

# NEXT

## Empowering Advanced Nuclear Deployment with Non -Power Reactors

by

Dr. Rusty Towell NEXT Lab Director

March 15, 2023

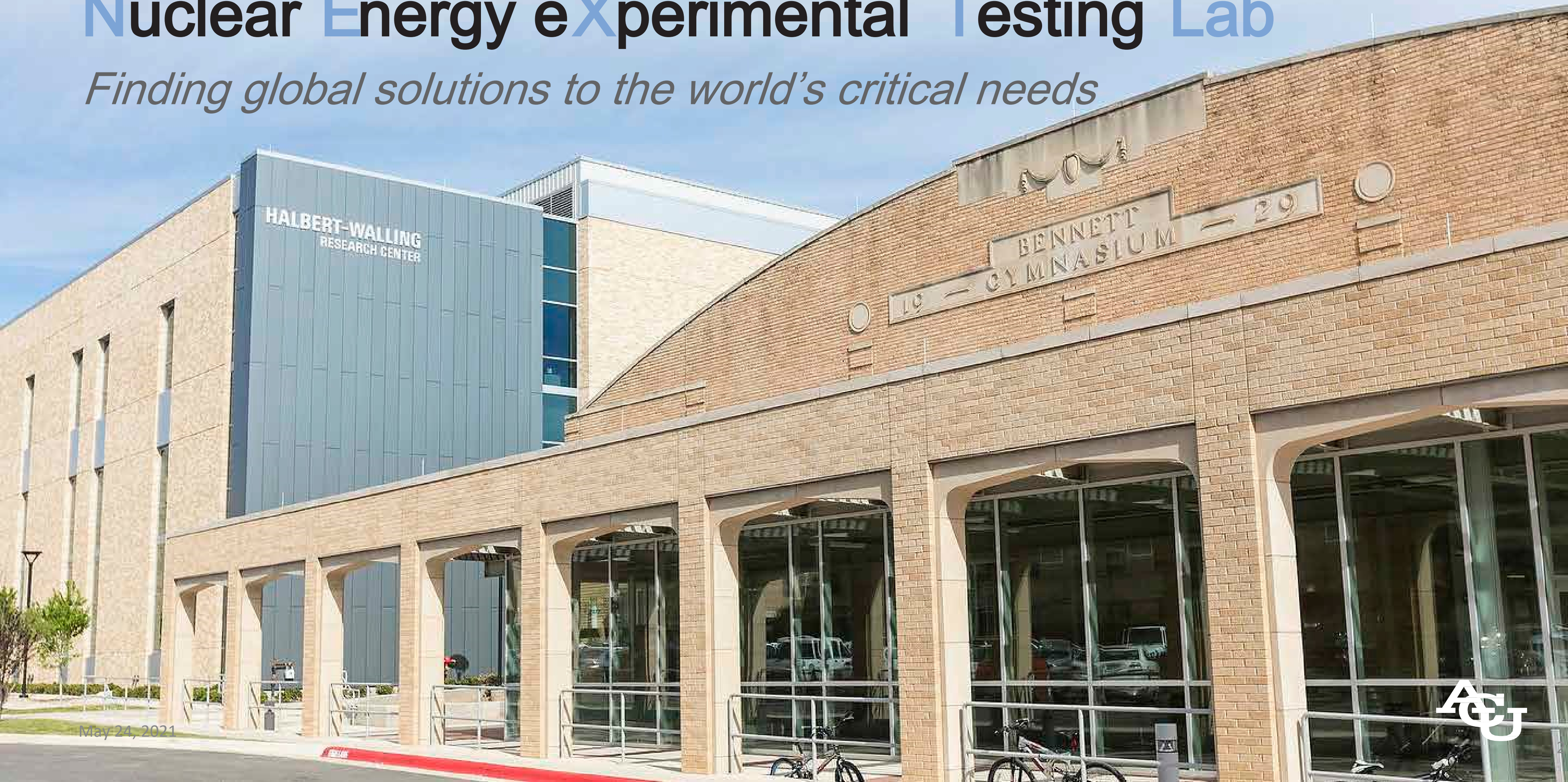


ABILENE CHRISTIAN  
UNIVERSITY



# Nuclear Energy eXperimental Testing Lab

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



May 24, 2021



# Humanitarian Focus

NEXT

Nuclear Energy eXperimental Testing

