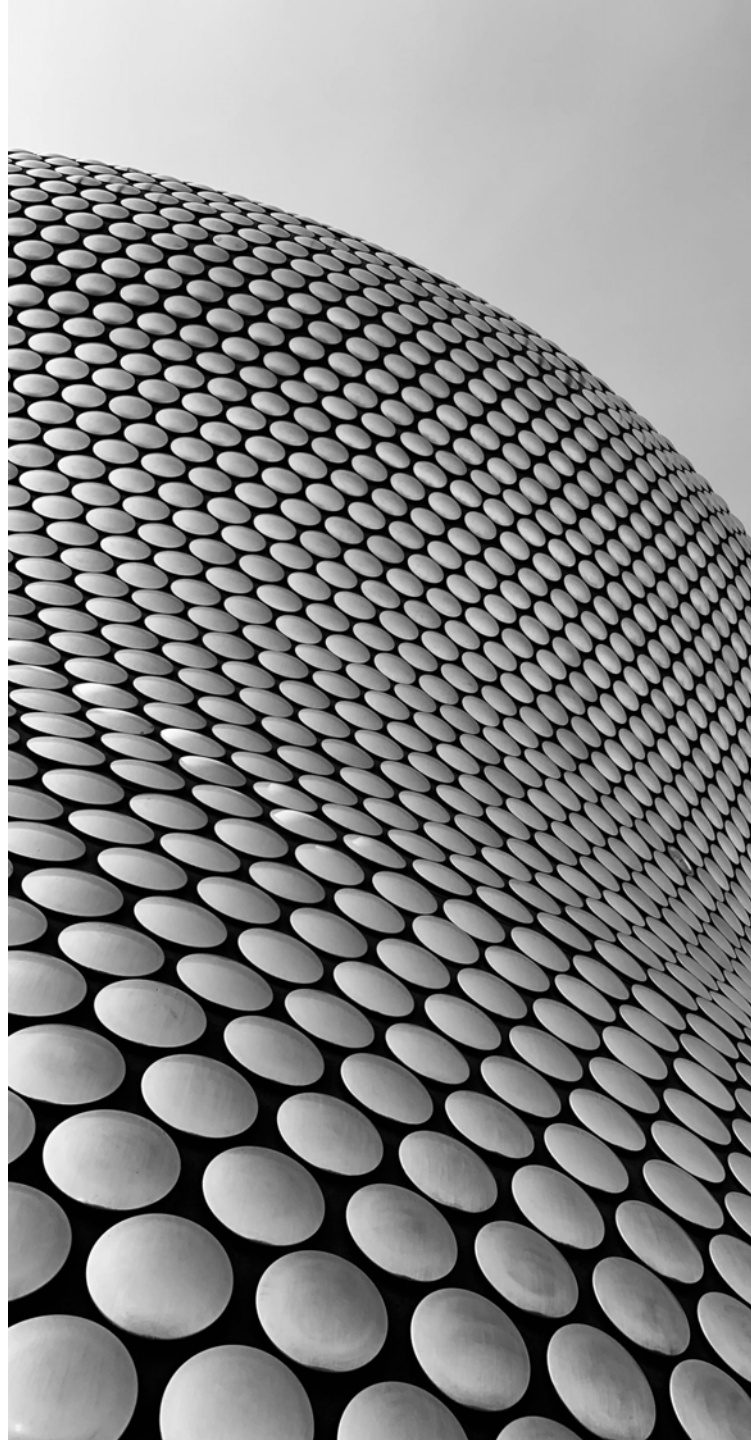
Nuclear Regulatory Commission

Advanced Reactor Program Update

National Meeting- State Liaison Officers
June 2025

Jon Greives
Deputy Director
Division of Advanced Reactors and Non-Power Production and Utilization Facilities
Office of Nuclear Reactor Regulation



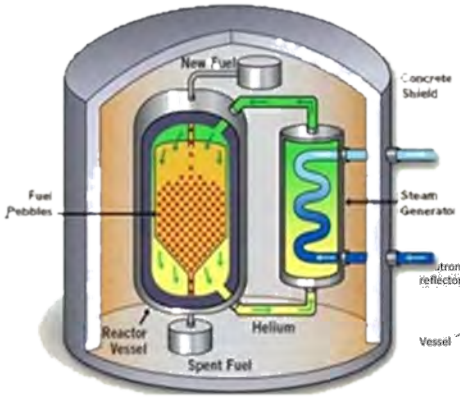
Flexible Reactor Licensing Pathways

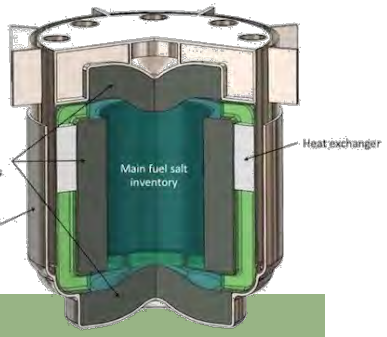
10 CFR Part 50

- Large majority of operating power reactor and NPUF fleet
- Construction Permit + Operating License

10 CFR Part 52

- Vogtle AP-1000, NuScale
- Early Site Permit, COL, Design Certification, Manuf. License





10 CFR Part 53

- New licensing framework under development
- Technology-inclusive, risk-informed, performance-based framework
- Publish by mid-2025

Licensing Process Brochure (NUREG/BR-0298)

Vendors/Applicants

Construction Permit Applications Issued

Kairos Power

Abilene Christian University

License Reviews in Progress

TerraPower

NuScale Power for all humankind

Dow

TVA

Fuel Fabrication Review

X energy

Ongoing Preapplication Activities/Potential Applications

OKLO

GE

Hitachi

Last Energy

General Atomics

Aalo

Radiant

Duke Energy

Shepherd Power

NANO Nuclear Energy Inc.

