



# Molten Salt Research Reactor

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# Nuclear Energy eXperimental Testing Lab

*Finding global solutions to the world's critical needs*





# Humanitarian Focus

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



**1 in 2** will develop **cancer**



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

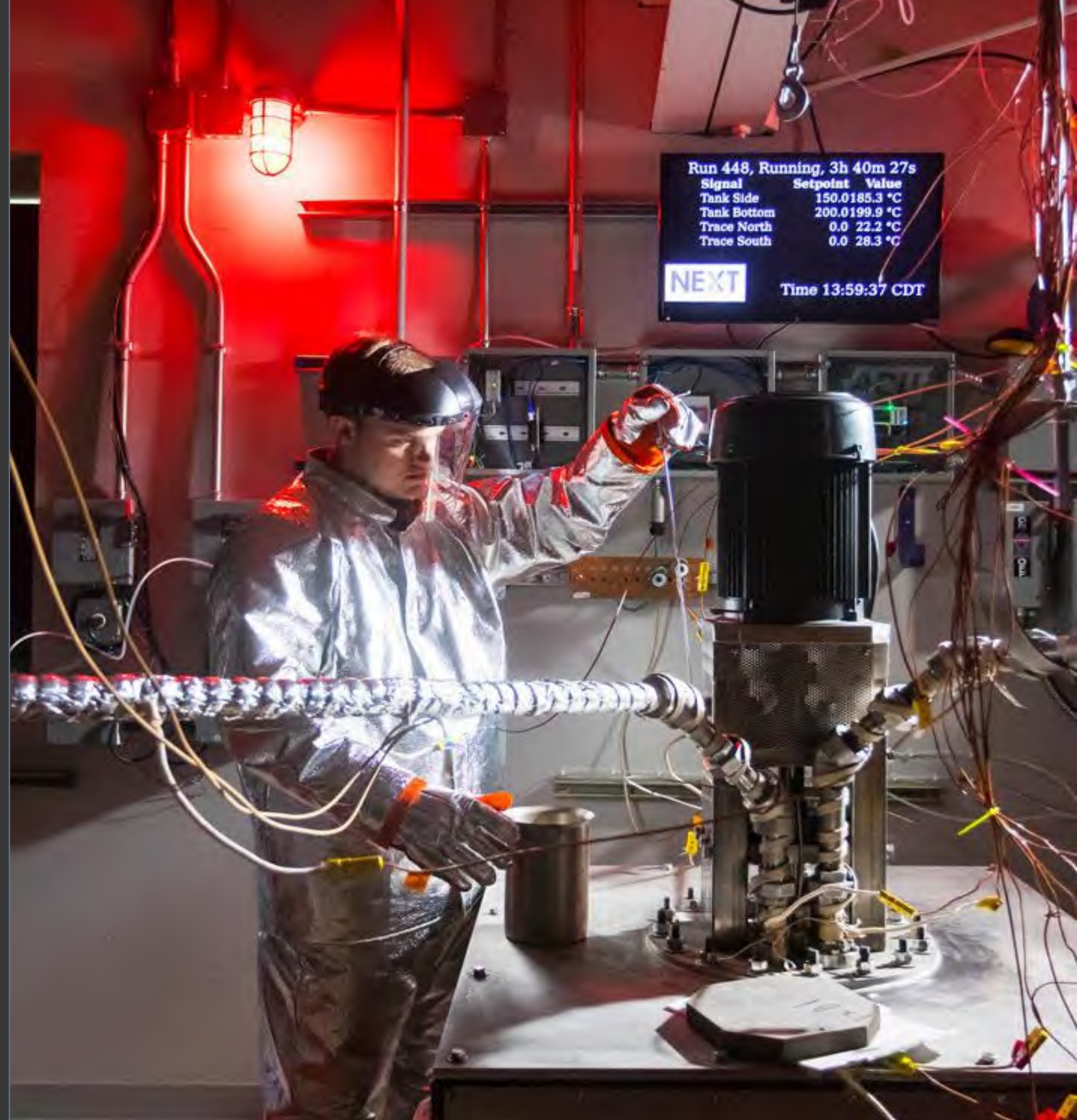


*"Nuclear energy is indispensable for achieving global sustainable development and has a crucial role in decarbonizing the energy sector, as well as **eliminating poverty, ending hunger, providing clean water, affordable energy**, economic growth, and industry innovation."* - United Nations Economic Commission for Europe (UNECE) Expert Group on Resource Management (EGRM)

