



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
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ENCLOSURE

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO GENERIC LETTER 83-28, POSITION 1.2

POST-TRIP REVIEW: DATA AND INFORMATION CAPABILITY

SOUTHERN CALIFORNIA EDISON COMPANY

SAN DIEGO GAS AND ELECTRIC COMPANY

SAN ONOFRE NUCLEAR GENERATING STATION, UNIT NO. 1

DOCKET NO. 50-206

1.0 INTRODUCTION

On February 25, 1983, both scram circuit breakers at Salem Nuclear Power Plant, Unit No. 1 (SNPP-1), failed to open upon receipt of an automatic reactor trip signal from the reactor protection system. This incident occurred during plant start-up and the reactor was tripped manually by the operator about 30 seconds after initiation of the automatic trip signal. Failure of the circuit breakers to trip was attributed to a sticking problem related to the undervoltage trip attachments. Prior to this incident, on February 22, 1983, also at SNPP-1, an automatic trip signal was generated due to steam generator low-low level during plant start-up. In this case, the reactor was tripped manually by the operator almost coincidentally with the automatic trip. Following these incidents, on February 28, 1983, the NRC Executive Director for Operations (EDO), directed the staff to investigate and report on the generic implications of these occurrences at SNPP-1. The results of the staff's inquiry into the generic implications of the Salem incidents were reported in NUREG-1000, "Generic Implications of ATWS Events at the Salem Nuclear Power Plant." As a result of this investigation, the NRC issued Generic Letter (GL) 83-28, "Required Actions Based on Generic Implications of Salem ATWS Events," dated July 8, 1983, which requested all licensees of operating reactors, applicants for an operating license, and holders of construction permits to respond to certain generic concerns.

Southern California Edison Company (SCE or the licensee) has provided its response to Position 1.2 of Generic Letter 83-28, "Post Trip Review: Data and Information Capability," for San Onofre Nuclear Generating Station, Unit No. 1 (SONGS-1). This Safety Evaluation provides the results of the staff's review related to the licensee's response to this topic.

2.0 DISCUSSION

By letter dated November 28, 1983, the licensee provided its 120 day response to GL 83-28, which included its response to Position 1.2 of the generic letter. The results of the NRC staff's preliminary evaluation of the licensee's response

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was sent to the licensee by letter dated September 3, 1985. The staff concluded that the licensee did not satisfy the criteria that had been established for evaluating licensee responses to Position 1.2 of GL 83-28 in certain respects and indicated that additional information would be required to complete the review. By letters dated January 21 and July 15, 1986, and April 28, 1987, the licensee provided additional information to address the discrepancies that were identified by the staff during its preliminary review of this topic.

Because NRC review of this issue was delayed, by letter dated May 16, 1990, the staff requested that the licensee update the information that was previously submitted in order to facilitate the continued NRC review of this topic. The licensee provided its response to this request by letter dated August 14, 1990.

### 3.0 EVALUATION

The staff has completed its review of the licensee's response to GL 83-28, Position 1.2, and the additional information that was provided. The staff's preliminary evaluation of the licensee's response identified a number of discrepancies between the staff's review criteria and the licensee's capabilities for gathering data and information. This evaluation, which completes the staff's review of this topic, will focus principally on the discrepancies that were previously identified and discussed in the staff's preliminary evaluation dated September 3, 1985.

#### 3.1 Information Recording Capabilities

The licensee uses an events recorder to record sequence-of-events (SOE) information, and the critical function monitoring system (CFMS) and various control room data recorders are used to gather time-history (analog) information. The staff's preliminary evaluation included a list of plant parameters that licensees should monitor for post-trip review purposes. In this regard, the staff questioned the licensee's ability to monitor the following plant parameters:

- a. Containment Isolation - desired for SOE information.
- b. Control Rod Position - desired for SOE information.
- c. Neutron Flux, Power - desired for SOE and time-history information; not monitored by the events recorder.
- d. Containment Pressure - desired for SOE and time-history information; not monitored by the events recorder.
- e. Containment Radiation - desired for either SOE or time-history information.
- f. Primary System Temperature - desired for SOE and time-history information; not monitored by the events recorder.
- g. Reactor Coolant Pump (RCP) Status - desired for SOE information.

- h. Primary System Flow - desired for SOE and time-history information; not monitored by the CFMS or other control room data recorder.
- i. Main Steam Isolation Valve (MSIV) Position - desired for SOE information.
- j. Steam Generator Pressure - desired for SOE and time-history information; not monitored by the events recorder.
- k. Feedwater Flow - desired for SOE and time-history information; not monitored by the events recorder.
- l. Steam Flow - desired for SOE and time-history information; not monitored by the events recorder.
- m. AC and DC System Status - desired for SOE information.
- n. Diesel Generator Status - desired for SOE information.
- o. Power Operated Relief Valve (PORV) Position - desired for SOE information.

