The Molten Salt Research Reactor at Abilene Christian University :

The leading advanced reactor project sponsored by Natura Resources

Nuclear Energy and Applications IEEE Workshop
Dr. Rusty Towell, ACU NEXT Lab Director
October 19, 2026

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ABILENE CHRISTIAN UNIVERSITY



- ACU's mission is to educate students for Christian service and leadership throughout the world.
- ACU is an R2 university with our main campus in Abilene, Texas: population 130,500
- **2026-27 marks the ninth consecutive year** for record student enrollment at ACU: 7,877

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ABILENE CHRISTIAN UNIVERSITY

TOP 25 IN UNDERGRADUATE TEACHING

BEST COLLEGES U.S.News & WORLD REPORT UNDERGRADUATE TEACHING 2027

Also nationally recognized for research, innovation and student experience

BEST COLLEGES U.S.News & WORLD REPORT UNDERGRADUATE RESEARCH / CREATIVE PROJECTS 2027

BEST COLLEGES U.S.News & WORLD REPORT MOST INNOVATIVE 2027

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BEST COLLEGES U.S.News & WORLD REPORT FIRST-YEAR EXPERIENCES 2027

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POWERED BY

Natura Resources

N*uclear* **E***nergy*
*e***X***perimental* **T***esting Lab*



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GLOBAL CRITICAL NEEDS



1 in 2 do not have access to the **energy** needed to lift them out of poverty



1 in 3 do not have access to clean **water**



1 in 2 will develop **cancer** and need medical isotopes

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OUR MISSION

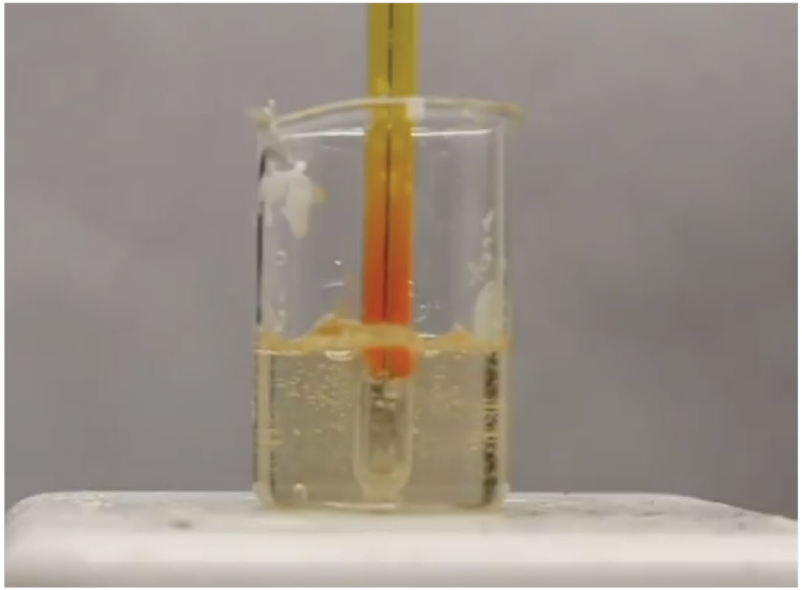
The mission of ACU's NEXT Lab is to provide global solutions to world's need for energy, water, and medical isotopes by advancing the technology of molten salt reactors while education future leaders in nuclear science and engineering.

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KEY REQUIREMENT 1: MOLTEN SALT COOLANT

