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SUBJECT: Forwards response to questions re proposed Tech Spec change, per 841003 request.Core operating limit supervisory sys used to monitor DNB & local power density limiting conditions for operations.

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October 24, 1984

Director, Office of Nuclear Reactor Regulation
Attention: Mr. George W. Knighton, Branch Chief
Licensing Branch No. 3
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

Subject: Docket Nos. 50-361 and 50-362
San Onofre Nuclear Generating Station
Units 2 and 3

During a telephone conversation on October 3, 1984, SCE received an informal request from the NRC (Mr. Y. Hsii) for additional information on the following items relative to Proposed Change NPF-10/15-138:

1. Provide the analysis or reference any document that has been submitted to the NRC for the determination of the ROPM in COLSS. What are the values of the ROPM for San Onofre Units 2 and 3?

2. Provide a description on the determination of the COLSS power operating limit bias term. What is the value of the POL bias term at San Onofre Units 2 and 3?

3. When COLSS is out-of-service, rather than compensating the COLSS POL bias term by the CPC's, the proposed Technical Specification change will restrict the CEA's to the Short Term Steady State Insertion Limit shown in Figure 3.1-2. Provide the analysis to show that limiting the initial CEA configuration in accordance with this insertion limit is sufficient to compensate for the POL bias term when COLSS is out-of-service.

4. With the part-length CEA's restricted to the insertion limit shown in Figure 3.1-3, what will be the maximum positive reactivity insertion with a PLR drop? What is the minimum ROPM for COLSS? Describe how this ROPM is sufficient to accommodate the power increase resulting from a PLR drop.

5. With the reduction of inward CEA deviation penalty factors to 1.0, the CPC will not provide a reactor trip on a CEA drop event. The analysis in FSAR Chapter 15.4.1.3 on CEA misoperation is no longer valid. Provide the safety analysis on CEA misoperation to reflect the change in CEA penalty factors.

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SCE's response to the above mentioned NRC concerns relative to proposed change NPF-10/15-138 is provided as an enclosure to this letter. It should be noted that the information provided by this letter and SCE's letter of August 1, 1984 relative to Proposed Change NPF-10/15-138 provide no new information; only clarification of information previously submitted to the NRC.

Mr. Hsii indicated that following resolution of these concerns, his review and approval of proposed change NPF-10/15-138 would be complete. SCE believes that the response provided by this letter and SCE's response to a previous NRC (Mr. Hsii) request for additional information dated August 1, 1984 provide the NRC with sufficient information to resolve all NRC concerns relative to proposed change NPF-10/15-138. Proposed Change NPF-10/15-138 provides substantial benefits for the remainder of Cycle 1 for Unit 3 and forms part of the groundrules for the Cycle 2 reload analysis for Units 2 and 3. Since all NRC questions concerning this proposed change have been answered satisfactorily by SCE, it is requested that proposed change NPF-10/15-138 be approved in an expidited manner.

If you have any questions concerning the enclosed information, please call me.

Very truly yours,

M. O. Medford

Enclosure

cc: Harry Rood (to be opened by addressee only)
J. O. Ward, California Department of Health Services
A. E. Chaffee, USNRC Senior Resident Inspector; Units 1, 2 and 3

RESPONSE TO NRC QUESTIONS ON
PROPOSED TECHNICAL SPECIFICATION CHANGE NPF-10/15-138

Question 1:

Provide the analysis, or reference any document that has been submitted to the NRC for the determination of the ROPM in COLSS. What are the values of the ROPM for San Onofre Units 2 and 3?

Response:

The COLSS is used to monitor the DNB and LPD limiting conditions for operation. The system preserves sufficient margin in terms of core flow (i.e., biasing the steady state flow by a multiplier) to the DNB SAFDL so that DNB would not occur during any AOO. The four pump loss of flow event is the most limiting such event and determines the minimum required margin. This margin is equivalent to a penalty multiplier on core power of at least 1.14, although more margin is reserved at most conditions. This is referred to as the ROPM for SONGS Units 2 and 3. The core flow multiplier (Under Flow Fraction) curve for San Onofre Units 2 and 3 are shown in Figure 1.

Question 2:

Provide a description of the COLSS power operating limit bias term. What is the value of the POL bias term at San Onofre Units 2 and 3?

Response:

The COLSS Power Operating Limit (POL) bias term automatically sets aside thermal margin in the COLSS system. It is implemented as a function of core power level. The following equation illustrates its use in COLSS:

$$POL_{COLSS} = POL_{ACTUAL} - DPOL$$

Where:

POL_{COLSS} = POL displayed to the operator and used to test against alarm limits,

POL_{ACTUAL} = actual POL calculated by COLSS for present conditions of power shape, flow, temperature, etc..., and

DPOL = COLSS POL bias term which is a function of power.

