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U.S. Seeks to Give Weapons-Grade Plutonium to Start-Ups for Fuel

Companies say it's a better way to dispose of the Cold War-era material — and fix a shortage of nuclear fuel. But the plan has also faced criticism from nonproliferation experts.

By Brad Plumer

The Trump administration is moving forward with a plan to provide Cold War-era plutonium from dismantled nuclear warheads to companies that want to convert the dangerous material into fuel for nuclear power plants.

The plan has generated debate and some unease among nonproliferation experts. If finalized, it would mark the first time the U.S. government has made weapons-grade plutonium available to private companies. The Energy Department has more than 50 tons of surplus plutonium left over from nuclear weapons programs, and the agency had previously been planning to dilute much of that material and bury it.

Some of the nuclear start-ups trying to obtain that plutonium say that transforming the waste into fuel is a better way to dispose of it.

On Tuesday, the Energy Department said that it had selected five companies to enter into “advanced negotiations” to potentially receive some surplus plutonium. That includes Oklo, a California-based nuclear power company, which plans to partner with Newcleo, a European developer of advanced nuclear reactors.

Using plutonium for fuel, Oklo and Newcleo said, could solve a looming problem: Energy firms want to build a new wave of nuclear reactors, but the United States can't yet make enough conventional fuel from uranium to supply the plants. Harvesting old plutonium stockpiles could provide a short-term fix.

“A lack of fuel is one of the biggest choke points in expanding nuclear power right now,” said Jacob DeWitte, the chief executive of Oklo, which is developing a novel type of small reactor intended to run on plutonium. “This will help us get more nuclear power online faster.”

The plan has been criticized by some Democrats and nuclear nonproliferation experts, who point out that plutonium can be used to create nuclear weapons and argue that it needs extremely strict safeguards. Critics also say that past efforts by the United States and other governments to turn plutonium into fuel for reactors have faced technical difficulties and soaring costs.

“Countries have tried this before, and they concluded that, as nice as it would be to use that plutonium as fuel, it’s really just a liability and we need to dispose of it permanently,” said Scott Roecker, a vice president at the Nuclear Threat Initiative, a nonprofit group dedicated to reducing the spread of nuclear weapons.

The plan is not yet final, and companies will still have to negotiate with the federal government over how to secure and transfer the plutonium. In addition to Oklo, the Energy Department said it had also selected four other companies — Standard Nuclear, Exodys Energy, SHINE Technologies and Flibe Energy — to enter into advanced negotiations to receive the material under its Surplus Plutonium Utilization Program, which was established last year.

The program “is anticipated to help companies unlock the next level of private funding to broaden domestic nuclear fuel supplies, spur innovation on American recycling technologies, and unlock private sector funding to fuel the nation’s nuclear renaissance,” said Michael Goff, the principal deputy assistant secretary of nuclear energy, in a statement.

Oklo’s stock price was up more than 4 percent on Tuesday after the company announced its involvement in the program.

The Energy Department has been debating for years what to do with the large amounts of plutonium in its possession.

Plutonium does not typically exist in nature: It is a byproduct of nuclear fission, the process that powers nuclear reactors. In the 20th century, the United States created and stockpiled roughly 100 tons of the material as a key component for nuclear weapons.

Since the end of the Cold War, however, the U.S. military has dismantled thousands of nuclear warheads, leaving behind a stockpile of surplus plutonium at heavily guarded federal facilities across the country. Plutonium-239, the isotope used for weapons, is highly toxic if inhaled and has a half-life of 24,000 years.

In the 2000s, the U.S. government sought to build a plant in Savannah River, S.C., that would take surplus plutonium and blend it with uranium to create a mixed oxide fuel, or MOX, that could be used in nuclear power plants, which typically run on uranium alone. But the project was plagued by delays and cost overruns, and in 2018, the first Trump administration canceled the program, whose expected price tag had risen to more than \$50 billion.

The Energy Department that same year announced a plan to instead take 34 metric tons of surplus plutonium, dilute it so that it could no longer be used for weapons, and bury it in New Mexico. Doing so was estimated to cost \$20 billion.

