APR 15 1985

MEMORANDUM FOR: Hugh L. Thompson, Jr., Director
Division of Licensing, NRR

FROM: Dennis F. Kirsch, Acting Director
Division of Reactor Safety and Projects

SUBJECT: REGION V SAFETY EVALUATION REPORT FOR RANCHO SECO NUCLEAR GENERATING STATION - NUCLEAR INSTRUMENT CALIBRATION - TAC. NO. 55607

Plant Name: Rancho Seco
Docket Number: 50-312
Responsible Branch: Operating Reactors Branch No. 4
Project Manager: S. Miner
Review Status: Complete

Enclosed is the Region V Safety Evaluation Report addressing the subject licensing action. We have also enclosed a draft letter to the licensee, a draft license amendment, revised technical specification pages and page replacement instructions. Inasmuch as this action has been completed, TAC Number 55607 may be closed.

We have also enclosed the SALP input requested by NRR Office Letter Number 44.

If you have any questions regarding this SER, please contact Jerry Zwetzig at FTS 463-3749.

Original signed by
D. F. Kirsch

Dennis F. Kirsch, Acting Director
Division of Reactor Safety and
Projects

Enclosures:
As stated

cc:
S. Miner, NRR
J. Stolz, NRR
J. Thoma, NRR
F. Miraglia, NRR
R. Pate, RV
G. Zwetzig, RV
Via 5520: Division of Licensing, NRR
ID: Rancho TAC No. 55607

RV/dot
Zwetzig 4/11/85
Pate 4/11/85
Kirsch 4/15/85

IE01
1/1

SALP INPUT FOR COMPLETED SER

Organization Preparing SALP Input: Region V
Facility: Rancho Seco Docket No.: 50-312 Phase: Operating
SER Subject: Nuclear Instrument Calibration TAC No. 55607

Functional Area: Licensing Activities

Evaluation Criteria

1. Management Involvement in Assuring Quality

   The licensee's submittals reflected a management program where activities affecting quality were usually under control. It appears decision-making generally occurred at an appropriate level.

   Rating: Category 2

2. Approach to Resolution of Technical Issues from a Safety Standpoint

   The licensee's submittals reflected a good understanding of the technical and safety issues involved and provided a conservative approach to the problem.

   Rating: Category 1

3. Responsiveness to NRC Initiatives

   The licensee was usually very responsive to staff requests and suggestions.

   Rating: Category 1

4. Reporting and Analysis of Reportable Events

   Not observed.

   Rating: None

5. Staffing (Including Management)

   Based on the timeliness of the licensee's submittals, it appeared that staffing was adequate.

   Rating: Category 2

6. Training and Qualification Effectiveness

   Not observed.

   Rating: None

D-R-A-F-T

Docket No. 50-312

Mr. Ronald J. Rodriguez
Executive Director, Nuclear
Sacramento Municipal Utility District
6201 S Street
P. O. Box 15830
Sacramento, California 95813

Dear Mr. Rodriguez:

SUBJECT: AMENDMENT NO. TO FACILITY OPERATING LICENSE NO. DPR-54
CALIBRATION OF NUCLEAR INSTRUMENTATION

The Commission has issued the enclosed Amendment No. to Facility Operating License No. DPR-54 for Rancho Seco Nuclear Generating Station. This amendment consists of changes to the Technical Specifications in response to your application dated June 6, 1983, as supplemented by your letters of June 29, 1983; July 11 and November 28, 1984; and February 8 and April 3, 1985.

The amendment revises the Technical Specifications defining the requirements for calibration of power range neutron instrumentation.

A copy of the Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's Monthly Notice.

Sincerely,

Operating Reactors Branch No. 4
Division of Licensing

Enclosures:
1. Amendment No. to DPR-54
2. Safety Evaluation

cc w/enclosures:
See next page

SACRAMENTO MUNICIPAL UTILITY DISTRICT

DOCKET NO. 50-312

RANCHO SECO NUCLEAR GENERATING STATION

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No.
License No. DPR-54

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Sacramento Municipal Utility District (the licensee) dated June 6, 1983, as supplemented by letters of June 29, 1983; April 3, July 11 and November 28, 1984; and February 8 and April 3, 1985, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public;

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the licensee is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-54 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendices A and B, as revised through Amendment No. , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications, except where otherwise stated in specific license conditions.

