



# Deployment of the Natura Resources MSR-1 as a University Research Reactor at the ACU Nuclear Energy eXperimental Testing Lab

Dr. Tim Head, Assistant Lab Director

Abilene Christian University NEXT Lab

March 20, 2025



ORGANIZER  
**ISGF**  
India Smart Grid Forum



[www.isuw.in](http://www.isuw.in)

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UNIVERSITY

**ISUW 2025**

11th International Conference and  
Exhibition on Smart Energy  
and Smart Mobility

**18 - 22 March 2025**

**Hotel Lalit, New Delhi**

# Outline

**NEXT**  
*Nuclear Energy eXperimental Testing*

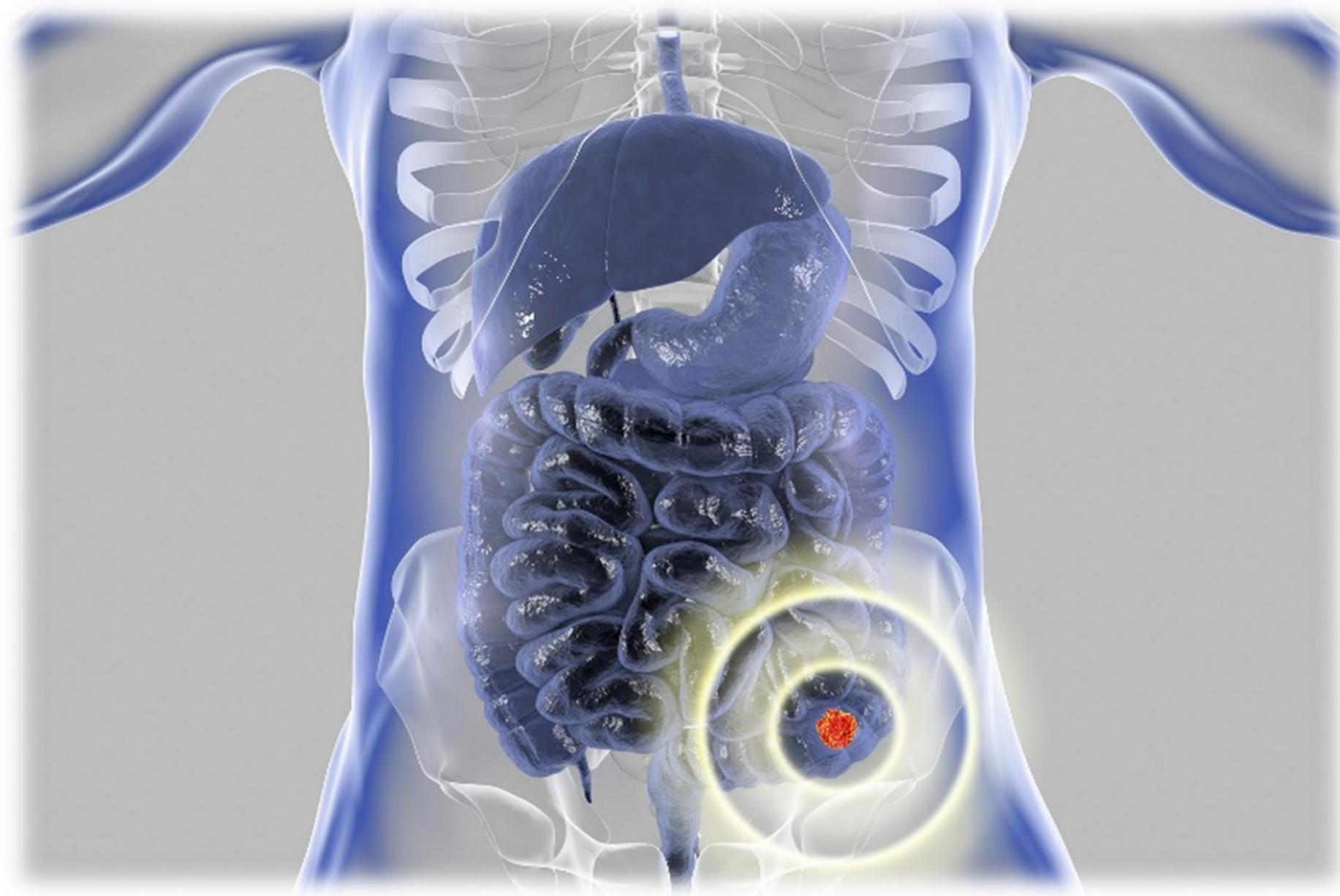
- What are the worlds most critical needs?
- Addressing needs by advancing molten salt reactors
- Who are ACU NEXT LAB and Natura Resources?
- What are the plans for our Molten Salt Research Reactor
- MSRR next steps
- MSRs in India



# Critical Needs

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Cancer:  
Half of people will develop cancer in their lives  
In 2017 approximately 1 in 6 deaths was due to cancer



IHME Global Burden of Disease

# Critical Needs

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Clean Water:  
One third of the world  
needs water for sanitation



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## UNICEF: Collecting water is often a colossal waste of time for women and girls

29 August 2016

Available in: English [Français](#) [Español](#)



UNICEF/UN017117/Shrestha

**NEW YORK STOCKHOLM, 29 August 2016** – UNICEF said the 200 million hours women and girls spend every day collecting water is a colossal waste of their valuable time.

### Media contacts

**UNICEF Media Team**

Tel: +1 212 303 7984

Email: [media@unicef.org](mailto:media@unicef.org)



# Critical Needs

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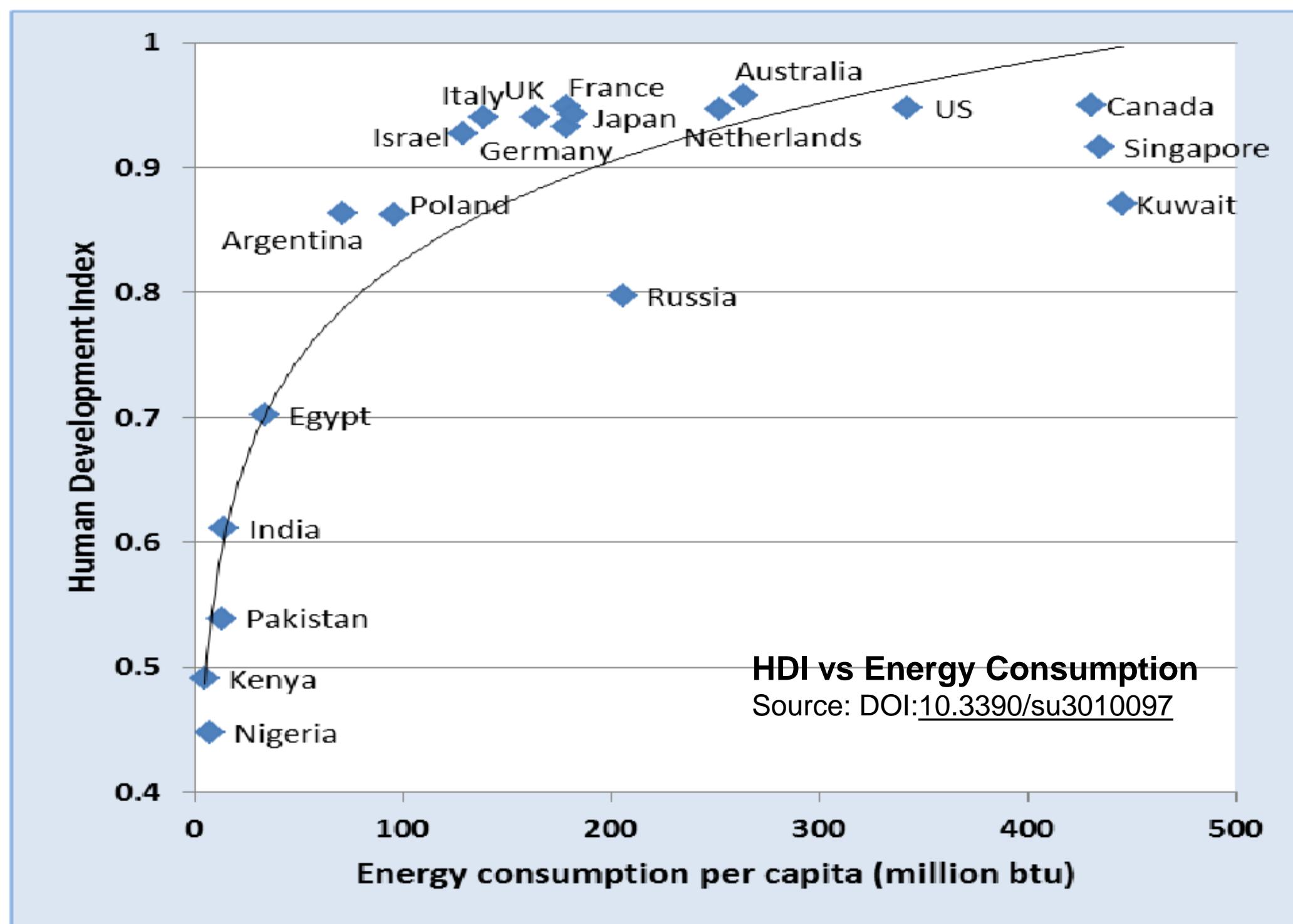
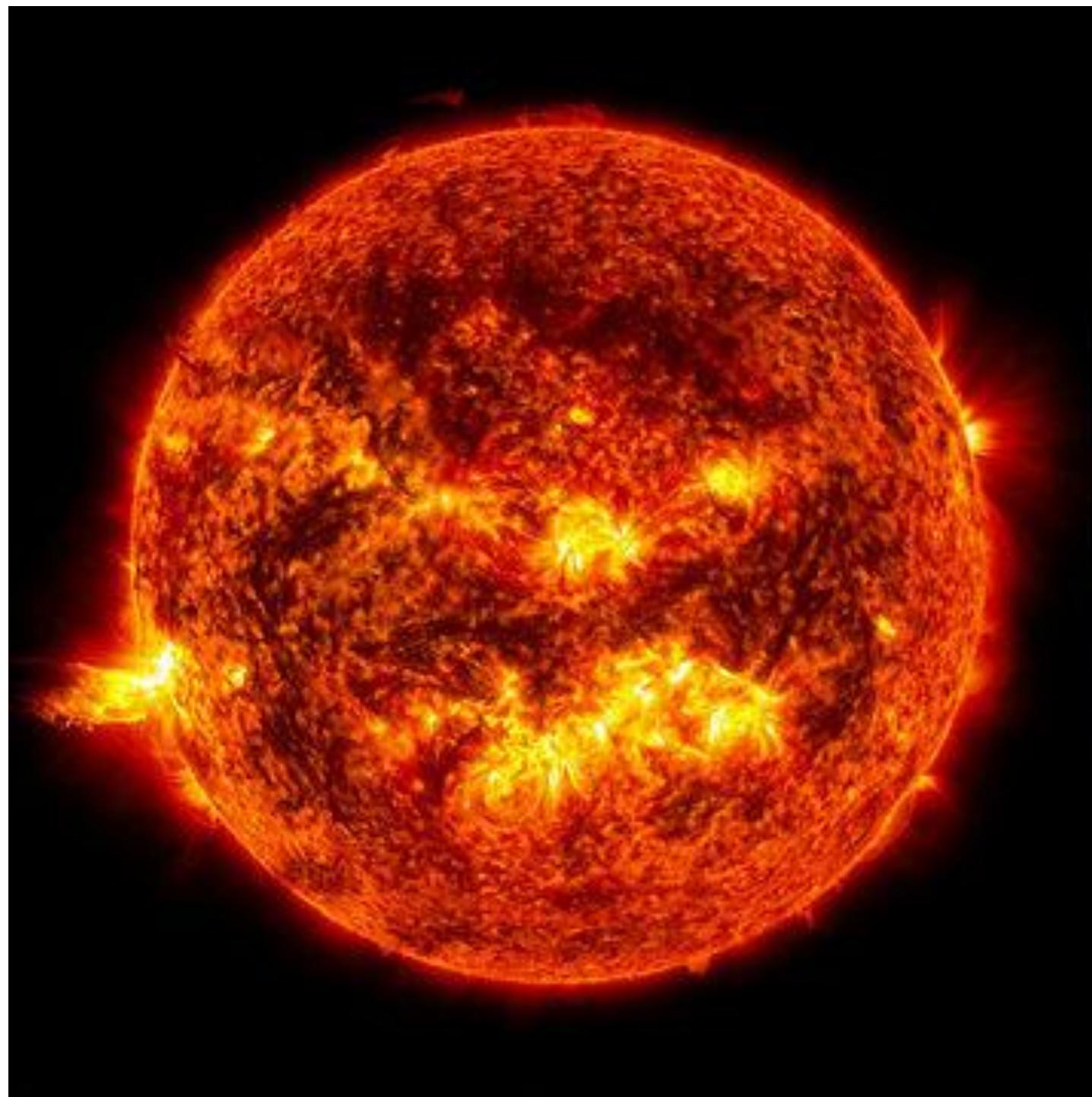
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# Critical Needs

