November 4, 1982

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Docket No. 50-206
LS05-82-11-011

Mr. R. Dietch
Vice President
Nuclear Engineering and Operations
Southern California Edison Company
2244 Walnut Grove Avenue
Post Office Box 800
Rosemead, California 91770

Dear Mr. Dietch:

SUBJECT: OVERPRESSURE MITIGATION SYSTEM - SAN ONOFRE UNIT 1

By letter dated October 28, 1982, we issued the staff's evaluation with respect to the captioned matter. Attached to this evaluation is a related Technical Evaluation (TE), dated June 1980, prepared by our contractor, Lawrence Livermore Laboratory.

It has been brought to our attention that those who received reproduced copies of the TE are missing "even-numbered" pages. Accordingly, pages 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22 and 24 to the TE are enclosed with this letter, for the purpose of rectifying this inadvertent error.

Sincerely,

Original signed by/

Walter A. Paulson, Project Manager
Operating Reactors Branch #5
Division of Licensing

SEO1

DSG USE(08)

Attachment:
As stated

cc: See next page

OFFICE	DL/ORB#5	DL/ORB#5					
SURNAME	HSmith:ajs	WPaulson					
DATE	11/4/82	11/4/82					

cc
Charles R. Kocher, Assistant
General Counsel
James Beoletto, Esquire
Southern California Edison Company
Post Office Box 800
Rosemead, California 91770

David R. Pigott
Orrick, Herrington & Sutcliffe
600 Montgomery Street
San Francisco, California 94111

Harry B. Stoehr
San Diego Gas & Electric Company
P. O. Box 1831
San Diego, California 92112

Resident Inspector/San Onofre NPS
c/o U. S. NRC
P. O. Box 4329
San Clemente, California 92672

Mayor
City of San Clemente
San Clemente, California 92672

Chairman
Board of Supervisors
County of San Diego
San Diego, California 92101

California Department of Health
ATTN: Chief, Environmental
Radiation Control Unit
Radiological Health Section
714 P Street, Room 498
Sacramento, California 95814

U. S. Environmental Protection Agency
Region IX Office
ATTN: Regional Radiation Representative
215 Freemont Street
San Francisco, California 94111

Robert H. Engelken, Regional Administrator
Nuclear Regulatory Commission, Region V
1450 Maria Lane
Walnut Creek, California 94596

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(4) Seismic Category I and IEEE Std-279-1971 Criteria. The OPS should satisfy both the seismic Category I and IEEE Std-279-1971 criteria. The basic objective is that the OPS should not be vulnerable to a failure mode that would both initiate a pressure transient and disable the low temperature overpressure protection system. Events such as loss of instrument air and loss of offsite power must be considered.

2.2 SCEC OVERPRESSURE PROTECTION SYSTEM DESIGN

The overpressure protection system (OPS) provided at San Onofre Nuclear Power Plant, Unit 1 will utilize pressurizer power-operated relief valves (PORVs) to prevent a postulated pressure transient from exceeding the limits in 10 CFR 50, Appendix G. The system will use the existing PORVs (CV545 and CV546) with an added low pressure setpoint interlocked with an administratively controlled enable/disable switch. The low pressure setpoint logic is in addition to the existing PORV actuation logic, and will not interfere with existing automatic or manual actuation of CV545 or CV546. Drawing UDS-SK-082277 is a logic flow diagram of the OPS; drawings UDS-SK-082377 and UDS-SK-082477 show the controls and the electrical schematics for the OPS.

Valves CV545 and CV546 are spring-loaded, closed type valves that require plant instrument air to open. The valves are 2-inch control valves with a minimum valve coefficient (C_v) of 31 gpm$\sqrt{\text{psig}}$. The opening times of CV545 and CV546 have been measured and are 2 seconds and 1.8 seconds, respectively; the closing times are 1.5 and 1.4 seconds.

The line between the pressurizer and the PORVs includes isolation valves CV531 and CV530. These valves are 2-inch spring-open valves and require plant instrument air to close.

The PT-425 loop will be modified by adding two separate circuits to provide the low pressure setpoint and actuation logic for each of the PORVs. Each of the added actuation logics will include a two-channel

pressure setpoint for PORV actuation is to be enabled by placing the control switch in the "Enable" position. Annunciator A4 alarms in the control room, indicating "PORV CONTROL SWITCH ENABLED," and can be reset (extinguished) only when the control switch is in the "Disable" mode.

The normal source of air supply to the PORVs is through plant instrument air lines which come from a common header that is located approximately 8 feet above the control valves. A pressure switch to monitor the loss of instrument air to the PORVs is installed directly on the air-supply header, and will alarm in the control room to notify the operator if instrument air is lost.

