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YANKEE ROWE CORE XVI
ALLOWABLE PEAK ROD LHGR VERSUS CYCLE BURNUP

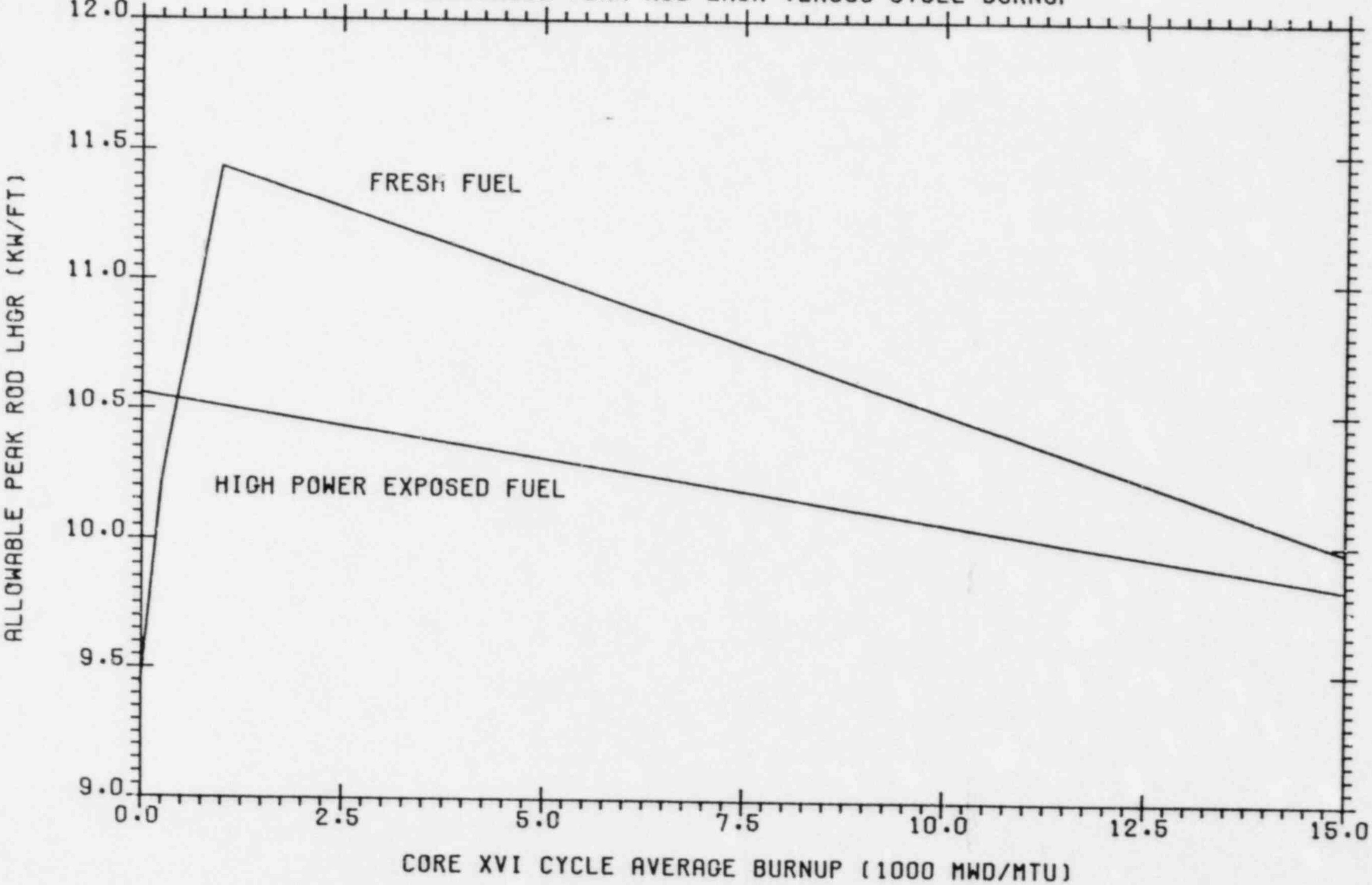

Figure 3.2-1

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5.3 Changes in Analytical Methods

There has been one change in the analytical methods used for Core XVI.

For the calculation of moderator density reactivity coefficients used in the LOCA analysis, the FOG (Reference 41) computer code was utilized.

