UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

NRC STAFF TESTIMONY OF THOMAS M. NOVAK REGARDING RECONSIDERATION OF THE REQUIREMENTS FOR AUTOMATIC AND MANUAL SAFETY ACTIONS

(CEC Issue 5-3a)

Q.1 Please state your name and position with the NRC.

A. My name is Thomas M. Novak. I am an employee of the U.S. Nuclear Regulatory Commission assigned to the Reactor Systems Branch, Division of Systems Safety, Office of Nuclear Reactor Regulation. However, from June through December, 1979, I was assigned as the Deputy Director of the Bulletins and Orders Task Force, Office of Nuclear Reactor Regulation.

Q.2 Have you prepared a statement of professional qualifications?

A. Yes. A copy of this statement is attached to this testimony.

Q.3 Please state the nature of the responsibilities that you have had with respect to the Rancho Seco Nuclear Generating Station.

A. The accident at Three Mile Island Unit 2 (TMI-2) on March 28, 1979 involved a feedwater transient coupled with a small break in the reactor coolant system. Because of the resulting severity of the ensuing events and the potential generic aspects of the accident on other reactors, the NRC staff initiated prompt action to: (1) assure that other reactor licensees, particularly those plants such as Rancho Seco which have a similar design

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to TMI-2, took the necessary actions to substantially reduce the likelihood of future TMI-2-type events from occurring, and (2) start comprehensive investigations into the potential generic implications of this accident on other operating plants. To accomplish some of this work, the Bulletins and Orders Task Force (B&OTF) was established within the Office of Nuclear Reactor Regulation (NRR) in early May 1979. The B&OTF was responsible for reviewing and directing the TMI-2-related staff activities associated with loss of feedwater transients and small break loss-of-coolant accidents (LOCAs) for all operating plants to assure their continued safe operation.

The initial priority of the B&OTF was placed on evaluating the actions taken by the B&W operating plant licensees in response to the Confirmatory Shutdown Orders issued in May 1979. I was assigned to the Task Force in mid-June 1979. Upon assuming that position, I participated in the final preparation of the Staff Safety Evaluation which documented our evaluation of SMUD's compliance with the immediate requirements of the May 7, 1979 Order. On the basis of this report, issued on June 27, 1979, the Rancho Seco facility was authorized to return to power operation.

Q.4 What is the purpose of your testimony?

A. The purpose of my testimony is to supplement the response of Bruce A. Wilson to CEC Issue 5-3a, which states:

<u>CEC Issue 5-3a</u>

> Are the special features and instruments installed at Rancho Seco adequate to aid in diagnosis and control after an off-normal condition engendered by a loss-of-feedwater transient?

My testimony addresses the question of whether adequate consideration has been given to the determination of what operations of Rancho SEco should be automated and what actions can be conducted manually.

Q.5 What are the requirements for achievening safety actions that the Licensee must provide as part of his design?

A. The Licensee is required to provide those safety actions necessary to avoid exceeding safety limits during normal operation and for anticipated operational occurrences. By restricting core conditions so as to not violate these safety limits, overheating of the fuel and possible cladding perforation which would result in the release of fission products to the reactor coolant is prevented. Depending on the transient characteristic, the protective action may have to be performed automatically.

Q.6 What are the acceptance criteria for systems which require an automatic safety action?

A. The general requirements for systems which must provide an automatic safety action are described in General Design Criteria (GDC) 20, 21, 25, and 29. The staff acceptance criteria for meeting these GDC are described in Standard Review Plan (SRP) 7.1 through 7.7.

Q.7 For what type of transients has the staff permitted manual actions for responding to anticipated operational occurrences?