In the event of loss of plant instrument air, the plant nitrogen (N_2) system will automatically provide a redundant pneumatic source for the PORVs. Because the N_2 system is independent, a failure of the instrument air system will not result in loss of N_2 to the PORVs. Similarly, a failure in the N_2 system will not affect the air supply to the valves. A pressure switch is provided on the N_2 header to notify the operator of the availability of the N_2 system to supply the PORVs. Either the instrument air supply or the N_2 system provides sufficient pneumatic capacity to handle PORV-cycling for the duration of a pressure transient. Based on the Westinghouse bounding analysis report [Ref. 23] and the faster closing characteristics of CV545 and CV546, the number of relief cycles is conservatively estimated to be 45.

2.3 EVALUATION OF THE SAN ONOFRE NUCLEAR POWER STATION, UNIT 1 USING DESIGN BASIS CRITERIA

The San Onofre Nuclear Power Station, Unit 1 was evaluated under the guidance of the four design basis criteria stated in Section 2.1 of this evaluation. Specific attention was given to various pertinent NRC staff positions resulting from these criteria. Sections 2.3.1 through 2.3.4 are concerned with the four design criteria.

The Westinghouse Electric Corporation generic bounding analysis entitled, "Pressure Mitigating Systems Transient Analysis Results," dated July 1977 [Ref. 23] demonstrates that one pressurizer power-operated relief valve is adequate to mitigate potential overpressure conditions from possible inadvertent heat and mass inputs during water-solid operation.

The use of two pressurizer power-operated relief valves controlled by redundant logic trains provides protection against failure of the system to operate due to a single failure in addition to the failure which caused the transient. A failure mode and effects analysis was also performed to demonstrate the effective operation of the OPS in the event of a single failure of any instrument or equipment within the system.

Based on the system description and the information referenced in this section, we conclude that the OPS at San Onofre Nuclear Power Station, Unit 1 satisfies NRC's single failure criterion.

2.3.3 System Testability

There are two aspects associated with the testability of the OPS. The first aspect is concerned with the PORV-testing program for low pressure protection system operability, and has resulted in the following NRC Staff Position: "the control circuitry from pressure sensor to valve solenoid should be tested prior to each heatup or cooldown. The PORVs should be stroked during each refueling. Deviations from this criterion should be justified." Consequently, the testability program for the PORVs will be as follows:

(1) Verification of upstream isolation valves functioning once per cold shutdown.

(2) Performance of a channel functional test of the control circuitry from the pressure sensor to the valve solenoid once per refueling outage.

(3) Performance of a channel calibration of the pressurizer pressure sensors once per 18 months.

portions of the system are designed at least to seismic Category 2. In view of the very limited time that the plant is actually in a water-solid condition when there is a potential for overpressurization (for a brief time during startup from and shutdown to a cold shutdown condition), the probability of experiencing a design basis earthquake coincident with these conditions is extremely low. In view of this low probability, it is considered unnecessary to design the OPS to seismic Category 1 requirements, with the exception of those portions of the system which could affect existing seismic Category 1 equipment. In this way the OPS provides the required protection against overpressurization without degrading existing plant equipment.

We conclude that the OPS at San Onofre Nuclear Power Station, Unit 1 satisfies the NRC criterion on seismic design.

2.3.4.2 IEEE STD-279-1971. The control circuitry added for the OPS meets all applicable portions of IEEE STD-279-1971. Control of the PORVs and associated isolation valves is through redundant and physically separate systems. Each PORV has the capability for manual control to initiate valve actuation. No single failure within the PORV actuation logic or manual control circuitry will prevent initiation of overpressure protection. The system also has the capability for operational testing.

We conclude that the OPS at San Onofre Nuclear Power Station, Unit 1 satisfies the IEEE STD-279-1971 criteria.

2.4 ALARM SYSTEMS DESIGN AND OPERATION

Specific details concerning the design and operation of acceptable alarm systems for the San Onofre Nuclear Power Station, Unit 1 OPS are described below.

(2) The alarms shall be of the audio/visual type and provide unambiguous information to the operator.

The OPS at San Onofre Nuclear Power Station, Unit 1 is designed so that if the low pressure setpoint is activated and the PORV isolation valve is not open, annunciator A3 (indicating "Open CV530" or "Open CV531") in the control room activates.

We conclude, therefore, that the OPS at San Onofre Nuclear Power Station, Unit 1 satisfies the NRC staff position on isolation valve alarms.

2.4.3 Enable Alarm

The NRC staff position requires that

(1) An alarm shall be activated as part of the plant cooldown process to ensure that the OPS is activated before the RCS temperature is less than 350°F. Prior to cooling the RCS below 350°F, operating procedures require the activation of the OPS by setting both keylock permissive switches to the "enable" position.

(2) The alarm shall be of the audio/visual type and provide unambiguous information to the operator.

In the OPS for San Onofre Nuclear Power Station, Unit 1, the second channel of each bistable is used as a permissive setpoint to activate annunciator A2 in the control room when the pressurizer pressure is less than or equal to 400 psig. The setpoint pressure of 400 psig encompasses all operating conditions at which the RCS would be expected to be water-solid and susceptible to an overpressure event. Annunciator A2, indicating "ARM PORV," alerts the operator that the low pressure setpoint for PORV actuation is to be enabled by placing the control switch in the "Enable" position.

