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U.S. DEPARTMENT of ENERGY

NRC Certifies First U.S. Small Modular Reactor Design

NuScale power module becomes the first SMR design certified by the NRC.

Office of Nuclear Energy

January 20, 2023

3 min

NUCLEAR MILESTONES

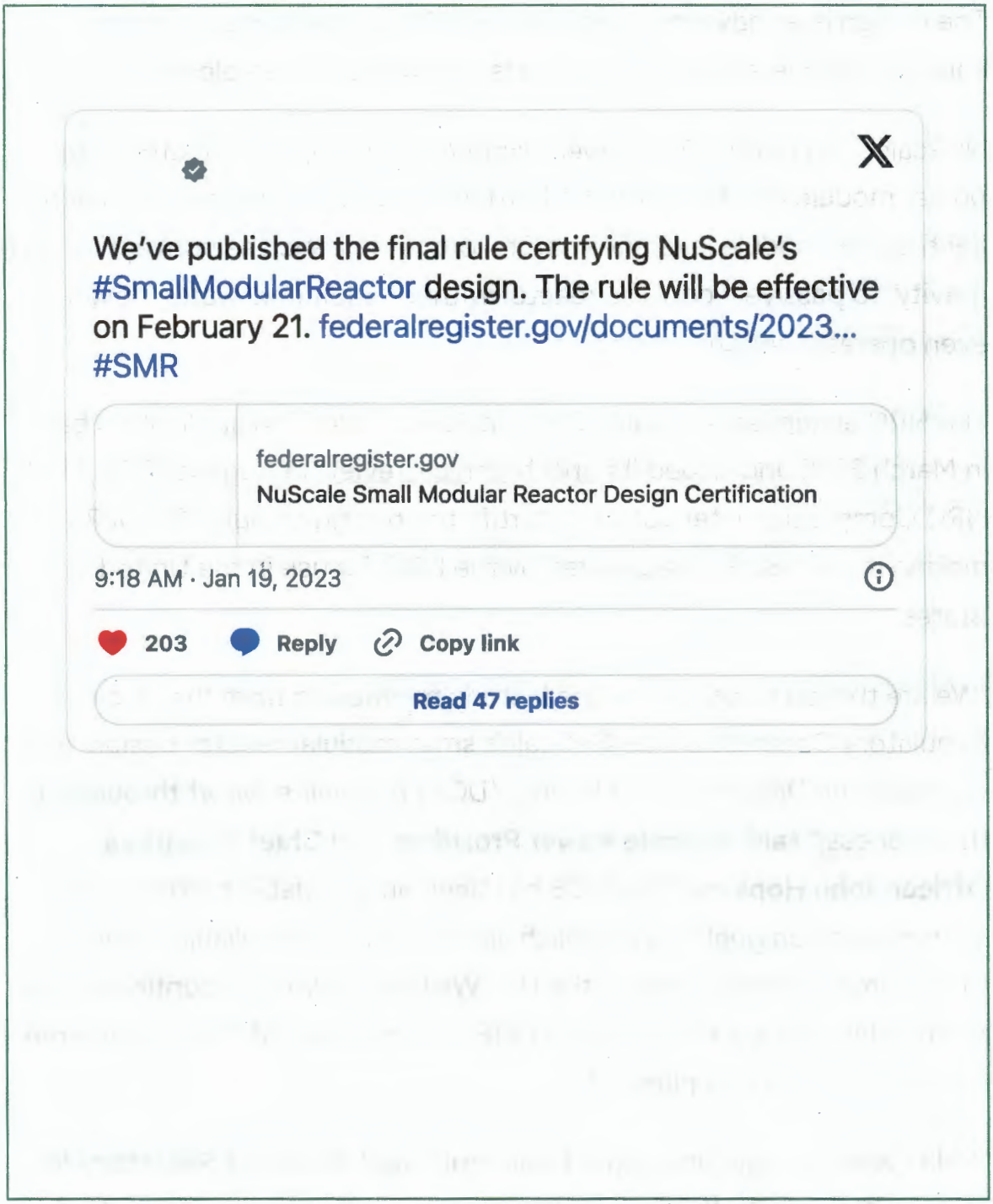
NuScale VOYGR™ SMR power plant

NuScale Power

The U.S. Nuclear Regulatory Commission (NRC) issued its final rule in the Federal Register to certify NuScale Power's small modular reactor.

The company's power module becomes the first SMR design certified by the NRC and just the seventh reactor design cleared for use in the United States.

