The story of modular nuclear reactors as a deux ex machina solution for the energy future of Serbia sounds convenient and modern among domestic elites, but it has one unpleasant drawback – practically no one still uses it. It may surprise you, but while there are about 450 conventional reactors in operation in the world today, the number of modular ones that currently provide electricity is correct – one.

If the Republic of Serbia decides on such a dramatic turn, repeals the Law on Prohibition of Construction of Nuclear Facilities (known as the Moratorium), invests in new staff and replaces coal with nuclear energy, the question arises whether it will go through modular reactors. That question is actually a dilemma – is it wiser to choose a technology that is very promising, but which is in its infancy, or a technology that is powerful and risky at the same time, but has been used for seven decades in hundreds and hundreds of locations?

Modular nuclear reactors (SMR) are smaller than conventional ones and, according to the definition of the International Atomic Energy Agency (IAEA), are reactors with a power of less than 300 MW. Conventional reactors are usually larger than 700MW, and although truly giant reactors are being built in France and China today, the conventional reactor is usually a machine comparable in power to the TENT B power plant, the most modern thermal power plant in Serbia.

While modular reactors are proportional to the smaller units in our other power plants, they can theoretically be quite small, of only 10MW, such as a solar power plant or wind turbine. According to the Small Nuclear Power Reactors study published by the World Nuclear Association in December 2021, there are currently about 70 different design ideas for these reactors in the world, and their popularity seems to be global.

What are these reactors for? The fact that they are modular actually means that they are not being built in the way that nuclear power plants are now being built – as priority national construction and technological undertakings that engage entire segments of industry and society. The idea is that SMRs are produced in the factory and then transported to the location. This ensures, on a longer scale, their lower price, but also their physical availability.

As Joanne Liou points out in an article on SMR published on the IAEA website, modular reactors are essentially intended for places where a classic nuclear power plant cannot be built at all – in inaccessible mountains, deserts, polar regions or as the Russians demonstrated, on water. . If we are thinking about building such plants in Serbia, we should remember that it is not a jungle or rocky outcrop, but a gentle area intertwined with roads, railways and, most importantly, large rivers, so a conventional reactor can be easily built.

While there are no incidents, by the way, nuclear energy provides numerous benefits, primarily due to the astonishing amount of energy released in the reactor. Thus, for example, in a PWR reactor with pressurized water, such as the Krško NPP in Slovenia, uranium dioxide powder, compressed into 8 × 9 millimeter tablets, is used as fuel. Just one

such miniature tablet of uranium fuel releases as much energy as one ton of coal, 2.5 tons of firewood, three barrels of 200 liters of oil or 500 cubic meters of natural gas.
That is why at the beginning of the 21st century, a significant number of countries returned to nuclear energy, which was called the nuclear renaissance. Similar ideas emerged in Serbia in 2007 and 2010, but the reactors lost popularity again after the monstrous tsunami on March 11, 2011 hit Japan's Fukushima 1 nuclear power plant. With the war in Ukraine, the topic was reopened, and in Serbia is .
Proponents of modular reactors point out that due to their small size, they have numerous advantages over conventional technology – they take up ten times less space, require fewer staff and are significantly cheaper to build. Of simpler design, they rely on so-called passive systems and are therefore safer in themselves. This theoretically also means that they do not need human intervention or an external source of energy to extinguish it, because passive systems rely on the very physics of the process. As it happens, unfortunately, the story is a bit more complicated.
While there are about 450 conventional reactors in operation in the world today, so far only one modular nuclear reactor has been installed that already provides electricity. It is about the KLT-40 reactor, with a power threshold of 70 MW, which the Russians installed in the plant called "Academician Lomonosov", a floating nuclear power plant which is the pride of Russian engineering knowledge and which is anchored on a barge in the Arctic port Pevek. This reactor was the first active SMR to be connected to the electricity grid in May 2020. There are five of them under construction: another in Russia, one in Argentina and three in China. One of China's 210MW HTR reactors, demonstrated, was plugged in in December. These ventures certainly indicate that SMR technology is evolving, but it should be borne in mind that in addition to existing conventional reactors, the total power of the 393GW in the world today, despite Chernobyl and Fukushima, as many as 53 conventional reactors are currently being built around the planet, and another 93 are planned to be built, with an average power of 1000MW.
There is no doubt that countries continue to opt for conventional reactors because of their strength. Nuclear risk, no matter how small, is still not worth building a machine that is too small, which will not solve the energy problem at all. With a power of only ten or a hundred megawatts, SMR is a resource comparable to wind farms.
In Serbia, he can not cancel the thousands of megawatts of powerful TENT, which consists of power plants A and B near Obrenovac. For the sake of comparison, the current power that EPS has at its disposal and which is predominantly provided by thermal power plants is around 8400 MW. When there are no disasters like the ones that hit Serbia in the spring of 2014 and the winter of 2021, in practice, this force proves to be quite sufficient to start the domestic economy and still provides additional value like no other of our resources.
As no new capacity has been built for four decades, and the risks are growing, it is obviously

necessary to install at least another 1000MW to make the system less dependent on poor lignite quality in the medium term, which is significantly more power than a modular reactor. In the long run, when there is no more coal, a completely new source of energy must be found that will replace thermoblocks of a total of several thousand megawatts. Whether it is nuclear or not, the new source must certainly be many times more powerful than small, modular reactors, Science through Stories writes.