

Fusion: Startups prepare to power grid

Futuristic energy races to reality

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Nuclear fusion companies, backed by the Trump administration, are racing to build futuristic power plants that produce what industry experts call the ultimate sustainable energy source.

Nuclear fusion creates massive amounts of energy: roughly 4 million times more than burning coal, oil or gas, and four times more energy than nuclear fission, according to the World Nuclear Association.

For decades, fusion technology has been hyped as a way to easily meet the world's energy needs, if only it could be produced outside the laboratory.

Development is now progressing rapidly to bridge that gap, and nuclear fusion proponents say it is on the verge of powering the nation's grid, backed by significant funding and government support.

Current power plants use nuclear fission, which splits heavy atoms to release energy. Nuclear fusion joins light atoms, creating more power with less nuclear waste.

Dozens of U.S. companies are planning to achieve grid-scale nuclear fusion in the next decade and have the support of investors and the Trump administration.

Energy Secretary Chris Wright has created the Office of Fusion and announced a comprehensive national strategy to speed up the development and commercialization of fusion energy by the middle of the next decade. The office is providing grants and pairing private companies with government researchers to advance the technology.

Fusion energy development has

bipartisan support. In November, members of Congress introduced bipartisan legislation to make the fusion office permanent.

Fusion energy would not only add tremendous amounts of energy to the grid but also produce no carbon emissions. Unlike nuclear power plants, which generate energy through fission, fusion does not produce highly radioactive, long-lasting nuclear waste.

Mr. Wright said he expects fusion to deliver power to electricity grids worldwide within eight to 15 years, thanks to research at national labs and the work of private companies backed by billions of dollars in private investment.

“Secretary Wright has made clear that investing in the science and public private partnerships needed to turn decades of research into a clear pathway for delivering commercial fusion power to our grid is essential to advancing President Trump’s vision of unleashing American nuclear energy,” a department spokeswoman said.

One fusion startup, Denver-based Xcimer Energy, is shopping for a site in the United States to build a full-scale demonstration of nuclear fusion energy produced by a powerful laser beam. Company CEO Alexander Valys told The Washington Times that he is aiming to complete a commercial fusion energy power plant using these laser beams by 2035.

“Fusion is solar power without the middleman,” Mr. Valys said.

Fusion is the process by which two nuclei combine to form another nucleus. The fusion process powers the sun and other stars, releasing massive amounts of energy.

Fusion companies can’t replicate the sun. Instead, they use a process that fuses deuterium, extracted from seawater, with tritium produced in a nuclear reactor’s core.

Xcimer uses laser beams to compress and heat deuterium and tritium, initiating fusion reactions that produce more energy than they consume.

“The physics of fusion has already been demonstrated. Our challenge is the lasers tend to be very expensive. So now our focus is how do you make a laser much cheaper? If we can do that, then we can rely on the physics that are already proven.”

Producing and maintaining the lasers cost tens of millions of dollars.

Fusion startup Focused Energy, which is building a fusion power plant in the San Francisco Bay Area, purchased two of the world’s most powerful lasers in 2024 at a cost of nearly \$40 million.

Other companies plan to use high temperature, superconducting magnets to create fusion energy. It’s less expensive, but unlike laser technology, it is a process that hasn’t yet produced a net gain in energy. In other words, creating fusion with magnets consumes more energy than it generates.

Magnet fusion technology is advancing rapidly, and fusion companies are investing in it and building projects they say will start powering the grid in the next decade.

Type One Energy, based in Knoxville, Tennessee, is among the companies racing to build a commercial fusion project using a modular high-temperature superconducting magnet system.

It submitted an initial licensing application last month to become the state's first commercial fusion project, working in collaboration with the Tennessee Department of Environment and Conservation and the Tennessee Valley Authority.

The company plans to build two fusion power plants at the TVA's Bull Run Energy Complex in Clinton, Tennessee. Construction on the project will begin as early as 2028, pending additional state approvals.

The Infinity Two plant is designed to generate 800 megawatts of fusion power and 350 megawatts of electricity.

If companies can achieve commercial- scale fusion energy, then it will dwarf energy production from all other sources.

"I calculated you could power the entire grid in Colorado for an entire year with fusion fuel that you could carry in the back of a pickup truck," Mr. Valys said.

Proponents of wind and solar energy are critical of nuclear fusion, arguing it could be massively expensive. They point out that fusion produces some nuclear waste, although its low- and medium-level radioactive materials pose a much lower risk to the environment and human health than waste from traditional nuclear power plants.

Critics argue that, unlike renewables, fusion has yet to be proved to work at a commercial scale.

"Startups will need to build pilot plants to prove their concept. Raising enough capital to make those plants will likely be tricky," said Adam Stein, director of the Nuclear Energy Innovation program at the Breakthrough Institute, an environmental think tank. "First-generation stations are likely to be costly and unreliable. That is just a part of innovation.