



SMUD

SACRAMENTO MUNICIPAL UTILITY DISTRICT □ 6201 S Street, Box 15830, Sacramento, California 95813; (916) 452-3211

November 4, 1982

DIRECTOR OF NUCLEAR REACTOR REGULATION
ATTENTION JOHN F STOLZ CHIEF
OPERATING REACTORS BRANCH 4
U S NUCLEAR REGULATORY COMMISSION
WASHINGTON D C 20555

DOCKET 50-312
RANCHO SECO NUCLEAR GENERATING STATION
UNIT NO 1
LOW TEMPERATURE OVERPRESSURIZATION PROTECTION

Our October 29, 1982 letter, responded to your request for additional information contained in your April 9, 1982 letter. Our response contained some incomplete information and commitments were made to supply that information at a later date. The date that we proposed was January 15, 1982. This date is obviously incorrect; we intended to use January 15, 1983. Consequently, we are resubmitting our response with corrected dates. There were a number of drawings enclosed with our October 29, 1982 letter. These are not being resubmitted. I apologize for any inconvenience this may have caused you.

John J. Mattimoe
General Manager

Enclosure

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ENCLOSURE 1
Responses to Request for Additional Information

Item 1: "Branch Technical Position (SRP 5.2.2/RSB 5-2) specifies that the Rancho Seco, Unit 1, Overpressure Protection System (OPS) should prevent exceeding applicable Technical Specifications and 10 CFR 50, Appendix G limits. In your analysis and system description, you use 550 psig as the low temperature operation PORV setpoint and as the value that RCS pressure is allowed to reach prior to any credited operator action.

- a. Does the 550 psig setpoint provide adequate assurance that the Appendix G curve limits will not be exceeded for all temperatures below 312°F (the minimum pressurization temperature)?"

Response: The District is presently evaluating a change to the temperature for placing low temperature overpressure protection controls in service from the present 200°F to a new value of 350°F. This is discussed further in our response to Item 8. With this change, we believe that the current 550 psig setpoint can be shown to be acceptable for overpressure protection for Appendix G limits for at least 8 EFPY of reactor operation. Analyses are presently being performed by our NSSS vendor to demonstrate that reactor vessel pressure--temperature limits are acceptably maintained by the existing 550 psig setpoint. These analyses remove some conservatism from the Appendix G, Technical Specification limits for normal operation and are expected to show that the RCS pressure boundary integrity is still assured with the present 550 psig setpoint.

The results of these analyses are anticipated to be complete to support submittal by January 15, 1983.

Item 2: "The OPS is required to function assuming any single active component failure. The Rancho Seco overpressure protection system does not meet this criterion for the cases of (a) the makeup control valve failing in full open position, and (b) an inadvertent actuation of the high pressure injection (HPI) system, either case with the PORV failing closed. You discussed several procedural and administrative controls used to prevent an inadvertent actuation of high pressure injection and the Branch Technical Position allows for such cases, if reviewed and approved on an individual basis, and if adequate controls to prevent the event are included in the plant Technical Specifications.

- a. Provide a copy of all Technical Specifications that deal with this subject, or propose appropriate ones.
- b. List all procedural and administrative controls used during HPI system tests to prevent violating Appendix G limits.
- c. Could an HPI isolation valve (SFV 23810, SFV 23811, or SFV 23812) be manually opened locally?"

Response: The Sacramento Municipal Utility District does not consider inadvertent actuation of the high pressure injection (HPI) system to be a credible occurrence. We believe this to be the case because inadvertent actuation requires at least two concurrent failures of safety grade equipment. Further, since the HPI system is not required to be operable until the Reactor Coolant System (RCS) temperature is above the minimum pressurization temperature, the Safety Features Actuation System can remain bypassed, further assuring that inadvertent actuation will not occur. Even if inadvertent actuation could occur, the circuit breakers for the closed HPI motor operated valves are open and tagged.