3. This license amendment is effective as of its date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Operating Reactors Branch No. 4
Division of Licensing

Attachment:
Changes to the Technical Specifications

Date of Issuance:

ATTACHMENT TO LICENSE AMENDMENT NO.

FACILITY OPERATING LICENSE NO. DPR-54

DOCKET NO. 50-312

Replace the following pages of the Appendix A Technical Specifications with the enclosed pages as indicated. The revised pages are identified by Amendment number and contain vertical lines indicating the area of change.

Remove	Insert
4-2	4-2
4-3	4-3

Calibration

Calibration shall be performed to assure the presentation and acquisition of accurate information. The nuclear flux (power range) channels amplifiers shall be calibrated (during steady state operating conditions) against a heat balance standard whenever the Nuclear Instrumentation indication is 10 percent or more above the core thermal power or 2 percent or more below the core thermal power.

Channels subject only to "drift" errors induced within the instrumentation itself and consequently, can tolerate longer intervals betwen calibrations. Process system instrumentation errors induced by drift can be expected to remain within acceptable tolerances if recalibration is performed at the intervals of each refueling period.

Substantial calibration shifts within a channel (essentially a channel failure) will be revealed during routine checking and testing procedures..

Thus, minimum calibration frequencies set forth are considered acceptable.

Testing

The frequency of on-line testing of reactor protective channels as shown in table 4.1-1 will assure the required level of performance.

The equipment testing and system sampling frequencies specified in Table 4.1-2 and table 4.1-3 are considered adequate to maintain the equipment and systems in a safe operational status.(1)

Power Distribution Mapping

The incore instrumentation detector system will provide a means of assuring that axial and radial power peaks and the peak locations are being controlled by the provisions of the Technical Specifications within the limits employed in the safety analysis.

REFERENCES

(1) FSAR paragraph 1.4.12.

Table 4.1-1

INSTRUMENT SURVEILLANCE REQUIREMENTS

	Channel Description	Check	Test	Calibrate	Remarks
	Reactor Protective System				
	1. Source range channel	S (1)	P	NA	(1) When in service.
	2. Intermediate range channel	S	P	NA	
	3. Power range amplifier	S (1)	NA	(2)	(1) Heat balance check each shift. (2) Heat balance calibration will be conducted whenever the Nuclear Instrumentation indication is 10% above the core thermal power or 2% below the core thermal power.
4.	Power range channel	S	M	M (1,2)	(1) Using incore instrumentation for split detector calibration. (2) Imbalance, upper and lower chambers at equilibrium xenon after each startup if not done the previous week.
5.	High reactor coolant pressure channel	S	M	R	
6.	Low reactor coolant pressure channel	S	M	R	
7.	Reactor coolant temperature channel	S	M	R	

SAFETY EVALUATION BY NRC REGION V

SUPPORTING AMENDMENT NO. ___

TO FACILITY OPERATING LICENSE NO. DPR-54

SACRAMENTO MUNICIPAL UTILITY DISTRICT

RANCHO SECO NUCLEAR GENERATING STATION

DOCKET NO. 50-312

1. INTRODUCTION

A. DESCRIPTION OF PROPOSED ACTION

The proposed action would amend Item 3 of Table 4.1-1 of Appendix A of the facility Technical Specifications. This item relates to the calibration requirements for the power range nuclear instrumentation amplifiers. Instead of the present requirement that calibration be performed "...whenever indicated neutron power and core thermal power differ by more than 2 percent and daily during non-steady-state operation...", the requirement would be changed to "...whenever the Nuclear Instrumentation indication is 10% above the core thermal power or 2% below core thermal power."

B. BACKGROUND INFORMATION

By letter dated June 6, 1983, the Sacramento Municipal Utility District (the licensee) requested amendment of the Operating License for Rancho Seco Nuclear Generating Station (the facility) such that the power range nuclear instrumentation would only require calibration when it read low - that is, when the calibration was not conservative. Supplementary information concerning this request was provided by the licensee's letters of June 29, 1983 and April 3, 1984.

