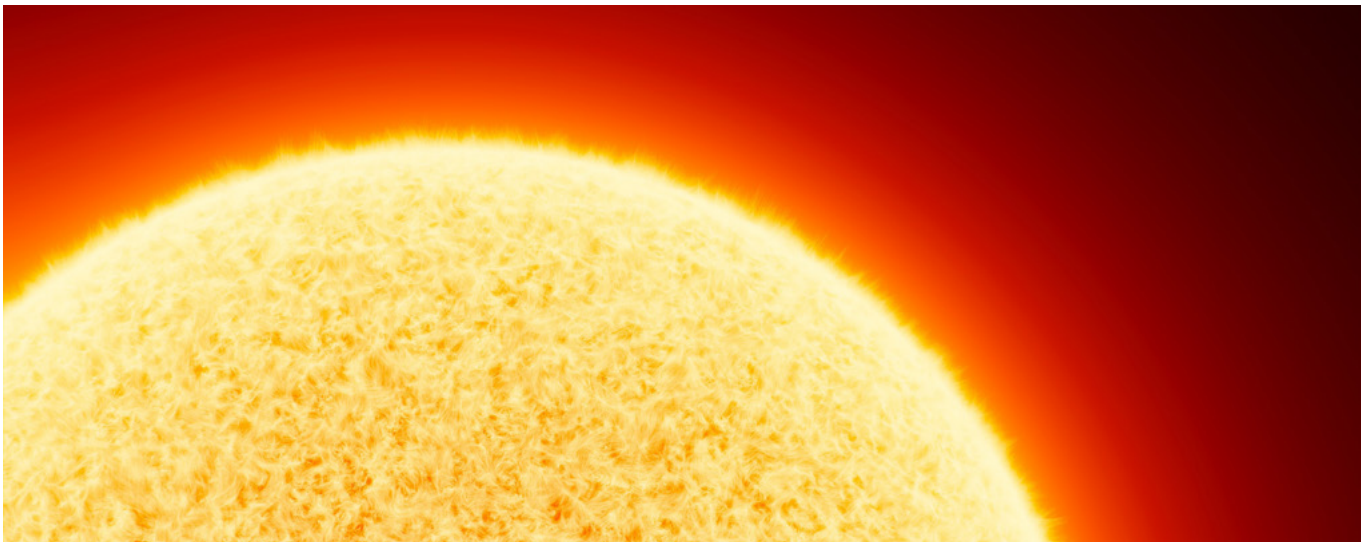


OPPORTUNITY #40

What if solar farms were moved to space?

INFINITE 'SOLAR' ENERGY

Floating solar panel farms are installed in space and are operated by advanced machine intelligence to ensure optimal positioning, allowing unlimited renewable energy to be generated and transmitted to earth.



MEGATREND
Energy Boundaries

TRENDS
Future of Space
Transforming Energy

SECTORS AFFECTED
Materials & Biotechnology
Automotive, Aerospace & Aviation
Communication Technologies & Systems
Data Science, AI & Machine Learning
Energy, Oil & Gas & Renewables
Insurance & Reinsurance
Logistics, Shipping & Freight
Manufacturing
Utilities



WHY IT MATTERS TODAY

Every hour, more solar energy reaches earth than the total annual energy used by global populations,⁶⁶⁹ around 160,000 TWh of energy.⁶⁷⁰ Yet, about 770 million people live without access to electricity, most of them residing in Africa or Asia.⁶⁷¹ The world's population is expected to reach 9.7 billion by 2050, and energy consumption is anticipated to increase by at least 50% over the same period.⁶⁷²

In 1975 solar panels started out at the price of \$105 (2015 price equivalent) per Watt, but by 2013 they had fallen to less than a dollar.⁶⁷³ China's heavy investment in solar photovoltaics was one of the key drivers of this reduction, and by the end of 2021 China's share across all manufacturing stages for solar panels exceeded 80%⁶⁷⁴ and the value of China's solar photovoltaic related exports was over \$30 billion.⁶⁷⁵

Of more benefit, solar energy is also cost-effective as consumers in the United States, for example, can save up to 50% of electricity costs in some countries compared to the traditional grid.⁶⁷⁶ Solar energy also enables the transition to renewable energy thereby reducing carbon dioxide emissions from the energy sector. In 2021, carbon dioxide emissions from energy combustion and industrial processes were responsible for 89% of the energy sector's greenhouse gas emissions worldwide. Energy-related carbon dioxide emissions grew by 6% in 2021.⁶⁷⁷ In Egypt, three-quarters of carbon dioxide emissions are derived from the energy sector, with power plants accounting for 45% of these emissions.⁶⁷⁸

About

770 MILLION PEOPLE

live **without access to electricity**,
most of them residing in Africa or Asia



THE OPPORTUNITY

Far greater quantities of solar energy can be generated and transmitted from space than on earth, and with no downtime,⁶⁷⁹ space-based solar panels have the capacity to generate 40 times more energy than solar panels on earth.⁶⁸⁰ Emissions-free, solar space farms could accelerate efforts to reduce the production of greenhouse gases and become the cleanest alternative to increasing energy needs.

Many countries are looking to tap into the potential of space-based power stations. For example, the UK government is considering an investment of nearly \$20 billion^q to build a solar power station in space.⁶⁸¹ In Europe, installing a continent-wide space-based solar power programme could bring in benefits worth over \$190 billion.^{r,682}

With reusable space rockets, the cost of launching solar panels into space could continue to decrease,⁶⁸³ and as scientists continue to uncover ways that solar energy can be stored for long periods,⁶⁸⁴ the capture and storage of solar energy could be optimised through materials science, robotics and advanced machine intelligence.

Energy could be beamed to earth via technologies such as microwave laser satellites or laser solar satellites,⁶⁸⁵ and uninterrupted flows of solar energy could fulfil the increasing industrial and domestic demand around the world, supporting economic growth and development and facilitating access to new technology and systems that improve health, education and well-being.

BENEFITS

Constant flow of clean energy beamed around the world.
Ability to meet energy demands and provide off-grid access in remote areas.

RISKS

Difficulty of managing extra-terrestrial energy facilities and protecting them from accidental (e.g. from asteroids or space debris) or deliberate damage causing power outages on earth.

q Based on GBP/USD exchange rates as at 20 January 2023.

r Based on EU/USD exchange rates as at 20 January 2023.



Energy consumption is anticipated
to increase by at least

50%

by 2050