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## Energy – Correlates with quality of life: Half live in poverty

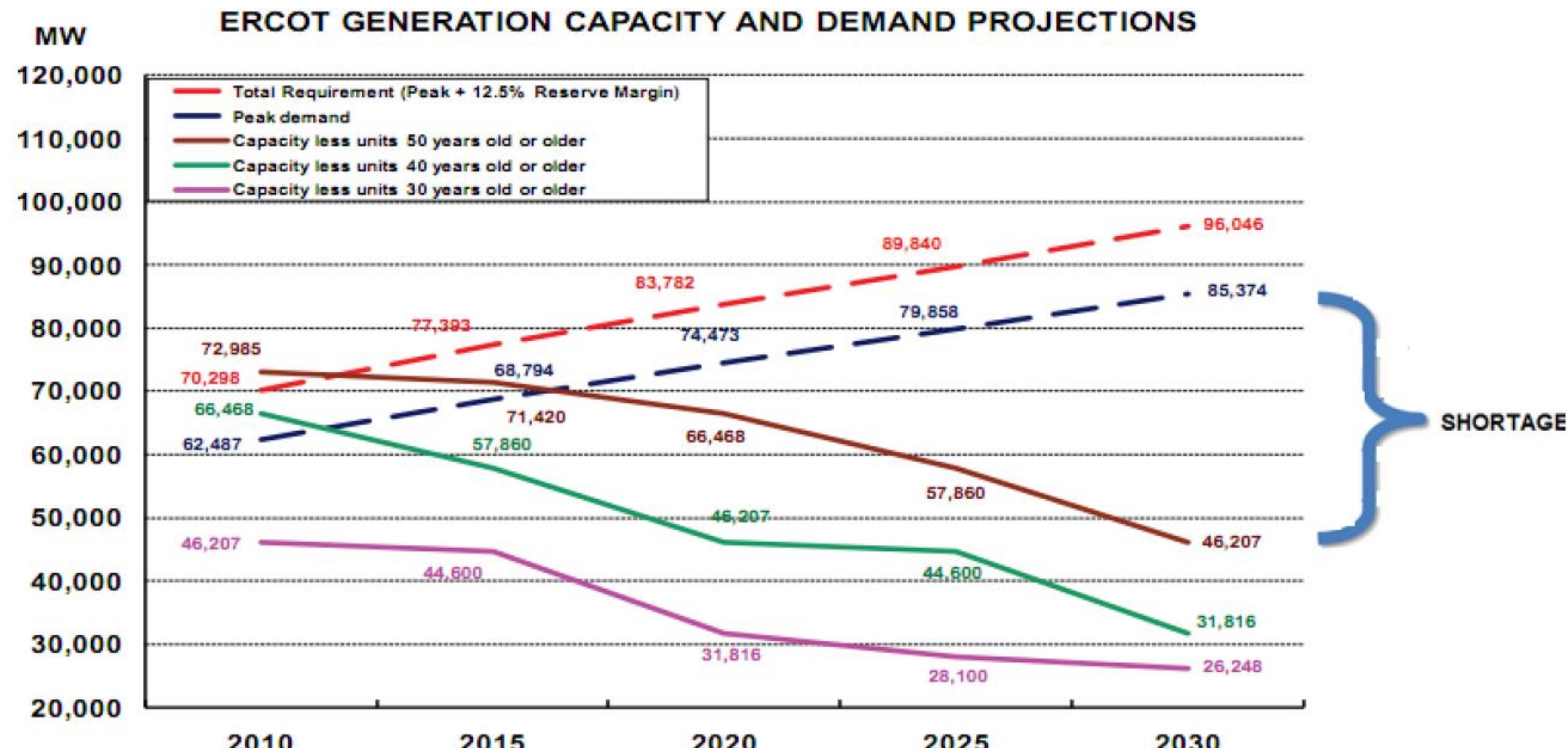
**Figure 20.** Relationship between Energy Consumption and Human Development Index.  
Data from [106,107].