Typically, the CEA deviation penalty factors are larger for operation at less than full rated power than for operation at full power. At these lower power levels, the margin set aside by the Under Flow Fraction to accommodate the LOFA event may be insufficient to completely compensate for the increased penalty factor. Since the CEA deviation penalty factor is calculated from the change in POL due to the deviation, this excess margin requirement can be set aside through the COLSS POL bias term. Figure 2 shows the values of DPOL implemented in both San Onofre Units 2 and 3. The magnitude of the DPOL term is determined so that it will cover any excess margin requirement without compromising the plant's power capability.

Question 3:

When COLSS is out-of-service, rather than compensating the COLSS POL bias term by the CPC's, the proposed Tech. Spec. change will restrict the CEA's to the Short Term Steady State Insertion Limit shown in Figure 3.1-2. Provide the analysis to show that limiting the initial CEA configuration in accordance with this insertion limit is sufficient to compensate for the POL bias term when COLSS is out-of-service.

Response:

When COLSS is out of service a separate PDIL will restrict rod motion to the short term insertion limits. In addition, the COLSS out-of-service DNBR limit specification (Technical Specification 3.2.4) should not be violated. This DNBR limit specification preserves the ROPM when COLSS is out of service.

At power levels above 75% of rated power the ROPM reserved along with the PDIL restriction is sufficient to accommodate all single CEA drops. No further analysis is thus required at these power plateaus.

At power levels below 75% of rated power the single CEA drop penalty factors are typically larger than those at above 75% power. This larger penalty factor is accounted for in two ways. First, the restricted PDIL by limiting the number of CEA configurations to be analyzed will reduce the penalty factor. Second the increased margin available at lower powers can be used to offset the penalty factors. At below 78.4% of rated power, it has been determined that the plant cannot be at a POL. Thus the actual ROPM available at below 75% of rated power will be as follows:

$$ROPM_{available} = 1.14\ (78.4\%\ power)/(x\%\ power)$$

Where:

x = core power level

This additional ROPM availability will adequately compensate for the CEA deviation penalty factors at below 75% of rated power.

Question 4:

With the part-length CEA restricted to the insertion limit shown in Figure 3.1-3, what will be the maximum positive reactivity insertion with a PLR drop? What is the minimum ROPM for COLSS? Describe how this ROPM is sufficient to accommodate the power increase resulting from a PLR drop.

Response:

The part length insertion limits of the referenced figure prevent a positive reactivity insertion for a single PLR drop at all power levels above 50% of rated power. Single PLR drops from allowed positions below 50% power will have a positive reactivity insertion due to the drop of less than $.064\%\Delta\rho$ starting from an initial worst case negative ASI within the LCO space.

For PLR drops for power levels above 50% power the minimum 1.14 ROPM set aside for the 4 pump loss of flow accident (see response #1) is more than adequate to accommodate the power redistribution due to a PLR drop since there is not a power increase.

For PLR drops from power levels below 50% power, the minimum 1.14 ROPM is augmented by margin available due to the low initial power. The minimum power at which a POL can be reached in the LCO space has been demonstrated to be at least 78.4% of rated power. Thus, the actual ROPM available to accommodate a PLR drop from below 50% power is at least

$$(1.14)(78.4\ \%\ \text{power})/(50\%\ \text{power}) = 1.79.$$

This is sufficient to accommodate the power increase from a PLR drop with positive reactivity insertion in conjunction with a hypothetical $+ 0.5 \times 10^{-4}\ \Delta\rho/^{o}F$ MTC.

Question 5:

With the reduction of inward CEA deviation penalty factors to 1.0, the CPC will not provide a reactor trip on a CEA drop event. The analysis in FSAR Chapter 15.4.1.3 on CEA misoperation is no longer valid. Provide the safety analysis on CEA misoperation to reflect the change in CEA penalty factors.

Response:

The analysis in FSAR Chapter 15.4.1.3 illustrates a case where a reactor trip is generated for a CEA misoperation event which would otherwise cause the DNB SAFDL to be violated. This analysis is still valid and the results given in this section are conservative. Later cycle specific setpoint analyses have shown that the consequences of dropping a single CEA are not as adverse as described in the FSAR, so that a reactor trip

is not required. Thus, the FSAR case shows a closer approach to the DNB SAFDL than would actually occur in the event of a single CEA drop. A margin estimate was performed to illustrate the impact for a limiting CEA drop into an all rods out core at 100% power. The axial power distribution was chosen to have large negative ASI. The initial DNBR for the event, which was assumed to start at a COLSS monitored Power Operating Limit (POL), was 1.57. Using the appropriate distortion factor for the CEA drop with 15 minutes of xenon redistribution, the minimum DNBR of 1.34 was reached just before the operator begins the power reduction mandated by Technical Specifications. This is greater than the DNBR limit of 1.20 and is equivalent to a margin reduction of 1.0% which is less than the 14% assured for the Loss of Flow event.