**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**

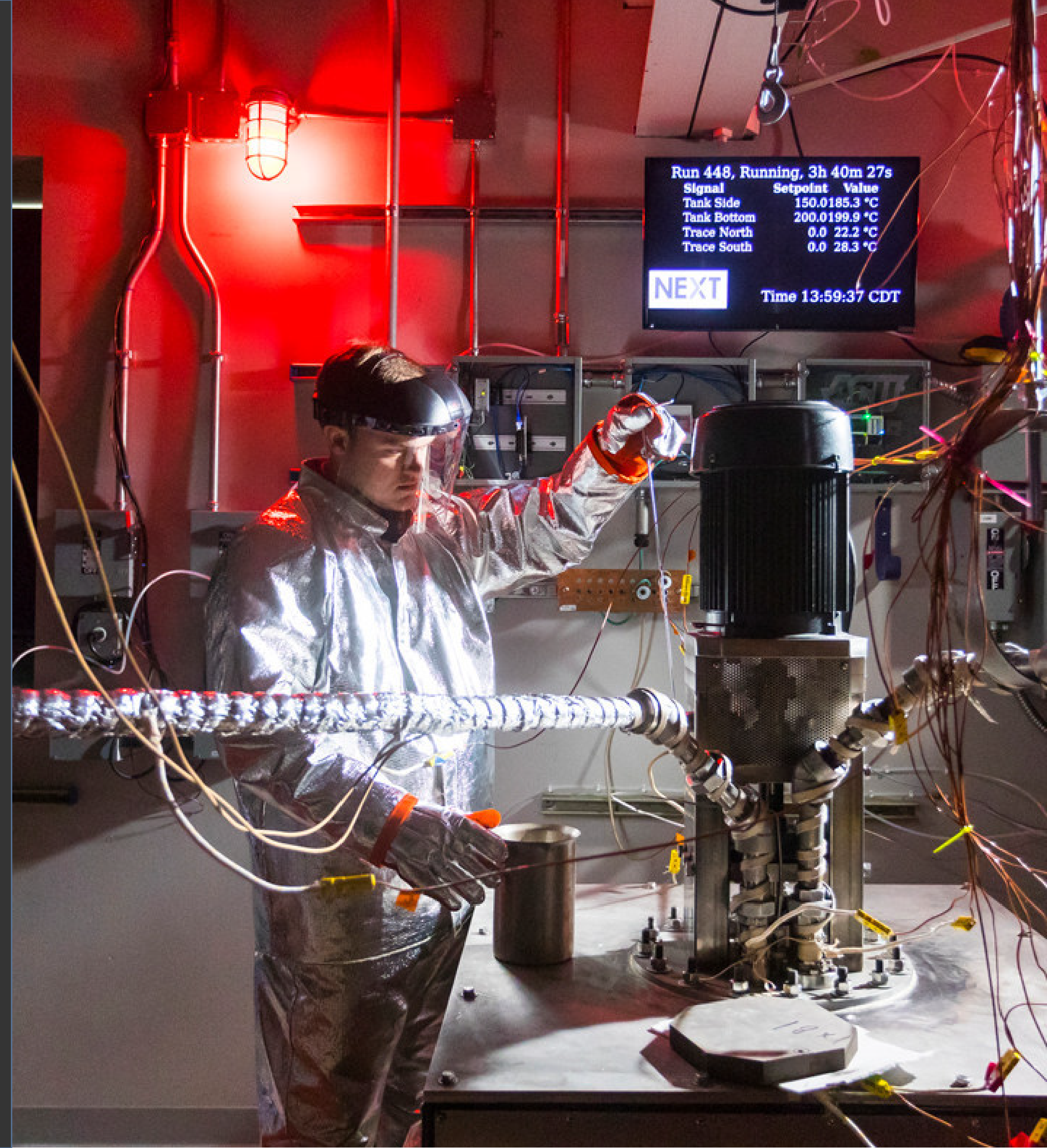


*"Nuclear energy is indispensable for achieving global sustainable development and has a crucial role in decarbonizing the energy sector, as well as **eliminating poverty, ending hunger, providing clean water, affordable energy**, economic growth, and industry innovation."* - United Nations Economic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