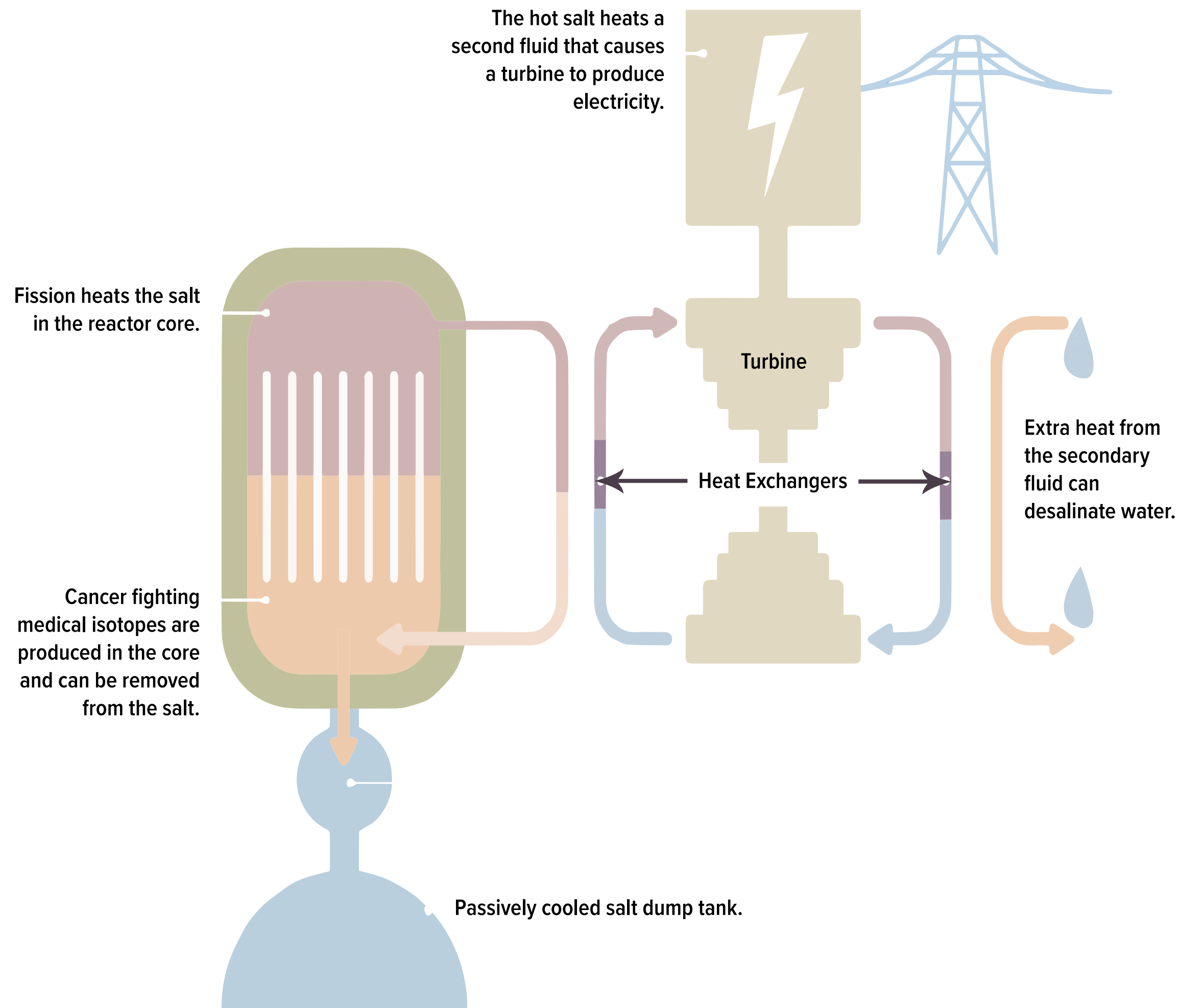
**Molten Salt Reactors (MSRs) provide answers to critical global needs**



*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.*





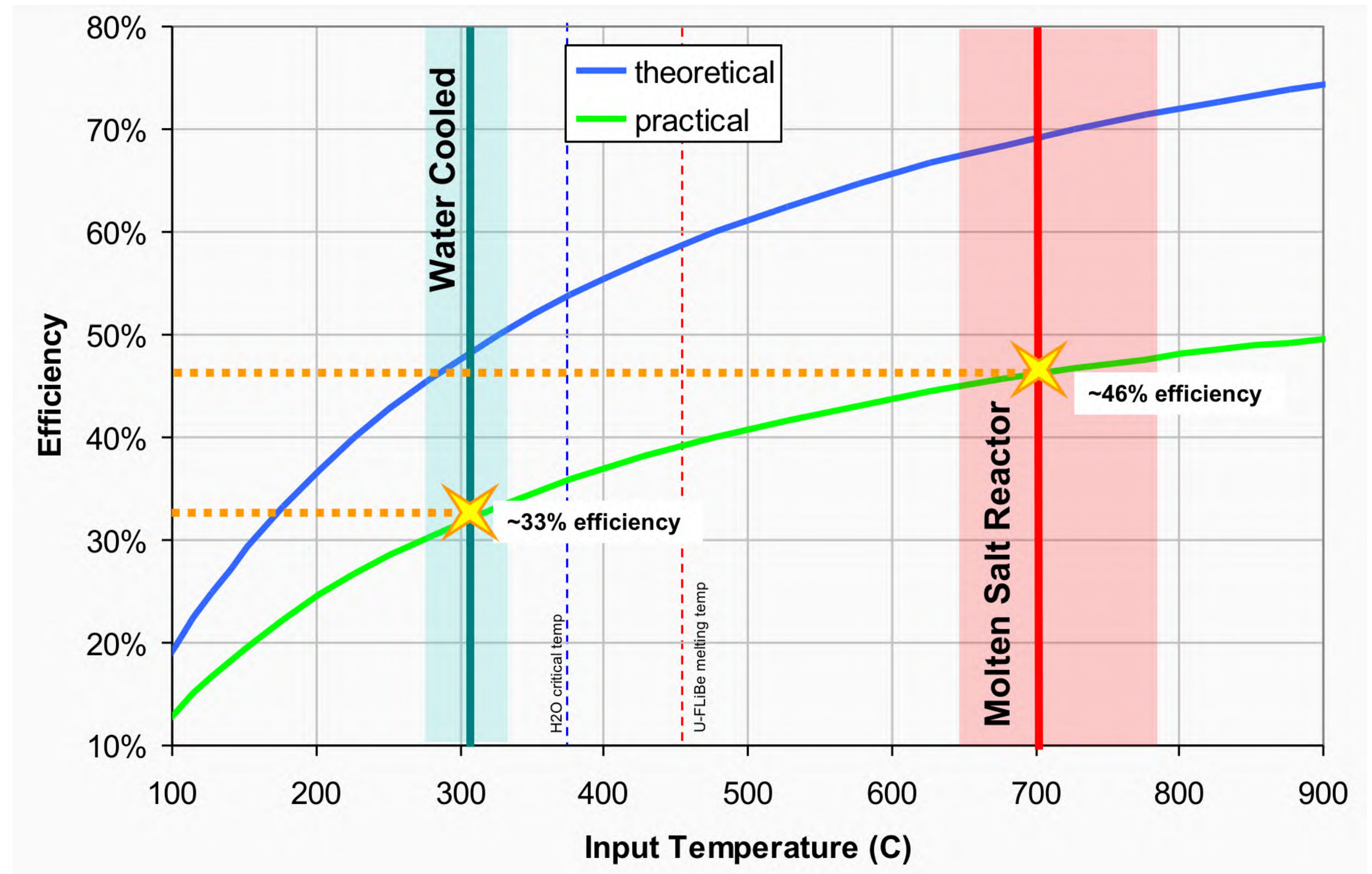


## Molten Salt Reactor

- **Safe**
- **Clean**
- **Efficient**
- **Multi-functional**
- **Scalable**
- **Carbon-free**
- **Reliable**
- **Can use SNF**

