ABILENE CHRISTIAN UNIVERSITY

acunextlab.org

NEXT

Nuclear Energy eXperimental Testing

Finding global solutions to the world's most critical needs

Changing the world

The mission of Abilene Christian University is to educate students for Christian service and leadership throughout the world. ACU's 21st-Century Vision is to be a premier university for the education of Christ-centered, global leaders – a unique position in higher education where students and faculty work together in a mentoring relationship while addressing real-world problems with global impact.

The mission of ACU's NEXT Lab is to provide global solutions to the world's need for energy, water and medical isotopes by advancing the technology of molten salt reactors while educating future leaders in nuclear science and engineering.

The key technologies of these advanced reactors are cooling them with molten salt and providing fuel in a liquid form. Nuclear power is already the safest and cleanest energy source in the world, but it can still be improved. By adding these two critical design features, advanced reactors will be even safer than current nuclear reactors, produce no carbon emissions, increase efficiency and decrease waste, all while making electricity more affordable.

ACU is collaborating with the Georgia Institute of Technology, Texas A&M University, and The University of Texas at Austin to design, license and commission a molten salt-fueled research reactor to be hosted on ACU's campus. The four-university consortium called NEXTRA (NEXT Research Alliance) recently announced funding of $30.5 million over the next three years from Abilene-based Natura Resources.

To secure a license from the Nuclear Regulatory Commission, considerable research is needed including testing advanced instrumentation, evaluating salt properties, making fundamental data measurements and testing hardware that can be used with molten salts. All of this work is being done at ACU.

ACU: The right place, the right time

ACU is well positioned to contribute in significant ways to this challenge. The university is widely recognized for involving undergraduates in world-renowned research alongside its distinguished faculty and collaborating across disciplines, setting Abilene Christian apart from its peers in higher education.

The NEXT Lab fits perfectly into this model, as students will provide invaluable help in developing molten salt test systems. For years, ACU undergraduates in physics and engineering have filled major roles at national physics laboratories, contributing to groundbreaking research and discoveries. Collaboration at the NEXT Lab has already successfully engaged undergraduates majoring in physics, engineering, chemistry, mathematics, computer science, finance, and advertising/public relations.

The molten salt test loop was the first system to flow salt and is housed in the Bennett Engineering and Physics Laboratories, a historic and renovated facility where classes and labs meet. This system was critical to testing the first patent produced by NEXT Lab, a high temperature flow meter.

ACU's on-site test facility is providing unprecedented access for students and faculty to collaborate in this cutting-edge research to solve one of the world's most pressing problems: the need for clean, safe, and affordable energy.

Students at ACU, led by outstanding faculty and others at consortium institutions, will be well prepared to serve and lead around the globe in the fields of nuclear science, chemistry and engineering.

Science education and research have been long-standing priorities at ACU and were enriched in 2018 by a $45 million investment in Bennett Labs, Onstead Science Center and Halbert-Walling Research Center. Plans are underway for a 28,000-square-foot Science and Engineering Research Center, scheduled for completion in 2022. The SERC will house a radiochemistry lab as well as the next iteration of molten salt test system, allowing all the components to be tested in full size before constructing the actual research reactor.

Abilene Christian's state-of-the-art science facilities and world-renowned programs make ACU the right fit to lead and house the NEXT Lab.

NEXTRA
Nuclear Energy eXperimental Testing Research Alliance

The need for advanced reactors

Energy is essential for the delivery of drinking water, high-quality health care, security, commerce, communication and virtually every other part of our modern life.

In many parts of the developing world where the supply of energy is expensive, intermittent or unavailable, quality of life is greatly decreased. The living standard of people around the world is directly related to the amount of energy that is available for consumption.

Advanced reactors, such as the molten salt research reactor, have never been more essential to addressing the critical needs of the world's population.

Safer, cleaner and less-expensive energy

Advanced reactors modeled after the molten salt research reactor are the preferred reactors to use in the quest for improving energy supply for several reasons.

SAFE AND CLEAN: Nuclear power is the safest and cleanest method to generate electricity on a commercial scale. The safety record of nuclear power is far superior to any other electricity-producing method and advanced reactors will be even safer. The molten salt research reactor will produce trivially small amounts of waste, less than a pound per year. Advanced reactors like the molten salt research reactor only produce a few percent of the total waste that current reactors produce, and this waste will be relatively short-lived. In addition, nuclear power produces zero carbon dioxide emissions.

INEXPENSIVE: With new advanced reactor designs, the cost of power plants can be significantly reduced. Electricity can be produced at a true cost that is cheaper than any current energy source including coal, natural gas, solar or wind.

AVAILABLE ON DEMAND: Intermittent sources of electricity, such as wind or solar, can't be depended on to supply electricity in a meaningful large-scale manner. Conversely, nuclear reactors are designed to naturally produce more energy when there is a higher demand for electricity.

