidavit of Joesph F. Lesyna

My name is Joseph F. Lesyna. I am employed at General Electric Company as a Senior Controls Application Engineer. I have worked in this capacity for 8 years. A statement of my experience and qualifications is set out in Attachment 1.

This affidavit addresses Doherty Contention #12 which alleges that a reactivity insertion accident can occur during reactor startup because of the unreliability of the Rod Pattern Control System (RPCS). Intervenor contends that past reports of inoperable instrumentation systems indicates that the RPCS design is inadequate. In support of this contention, Intervenor cites reports of problems that have occurred with various instrumentation systems at other operating BWR's.

The incidents Intervenor cites primarily involved the Rod Worth Minimizer (RWM) System used by older BWR's to limit control rod worth in the event of a rod drop accident. The occurrence of these and other instrumentation problems is not

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relevant to the ACNGS design for the RPCS. A discussion of the designs of the systems cited by Intervenor and of the RPCS will illustrate that the previous problems are not applicable to ACNGS.

The RWM is a single-channel, computer-controlled device that compares control rod position with a pre-determined withdrawal sequence that has been placed in memory. The withdrawal sequence is a software information package loaded into the plant computer and can be changed in the plant simply by reprogramming the computer. The control rod position is obtained from magnetic reed switches in the control rod hydraulic drive. These switches are activated by a magnet attached to the piston which moves the control rod up or down. As the piston and magnet pass a reed switch, a signal is sent to the RWM indicating control rod position.

Problems developed in this system primarily associated with inoperable reed switches. A faulty reed switch would render the RWM inoperable and require bypassing to continue startup. Bypass of the entire system was accomplished by the use of a key-lock switch in the Control Room.

The Rod Pattern Control System to be used in ACNGS is a totally different design consisting of a hard wired system with a prescribed withdrawal sequence controlled by electronic circuit cards. The electronic cards will have the required information and logic in storage to prevent unacceptable rod patterns. Changes in the withdrawal sequence can only be accomplished, therefore, by changing the RPCS hardware through replacing the electronic circuit card. This represents a significant step in assuring that the withdrawal sequence, which has been thoroughly analyzed prior to use, is not inadvertently altered or defeated.

The RPCS is a dual-channel, safety-related system. The RPCS gets its information on rod position from a dual rod position probe installed on each control rod hydraulic drive. Each probe has two sets of reed switches at three inch intervals, that provide redundant rod position information in a manner similar to that described above for the older single channel probe used by the RWM. The information is transmitted through two separate transmission channels to two separate RPCS controllers. The RPCS controllers are electronic devices that monitor the information provided by the two channels. Both channels must be operable and have identical outputs before control rod motion is permitted. The RPCS controller will check the rod position information supplied, identify the rod selected and its mode of operation, and decide if the rod movement being attempted by the operator is permissible. If the attempted movement is within the restrictions of the prescribed sequence, a rod motion permissive signal is generated. If the movement is not acceptable and could result in unacceptably high control rod reactivity worth, a rod select or rod motion block signal is generated to prevent movement.*/ Each RPCS controller produces an output signal to the control rod drive portion of the Rod Control and Information System (RCIS). The portion of the RCIS that controls operation of the individual control rod hydraulic drives is a single-channel system. If the RPCS channels provide a rod motion permissive signal, it will generate appropriate signals to the hydraulic drive to carry out the rod movement. If a rod block signal is received from either one or both RPCS channels, the RCIS will not be able to generate any signals to cause control rod movement. Any failure in the RCIS will result in the inability to move any rods but will not prevent shutting down the reactor when a reactor trip signal is generated.

Because of the possibility of inoperable reed switches or control rod drives, which would make it impossible to complete the start-up sequence, provisions are made to substitute a carefully limited number of failed inputs to the RPCS according to the following rules. Substitute rod positions will be accepted by the RPCS provided:

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*/ The ACNGS PSAR states that 1 withdraw and 2 insert errors are allowed by the RPCS before it blocks control rod movement. The PSAR has not been updated to reflect current design of the RPCS which will allow no withdrawal or insert errors. The PSAR will be updated in the near future.

(a) Only one entry per channel per control rod subgroup is entered.

(b) The same position is not entered into both channels.

Each time a rod is moved, the RPCS scans the core and determines new rod positions. If a rod with a substitute position (failed reed switch) is moved to a position with an operable reed switch, the actual position indication will automatically replace the substitute data. Substitute positions are also automatically logged and indicated in the control room.

Rod position inputs for failed control rod drives may be deleted entirely through the use of switches in the RPCS circuitry. The maximum number of drives that can be deleted is limited to 8*/ out of a total of 177 drives. The eight deleted rod limit is subject to further restrictions, as outlined in the plant technical specifications, which are part of the Operating License. These restrictions work in conjunction with the RPCS to guarantee that deleted inputs will not produce unacceptable rod patterns. Deleted rods are not checked by the RPCS since they are unable to move because

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*/ The ACNGS PSAR states that 20 control rod inputs may be deleted. Current RPCS design allows only 8 deletions. The PSAR will be updated to reflect current design.

inoperable rods are required to be electrically disarmed and hydraulically isolated by the plant technical specifications. Deletion switches are kept under keylock control to prevent inadvertent operation.

