Advanced Reactors

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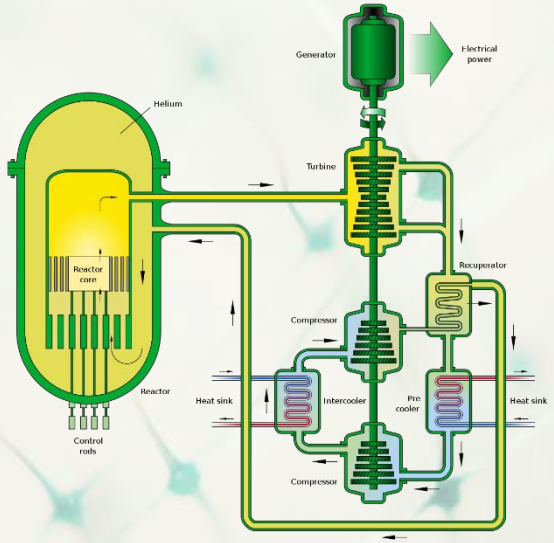
Vision

Creating new paradigms to make the SAFE use of nuclear technologies POSSIBLE

Reactor Concepts

Light Water Small Modular Reactors (SMR)

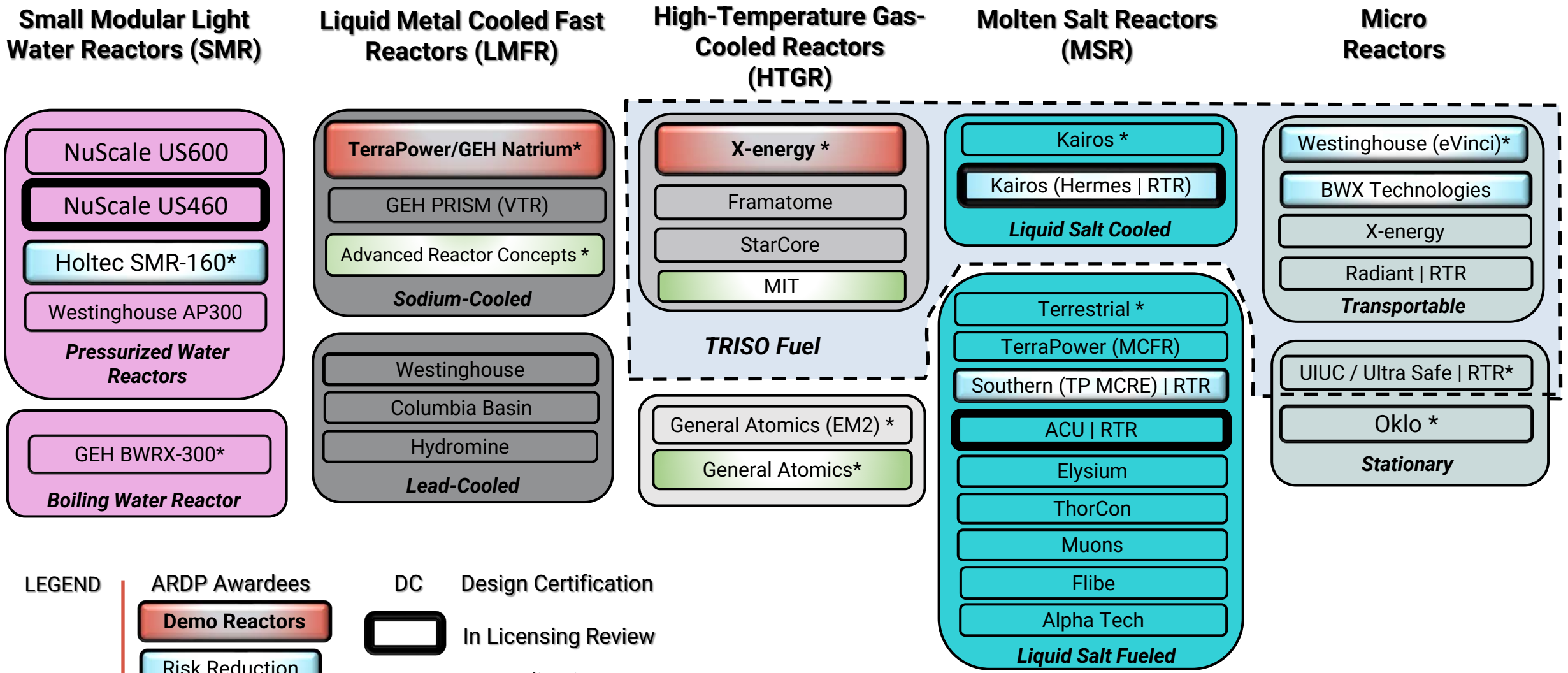
Compact LWR designs generating 300 MWe or less



