Technical Comments

Comment on "Large Space Station Power System"

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THE article by J. E. Boretz[4] develops the type of comparisons needed by developers and potential users of large space station power systems. It was a particularly interesting article because he meticulously listed his selection rationale and pertinent factors. Consequently, because of the value of such data I would like to up-date the assumptions regarding radioisotopes and show the effects on the results.

It is true that β emitters are usually easier to produce than α emitters and can be produced in much larger quantities at far less cost. The statement "β shielding requirements are much higher [than for α emitters, thus] increasing system weight and greatly complicating handling, safety in abort, and recovery problems" would be true only if one tried to fit a β emitter like Co-60 into a heat source concept developed for an α emitter such as Pu-238.

It has been shown[1] that Co-60 and Pu-238 heat source weights are comparable in the multikilowatt power range if

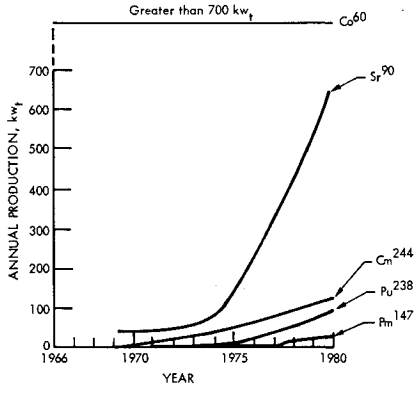

Fig. 1 Potential production of isotopes based upon projected installed civilian power.

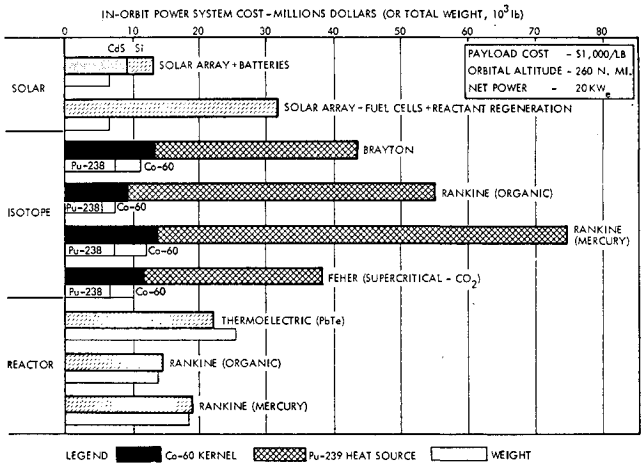

Fig. 2 Candidate power systems—weight and cost comparisons.

Received November 7, 1969; revision received November 20, 1969.

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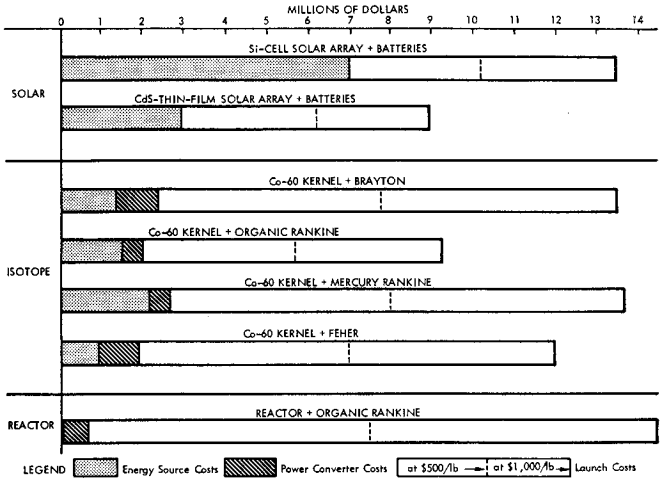

Fig. 3 Major items of cost for in-orbit power.

the Aerojet Kernel is used for the Co-60 source. The initial space safety study of the Co-60 Kernel[2] sponsored by the AEC-Space Nuclear Systems indicated that this source would survive all hazards of ground handling, flight, and disposal. In addition, the relatively low cost and shorter half-life of Co-60 rule out the necessity for recovery after use, thereby significantly reducing application costs and system complexities. The net result is that the Co-60 Kernel is the strongest radioisotope candidate for large electric power systems.

The relationship of Co-60 availability to other isotopes, and of Co-60 Kernel power systems to other sources is shown in the reprints of Figs. 7, 12, and 13 from Boretz' paper relabelled here Figs. 1, 2, and 3, respectively. The only change made in each case was the addition of the Co-60 fuel and kernel system. Costs and weight for the power system include the Co-60 fuel with a decay allowance priced at reported SRL costs,[3] and the kernel heat source with it heat management and re-entry systems.

References

[1] Ruehle, W. and Forrest, D. L., "The Compact Co-60 Kernel for Space Power," paper 699036, Sept. 22–26, 1969, Intersociety Energy Conversion Engineering Conference.

[2] "Design Definition and Safety Evaluation Study of a Compact Co-60 Heat Source in Space," Final Report, AGN-8341, Sept. 1969.

[3] "Savannah River Laboratory Isotopic Power and Heat Sources," Quarterly Progress Report, DP-1129-1, July–Sept. 1967 Atomic Energy Commission.

[4] Boretz, J. E., "Large Space Station Power Systems," *Journal of Spacecraft and Rockets*, Vol. 6, No. 8, Aug. 1969, pp. 929–936.

Reply by Author to W. Ruehle

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THE Technical Comment provided by W. Ruehle to Ref. 1 pertained to the desirability of considering the use of the β emitter isotope, Co-60, rather than the recommended α emit-

Received January 9, 1970.

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