# Key Requirement 1: Molten Salt Coolant

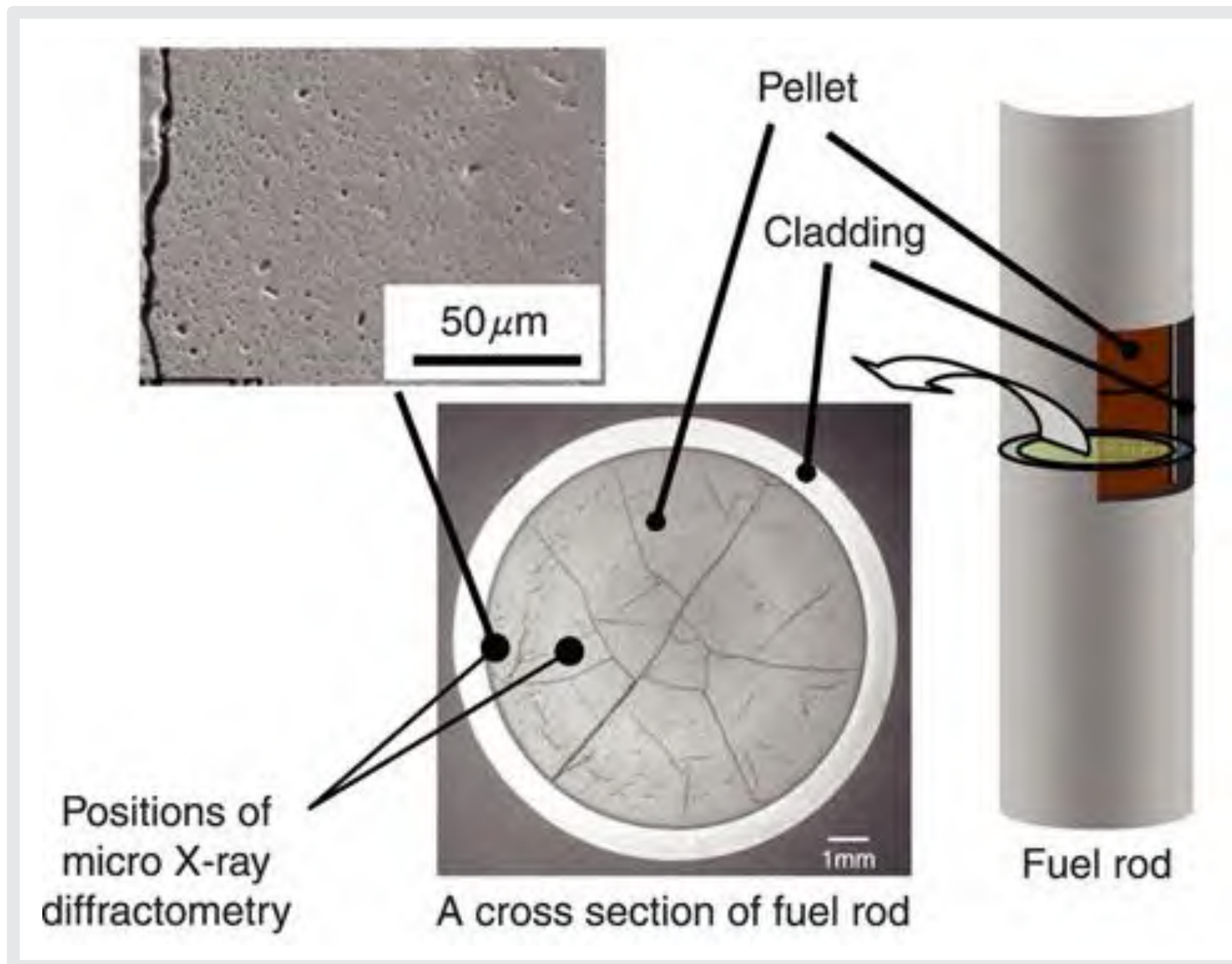
- High Temperature:
  - Improved efficiency
  - Industrial heat
- Safe
  - No phase transition to a vapor
  - Walk-away-safe





# Key Requirement 2: Liquid Fuel

## Old Solid Fuel Technology



## Advantages of Liquid Fuel

- Increased fuel utilization
- Decreased waste
- Access to medical isotopes
- Can not melt down



