

weigh approximately 2300 KG.⁶⁹ Thus, the biggest drawback of solar-battery technology is the high weight, and with launch costs averaging in excess of \$6,000 per KG,⁷⁰ this becomes a significant factor.⁷¹

Nuclear power sources offer significant reductions in mass when power levels needed exceed a few 10's of kilowatts, and may be unavoidable when moderate to high levels of continuous power are required for an extended period of time.⁷² The United States has launched a significant number of nuclear powered satellites since 1961, primarily radio-isotope thermal generators. The Soviet Union has launched considerably more systems, using mostly small nuclear reactors. At the present time, the Soviets have flight tested a new type of thermionic reactor called the "Topaz" which produces about 10 KW of electrical power.⁷³

Table D-3 compares the power levels available from the two technologies.

Table D-3
Satellite Power Technologies (> 1 year duration)⁷⁴

Power Level	Technology
0.1 to 1 KW	radioisotope thermal generator and solar arrays
1.0 to 10 KW	dynamic isotope power systems and solar arrays
10 to 100 KW	nuclear reactors and solar
> 1 00 KW	nuclear reactors

⁶⁹ *Ibid.*, p. 573.

⁷⁰ "Funds Sought for Coil Gun Device," *Space News*, 15 - 21 January 1990, p 1.

⁷¹ As another example, *Journal of Global Security*, Volume 1, 1989 p. 94: for a projected 100 KW system a nuclear reactor would weigh approximately 5000 KG, a solar panel about 10,000 KG and a chemical equivalent mass would be about 6 million KG.

⁷² G.N. Tsandoulas p. 237.

⁷³ Daniel Hirsch p. 155.

⁷⁴ *Science and Global Security*, p. 94.