arc Clean Technology

Westinghouse

Dominion Energy

Terrestrial Energy USA

Energy Northwest

Blue Energy

Deep Fission

JAEA

Terra Innovatum Solo

Holtec International

Texas A&M

University of Illinois

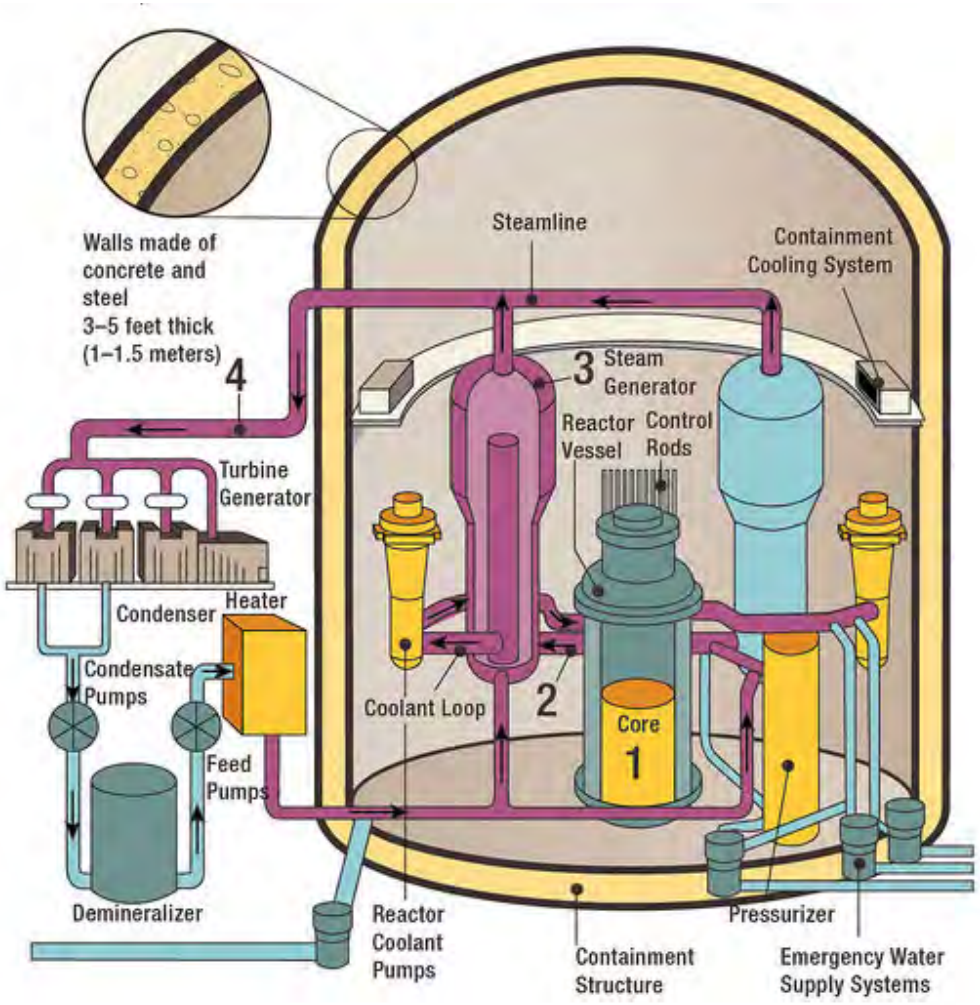
Rolls-Royce

Natura Resources

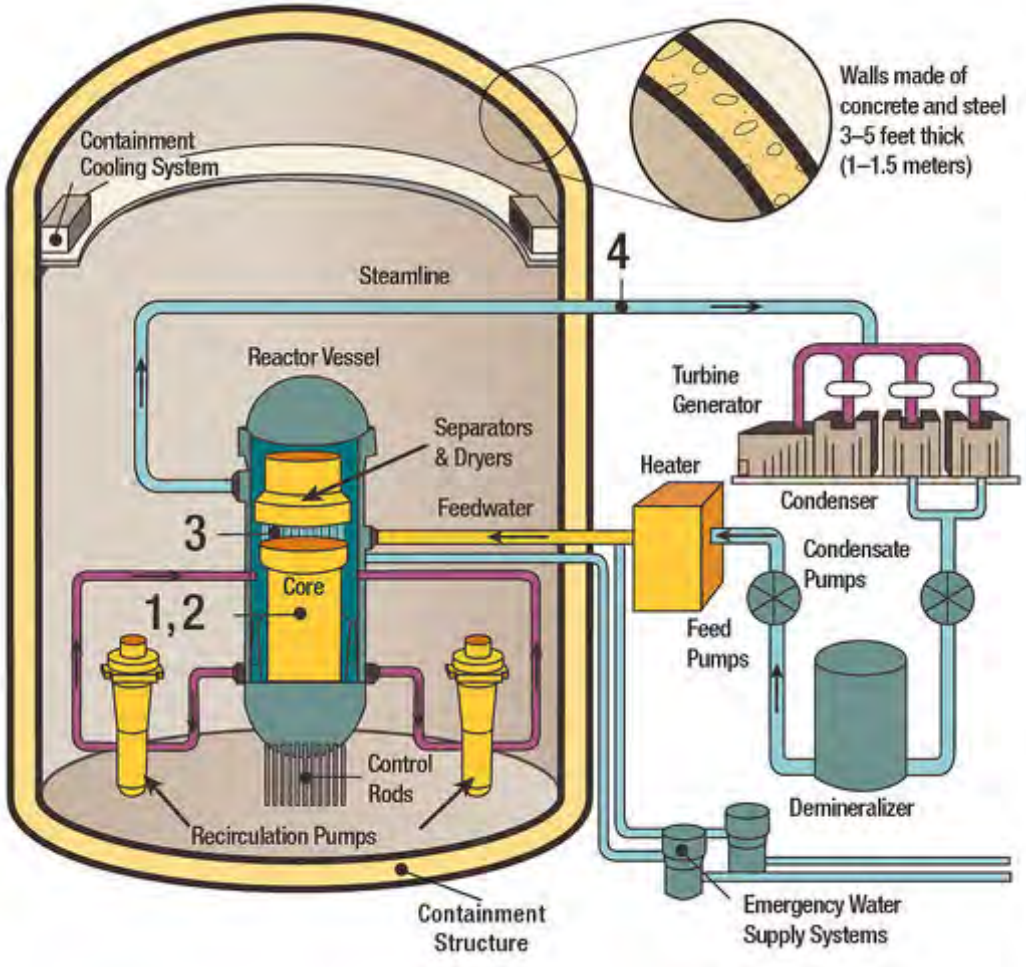
Appalachian Power An AEP Company

Current Fleet (Large LWRs)