The rule takes effect February 21, 2023, and it equips the nation with a new clean power source to help drive down emissions across the country.



Historic Rule Making

The published final rule making allows utilities to reference NuScale's SMR design when applying for a combined license to build and operate a reactor.

The design is an advanced light-water SMR with each power module capable of generating 50 megawatts of emissions-free electricity.

NuScale's VOYGR™ SMR power plant can house up to 12 factory-built power modules that are about a third of the size of a large-scale reactor. Each power module leverages natural processes, such as convection and gravity, to passively cool the reactor without additional water, power, or even operator action.

The NRC accepted NuScale's SMR design certification application back in March 2018 and issued its final technical review in August 2020. The NRC Commission later voted to certify the design on July 29, 2022—making it the first SMR approved by the NRC for use in the United States.

"We are thrilled to announce the historic rulemaking from the Nuclear Regulatory Commission for NuScale's small modular reactor design, and we thank the Department of Energy (DOE) for their support throughout this process," **said NuScale Power President and Chief Executive Officer John Hopkins**. "The DOE has been an invaluable partner with a shared common goal – to establish an innovative and reliable carbon-free source of energy here in the U.S. We look forward to continuing our partnership and working with the DOE to bring the UAMPS Carbon Free Power Project to completion."

"SMRs are no longer an abstract concept," **said Assistant Secretary for Nuclear Energy Dr. Kathryn Huff**. "They are real and they are ready for deployment thanks to the hard work of NuScale, the university community, our national labs, industry partners, and the NRC. This is innovation at its finest and we are just getting started here in the U.S.!"

NuScale is currently seeking an uprate to enable each module to generate up to 77 megawatts. The NRC is expected to review their application this year.

Supporting SMR Development

The U.S. Department Energy provided more than $600 million since 2014 to support the design, licensing, and siting of NuScale's VOYGR SMR power plant and other domestic SMR concepts.

DOE is currently working with Utah Associated Municipal Power Systems (UAMPS) through the Carbon Free Power Project to demonstrate a six-module NuScale VOYGR plant at Idaho National Laboratory.

The first module is expected to be operational by 2029 with full plant operation the following year.

UAMPS finished subsurface field investigation activities at the proposed INL site and expects to submit a combined license application to the NRC in the first quarter of 2024.

NuScale Power has 19 signed and active domestic and international agreements to deploy SMR plants in 12 different countries, including Poland, Romania, the Czech Republic, and Jordan in addition to the Carbon Free Power Project.




Tags:

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COMMERCIAL IMPLEMENTATION DEPLOYMENT

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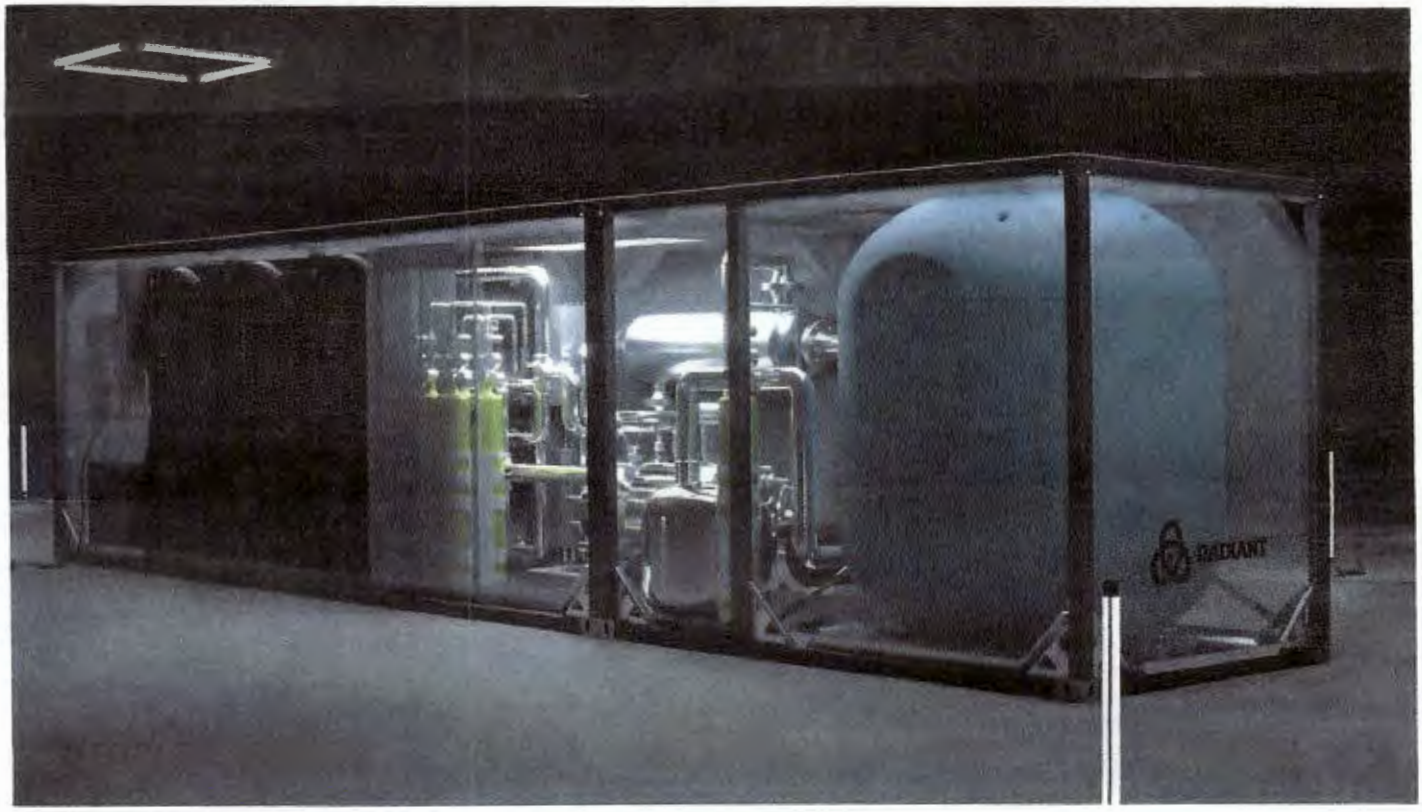
SMR = Small Modular Reactors. information from Freethink & Nuscale Power -



