Nuclear energy

Security concerns fuel nuclear energy renaissance

The west is focusing on new technology to reduce reliance on Russia and carbon

In deep: construction work in the miles of tunnels beneath the Hinkley Point C nuclear power station expansion project in Somerset, west of England, last year © EDF

Jamie Smyth in New York 13 HOURS AGO

When Vladimir Putin launched a full-scale invasion of Ukraine, just over two years ago, it sparked a global energy crisis that left western nations scrambling to reduce their reliance on Russian oil and gas.

But the EU and US have found it harder to kick their addiction to enriched uranium from Russia, which is used to make more than a fifth of the fuel for their nuclear reactors.

Russia controls almost half of the global capacity to enrich uranium and has established a monopoly over commercial supplies of high-assay low-enriched uranium (Haleu) — a new type of fuel which is required to power the latest generation of reactors. This has left US and European power plant operators with little option, in the short term, but to continue buying raw materials and enrichment services from Russia's state-owned nuclear giant: Rosatom.

"Just like Europe got over-reliant on Russian gas, the free world nuclear companies got over-reliant on Russian fuel, which was being dumped at low prices in our free world countries," says Chris Levesque, chief executive of engineering company TerraPower.

TerraPower is one of dozens developing new nuclear reactor technologies, which industry leaders and a growing number of western policymakers argue are needed if the world is to have any chance of meeting the Paris Agreement target of net-zero greenhouse gas emissions by 2050. Founded and chaired by billionaire philanthropist Bill Gates, the company plans to start building the first sodium fast nuclear reactor with on-site energy storage in the US, in June.

President Emmanuel Macron of France, centre, poses with other leaders and participants after a nuclear energy session at Cop28 in Dubai last year © Ludovic Marin/AFP via Getty Images

TerraPower's proposed reactor in Kemmerer, Wyoming, is among the many projects now tapping into a global upswing of interest in nuclear power, which is hailed by advocates as a key tool in fighting climate change and boosting energy security.

At the Cop 28 climate conference in December, more than 20 nations — including the US, France and UK — pledged to work to triple global nuclear energy capacity by 2050. And momentum is growing, with world leaders attending a first-of-a-kind Nuclear Energy Summit this week in Brussels, to discuss funding for the industry's expansion, with the International Atomic Energy Agency (IAEA).

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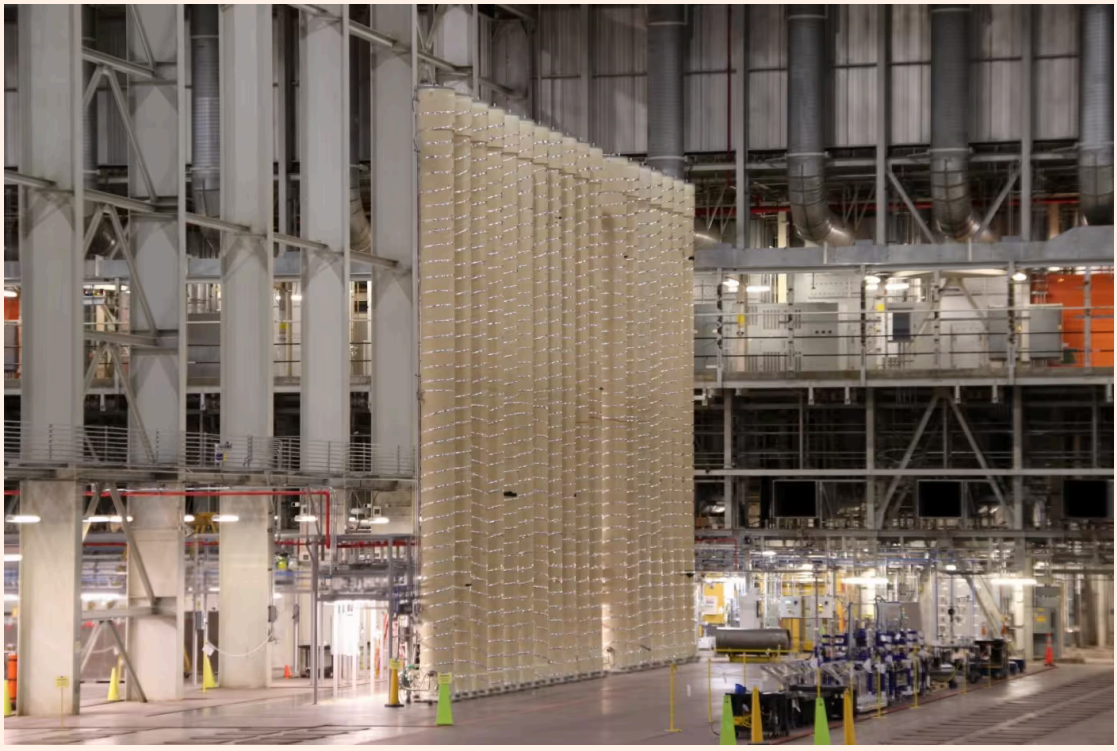
"There has been a sea-change in global perception and global policymaking towards nuclear energy," says Rafael Grossi, IAEA director-general, who will co-chair the summit. "One reason is global warming and the need to do something about climate change and another is energy security with a war in Europe."