As a result of review of this request by the staff, the licensee was requested to provide additional information justifying the safety of the proposed change and placing an upper limit on the amount the instrumentation could deviate from the core thermal power on the high side (the conservative direction). This information was provided by the licensee's letters of July 11 and November 28, 1984 and February 8 and April 3, 1985.

C. SCOPE OF REVIEW

This review has considered only the changes in the facility technical specifications requested by the licensee. It has not considered portions of the technical specifications for which changes were not requested. In performing this review we have

considered whether the changes would reduce any of the operational or administrative requirements implemented at the facility. Whether or not such a reduction was proposed, we have evaluated whether the change would (1) increase the probability or consequences of accidents considered in the FSAR, (2) create the possibility of an accident not considered in the FSAR, or (3) reduce the margin as defined in the basis for any technical specification.

Although the technical specifications for this facility do not follow the format and provisions of the Commission's current Standard Technical Specifications (the facility was licensed prior to implementation of these standard specifications), we have discussed the proposed changes with a representative of the Standard Technical Specifications group, Division of Licensing, NRR, and no objections were expressed.

Our evaluation has also considered, where applicable, the guidance contained in 10 CFR 50, Appendices A and B; the NRC Standard Review Plan; industry codes and standards, NRC Regulatory Guides and the technical specifications of other facilities having the same NSSS supplier (Babcock and Wilcox).

II. EVALUATION

As a result of inquiries by and discussions with the staff, the changes requested by the licensee are as follows:

1. Change the requirement for calibration of the nuclear instrumentation power range amplifier from "...whenever indicated neutron power and core thermal power differ by more than two percent..." to "...whenever the Nuclear Instrumentation indication is 10% above the core thermal power or 2% below thermal power."

2. Increase the frequency of performing a heat balance check from daily to once per shift. And,

3. Delete the present requirement for daily calibration during non-steady-state operation.

Regarding item 1, the licensee states this change is needed because power range nuclear instruments (NI) that are within calibration limits at or near full power will read high (with respect to thermal power) at reduced power levels (a conservative error). However, if the NI are brought within calibration limits at reduced power, they will then read low (a non-conservative error) when the reactor returns to full power. This condition will then exist until the next calibration. Typically this period would be several hours because the facility technical specifications presently require a heat balance daily.

This behavior occurs because neutron leakage from the reactor vessel changes with reactor power. This occurs in part, because the reactor control system is designed to provide a Constant T-Average value above 15% power (Note: T-Average is the average temperature of the reactor coolant in the hot leg, Th, and the cold leg, Tc, of the reactor coolant

system. Thus Tavg = (Th + Tc)/2). The other reason this occurs is because the coolant in the inlet downcomer annulus adjacent to the vessel wall is water from the cold leg of the reactor coolant system. Therefore, this water is at a temperature, Tc. Since the temperature rise which occurs in passing through the core must increase with power level, it is clear that with constant Tavg control, Th must increase and Tc must decrease with power level. Thus, at full power Tc will have its minimum value and at lower power levels (greater than 15%), Tc will have higher values.

The result of the above is the water in the downcomer annulus is at its minimum operating temperature when the reactor is at full power. The water density, therefore, is greatest at full power and permits the smallest fraction of the generated neutrons to leak from the vessel and reach the out-of-core neutron detectors. At lower power levels, Tc is higher, the water in the downcomer annulus is less dense, and a larger fraction of the generated neutrons can escape from the vessel.

From the above, it is clear that neutron channels calibrated on the basis of a heat balance at full power, will provide high readings at lower power levels due to the increased neutron leakage. It is also clear, as the licensee notes, that if the neutron channels are calibrated at reduced power (when neutron leakage is high), the channels will read low (due to reduced neutron leakage) when the reactor returns to full power. This, of course, is an obviously non-conservative error which would persist until the next heat balance check was performed.

