

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

In the Matter of

SACRAMENTO MUNICIPAL UTILITY DISTRICT
(Rancho Seco Nuclear Generating Station)

}
}
} Docket No. 50-312 SP

AFFIDAVIT OF CHARLES E. ROSSI

I Charles E. Rossi being duly sworn, depose and state that:

1. I am an employee of the U. S. Nuclear Regulatory Commission (NRC). My present position is Section Leader, Section B, Instrumentation and Control Systems Branch, Division of Systems Integrator within the Office of Nuclear Reactor Regulation. A copy of my professional qualifications is attached.
2. The purpose of my affidavit is to respond to Item No. 1 of the Atomic Safety and Licensing Appeal Board Memorandum and Order dated October 7, 1981 (ALAB-655). Item No. 1 requests the following information:
"Status reports from SMUD and the staff on the six recommendations in BAW-1564 to enhance AFW safety and reliability."
3. To place the relation between the Integrated Control System (ICS) and Auxiliary Feedwater (AFW) System on Rancho Seco in perspective, it should be noted that currently the only interconnection between the ICS and the AFW system is for steam generator level control following AFW automatic or manual initiation. The automatic initiation circuitry for the AFW system is not dependent upon the ICS. As part of the short-term portion of the

May 1979 Commission Order, the licensee was required to implement operating procedures for controlling AFW independent of the ICS should a malfunction of the ICS occur. The necessary procedures were developed prior to plant startup, reviewed by the staff, and evaluated in the staff's Safety Evaluation Report of June 27, 1979. In addition, following re-start the staff required demonstration of the capability to provide and control flow to the steam generators independent of the ICS. This test was performed satisfactorily. As discussed in the staff's affidavit for Item No. 2 of ALAB-655, the longer term upgrade of the AFW system incorporates a completely safety-grade automatic start and level control system. The new system will completely divorce the AFW system from the ICS.

Following the Three Mile Island Unit 2 event, the staff expressed concerns regarding the response of Babcock & Wilcox (B&W) design reactors to transients. Since the staff did not perform a detailed review of failure modes and potential interactions within the Integrated Control System (ICS), it was unsure of the role the ICS might play in initiating or exacerbating transients. Therefore, the staff required a failure mode and effects analysis (FMEA) of the system. In August 1979, B&W submitted a report, BAW-1564, "Integrated Control System Reliability Analysis," which provided the results of a FMEA and an operating history review for the ICS installed at all operating B&W plants. BAW-1564 was endorsed by the licensee as applicable to Rancho Seco.

The staff completed its review of BAW-1564 through a technical assistance contract with Oak Ridge National Laboratory (ORNL). As a result of this review, both the staff and ORNL concluded that the ICS itself had a relatively low failure rate and did not appear to initiate a significant number of plant upsets.

However, there were aspects of the plant control system and related components outside the ICS for which improvements should be investigated. In BAW-1564, B&W recommended six actions aimed at improving system performance. In November 1979, the licensees with B&W plants (except Three Mile Island Unit 1) were requested to address the B&W recommendations. Responses were received from the licensees including the Sacramento Municipal Utility District (SMUD) and reviewed by the staff.

SMUD letter dated January 21, 1980, provided the SMUD position on the B&W recommendations as requested by the staff. A summary of the response on each recommendation is as follows:

- 1) The staff asked SMUD to address the B&W recommendation to improve the reliability of the Non-Nuclear Instrumentation (NNI)/ICS power supply. SMUD described equipment modifications already completed and additional modifications to be made to improve the reliability of the power supplies to these systems.
- 2) The staff asked SMUD to address the B&W recommendation to improve the reliability of the input signal from the Nuclear Instrumentation/Reactor Protection System to the ICS - specifically, the Reactor Coolant flow signal. SMUD described two improvements which were being considered for implementation. Subsequent to the January 21, 1980 letter, and following a decision to install a safety grade Auxiliary Feedwater initiation and control system, SMUD concluded that no modification was necessary.
- 3) The staff asked SMUD to address the B&W recommendation to improve ICS/ Balance of Plant tuning, particularly the interaction between the feed-water condensate systems and the ICS controls. The staff further asked

that the licensee address any particular operational problems experienced with the ICS, procedures used by the operator to take manual control of ICS functions, and ICS training provided for the operators. SMUD indicated that B&W Report BAW-1564 provided the most comprehensive summary available on ICS problems experienced during plant operation and described the operating procedures and training program at Rancho Seco pertaining to ICS operation. SMUD did not describe any particular problems associated with interactions between the feedwater condensate systems and the ICS. These types of problems would, however, be included in the operating experience summary of BAW-1564.

- 4) The staff asked SMUD to address the B&W recommendation to improve the main feedwater pump turbine drive minimum speed control. SMUD stated that the purchase of a new main feed pump control system was being considered. Subsequent to the January 21, 1980 letter, a new feedwater pump control system was purchased and installed.
- 5) The staff asked SMUD to address the means of preventing or mitigating the consequences of a stuck-open main feedwater startup valve. SMUD did not recommend any equipment modifications, but rather described the indications available to the operator to detect a stuck-open feedwater startup valve and the operator actions which would be taken to terminate excessive feedwater flow.
- 6) The staff asked SMUD to address the means of preventing or mitigating the consequences of a stuck-open turbine bypass valve. SMUD recommended no equipment modifications but described the operator actions which would be taken to terminate steam flow through the turbine bypass valve.

