

SPACE-BASED DATA CENTERS ROADMAP: THE CASE FOR CAUTION

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Six Main Messages



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WORKING PAPER

SIX MAIN MESSAGES

1. Space-based data centers are coming soon. In the United States, China and other countries, significant activity is underway to deploy space-based data centers in the next few years, including proposals to launch more than one million data centers into orbit.
2. Neither technical challenges nor high costs will be barriers to initial deployment of space-based data centers. Some space-based data centers are already operating. Leading companies will be willing and able to incur high costs for many years to gain technical proficiency and establish market position.
3. Many rocket launches would be required to deploy small amounts of compute in space. More than 700 launches of large rockets every year (2 per day) would be required in perpetuity to meet 10% of projected global demand for artificial intelligence data centers in 2030.
4. Large constellations of space-based data centers would create very significant risks and impacts. Risks and impacts include the following:
    - dramatic alterations of the night sky
    - large debris fields in low Earth orbit
    - loss of life and property damage from de-orbiting satellite
    - depletion of the stratospheric ozone layer
    - increased global warming
    - significant interference with astronomical observations and research
5. Current governance regimes are inadequate for managing the risks and impacts of large constellations of space-based data centers. The lack of international coordination is a particularly challenging problem.
6. Companies and policymakers should proceed with great caution. Keeping in mind accidents such as those at Deepwater Horizon and Fukushima, companies and policymakers should not deploy large constellations of space-based data centers without more operational experience and until risks and impacts are better understood and well managed.