PWRs



BWRs



NuScale US460 (6 Pack)

Design:

- 77 MWe each, 462 MWe total
- Light water SMR
- Fully Passive Safety Systems

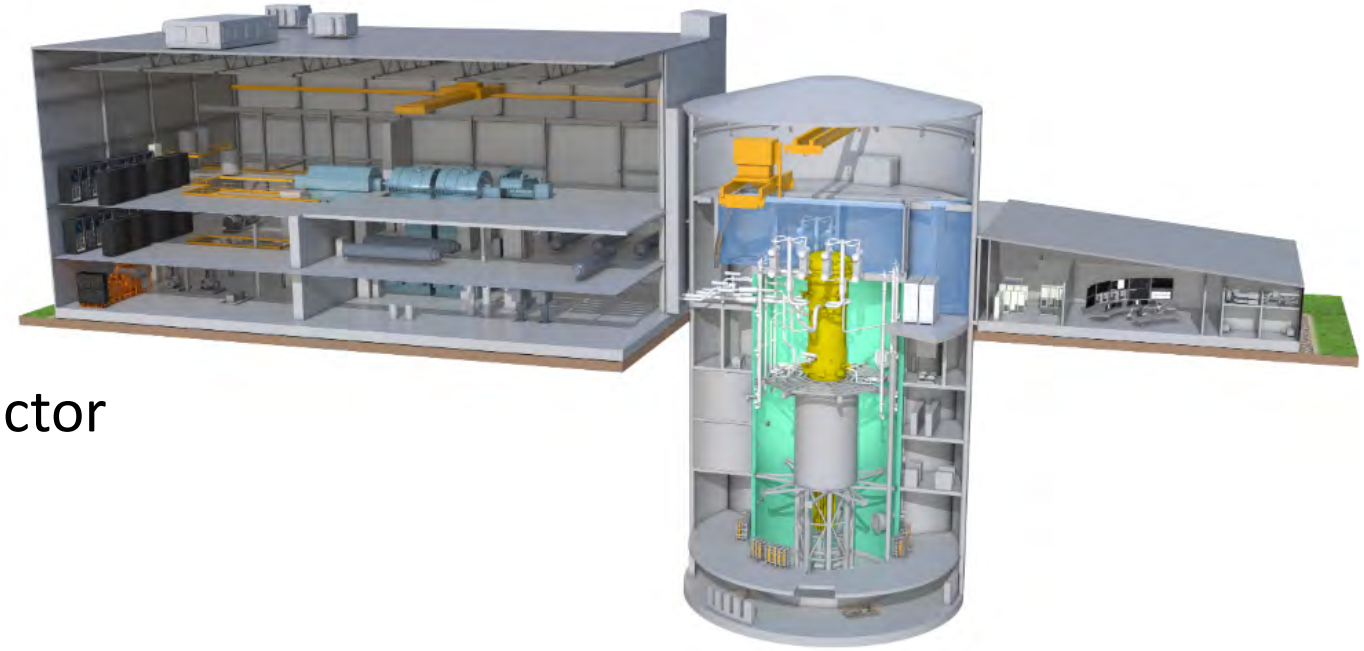
Licensing:

- Standard Design Approval submitted in July 2023

Source: © Nuscale Power, LLC

Clinch River (GE/Hitachi BWRX-300)

Location: Clinch River (Oak Ridge, TN)



Source: GE Hitachi

Design:

- 300 MWe
- Natural Circulation, Boiling Water Reactor
- Fully Passive Safety Systems

Licensing:

- CP application (Part 50) submitted in 2025

Kemmerer Power Station (TerraPower Natrium)

Location: Kemmerer, WY

Design:

- Sodium cooled, fast reactor, metal fuel (U-Zr)
- 345 MWe (840 MWth) reactor design, can be ramped to higher levels using heat storage of molten salt intermediate loop
- Functional Containment

Source: TerraPower

Licensing:

