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Role of RTRs in the development of advanced reactor technologies

by

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Nuclear Energy eXperimental Testing Lab

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Nuclear Energy eXperimental Testing



The mission of ACU's NECT 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. © 2024 Abilene Christian University

Natura Resources Research Alliance

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2016 – NEXT Lab established at ACU

2020 – First-of-a-kind research alliance established to design, license and build Molten Salt Research Reactor

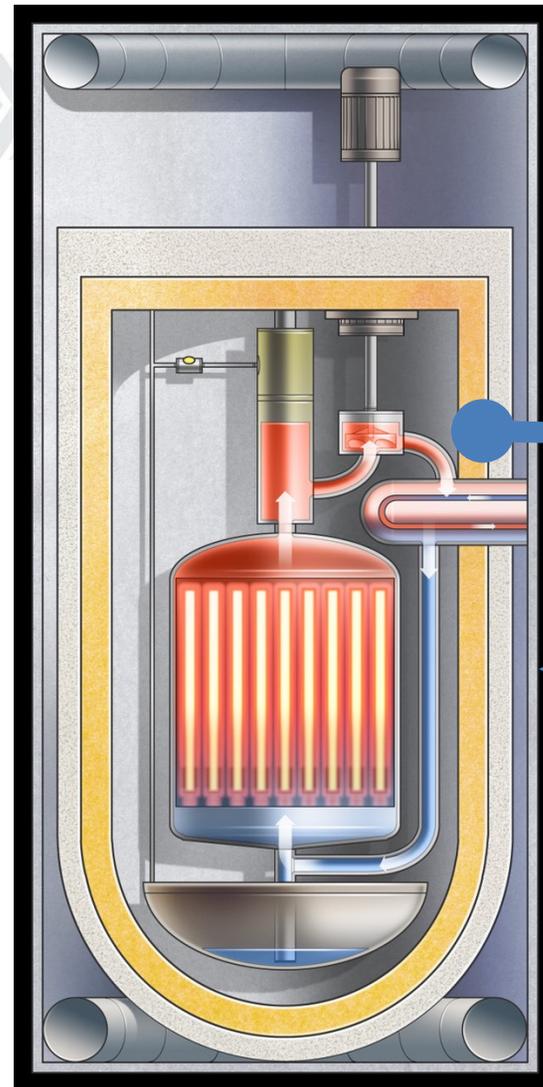
2022 – Construction Permit application submitted to the NRC and accepted for review

Goal: 2026 – MSRR begins operations



Molten Salt Research Reactor safety

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



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RTMS

Reactor
Enclosure



MSRR comparison to Molten Salt Reactor Experiment

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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 MWth instead of 8-10 MWth
- SS-316 instead of Hastelloy-N
- No freeze valve, shut down via simple drain
- Control rods not safety related
- No water





- 28,000 ft² facility
 - 6,000 ft² Research Bay
 - Specialty Research Labs
 - Offices
- Designed as advanced reactor test bed.
- Completed: 2023