Non-Light Water Advanced Reactors (non-LWR)

Non-LWR designs ranging from 1 MWe microreactors to several hundred MWe power stations

Advanced Reactor Landscape



Small Modular Light Water Reactors (SMR)

Pressurized Water Reactors

- NuScale US600 – certified design
- NuScale US460 – under review
- Holtec SMR-160 – preapplication
- Westinghouse AP300 SMR

Boiling Water Reactor

- GEH BWRX-300 preapplication

Adv Rx Demo Program - Risk Reduction

GEH BWRX-300

Westinghouse AP300 SMR

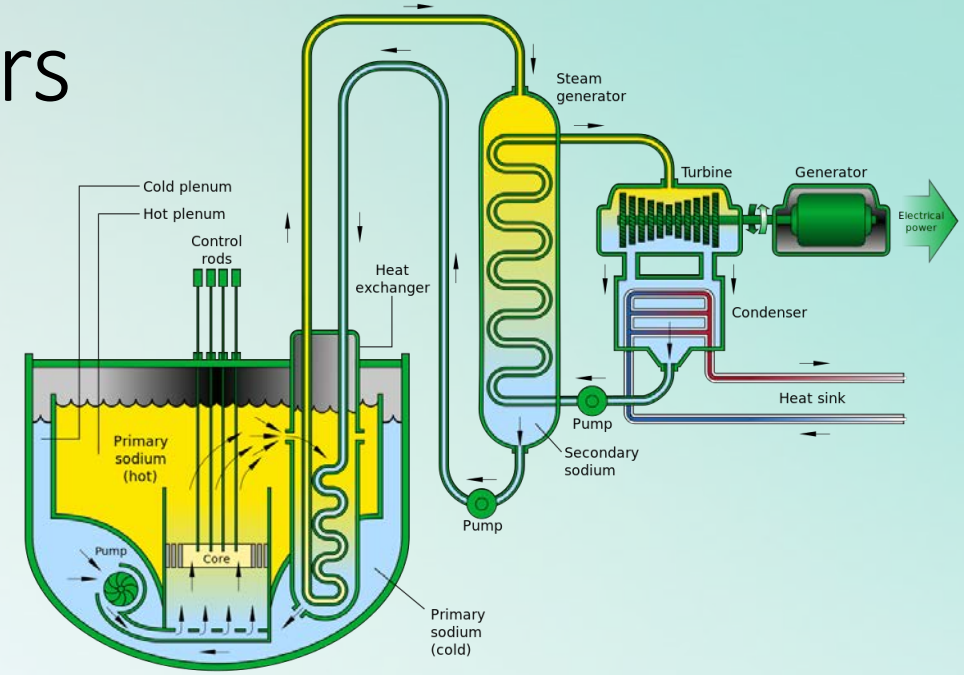
NuScale US460

Liquid Metal Cooled Fast Reactors

TerraPower/GEH Natrium - preapplication

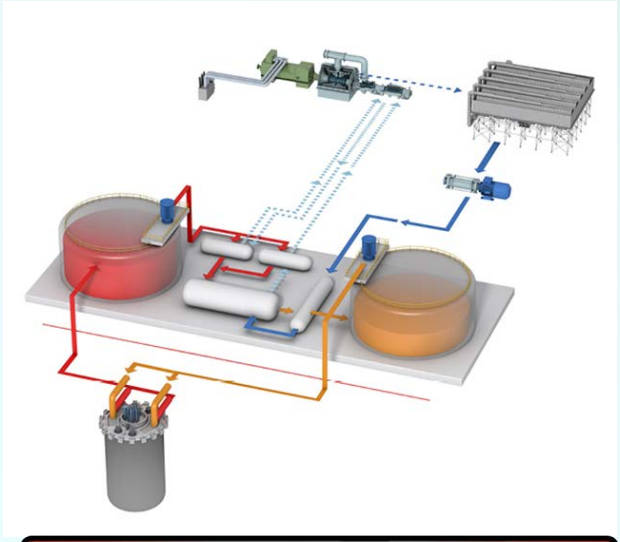
GEH PRISM – Versatile Test Reactor

Advanced Reactor Concepts ARC-100 - preapplication

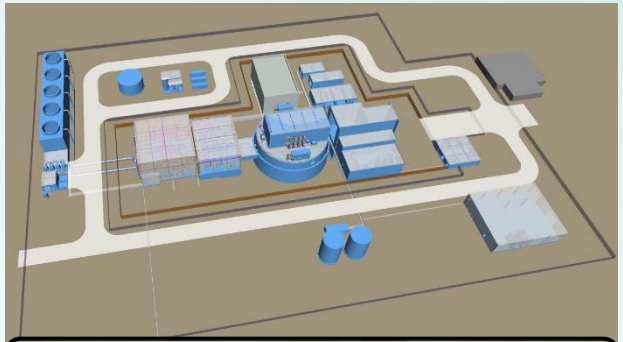


Adv Rx Demo Program – Demo Rx

Adv Rx Demo Program – ARC 20



TerraPower/GEH Natrium



Advanced Reactor Concepts ARC-100

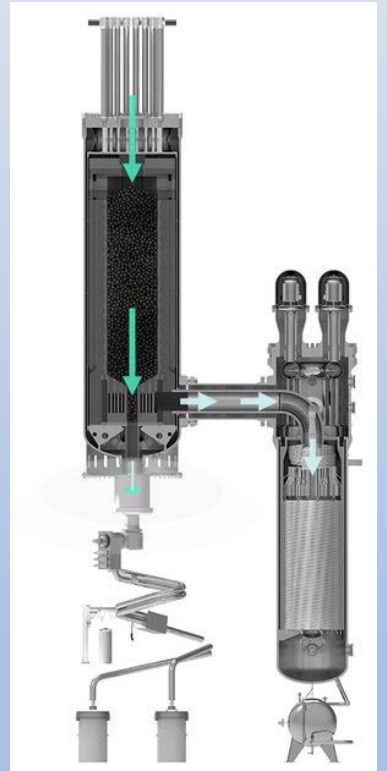
High-Temperature Gas-Cooled Reactors (HTGR)

