II. Physical Economy

The Artificial Sun: China's 'Manhattan Program' for Fusion Development

by William C. Jones

Jan. 23—The issue of the development of thermonuclear fusion energy has again been brought to the attention of the American public after nearly 40 years of deafening silence; an issue which once upon a time was on the front burner of American interest. The Magnetic Fusion Engineering Act of 1980, introduced by U.S. Rep. Mike McCormack (D-WA) and spearheaded by the organizing of the Fusion Energy Foundation, which economist and statesman Lyndon LaRouche had helped to establish for the explicit purpose of promoting an Apollo-like program for bringing fusion online in 20 years, passed both Houses of Congress and was signed into law by President Jimmy Carter. But Congress's refusal to fund the bill (roughly $1 billion per year for 20 years) and instead push toward "privatizing" R&D, along with belief in the "laws/magic of the market," left the legislation to die on the vine. The recent establishment of an Office of Fusion Energy Sciences in the Department of Energy and the publication last October of a "Fusion Science & Technology Roadmap," has again sparked interest in the United States in what could become a revolutionary and almost endless source of energy for mankind.

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Rep. Mike McCormack (D-WA), originator of the 1980 fusion bill, addresses a 1981 Fusion Energy Foundation meeting in Washington, D.C.

What has made fusion once again a "front burner" issue is the fact that, while the United States has neglected fusion research since the 1980s, other countries have not. The Soviet Union, which had been the leading nation in fusion, began working with the People's Republic of China in the 1970s, which was just beginning to get its bearings after a long period of policy dilemmas that had left the country immersed in poverty.

The Birth of Fusion in China

In 1973, the Institute of Physics in China set up a program to study magnetic fusion in the city of Hefei. The Institute of Physics and the Institute of Electrical Engineering under the Academica Sinica built its first tokamak device in 1974 in Beijing. It was a small tokamak, but provided a basis for development even before the announcement of the new "reform and opening up" policy by Deng Xiaoping in 1977, the policy which allowed China to pursue a course of real economic development.

While the Chinese fusion program still suffered from a lack of funding, their cooperation with Russia and France allowed them to nurture their scientific cadre in the field and to create an understanding of the plasma physics that lay at the basis of fusion. In 1990, they received their first superconducting tokamak from the Kurchatov Institute in Moscow, the HT-7. They reassembled the device in their workshop and began experiments with it. A hundred scientists also came to China from Russia to work on the project after the collapse of the Soviet Union. There had been cooperation with the United States until the latter began slashing funding on fusion in the mid-1980's.

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In 1997, China made the decision to build the Experimental Advanced Superconducting Tokamak (EAST), the first fully superconducting tokamak in the world. EAST is often referred to as China's "Artificial Sun," although the term is more generally applied to the overall program, which is advancing rapidly from the EAST reactor.

As the political situation for China has become more difficult, with the new U.S. tariffs and other restrictions, and with a general Western attitude which considers China as a rival, the Chinese government has given a greater push to making advances in the areas of science and technology in order to secure vital elements of its supply chain from sudden cutoffs by the West. While China maintains and encourages international cooperation in all these areas, the West has become more restrictive toward China. The 15th Five-year Plan of the Chinese government, decided upon last year, exhibits a clear determination to push forward on what are being characterized as "disruptive technologies," that is, new innovative technologies that tend to shift development to an entirely new stage. In that respect, the development of fusion energy by the 2030s has been placed at the top of the agenda. Also, in July of last year, China took the step of establishing the China Fusion Energy Company Ltd. (SCEC) within the China National Nuclear Corporation (CNNC).

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The Experimental Advanced Superconducting Tokamak (EAST).

The EAST tokamak broke a record last January by sustaining a high-intensity plasma for over 17 minutes, tripling the world record and reaching a temperature of 100 million degrees Celsius. Then, this January, EAST broke the record for maintaining plasma density at high temperatures.

But EAST is far from the final word in the Chinese fusion program. China has already started construction on the Burning Plasma Experimental Superconducting Tokamak (BEST). While EAST is primarily an apparatus for heating the plasma, BEST aims at producing net energy with a target of five times the energy gain (Q=5). While EAST uses deuterium as a fuel, BEST will maintain a self-sustaining deuterium-tritium burn. BEST is also significantly larger and heavier than EAST and is considered an intermediate step toward the China Fusion Engineering Test Reactor (CFETR), the cornerstone of China's fusion roadmap, by focusing on high neutron flux and the steady-state performance necessary for commercial viability. BEST also integrates more advanced superconducting technologies to handle significantly higher magnetic loads than its predecessor.