Radiant Industries Radiant Industries' Kaleidos microreactor is designed to fit inside a shipping container.

Potential, but not proven. The NRC has already approved one SMR, but its developer, NuScale Power, canceled its first planned project after the construction budget exploded from $5.3 billion to $9.3 billion. That was even more expensive, per kW, than the Vogtle reactors, which themselves took twice as long and cost twice as much as originally planned.

It's not clear whether NuScale's situation is a sign that SMRs aren't going to be as cheap as hoped or an example of the kinds of growing pains that can be alleviated with more experience. The ADVANCE Act could help us find out by getting more SMR and microreactor developers licensed to deploy their tech.

The DoE's recently announced plan to provide up to $900 million in funding to SMR developers could help get help, too, as could its Advanced Reactor Demonstration Program (ARDP), which has issued $160 million in funding to get innovative reactors — including one being developed by TerraPower — up and running.

The ADVANCE Act is also designed to help get new kinds of nuclear reactors licensed — this could include reactors with unique cooling systems, like TerraPower's sodium-cooled Natrium reactor, as well as small modular reactors (SMR) and microreactors.

As you'd expect from the names, SMRs and microreactors are smaller than the huge reactors mostly in use at current nuclear plants, which means they don't generate as much electricity.

However, their smaller size means they can be deployed in more locations — such as near power-hungry data centers, or as a complement to wind and solar farms — and multiple reactors can be added to a single site to scale up output to whatever is required.

SMRs and microreactors generally have simpler designs with safety characteristics that make them less likely to meltdown, and because they can (theoretically) be built on assembly lines in factories — rather than constructed on site like larger reactors — they have the potential to be cheaper and faster to deploy, too.

Right now, nuclear waste is stored on site at power plants in steel and concrete casks that pose no threat to human health. The US does lack a national plan for the *permanent* storage of its waste, though, and the consensus among experts is that we should eventually store it deep underground.

"When it's on the surface, it's dependent on a government that's going to continue to exist to protect it for 100, 200, 300 years," Elizabeth Muller, cofounder of

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Information of the differences on nuclear fission (currently in use in all nuclear power plants), and nuclear fusion (hopefully developed by 2040) information from the website of the IAEA International Atomic Energy Agency

What are the effects of fusion on the environment?

Fusion is among the most environmentally friendly sources of energy. There are no CO_2 or other harmful atmospheric emissions from the fusion process, which means that fusion does not contribute to greenhouse gas emissions or global warming. Its two sources of fuel, hydrogen and lithium, are widely available in many parts of the Earth.

What's the difference between nuclear fission and nuclear fusion?