For much of the 20th century, the US and European nations, such as France, Germany and the UK, were clear global leaders in the nuclear power sector. But accidents at the Chernobyl nuclear power station in Ukraine in 1986 and Fukushima in Japan in 2011 caused many western governments to rethink their commitment to the technology.



The pioneering American Centrifuge Plant in Ohio, which last year began producing Haleu fuel, required to power a new generation of reactors

The sudden pullback in investment sparked a crisis for many private companies supplying uranium and nuclear-related services, including conversion and enrichment, which are needed to make the fuel to power reactors. Project delays and cost overruns also sapped confidence in the industry and forced several high-profile US companies, such as Centrus Energy Corp and Westinghouse Electric Co, to file for bankruptcy.

Both companies have since been restructured and are positioning themselves to lead what industry insiders have dubbed the “nuclear renaissance”. But they face tough competition from state-run companies in Russia, China, and Kazakhstan, which control key parts of the fuel supply chain and have begun exporting their technology.

Kazakhstan, a country with close economic and political ties to Moscow, supplied more than a quarter of the uranium ore used by the US and Europe in 2022. Russia accounted for about 12 per cent of US imports and 17 per cent of EU imports in the same year, according to US and EU government agencies.

A 550-ton dome is hoisted in place at the world’s first commercial small modular reactor, Linglong One, in Hainan province, China, in February © Luo Yunfei/China News Service/VCG via Getty Images

Rosatom’s vertically integrated supply chain — which encompasses uranium mining, conversion, enrichment and fuel fabrication — makes it a tough competitor. China’s state-owned giants, China National Nuclear Corporation and China General Nuclear Power Group, are also expanding rapidly.

All three companies have begun exporting their technologies and are building reactors in several countries in Asia and Europe. China and Russia have both deployed small modular reactors (SMRs) — a more compact and efficient reactor that advocates say could transform the sector — ahead of more than a dozen western rivals.

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Carl Fisher, chief operating officer of NuScale, a US-listed nuclear company, noted last month that China and Russia were ahead of the US in deploying SMRs due to state-supported funding models. He said: "[When] the Chinese government finances [a nuclear project], they say, 'This is your customer base and here's your technology' and they just wrap it up. And Russia does the same thing. So, in the US, what we lack is the cohesiveness of those three areas."

Western nations have now begun to adapt their support for the industry. In April 2023, the US, UK, Japan, Canada and France formed a nuclear alliance on the sidelines of the G7, which the then British energy secretary Grant Shapps said was aimed at "pushing Putin out of the nuclear fuel market entirely". In December, these nations committed $4.2bn to develop a secure, reliable global nuclear energy supply chain, mainly focused on enhancing enrichment and conversion capacity in the west.

The UK and US have already allocated $1bn for programmes aimed at making Haleu, which currently can only be purchased on a commercial basis from Tenex, a Rosatom subsidiary.

Kathryn Huff, US assistant secretary for nuclear energy, says it is vital the US and its allies rebuild their nuclear supply chains and re-establish leadership for environmental and security reasons. "There is no choice," she says. "If we don't, we won't control the conversation around safeguard security, non-proliferation, safety, and the standards that would propagate across the world.

"But it will be seriously hard because we do need to build reactors on time and on budget from American suppliers and suppliers of like-minded nations — and that can be very challenging."