CGI

Space-based solar power

The next frontier for cyber security

As the struggle against energy instability and climate change intensifies, space has the potential to offer a secure, sustainable power source and this is being explored by governments and organisations globally - but cyber security is key to its success.

Alongside the climate emergency, energy instability - particularly across the UK and Europe - has accelerated efforts to find sustainable ways to meet our growing energy demands. Where traditionally technologies have focused on harnessing energy on Earth, for example wind turbines, solar installations, geothermal, hydroelectric and nuclear fission, space-based solar power could offer an effective way to harness intense solar energy and distribute it around the globe.

What is space-based solar power?

Space-based solar power is a concept that's been gradually developing over the last 50 years. Recent advances in satellite and launcher technology mean it's becoming more economically and technologically feasible as a form of power supply on Earth. Though still in the research and development phase, space-based solar power would use satellites in orbit to collect solar energy through an array of photovoltaic cells. This would then be converted into either microwave or laser energy and wirelessly transmitted back to Earth. On Earth, the power would be received by a rectenna station and converted back into electricity before being fed into the grid system of whichever location had received it.

Why security is vital: the risks of space-based solar power

Spanning both the space and energy sectors, space-based solar power would form part of the country's critical national infrastructure – making it an obvious target for malicious actors. It's vital that the various, highly technical expert areas involved in realising this form of energy production prioritise security by-design. Crucially, Solar Power Satellites (SPSs) must be designed with inherent security and fail-safe mechanisms that prevent malicious actors from launching cyber attacks on satellite equipment and processes. Although space-based solar power is less physically vulnerable than other energy infrastructure like pipelines, failure to address key areas of cyber security could result in SPSs being hijacked and energy supply disrupted.

The benefits of space-based solar power

Once protected, space-based solar power would solve many of the energy challenges we face today. SPSs spend 99.3% of the year in full sunlight, unaffected by day/night cycles. This means they guarantee a consistent supply of energy, providing a continuous, baseload supply that's clean and inexhaustible. Current aims to develop multi-Gigawatt operational capability would also more than double the average output of the UK's nuclear power stations. With the right operational capabilities, space-based solar power can supply multiple geographically distant users from a single satellite, with energy beamed to one continent and then redirected to another within a matter of seconds. A flexible, affordable way of supplying the world's energy needs, it's competitive with alternative clean or low-carbon energy sources, but also provides a lucrative export opportunity for those who own the satellite.

What is CGI doing in this space?

With a long track record working on critical national infrastructure, CGI has vast experience in the space, telecommunications and energy sectors. Our particular focus on securing technologies across these sectors, means we have tried-and-tested processes and expertise to ensure the security of space-based solar power. We're also a proud member of the Space Energy Initiative, a coalition of UK-based academic, industrial, and civil organisations with the shared goal of advancing the UK's space-based solar power capability to support the Government's Net Zero pledge. Furthering this area of development, we also recently started space-based solar power cyber security work packages for Satellite Applications Catapult and UKSA.

Read our factsheet to find out more about our work in this area.
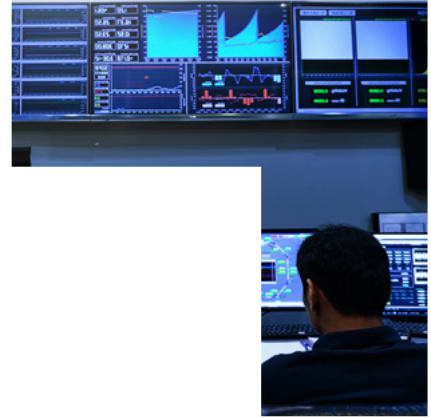
About CGI

Insights you can act on

Founded in 1976, CGI is among the largest IT and business consulting services firms in the world.

We are a true IT Systems Integrator. We work tirelessly to advise, build and operate bespoke, technically complex, mission-critical information systems which help our clients keep us all safe and secure.

We bring innovation to our clients using proven and emerging technologies, agile delivery processes and our deep expertise across the breadth of space, defence, intelligence, aerospace and maritime, all underpinned by our end-to end cyber security capability. We work collaboratively with global technology companies, cutting edge SMEs and academia to deliver the optimal solution for each client.

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