The District is also in the process of reevaluating the failure of the makeup control valve in the full open position. It appears that the previous analysis (reference our March 17, 1977 submittal) may have been overly conservative in the assumed makeup flowrate. This flowrate is being reevaluated presently and an updated submittal is expected to be ready by January 15, 1983. We expect that as a result of the analysis or by modification to restrict flow under low temperature operating conditions that greater than ten minutes for operator action can be assured for failure of the makeup control valve.

- a. The Rancho Seco Technical Specifications have not been modified to include administrative controls or limiting conditions for low-temperature overpressure protection. The District does not feel that it is appropriate to propose Technical Specifications or a schedule for submittal at this time since review of the proposed modifications by the NRC staff is incomplete.

Further, as stated in our March 29, 1978, letter, the District objects to a Technical Specification requirement on the administrative controls for the HPI pumps and valves because such a requirement could prohibit emergency boration during low temperature operation which might be needed in the event of an unplanned boron dilution.

Procedural controls have been included in the Rancho Seco operating procedures for Plant Shutdown and Cooldown as well as Plant Heatup and Startup to provide instructions to the operators in use of the overpressure protection equipment and to institute administrative controls for Appendix G limit protection. These procedures contain detailed instructions and signature blanks to ensure completion. Presently, the controls are introduced at 200°F during cooldown and are removed at 200°F during heatup. As stated in our response to Items 1 and 8, the District is evaluating changing this temperature to 350°F to provide broader protection.

- b. Under normal circumstances the HPI pump surveillance flow tests (ASME Section XI) are not performed when the RCS is below the minimum temperature for full pressurization. However, there can be instances during which such testing is required. In this case, testing is performed with the pump to be tested on recirculation back to the Makeup Tank. In this case, the administrative controls on the four motor-operated HPI valves and the other HPI pump(s) remain in force. When stroke testing of the HPI valves is performed during low temperature operation, operating procedures require that an in-series valve in the same line be closed and tagged unless all HPI pumps are tagged out. Consequently, testing of the HPI system does not compromise the overpressure protection controls.
- c. HPI isolation valves could be manually opened locally by intentionally defeating or ignoring the administrative controls placed on the HPI valves. The administrative controls placed on the valves for low temperature overpressure protection remove power from the valves by opening their breakers consistent with the NRC branch technical position. Since the Rancho Seco procedures comply with the NRC criteria, the District does not consider valve opening by intentionally defeating the administrative controls to be credible.

Item 3: "In your March 29, 1978, submittal, you stated that you decided against using the pump trip feature in the Rancho Seco overpressure mitigating system. You had used this feature as one of the diverse protective systems in your analysis of the makeup control valve failing full open. Address how you are going to meet all of the required criteria for this initiating event with the postulated failure (closed) of the single PORV. No credit can be taken for operator action until 10 minutes after the operator is aware of the transient."

Response: As discussed in our response to Item 2: (1) The District does not consider the inadvertent actuation of the HPI system to be credible and (2) reanalysis of the failed open makeup valve case is underway with the expected result being longer than ten minutes for operator action. Consequently, we feel that the pump trip feature is not necessary to provide diverse protection. Further, as expressed in our March 29, 1978, submittal, the District has a concern that the addition of such a feature would create a new failure mechanism for the HPI system. Consequently, the District does not believe it is desirable to add the feature nor could it be added without NRC review as an unreviewed safety question.

Item 4: "In the March 29, 1978, letter from SMUD to Mr. Reid, you proposed eight modifications which involve adding equipment or modifying existing equipment or procedures in order to prevent overpressure events or mitigate them should they occur."

- a. What is the status of implementation of the eight proposed modifications?
- b. Would a single power source failure disable more than one of the alarm functions identified, or an alarm and the PORV?
- c. The alarm for the HPI valves will actuate if any of the four valves is full open, however, the alarm will not sound if any or all of the valves is partially open. This situation could result in overpressurization of the RCS if an inadvertent actuation of an HPI pump occurred. Please discuss this scenario."

