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POWER AS A RESOURCE

Abstract

The advent of readily available, affordable power in high quality form has transformed Earth far for the better. Large amounts of power enabled the industrial Revolution, which dramatically improved the fortunes and quality of life of those nations which embraced it. The discovery of electrical power further transformed the world, as electricity was the only form of energy that was effectively weightless and could be transferred from place-to-place at extremely high rates. Power and energy have been a primary resource in space since the inception of spaceflight. All of our spacecraft, manned or unmanned, military, civilian, or commercial, deep space, orbiting celestial bodies or in orbit around Earth have all required electrical power. While not thought of as a resource, electrical power is the engine of space commerce as well. Space power is the engine of space-based telecommunications, remote sensing and Earth Observation, all now being accomplished in a revenue-generating sense. Space-based telecommunications is a *127B/year enterprise, all feasible because of space power. Space power converts the continuous stream of in-space photons into electricity; the photons are free, but the equipment to convert them into electrical power is very expensive, 3,000 Watt, not including the cost of launch.*

A typical space solar array has an operational life of about 12 years, during which time it can generate, (including diminution in performance), 90 kWh of electricity (not counting inefficiencies). If launch costs are excluded this is a cost of about *33/kWh, or about the cost of electricity at a generator – based diesel generating system in a far – forward remote operating military base. In space, such costs are dwarfed by the revenue. LH2 is the highest chemical energy form routinely used in space. Electrolyzing water for propellants is frequently mentioned*