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FACIL:50-261 H. B. Robinson Plant, Unit 2, Carolina Power and Ligh 05000261
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KILLGORE,M.R. Exxon Nuclear Co., Inc. (subs. of Exxon Corp.)
RECIP.NAME RECIPIENT AFFILIATION
GUTTMANN,J. Reactor Systems Branch

SUBJECT: Forwards preliminary neutronic parameters for steamline break analysis using RELAP5.Info developed assuming end-of-cycle core w/all control rod clusters less most reactive.

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50-261

August 7, 1984

Mr. Jack Guttmann
Reactor Systems Branch
Division of Systems Integration
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Bethesda, MD 20555

Dear Mr. Guttmann:

In response to your request, attached is the preliminary neutronics information needed for a RELAP5 analysis of the H. B. Robinson steamline break. The values given in this attachment are representative of a typical H. B. Robinson cycle. Exxon Nuclear is in the process of developing a steamline break methodology, and will be using similar values on a preliminary basis. At the present time, the preliminary parameters are judged to conservatively represent the upcoming cycles for H. B. Robinson Unit 2. However, the parameters may change as a result of the finalization of the ENC steamline break methodology. The neutronic parameters are presented in the format we understand to be appropriate following the discussion with Dr. Yu on July 30, 1984.

The attached information has been developed assuming an end-of-cycle (EOC) core with all control rod clusters less the most reactive, fully inserted. The neutronic parameters are provided on a core average basis. Perfect mixing of the coolant in the lower plenum has also been assumed which results in a uniform core inlet temperature. If neutronics parameters based on different assumptions with respect to system conditions are required, please provide details of the applicable conditions. (One example might be the assumption of a specific asymmetry in the core inlet conditions.)

Please keep us informed of your RELAP5 results utilizing this input.

Sincerely,

M R Killgore

M. R. Killgore,
Unit Manager, PWR Neutronics

/wrg

Attach.
cc: RA Copeland (ENC)
T. Clements (CP&L)
E. Yu (NRC)

A001
1/1

H. B. ROBINSON UNIT 2
NEUTRONIC PARAMETERS FOR STEAMLINE
BREAK ANALYSIS USING RELAP5

1) MODERATOR DENSITY COEFFICIENT - The change in core reactivity has been determined as a function of the moderator density. In determining the reactivity change, the most reactive control rod is assumed to be stuck out of the core. Further, a uniform core average density is assumed for each statepoint. The data is presented in Table 1.

2) DOPPLER POWER COEFFICIENT - The change in core reactivity has been determined as a function of core average power. As was done for the moderator density coefficient, the most reactive control rod is assumed to be stuck out of the core. In addition, uniform core average moderator density is assumed. The data is presented in Table 2.

3) MODERATOR TEMPERATURE COEFFICIENT - This parameter is not a true moderator temperature coefficient but rather is used to compensate for the increase in core reactivity associated with the decrease in fuel temperature during the cooldown. The appropriate coefficient is -0.005$/°F.

4) SHUTDOWN MARGIN - The shutdown margin is at least $3.61.

5) BORON WORTH COEFFICIENT - The boron worth coefficient is presented in Table 3 as a function of moderator density and soluble boron concentration.

6) DELAYED NEUTRON PARAMETERS - The delayed neutron parameters are provided in Table 4 for end-of-cycle operation.

Table 1 H. B. Robinson Unit 2, Variation of Reactivity with Moderator Density ($\beta = 0.0049$)

Moderator Density (lb/ft^3)	Reactivity ($)
43.93	-3.71
46.73	0
49.35	3.35
51.51	6.19
53.88	8.38
55.67	10.08
57.51	11.41

Table 2 H. B. Robinson Unit 2, Variation of Reactivity with Reactor Power (β = 0.0049)

Average Core Power (% of Rated)	Reactivity ($)
0	0
10	-1.18
20	-1.96
30	-2.61
40	-3.16

Table 3 H. B. Robinson Unit 2, Variation of the Boron Worth Coefficient with Boron Concentration and Moderator Density (= 0.0049)

Moderator Density (lb/ft^3)	Boron Coefficient ($/ppm)	
	0 ppm	1500 ppm
43.93	0.020	0.018
46.73	0.022	0.018
57.51	0.028	0.022

Table 4 H. B. Robinson Unit 2
Delayed Neutron Parameters

Group	Yield Fraction for Group i	Decay Constant for Group i ($Sec.^{-1}$)
1	0.033	0.0125
2	0.204	0.0308
3	0.185	0.118
4	0.396	0.316
5	0.146	1.26
6	0.036	3.47

Effective Delayed Neutron Fraction, 0.0049

Effective Neutron Lifetime, 22 μsec.