A. The staff has used as a general requirement that if any safety action is required within 10 minutes of an initiating event, that action must be performed by automatic means. For most transients requiring a safety action to be iniciated, for example a reactor trip in order to achieve reactivity control, the action has been designed to be achieved using automatic systems. For those transients where it can be shown that the transient behavior results in very slow changes in system characteristics, the safety action may be initiated my manual actions performed by the operator. One such transient which exhibits this behavior is the "boron dilution event" discussed in SRP 15.4.6. For this transient, credit for an operator corrective action is permitted no earlier than 30 minutes following an alarm during a refueling mode of operation or 15 minutes following an alarm for all other modes of operation, for example, startup and shutdown, and at power. These corrective actions can be initiated by the operator because sufficient time is available from the time the alarm occurs for the operator to acknowledge the presence of the alarm, diagnose the basis for the alarm, and initiate proper corrective actions. It should also be noted that these events are well behaved in terms of transient characteristics resulting in a transient for which the operator has been trained to recognize and respond to in a straight-forward manner. His actions would normally be directed towards identifying the possible cause for introducing lower than desired borated makeup water and correcting such makeup concentrations, if time permits. Finally, he can insert control rods or initiate a reactor trip if the reactor is critical.

For the example transient cited, the licensee has prepared emergency procedure D.6, "Moderator Dilution" to provide operator guidance for recovery actions.

Q.8 What manual actions are permitted as a response to an accident condition where immediate actions are provided by automatic actions but may be supplemented by manual actions as part of the long-term recovery from the accident?

A. The staff has permitted manual actions to be used for achieving a safety action if sufficient time exists for a procedural action to be followed in responding to and recovery from an accident. For example, in aligning the Emergency Core Cooling System (ECCS) for long-term core cooling following a loss-of-coolant accident (LOCA) manual actions relied on to achieve proper valve line-up, etc., may be permitted provided a sufficient time (greater than 20 minutes) is available for the operator to respond. For the example accident cited, the licensee has prepared emergency procedure D.5, "Loss of Reactor Coolant/Reactor Coolant Pressure" to provide operator guidance for recovery actions.

Q.9 What actions have been taken to improve existing operational capabilities?

A. The Commission required by its Order of May 7, 1979, that a series of actions be taken to increase the reliability and capability of Rancho Seco plant to various transient events. As part of this Order, the following [illegible]ons had to be performed:

- Develop and implement operating procedures for initiating and controlling auxiliary feedwater independent of Integrated Control System control.

- Complete analyses for potential small breaks and develop and implement operating instructions to define operator action.

- o Provide for one Senior Licensed Operator assigned to the control room who has had Three Mile Island Unit No. 2 (TMI-2) training on the B&W simulator.

In its evaluation of the licensee's compliance with the Commission's Order of May 7, 1979, the staff verified that the required improvements in operator training and emergency procedures had been accomplished. Because of these actions the staff concluded that feedwater transients similar to that which occurred at TMI-2 would be responded to by operators of the licensee without undue risk to the health and safety of the public.

The actions discussed above had as one of their objectives the improvement of the operator's understanding of and required actions in response to the loss of feedwater induced transients. In effect, these actions were directed at improving those manual actions required in response to a feedwater transient. These actions were not intended to replace any previous manual action with an automatic action, but to provide additional assurance that all manual actions required in response to a loss of feedwater transient would be performed acceptably.

The staff, as part of its continued review of the TMI-2 accident, issued NUREG-0578, "TMI-2 Lessons Learned Task Force Status Report and Short-Term Recommendations," which included recommendations for improving the operator's ability to respond to transient events. Specifically, the following recommendations will result in improved operator response to off-normal events at the Rancho Seco plant:

- o Recommendation 2.1.3 Information to Aid Operators in Accident Diagnosis and Control.

- o Recommendation 2.1.7 Improved Auxiliary Feedwater System Reliability for PWRs*

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*The essential elements of this recommendation were included in the Commission's Order of May 7, 1979.

- o Recommendation 2.1.8 Instrumentation to Follow the Course of an Accident.

- o Recommendation 2.1.9 Analysis of Design and Off-Normal Transients and Accidents.

- o Recommendation 2.2.1 Improved Reactor Operations Command Function.

- o Recommendation 2.2.2 Improved In-Plant Emergency Procedures and Preparations.

It is recognized that the recommendations listed above do not recommend replacing any action previously performed by manual action with an automatic action. Rather, it was intended that these actions would result in an improvement in existing operational capabilities with primary emphasis on improving operational reliability, i.e., improving the ability of plant operating personnel (both in-plant management and control room operation) to respond effectively to off-normal events.

Q.10 What specific recommendations has the staff made with regard to the need to replace a previous manual safety action with an automatic safety action?