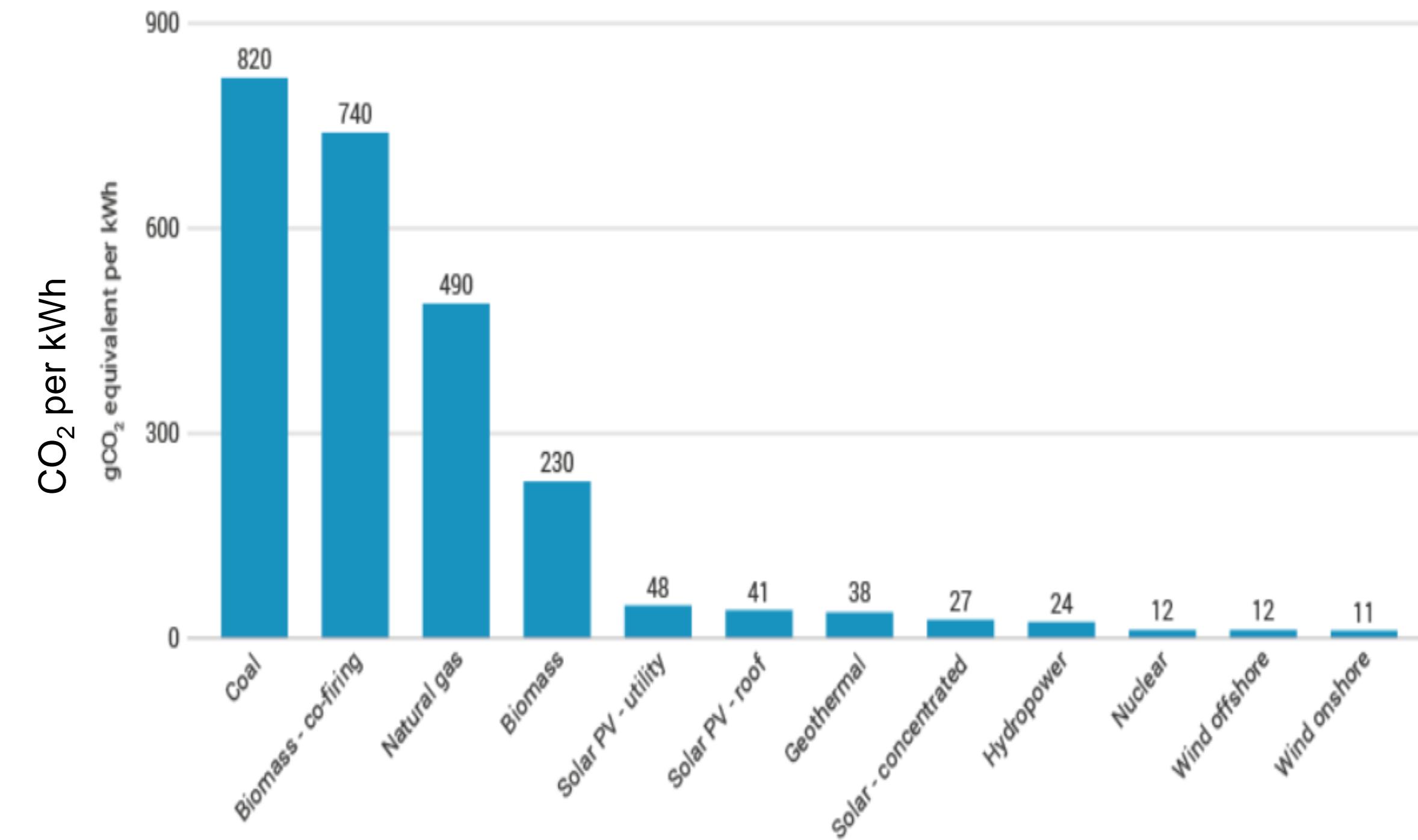
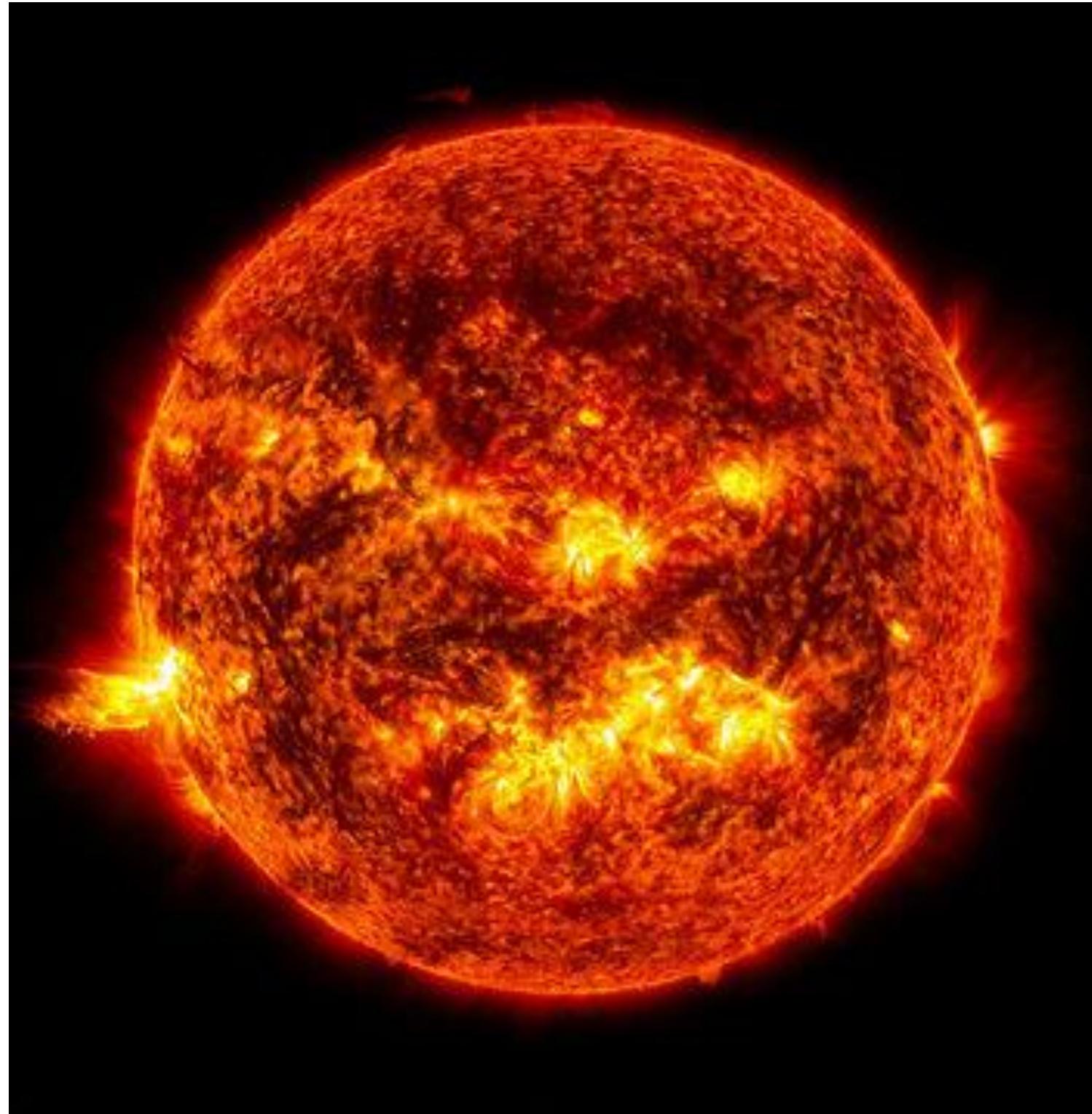
# Critical Needs

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- Projected Energy Shortfalls



## Energy – Needs to avoid CO<sub>2</sub> Emission



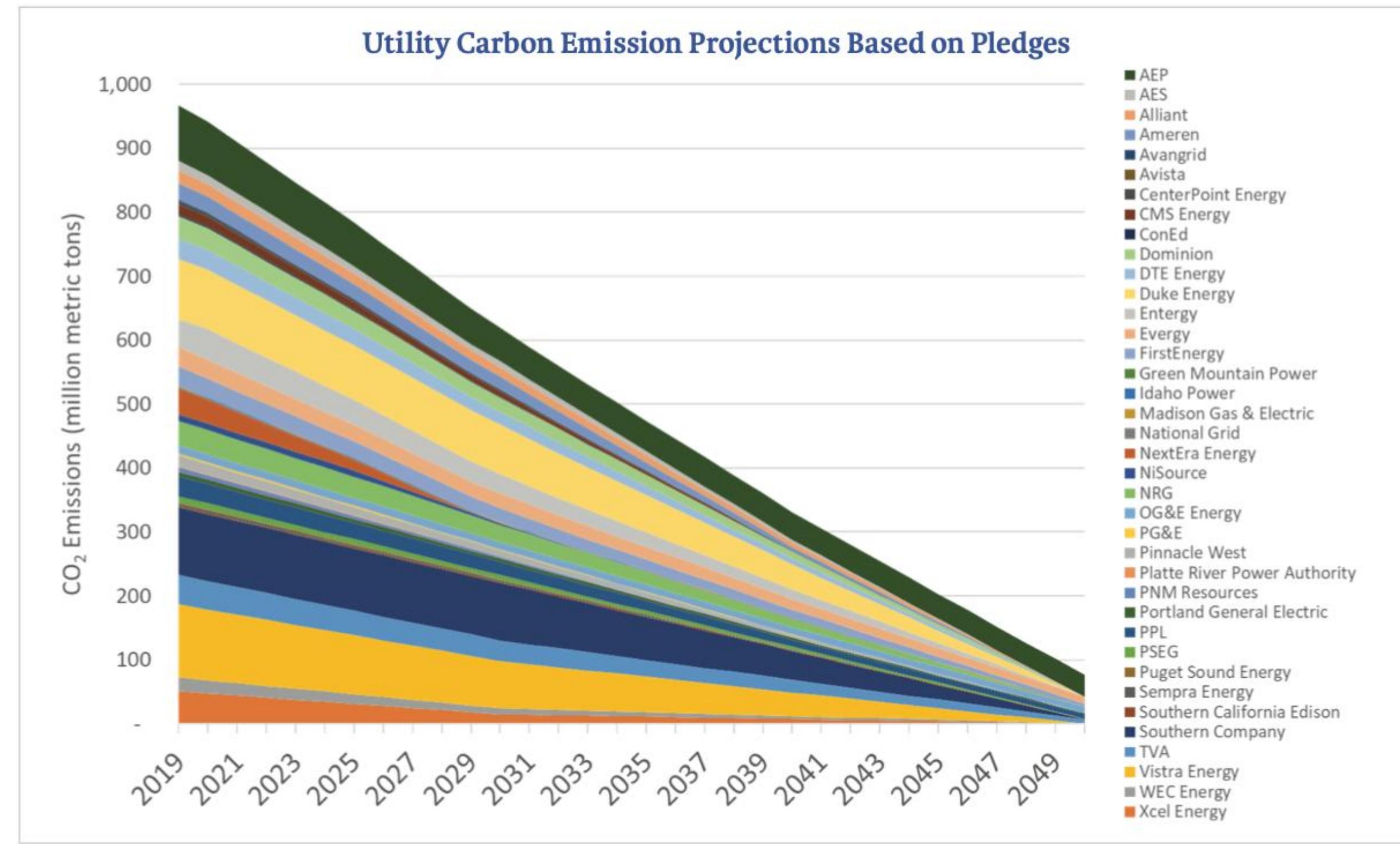
Average life-cycle carbon dioxide-equivalent emissions for different electricity generators (Source: IPCC)