Response: a. Referring to our March 29, 1978, letter, the following items of the eight proposed modifications are now complete:

- Item 1: The dual setpoint on the pilot-operated relief valve (PORV).
- Item 2: Annunciation to alarm when RCS pressure is reduced below 550 psig.
- Item 4: Plant operating procedure changes which require closing HPI valves and opening and tagging breakers for motor-operated valves downstream of the HPI pumps.
- Item 6: Operating procedure changes requiring power to be removed from two HPI pumps.
- Item 8: Annunciation on high makeup flow (to detect a failed open makeup control valve).

The others:

- Item 3: Annunciation on PORV block valve closure
- Item 5: Annunciation of the four motor-operated HPI valve positions
- Item 7: Annunciation of status of power to the HPI pumps

have not been installed because, as stated in our March 29, 1978, letter, the District considers that NRC approval is needed prior to implementation. Our plan at the time of that letter was for installation during the refueling which began in November, 1978. However, with no feedback from NRC and higher priority work at Rancho Seco (and within NRC undoubtedly) due to the TMI-2 accident, the modifications were not completed.

- b. All annunciators are powered from a common supply, consequently a single power source failure could disable all low temperature overpressure protection alarm functions. The PORV itself is powered by direct current and the pressure sensor supplying the signal for automatic PORV opening is from channel A of the safety features actuations system. The signal monitor itself is powered from the nonnuclear instrumentation (NNI) system.

All of these power sources are independent of the annunciator power supply. Two of the currently installed alarms (high makeup flow and pressurizer level) receive their signal from within the NNI. Consequently, a single power source failure could disable both the automatic opening of the PORV and the makeup flow and pressurizer level alarms. The designs for additional alarms proposed in our March 29, 1978, letter will be powered from independent supplies. The District will review the high makeup flow and pressurizer level alarm designs and will propose design modifications as necessary to ensure that the alarms and PORV opening functions are not subject to a single failure. We expect to be able to provide an updated submittal by January 15, 1983.

- c. The valves are normally expected to be either full open or full closed. While the valve is travelling from full closed to full open or vice versa, the indication in the control room shows both the closed light and the open light simultaneously. However, unless the valve fails during travel, this will exist only momentarily. Since the HPI valve travel limits to full open were modified in late 1978 due to an unrelated concern, the flow rate through an individual valve has been reduced significantly. Inadvertent actuation of an HPI pump with one HPI valve remaining partially (or full) open due to failure would not result in an event which allows less than ten minutes for operator action.

Item 5: "You take credit for operator action to mitigate a pressure transient for all analyzed events when a failure closed of the PORV is considered. No credit can be taken for operator action until ten minutes after the operator is aware that a pressure transient is in progress. For the most severe event that you analyzed, what audible alarm will alert the operators that a pressure transient is occurring (alarms associated with the PORV cannot be used because it is assumed failed closed)? We request that acceptable technical specification changes or system modifications be proposed to increase your calculated operator time from 4.4 minutes to at least ten minutes."

Response: As discussed in our response to Item 2, SMUD is presently reevaluating the possible flow rate to the RCS via the makeup control valve. Our intention is to reanalyze the event and, if necessary, modify the system to ensure that the operator has at least ten minutes for action to prevent violation of 10 CFR 50, Appendix G, pressure-temperature limits. As noted in our response to Item 2, the District does not consider HPI system inadvertent actuation to be credible. The analysis provided in our March 17, 1977 letter, showed the time for operator action to be seven minutes for the case of the failed open makeup valve.

Audible alarms which would alert the operator to a pressure transient event for the failed open makeup valve are:

- (1) the makeup line high flow alarm; and

- (2) the Pressurizer level high alarm (220") if RCS pressure is greater than 100 psig initially; or
- (3) the Pressurizer level High-High alarm (275") if RCS pressure is less than 100 psig initially.

Item 6: "What training has been conducted at Rancho Seco to make the operating personnel aware of overpressure incidents at other facilities and possible overpressure situations at Rancho Seco? How do you ensure that an emphasis is placed on this problem during your licensing and retraining programs?"