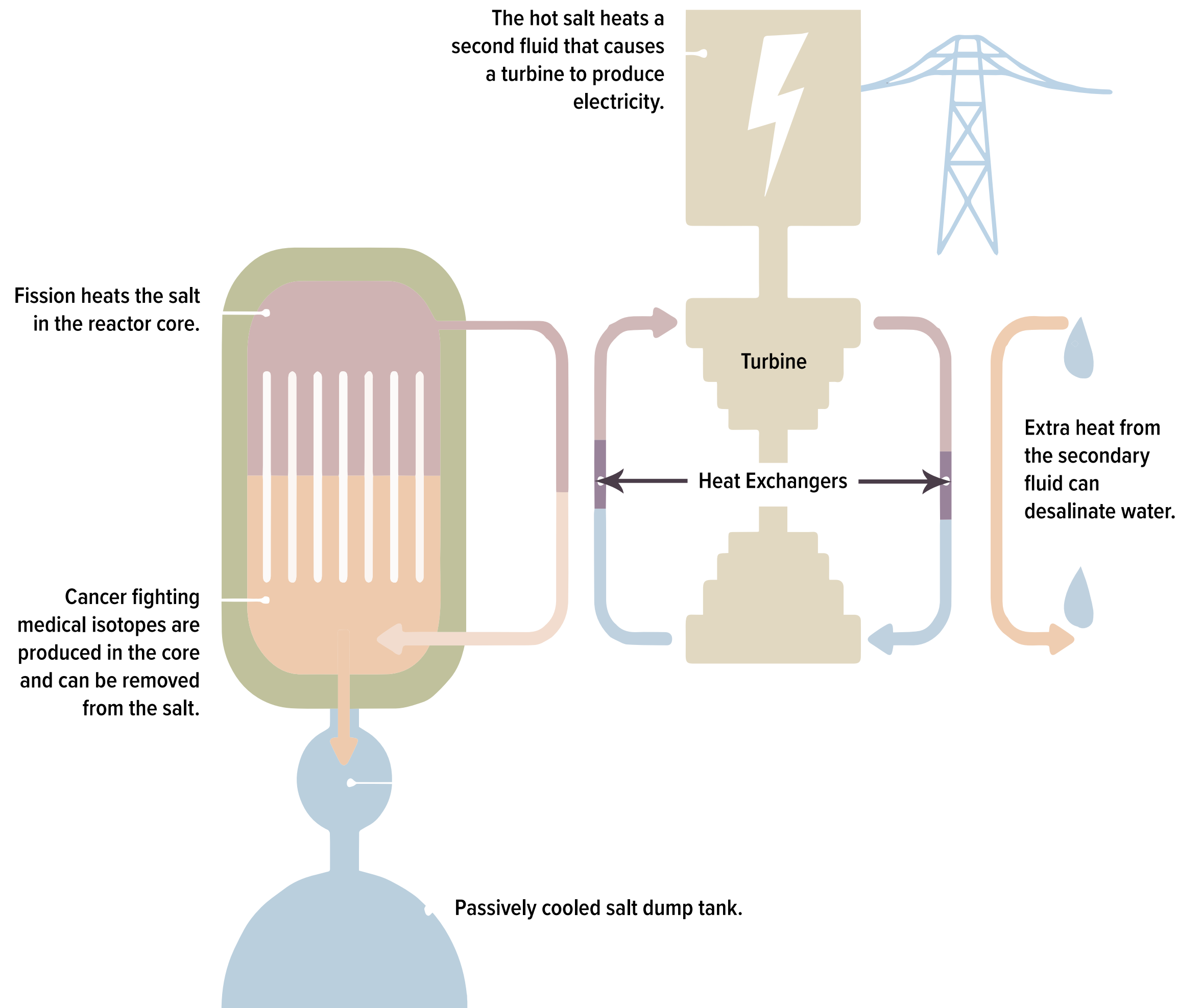
**Molten Salt Reactors (MSRs) provide answers to critical global needs**