# Critical Needs

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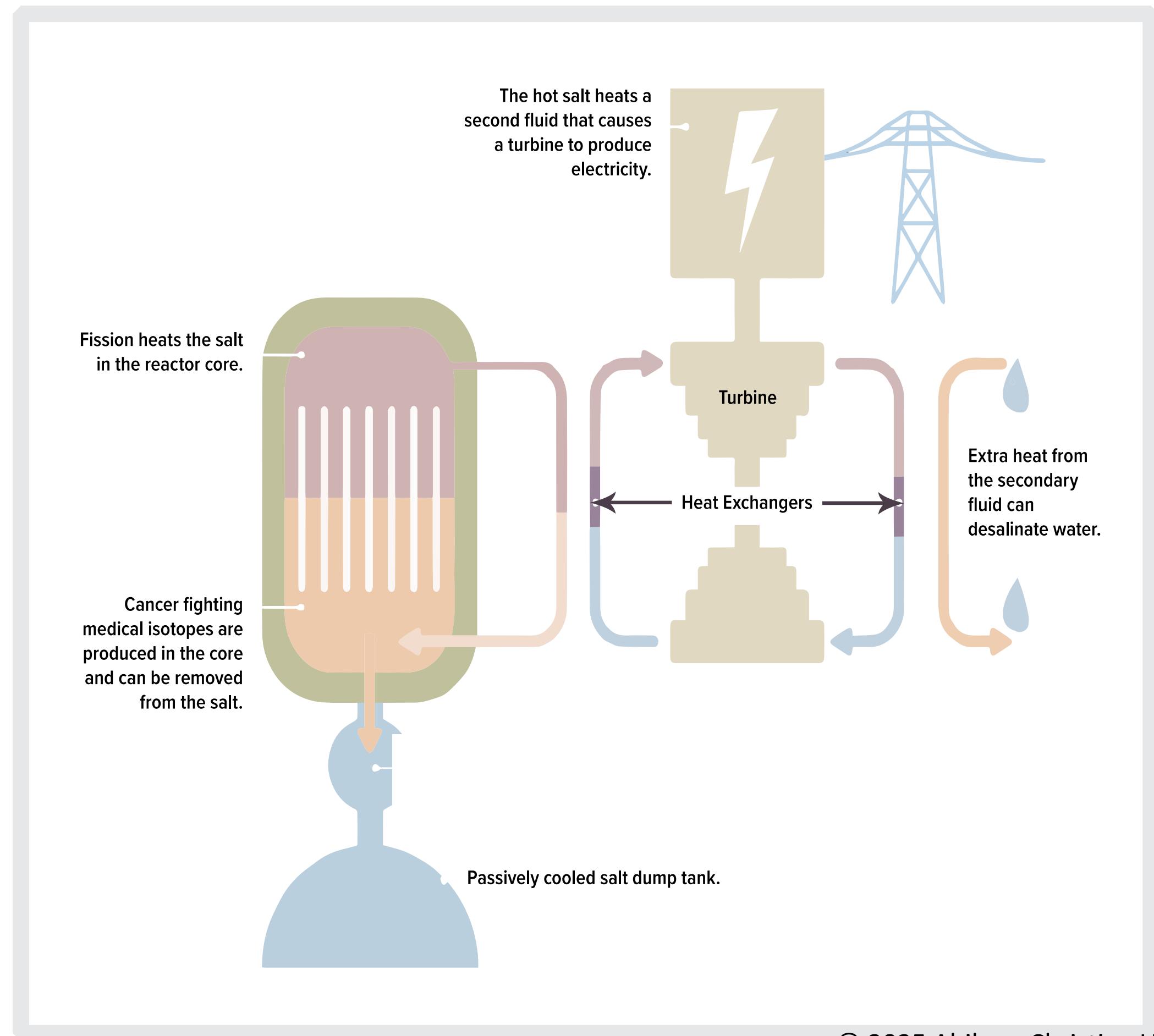
- Utilities are pledging to reduce CO<sub>2</sub> emissions



Capacity, Demand, and Reserves in the ERCOT Region; Dec. 2010

# A Solution to Critical Needs

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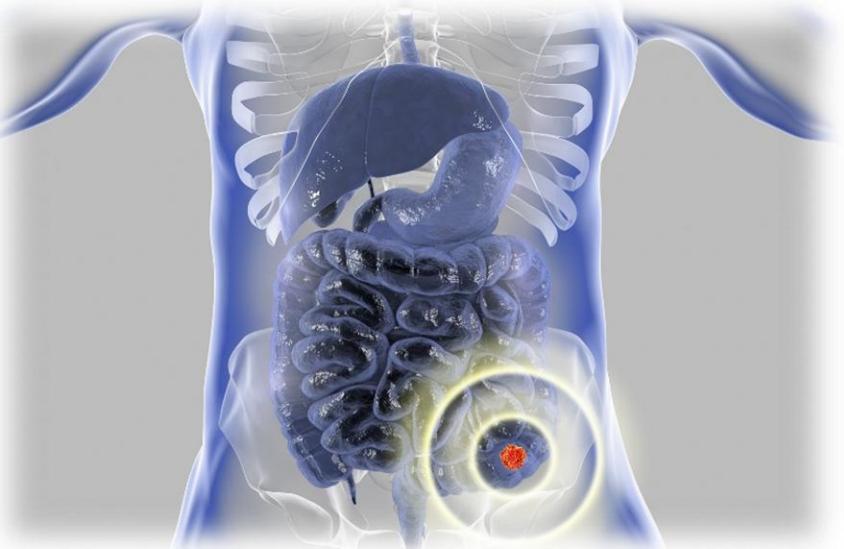
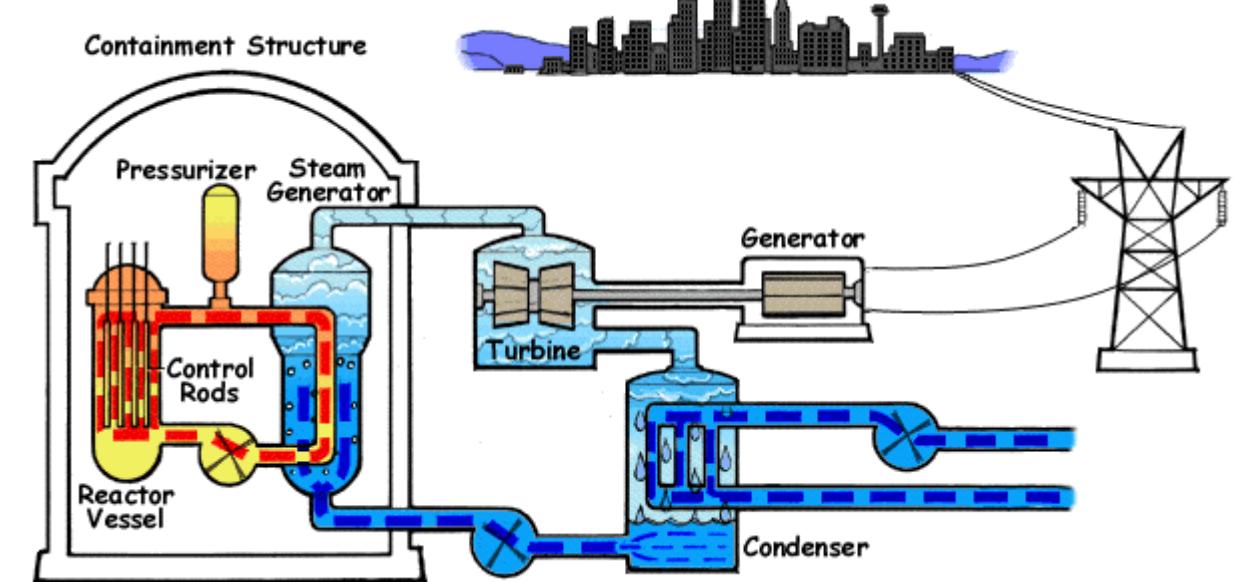
- ## Molten Salt Reactor
- Safe
  - Clean
  - Efficient
  - Multi-functional
  - Scalable
  - Carbon-free
  - Reliable

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# A Solution to Critical Needs

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- Molten Salt Reactors
  - Energy
    - Inexpensive energy production
  - Clean water production
  - A source of medical isotopes
    - For diagnostic imaging
    - For therapeutic treatments