As indicated previously, the RPCS acts to limit the reactivity worth of individual controls rods by restricting control rod movement, and therefore position, to within analyzed limits. It is necessary to limit control rod worth so that a reactivity insertion accident during startup, as postulated by Interventor, does not cause releases of radioactivity exceeding 10 CFR 100 limits.

The limiting reactivity insertion accident during start-up is the Control Rod Drop Accident (CRDA). A CRDA could occur if a control rod hydraulic drive became uncoupled from its control rod. In sequence, a hydraulic drive is then withdrawn with the control rod itself remaining stuck in the core fully inserted. After the drive is fully withdrawn, the control rod breaks free and falls out of the core due to gravity.

The design basis, therefore, is the CRDA. All effects of CRDA that are possible within the restrictions placed on the positioning of rods by the RPCS and technical specifications have been conservatively analyzed. The effect of deleted inoperable rods was fully considered in the analysis.

In all cases control rod reactivity worths were well within analytical limits which in turn guarantee that licensing limits on specific fuel enthalpy will not be exceeded.*/

Subject to the above described limited exceptions for individual rod bypasses, the RPCS must be operable to allow movement of control rods. This assures that control rod worths always remain within analyzed limits. It is most significant that the RPCS cannot be entirely bypassed as was possible with the RWM System.

Intervenor also cites alleged problems with the Average Power Range Monitor (APRM) System, proported to be part of the RPCS, in support of his contention. In fact, the primary safety function of the RPCS is to minimize control rod worths during startup of the reactor. The APRM system performs no function in limiting control rod worth. Any unrealiability in the APRM system is, therefore, only a reference to general instrumentation problems and is not applicable to the RPCS.

Intervenor also alleges inoperability of the Rod Block Monitor (RBM) system at one operating BWR, and general instrumentation problems at other BWR's. The RBM and other instrumentation systems cited do not perform any function

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*/ The CRDA analysis is more fully explained in the affidavit of Richard C. Stirn filed in this docket concurrently.

in minimizing the effects of the CRDA during startup as does the RPCS. No specific relationship between any reported failure and the ACNGS Rod Pattern Control System has been shown by Intervenor because none exists. Moreover, the RPCS and RCIS are designed such that <u>any</u> component failure will result in a rod block, thus preventing the operator from moving control rods into an unacceptable rod pattern.

Significant operational experience with the RPCS from operating BWR/6 plants will be available prior to ACNGS start-up. Moreover, in the unlikely event that ACNGS is the lead BWR/6 plant to receive an operating license, extensive reliability testing of the RPCS will have been performed during ACNGS Preoperational and Startup Testing Programs.

In summary, Intervenor offers only an unsupported speculation that the new design RPCSis inadequate. Specific concerns that Intervenor lists -- including restricting bypass operations, redundancy of signals and use of a method other than neutron flux to determine rod position -- have already been incorporated in the RPCS design.

References

1/ Paone, C. J., "Banked Position Withdrawal Sequence", NEDO-21331, January 1977.

2/ ACNGS PSAR, Section 7.7.1.1.3.5

3/ Beebe, M. R., "Nuclear Power Plant Operating Experience", NUREG-0483, 1977

4/ "Nuclear Power Experience Reports", Section IX-Instrumentation and Controls, Items 23, 40, 42

Joseph F. Lesyna

Professional Qualifications

I am a Senior Controls Application Engineer in the Domestic BWR Projects Department of the General Electric Company. My duties include, but are not limited to, review and approval of the control and instrumentation design for the Nuclear Steam Supply portion of the BWR 6 Standard Plant. Other duties include review of and providing guidance on generic issues to BWR 4, 5 and 6 domestic project managers. Some of these generic issues include: Control Rod Drop Accident, Anticipated Transient Without Scram and electrical separation for safeguards systems.

I received a Mechanical Engineering degree in 1955 from the Missouri School of Mines and Metallurgy (now called the University of Missouri - Rolla). I received a Master of Science degree in Electrical Engineering in 1962 (night) from Union College, Schenectady, New York. I received a Professional Engineering license from the State of New York in 1964 and a license in Control System Engineering from the State of California in 1978.

I have been employed by the General Electric Company since 1955. From 1955 to 1960, I completed various training assignments; performed electrical design of large direct current exciters for steam and hydro turbines; and performed transient network analyzer model studies of the effects of switching surges and lightning strokes on high voltage transmission lines.

From 1960 to 1968, I was an application engineer coordinating motors and controls for adjustable speed drives used in the Rubber and Plastics, Machine Tool, and Paper industries.

From 1968 to the present date, I have been involved in various aspects of control and instrumentation as relate to BWR (Boiling Water Reactor) nuclear power plants.

From 1968 to 1972, my primary duties included total coordination of all control room and local panels from Browns Ferry Units 1, 2 and 3 and Brunswick Units 1 and 2.

From 1972 to the present date, my duties included resolving technical concerns as they relate to specific projects and generic issues that affect all BWR plants. In particular, at the direction of my management, I have been directly and continuously involved in the generic solution to the Control Rod Drop Accident since 1972. This involvement includes: numerous presentations to the NRC; one presentation to the ACRS; participation in formulating the functional requirements for system design; and design approval of design documents for the BWR 6 Rod Control and Information System and the Rod Pattern Control System and its predecessor systems which are utilized on BWR 4 and BWR 5 plants.

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