A Dynamic Effect on the Entire Physical Economy

The advances in fusion have also been complemented by advances in related fields, like superconducting technologies and new materials development. China has developed specialized "super steels" like CHSNO1, a next-generation alloy engineered for fusion reactors, certified to handle intense magnetic fields and cryogenic temperatures. There has also been the development of high-temperature superconducting tapes, enabling the creation of more compact, powerful, and cost-effective electromagnets.

BEST will also incorporate the advances made by China in AI in assisting it in achieving real-time control, monitoring, and safety of fusion reactions. These AI models accurately predict the evolution of key plasma parameters, such as current and shape, allowing for millisecond-level adjustments to maintain stability.

China is also building the Comprehensive Research Facility for Fusion Technology (CRAFT), a 40-hectare complex near to the EAST tokamak that will develop the underlying engineering for future fusion machines. Results from EAST and CRAFT will then feed into the design of the China Fusion Engineering Test Reactor (CFETR), which is envisioned as a critical bridge between experimental and commercial fusion power. It will be similar in physical size to the international ITER fusion project in France, but optimized for steady-state

power production. Its functioning is envisioned in two stages: first, an engineering demonstration in which it will produce 200 MW of fusion power and achieve "tritium sufficiency," creating its own fuel; and secondly, a power demonstration, where it will be scaled up to produce 1,000 MW of power, which will rival that of a fission reactor.

While Chinese researchers, like most of the international fusion community, have been focusing on the tokamak as the "work horse" of a fusion economy, they are at the same time not neglecting other types of fusion generation. They have major experiments in both laser inertial confinement and Z-pinch magnetic confinement. China is now constructing a facility in Mianyang, Sichuan, which, based on its X-shape, scientists speculate could be intended for either laser or Z-pinch confinement experiments, though little has been said by the Chinese about its function.

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Comprehensive Research Facility for Fusion Technology (CRAFT), located in Hefei, Anhui Province.

China is also developing a fusion-fission hybrid, the Xinghuo (Spark), in Hefei, which aims for grid connection by 2030. The Xinghuo uses high-energy neutrons from fusion to trigger fission, which can boost energy output and reduce radioactive waste.

China has also made major gains in superconductivity. In September 2025, it set the record with a superconducting magnetic field of 323,500 gauss, which is 700,000 times stronger than the Earth's magnetic field. This will have major implications for fusion, for space propulsion, and magnetic resonance spectrometers, used widely in medicine.

China's financial commitment to fusion has increased almost exponentially, increasing from just a few billion dollars in the beginning to an overall investment today of $10 billion. The program has benefited greatly from the major emphasis on STEM education in China. China has around 19 million scientists and engineers with around 5 million graduating each year. In addition, the openness of China's fusion program—and its obvious success—has led to many scientists from all over the world going to work in China. Indeed, even many of those Chinese and Chinese-American scientists, who had been educated in the United States and worked here for a time, have been pushed to return to China, due to the vile anti-China mood being fueled by President Donald Trump's Administration and its aversive immigration policy.

The Search for the Real Soul of America

Now that the Trump Administration has made fusion a part of the U.S.-China rivalry, the race is on to see who can "light the first light bulb" with fusion energy. The odds here are with China. The issue, however, as everyone has said, is that the race for fusion is not a "sprint" but a "marathon." In that regard, China is well-prepared for the long haul. The United States, on the other hand, still has a lot of work to do. We must return to a policy in which the government, not private entrepreneurs, play the decisive role, in recommitting the nation to a Manhattan-style program of fusion development, not for the sake of "winning a race," but for the benefit of the people. And we should do this in cooperation with our "rivals," who have made such headway in the development of fusion, using the gains they have made in order to accelerate our own program. It is the United States which has built the "wall" of restrictions in science, not China and not Russia, which have remained open for collaboration in the area of fusion and other areas of high technology. When the United States passed the Magnetic Fusion Act in 1980, there was great enthusiasm among the Soviet researchers, with whom U.S. scientists were then collaborating. They realized that any breakthrough in fusion research would be a breakthrough for mankind, and not simply for a single nation.

We must return to this spirit, a spirit which emboldened President John Kennedy, in the midst of the Cold War, to propose cooperation with our then-rival, the Soviet Union, in sending a man to the Moon and returning him back to Earth. That was the real spirit of America, which made it a "beacon of hope" for mankind. In this 250th anniversary year of the founding of our republic, we must return to that spirit, or we are in danger of losing the real "soul" of America.