Gayle and Max Dillard Science and Engineering Research Center

Role of RTR in development of Advanced Reactor Technologies

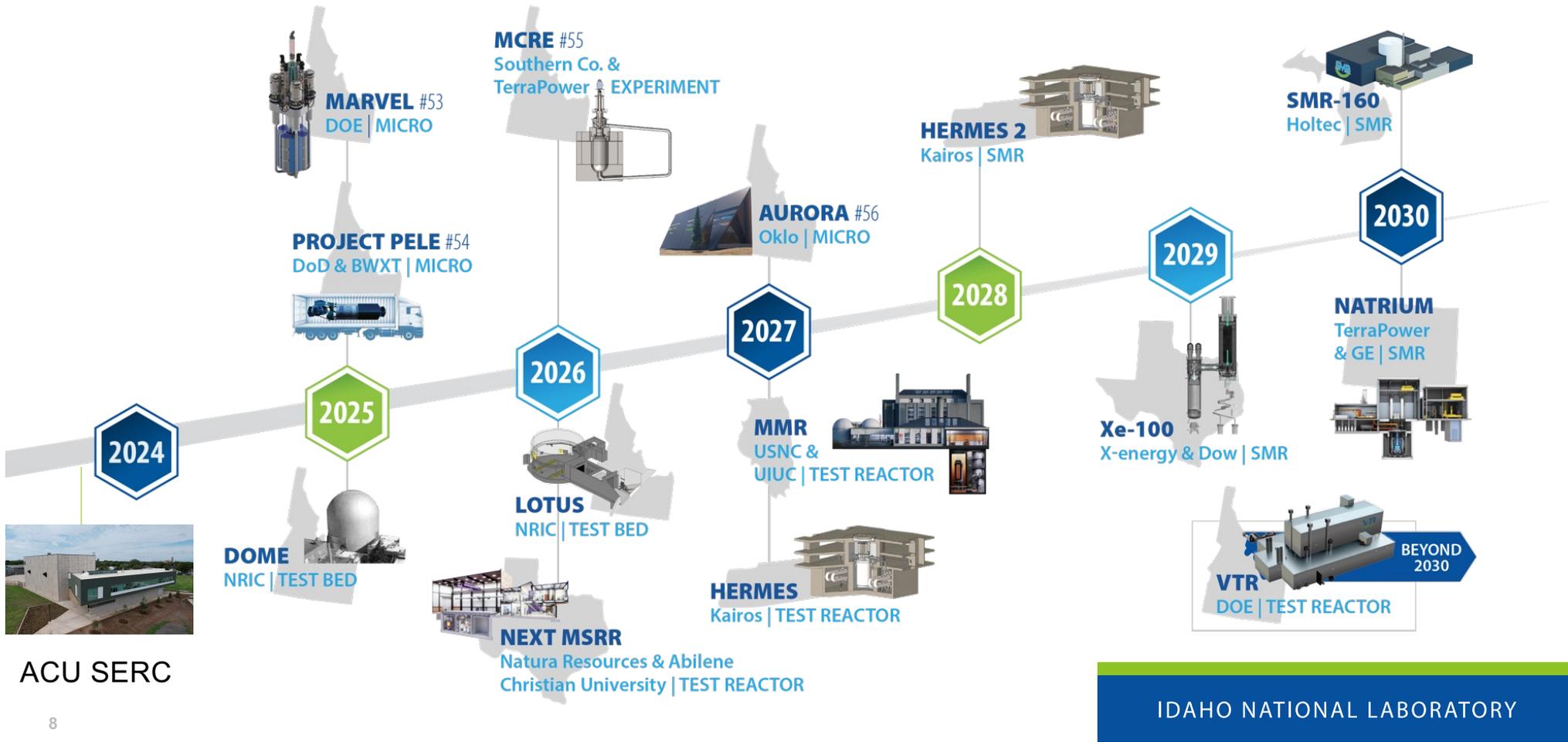


- Decrease risks for advanced reactor deployment
 - Regulatory Risk
 - Demonstrate NRC's ability to license a non-LWR
 - Collect data needed to support the licensing of commercial non-LWR
 - Provide learning opportunities for the NRC to review new technologies
 - Collect data on fuel behavior
 - Collect data on materials performance in nuclear environment
 - Supply Chain Risks
 - Demonstrate supply chain capabilities
 - Increase the Technical Readiness Level of supporting technologies
 - Improve cost certainty for new deployments
 - Train a nuclear qualified work force
 - Operators, regulators, designers, ...
 - Demonstrate the ability of Advanced Reactors to be multi-functional
 - Efficiently produce electricity, but also high process heat, isotope generation, ...
- Accomplish all these with lower risks (source term)

Needed to move beyond "minimum amount of regulation" of research reactors.



Accelerating advanced reactor demonstration & deployment





THANK YOU

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May 24, 2021

NEXT Summer Orientation 2021