

6/29/82

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of )  
LONG ISLAND LIGHTING COMPANY )  
(Shoreham Nuclear Power Station )  
Unit 1) )

Docket No. 50-322  
(OL)

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NRC STAFF TESTIMONY OF MARVIN W.  
HODGES ON ANTICIPATED TRANSIENTS WITHOUT SCRAM (ATWS)

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(SC Contention 16)

## OUTLINE OF TESTIMONY

This testimony addresses Suffolk County (SC) Contention 16, which concerns the issue of anticipated transients without scram (ATWS). The generic ATWS issue is currently being addressed by the NRC in a rule-making proceeding. However, the contention, and this testimony, are focused on the interim period for Shoreham prior to the implementation of the generic resolution.

The testimony describes the interim measures that will be taken at Shoreham to reduce the risk from ATWS events. These include:

- 1) a recirculation pump trip (RPT) system;
- 2) ATWS procedures; and
- 3) operator training.

The testimony further indicates that the NRC Staff has concluded that it is acceptable to operate Shoreham pending final resolution of the ATWS issue for several reasons. These include:

- 1) the low probability of a severe ATWS event;
- 2) the fact that the interim measures are adequate to mitigate most ATWS events; and
- 3) the fact that the interim period prior to issuance of an ATWS rule should be short.



compensate for the lack of an automatically initiated and totally redundant standby liquid control system (SLCS) which meets the single failure criterion.

Q. What is the status of the unresolved safety issue, "Anticipated Transient Without Scram (ATWS)"?

A. In November, 1981, the Commission issued for comment two proposed rules on ATWS. These are known as the "Staff rule" and the "Hendrie rule." The comment period for an earlier proposed ATWS rule which I call the "utility group rule" was also reopened. The comment period is over and a task force has been formed within the NRC Staff to prepare a Commission paper proposing a final ATWS resolution.

Q. Will the rulemaking address the need for "an automatically initiated and totally redundant standby liquid control system which meets the single failure criterion?"

A. It would not be fruitful for me to speculate on the requirements of the rule. However, I expect that a final decision on ATWS will be based upon a consideration of the expected frequency of ATWS events, the severity of various ATWS events and the desired equipment reliability. This leaves open the possibility that the ATWS mitigation systems may not be required to be totally redundant or single failure proof. For Shoreham, and other BWRs, multiple failures must occur for an ATWS to occur; therefore, it can be argued that an ATWS mitigation system need not be single failure proof.

Q. What is the purpose of the interim measures referenced in the contention?

A. The decision to permit Shoreham and other plants to operate prior to final resolution of the ATWS issue is based on the Staff's conviction that the present likelihood of severe consequences arising from an ATWS event is acceptably small, and that presently there is no undue risk to the public from ATWS. This conclusion is based on engineering judgment in view of: a) the estimated arrival rate of anticipated transients with potentially severe consequences in the event of scram failure; b) the favorable operating experience with current scram systems; and c) the limited number of operating reactors. However, as a prudent course, in order to further reduce the risk from ATWS events during the interim period before completing the plant modifications determined by the Commission to be necessary, the Staff felt that the interim measures would further reduce the risk due to ATWS.

Q. Describe the interim measures which are being implemented at Shoreham for ATWS mitigation.

A. LILCO has installed a recirculation pump trip (RPT) system at Shoreham. This system will trip the recirculation pumps and thus reduce reactor power on receipt of a high vessel pressure signal. LILCO has developed ATWS procedures based on emergency procedure guidelines developed by the BWR Owners' Group. These ATWS procedures have been reviewed and accepted by the NRC. LILCO has also committed to train the operators to perform the proper actions for ATWS events.

Q. Contention SC 16 claims that the interim measures to be taken at Shoreham for ATWS mitigation, including operational procedures and operator training, will not compensate for the lack of an automatically initiated and totally redundant standby liquid control system (SLCS)

which meets the single failure criterion. Does the Staff agree or disagree?

A. The Staff evaluations in NUREG-0460, volumes I through IV support the need for improved or new ATWS mitigation systems. The "Staff" version of the proposed rule and the "Hendrie" version of the proposed rule both provide for new or improved ATWS mitigation systems. We make no claim that the interim measures taken for ATWS mitigation (i.e., recirculation pump trip, ATWS procedures and operator training) are adequate to prevent core damage for all ATWS events.

The NRC Staff, in NUREG-0460, estimated the probability of an ATWS event to be approximately  $2 \times 10^{-4}$ /reactor year. The probability of an ATWS event which will result in core damage is somewhat smaller for several reasons. These include:

1) Not all plant transients result in closure of the main steam isolation valves (MSIVs). With the MSIVs open, the main condenser is normally available to absorb up to 25% of full power heat load.

2) Not all ATWS events will occur at full power. For example, the partial scram failure which occurred at the Browns Ferry plant was from a low power condition.

3) For some ATWS events, manual insertion of some control rods will rapidly terminate the event.

The major concern for an ATWS event in a BWR is the heat load to the suppression pool. Analyses in NEDO-24222 have shown that for even the most severe ATWS events, the vessel pressure remains within acceptable limits. However, overheating of the suppression pool could lead to a loss of heat sink and eventual core damage. Therefore, if the heat can

be rejected to the main condenser, if the event starts from reduced power or if manual rod insertion terminates the event, then the ATWS poses no serious threat.

The comment period for the proposed ATWS rules has ended and the Staff is in the process of evaluating the comments. The current Staff schedule calls for submission of a Commission paper in early fall of 1982. The resolution this appears to be proceeding on a reasonable schedule. Because the probability of a severe ATWS is small, because the interim ATWS mitigation measures are adequate for most ATWS events, and because the delay until issuance of an ATWS rule appears to be short, we feel that the incremental risk of severe ATWS in the interim is acceptable.

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I am employed as a Section Leader in Section B of the Reactor Systems Branch, DSI.

I graduated from Auburn University with a Mechanical Engineering Degree in 1965. I received a Master of Science degree in Mechanical Engineering from Auburn University in 1967.

In my present work assignment at the NRC, I supervise the work of 6 graduate engineers; my section is responsible for the review of primary and safety systems for BWRs. I have served as principal reviewer in the area of boiling water reactor systems. I have also participated in the review of analytical models use in the licensing evaluations of boiling water reactors and I have the technical review responsibility for many of the modifications and analyses being implemented on boiling water reactors post the Three Mile Island, Unit-2 accident.

As a member of the Bulletin and Orders Task Force which was formed after the TMI-2 accident, I was responsible for the review of the capability of BWR systems to cope with loss of feedwater transient and small break loss-of-coolant accidents.

I have also served at the NRC as a reviewer in the Analysis Branch of the NRC in the area of thermal-hydraulic performance of the reactor core. I served as a consultant to the RES representative to the program management group for the BWR Blowdown/Emergency Core Cooling Program.

Prior to joining the NRC staff in March, 1974, I was employed by E. I. DuPont at the Savannah River Laboratory as a research engineer. At SRL, I conducted hydraulic and heat transfer testing to support operation of the reactors at the Savannah River Plant. I also performed safety limit calculations and participated in the development of analytical models for use in transient analyses at Savannah River. My tenure at SRL was from June 1967 to March 1974.

From September 1965 to June 1967, while in graduate school, I taught courses in thermodynamics, statics, mechanical engineering measurements, computer programming and assisted in a course in the history of engineering. During the summer of 1966, I worked at the Savannah River Laboratory doing hydraulic testing.