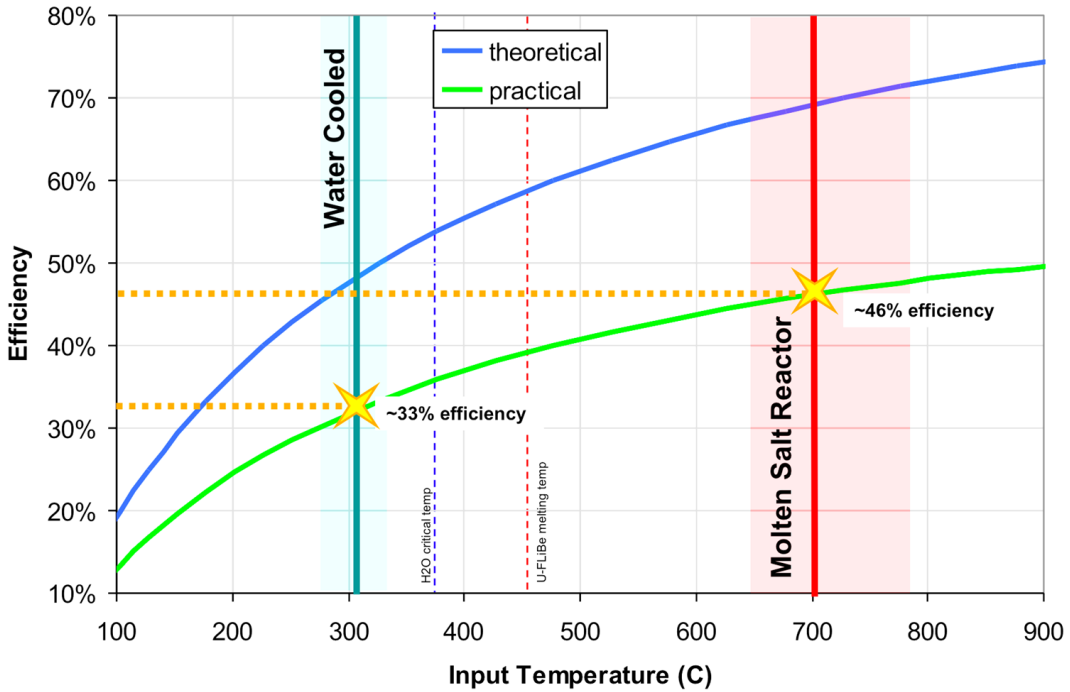




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KEY REQUIREMENT 1: MOLTEN SALT COOLANT

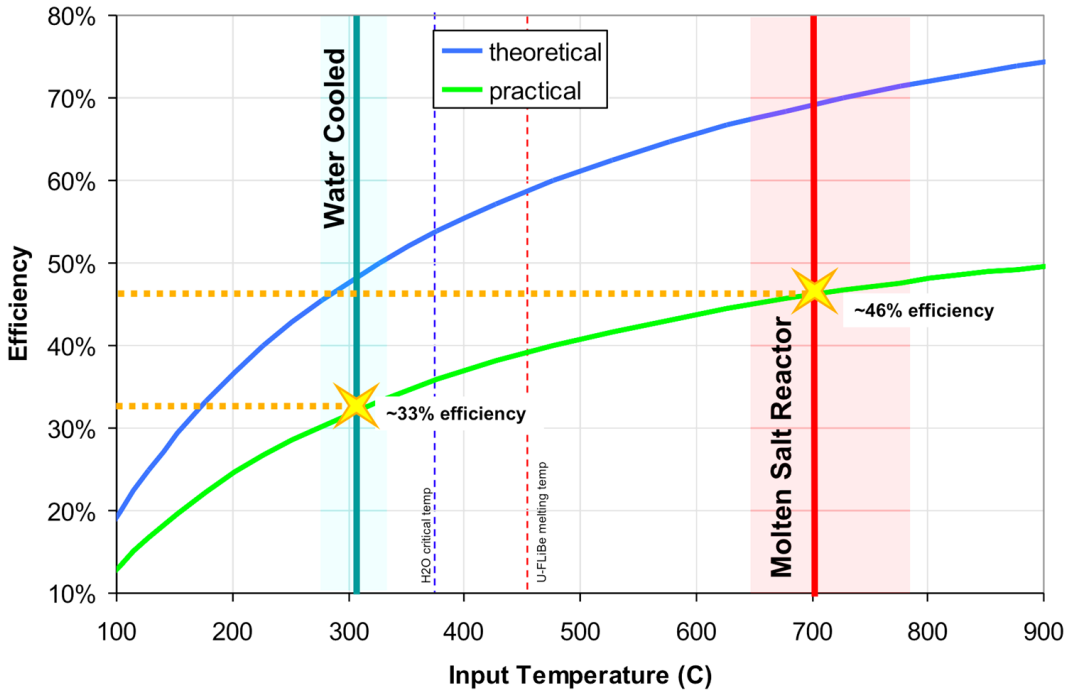
- **High Temperature:**
  - Improved efficiency
  - Industrial heat
- **Safe – Low Pressure**
  - No phase transition to a vapor
- **Enables…**



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KEY REQUIREMENT 1: MOLTEN SALT COOLANT