- CP application (Part 50) submitted in 2024 for use in 2026

Kairos Power Fluoride Cooled Reactor

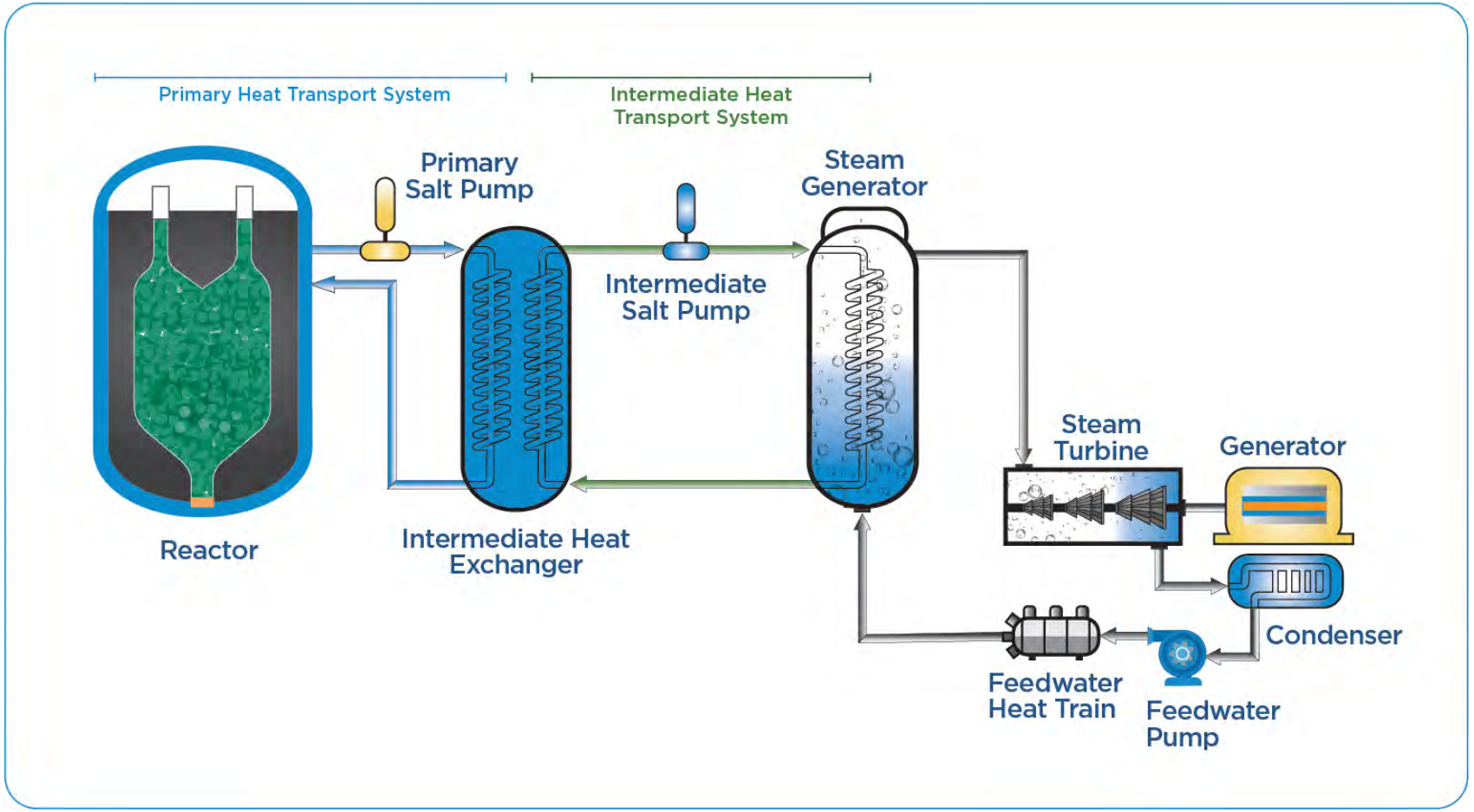
Location: Oak Ridge, TN

Design:

- molten Fluoride salt cooled
- TRISO pebble fueled
- 150 Mwe

Licensing:

- CP for Hermes-1 issued in 2023
- CP for Hermes-2 issued in 2024



Source: Kairos Power

Project Long Mott (X-energy Xe-100)

Location: Seadrift, TX (NE of Corpus Christi)

Design: Xe-100 High Temperature Gas-Cooled Reactor

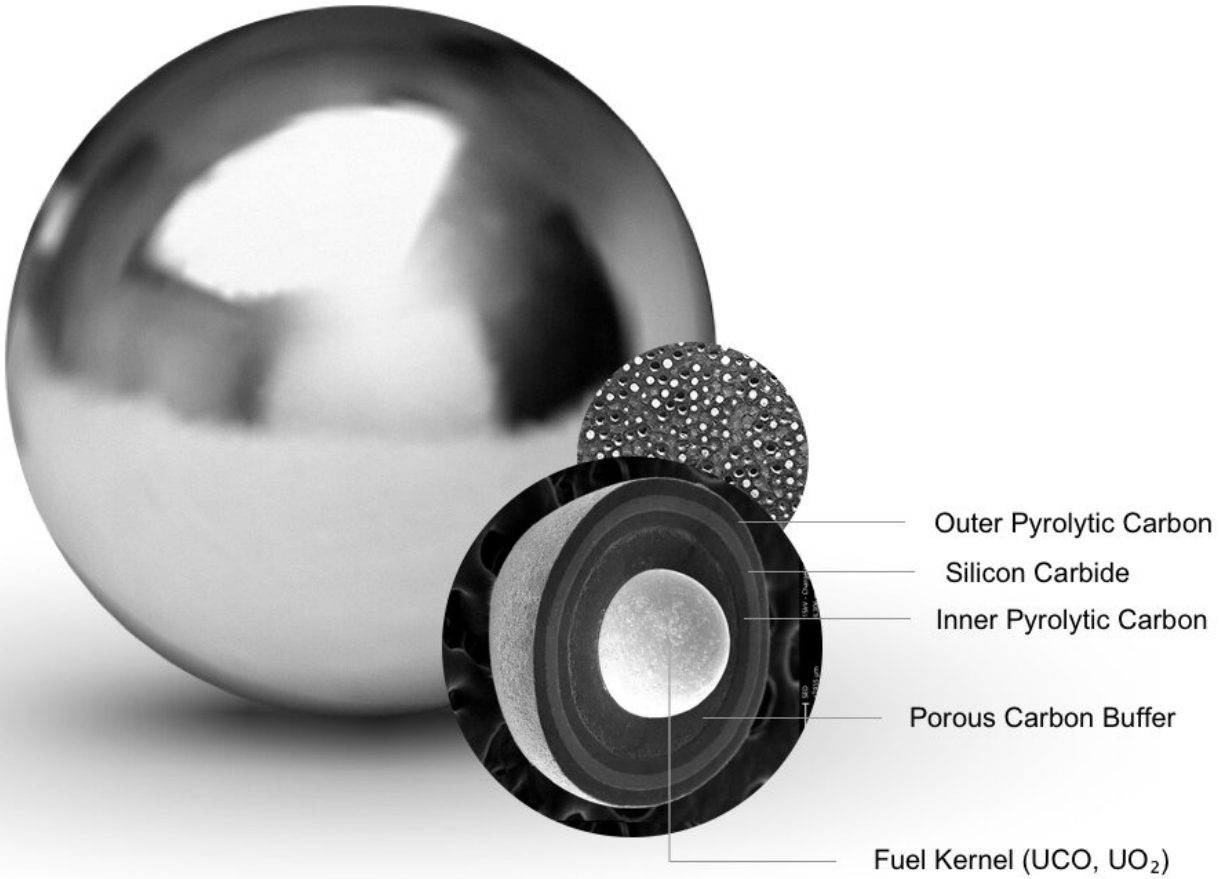
- Helium cooled
- 80 MWe reactor design, sold as a “4 pack” for 320 MWe.
- TRISO pebble fueled. Online refueling