In its August 14, 1990, submittal, the licensee provided the following additional information to address these discrepancies:

- a. Containment Isolation - This signal is recorded on the Technical Support Center data gathering computer which is a Foxboro Model III (FOX III). Reference SCE letters November 28, 1983, and July 15, 1986.
- b. Control Rod Position - This signal is recorded in the control room on the control room data recorders in the J-console. Reference SCE letter dated April 28, 1987.
- c. Neutron Flux Power - The events recorder records intermediate range high startup rate and power range over power trip signals. Nuclear power is recorded on the control room recorders. The FOX III records intermediate range and source range nuclear power. Reference SCE letters dated November 28, 1983, and April 28, 1987.
- d. Containment Pressure - This signal is recorded on the FOX III. Reference SCE letters dated November 28, 1983, and April 28, 1987.
- e. Containment Radiation - Control room data recorders record containment radiation. Reference SCE letter dated April 28, 1987.
- f. Primary System Temperature - Primary system temperatures are

recorded on both the FOX III computer and the control room data recorders. Reference SCE letter November 28, 1983.

- g. Reactor Coolant Pump (RCP) Status - The RCP status is not directly recorded. An indirect indication is provided by the RCP bearing temperature recorder. Reference SCE letter dated April 28, 1987.
- h. Primary System Flow - The system flow is recorded on the events recorder. Reference SCE letter dated April 28, 1987.
- i. MSIV Position - SONGS Unit 1 does not have MSIVs. Therefore, this indication does not apply.
- j. Steam Generator Pressure - The steam header pressure is recorded on the FOX III. The control room data recorders also record this signal. Reference SCE letter dated November 28, 1983 and SCE letter dated April 28, 1987.
- k. Feedwater Flow - Feedwater flow/steam flow mismatch trip signal is recorded on the events recorder. The control room data recorders also record this signal. Reference SCE letter dated April 28, 1987.
- l. Steam Flow - Steam flow/feedwater flow mismatch trip signal is recorded on the events recorder. The control room data recorders also record this signal. Reference SCE letter dated April 28, 1987.
- m. AC and DC System Status - AC & DC system voltages or frequencies are not currently recorded on the events recorder. However, the 220 kV frequency and the 18 kV bus voltage are recorded on other control room recorders. The status of the vital busses will be included in the safety parameter display system. Reference SCE letter dated April 28, 1987.
- n. Diesel Generator Status - Diesel generator status is not directly recorded. However, indirect indication is available whenever the safety injection system is actuated. The diesel generators are automatically started by the safety injection actuation signal. Safety injection initiation is recorded on the FOX III and on the events recorder. Reference SCE letter dated April 28, 1987.
- o. PORV Position - PORV position is recorded on the FOX III. Reference SCE letters dated November 28, 1983 and April 28, 1987.

The licensee's response has resolved many of the discrepancies that were

previously identified by the staff. Specifically:

1. The information recorded by the events recorder and the control room data recorders satisfies the staff's criteria for monitoring neutron flux power, feedwater flow and steam flow.
2. SONGS-1 does not have MSIVs and therefore, the staff's criteria for monitoring MSIV position is not applicable.
3. Alternate recording capability is available for monitoring certain parameters that are not monitored by the events recorder which satisfies the staff's criteria for monitoring SOE information. The licensee's capability to monitor the following parameters is acceptable on this basis:
  - a. Containment Isolation
  - b. Control Rod Position
  - c. Containment Pressure
  - d. Containment Radiation
  - e. Primary System Temperature
  - f. Reactor Coolant Pump Status
  - g. Steam Generator Pressure
  - h. PORV Position

Therefore, based on the considerations discussed above, it is the staff's position that the licensee currently does not satisfy the criteria for monitoring the following plant parameters:

- a. Primary System Flow - no time-history information.
- b. AC and DC System Status - no SOE information.
- c. Diesel Generator Status - no SOE information .

In its August 14 response, the licensee stated that these parameters will be monitored by the safety parameter display system (SPDS) after it has been installed during the Cycle 12 outage. Licensee resolution of this matter by implementing the SPDS at SONGS-1 during the Cycle 12 outage is acceptable to the staff provided that the SPDS satisfies the design and performance criteria discussed in the staff's preliminary evaluation dated September 3, 1985.

During review of this topic, the staff noted that the information submitted by letters dated July 15, 1986 (Table 1), and April 28, 1987 (Table 2), indicated

that auxiliary feedwater system (AFWS) flow is included in the post-trip review function of the CFMS and that containment pressure is not. This was not consistent with the information that was included in Table 1 of the April 28 letter, which indicated that containment pressure is included in the post-trip function of the CFMS and that AFWS flow is not. In a telephone conversation on November 21, 1990, the licensee (Mr. R. Ornelas et al.) confirmed that both AFWS flow and containment pressure are included in the post-trip review function of the CFMS, and that the information submitted in the July 15 and April 28 letters was in error due to an oversight.

### 3.2 Time-History Recorder Performance and Design Characteristics

The licensee credits the CFMS and various control room data recorders for supplying time-history (analog) information. The staff's preliminary evaluation discussed the desired design and performance characteristics for this equipment, which included the following criteria:

- a. Equipment used to monitor time-history information should be powered by a reliable and uninterruptible source.
- b. Time-history information should be recorded/updated at least every 10 seconds so that events can be accurately reconstructed.

