

TERRAPOWER'S MOLTEN CHLORIDE FAST REACTOR TECHNOLOGY: NUCLEAR FOR A CHANGING ENERGY SECTOR

TerraPower's innovation efforts expand the ability of nuclear technology to address carbon reduction in sectors beyond electricity. The molten chloride fast reactor (MCFR) project answers many of the needs of industries with high energy consumption. The MCFR technology can operate in a high-temperature regime. This means it can do more than generate high-efficiency electricity; it also offers potential in alternative industrial markets, such as process heat and thermal storage.

The MCFR design is a type of molten salt reactor (MSR). MSR experiments were first conducted in the 1950s-1970s. Today, modern computing power, materials and engineering developments enable new research and development of MSR technology. Integrating new reactor options into a diversified fleet can bring high-quality, carbon-free energy to heavy industry users, such as water treatment plants, refineries and chemical processors.

TerraPower's work focuses on a fast neutron spectrum, as opposed to the thermal neutron spectrum in which other salt reactors operate. The fast neutron spectrum minimizes the impact from fission contamination byproducts and allows the MCFR technology to avoid the need for the online reprocessing that is required in thermal spectrum and thorium concepts. Molten chloride salt fuel serves as both the fuel and the coolant. Conceptual designs expanded into testing activities in January 2016 when the U.S. Department of Energy (DOE) awarded a five-year, \$40 million cost-sharing award for continued research and development into TerraPower's MCFR program. The award initiated a U.S. public-private partnership that includes TerraPower, Southern Company, Oak Ridge National Laboratory, Idaho National Laboratory, the Electric Power Research Institute and Vanderbilt University.

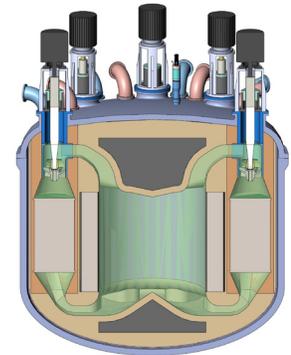
Part of this partnership between Southern Company and TerraPower includes an Integrated Effects Test (IET) to learn how the MCFR technology will scale and behave at larger, commercially relevant sizes. The IET is expected to be commissioned and begin operating in TerraPower's Everett, Washington, facility in 2022.

In December 2020, DOE selected the Molten Chloride Reactor Experiment (MCRE) proposal, with Southern Company as the prime, as a winner of the second Advanced Reactor Demonstration Program risk-reduction pathway. MCRE is relevant to TerraPower's MCFR design.

EVOLUTION OF THE DOMESTIC NUCLEAR MARKETPLACE

TerraPower is a nuclear innovation company, dedicating its efforts to new ideas and technologies in the energy sector. The company's diverse energy technology portfolio provides options for a more efficient and economic energy sector that meets society's needs for health and well-being. TerraPower believes this approach will prove more reliable and beneficial to addressing future energy needs than the utilization of a one-size-fits-all technology.

TerraPower is a member company of the MSR Technology Working Group (TWG), which aims to accelerate the development and market deployment of MSR technologies. The MCFR program and collaboration through programs like the TWG will help determine licensing approaches, establish unique test facilities and result in the development of liquid-fueled reactors in the United States.



MCFR conceptual design

MAJOR MCFR TECHNOLOGY BENEFITS

High operating temperatures increase plant efficiency.

High-grade heat enables new valuable industrial applications.

Very stable and inherently safe operation with no need for operator actions.

Refueling without the need for ongoing enrichment or reprocessing facilities effectively eliminates weapons proliferation risks.

Electricity production is only one benefit nuclear energy can provide. The diversity of reactor types under evaluation offers the potential to address a myriad of problems, which is why TerraPower is dedicated to advancing new nuclear technologies.

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