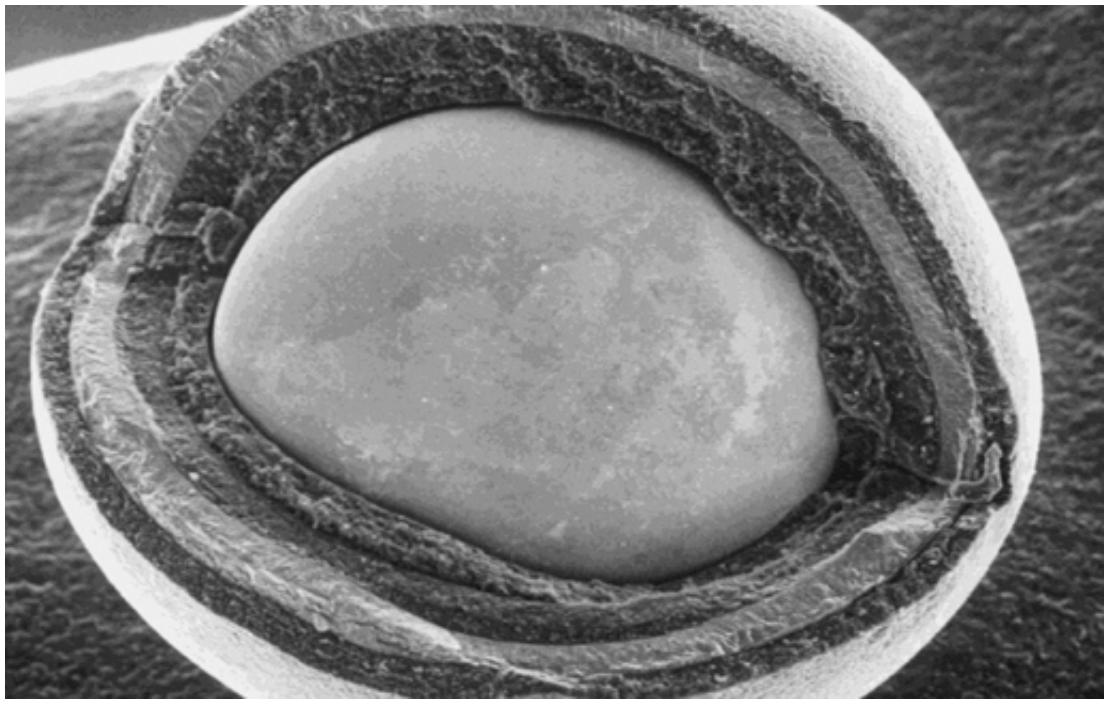
Licensing:

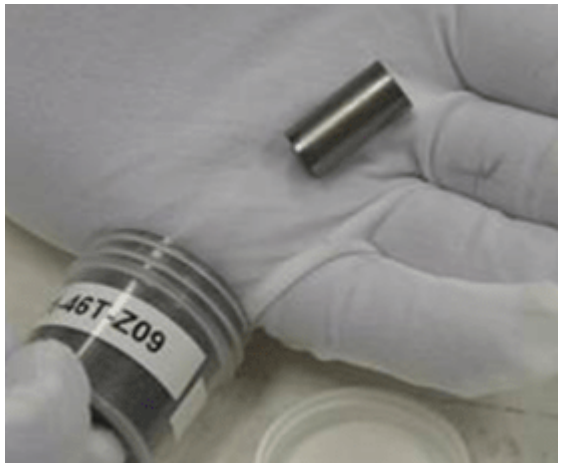
- CP application (Part 50) submitted in March 2025

Source: X-Energy

TRISO Fuel (TRi-structural ISOtropic particle fuel)