Response: Design changes for the present dual setpoint PORV protection and associated operating procedure changes to implement the required administrative controls were implemented during 1973. At that time, all licensed operators were given training on the purpose and utilization of the associated hardware and administrative controls. New licensed operators receive similar instruction during their training period prior to licensing.

Requalification training for Licensed Operators is primarily aimed at hardware and procedure changes rather than retraining on long existing equipment and procedures which are in routine use and of high familiarity. In addition to plant changes, requalification training does cover unusual operations, response to emergencies and anticipated transients as well as nuclear plant operating theory. Considerable emphasis in requalification training is placed upon protecting the Reactor Vessel by maintaining the 10 CRF 50, Appendix G limits during all operations and transients. The recent high level of attention to potential thermal shock events has caused increased emphasis upon maintaining the vessel pressure-temperature limits within acceptable bounds in all conditions.

Item 7: "Provide current P&IDs of the overpressure protection system."

Response: The drawings attached to our March 28, 1978, letter continue to represent current overpressure protection system design. The alarm logic and elementary drawings are still proposed pending NRC approval. A current copy of E-203, Sheet 65, (Elementary Diagram for the pressurizer relief valve) is attached as are current copies of M-520, M-521, and M-522 (P&ID's for the Reactor Coolant System, Makeup and Purification System, and Decay Heat Removal System).

Item 8: "The administrative controls you use to ensure against the inadvertent opening of an HPI valve are not put into use until RCS temperature drops to 200°F during cooldown and they are removed once temperatures reach 200°F during system heatup. This leaves the time spent between 200°F and 312°F (the minimum pressurization temperature) where an inadvertent valve opening or a valve malfunction could result in a pressure transient that could exceed an Appendix G curve limit. Please discuss the protection afforded the reactor coolant system between 200°F and 312°F."

Response: The District is investigating making a change to the point at which the administrative controls for low temperature overpressure protection are imposed from 200°F to 350°F. This change appears to be feasible, however, we have not completed our evaluation to ensure that all safety analyses and Technical Specification bases are unaffected. This review is expected to be complete soon enough to support an updated submittal by January 15, 1983.

Item 9: "Provide the age of the primary system, in effective full power years (EFPY) at which the current Appendix G limits are calculated."

Response: The current Appendix G limits are valid until 5 EFPY. The anticipated accumulated exposure at the time of the next refueling outage (scheduled for January, 1983) is 4.4 EFPY. Due to the expected duration of that refueling outage, SMUD does not anticipate needing to change the current Appendix G limits for at least one year. The District is currently evaluating the effect of future Appendix G limits (which will be valid out to 8 EFPY or beyond) upon the Low Temperature Overpressure Protection System controls. We anticipate that this evaluation will be complete in time to support an updated submittal by January 15, 1983.

ENCLOSURE 2
Responses to Recommendations of Enclosure 2
of April 9, 1982 NRC Letter

- Recommendation 5.1.1: "Any operation or failure of the PORV to operate to relieve pressure transients must be reported to the NRC."
- Response: The District's January 16, 1981 response to NUREG 0737 item II.K.3.3 committed to promptly report future failures of relief valves and to report future challenges of relief valves via an annual report.
- Recommendation 5.1.2: "The existing (Overpressure Mitigation System) OMS and alarms must be operable (in operation) when the RCS temperature is below 280°F. If the OMS modification is installed and in operation, then the system and its related alarms must be operable when the RCS temperature is below the minimum pressurization temperature. If these conditions are not met, the primary system must be depressurized and vented to the atmosphere within eight hours."
- Response: SMUD is investigating a change to make the OMS controls operable when RCS temperature is below 350°F which will ensure operability when the RCS temperature is below the minimum pressurization temperature. Presently the controls are only enforced when the RCS is below 200°F. We expect to be able to provide an updated submittal by January 15, 1983.
- Recommendation 5.1.3: "The four HPI motor-operated valves must be closed and the supplying circuit breakers open and tagged when the temperature is below 280°F and the reactor coolant is not vented to the atmosphere."
- Response: Present Rancho Seco procedures require that the four HPI motor-operated valves must be closed with their associated circuit breakers open and tagged when the RCS temperature is below 200°F unless the RV head is removed. The District is currently evaluating increasing the temperature for initiating OMS controls to 350°F. An updated response should be possible by January 15, 1983.
- Recommendation 5.1.4: "The low temperature overpressure protection system and added alarms must be tested on a periodic basis consistent with the need for its use. A system functional test and a setpoint verification test shall be performed prior to enabling the overpressure protection system during cooldown and startup. The system shall be calibrated, and the PORV and related OMS alarm operations tested at refueling intervals."