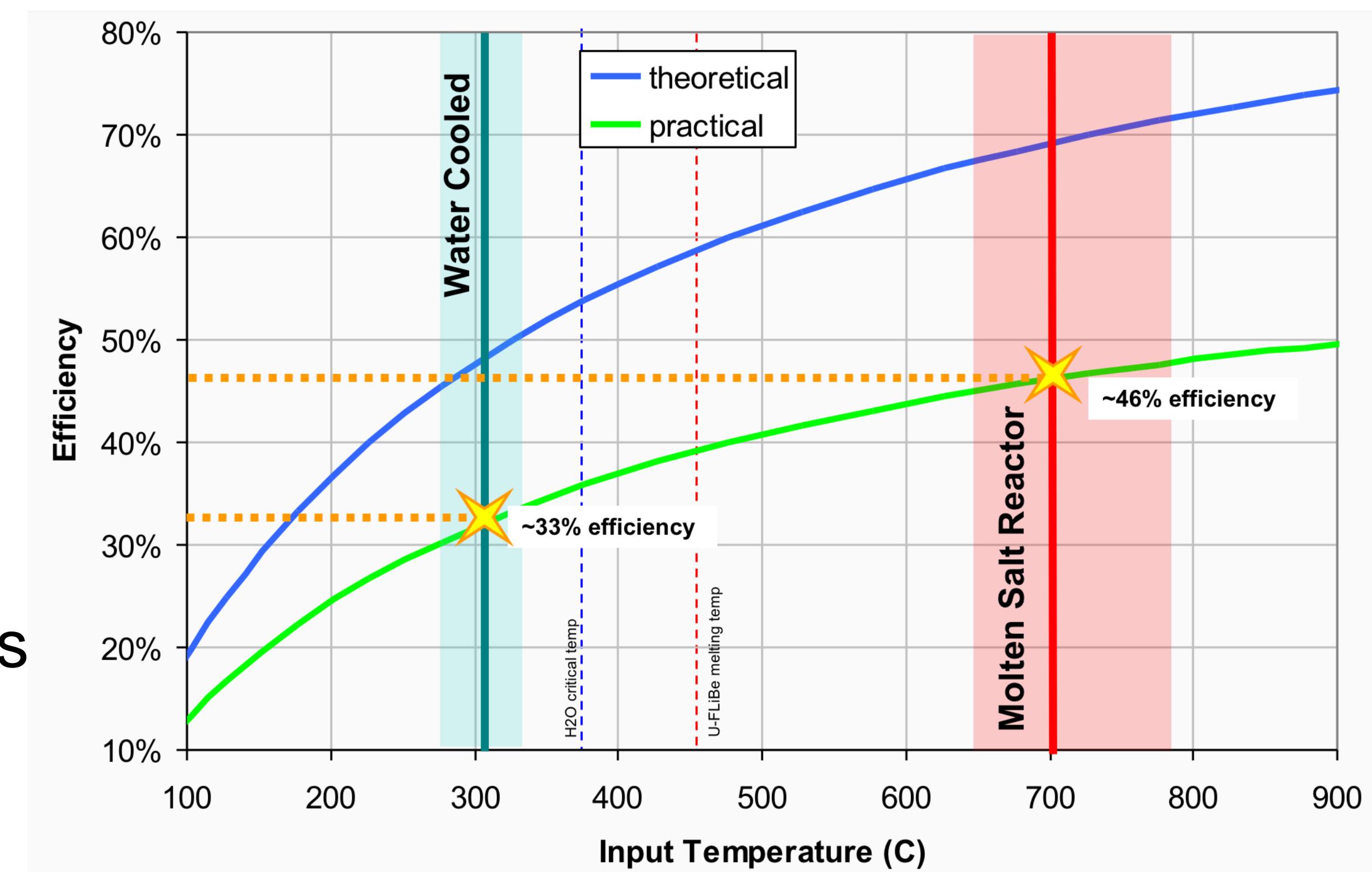


# A Solution to Critical Needs

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Salt cooled, liquid fueled  
enables:

- High temperatures
  - Improved efficiency
  - Industrial heat applications
- Enhanced safety
  - Low pressure
  - No containment domes
- Access to medical isotopes
  - Cancer treatments
  - Diagnostic imaging
- Decreased waste



- ACU's mission is to educate students for Christian service and leadership throughout the world.
- Main Campus in Abilene, Texas population 123,000
- Fall **2023 marks the sixth consecutive year** for a record number of students enrolling at ACU: 6,219



## NATIONALLY RANKED



# Nuclear Energy eXperimental Testing Lab

ACU's *NEXT* Lab works 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.

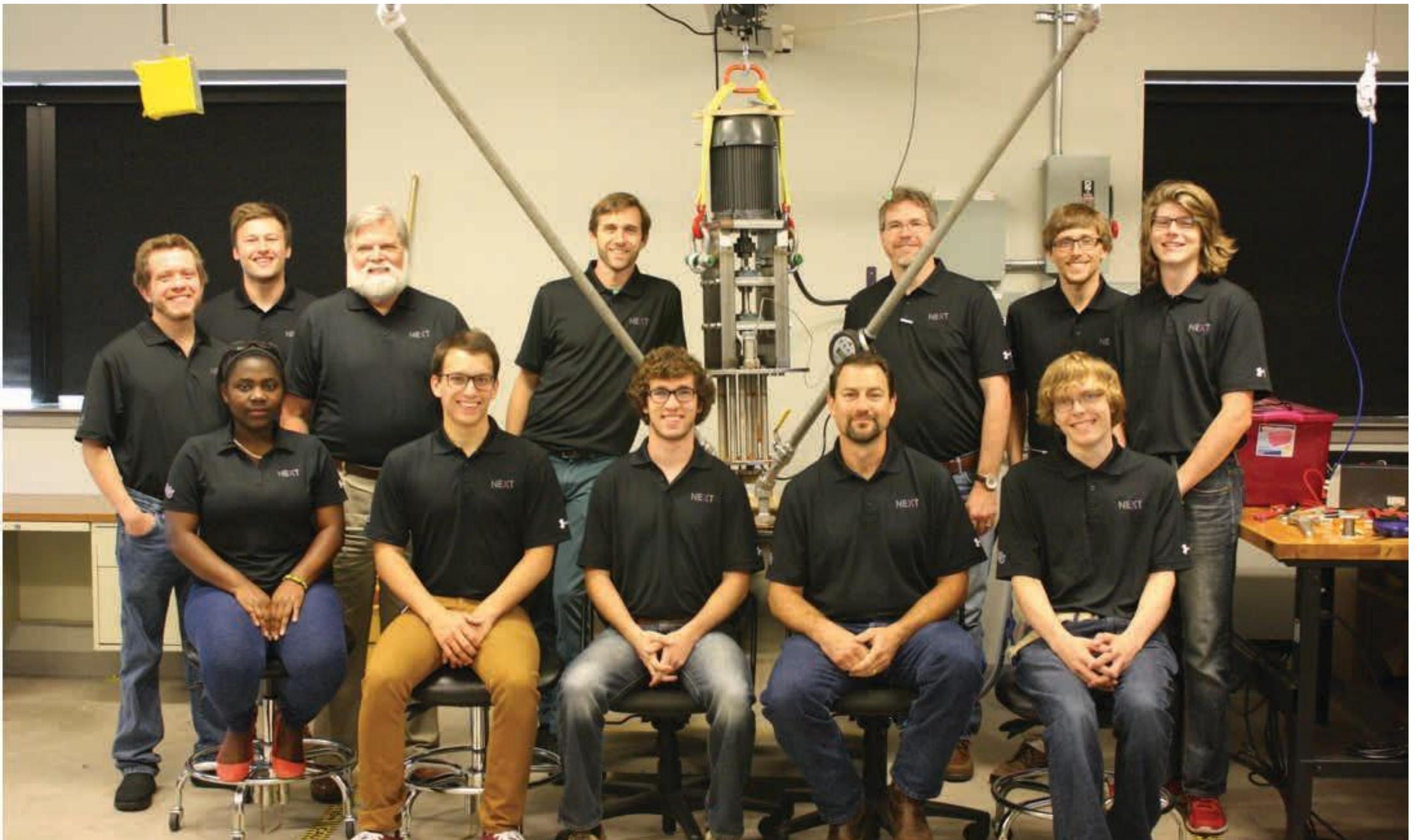


May 24, 2021

# Who is NEXT

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





U.S. DEPARTMENT OF  
**ENERGY**

2018 Campus Visit

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## DOE visits NEXT

- Principal Deputy 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





U.S. DEPARTMENT OF  
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2019 DC Visit

