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April 21, 1981

2R-0481-07

Director of Nuclear Reactor Regulation
ATTN: Robert A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Arkansas Nuclear One-Unit 2
Docket No. 50-368
License No. NPF-6
Supplemental Response to Thermal Hydraulic Section Questions Regarding ANO-2, Cycle 2, Reload Application
(File: 2-1510)

Gentlemen:

In response to NRC staff questions regarding the ANO-2, Cycle 2 reload application, the enclosed information is provided. The NRC questions were provided to AP&L during a March 26, 1981, meeting with the staff and formally transmitted to AP&L on April 1, 1981.

An advance copy of the attached responses was hand delivered to Mr. Bob Martin of your staff on April 10, 1981. These responses supplement those formally submitted to you by our letter dated April 14, 1981.

Very truly yours,

Donald A. Rueter
for David C. Trimble
Manager, Licensing

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Response to NRC Questions on ANO-2 Cycle 2

Question 492.30 (Section 6)

Clarify the Statement:

Steady state DNBR analyses of Cycle 2 at the rated power level of 2815 MWT have been performed using the TORC computer code described in Reference 6-1, the CE-1, critical heat flux correlation described in Reference 6-2, the simplified modeling models described in Reference 6-3, and the CETOP code described in Reference 6-4.

Which code, TORC/CE-1 or CETOP/CE-1, has been used for each of the steady state DNBR analysis?

Answer

CETOP was used for all steady state DNBR analyses. CETOP is a simplified version of TORC benchmarked to detailed TORC in a manner similar to that described for S-TORC in CENPD-206-P (Reference 6-3). The approved TORC code and the aporoved CE-1 CHF correlation form the basis for the CETOP model and all CETOP-DNBR analyses performed for Cycle 2.

Question 492.31 (Section 6.2)

Supplement 3P to CENPD-225P Fuel and Poison Rod Bowing, June, 1979, is not an approved document. Accordingly, it is the staffs position that the rod bow penalty currently specified in Technical Specification 4.2.4.4 shall be applicable to Cycle 2 operation. Please indicate compliance with this position and discuss the method of implementing the position.

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Answer

Supplement 3P to CENPD-225-P was submitted in June of 1979. It follows NRC guidelines of June 12, 1978. The June 12, 1978 NRC letter (Reference 6-9 of the Reload Analysis Report) indicated that the guidelines could be used "as an interim method of accommodating the effects of rod bow on CHF". Therefore, C-E (and AP&L) feel that the proposed rod bow penalty in CEN-139 (A)-P should be acceptable as an interim penalty until review of CENPD-225-P Supplement 3P is completed.

If NRC does not agree with this position they can impose the penalty presently in the ANO-2 technical specifications and AP&L will implement it by applying an equivalent overpower margin penalty in BERR1. The penalty will be applied on a batchwise basis and BERR1 will be adjusted to accommodate the net penalty on the most limiting batch.

It is requested that the proposed tech. spec. change removing the penalties in Tech. Spec. 4.2.4.4 be issued by NRC if the staff concurs with the interim recommendation made above, or as soon as the review of CENPD-225-P Supplement 3P is completed.

Question 492.32 (Section 7)

Identify the transient for which the following statement applies: If the Cycle values of key parameters for a particular event are bounded by the reference cycle using the same analytical procedures, then no reanalysis is required.

Answer

The transients for which reanalysis was not required are indicated as "Not Reanalyzed" in Table 7-1. The Startup of an Inactive Reactor Coolant Pump was not reanalyzed since Technical Specifications do not permit operation at power with less than four pumps operating. The others indicated as "Not Reanalyzed" were not reanalyzed since key parameters were bounded by the

Answer (cont'd.)

reference cycle using the same analytical procedures and no benefit could be foreseen in the areas of enhanced operating flexibility or bounding for future cycles.

Question 492.33 (Section 7.1.10)

Does ANO-2 have Asymmetric Steam Generator Transient Protection trip (ASGTP) similar to Calvert Cliffs Unit 1?