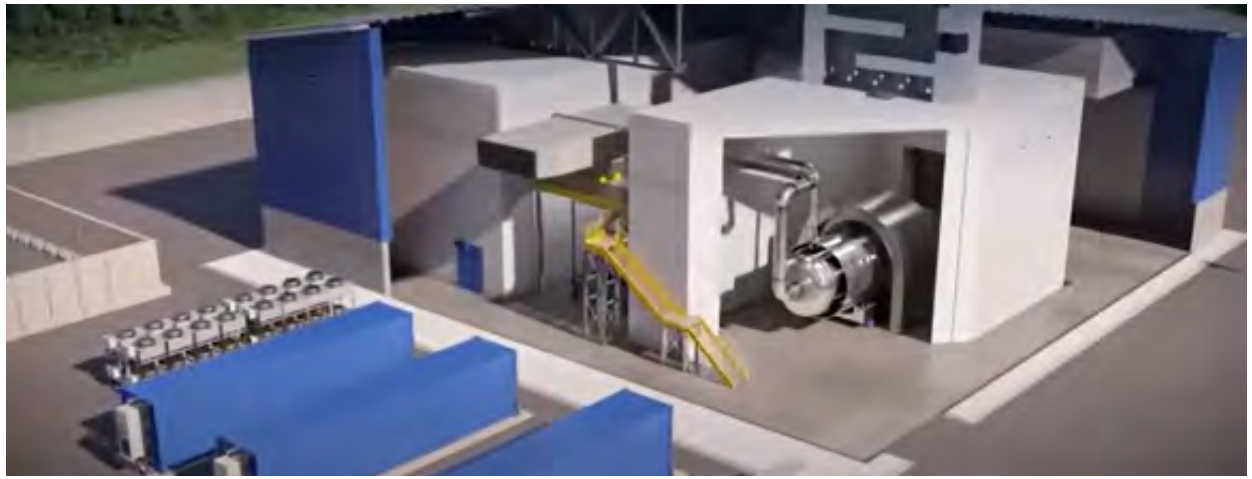




Westinghouse eVinci

Design:

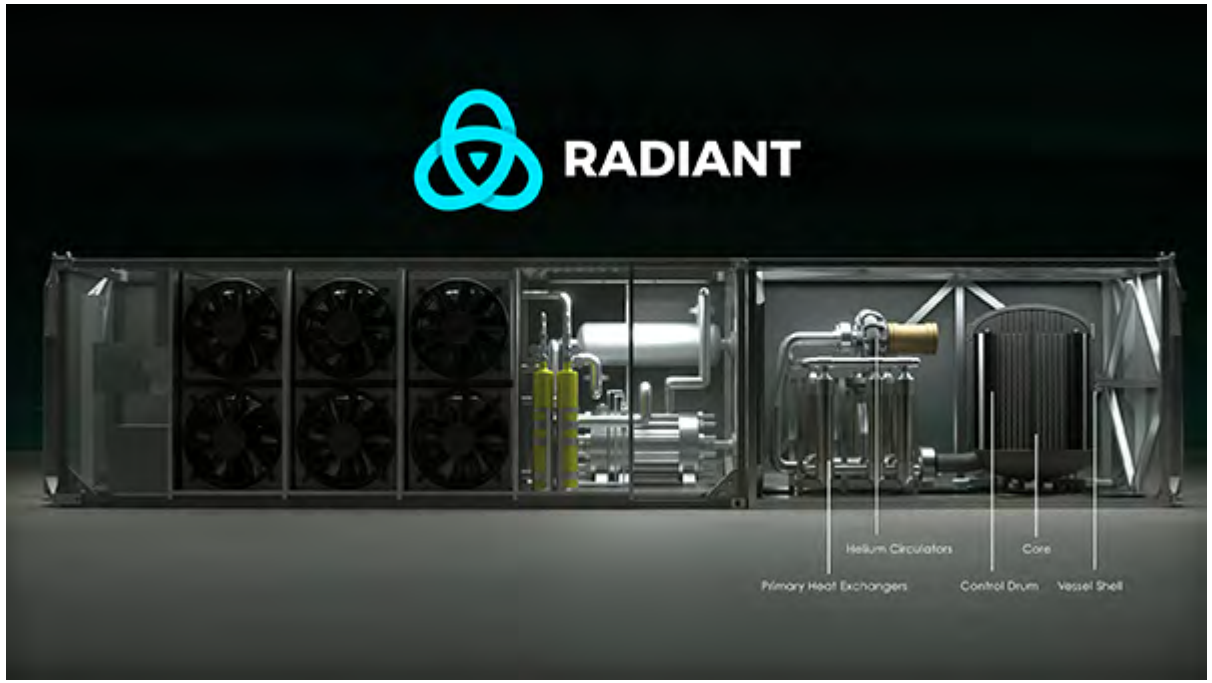
- Heat pipe cooled (Na)
- 5 MWe
- TRISO fueled
- Passive heat removal
- Transportable, 8+ year operating cycle



Source: Westinghouse

Radiant Kaleidos

- Transportable micro-reactor
- 3MWth and approximately 1MWe
- High-temperature gas-cooled reactor
  - TRISO fuel,
  - Helium gas coolant
  - Passive heat removal via air convection
- Each micro-reactor will be fully contained in a single shipping container.

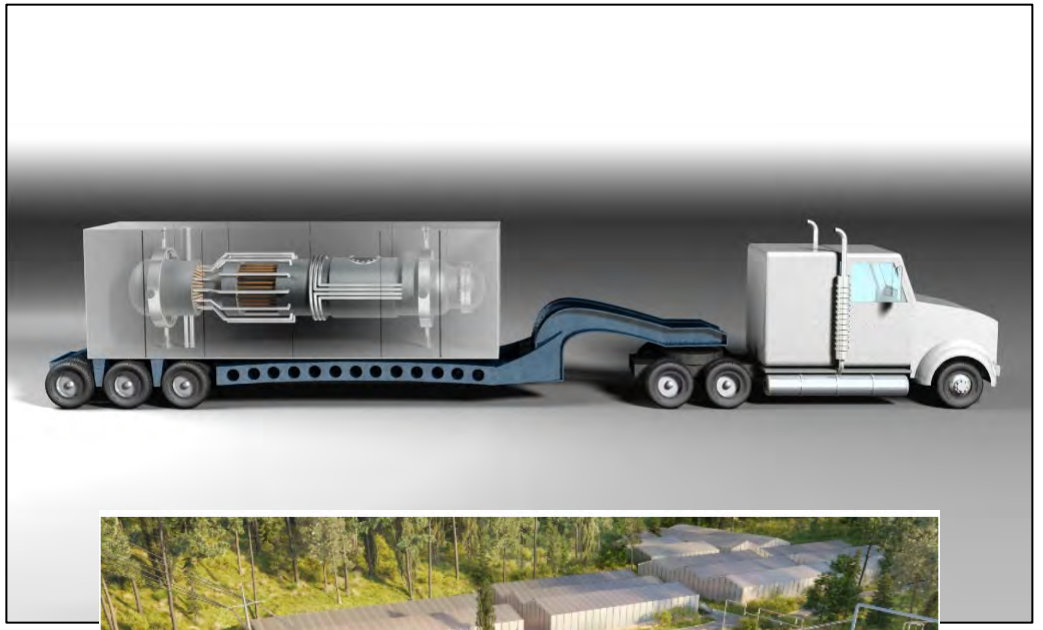


Source: Radiant

Deployment Model Shifts

A completed reactor being shipped from a manufacturer to the construction site

Source: © Nuscale Power, LLC



Source: DOE

Our Accomplishments

Addressing more than **35** **policy** issues & created more than **60** **guidance** documents