**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)

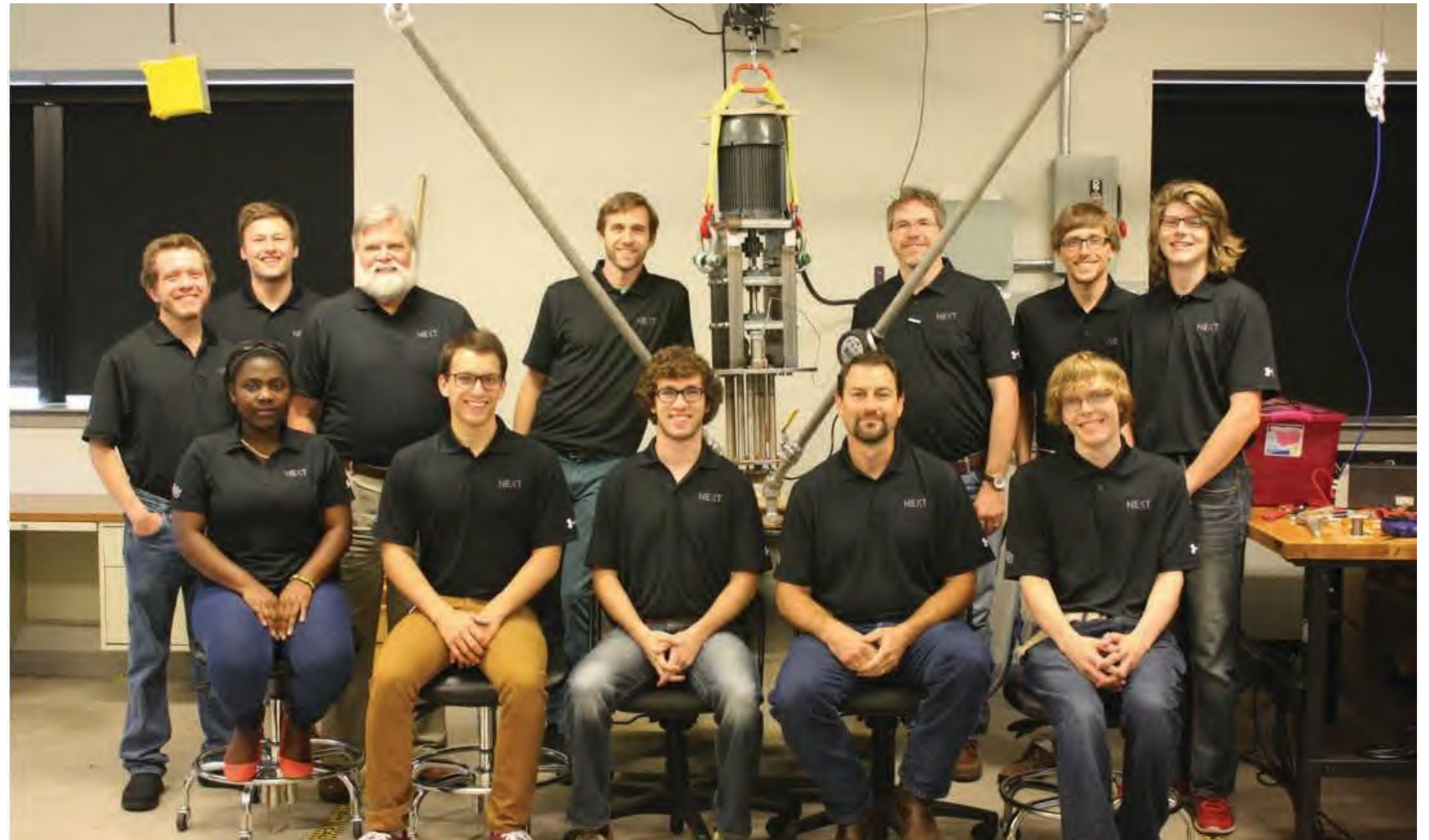


# NEXT Team (2017)

# NEXT

*Nuclear Energy eXperimental Testing*

- 5 faculty/staff members
- 7 students
- 2 lab rooms
- Advisory Board



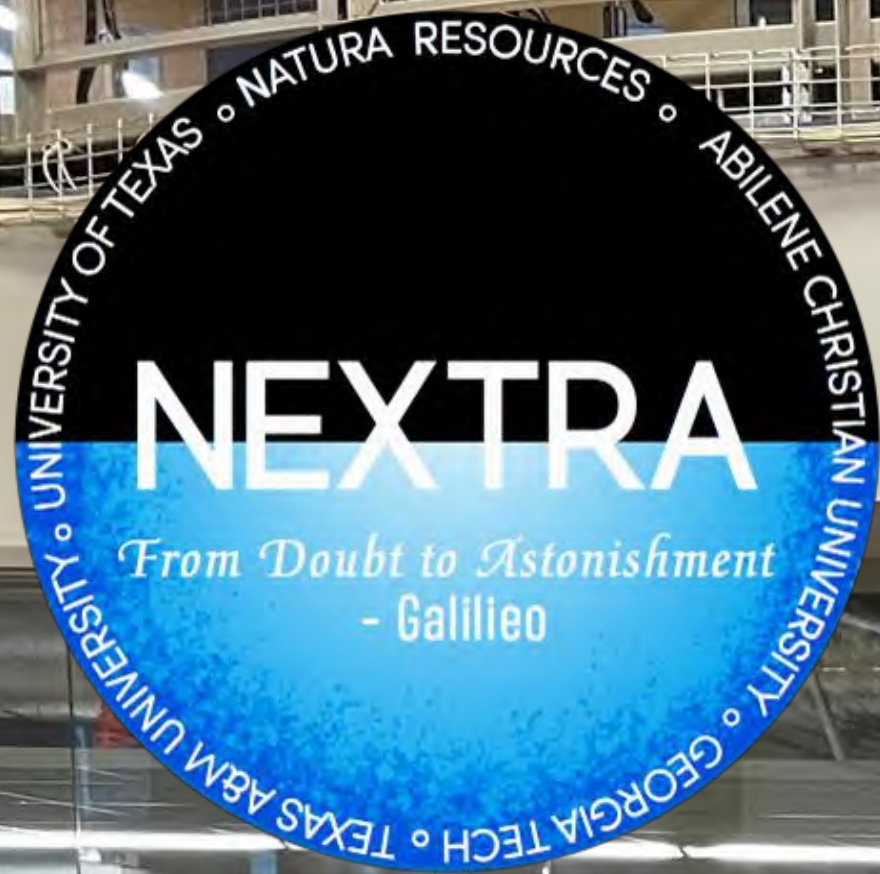


# Summer 2022 NEXT Team

# NEXT







**NEXTRA**

Faculty & Staff



# NEXT Lab Research Projects

NEXT

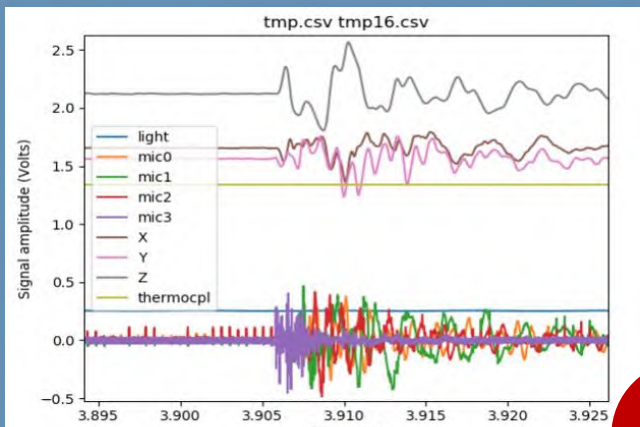
Nuclear Energy eXperimental Testing



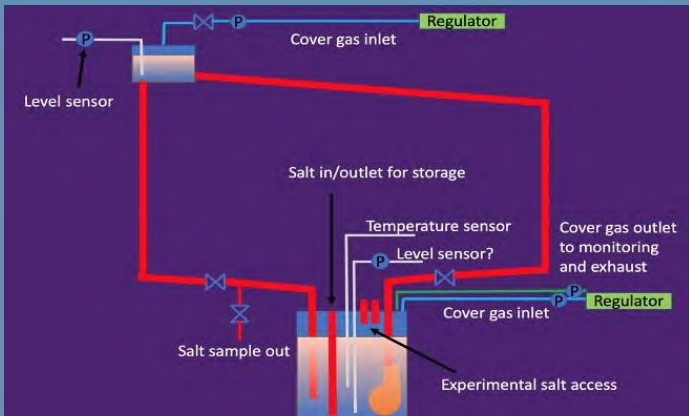
Molten Salt Test Loop



Isotope Extraction & Purification



Instrumentation



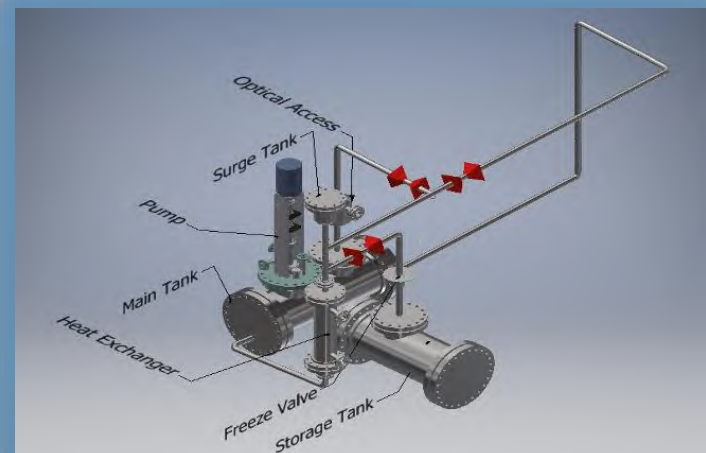
Fluoride Molten Salt Test Loop



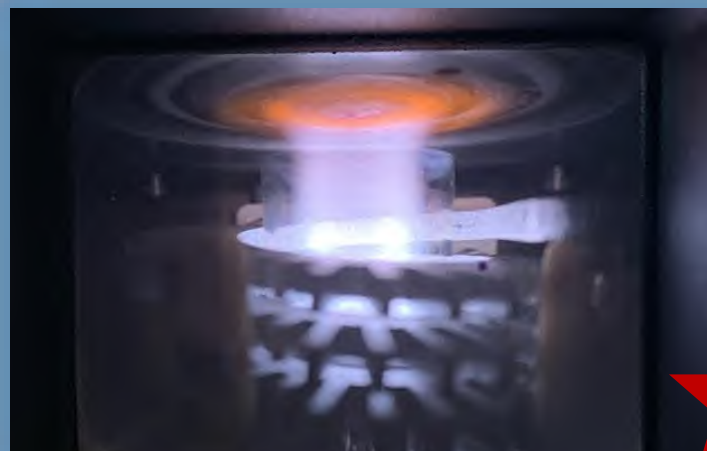
Salt Purification System