Has this ASGTP been previously approved for ANO-2?

Answer

ANO-2 and Calvert Cliffs Unit 1 have asymmetric steam generator transient protection (ASGTP) trips based on the Instantaneous Closure of a Single MSIV (ICSM) transient. The Calvert Cliffs Unit 1 ASGTP trip is activated when the pressure differential between the two steam generators exceed a fixed setpoint.

For ANO-2 Cycle 1, the low steam generator level trip was credited in the ICSM transient analysis. This trip was complemented by an ASGTP trip in the CPC software activated when the cold leg temperature differential between the steam generators exceeds a fixed setpoint. This ASGTP trip was implemented in the CPC's during the MOD 2B/3 revisions of May 1980 and its setpoint was determined based on the ICSM transient analysis.

For ANO-2 Cycle 2, the ICSM transient analysis (Section 7.1.10 of the Reload Analysis Report) credited the ASGTP trip instead of the low steam generator level trip. Even though the low steam generator level trip is no longer credited for the ICSM event, no technical specification change has been requested at this time to lower its setpoint.

Question 492.34 (Change No. 7, Technical Specification No. 2.1.1.1)

Is the change in methodology from COSMO/W-3 to TORC/CE-1 or CETOP/CE-1?

Answer

The change in the DNBR limit from 1.3 to 1.24 is a result of the change in methodology from COSMO/W-3 to TORC/CE-1. CETOP is the design thermal margin code used in Cycle 2 and is benchmarked to the approved TORC code as discussed in response to questions 492.1, 492.2, 492.6, 492.7, 492.14 and 492.27.

Question 492.35 (Change No. 31, Technical Specification No. 3.2.4)

Provide a discussion of the analysis performed to define the proposed Figure 3.2-4.

Answer

The LCO on DNBR with COLSS out of service is a limit on the minimum DNBR from which a loss of flow event can be initiated and not violate the SAFDL on DNBR. This required margin is normally specified by the underflow fraction in COLSS. If COLSS is not in service, this margin is then preserved by specifying a limit on the CPC calculated DNBR. The DNBR limit specified by Figure 3.2-4 is the upper bound of a scatter plot of initial DNBR versus ASI. The points of this plot were calculated so that if the flow were decreased by the underflow fraction (the fraction of flow at the time of minimum DNBR during a loss of flow event), the DNBR SAFDL would not be violated.

Question 492.36 (Change No. 32, Technical Specification No. 3.2.6)

Justify replacing Technical Specification 3.2.6 page 3/4 2-11 into Technical Specifications 3.2.6, 3.2.7, and 3.2.8 with respect to how the new specifications will support the initial conditions used for the LOCA analyses and DNBR analyses.

Answer

Technical Specification 3.2.6 was changed from an upper bound on core average coolant temperature to a range on cold leg temperature. Cold leg temperature is a more appropriate parameter for an LCO and the limits in tech. spec. 3.2.6 correspond to those in Table 7-3 after instrumentation uncertainties

Answer (cont'd.)

are applied. Similarly, Tech. Specs. 3.2.7 and 3.2.8 set limits on axial shape index (ASI) and pressure which correspond to those in Table 7-3 after instrumentation uncertainties are applied. ASI uncertainties are different for COLSS and CPC and thus the LCO on ASI is different when COLSS is out of service.

Question 492.37 (Change No. 37, Technical Specification No. 3.3.1-1)

Discuss the basis for the change from 8% to 11% of rated thermal power.

Answer

For ANO-2 Cycle 2, COLSS will preserve sufficient margin to the DNBR SAFDL based on the Loss of Flow Analysis. If both CEA Calculators (CEAC's) are inoperable, the required margin to the DNBR SAFDL must be increased to account for CEA misoperation events which could go undetected by CPC. The additional required margin was determined to be 8% for Cycle 1 and 11% for Cycle 2. The 11% additional margin penalty to the DNBR SAFDL when the CEAC's are inoperable is calculated based on the most limiting single CEA drop event, including xenon redistribution effects.