

Watch this Space...

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ABSTRACT

Is profitable exploitation of Space Resources like fusion technology? Only twenty years out, and always will be. We think not! Space Resources viability could change very rapidly with modest improvements to the certainty and disposition of deposits and the required technologies.

The time horizon to achieve a hurdle IRR can be very sensitive to changes in the ratio of the initial cost to ongoing revenues - a small improvement can pull the horizon from thirty years to under a decade. Public investments in lunar exploration are removing initial costs and uncertainty, and my work focuses on increasing the certainty and size of revenues per ton mined.

We can think of Space Mining as many layers; resource, extraction, power, transportation, logistics, products, markets, and players. In many cases, improvements multiply. If you double the market price and the efficiency of extraction and transportation, you have an eight times improvement. Within a layer, it is more complex, some combinations are synergistic.

I will present some examples from my research that show a range of improvements to current baselines and how they interact to increase IRRs. For example:

Shifting from supplying rocket fuel in Low Earth Orbit to a satellite raising service in Geostationary Transfer Orbits increased IRR from 5% to 50% and is an existing market; if you owned a lunar water mine, there are customers now.

Supplying oxygen in LEO increases revenues by 50%. The SpaceX Mars Project would require a megaton of oxygen in Low Earth Orbit (LEO) every 26 months.

Analysing vehicle efficiency shows that a market for propellants in LEO is a market for lunar manufactured tanks; not carrying the tanks back to the Moon increases deliverable product by 30%.

Multiple improvements on this scale, together with public exploration pre-paying initial costs, will transform Space Resources viability.