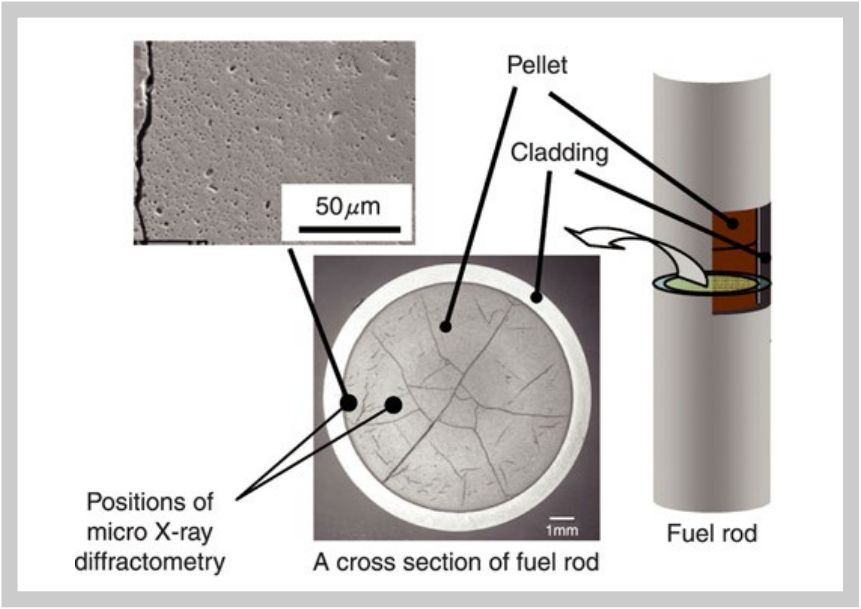
- **High Temperature:**
  - Improved efficiency
  - Industrial heat
- **Safe – Low Pressure**
  - No phase transition to a vapor
- **Enables…**



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KEY REQUIREMENT 2: LIQUID FUEL

Old Solid Fuel Technology

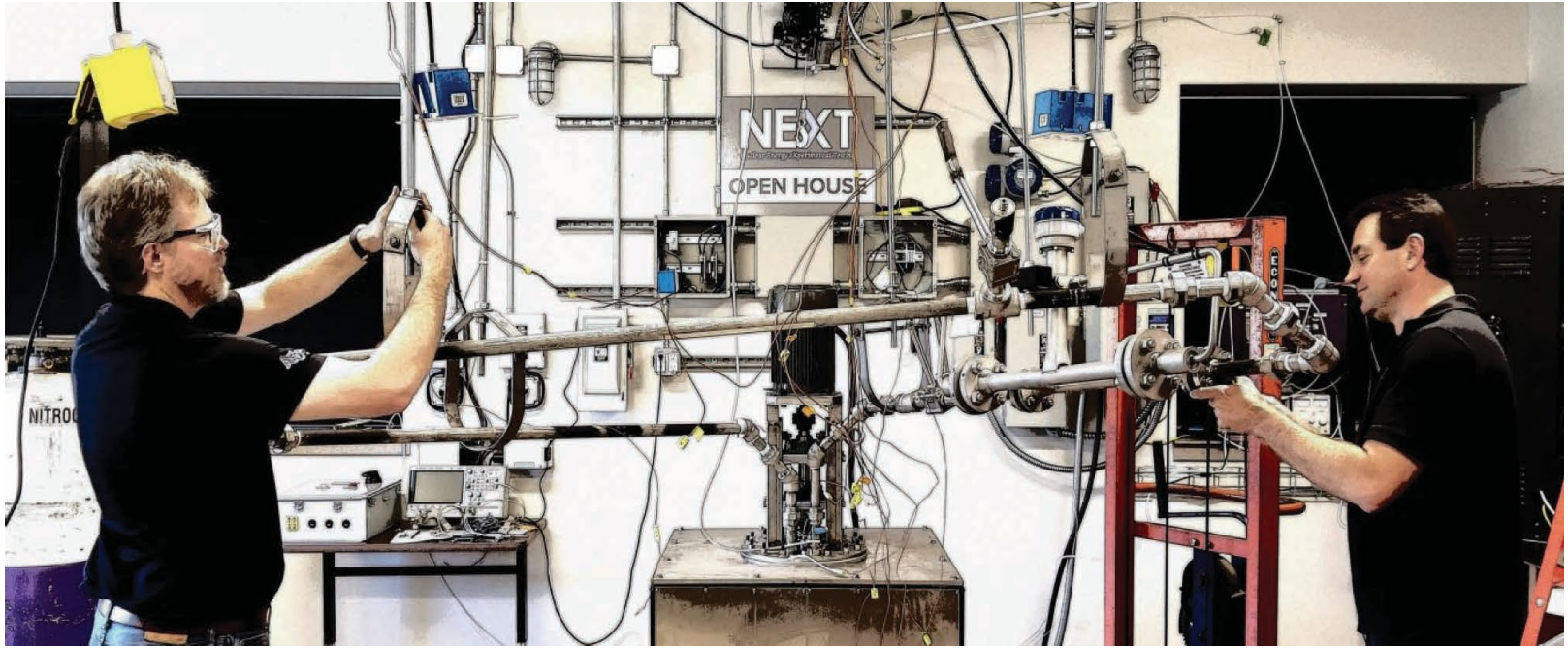


Advantages of Liquid Fuel:

