INVESTING IN AMERICA'S NUCLEAR FUTURE

Recent legislation **allocates money toward** replacing fossil-fueled power plants with **advanced nuclear reactors.**

Terry Pratchett once wrote, "Most magic merely consists of knowing one extra fact." In 1912, when scientists began reporting that carbon emissions from burning coal would impact our climate, the specter of climate change became reality. But atomic power was unquestionably still magic.

In the 1930s, humanity discovered the one extra fact that brought the magic of nuclear fission into reality. Experiments by chemists Otto Hahn and Fritz Strassman, along with the explanatory theory from physicists Lise Meitner and Otto Robert Frisch, revealed the possibility of unleashing vast amounts of power from atom splitting. As world war approached, unprecedented spending by the U.S., a rapidly mobilized workforce, and profound ingenuity enabled us to harness that magic for both war and peace.

As soon as we harnessed nuclear fission, the U.S. built reactors, not just experimental, research, and naval reactors, but also commercial power plants. Between 1970 and 1990, U.S. workers put over 95 GWe of commercial nuclear energy capacity on the grid, slightly more than what remains on it today.

Nuclear energy remains the largest source of carbon-free electricity in the U.S. The goals set by the Biden-Harris Administration for a 50 percent reduction in carbon emissions by 2030, a 100 percent clean-power grid by 2035, and a net-zero economy by 2050 will require a buildout of every clean energy technology available, including nuclear power. When two new Westinghouse AP1000 reactors come online in Georgia (at Vogtle Units 3 and 4) in the coming year, they'll add nearly 2.5 GWe of clean power to the grid.

But that's not nearly enough. Recent analyses by federal agencies and the International Energy Agency indicate our national carbon mitigation targets can only be achieved by keeping as many existing reactors online as possible and potentially doubling U.S. nuclear power capacity by 2050.

The Biden-Harris Administration is meeting this challenge via the Bipartisan Infrastructure Law (BIL) and the Inflation Reduction Act (IRA).

The BIL includes $6 billion for the Civil Nuclear Credit Program for credits to keep existing nuclear reactors from prematurely retiring due to economic factors. The BIL also provides $2.5 billion for the Advanced Reactor Demonstration Program to develop, license, construct, and deploy two advanced reactors by 2028: X-energy's Xe-100 small modular high-temperature reactor in Washington state and TerraPower's Natrium sodium-cooled fast reactor at a retiring coal plant in Wyoming.

Meanwhile, the IRA includes clean energy production tax credits rewarding existing and new nuclear reactors for the emissions they avoid as well as the high-paying jobs they support. IRA also appropriates $700 million for a domestic supply chain of High-Assay Low-Enriched Uranium (HALEU). This fuel, with a ratio of ^{235}U between 5 percent and 20 percent, enables higher power densities, supports longer core lifetimes, and is needed for most advanced nuclear reactor designs. Establishing a HALEU supply will help improve U.S. energy security by providing a trustworthy fuel supply chain for advanced reactor deployment.

Today's advanced reactor designs seek economies of scale through modular fabrication and assembly. Many can adjust their power output to match demand and pair with renewables to provide 24/7 emissions-free electricity. These reactors hold massive potential for decarbonization, not only for a reliable electric sector, but also for clean hydrogen production, desalination, and process heating for the industrial and manufacturing sectors.

DOE's Office of Nuclear Energy supports RDD&D—research, development, demonstration, *and* deployment—for many advanced small modular reactor and microreactor concepts through our annual appropriations. Chief among these is the Carbon Free Power Project, in which we've partnered with Utah-based energy services provider UAMPS on a first demonstration and commercial deployment of NuScale's VOYGR-6. That sixpack of small, modular, light-water reactors will be built in Idaho Falls and connected to the grid by 2029.

Our planet's clean energy transition must transform terawatts, requiring hundreds of gigawatts of nuclear energy to complement the hundreds of gigawatts of renewable and storage capacity we must also deploy. We must also stop emitting carbon dioxide, which requires retiring fossil generation. Advanced reactors are well-suited to replace these fossil assets without leaving communities and skilled craftspeople behind. If we can replace most of our coal plants with nuclear energy, we may yet meet this moment. But it will require a great deal of engineering, and perhaps a bit of magic. **ME**

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