



Purdue University and Duke Energy Small Modular Reactor and Advanced Reactor Feasibility Study Interim Report | May 2023



A mutual interest in safe, reliable and clean energy brought Purdue University and Duke Energy together to explore the feasibility of bringing advanced nuclear technology to Indiana – pairing the nation’s largest operator of regulated nuclear power plants with one of the country’s top nuclear engineering schools.

To date, the study revealed several findings – spurring questions about the future of clean energy and recommendations for how to advance new nuclear development in the 2030s and beyond.



The full Small Modular Reactor and Advanced Reactor Feasibility Study Interim Report is available:
<https://purdue.ws/smrstudyreport>

Finding: Small modular reactors (SMRs) are a potential option to zero carbon emissions for Purdue University and should be further studied to help meet the future, long-term power needs of the West Lafayette campus with excess energy supplementing Indiana’s electric grid.

Electricity from nuclear power plants is a clean, carbon-free source of energy that is safe, reliable and available 24 hours a day. Nuclear technology also operates continuously and can complement the operations of renewable power, such as solar and wind.

Small modular reactors are one of the most promising emerging technologies capable of producing up to 300 megawatts electric (MW) per unit. Some newer SMR designs have higher generating capacities.

Finding: Small modular reactors offer significant safety and other advantages.

Small modular reactor designs are simpler, and some prefabrication can be performed off-site, making them easier, faster and more affordable to build than traditional nuclear plants.

The technology has enhanced safety systems that require no operator action or external power to shut down and cool the reactor. Emergency planning zones are also expected to be smaller than traditional nuclear power plants.

Finding: Small modular reactors offer economic benefits to Purdue and Indiana.

Building small modular reactors would create thousands of temporary construction jobs and hundreds of high-wage permanent jobs and generate millions in local taxes.

Purdue can play a critical role in workforce development along with other research universities, community colleges and private companies. Bringing small modular reactor technology to Indiana will help retain and attract talent to the state, and a significant number of the workforce could transfer from retiring coal plants. Zero carbon, reliable nuclear power will attract private companies to locate and expand in Indiana.

Finding: Innovation is happening now.

In the U.S., dozens of innovative, private companies are developing advanced nuclear technologies, and the U.S. Department of Energy is supporting many of them through research, development and demonstration projects to reduce the risk of commercialization. First-of-a-kind SMRs are expected to be in service in the U.S. later this decade.

Through the Advanced Reactor Demonstration Program, the U.S. Department of Energy is providing funding to two advanced nuclear projects that are expected to come online by the end of this decade and five others to help advance their designs.

Finding: Federal law supports advanced nuclear development, but more work is needed.

The 2022 Inflation Reduction Act gives utilities incentives for advanced nuclear technology, including repurposing retiring coal sites into nuclear power plant sites. At the state level, current policy allows for constructive cost recovery and incentives for nuclear.

The federal regulatory approval process is complex and lengthy, and streamlined planning, design, construction and financing are needed to establish private sector markets and supply chains for building and operating small modular reactors and advanced reactors.

Recommended next steps

At Purdue, and for Duke Energy's Indiana system, no technology has been selected, and no decision to build a new nuclear plant has been made. However, to further evaluate the viability of small modular reactors for Purdue University and Indiana, the study recommended these next steps:

Advocate for state and federal policy and funding needs



Advocate for constructive regulatory outcomes and economic incentives for advanced nuclear planning, development, construction, financing and operations.

State policy recommendations include offering additional support for development activities and state tax credits.

Federal policy recommendations include federally backed funding insurance options, increasing nuclear engineering and science workforce development programs, launching a public-private advanced reactor development program, creating a fuel availability program and maintaining federal tax credits.

Engage stakeholders



Purdue and Duke Energy hosted a six-part lecture series titled "Understanding Tomorrow's Nuclear Energy," which reached an audience of 4,900 in person and virtually. This outreach helped build awareness of the benefits and opportunities of new nuclear development. As technology advances, more opportunities to engage stakeholders are needed on topics such as carbon reduction, safety, reliability, economics, fuel supply and used fuel storage.

Conduct cost and economic studies, site evaluations and additional technology assessments



As first-of-a-kind projects progress, continue monitoring developments in advanced nuclear technologies and perform more detailed studies – identifying potential designs and locations for new nuclear units and quantifying the economic benefits of advanced nuclear deployment.