The HPI valves will be allowed to be cycled only if (a) all HPI pumps are out of service, or vessel temperature is above the minimum value for which the vessel can be fully pressurized, or (b) the reactor vessel head is removed."

Response:

The low temperature overpressure protection system (dual setpoint PORV) receives its pressure signal from Safety Features Actuation System (SFAS) Channel A and the equipment receives a functional test once per month along with SFAS Channel A. The system is calibrated and the PORV and associated alarms are tested at each refueling outage.

Rancho Seco procedures allow cycling of HPI valves during low temperature operation only if another valve in the same path from the HPI pump(s) to the RCS is closed and tagged unless the reactor vessel head is removed. This of course can be violated in an emergency situation if makeup or boration is required. One other exception is for the performance at refueling intervals of the integrated engineered safety features actuation tests required by the Technical Specifications.

Recommendation 5.1.5:

"When the reactor vessel temperature is below the minimum value for which the vessel can be fully pressurized, the PORV may be removed from service for a maximum of two hours only if (a) charging pumps are out of service and all HPI injection valves are closed and power removed, or (b) the vessel head is removed."

Response:

Rancho Seco procedures do not allow the PORV or associated low range 550 psig trip logic to be taken out of service unless the reactor vessel head is removed or for periodic surveillance testing to verify the functional operability of the low temperature overpressure protection equipment and SFAS Channel A.

Recommendation 5.2.1:

"Submit Technical Specifications to comply with the requirements listed in Section 5.1"

Recommendation 5.2.2:

"Identify, in the Technical Specifications, the enabling temperature and PORV setpoint"

Recommendation 5.2.3:

"Propose Technical Specifications related to system testing"

Response:

The District does not feel it is appropriate to discuss the content of Technical Specifications or a schedule for their submittal until all analyses are complete and NRC approval of the District's overpressure protection system design is complete.

Recommendation 5.2.4: "Install pressure alarms to give the operator direct indication that a low temperature-pressure transient is in progress and that the RCS pressure has exceeded 550 psig."

Response: The District does not consider additional low range pressure alarms to be necessary since there are several other alarms presently available and proposed as described in our March 17, 1977, and March 29, 1978, submittals.

Recommendation 5.2.5: "Examine the maintenance and testing restrictions to assure compatibility with present/proposed Technical Specifications regarding the operability and periodic testing of ECC and emergency boration system."

Response: This consideration should be addressed after completion of design review of the low temperature overpressure protection system and controls. The concerns addressed in the recommendation mirror some of the District's concerns in developing Technical Specifications for the overpressure protection system and related administrative controls.

Recommendation 5.3.1: "All alarms, instrumentation, control circuits, and power required by the operator to detect HPI overpressure transients should be electrically and physically separated from the PORV system (i.e., meet IEEE 279 criteria)."

Response: Please refer to our Response to Item 4(b), Enclosure 1.

Recommendation 5.3.2: "Assure that the new equipment is seismic qualified and testable."

Response: Due to the low probability of design basis seismic events at Rancho Seco and the low probability of cold overpressurization at B&W plants (water-solid operation is not allowed), the District does not believe that the low temperature overpressure protection equipment needs to be designed to seismic category I standards. The overpressure protection equipment is testable and in fact is currently being tested periodically (see response to recommendation 5.1.4).