*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.*





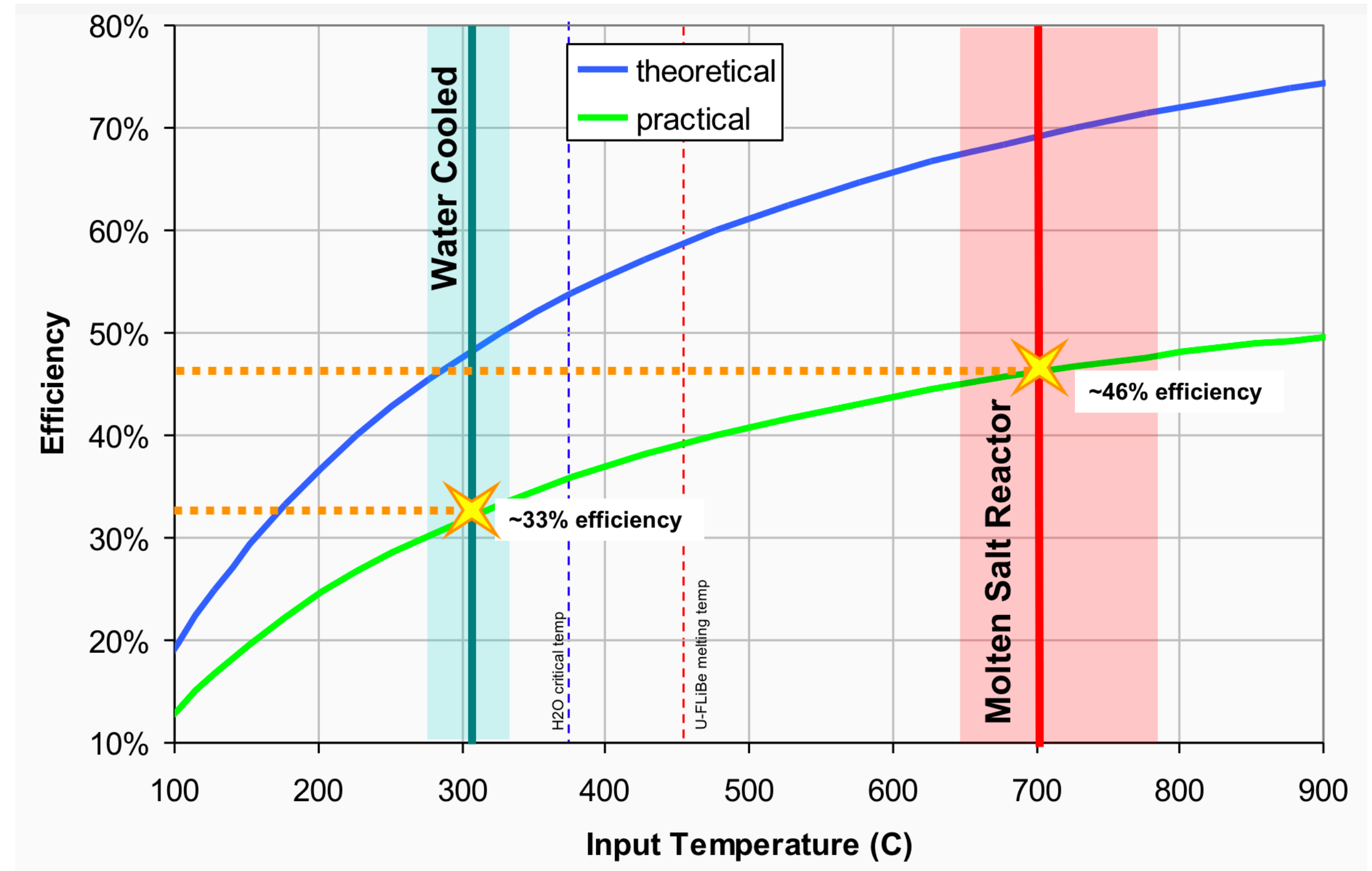


## Molten Salt Reactor