- Increased fuel utilization
- Decreased waste
- Access to isotopes
- Can not melt down
- Efficient use of many fuel forms

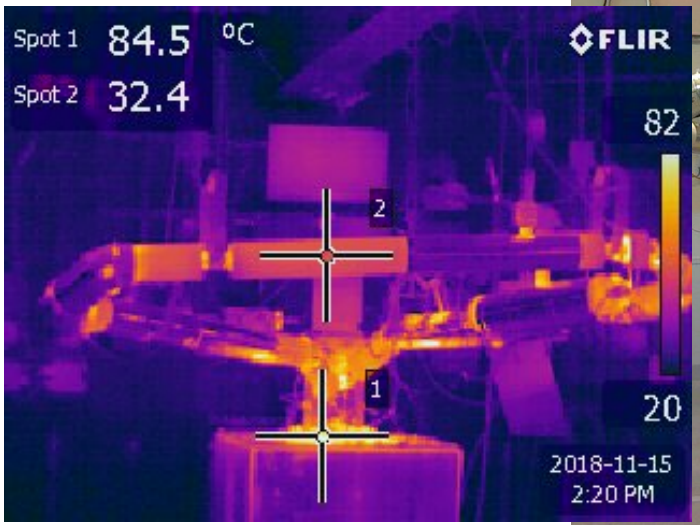
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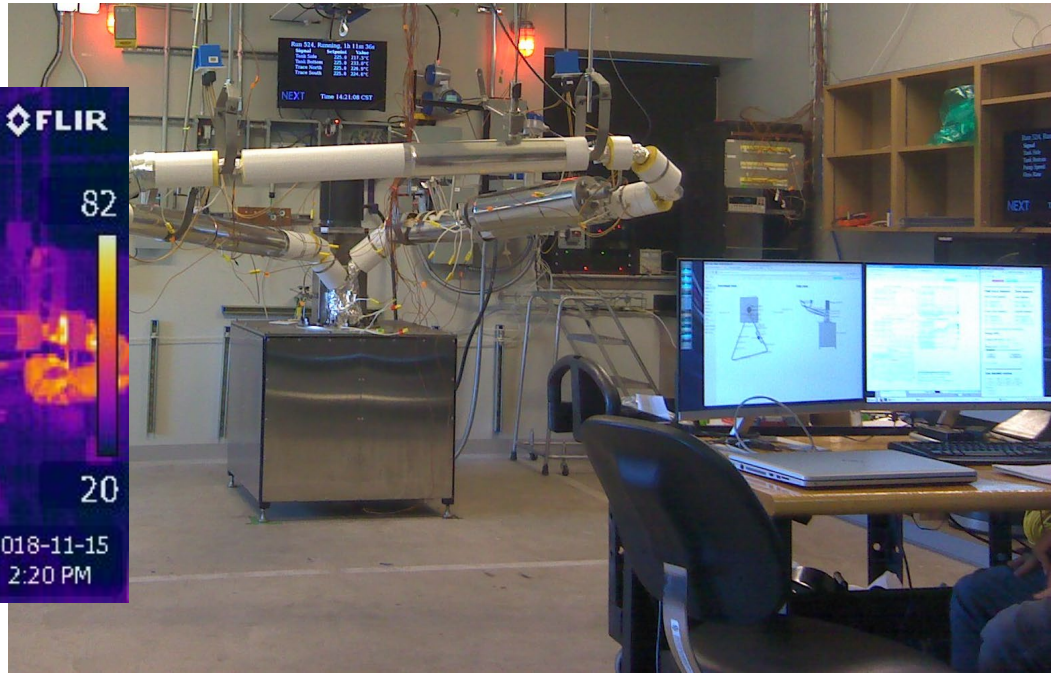
MOLTEN SALT TEST LOOP (2018)



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MOLTEN SALT TEST LOOP





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Department of Energy NEXT Lab visit 2018

- **Assistant Secretary for Nuclear Energy Edward McGinnis**
- **Extremely impressed with our Vision and Work**
- **Wanted more details about our Plan**
- **Follow up visit to DC in January**



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ACU visit to Department of Energy in DC in 2019

- **Presented a plan to build the Molten Salt Research Reactor.**
- **Asked DOE for fuel (500 kg HALEU), salt (FLiBe), and licensing support.**
- **DOE was excited to help and committed their support in writing.**