We conclude that the OPS at San Onofre Nuclear Power Station, Unit 1 satisfies the NRC staff position on enable alarms.

An alarm will annunciate when the RCS pressure exceeds the PORV setpoint, provided the control switch is in the low pressure mode. Annunciator A4 alarms in the control room to notify the operator that the control switch is in the "Enable" position, and also indicates that the "TRANSIENT IN PROGRESS" annunciator is activated. In this way, the alarm is available during all water-solid operations.

In addition to the above annunciators, indication of pressurizer relief valve operation during cold shutdown conditions would be indicated on one or more of the following instruments:

(1) Pressurizer relief tank high level (LC 440A)

(2) Pressurizer relief tank high temperature (TC 440B)

(3) RV-206 high temperature (TIC 1104)

(4) Pressurizer relief header temperature (TIC 433A, B, and C)

We conclude that OPS at San Onofre Nuclear Power Station, Unit 1 will satisfy the NRC staff position on PORV open alarm if one of the proposed direct indicators is provided with an audio/visual alarm.

2.5 PRESSURE TRANSIENT REPORTING AND RECORDING REQUIREMENTS.

The NRC staff position is that a pressure transient which causes the OPS to function, thereby indicating the occurrence of a serious pressure transient, is a 30-day reportable event. In addition, pressure-recording and temperature-recording instrumentation are required to provide a permanent record of the pressure transient. The response time of the pressure/temperature recorders shall be compatible with pressure transients that increase at a rate of approximately 100 psig/s.

San Onofre Nuclear Power Station, Unit 1 has a wide-range temperature recorder for Cold Leg Loop A (TR402) in the unit control console in the control room. There is, however, no mention of a wide-range pressure

Two alternative valve arrangements are provided for in this instruction. The primary arrangement requires: (1) the following valves are closed with a yellow caution tag affixed to the remote manual switch: MOVs 850A, 850B, and 850C and HVs 851A and 851B; (2) the safety switches (breakers) for MOVs 850A and 850B are opened, the fuse blocks removed, and a yellow tag affixed to the breaker; (3) the output breaker for the UPS inverter to MOV 850C is opened with the manual transfer switch aligned to the inverter output breaker, and a yellow tag is affixed to the output breaker and the transfer switch; and (4) the hydraulic oil block valves on the operators for HVs 851A and 851B are closed and tagged.

The alternative arrangement requires (1) closing, locking, and tagging the safety injection pump suction valves 861A and 861B; (2) closing, locking, and tagging the feedwater safety injection bypass valves 856A and 853B; and (4) closing and tagging the hydraulic oil valves on the operators for HVs 853A and 853B.

(2) Cold Operation Test of the Safety Injection System (Operating Instruction S-3-3.4)

This operating instruction describes the procedure for conducting a "no-flow test" of the SIS to demonstrate operability. This test is conducted with the RCS in a cold shutdown condition, with the RCS vented and not water solid. The safety injection pumps and feedwater pumps are not operating and their respective breakers are racked-out to the test position with control power available. At the start of the test the SIS is in the cold shutdown arrangement (see item 1, "Cold Shutdown Arrangement of Safety Injection System"). In order to complete the test, however, the system is temporarily removed from this arrangement under the supervision of the Watch Engineer.

In accordance with this procedure, two tests are conducted: one on the SIAS circuits and one on the Safety Injection Actuation System/Loss of Power (SIAS/LOP) circuits. In the first test, the SIS is changed from the cold shutdown arrangement to the SIAS no-flow test condition. This includes (1) positioning MOVs 850A, 850B, and 850C in the closed position, and (2) positioning HVs 851A and 853B in the closed position with the

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SPECIFICATION: A. When the RCS pressure is ≤400 psig andd pressurizer water level is greater than 50%, at least one of the following overpressure protection systems shall be operable:

(1) Two power operated relief valves (PORVs) with a lift setting of ≤522 psig, or

(2) A reactor coolant system vent(s) of ≥1.75 square inches.

B. With one PORV inoperable when required in accordance with Specification A above, either restore the inoperable PORV to operable status within seven days or depressurize and vent the RCS through a 1.75 square inch vent(s) within the next eight hours; maintain the RCS in a vented and tagged condition until both PORVs have been restored to operable status.

C. With both PORVs inoperable when required in accordance with Specification A above, depressurize and vent the RCS through a 1.75 square inch vent(s) within eight hours; maintain the RCS in a vented and tagged condition until both PORVs have been restored to operable status.

D. In the event either the PORVs or the RCS vent(s) are used to mitigate a potential RCS pressure transient, a Special Report shall be prepared and submitted to the Commission pursuant to Specification 6.9.2.b within 30 days. The report shall describe the circumstances initiating the transient, the effect of the PORVs or vent(s) on the transient and any corrective action necessary to prevent recurrence.

APPLICABILITY: Applies to operability of the overpressurization protection systems.

OBJECTIVE: To verify that the overpressure protection systems will respond promptly and properly if required.

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