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INTERIM REPORT NO. 2
E-N LOAD CONVERSION RATIOS

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INTERIM REPORT NO. 2
E-N LOAD CONVERSION RATIOS

INTRODUCTION

Experimental data on tritium yield from lithium-aluminum pieces irradiated under PT-IP-255-A-9-FP have been reported previously.¹ Experimental data on plutonium yield and U²³⁵ burnout in the E metal portion of one central zone striped E-N column are now available. These data are now reported. The combined data are compared to the experimental and theoretical values used in the economic analyses of the E-N loadings^{2,3,4}.

RESULTS AND CONCLUSIONS

In every case, experimental results indicate higher conversion ratios than were used in developing the economic analyses of E-N loadings (See Table I). While conversion ratio data are not yet available for the E column portion of the fringe blanket loading, the assumption of currently accepted E metal conversion ratios in this case will be conservative. It is anticipated that experimental data, when available, will indicate a conversion ratio for these columns about 5% higher than presently accepted values.

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The one datum point available on plutonium and uranium analysis indicates that the burnout of U^{235} is significantly higher in an E-N loading than in a natural uranium loading or in a normal E column. However, it is not possible to reconcile this higher burnout with the recorded column exposure, which has been determined independently from two sources of data. Use of the higher burnout value in economic analyses does not significantly alter their conclusions, and is recommended until further data points establish a better value.

TABLE I
E-N LOAD CONVERSION RATIOS*
(740 MWD/T EXPOSURE)

	Central Zone Striped Columns	Fringe Blanket Li-Al Columns	Fringe Blanket E Columns
Experimental Values (PT-255)	1.0025 g/MWD	1.407 g/MWD _{adj} **	- - -
Values used in Economic Analyses	.948 g/MWD	1.15 g/MWD _{adj}	.7558 g/MWD
Interim Values Used in Optimization Study	.949 g/MWD	1.25 g/MWD _{adj}	.7518 g/MWD

* Conversion ratios are expressed as grams plutonium/MWD; tritium yields are included, where tritium is expressed as grams equivalent plutonium. Goal exposure of the E metal is 740 MWD/T.

** MWD_{adj} is the exposure of the adjacent E metal segment of the same length as the lithium-aluminum column.

DISCUSSION

STRIPED E-N LOAD

Experimental Values:

Data are available on the tritium extracted from four (4) columns, each containing four (4) pieces of lithium-aluminum target material.

Tritium yield = .2348 grams Pu equivalent/MWD generated in the column

Data are available on plutonium and uranium analyses from one (1) striped column, containing 38 pieces of I & E E metal.

Plutonium buildup = .7709 gms Pu/MWD at 740 MWD/T
 Pu^{240} = 5.4%
 Pu^{241} = .54%
 235 Burnout = 1.2154 gms 25/MWD at 740 MWD/T

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After correcting to a full-length striped column of 41 I & E E pieces and combining the tritium and plutonium yields, the resulting conversion ratio is:

Plutonium buildup = 1.0025 gms Pu equivalent/MWD at 740 MWD/T

235 burnout = 1.215 ~~gms~~ gms 25/MWD at 740 MWD/T

Values Used for Previous Economic Analysis²

Tritium yield = .1920 gms Pu eq./MWD

Pu Buildup = .7558 gms Pu/MWD

Total = .9478 gms Pu eq./MWD at 740 MWD/T

Interim Values Used for Optimization Calculations^{2,4}

Tritium yield = .197 gms Pu eq./MWD

Pu Buildup = .752 gms Pu/MWD

Total = .949 gms Pu eq./MWD at 740 MWD/T

FRINGE LOAD

Experimental Values

Data are available on the tritium extracted from 10 lithium-aluminum pieces selected from two fringe lithium-aluminum blanket columns. The data are applied to full length columns using flux traverse data and actual yield data:

Tritium yield = 1.407 gms Pu eq./MWD_{adj}

where MWD_{adj} = production in adjacent E column at the same length

Value Used for Previous Economic Analysis³

Tritium yield = 1.15 gms Pu eq./MWD_{adj}

(Note: The reference expresses this value in terms of grams tritium per MWD generated in all supporting enriched columns.)

Interim Value Used for Optimization Calculation^{2,4}

Tritium yield = 1.250 gms Pu eq./MWD_{adj}

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No data are available for the conversion ratio at blanket E columns; for these columns and for the present natural uranium plus E ring loading, currently accepted accountability values should be assumed. In the case of blanket E columns this assumption is considered quite conservative.

WS Nechodom

Reactor Physics
Research and Engineering
IRRADIATION PROCESSING DEPARTMENT

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