



"I'm excited to be part of the momentum and optimism around advanced reactors."

Ben Betzler, Nuclear Engineer



## Advanced Reactors: The Next Step in Nuclear Energy

Oak Ridge National Laboratory (ORNL) pioneered nuclear energy and is well positioned to usher in the next era of nuclear innovation. Since building the first permanent nuclear reactor more than 70 years ago, ORNL has shaped the development of reactors that now generate 20% of America's electricity. Today, ORNL leads efforts in advanced reactor technologies to address challenges related to our nation's aging reactor fleet and an ever-growing demand for energy.

### Reactors Reimagined

America's nuclear reactors operate on 40-year licenses from the Nuclear Regulatory Commission (NRC), with 20-year extensions possible. Because most reactor licenses will expire by 2030, America could face a significant energy deficit, with devastating effects on our electric grid and economy.

To address this challenge, ORNL is working with other national laboratories, universities, and industry leaders to research, develop, and eventually commercialize new nuclear power plants. These "advanced reactors" could improve nuclear energy's performance through enhanced safety features, increased power production, and significant decreases in nuclear waste. ORNL offers significant resources to assist in deploying advanced reactors.

- **Computing:** ORNL's supercomputing facilities provide tools for modeling and simulation to investigate advanced reactor designs and safety features, potentially reducing the time required to develop and license new designs.
- **Materials science:** ORNL facilities and instruments at the Spallation Neutron Source and High Flux Isotope Reactor allow ORNL scientists to develop and test materials used in nuclear environments.
- **Design expertise:** While ORNL is equipped to support the development of any advanced reactor design, its expertise in molten salt reactors is particularly extensive and has influenced several advanced reactor concepts from the nuclear industry.

**13**

Nuclear reactors built at ORNL for a variety of purposes from research to radioisotope production

**20%**

Total US electricity generated by nuclear reactors in 2016, up from 11% in 1980

**1%**

Estimated annual increase in demand for domestic electricity through 2030

**100,000**

American jobs associated with nuclear energy production\*



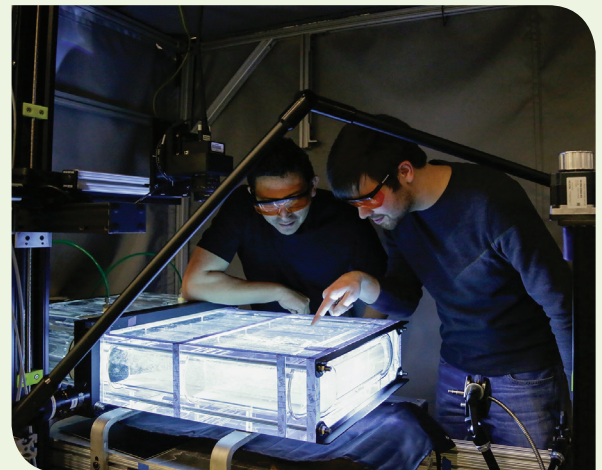
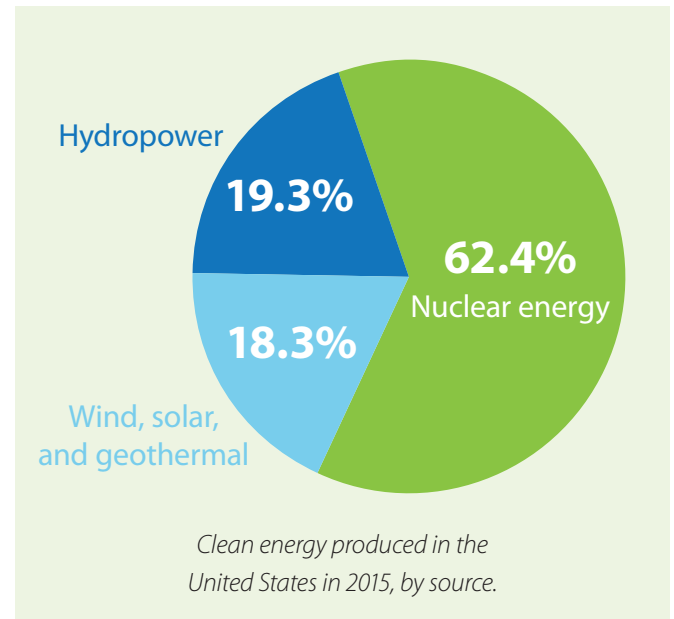
## Partnerships and Collaborations

ORNL has worked with other national laboratories on initial drafts of advanced reactor design criteria, which are instrumental in the NRC's proposed guide for new reactor development. Expected to be published in 2017, this regulatory guide will help designers and applicants through the licensing process. ORNL also participates in a variety of efforts to support the development and implementation of advanced reactors, including

- The US Department of Energy's Gateway for Accelerated Innovation in Nuclear (GAIN), where ORNL participates in various projects to move nuclear energy technologies toward commercialization. Partners include Southern Company Services, X-energy, Transatomic Power Corporation, TerraPower, Electric Power Research Institute, Vanderbilt University, BWX Technologies Inc., Oregon State University, Teledyne-Brown Engineering, SGL Group, and Idaho National Laboratory.
- Additional agreements that connect the Lab's expertise to industry's efforts to move reactor designs closer to reality. Partners on these projects include Transatomic Power, Terrestrial Energy Inc., Tennessee Valley Authority, and NuScale Power.
- The second Molten Salt Reactor Workshop, held at ORNL in 2016, where nearly 200 attendees from industry, utilities, reactor design firms, and universities convened. The Lab also hosted the Nuclear Infrastructure Council's Advanced Reactor Technical Summit III, which focused on lowering the cost and accelerating the deployment of advanced reactors.

### Contact:

Ken Tobin, Director, Reactor and Nuclear Systems Division  
tobinkwjr@ornl.gov, 865-574-5267  
One Bethel Valley Road, Oak Ridge, TN 37831



ORNL researchers use various techniques, including high speed photography, to improve experiment accuracy.

\*Source: The Nuclear Energy Institute

