

MP-IDSA *Commentary*

China's 'Artificial Sun': The Holy Grail of Energy

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S*ummary*

China's rapid progress in nuclear fusion highlights its ambition to emerge as a dominant force in next-generation energy technologies.

China has achieved a major milestone in its pursuit of commercial nuclear fusion, with two domestically developed superconducting magnets designed for a fusion reactor successfully passing technical acceptance and full-load testing.¹ This is an important step towards building more efficient and scalable nuclear fusion energy systems. Over the years, China’s sustained financial investments and significant technological breakthroughs by its scientific community have placed it as a global leader in the development of advanced nuclear fusion technologies.

At present, the global nuclear energy industry relies on the technique of nuclear fission for energy generation. Here, heavy atoms (say, uranium 235) are split through a controlled chain reaction to release heat for electricity generation. For decades, based on this basic principle, nuclear energy has been generated in various parts of the world. Nuclear fission is a reliable source of low-carbon baseload electricity, but there are challenges related mainly to radioactive waste management and safety concerns. Cost is definitely an important factor.

There is growing global interest in developing nuclear fusion energy systems due to their imminent advantages. One of the most important aspects of this form of energy generation is that it could provide a clean, sustainable, and low-carbon energy source, significantly contributing to global Net Zero goals.

Nuclear fusion generates energy by forcing light atomic nuclei (like hydrogen isotopes) to combine under extremely high temperatures and pressures to form heavier atoms like helium. It is the same process that powers the Sun. Fusion has the potential to produce significantly higher energy output with negligible radioactive waste. At present, this technology remains in the development phase.

However, countries such as China have achieved significant progress in recent years, particularly in advanced superconducting technologies, magnets and plasma confinement systems. Also, for some years now, there has been a push towards developing commercially operational fusion power reactors. In recent years, global private investment in fusion has exceeded US\$ 10 billion. The World Fusion Energy Group, established in 2024, is promoting global cooperation and coordination in fusion research.²

¹ [**“China’s ‘Artificial Sun’ Hits New Milestone, Targets 2030 for First Electricity Output”**](#), *Global Times*, 5 July 2026.

² Emma Midgley, [**“Fusion Energy in 2025: Six Global Trends to Watch”**](#), International Atomic Energy Agency, 28 October 2025; [**“IAEA World Fusion Energy Group \(WFEG\)”**](#), International Atomic Energy Agency.

One of the most important multi-agency projects, the International Thermonuclear Experimental Reactor (ITER), was formally established in 2006. It is located in southern France, and a group of 34 countries, including China, the European Union (EU), India, Japan, South Korea, Russia and the United States (US), are working jointly on this project. It is based on the tokamak concept (a tokamak is an experimental machine designed to harness fusion energy; inside a tokamak, a fusion plasma is created and confined by strong magnetic fields).

It was first proposed for international collaboration in 1985 and aims to demonstrate the scientific and technological feasibility of fusion as a large-scale, carbon-free energy source. Currently, ITER remains in the construction and assembly phase, with experiments planned to pave the way for future commercial fusion power reactors.³

China had begun investing in nuclear fusion before joining ITER. Construction for China's Experimental Advanced Superconducting Tokamak (EAST) began in 2000, and the reactor officially began operations with its first plasma in 2006. China officially joined the ITER programme in 2006 as its seventh member. Under the agreement, China is responsible for approximately 9 per cent of the project's construction and operation.⁴

On 27 June 2026, China marked a significant milestone in the global nuclear fusion race by successfully developing advanced superconducting magnets for a fusion reactor. These magnets are a critical technology for generating the powerful magnetic fields required to confine and control ultra-hot plasma, a key challenge in achieving sustained fusion energy production. They are required to control and sustain superheated plasma at temperatures far exceeding those in the Sun's core.

This recent success demonstrates China's growing capabilities in advanced superconducting technologies, precision engineering and fusion reactor development. These magnets are central to controlling plasma heated beyond 100 million °C, the core challenge in recreating the Sun's energy-generation process on Earth. The development supports China's plans to complete a compact fusion experimental device by 2027 and to target fusion-based electricity generation demonstrations around 2030.⁵

³ [**“What is ITER”**](#), International Thermonuclear Experimental Reactor.

⁴ [**“Experimental Advanced Superconducting Tokamak”**](#), Chinese Academy of Sciences; Chinese Academy of Sciences, [**“Chinese 'Artificial Sun' Sets A Record towards Fusion Power Generation”**](#), *Phys.org*, 21 January 2025.

⁵ [**“China's 'Artificial Sun' Targets First Electricity Output by 2030”**](#), *CGTN*, 5 July 2026.

Currently, various scientific institutions in China are contributing to the mega project to achieve nuclear fusion. The Institute of Plasma Physics under the Chinese Academy of Sciences was responsible for the development of superconducting magnets, which is also known as the ‘artificial sun’ programme. The achievement, realised under the Comprehensive Research Facility for Fusion Technology (CRAFT), demonstrates China’s growing self-reliance with 100 per cent domestic production of critical fusion technologies.

The highlight of the development is the Toroidal Field (TF) superconducting magnet, which is possibly the largest ever built for a fusion device, measuring 21 metres in length, 12 metres in width, and 3.3 metres in height, and weighing 582 tonnes. This magnet surpasses ITER’s TF magnets in size and energy storage capability. Alongside this successful test, China also successfully tested a high-temperature superconducting central solenoid coil capable of operating at 60 kiloamperes, a crucial technology for generating and controlling plasma currents. This success is an outcome of six years of research. China has multiple patents in this field.⁶

China’s ‘artificial sun’ programme aims to achieve its first fusion-based electricity output around 2030. This recent breakthrough needs to be viewed not merely as a scientific advancement, but as a strategic step towards gaining leadership in next-generation clean energy technologies. It reflects China’s strategic push to establish leadership in one of the most important emerging technology domains of the 21st century. China is expanding its capabilities in challenging technological arenas such as high-temperature superconducting materials, precision manufacturing and magnet engineering.

China’s rapid progress in nuclear fusion highlights its ambition to emerge as a dominant force in next-generation energy technologies. Since this technology was in its infancy for many years, no efforts have likely been made to establish globally accepted definitions, safety standards, and regulatory frameworks for commercial fusion power plants. As the world moves closer to commercially viable fusion energy, technological advancement must be accompanied by responsible global governance. Nuclear fusion represents a potential pathway towards clean, sustainable, and plentiful energy for the benefit of humanity as a whole. Hence, all efforts should be made to avoid any technological monopolies, supply chain control, narrow market-driven interests and geopolitical rivalries.

⁶ [**“World’s Largest Superconducting Magnet Completed in China”**](#), World Internet Conference, 28 June 2026.

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