The previous analyses (Cores XIV and XV) to determine core reactivity response as a function of moderator density were performed with the LEOPARD computer code. LEOPARD is a "zero-dimensional" code that does not account for the spatial dependence of the neutron population in the reactor (other than within the unit cell). Therefore, the original calculation accounted only for the reactivity effects due to changes in the moderating properties of the unit cell. No account is taken for the changing core leakage effects due to changes in the moderator and reflector density.

The revised analysis of reactivity as a function of moderator density was performed with the FOG computer code. FOG is a one-dimensional diffusion theory code that can account for part of the spatial leakage effects. The calculation was performed assuming a geometry of a right circular cylinder. This geometry was obtained by homogenizing the reactor core into four cylindrical regions. The first three regions describe the fueled area, with the fourth region a homogenized representation of the core baffle and water reflector.

For the FOG analysis, appropriate macroscopic two-group cross sections were obtained for all regions based on LEOPARD calculations which were run at various moderator densities. Assembly average burnups were input by region to obtain the assembly-weighted values of the macroscopic cross sections. A Beginning-of-Life core condition was assumed since this reflects the minimum expected negative reactivity insertion for Core XVI. This is due to the most positive moderator temperature coefficient calculated for Core XVI.

37. USNRC Letter, R. W. Reid to R. H. Groce, dated January 17, 1979.

38. YAEC 1202, "Maine Yanke Cycle 5 Core Performance Analysis", December 1979.

39. USNRC Letter, D. Crutchfield to J. A. Kay, dated July 22, 1981.

40. Letter, H. A. Autio to R. C. Haynes, USNRC, LER 50-29/82-28 01 T.

41. H. P. Flatt, "The FOG One-Dimensional Neutron Diffusion Equation Codes", NAA-SR-6104, January, 1961.

APPENDIX A

REVISED LARGE BREAK LOCA ANALYSIS

A change in the method of calculating moderator density reactivity coefficients for use in the large break LOCA analysis is described in Section 5.3. The use of this new method results in more negative reactivity effects and as a result, lower calculated cladding temperatures following a postulated LOCA. Using a new table of reactivity versus moderator density, obtained through this new method, some of the calculations of Section 9.0 were revised.

The break spectrum (Section 9.4) had to be re-evaluated to assess the impact of using the revised reactivity coefficients. The effect of using these new coefficients is to lower the cladding temperature at the end of the blowdown phase and as a result, lower the peak cladding temperatures. Table A-1 presents the revised Peak Cladding Temperatures (PCT) along with original PCTs from Table 9-1. It should be noted that the revised 0.8 DECLG temperature is higher than the revised 0.6 DECLG temperature and also higher than all of the other original peak cladding temperatures. Since all breaks will benefit from the new reactivity coefficients, all PCTs should decrease. Therefore, only the 0.8 DECLG and the 0.6 DECLG cases had to be re-analyzed to validate the break spectrum.

The burnup sensitivity was then performed using the new blowdown results for the 0.8 DECLG. Only the 1000 MWD/MTU fresh fuel case was re-analyzed since additional margin for the other burnup points is not needed for full power operation. Table A-2 presents the burnup study results with the addition of the re-analyzed 1000 MWD/MTU fresh fuel results.

Based on the above analysis, the break spectrum results of Section 9.4 are proven to be valid since the 0.8 DECLG remained the limiting break. Therefore, using the revised 0.8 DECLG blowdown a PLHGR of 11.75 kw/ft was obtained for the 1000 MWD/MTU fresh fuel case.

Figure A-1 presents revised limits whereby operation within these limits yields LOCA results within the limits specified in 10CFR50.46.

TABLE A-1

CORE XVI COMPARISON OF ORIGINAL AND REVISED
LARGE BREAK SPECTRUM RESULTS

	1.0 DECLG	0.8 DECLG	0.6 DECLG	1.0 DECLS	0.8 DECLS	0.6 DECLS
Original Peak Clad Temp. (^oF)	1742.3	1877.5	1766.3	1729.9	1707.0	1725.7
Revised Peak Clad Temp. (^oF)		1752.9	1748.8			

TABLE A-2

YANKEE ROWE CORE XVI BURNUP SENSITIVITY STUDY
SUMMARY OF RESULTS

Case Description	PLHGR(1) (kw/ft)	CAB(2) (MWD/MTU)	PCT(3) (°F)
Beginning-of-Cycle Fresh Fuel	9.7	0.0	2,197
250 MWD/MTU Fresh Fuel	10.5	250	2,191
1,000 MWD/MTU Fresh Fuel	11.0	1,000	2,195
*1,000 MWD/MTU Fresh Fuel	11.75	1,000	2,164
End-of-Cycle Fresh Fuel	10.25	15,000	2,142
Beginning-of-Cycle Highest Power Recycled Fuel	10.85	0.0	2,160
End-of-Cycle Highest Power Recycled Fuel	10.1	15,000	2,012

(1) Peak Linear Heat Generation Rate

(2) Cycle Average Burnup

(3) Peak Clad Temperature

*Re-analyzed using the revised moderator density reactivity coefficients.