On the basis of the foregoing, we conclude the present requirement to calibrate the neutron channels whenever the difference between the neutron-indicated power and the heat balance power is greater than two percent can lead to non-conservative calibration if it is performed at reduced power. On the other hand, the licensee's proposal to require calibration only when the heat balance power exceeds the neutron-indicated power by two percent would appear to resolve this temporary non-conservative condition.

To explore the issue further, we asked the licensee to address the possibility that xenon transients could alter this typical behavior. In response, the licensee stated that xenon transients could introduce calibration errors in either the conservative or non-conservative directions. The licensee also stated, however, that such changes have always been smaller than the thermal effects discussed above. The licensee also noted that even if a transient were to cause the neutron channels to give a non-conservative indication, a recalibration would be required under both the existing and proposed technical specifications.

We also asked the licensee to address the effect of neutron channel readings more than two percent higher than thermal power on accidents considered in the FSAR and technical specification limits. The licensee responded that the accidents considered in the FSAR are terminated or limited by the Safety Limits and Limiting Conditions for Operation set forth in the technical specifications. The licensee cited reactor maximum power limit, power imbalance limits and control rod insertion limits as examples of parameters which are dependent upon reactor power.

The licensee also correctly notes that power imbalance and control rod insertion limits become more restrictive as power level increases. Thus, neutron channel indications which are high, impose stricter and more conservative limits on reactor operation. In addition, we note that in the event of a power transient, neutron channels which read high would provide reactor trip at a lower thermal power, and thereby produce a less severe transient in terms of integrated energy release.

Based on the foregoing, we were unable to identify any situation where the licensee's failure to calibrate the power range neutron instrumentation while it was indicating higher than the true thermal power could cause or increase the severity of an accident. Further, we note the plant operators have a significant incentive to avoid such a condition since it could cause inadvertent plant trip. Nevertheless, from the human factors standpoint of retaining operator confidence in instrument indications, the staff considered it inadvisable to approve a request that would allow an unlimited ceiling on the amount that the neutron instrumentation could be out of calibration on the high (conservative) side. Accordingly, the licensee was requested to revise their original request, which provided no upper limit for calibration errors on the high side, to provide a finite upper bound. This revision was provided by the licensee in a letter dated February 8, 1985. In this letter the licensee proposed an upper limit of 10% for the maximum amount the indicated neutron power may exceed the core thermal power.

Based on discussions with the licensee's representatives, the value of 10% is sufficient to encompass typical out-of-calibration situations which occur during power reductions and thereby correct the situation which led to this request. At the same time, 10% is sufficiently close to the true power to resolve human factors concerns related to unbounded out-of-calibration conditions.

Therefore, on the basis that Item 1 would eliminate a calibration requirement that can lead to a non-conservative instrument setting, because no condition has been identified which indicates the need for correction of a high neutron channel reading, and because the licensee has proposed an appropriate upper limit for out-of-calibration conditions on the high side, we conclude the proposed change identified as item 1 is acceptable.

As noted previously, Item 2 would increase the minimum required frequency for performing heat balance checks from daily to once per shift. We conclude that because this change would provide more frequent monitoring of the calibration of the power range neutron instrumentation, this is an improvement to the safety of operations and is acceptable.

Regarding Item 3 which would eliminate the requirement for daily calibration of the power range neutron instrumentation during non-steady-state operation, we agree this is an unnecessary requirement. The reason this requirement is unnecessary is because the proposed new specification would require a heat balance check (comparison of indicated neutron power and core thermal power) at least once each shift. This, in turn, would require calibration whenever the nuclear instrumentation indication was 2% below core thermal power or 10% above core thermal

power. These requirements, therefore, address any calibrations needed during steady-state or non-steady-state operations more frequently than the present requirement. Accordingly, we conclude the present requirement for daily calibration of the power range nuclear instrumentation during non-steady-state operations is fully satisfied by the proposed revised specifications and the deletion of the present requirement is acceptable.

III. CONCLUSIONS

Environmental Consideration

This amendment involves a change in the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The staff has determined that the amendment involves no significant increase in the amounts of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

Conclusion

We have concluded, based on the considerations discussed above, that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations, and the issuance of the amendment will not be inimical to common defense and security or to the health and safety of the public.

Date:

Principal Contributor: G. Zwetzig