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Natura Resources

Natura Resources, LLC is committed to answering the world's increased demand for **reliable energy**, **medical isotopes**, and **clean water**, by developing **commercially deployable** molten salt reactors (MSRs)

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Natura Resources

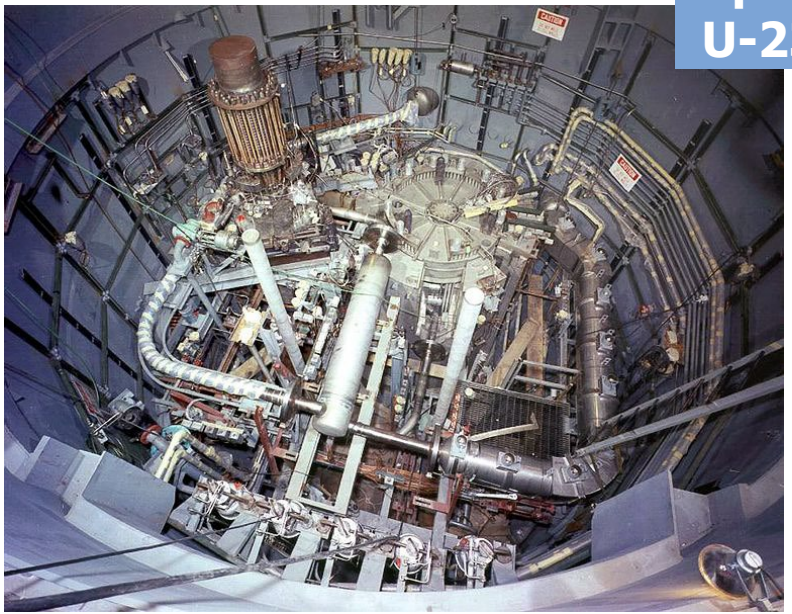
RESEARCH ALLIANCE

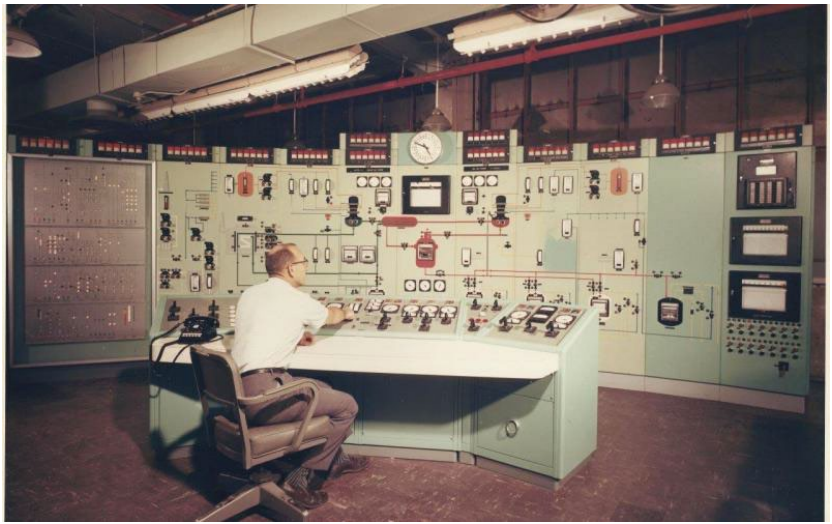
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MOLTEN SALT RESEARCH REACTOR IS SIMPLIFIED MSRE

The Molten Salt Reactor Experiment operated at ORNL from 1965-1969 on U-235 and U-233.





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MOLTEN SALT RESEARCH REACTOR IS SIMPLIFIED MSRE

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Shared Concepts

- Same Salt and Fuel Form: UF_4, LiF-BeF_2
- Loop design
- Graphite moderator
- Drain tank
- Trench-based radiation protection
- Short expected lifetime
- Low pressure

