China's thorium revolution

*by Alex Krainer, TrendCompass**

Alex Krainer. (Picture ma)

Last month, Chinese scientists made a major breakthrough with the experimental 2-megawatt thorium reactor in the Gobi Desert by refueling the reactor while in full operation – a world-first achievement.

The reactor reached criticality[1] in October 2023 and scaled up to full power by June 2024. The Chinese reactor was based on the 1960 US *Molten Salt Reactor Experiment* (MSRE) developed at *Oak Ridge National Laboratory* which the U.S. declassified, having abandoned the technology. Chinese scientists at the *Shanghai Institute of Applied Physics* (SINAP) used these designs and perfected them, stating that "the US left its research publicly available, waiting for the right successor. We were that successor."

In March, China announced the discovery of a massive thorium deposit which now represents fuel that could power the country for 60,000 years. Compared to uranium, thorium is a significantly safer fuel, it is far more abundant, and it produces less nuclear waste, which could make it a game-changer in nuclear energy production.

Developed in USA in 1959

Thorium reactor technology was originally developed in the U.S. in 1959 and from 1962 to 1972, the U.S. ran a cargo ship fueled by thorium with no incidents. But ultimately, thorium was abandoned in 1972 in favor of plutonium because the US defense establishment determined that thorium couldn't be weaponized and therefore couldn't have military uses.

China adopted the thorium intellectual property from 2011 on

For mysterious reasons, around 2010 the U.S. gave away its thorium intellectual property, and

Thorium-Reactor. (Picture commons)

from 2011 on, China adopted it and invested heavily in its development. Thorium is abundantly available throughout the world, its exploitation is much cheaper than other nuclear fuels and nobody controls its supply. Apparently, thorium reactors can generate 200 times more energy from the same amount of fuel than traditional nuclear reactors, ad they burn 80% clean, leaving very little post-usage pollutants.

So why didn't the Western nations continue to develop this potential game changer? In addition to the military usage angle, the sunk cost fallacy could be at fault, as it seems that Western nations are too invested in uranium reactors and uranium mining and trade, making them reluctant to embrace the transition. Another problem could be that Western powers are focused on near-term plays (the US is focused on selling LNG to Europe) while China is looking at long-term strategic development.

New possibilities for development

The transition is now gathering momentum, opening entirely new possibilities for development: in a not-too-distant future, thorium reactors could transform not only power generation but also shipping and transportation, for example, by enabling rapid trans-Eurasia travel supporting the rationale for extending China's nearly 30,000 miles of high-speed railroads across the Eurasian continent. This new energy technology could also prove to be essential for powering artificial intelligence.

This is yet another area where China has become a dominant player, not by deregulating

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markets and giving free reign to private capital, but through strategy and planning. Already in 2006, the Chinese government formulated the *"Medium-to Long-Term Plan for the Development of Science and Technology"* (MLP),[2] setting out the strategy to transform China into "an innovative society" by 2020 and a world leader in science and technology by 2050. It also helped that China didn't squander their wealth and economic potential on waging endless wars.

Source: https://trendcompass.substack.com/p/chinas-thorium-revolution, 9 May 2025

[1] *Criticality* in nuclear engineering refers to both the neutron balance of a nuclear facility and the critical state of a nuclear reactor or fissile material assembly. An assembly is critical when the number of free neutrons produced per unit of time is equal to the number that disappear through absorption and leakage (i.e. loss to the outside). The critical state is the normal operating state of a nuclear reactor in which a self-sustaining chain reaction takes place. The neutron flux and thus the power generated, i.e. the heat energy released per unit of time, can be higher or lower; criticality only means that these variables remain constant over time. (Wikipedia)

[2] *https://www.itu.int/en/ITU-D/Cybersecurity/Documents/National_Strategies_Repository/China_2006.pdf*