LETTER TO THE EDITOR

EFFECTS OF ASSUMPTIONS ON FUTURE TRENDS

Dear Sir:

The article by W. I. Neef and E. D. Jones, Jr. ["Conservation Economics and Reactor Technology," *Nucl. Appl.* **3**, 32 (1967)] presents some very interesting results which, however, might be misleading to some of your readers. During the past year many people have made similar studies, in which one tries to project future trends in the nuclear economy, and it is important to realize that the results one obtains depend very strongly upon the initial assumptions made. Gross assumptions concerning the rate of growth of nuclear generating capacity and specific characteristics of future reactors, for instance, will lend much more importance to the results than detailed sophistication in the calculations, such as provision for design reoptimization as conditions change.

The number of uncertainties involved when one tries to predict the exact composition of a future nuclear economy, which will involve both producers and users of plutonium (thermal converters and fast breeders) as well as systems using both uranium-plutonium fuel cycles and thorium fuel cycles, is legion. The rate of growth of the nuclear industry, the actual supply of uranium resources, and the number and type of reactor plants that actually will be built (based upon shifting economic conditions) are only a few of the important considerations.

All of these comments are really introductory to the one which motivates this letter, viz that the results presented in the article are strongly influenced by the assumed rate of expansion of nuclear electrical capacity with time. Since most recent projections of nuclear capacity growth and the recent boom in nuclear plant sales all reflect significantly more rapid growth than that assumed by the authors, the results presented are felt to be quite misleading. If high-gain breeder reactors are assumed to be available during the next 10 to 20 years, and if the rate of expansion of nuclear capacity is slow enough, there should not be any critical drain on our uranium resources nor any excessive demand for diffusion plant capacity, as indicated in the article. As a matter of fact, if the industry growth rate is slow enough, the effect of the breeder masks completely any differences in ore conservation due to the use of more efficient converters during the early years (1980's).

In order to illustrate these points, compare critical quantities presented in the article with similar data recently calculated here. Admittedly our calculations differ in many respects with those performed by the authors. Our code, for instance, does not permit reactor reoptimization with changing conditions, nor did we attempt to show the effect of varying reactor physics parameters or operating conditions. However, the results presented in the article have shown these effects to be very small compared to the gross differences engendered by the single assumption of more accelerated growth of the nuclear industry, which seems to be well justified. These small effects can, therefore, be ignored.

The table below summarizes some of the important differences discussed in this letter.

Comparison of Characteristics
of
Mixed Nuclear Economics

	Neef and Jones	AI/CE
Total nuclear electrical capacity by 1980, MW(e)	40 000	150 000
Tons of natural uranium required by 2010, PWR only (no breeder)	1.4×10^6	3.5×10^6
Tons of natural uranium required with high-gain breeder in 1975 + PWR	0.7×10^6	2.0×10^6
Tons of natural uranium required with high-gain breeder in 1975 + HWOCR (natural uranium fuel)	0.7×10^6	0.8×10^6
Peak separative duty required, kg units/year:		
PWR + breeder	24×10^6	64×10^6
HWOCR + breeder	5×10^6	24×10^6

It is obvious from this comparison that the degree of concern over the projected values for ore requirements and diffusion plant capacity would be quite different for the two cases. In addition, it should be mentioned that current industry and AEC projections conform more closely to the AI/CE projection of industry growth rate [>100 000 MW(e) by 1980] than to that proposed by the authors.

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