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## NEXT visits DOE

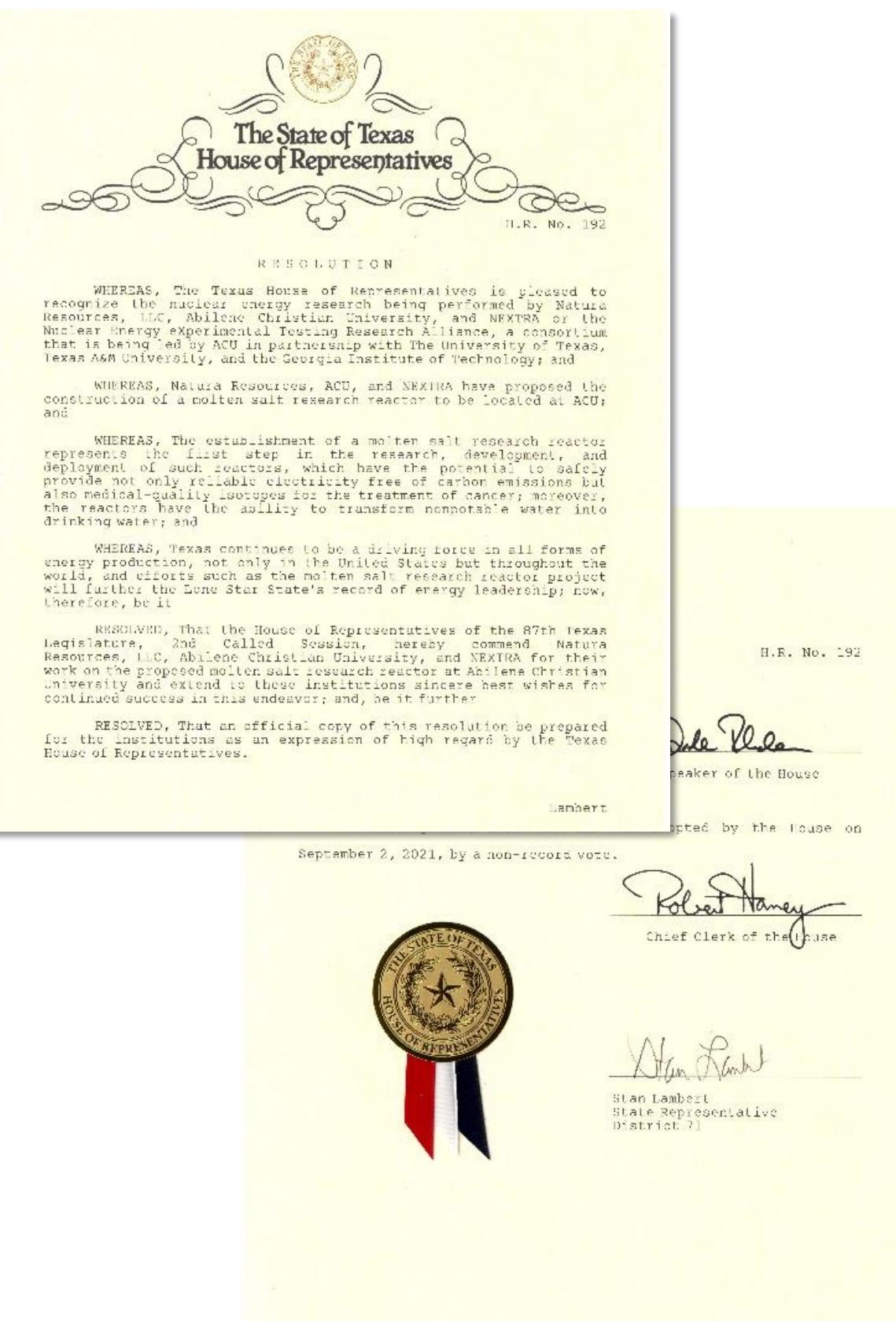
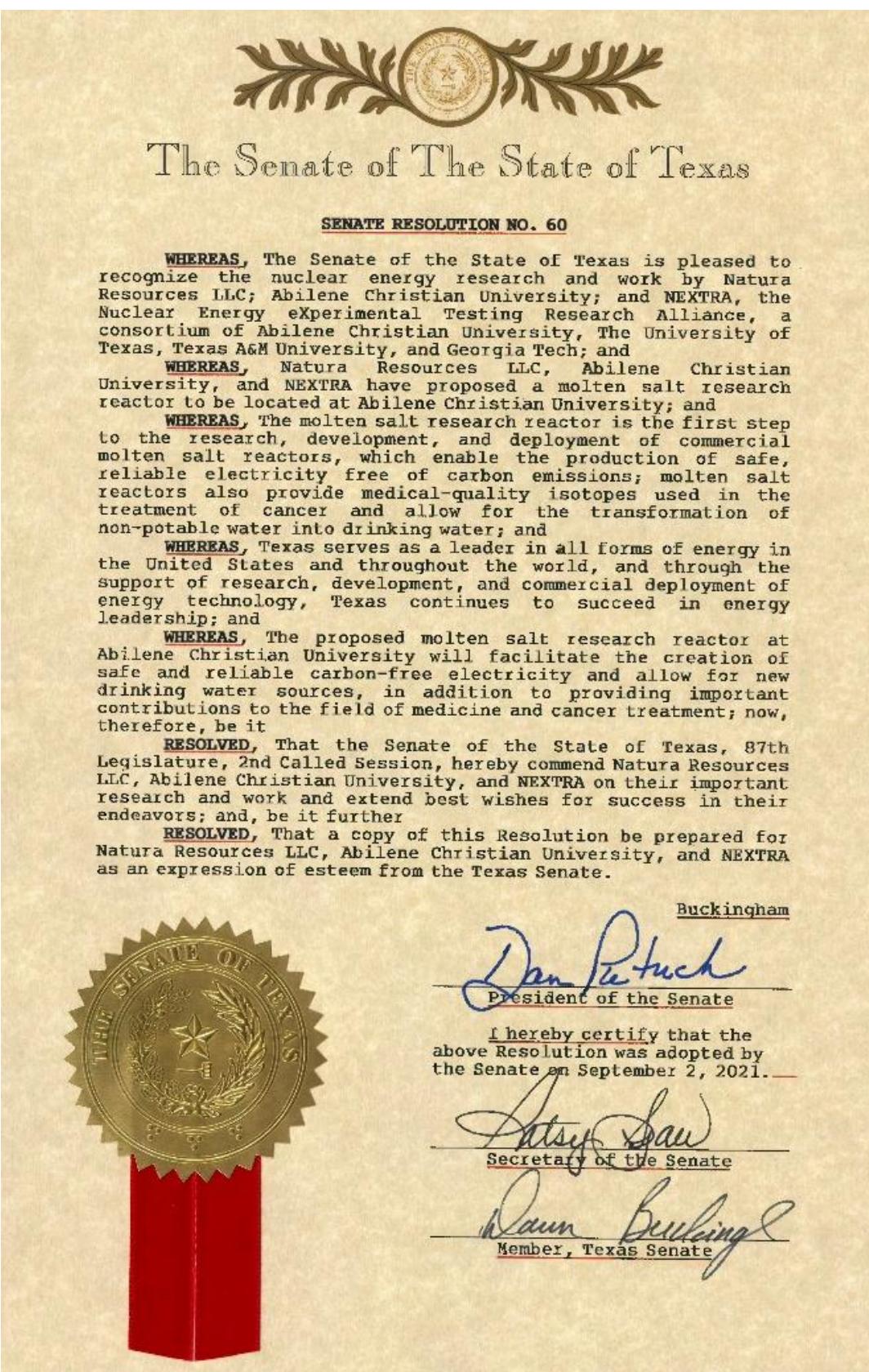
- Presented a plan to build a Molten Salt Research Reactor in 5 years.
- Asked DOE for fuel (500 kg HALEU), salt (FLiBe), and licensing support
- DOE was excited to help and has committed their support in writing.



# Making These Solutions Reality

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**Department of Energy**  
Washington, DC 20585  
November 15, 2019

NOV 25 2019

Dr. Philip J. Schubert, President  
Abilene Christian University  
206 Hardin Administration Building  
ACU Box 29100  
Abilene, Texas 79699-9100

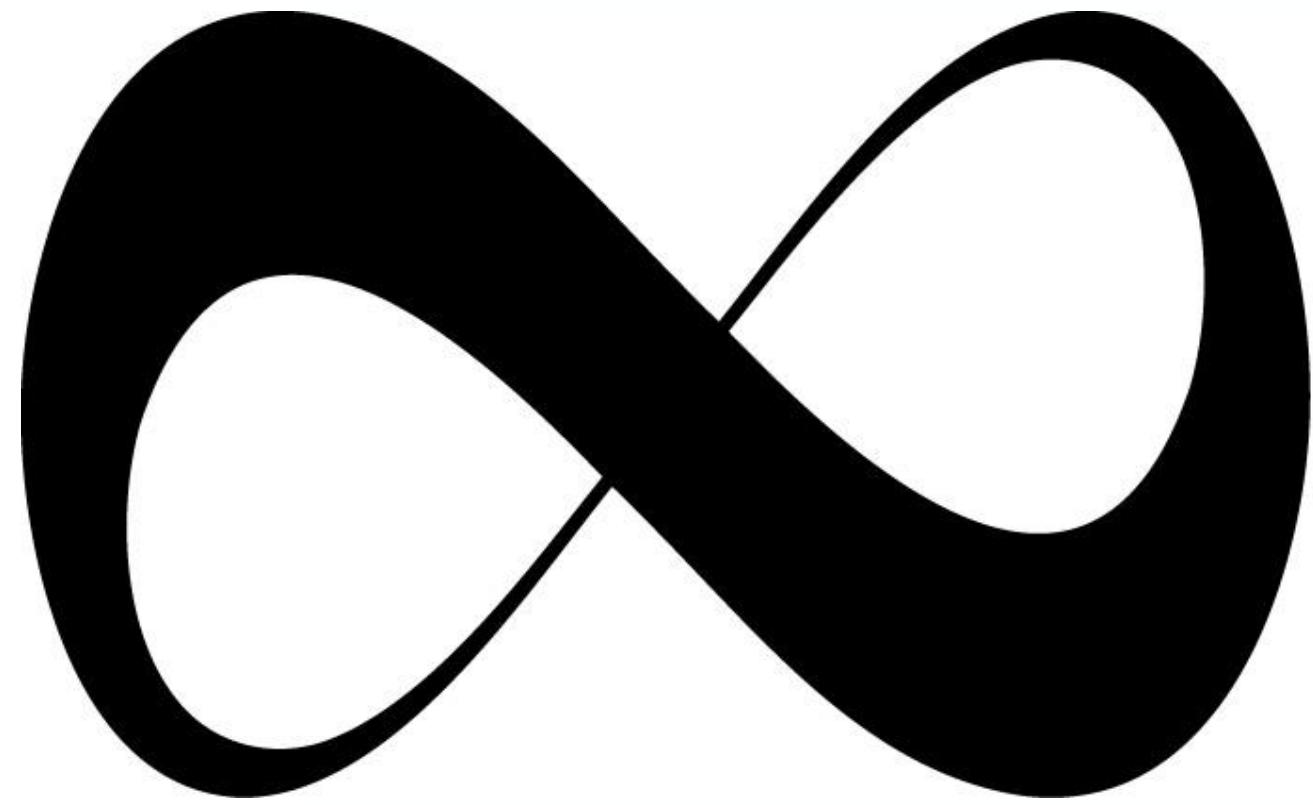


**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001**

September 16, 2020

Dr. Rusty Towell  
Director of NEXT Lab  
Abilene Christian University  
ACU Box 27963  
Abilene, TX 79699