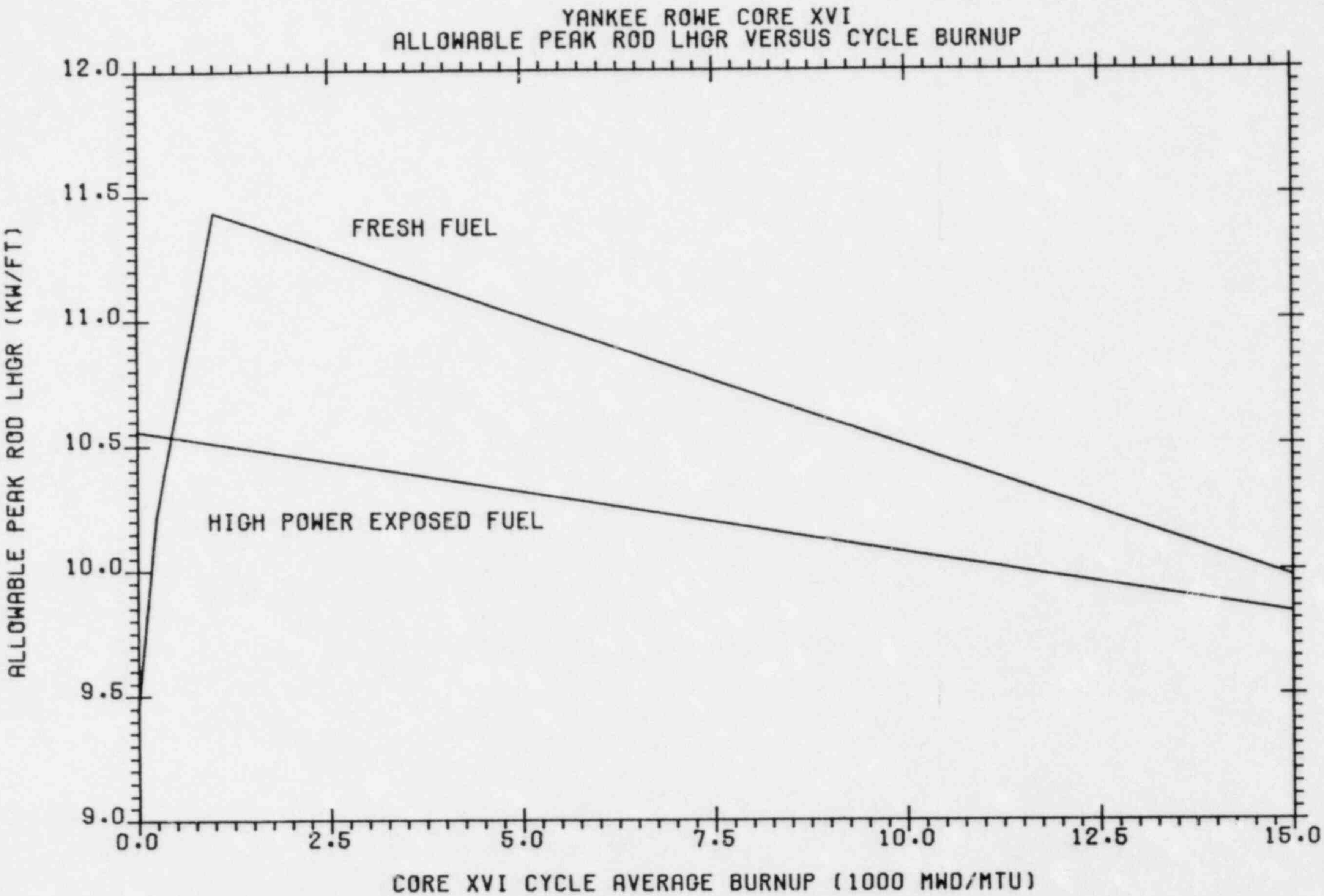

FIGURE A-1
CORE XVI ALLOWABLE PEAK ROD LHGR
VERSUS CYCLE BURNUP