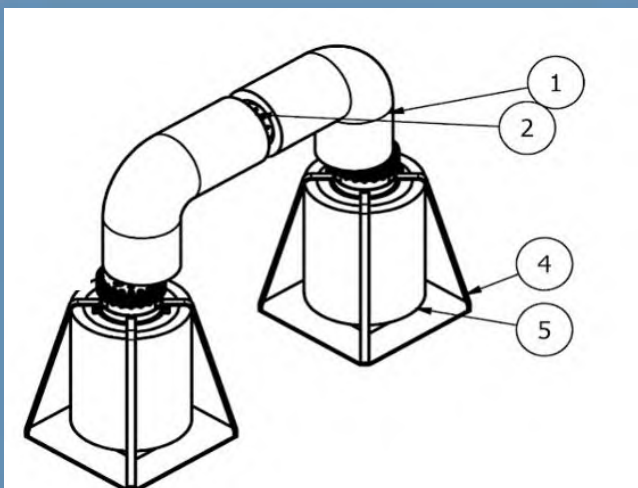
Data Acquisition



Molten Salt Test System



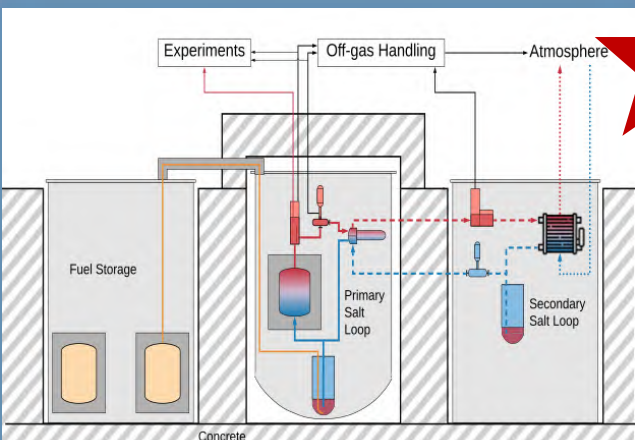
Chemical Analysis System



Molten Salt Filters



Component Test System



Molten Salt Research Reactor

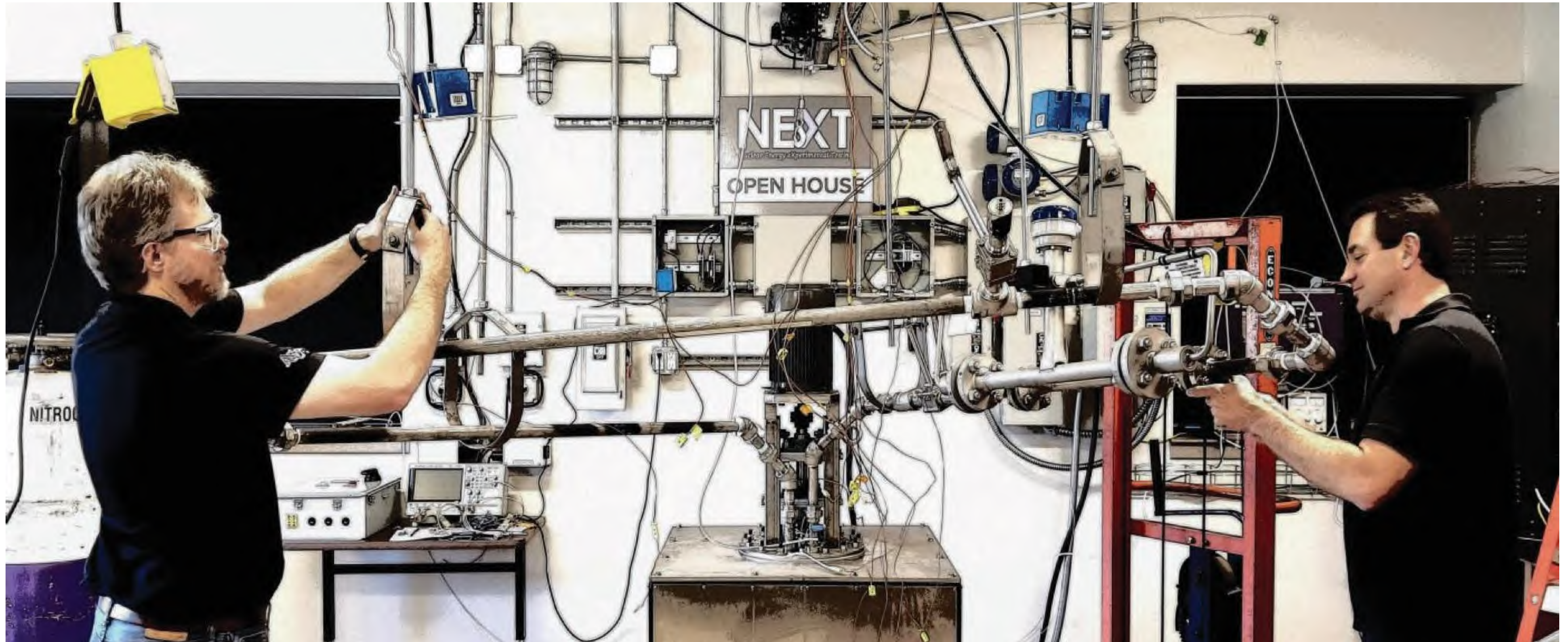




# Molten Salt Test Loop

NEXT

*Nuclear Energy eXperimental Testing*

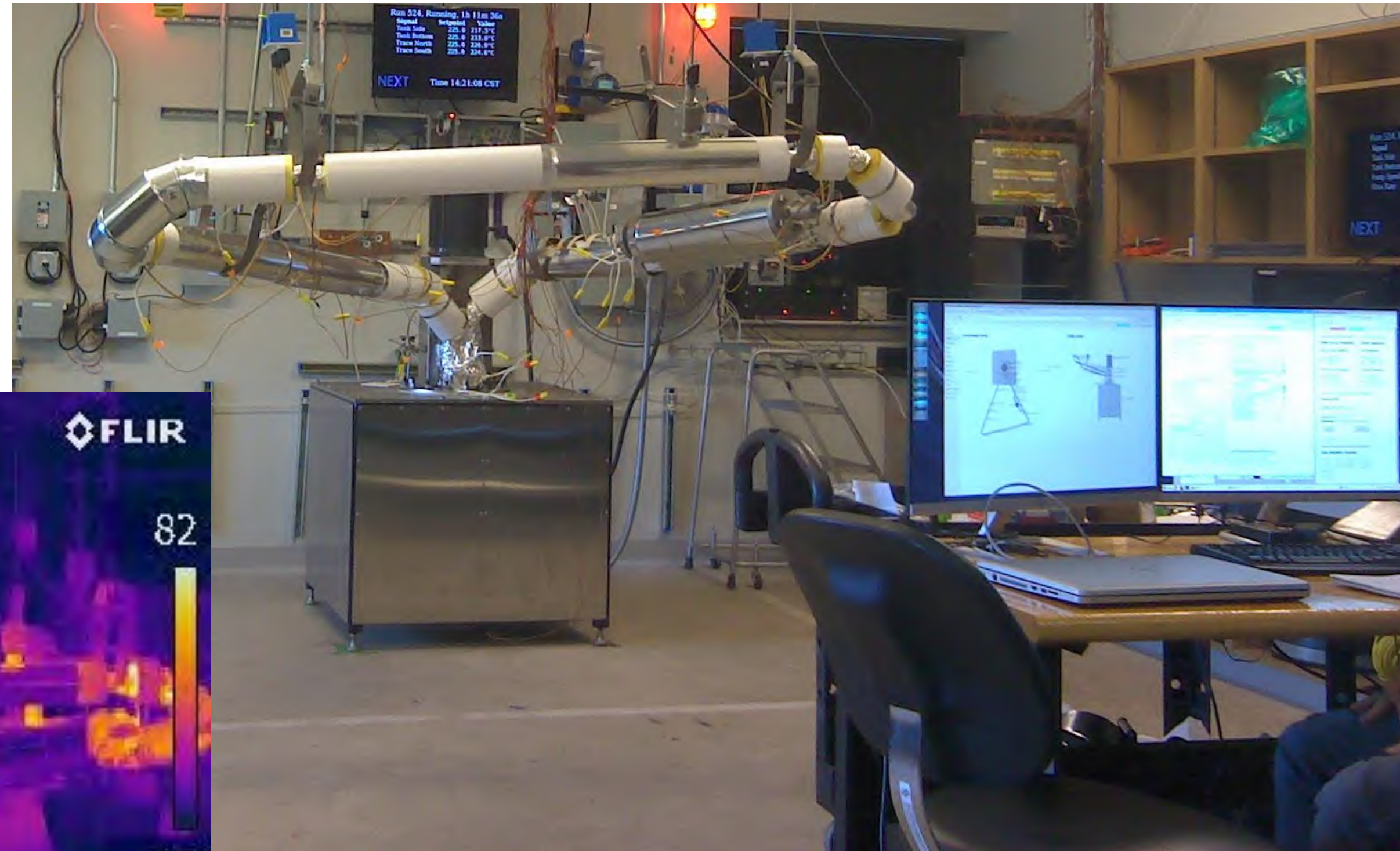




# Molten Salt Test Loop

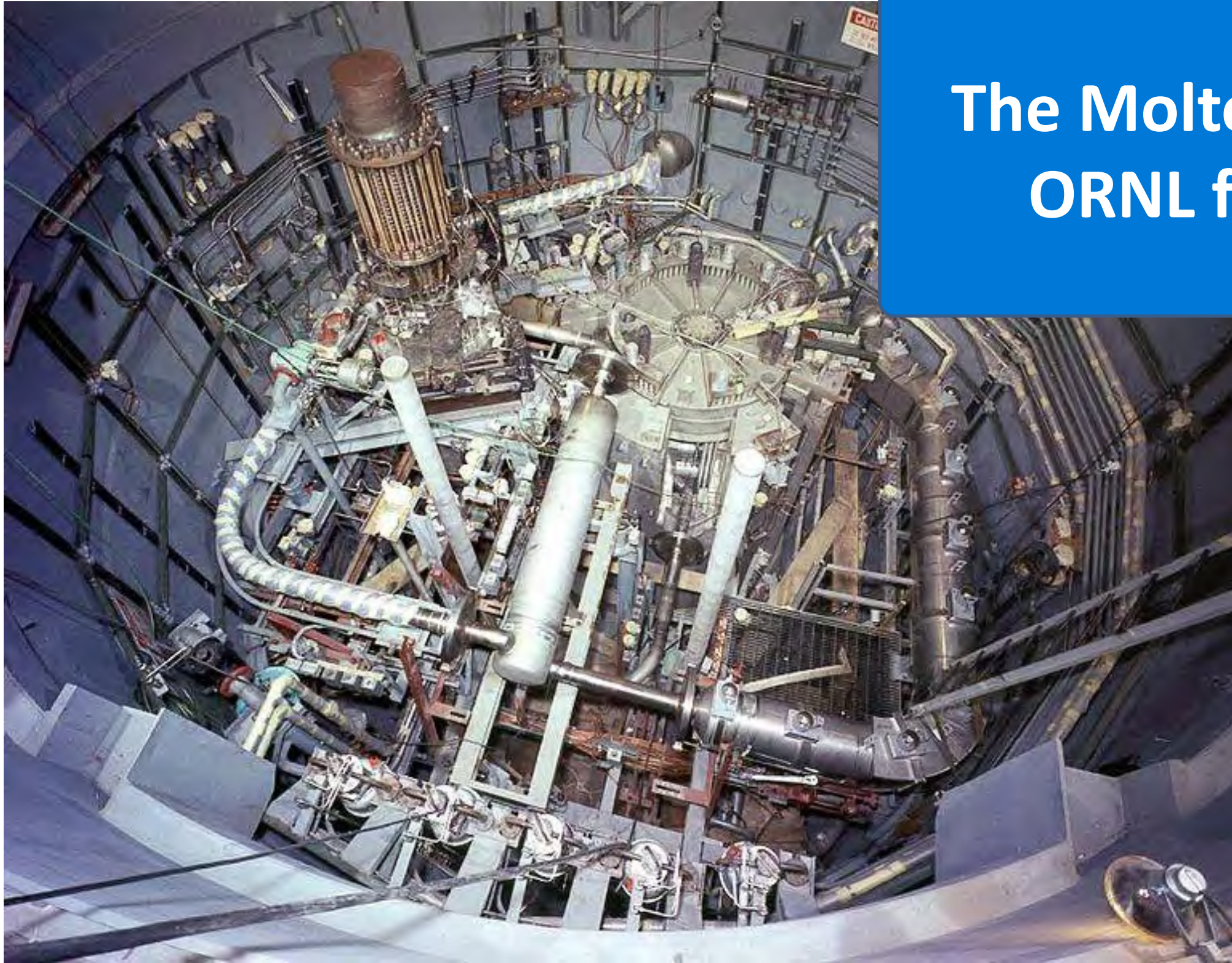
NEXT

Nuclear Energy eXperimental Testing

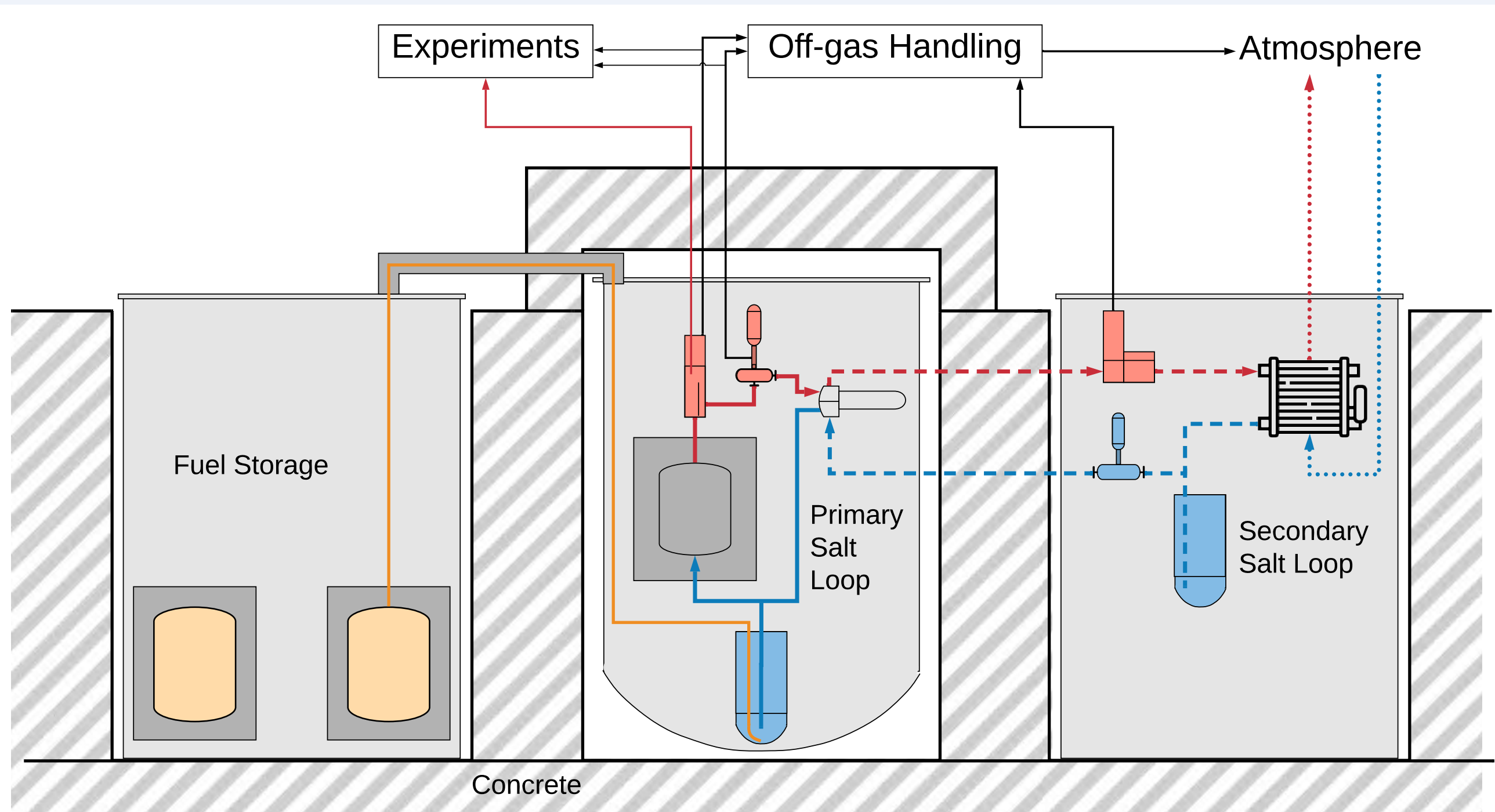




The Molten Salt Reactor Experiment operated at ORNL from 1965-1969 on U-235 and U-233.







## MSRE

### shared concepts

- $\text{UF}_4$  LiF-BeF<sub>2</sub> fuel