But those plans changed again last May, when President Trump issued executive orders aimed at speeding up the construction of nuclear power plants in the United States. In one order, Mr. Trump told the Energy Department to identify any federally owned

plutonium and once again explore converting it into fuel.

Working with plutonium can be more challenging than working with uranium — the most common element used to make nuclear fuel — and typically requires specialized handling and ventilation systems. Because plutonium can be used to make bombs, it also needs high levels of security. Some of the government’s plutonium may also still be in weapons that haven’t yet been dismantled, in which case it will need to be processed and declassified before handed over.

Some Democrats have opposed the plan to hand over plutonium to the private sector, which the Energy Department initially announced last year.

“It raises serious weapons proliferation concerns, makes little economic sense, and may adversely affect the nation’s defense posture,” Senator Edward Markey of Massachusetts and Representatives Don Beyer of Virginia and John Garamendi of California wrote in a September letter to the agency.

The companies say they are prepared to deal with logistical challenges.

In an interview, Stefano Buono, the chief executive of Newcleo, said his company planned to build a fuel fabrication facility in Savannah River, S.C., near the site of the canceled MOX project. He said Newcleo could succeed where previous efforts had failed.

“The last time this was tried, it was not run as a private company, and there were basically no clients for the fuel,” said Mr. Buono. “We think we can do this at a very competitive

cost.” The plant, he said, could produce a wide range of nuclear fuels from MOX fuels to metallic plutonium fuels.

“If we can do this economically, we can also help reduce nuclear waste,” he added. “That’s the most sustainable option.”

The Trump administration has set a goal of quadrupling the size of the U.S. nuclear fleet by 2050, and many companies are developing a new generation of advanced reactors that are meant to be smaller and easier to finance than older reactors.

Yet many of those advanced reactors will require a specialized type of enriched uranium for fuel, known as HALEU, and the United States has lost much of its enrichment capacity in recent decades. A large fraction of enriched uranium for nuclear power plants still comes from Russia. While the Energy Department is spending billions of dollars to build up domestic fuel supply chains, that will take years, and Oklo and Newcleo are betting they can create fuel from plutonium more quickly as a stopgap.

“The plutonium is ready now,” said Caroline Dewitte, the chief operating officer of Oklo. “We just have to fabricate it.”

Oklo is developing a type of so-called fast reactor that can run on either uranium fuel, recycled nuclear waste or plutonium. The company has been conducting experiments at Los Alamos National Laboratory in New Mexico on using plutonium as fuel.

Mr. Markey has raised concerns that Energy Secretary Chris Wright had previously sat on

Oklo's board before joining the government. Mr. Wright has since divested his shares and has publicly pledged to "not participate personally and substantially" in decisions regarding Oklo.

Separately, the Trump administration is pursuing efforts to expand nuclear waste recycling and reprocessing, which could involve harvesting plutonium from the leftover waste of nuclear power plants and creating more fuel, something that France already does on a small scale.

To some experts, that is worthwhile. The world only has a finite amount of uranium. If nuclear power were to expand greatly across the planet, countries may eventually need some sort of reprocessing to power those reactors.

"If we're really serious about expanding humanity's use of nuclear power, then using plutonium makes a lot of sense," said Nick Touran, a nuclear engineer who runs the consultancy What Is Nuclear.

Yet nuclear waste recycling unnerves some nuclear nonproliferation experts. Starting in the 1970s, the United States sought to discourage other countries from reprocessing nuclear waste over concerns that it would create significant amounts of plutonium that could be diverted into weapons programs. New efforts to turn plutonium into fuel could break that longstanding taboo, critics say.

"Plutonium-based fuels and reprocessing have a poor track record when introduced in civilian nuclear energy programs," Ernest Moniz, a nuclear physicist who served as

energy secretary during the Obama administration, wrote last year.

Trying to revive the efforts, he added, "would introduce long-recognized security risks and have the unintended consequence of impeding nuclear energy expansion just as momentum builds for such an outcome."

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