A representative system response for a CEA drop that doesn't require a trip is provided in Section 7.4.3 of the Cycle 2 Reload Analysis Report transmitted to the NRC by SCE letter from M. O. Medford to G. Knighton dated September 28, 1984. This response is typical of that which would be obtained for a Cycle 1 reanalysis. The specific numerical values of DNBR would differ since Cycle 1 did not use the full SCU program. However, the relative differences would be similar. That is, CEA drop event starting from a POL determined by the Cycle 1 partial SCU COLSS will make a similar approach to the appropriate DNBR limit. The impact of the SCU program is to shift the DNBR numeric values but not relative response of a specific event that starts from a consistently calculated POL.

FIGURE 1

Under Flow Fraction vs. Core Average ASI
for San Onofre Units 2 and 3

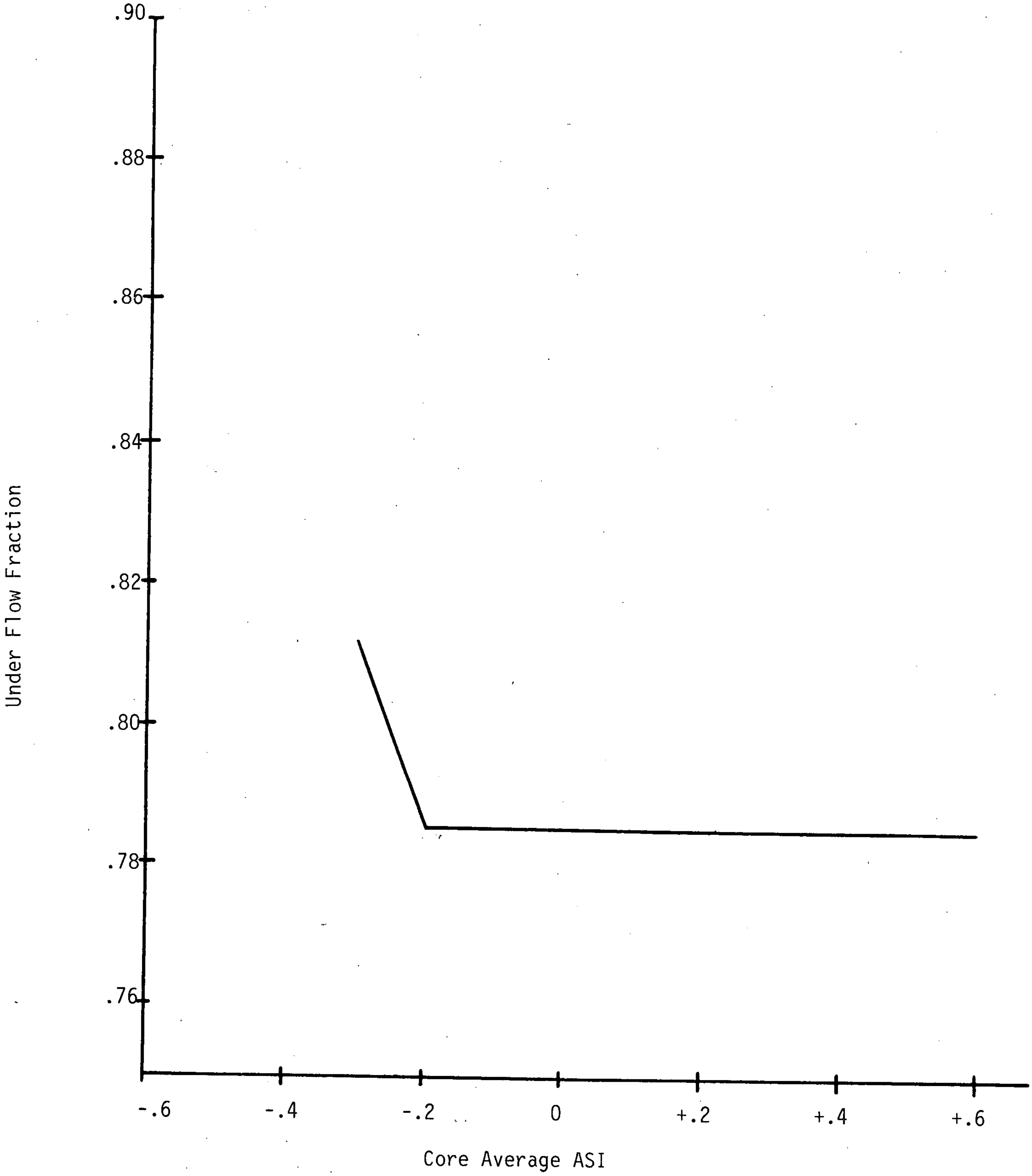

FIGURE 2

Values of the COLSS POL Bias Term (DPOL)
Implemented at San Onofre Units 2 and 3