In the preliminary evaluation, the staff concluded that the licensee did not fully satisfy these criteria. The licensee provided additional information to address this matter by letters dated July 15, 1986, April 28, 1987 and August 14, 1990. The staff reviewed this information and required clarification regarding power supplies for time-history monitoring equipment and recording capability for certain time-history parameters. In a telephone conversation on November 21, 1990, the licensee (Mr. R. Ornelas et al.) provided the following information:

- a. All of the control room data recorders are powered by safety-related electrical busses with battery back-up power, and the CFMS is powered by an uninterruptible power supply.
- b. The control room data recorders that monitor safety injection pump bearing temperature and containment radiation are continuous type recorders.

Based on the information that was provided, it is the staff's understanding that upon an interruption of normal power to the time-history monitoring equipment, back-up power would be available such that intermittent failure of this equipment would not occur. Additionally, it is the staff's understanding that time-history information is recorded/updated at least every 10 seconds. Therefore, it is the staff's position that the equipment used by the licensee to monitor time-history information satisfies the desired performance and design criteria.

### 3.3 Events Recorder Design and Performance Characteristics

The licensee credits the events recorder, the CFMS, and various control room

data recorders for monitoring SOE information. The staff's preliminary evaluation discussed the desired design and performance characteristics for this equipment, which included the following criteria:

- a. Equipment used to monitor SOE information should be powered by a reliable and uninterruptible source.
- b. Equipment used to monitor SOE information should be able to discriminate between events that occur 100 msec apart.

In the preliminary evaluation, the staff questioned whether the equipment used by the licensee could satisfy these criteria. The licensee provided additional information to address this matter by letters dated January 21 and July 15, 1986, April 28, 1987, and August 14, 1990. The staff reviewed this information and required clarification regarding the power supply for the events recorder and for various control room data recorders; and additional information was required regarding the capability to monitor RCP bearing temperature and control rod position. In a telephone conversation on November 21, 1990, the licensee (Mr. R. Ornelas et al.) provided the following information:

- a. The control room data recorders are powered by safety-related Class 1E electrical busses. Additionally, the safety-related Class 1E electrical busses are provided with battery back-up power.
- b. Control rod position is recorded every 5 seconds.

Also, in a telephone conversation on November 28, 1990 the licensee (Mr. R. Ornelas) stated that RCP bearing temperature is recorded periodically. The recorder monitors 15 data points, 5 for each RCP, and records the value of each data point approximately every 90 seconds. Based on the information that was provided, it is the staff's understanding that upon a loss of normal power to the events recorder, back-up power would be available such that intermittent failure of the events recorder would not occur. See Section 3.2 of this SE for further discussion regarding back-up power for the CFMS and control room data recorders.

Although the staff is satisfied that the events recorder is capable of discriminating between events in accordance with the staff's criteria when it is operating in the high speed mode, the events recorder only operates in this mode for 24 seconds after event initiation and it is the staff's judgement that 24 seconds is not of sufficient duration for monitoring SOE information. Additionally, the staff's criteria for time discrimination is not satisfied for the following SOE parameters that are not monitored by the events recorder (see Section 3.1 of this SE):

1. Containment Isolation
2. Control Rod Position

3. Containment Pressure
4. RCP Status
5. PORV Position

Based on the considerations discussed above, it is the staff's position that the equipment used by the licensee to monitor SOE information does not fully satisfy the desired performance and design criteria.

In its August 14, 1990 response, the licensee indicated that the SPDS for SONGS-1 will be implemented during the Cycle 12 outage and that the SPDS will be capable of monitoring the desired SOE information with the exception of RCP Status. Licensee resolution of this matter by implementing the SPDS at SONGS-1 during the Cycle 12 outage is acceptable to the staff provided that the SPDS satisfies the design and performance criteria discussed in the staff's preliminary evaluation dated September 3, 1985. The staff is satisfied with the licensee's current capabilities for monitoring RCP status, however, and no additional licensee action in this regard is required.

#### 4.0 CONCLUSIONS

Based on the foregoing evaluation, the staff concludes that the licensee currently does not satisfy the criteria for resolving Position 1.2 of GL 83-28, "Post-Trip Review: Data and Information Capability," which were discussed in the staff's preliminary evaluation of this issue dated September 3, 1985. The following discrepancies currently exist:

- a. Time-history and SOE information is not available for certain parameters to facilitate post-trip review efforts (SE Section 3.1).
- b. Equipment used to monitor SOE information does not satisfy design and performance criteria (SE Section 3.3).

As discussed in this SE, licensee resolution of Position 1.2 of GL 83-28 by implementing the SPDS for SONGS-1 during the Cycle 12 outage is acceptable to the staff provided that the SPDS satisfies the performance and design criteria discussed in the staff's preliminary evaluation. Additionally, provided the design and performance criteria are satisfied, the licensee may credit the SPDS for monitoring other SOE and time-history parameters after the SPDS has been fully implemented.

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