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

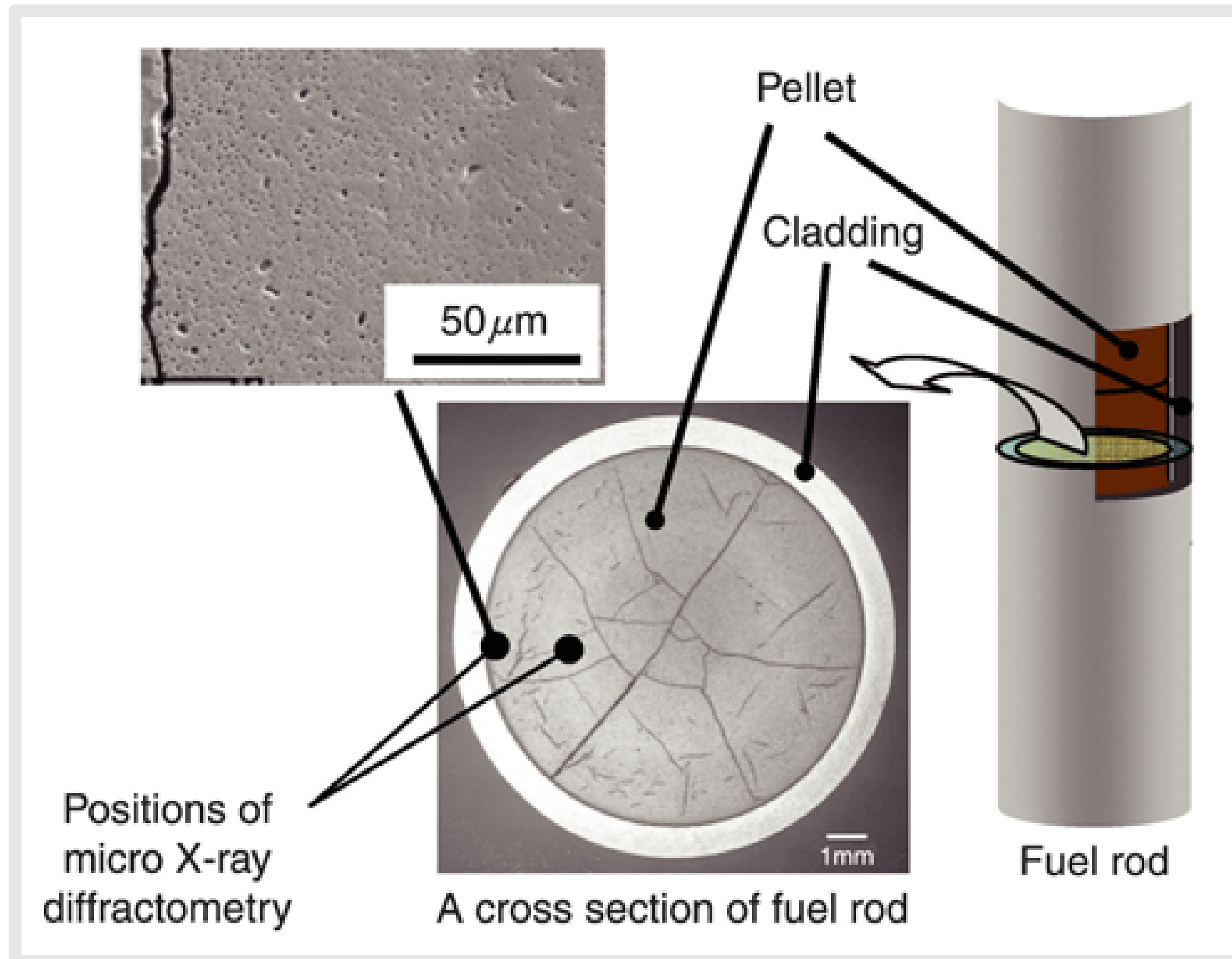
# Key Requirement 1: Molten Salt Coolant