10 **NRC/DOE MOUs** focused on advanced reactor collaboration

Developed **10** **work plans** & issued **8** **joint reports** with Canada

Completed more than **10** advanced reactor design computer **models**

Engaged with **20+** **vendors** in licensing/ preapplication activities

More than **140** **public engagements** a year on advanced reactor topics

Reviewed more than **90** **topical report/white paper** **33%** **faster** than the generic schedule

Completed Kairos Hermes 1, Hermes 2, and ACU construction permit safety reviews **faster** than the generic schedule goal

Statistics since 2018

Framework Modernization

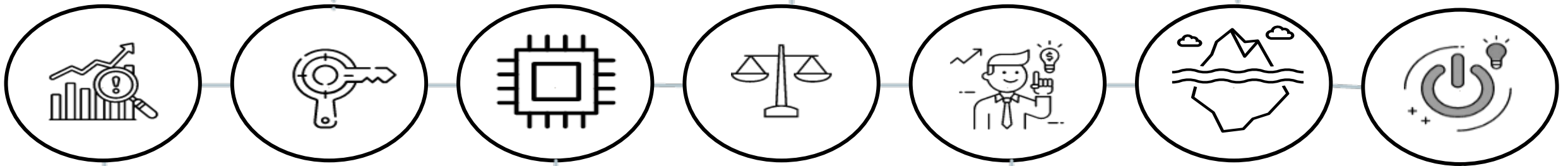
- Part 53
- Physical Security
- Emergency Preparedness
- Generic Environmental Impact Statement
- Siting
- Part 50/52 alignment
- Construction Oversight (ARCOP)
- Fees
- Fusion
- Guidance (TICAP/ARCAP)
- Microreactors

