VERSATILE TEST REACTOR

World-Class R&D enabled by fast neutrons

WHY NUCLEAR?

Energy and electricity demands are increasing worldwide. Meanwhile, nearly a billion people today have no access to electricity, according to the International Energy Agency. Nuclear energy will be part of an integrated solution going forward, helping supply carbon-free power to an energy-hungry world.

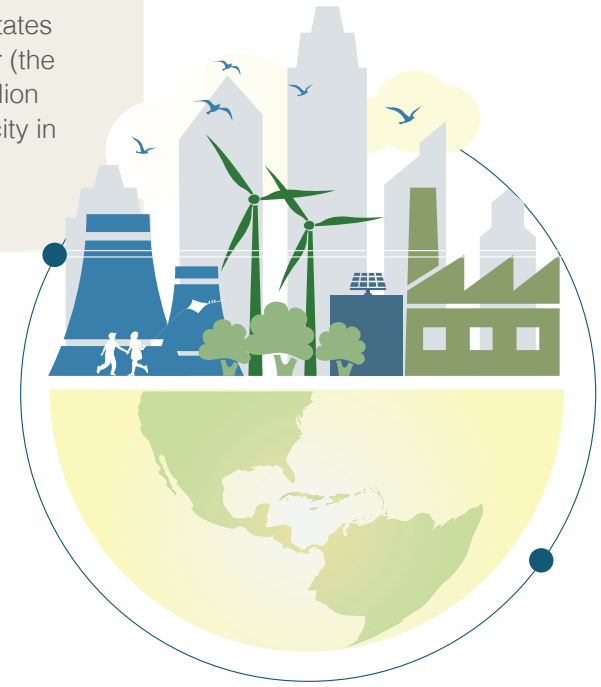
Nuclear energy provides

10.5%

of all electricity generated in the world, with the United States being the lead producer (the U.S. produced 807.1 billion kilowatt-hours of electricity in 2018 – the highest total ever).

ENVIRONMENT

- According to the World Health Organization, exposure to air pollution causes up to 4.2 million premature deaths worldwide per year through cardiovascular and respiratory disease. Using clean electrical generation such as nuclear will help save lives.
- Nuclear power electrical generation has a very low impact to the environment compared to other sources at similar scale.
- 20% of America's electricity is produced from 96 nuclear reactors in 29 states. These reactors provide more clean energy to the grid than any other energy source, accounting for 55% of the country's clean energy electricity production.



SAFETY AND SECURITY

- The ability to positively impact global nuclear safety, security, and nonproliferation policy relies upon ensuring a robust nuclear program.
- In the U.S., nuclear power plants operated at full capacity more than 92% of the time in 2018 – making it the most reliable energy source in America.

ECONOMICS

- The Nuclear Energy Institute estimates each nuclear plant employs 530 employees, and for every 100 direct jobs at a nuclear facility, the local economy produces an additional 66 jobs and another 726 jobs throughout America.
- The global market for nuclear generating capability is estimated to be $1 trillion. Nuclear power generation is projected to grow 73% by 2040, primarily driven by developing countries, especially China and India.
- Nuclear power provides a reliable energy supply at a reasonable cost, an important factor in U.S. citizens' quality of life and industrial and economic competitiveness.

WHY VTR?

The United States has long been a leader in the development of nuclear technologies. Currently, there is no fast neutron testing capability in the United States to support advanced reactor research and development. The only capability for fast neutron testing is the Bor-60 reactor in the Russian Federation. The VTR will leverage existing U.S. government and industry investments in nuclear reactors to accelerate its design and construction process, using proven nuclear reactor technology to create a world-class scientific infrastructure.

MEDIA CONTACT

Kortny Rolston-Duce
kortny.rolston-duce@inl.gov

TECHNICAL CONTACT

Kemal Pasamehmetoglu,
Executive Director
kemal.pasamehmetoglu@inl.gov

VTR
VERSATILE
TEST REACTOR

WHAT IS THE PROBLEM?

The U.S. lacks a scientific facility to provide fast neutron testing, required for rapid and accurate new material and nuclear fuel research and development. Many U.S. companies are working on technologies to make the next generation of reactors and the existing reactors more economically competitive and reliable. New reactors and support of existing reactors require continuing research and development of new materials and nuclear fuels.

New Materials and Nuclear Fuels Development

Development efforts typically start with materials research, progress through refining and testing the material, and finally perform rigorous safety testing to qualify the new material or nuclear fuel for nuclear reactor use. Fast neutrons are used for all phases of this development.

Fast Neutrons for Testing

Fast neutrons have a higher energy level than slow (thermal) neutrons; therefore, they interact differently with the material exposed to these neutrons. This energy level is necessary for developing and providing accelerated testing of materials, fuels, and instrumentation for use in the existing fleet and advanced reactor concepts.

Impact of Testing Gap

The impact of not supporting nuclear technology development includes:

- Losing global nuclear technology leadership.
- Diminished ability to compete in estimated $1 trillion global market.
- Substantially reduced global influence in nuclear safety, security, and nonproliferation policies.

WHAT IS THE SOLUTION?

VTR – A Flexible Resource for Generations

The VTR will use existing proven nuclear reactor technology to provide fast neutrons, and a capability to rapidly insert, conduct, and remove state-of-the-art experiments. Future innovations in experimental capability can be used in the VTR without modification to the facility.

The VTR will provide support for progress in multiple important science and technology areas including:

- Testing and qualification of advanced reactor fuels.
- Testing and qualification of innovative structural materials.
- Testing of innovative components and instruments.
- Validation of advanced modeling and simulation tools, and the versatility to support future technical missions.

By using proven technology, the VTR will leverage existing reactor designs and operating experience to reduce the risk, cost, and time for design and construction.

The VTR development efforts are using the best available resources from the DOE laboratories, industry, and universities to expedite the reactor design and construction, and to develop the scientific infrastructure for a powerful testing capability sustained over many decades.

The VTR specific reactor technology and location are being determined by the U.S. Department of Energy in accordance with capital acquisition and NEPA processes.

19-50140_R1