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October 31, 1980

Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

ATTENTION: Mr. R. A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit No. 1, Docket No. 50-317
Amendment to Operating License DPR-53
Fifth Cycle License Application
Responses to NRC Staff Questions

Gentlemen:

Enclosed are our reponses to questions posed by NRC staff on the subject application.

Very truly yours,

BALTIMORE GAS AND ELECTRIC COMPANY

A. E. Lundvall, Jr.
Vice President - Supply

AEL/WJL/mit

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Enclosure (1): 40 copies

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ENCLOSURE 1

Question 1:

It has been the practice of C-E and all other PWR vendors, in the past to include a calculational uncertainty in the conservative direction in determining the total available CEA worth less allowances as shown in Table 5-2. In view of this and the requirements of Reg. Guide 1.70, Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants, for the presentation of required and expected shutdown margin as a function of time in cycle along with uncertainties in the shutdown margin, justify the exclusion of any calculation uncertainty in Table 5-2.

Response

The basic format of reactivity worths as presented in Table 5-2 of the reload submittal is consistent with past reload analyses presented by Combustion Engineering. Previous reload submittals and FSAR's, not only for Calvert Cliffs but also for other C-E reload plants, have used this structure to present available and required reactivity parameters.

As stated in the text of Section 5.1.1, this table is generally meant to characterize the changes in reactivity that occur during a trip from full power due to the corresponding change in core parameters while cooling to the zero power state. As such, this table does not represent the conditions actually experienced during any particular transient, although the quantity shown as "Required Shutdown Margin" represents the numerical value of the worth which is applied to the hot zero power steam line break accident. For the analysis of a particular transient, a detailed, transient specific scram worth analysis is performed and a calculative uncertainty of 10% is applied in determining the actual available worth to be used in the safety analyses.

As an example of the type of scram worth analysis performed for a specific transient, let us consider the end-of-cycle (EOC) zero power steam line break accident, which Table 5-2 attempts to model in a less precise manner.

The EOC zero power steam line break was selected since it is the most limiting steam line break accident, and thus provides the basis for judging the adequacy of the CEA worth. This transient thus provides the basis for establishing the Technical Specification Shutdown Worth. Table 5-2A and the corresponding descriptions have been constructed to illustrate this accident:

1. The "Worth Available" entries (Items 1 through 3) in Table 5-2A p rallel those of Table 5-2 except that zero power parameters are substituted for full power values.

2. The only reactivity allowance required at hot zero power (Item 4) is the penalty for the CEA reactivity bite due to the lower limit on the zero power dependent insertion limit (ZPDIL). The losses in rod worth due to power defect, fuel and moderator temperature changes, axial redistributions, moderator voids and full power CEA bite are no longer appropriate, since all parameters are calculated at HZP conditions. When combined in Table 5-2, these HFP to HZP allowances will not always equal the ZPDIL CEA reactivity bite. This latter point is the principal difference between Tables 5-2 and 5-2A.

3. A 10% uncertainty (Item 6) is then subtracted from the calculated scram worth (Item 5), resulting in the net available scram worth (Item 7).

4. The shutdown Tech Spec value is specified to be somewhat lower than the net available scram worth for the limiting EOC hot zero power steam line break transient so as to identify an excess margin (Item 9) in order to insure that the measured rod worth at EOC will not fall below the Technical Specification value.

5. The Technical Specification value is employed as the minimum available worth in the limiting EOC hot zero power steam line break analysis. The acceptability of the steam line break transient demonstrates the adequacy of the available CEA worth less allowances. As noted above, these allowances include a 10% allowance for calculational uncertainty.

Appropriate revisions to the shutdown margin Technical Specification to reflect steam line break considerations have already been provided in the reload submittal.

Table 5-2A

Calvert Cliffs Unit I Cycle 5

Limiting Values of Reactivity Worths and Allowances for

Hot Zero Power Steam Line Break, % $\Delta\rho$

End-of-Cycle (EOC)

		EOC
1.	Worth of all CEA's inserted	9.4
2.	Stuck CEA allowance	2.2
3.	Worth of all CEA's less highest worth CEA stuck out	7.2
4.	Zero Power Dependent Insertion Limit CEA Bite	2.0
5.	Calculated Scram Worth	5.2
6.	Physics Uncertainty (10% of Item 5)	.5
7.	Net Available Scram Worth (Item 5 minus Item 6)	4.7
8.	Technical Specification Shutdown Worth	4.3
9.	Margin in Excess of Technical Specification Shutdown Worth	+0.4

Question 2:

What is the change in power peaking resulting from the extension of the Cycle shutdown window from 11,600 to 11,800 MWD/T?

Response

The power peaking values presented in Figures 5-1 through 5-5 of Section 5 in the reload submittal are values which were originally calculated for a Cycle 4 shutdown window to 11,600 MWD/T. The change from 11,600 to 11,800 MWD/T was subsequently determined to produce only a minor perturbation of less than 1% to the Cycle 5 power distributions. Consequently, the above mentioned power distributions are considered to be applicable to an 11,800 MWD/T shutdown window.

In addition, power peaking safety parameters havebeen reassessed and the enveloping values presented in Section 5 have been determined to be unchanged as a result of the burnup extension.

Question 3:

What is the magnitude of the bias that is applied to fuel rod power peaking values to account for the increased peaking which occurs near water holes?

Response

For the Calvert Cliffs I Cycle 5 analysis, a bias value of 6% was applied to increase the maximum calculated radial peaking factors around the water holes. This 6% bias factor was applied to all peaking information and was independent of fuel rod exposure for high power rods. The effects of water hole peaking are included in both the nominal and safety peaking data presented in the reload submittal.

Question 4:

Is our assumption correct that the ROCS code was used to compute the same safety parameters for Cycle 5 as for Cycle 4 namely: fuel temperature coefficients, moderator temperature coefficients, boron worths, critical boron concentrations, and CEA reactivity worths?

Response

The use of the ROCS computer code as a nuclear design tool continues to be the same as for Cycle 4 analysis.

For Cycle 5, the following safety parameters were computed using the ROCS code:

- Fuel Temperature Coefficients
- Moderator Temperature Coefficients
- Inverse Boron Worths
- Critical Boron Concentrations
- CEA drop distortion factors and reactivity worths
- Reactivity Scram Worths and Allowances
- Reactivity worth of regulating CEA banks
- Changes in 3-D core power distributions that result from inlet temperature maldistributions (asymmetric steam generator transient)

None of these parameters require detailed knowledge of pin peaking factors and in some cases are calculated more accurately by ROCS because of its ability to account for 3-D effects.