- Loop design
- Graphite moderator
- Drain tank
- Trench-based radiation protection
- 5-years of full-power operation

## MSRR

### simplified concepts

- 19.75% instead of 33%  $^{235}\text{U}$
- 1 MWth instead of 8-10 MWth
- SS-316 instead of Hastelloy-N
- No freeze valve
- Utilizing 50 years of technology advancement



# University Research Reactors

# NEXT

## NuclearNews

April 2022

### University Programs

### Four universities team up to design molten salt research reactor

Fri, Aug 21, 2020, 12:11PM | Nuclear News

Abilene Christian University (ACU) is leading a consortium called NEXTRA—the Nuclear Energy eXperimental Testing Research Alliance—with the Georgia Institute of Technology, Texas A&M University, and the University of Illinois at Urbana-Champaign.

### U of Illinois plans to integrate research and education with a microreactor

W

### Abilene Christian's NEXT Lab applies for MSRR construction permit

Thu, Aug 18, 2022, 3:04PM

ANS Nuclear Cafe

The Nuclear Energy eXperimental Testing (NEXT) Laboratory at Abilene Christian University in Texas submitted a construction permit application to the Nuclear Regulatory Commission for its...



### University may host the second USNC microreactor in

Canada

Tue, May 24, 2022, 10:30AM | Nuclear News

McMaster University, Ultra Safe Nuclear Corporation (USNC), and Global First Power (GFP) have embarked on a new partnership to study the feasibility of deploying a USNC Micro Modular Reactor...







# Science and Engineering Research Center

- 28,000 ft<sup>2</sup> facility
  - 6,000 ft<sup>2</sup> Research Bay
  - Specialty Research Labs
  - Offices
- Design completed by Parkhill
- Linbeck construction company
- Design Completed: 2021
- Begin Construction: 2022
- Completed: 2023































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

1. ACU will finish building the SERC in July to house the MSRR.
2. ACU has submitted the construction permit to the NRC.
3. The NRC accepted our CP and agreed to an 18-month review.

**NEXTRA**

*Nuclear Energy eXperimental Testing Research Alliance*

**Natura  
Resources**  
*SUSTAINABLE ENERGY*







THANK YOU

*acunextlab.org*

