

The Case for Advanced Nuclear Energy

Summary

- **The next generation of nuclear energy can greatly contribute to national and global climate mitigation for the electric power and other sectors**
- **Advanced nuclear energy can protect human health by reducing air pollution while creating a new industry and supporting economic growth with high-paying construction and operation jobs**
- **American companies are leading nuclear technology innovation through research, development, and demonstration projects in partnership with the federal government. These innovations can restore the competitiveness of the United States in international markets**
- **The success of advanced reactors is not guaranteed. Federal support, regulatory reform, and cost competitiveness are all needed to fully unlock the climate mitigation potential of advanced reactors**

Overview

Advanced nuclear energy is a climate and clean energy solution to meet net-zero emissions goals. Existing nuclear energy supplies 10% of global electricity and 20% of U.S. electricity. In the United States, the existing nuclear fleet provides more carbon-free electricity than wind, solar, and hydro power combined. In addition to providing clean electricity, advanced reactors can also decarbonize non-electric sectors by providing district or industrial heating, producing hydrogen, and desalinating water. Together with renewable energy and other carbon-free energy sources, nuclear power can enable the U.S. to reach 100% clean energy by 2050. Because nuclear power is both highly reliable and carbon-free, it [substantially increases the likelihood](#) and reduces the overall cost of achieving mid-century climate targets. In addition to climate mitigation, nuclear power saves lives by reducing air pollution. A [2013 study](#) co-authored by noted climate scientist James Hansen found that nuclear power had prevented almost 2 million deaths between 1971 and 2009, and projected as many as 7 million lives saved by mid-century. However, despite these past and prospective benefits, the high costs associated with building conventional nuclear technology has led to U.S. industry stagnation, with few new nuclear plants built here in recent years. Through technological innovations, advanced reactors can catalyze a resurgence of new nuclear power and play a major role in decarbonizing the U.S. in line with Biden Administration goals.

Among other advantages, advanced reactors feature innovations that can reduce costs, improve safety, and mitigate spent fuel concerns. Nuclear innovators are pursuing multiple strategies to create new designs that make the next generation of reactors even better. By reducing the size of reactors, developers can lower absolute upfront capital costs, shorten construction timelines, and decrease financing uncertainty. By building plants quickly, developers can achieve rapid innovation cycles and continuous [technological learning](#) to reduce costs, much like what wind and solar power have achieved. Smaller reactors, less nuclear material, and the use of inherent or passive safety features mean that advanced reactors promise to be even safer than conventional nuclear by orders of magnitude. Finally, reactor and fuel cycle innovations can improve [fuel efficiency](#) or even recycle used fuel, lowering the spent fuel inventories that require long-term geological storage.

Advanced nuclear technologies can bring substantial economic benefits, including improved international competitiveness. Currently, the U.S. nuclear power industry supports [half a million employees](#) with salaries that are 30% higher than local averages. In addition to higher salaries, nuclear employees have higher rates of union labor and provide large employment opportunities for veterans. First-of-a-kind demonstration projects can support regional and state economies through innovation hubs and by attracting human capital. Small microreactors promise to make nuclear energy a [distributed energy source for the first time](#), powering microgrids and remote, energy-poor communities that currently rely on diesel fuel for electricity. Internationally, according to the U.S. Department of Commerce, nuclear developers and suppliers are at risk of missing out on a [\\$740 billion industry over the next 10 years](#). U.S.-developed advanced reactor designs can be competitive in global markets, growing U.S. exports while enabling decarbonized, clean growth for emerging economies. Congress and the administration must act swiftly to reestablish and secure America's place as the world leader in nuclear energy.

Recent government and industry activities are encouraging innovation. Bipartisan legislation has [provided a foundation](#) for federal research and development activities, and catalyzed long-term regulatory restructuring. Recently, the U.S. Department of Energy initiated the Advanced Reactor Demonstration Program to fund public-private partnerships for first-of-a-kind demonstrations and other industry activities. Companies like TerraPower and X-energy will receive [government funding up to \\$3.2 billion](#) over seven years to build and operate their advanced reactor projects.

More action is needed to fully unlock the potential of next generation nuclear energy, including continued regulatory modernization, increased investment in commercialization, and the reduction of barriers to innovation. Along with industry, NGO partners, and other stakeholders, groups like the [Nuclear Innovation Alliance](#) work to enhance the prospects of advanced reactors substantially contributing to climate mitigation. A [comprehensive strategy](#) developed by NIA and the Partnership for Global Security identifies actions the U.S. must take in order to establish advanced reactor leadership. Nuclear technology development is complex and requires enabling policy, regulatory, and market environments. A whole-of-society approach is needed. As the Nuclear Regulatory Commission is embarking on wide-ranging [regulatory modernization](#) to enable it to license advanced reactors, robust independent analysis can inform and improve this process to facilitate rapid adoption of advanced nuclear energy. As designs mature and reach the market, development banks and investors also need to be educated on the prospects of nuclear power growth in order to unlock additional capital. Energy market and policy design, particularly climate policy, will only be effective if it incorporates the benefits of advanced reactors.

For more information, please visit: <https://nuclearinnovationalliance.org/>