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



# 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)





Faculty & Staff

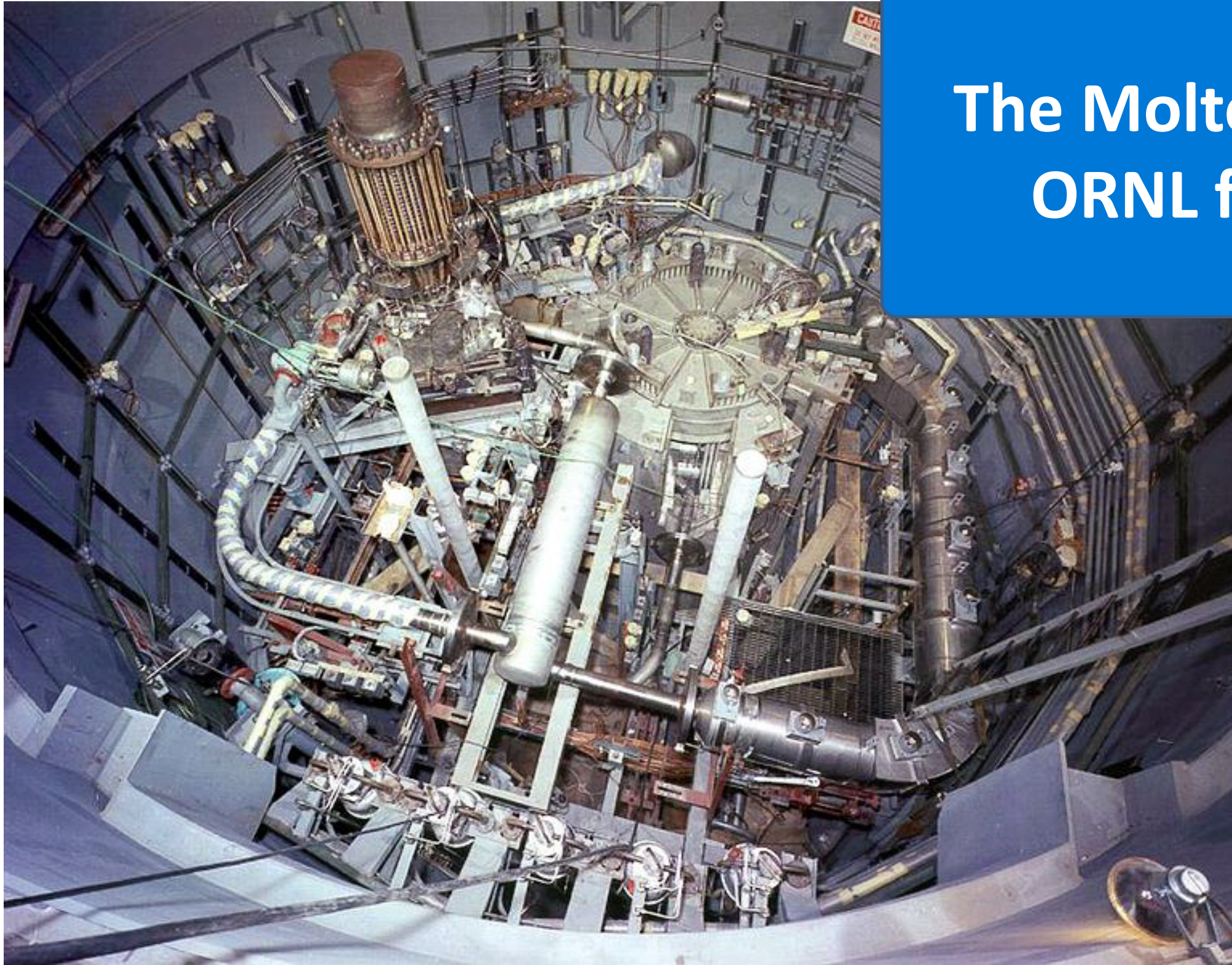


# Molten Salt Research Reactor is Simplified MSRE

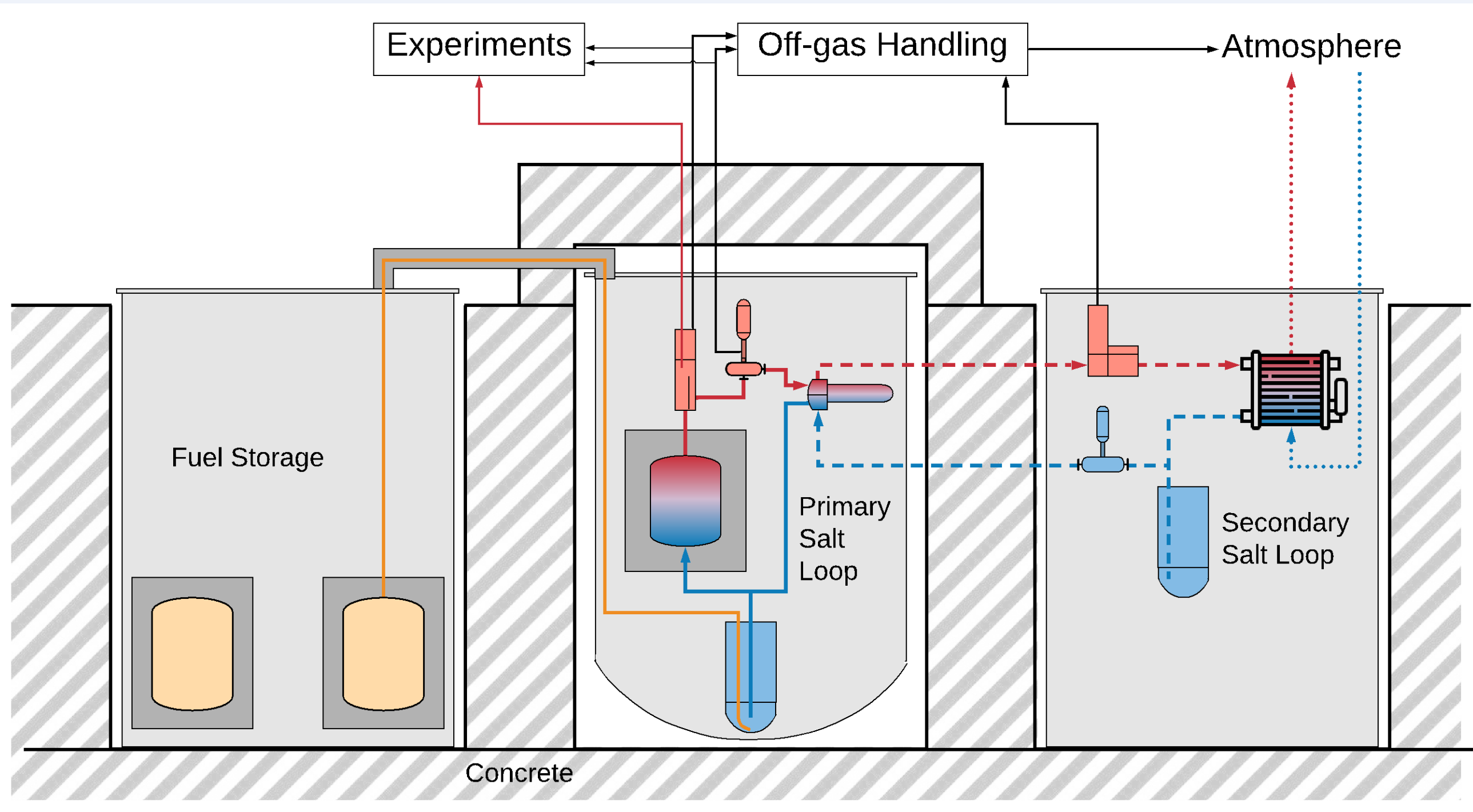


Nuclear Energy eXperimental Testing

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% <sup>235</sup>U
- 1 MWth instead of 8-10 MWth
- SS-316 instead of Hastelloy-N
- No freeze valve
- Utilizing 50 years of technology advancement





# 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

















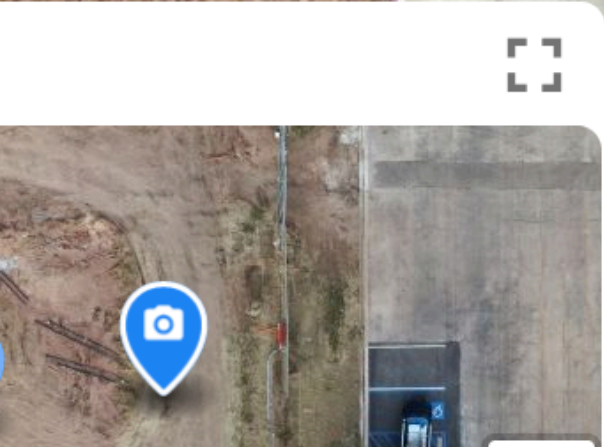














The Natura Resources sponsored Research Alliance is leading the way in MSR development and deployment.

1. ACU is building the SERC 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.

**We are the only project with accepted CP and construction**

**NEXTRA**

*Nuclear Energy eXperimental Testing Research Alliance*

**Natura  
Resources**  
*SUSTAINABLE ENERGY*





THANK YOU

*acunextlab.org*