Both are nuclear processes, in that they involve nuclear forces to change the nucleus of atoms. Chemical processes on the other hand involve mainly electromagnetic force to change only the electronic structure of atoms. Fission splits a heavy element (with a high atomic mass number) into fragments; while fusion joins two light elements (with a low atomic mass number), forming a heavier element. In both cases, energy is freed because the mass of the remaining nucleus is smaller than the mass of the reacting nuclei. The reason why opposite processes release energy can be understood by examining the binding energy per nucleon curve. Both fusion and fission reactions shift the size of the reactant nuclei towards higher bounded nuclei.

Does Fusion produce radioactive nuclear waste the same way fission does?

Nuclear fission power plants have the disadvantage of generating unstable nuclei; some of these are radioactive for millions of years. Fusion on the other hand does not create any long-lived radioactive nuclear waste. A fusion reactor produces helium, which is an inert gas. It also produces and consumes tritium within the plant in a closed circuit. Tritium is radioactive (a beta emitter) but its half life is short. It is only used in low amounts so, unlike long-lived radioactive nuclei, it cannot produce any serious danger. The activation of the reactor's structural material by intense neutron fluxes is another issue. This strongly depends on what solution for blanket and other structures has been adopted, and its reduction is an important challenge for future fusion experiments.

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Only SMR company approved by NRC Nuclear Regulatory committee

Renee Weinberg <renee@weinberginvestments.net> Tue, Aug 5, 2025 at 1:57 PM
To: OWNER-Renee georgette weinberg <renee@weinberginvestments.net>

NuScale?
NuScale remains the only SMR technology company with design approval from the NRC, and the company remains on track for deployment by 2030. "We are thrilled that the NRC has approved our second SDA application, this time for our 77 MWe design.May 29, 2025

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Fission vs fusion in nuclear power plants

Renee Weinberg <renee@weinberginvestments.net> Tue, Aug 5, 2025 at 1:46 PM
To: OWNER-Renee georgette weinberg <renee@weinberginvestments.net>

Is fission or fusion better for nuclear energy?
Nuclear fission power plants have the disadvantage of generating unstable nuclei; some of these are radioactive for millions of years. Fusion on the other hand does not create any long-lived radioactive nuclear waste.
Do SMRs use nuclear fission or fusion?
Small modular reactors, or SMRs, use fission to create heat that generates energy like traditional nuclear reactors. They're designed to be smaller than a traditional reactor. They vary in size and the power they produce.Aug 29, 2024

The Fight Against Yucca Mountain

The state's official position is that Yucca Mountain is a singularly bad site to house the nation's high-level nuclear waste and spent nuclear fuel for several reasons:

GEOLOGY and LOCATION: There are many unresolved scientific issues relative to the suitability of the Yucca Mountain site. These issues include hydrology, inadequacy of the proposed waste package, repository design and volcanism. The Yucca site is seismically and volcanically active, porous and incapable of geologically containing the waste. Yucca's aquifer drains to the Amargosa Valley, one of Nevada's most productive agricultural regions, is adjacent to a busy and growing Nellis Air Force Base, and is only 90 miles from our largest metropolitan area, Las Vegas.

LIMITED SPACE: Yucca isn't big enough to store all of the nation's nuclear waste. More than 70,000 metric tons of high level nuclear waste and spent nuclear is stored in more than 77 reactor sites across the country. That number increases by more than 2,000 tons each year. Yucca's statutory design capacity is only 77,000 metric tons. By the time Yucca would be filled to capacity in 2036, there will still be at least the same amount of spent fuel still stored at the reaction sites, even if no new plants are built.

TRANSPORTATION: Transporting waste to Yucca Mountain puts the American public at risk. More than 123 million people live near the proposed truck and train routes which would be used to deliver waste to Yucca Mountain. Those routes travel through 703 counties in 44 states. An accident or attack along those routes could hurt or kill thousands of innocent people.

NATIONAL SECURITY: Contrary to DOE arguments, building the Yucca Mountain repository will not make America safer. Instead, it will give terrorists more attractive and vulnerable targets. The DOE expects more than 100,000 shipments of spent fuel to be transported to Yucca Mountain-thus creating 100,000 mobile targets. Furthermore, the DOE plans to store high-level nuclear waste and spent nuclear fuel above ground at the Yucca site for at least 100 years. This creates the largest new spent fuel storage target in the world.

- The Nevada Agency for Nuclear Projects
- Yucca Mountain-Nevada's Perspective

Recent Yucca Mountain News

May 8, 2012 - Journal of Radiolocation Protection

- OPINION: Is Yucca Mountain a long-term solution for disposing of US spent nuclear fuel and high-level radioactive waste?