In May 1981, subsequent to the review of the responses from the licensees on the B&W recommendations, the staff held a meeting with Duke Power Company to discuss the Duke response on the Oconee units. The meeting was held not only to review the specific Duke responses to the B&W recommendations, but also to provide the staff with an opportunity to better understand the details of the ICS design and its effect on plant safety. B&W representatives were in attendance at this meeting to give a presentation on the functions of the ICS and respond to staff questions on the effects of failures in the ICS. The basic contention was that plant transients caused by ICS failures will be terminated by the Reactor Protection System prior to exceeding any plant safety limit.

Based on the meeting with Duke Power Company and reviews made to date, the staff has identified no specific control system failures or actions which would lead to unacceptable consequences nor any control system design feature on B&W designed plants which violates any Commission regulation. The staff has concluded that little more can be gained by pursuing the issue of control system failures on a plant by plant basis for operating plants, but, rather intends to pursue the issue on a broader basis which will include all vendor designs and all control systems that could affect plant safety. The Commission has designated the "Safety Implications of Control Systems" (USI A-47) as an Unresolved Safety Issue (see NUREG-0705, "Identification of New Unresolved Safety Issues Relating to Nuclear Power Plants, Special Report to Congress" dated March 1981). The purpose of this Unresolved Safety Issue is to perform in-depth evaluations of control systems that are typically used during normal plant operation and to evaluate the adequacy of current licensing requirements.

In summary, the staff has reviewed the Reliability Analysis of the ICS (BAW-1564) and the licensee's response to the six recommendations contained in BAW-1564. Based upon these reviews, the staff believes that the Rancho Seco design meets all current regulatory requirements. In addition, since the staff has not identified any specific control system failures or actions that would lead to unacceptable consequences at Rancho Seco, the staff does not believe that any additional immediate licensing action is warranted at this time. However, for the longer term, USI A-47, which was begun in December 1980, has as its principle task, the assessment of the adequacy of current regulatory requirements for control systems. Resolution of A-47 will determine whether it will be necessary to impose additional and more stringent requirements on control systems in the future.

The above statements and opinions are true and correct to the best of my personal knowledge and belief.

Charles E. Rossi
CHARLES E. ROSSI

Subscribed and Sworn To Before
me this ___ day of December, 1981

[Signature]
_____, Notary Public
My Commission Expires: July 1/1982

I have been with the U. S. Nuclear Regulatory Commission (NRC) since October 1980. Since August 1981 I have been a Section Leader in the Instrumentation and Control Systems Branch, Division of Systems Integration, Office of Nuclear Reactor Regulation. I am responsible for supervising the review of nuclear power plant instrumentation and control system designs for compliance with regulatory criteria. From October 1980 to August 1981 I was a Principal Reactor Engineer in the Instrumentation and Control Systems Branch. I performed the operating license review of the Callaway and Wolf Creek instrumentation and control system designs, the review of construction permit applicant responses to Three Mile Island Lessons Learned Items related to instrumentation and control systems, and the review of licensee responses to recommendations made by Babcock and Wilcox resulting from failure modes and effects analyses of the Integrated Control System.

I have a Ph.D degree (1969) and M.E degree (1967) in Applied Physics from Harvard University, a M.S degree (1962) in Physics from George Washington University and a B.A degree Magna cum Laude Highest Honors (1958) in Engineering and Applied Physics from Harvard University. I have a certificate from a six month reactor engineering course given by the Bettis Atomic Power Laboratory (1960). I was elected to Phi Beta Kappa in 1958 and Sigma Xi in 1962.

From June 1958 to July 1962 I served as a commissioned officer in the United States Navy. I was assigned to Naval Reactors, U. S. Atomic Energy Commission, where I reviewed and approved test and operating procedures for submarine nuclear power plant fluid systems and reactor instrumentation and control systems designs for the pressurized water reactor at Shippingport, PA.

From September 1966 to November 1977 I held professional and management positions in the Nuclear Energy Systems division of the Westinghouse Electric Corporation. As a manager I supervised the preparation of system functional design requirements for nuclear reactor plant systems which affect plant control, protection, and transient performance. In addition to reactor control and protection systems, these systems included emergency feedwater systems, emergency boration systems, and steam dump systems. For four years I was the lead engineer responsible for establishing functional requirements for reactor control and protection systems used in the Westinghouse 3 loop nuclear reactor plants and for performing accident analyses of these plants for safety analysis reports submitted to the Atomic Energy Commission.

From November 1977 to October 1980 I was Systems and Civilian Applications Program Manager in the Office of Inertial Fusion at the U. S. Department of Energy. In this position, I provided technical and administrative direction for studies of the commercial applications of inertial confinement fusion.

I am a member of the American Nuclear Society and past member of the IEEE Standards Committee on Safety Related Systems. I have authored or co-authored over ten technical articles for presentation at conferences or publication in journals.