SUBJECT: ABILENE CHRISTIAN UNIVERSITY – ASSIGNMENT OF PROJECT NUMBER  
99902088 (EPID NO. L-2020-LRM-0081)



# 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)

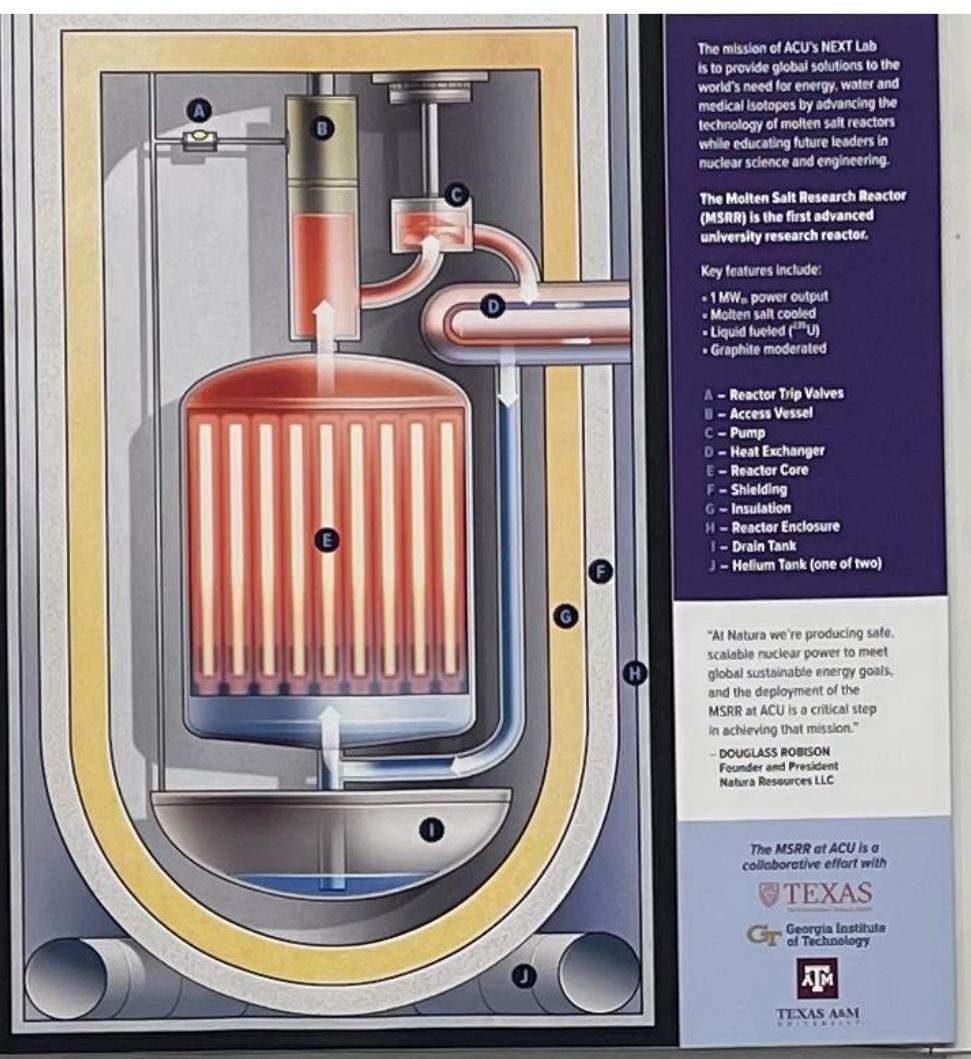
# Natura Resources Research Alliance



$\infty$  Natura  
Resources

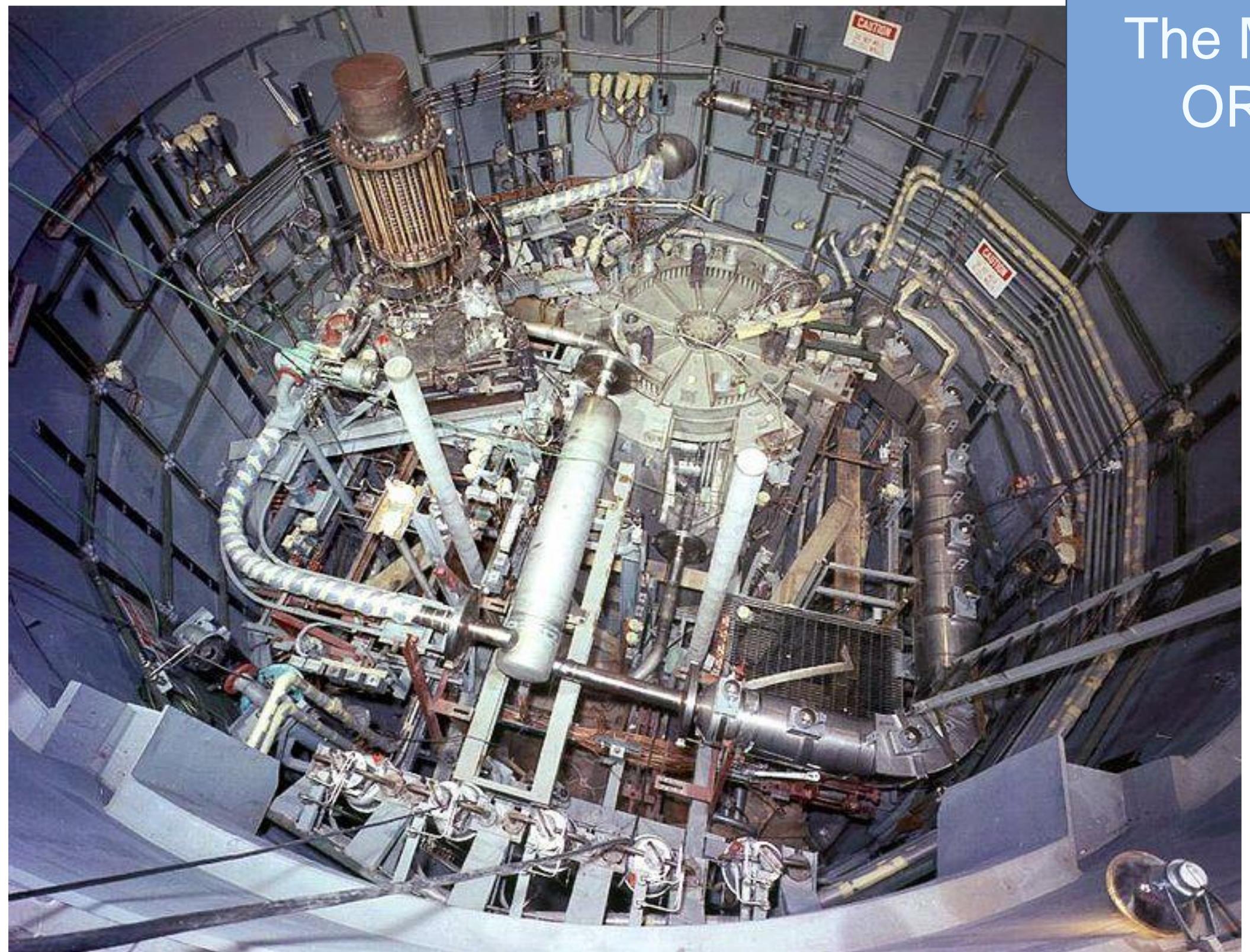


# Summer 2024 NEXT Team

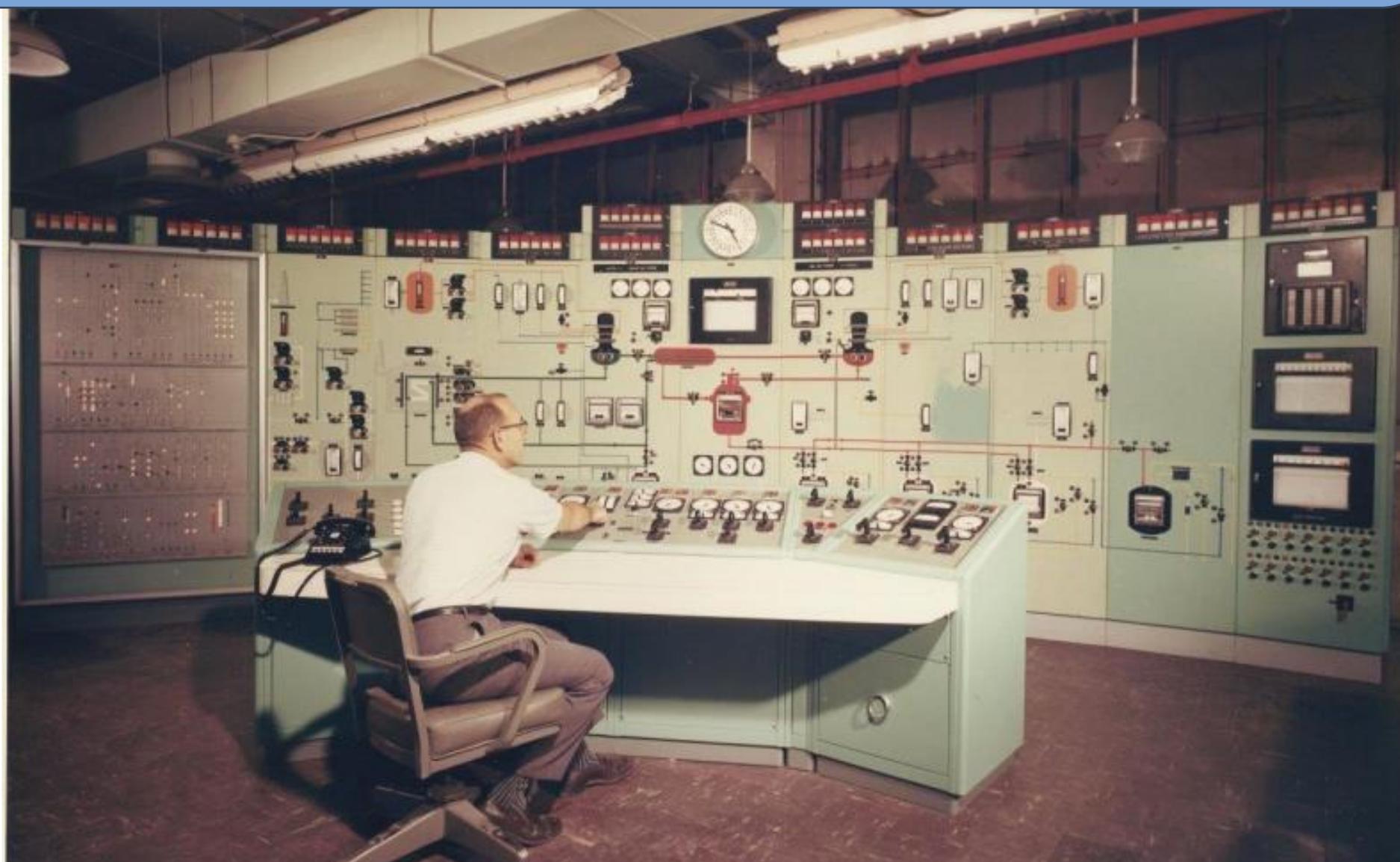


# Plans for Molten Salt Research Reactor

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



## MSRE Shared Concepts

- Similar Fuel Salt form:  $\text{UF}_4$ ,  $\text{LiF-BeF}_2$
- Loop design
- Graphite moderator
- Drain Tank
- Subterranean radiation protection
- Short expected lifetime
- Low pressure

## Simplified Concepts

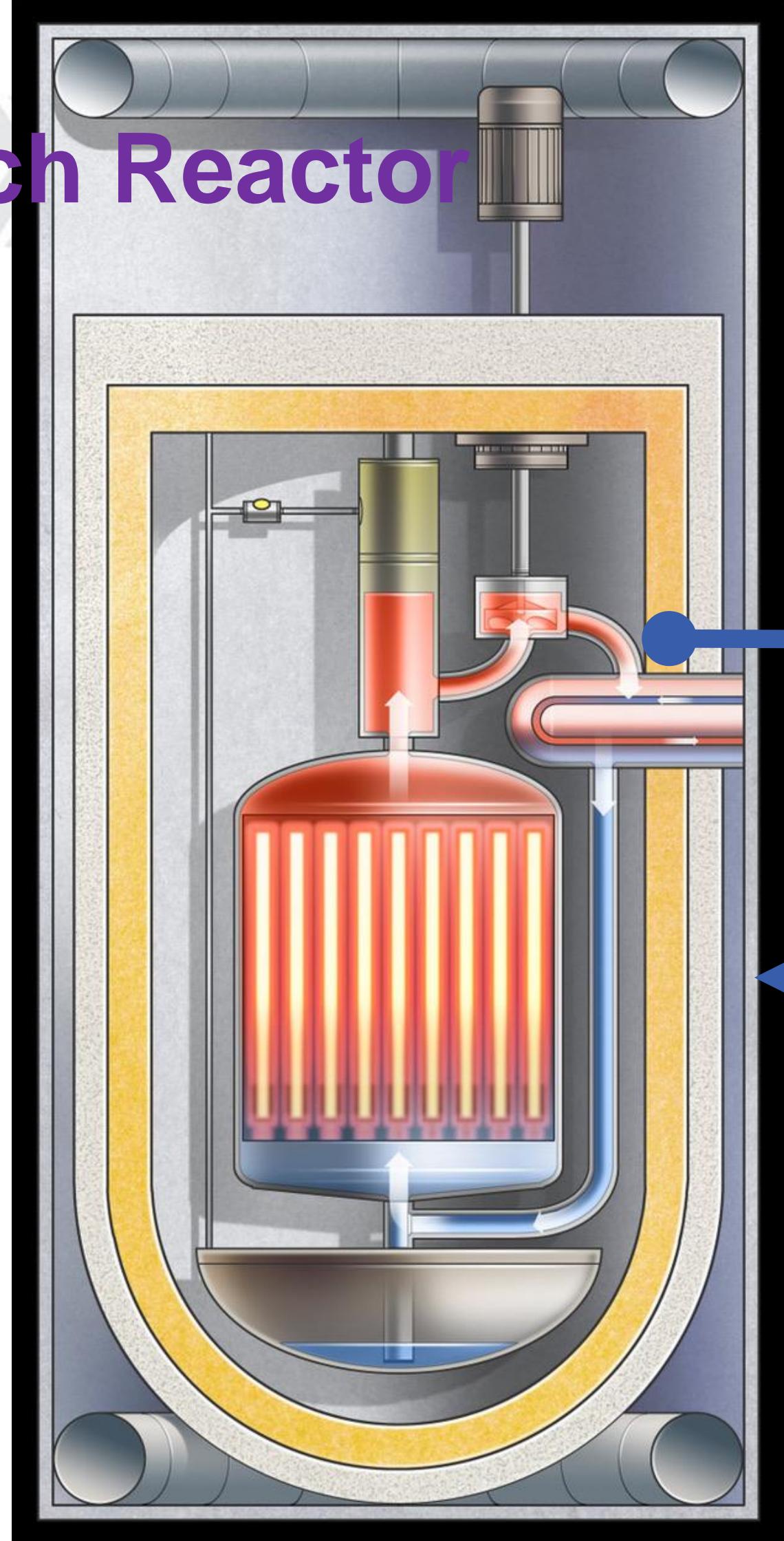
- 19.75% HALEU instead of 33%  $^{235}\text{U}$
- $1\text{MW}_{\text{th}}$  instead of 8-10  $\text{MW}_{\text{th}}$
- ASME Qualified SS-316, not Hastelloy-N
- Shutdown via drain, no freeze valve
- Control rods are not safety related
- No cooling water required
- Walk-away safe

# Plans for Molten Salt Research Reactor

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## MSRR Safety Features

- Multiple barriers:
  - 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



# Plans for Molten Salt Research Reactor

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# NEXT

