

# Researchers discover how to improve safety of nuclear power plants

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Credit: [rosatom.ru](http://rosatom.ru)

Researchers at Tomsk Polytechnic University found a method to increase fuel lifetimes by 75%. According to the research team, it will significantly increase safety and reduce the operating cost of nuclear

power plants in hard-to-reach areas. The study results were published in *Nuclear Engineering and Design*.

Previously, a team of researchers from the Russian Federal Nuclear Center—All-Russian Research Institute of Technical Physics, Tomsk Polytechnic University, and the Budker Institute of Nuclear Physics proposed the concept of a thorium hybrid reactor, where high-temperature plasma confined in a long magnetic trap is used to obtain additional neutrons. Unlike operating reactors, the proposed thorium hybrid reactor has moderate power, a relatively [small size](#), high operational safety, and a low level of radioactive waste.

One of the biggest challenges for the development of remote areas, such as the Far North, is a stable energy supply. According to Tomsk researchers, often the only solution is to use low-power nuclear plants.

However, reactor refueling, one of the most hazardous and time-consuming procedures in nuclear energy, is a significant problem. "Reduction of refuel frequency will drastically improve operational safety. Furthermore, it reduces transportation costs of fresh fuel or a [nuclear power plant](#) to a transshipment site," Vladimir Nesterov, associate professor of the TPU Division for Nuclear-Fuel Cycle, says.

The scientists carried out theoretical calculations proving the possibility of creating a thorium-based nuclear fuel cycle. Thorium is four times as abundant as uranium. Additionally, thorium fuel has a significantly higher regeneration intensity of fissile isotopes necessary for energy production.

"The achieved results can draw the attention of the scientific community to the potential of the thorium [nuclear fuel cycle](#). We demonstrated that the implementation of this cycle in a low-power reactor installation results in increasing the fuel lifetime by 75%," the expert says.

In the future, researchers want to continue experiments in the verified software and carry out thermophysical calculations of low-power reactors operating in the thorium-uranium [fuel](#) cycle with subsequent implementation of the developed calculation methods in the educational process.

**More information:** Sergei V. Beliauskii et al, Effect of fuel nuclide composition on the fuel lifetime of reactor KLT-40S, *Nuclear Engineering and Design* (2020). [DOI: 10.1016/j.nucengdes.2020.110524](https://doi.org/10.1016/j.nucengdes.2020.110524)

Provided by Tomsk Polytechnic University

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