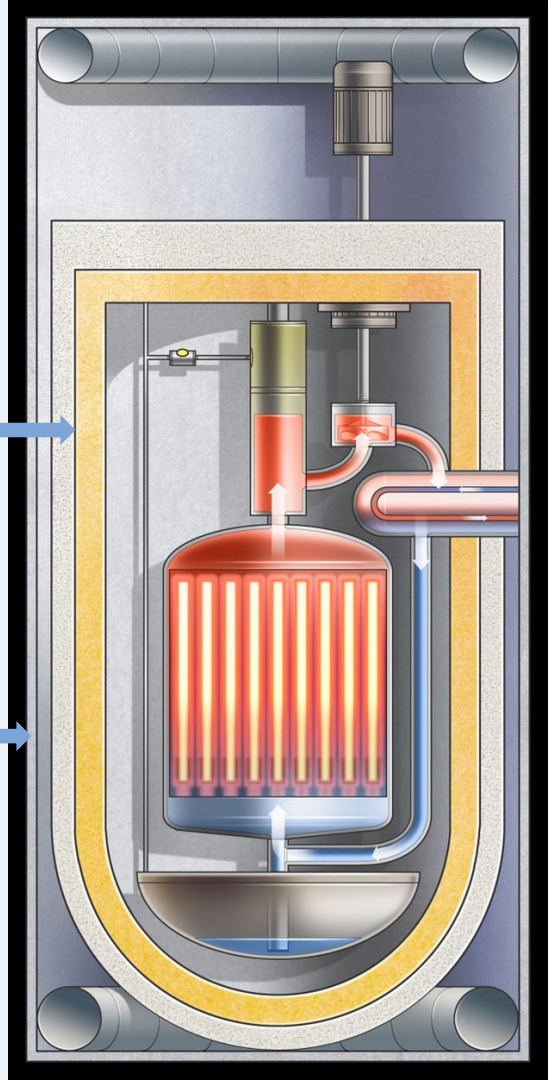
Simplified Concepts

- 19.75% instead of 33% ^{235}U
- <<1 MW_{th} not 8-10 MW_{th}
- SS-316 instead of Hastelloy-N
- No freeze valve, shut down via simple drain
- Control rods not safety related

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MSRR SAFETY FEATURES

- **Layered enclosures:**
  - Salt
  - Primary fueled salt loop
  - Reactor Thermal Management System (RTMS)
  - Reactor Enclosure
  - Reactor Cell
- **Low pressure system**
- **Shutdown via core drain**
- **Passive heat removal during shutdown**



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HISTORIC NRC CONSTRUCTION PERMIT APPROVAL SEPT. 16, 2024

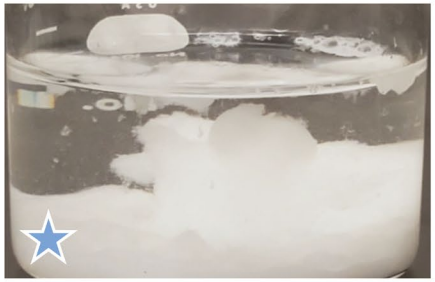


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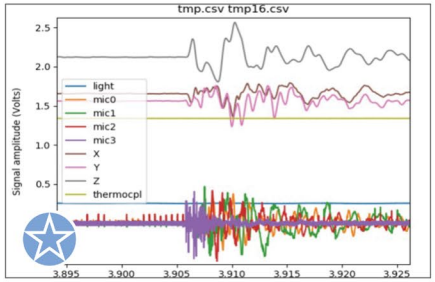
NEXT LAB RESEARCH PROJECTS



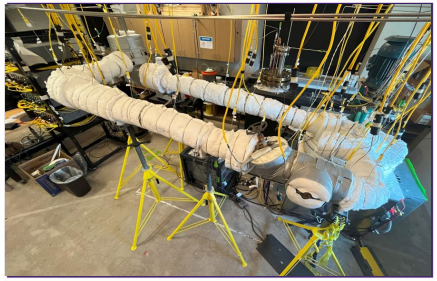
MOLTEN SALT TEST LOOP



ISOTOPE EXTRACTION & PURIFICATION



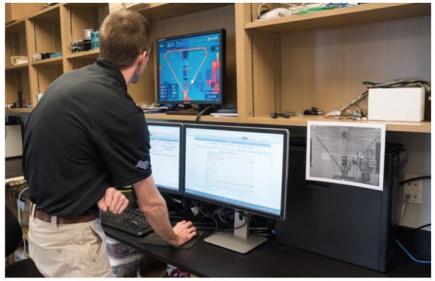
INSTRUMENTATION



FLUORIDE MOLTEN SALT TEST LOOP



SALT PURIFICATION SYSTEM



DATA ACQUISITION

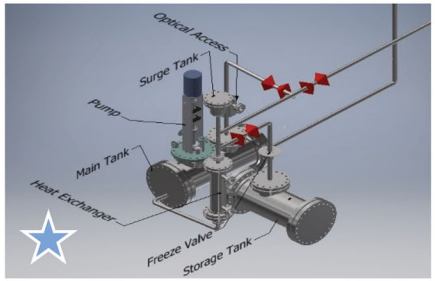
Patent Pending

Patented Technology

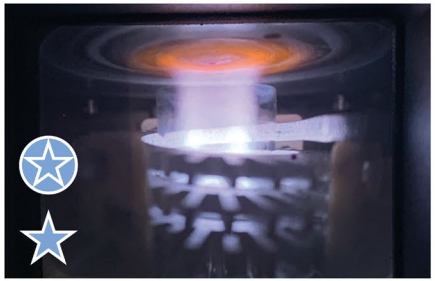
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https://doi.org/10.1016/j.anucene.2023.109772