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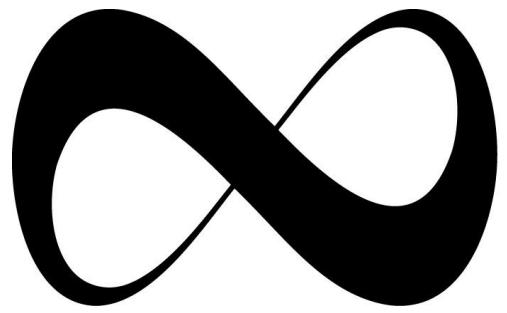


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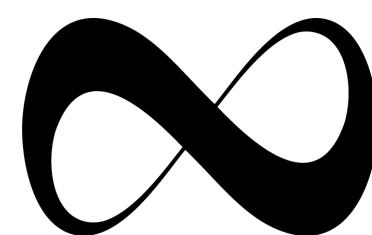
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# Historic NRC Construction Permit Approval of MSRR on Sept 16, 2024



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

- ACU has received the first construction permit for an 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 molten salt reactor in the U.S. since the MSRE.
- Natura Resources is positioned to be one of the first commercial reactor vendors capable of deployment.



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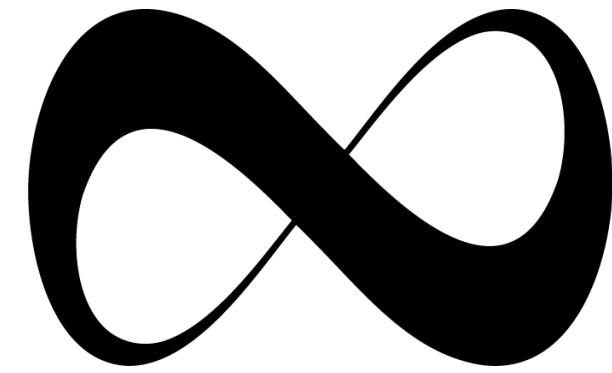
**TEXAS**  
The University of Texas at Austin



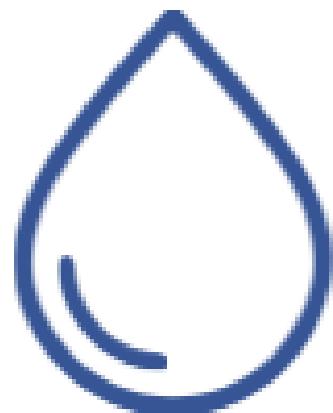
**TEXAS A&M**  
UNIVERSITY®



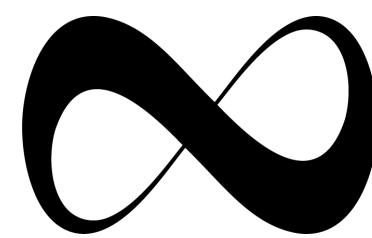




# Natura Resources



- MSRs can make nuclear even safer
- MSRs have applications besides energy
- MSRs reduce wasted fuel
- Small modular MSRs have potential to reduce construction costs and improve grid stability
- The thorium fuel cycle
- International collaborations



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Resources**



NE<sup>X</sup>T  
Juc<sup>er</sup> v eY<sup>al</sup> T<sup>h</sup>

# THANK YOU

*acu.edu/next*

*naturaresources.org*



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