The Future of Construction Oversight

Performance-Based

Scalable

Comprehensive



Risk-Informed

Technology Inclusive

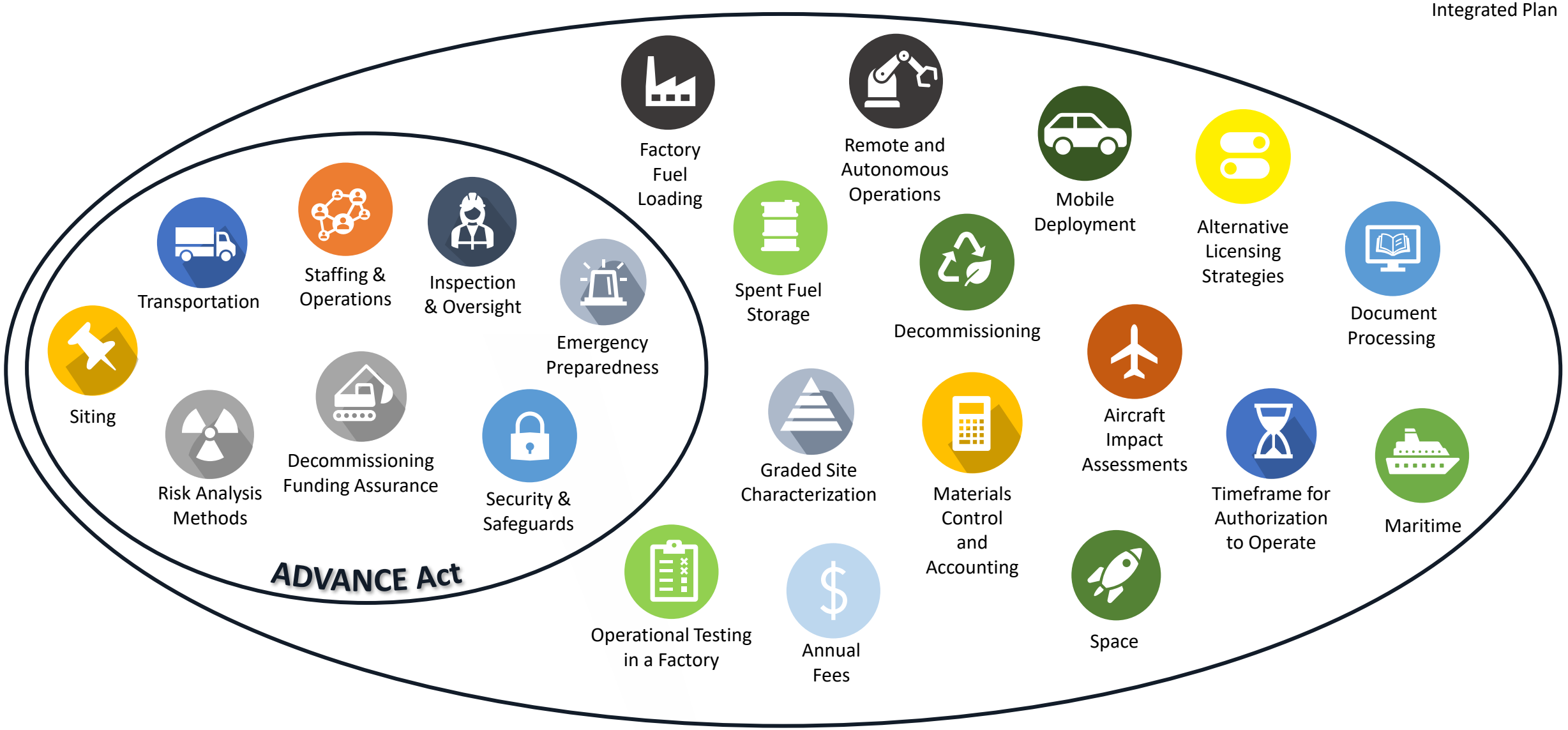
Informed by Experience

Innovative

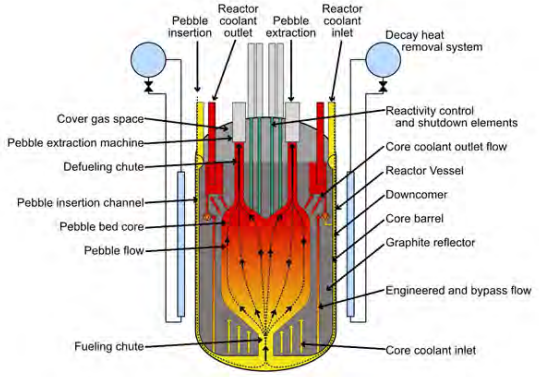
SECY-23-0048

Microreactors

Integrated Plan

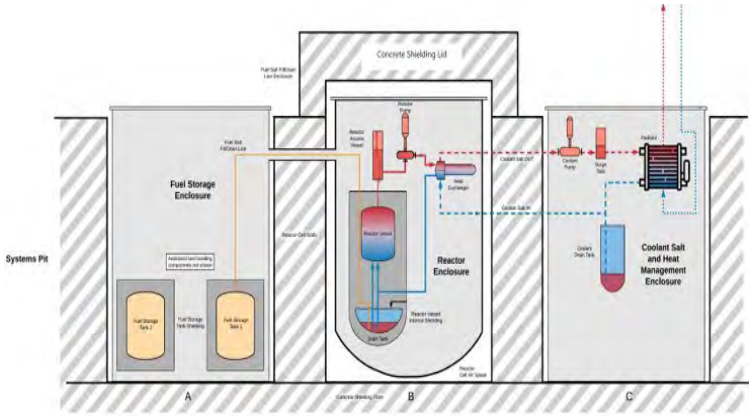


Ensuring Safety
Ahead of Schedule & Under Budget



Kairos Power

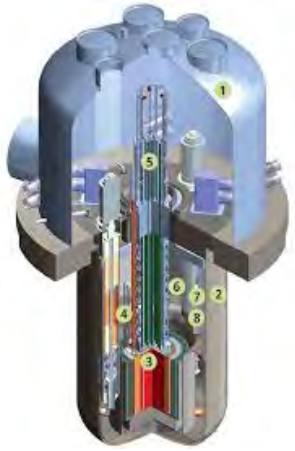
ABILENE CHRISTIAN UNIVERSITY



Regulatory Review Project	Planned Review Schedule	Executed Safety Review Schedule	% Under Resource Estimate
Kairos Hermes 1 (CP)	21 months	18 months	6%
Kairos Hermes 2 (CP)	14 months	10 months	43%
Abilene Christian University Molten Salt Research Reactor (CP)	22 months	21 months	13%
NuScale (SDA)	24 months	22 months	13%

Recent Experience Informing Current Execution

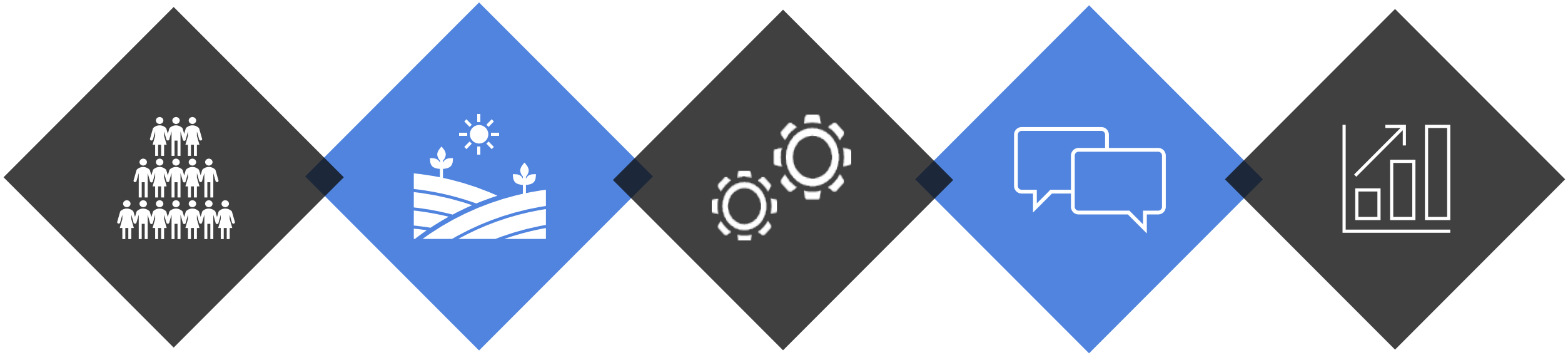
TerraPower



NUSCALE

Regulatory Review Project	Generic NEIMA Milestone	Planned Review
TerraPower Kemmerer Unit 1 Construction Permit	36 months	18 Months
Long Mott Generating Station Construction Permit	36 months	18 months
20+ vendors engaged in pre-application activities with the NRC		

Evolving to Meet Future Demand



Ensure Sufficient **Staff Capacity**

Establish Appropriate **Regulatory Landscape**

Effective Process **Implementation**

Communicate Effectively with Stakeholders

Strive for **Continual Improvement**

Find out more…

Advance Reactors

THANK YOU