Pure and abundant water

The molten salt research reactor will operate at high temperatures (above 600° C), and commercial reactors using this technology will be an efficient heat source for industrial applications, including the desalination of water. Given that one in three people around the world suffer from a shortage of fresh water, this addresses a fundamental global need.

Medical isotopes for diagnosing and treating cancer

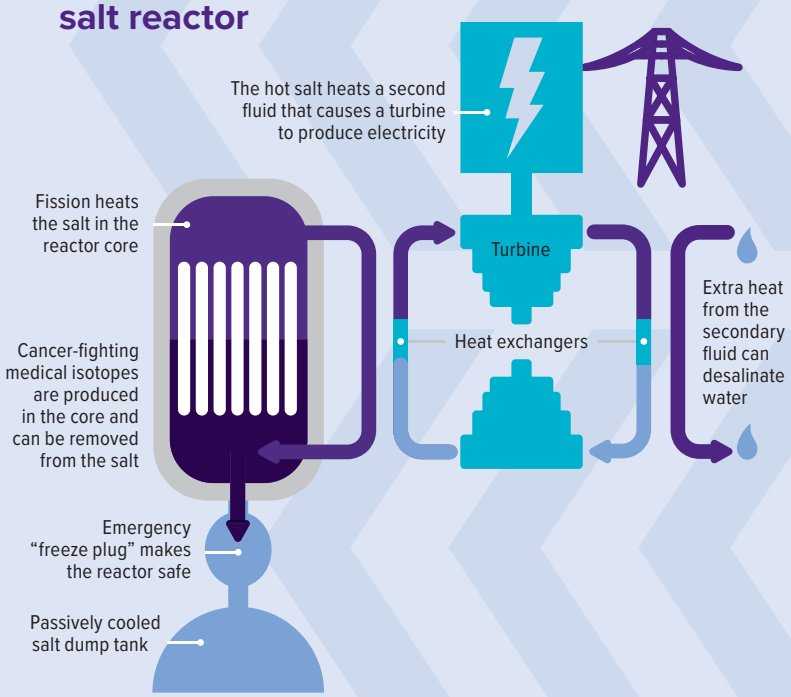
The molten salt research reactor will naturally produce isotopes that are needed for treating cancer but are not found in nature. Molybdenum-99 (Mo-99) and bismuth-213 (Bi-213) are two radiopharmaceuticals showing great promise for diagnosing and treating cancer. Mo-99 allows doctors to make diagnoses quickly without the need for an invasive procedure.

Bi-213 provides a new treatment option, one that would spare patients from the pain caused by chemotherapy and has been amazingly effective in limited trials.

With the current unstable and limited worldwide supply of Mo-99, doctors are sometimes forced to make choices on which patient has a greater need for the procedures. To solve this shortage problem, people around the world are searching for a reliable supply of Mo-99. Currently, there is no source for Bi-213.

In both cases, the molten salt research reactor is the first critical step to a solution. Bi-213, Mo-99 and many other medical isotopes are formed efficiently in the natural nuclear processes inside the molten salt research reactor.

Liquid-fueled molten salt reactor



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The percentage of people on Earth who use animal dung or other waste products to heat their homes and cook their food

1 in 2

The number of people at risk of developing cancer in their lifetime

1 in 4

The number of people at risk of dying from cancer

1 in 3

The number of people who do not have access to the water needed for proper hygiene and sanitation

NEXT Lab's history

2015 After several years of research into sustainable energy sources, Dr. Rusty Towell, ACU professor of engineering and physics, presented findings at a TEDxACU talk titled "Why Making Energy From Dirt Might Save the World." His talk sparked interest in funding and support for future research.

2016 NEXT Lab officially formed.

2018 The Development Corporation of Abilene approved $300,000 in research and development funding for NEXT Lab, and the first full-time staff member was hired. Just a few months later, $3.2 million was contributed by the Robison Excelsior Foundation, and salt flowed through a molten salt test loop for the first time. Officials from the U.S. Department of Energy toured NEXT and requested follow-up visits in Washington, D.C.

2019 ACU hosted NEXTRA workshops in March and October. In June, the U.S. Department of Energy awarded an $800,000 grant to NEXT Lab for molten salt research, and the DOE issued a Letter of Support.

2020 Natura Resources announced funding of $30.5 million to NEXTRA over the next three years, with $21.5 million going to ACU and the remaining $9 million to the other consortium universities. NEXT Lab received its first patent – for a high-temperature flow meter to help monitor the flow of molten salt through a pipe at temperatures as high as 700 degrees Celsius. NEXT Lab submitted a Regulator Engagement Plan to the NRC and began a series of public meetings leading to a construction permit application.

Natura Resources SUSTAINABLE ENERGY

2021 In January, NEXT Lab installed a second molten salt test loop in its on-campus facility in Abilene, Texas, and plans are formalized for a third larger molten salt test system.

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