A. In NUREG-0565, "Generic Evaluation of Small Break Loss-of-Coolant-Accident Behavior in Babcock and Wilcox Designed 177-FA Operating Plants," the staff recommended that an automatic system be provided to assure that the block valve which protects against a stuck-open Power-Operated Relief Valve (PORV) will close when the Reactor Coolant System (RCS) pressure has decreased to some value below the pressure at which the PORV should have reseated. This automatic action would replace, for example, the manual action described by Operator Action 5.2.2.17 of Emergency Procedure D.5, "Loss of Reactor Coolant/Reactor Coolant Pressure" which required that the operator isolate EMOV (Block Valve HV-21505) by manual actions from within the control room.

Q.11 What additional studies does the staff plan to perform to identify the need to replace manual safety actions with automatic safety actions?

A. The staff's Lessons Learned Task Force considered the actions of the operator in responding to the TMI-2 accident. In NUREG-0585, "TMI-2 Lessons Learned Task Force Final Report," Recommendation 7.4, Manual Versus Automatic Operations, recommended that an NRC-sponsored research program be initiated to study the following:

a. Complexity of the safety function;

b. Rapidity of the initiating events;

c. Response time available to diagnose the event and to implement corrective action, and

d. Verification of the corrective action.

The staff has considered this recommendation and has included the elements discussed above in NUREG-0660, "NRC Action Plans Developed as a Result of the TMI-2 Accident." Specifically, the objective of Task I.A.4, "Simulator Use and Development," is to establish and sustain a high level of realism in the training and retraining of operators, including dealing with complex transients involving multiple permutations and combinations of failures and errors. It can be expected from this task that certain changes will be made to the diagnostic evaluations and actions performed by the operator. From this task, recommendations will be developed relative to the degree of automation that should accompany the activation and operation of engineered safety features, as well as the resulting information display. The Action Plan has as one of its goals to identify actions previously performed by operator action, but which this study has now concluded should be performed automatically. These changes will then be considered by the Commission with regard to the need to backfit these requirements as a result of the TMI-2 accident.

THOMAS M. NOVAK

PROFESSIONAL QUALIFICATIONS

I am employed as Chief, Reactor Systems Branch, Division of Systems Safety, Office of Nuclear Reactor Regulation. My responsibilities include supervising the performance of safety reviews and evaluations of applications for nuclear power plant construction permits and operating licenses.

I graduated from Rutgers University in 1958 with a Bachelor of Science degree in Mechanical Engineering. In 1968 I received a Master's degree in Mechanical Engineering from Catholic University of America.

In June of 1958, I joined the Westinghouse Electric Corporation and participated in the Graduate Student Training Program. In November of 1958, I accepted a permanent assignment at the Bettis Atomic Power Laboratory, West Mifflin, Pennsylvania. While at the laboratory, I worked in a section responsible for thermal and hydraulic design and analysis of submarine reactor cores. As a member of this section, I performed design and accident analyses for a variety of core designs. Prior to leaving the laboratory, I was assigned project responsibility for a series of tests to determine heat transfer and fluid flow characteristics for a potential fuel element configuration.

In November of 1964, I undertook employment with the U.S. Marine Engineering Laboratory, Annapolis, Maryland. As a senior project engineer, I was given the responsibility for developing and carrying out R&D programs for improving the performance of naval steam generators. My duties included supervising the design, construction, and operation of high pressure heat transfer and water treatment test facilities. I supervised the development of computer codes to predict steady-state and dynamic thermal performance characteristics of naval propulsion boilers involving both pressure-fired and forced-draft systems.

In November of 1968, I accepted a position with the Atomic Energy Commission in the Division of Reactor Licensing (DRL). While a member of DRL, I participated in the review of both pressurized and boiling water reactors.

Following a reorganization within the Regulatory Staff, I was assigned on March 5, 1972, to the Reactor Systems Branch as a senior nuclear engineer. My primary work assignments involved the review of emergency core cooling systems.

In March of 1973, I was promoted to my present position. This branch has the responsibility for the reviews of core thermal and hydraulic behavior for normal operations, anticipated transients, and accidents. In May of 1979, as part of the Office of Nuclear Reactor Regulation interim organizational changes to deal with Three Mile Island 2, I was assigned to the Bulletins and Orders Task Force. My present assignment is Deputy Director, Bulletins and Orders Task Force.