NEXT LAB RESEARCH PROJECTS



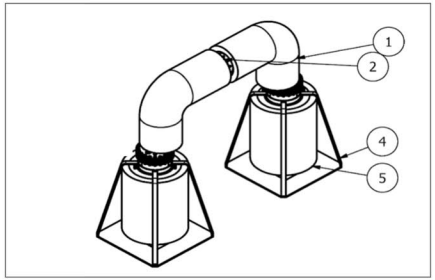
MOLTEN SALT TEST SYSTEM



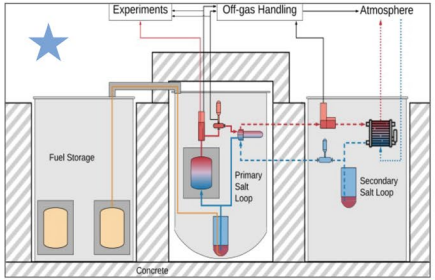
CHEMICAL ANALYSIS SYSTEM



COMPONENT TEST SYSTEM



MOLTEN SALT FILTERS



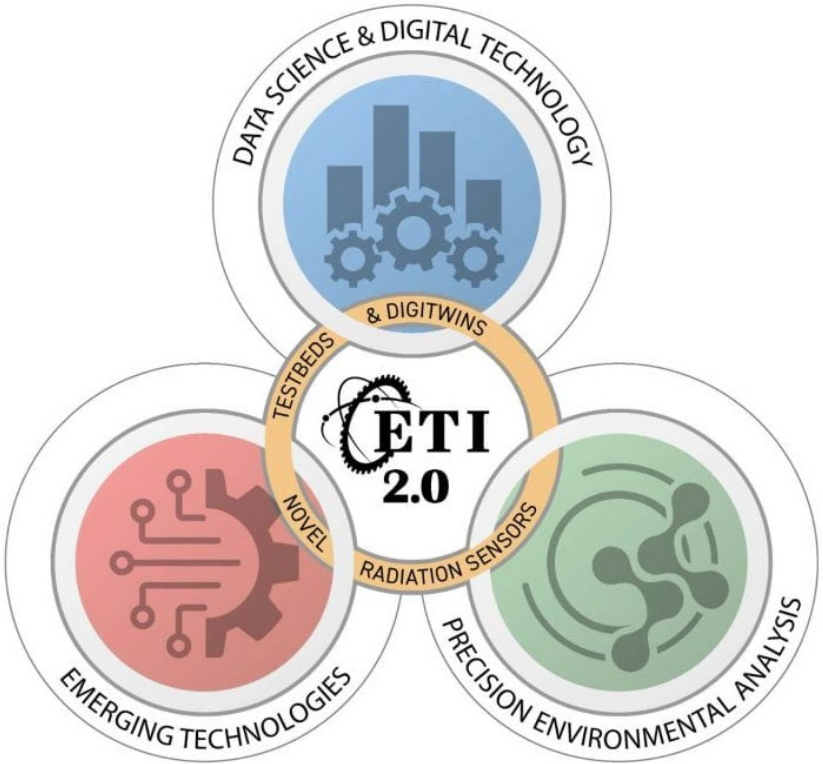
MOLTEN SALT RESEARCH REACTOR

Patent Pending

Patented Technology

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CONSORTIUM FOR ENABLING TECHNOLOGIES AND INNOVATION



National Nuclear Security Administration

Defense Nuclear Nonproliferation

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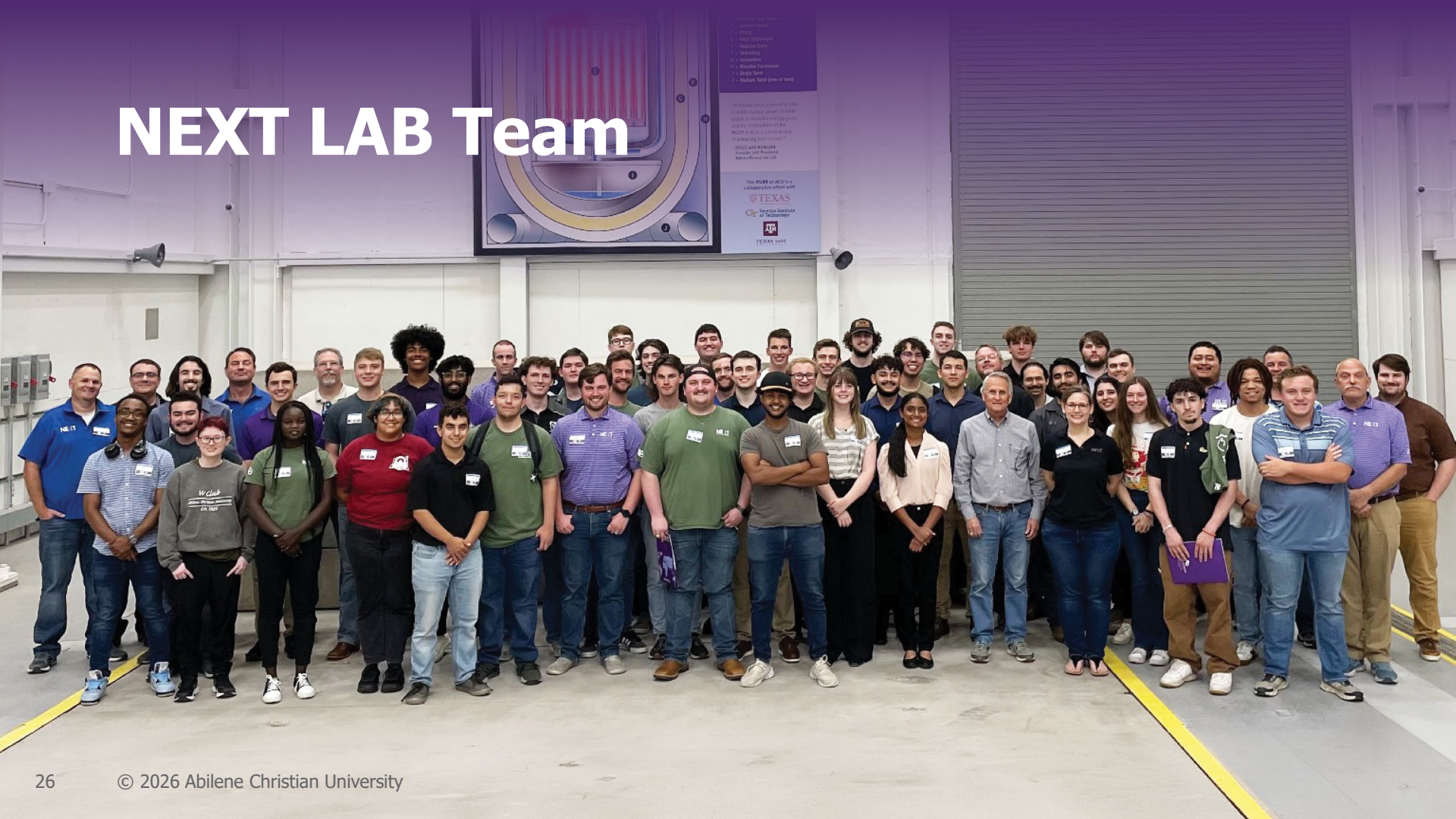
CONSORTIUM FOR ENABLING TECHNOLOGIES AND INNOVATION

NEXT Lab is a member of ETI 2.0



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NEXT LAB Team



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DILLARD SCIENCE AND ENGINEERING RESEARCH CENTER



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THE FIRST ADVANCED REACTOR TEST FACILITY IN THE U.S.



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RECENT FEDERAL HIGHLIGHTS

- Allocated 500 kg of HALUE fuel to ACU/Natura for MSRR.
- Picked this project to be part of the DOE Pilot Reactor Program to support Executive Order 14301.
- Received the Molten Salt Reactor Experiment Secondary Side Coolant Salt at ACU.



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RECENT STATE HIGHLIGHTS

- Texas committed $120 million to this project in collaboration with Natura and Texas Tech University.
- Texas announced an additional $350 million for nuclear energy to be managed by the new Texas Advanced Nuclear Energy Office (TANEO).

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NATURA RESOURCES MSR-1 DEPLOYMENT SUMMARY

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The Natura Resources Research Alliance is leading the way in SMR and MSR development and deployment

- ACU has received a construction permit for the first advanced university research reactor with the NRC.
- ACU has completed the SERC to house the MSRR.
- We are on a path to be the first operating advanced reactor in the U.S.
- Natura is positioned to be one of the first commercial reactor vendors capable of deployment.

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THANK YOU

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