TRISO Fueled

- X-energy Xe-100 - preapplication
- Framatome
- StarCore
- MIT

- General Atomics (EM2) *
- General Atomics - preapplication

- Adv Rx Demo Program – Demo Rx
- Adv Rx Demo Program – ARC 20



X-energy Xe-100

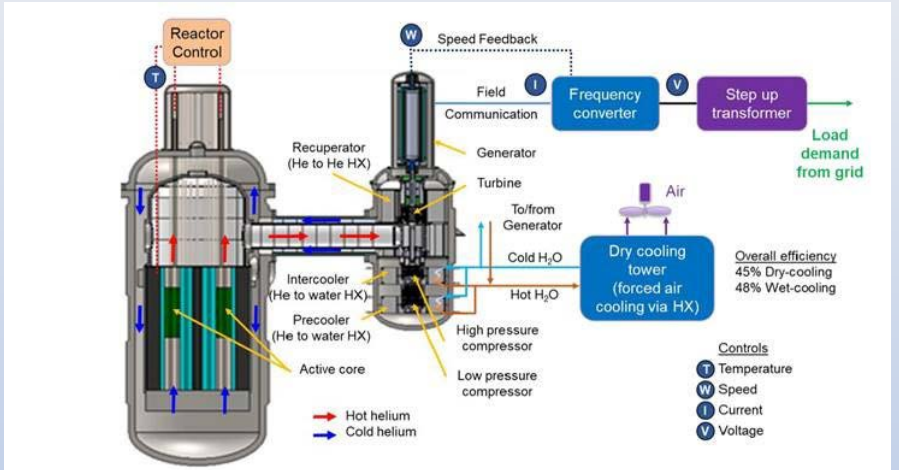


Figure 2. FMR Primary Coolant Flow and Power Generation

Figure 3. Nuclear Island Components

General Atomics “Fast Modular Reactor” (FMR)

Molten Salt Reactors (MSR)

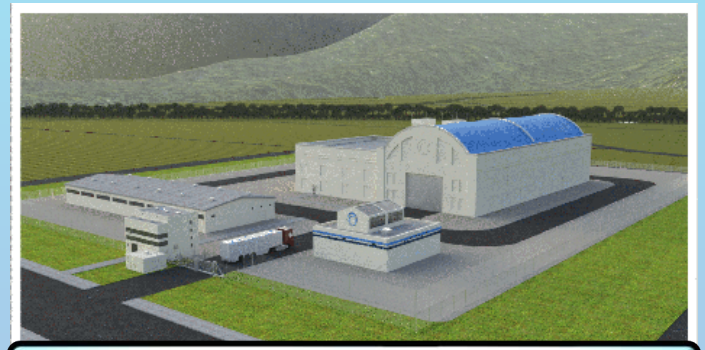
Fluoride Salt Cooled; TRISO Fueled

- Kairos KP-FHR - preapplication
- Kairos Hermes RTR– under review

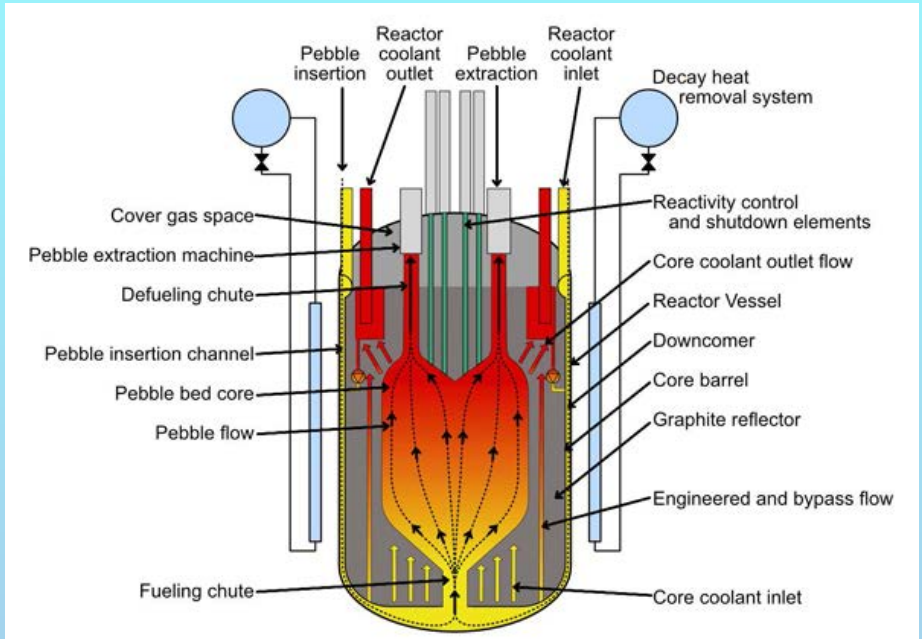
Liquid Salt Fueled

- Terrestrial IMSR - preapplication
- TerraPower (MCFR)
- Southern (TP MCRE) | RTR
- ACU MSRR | RTR – under review
- Elysium
- ThorCon
- Muons
- Flibe
- Alpha Tech

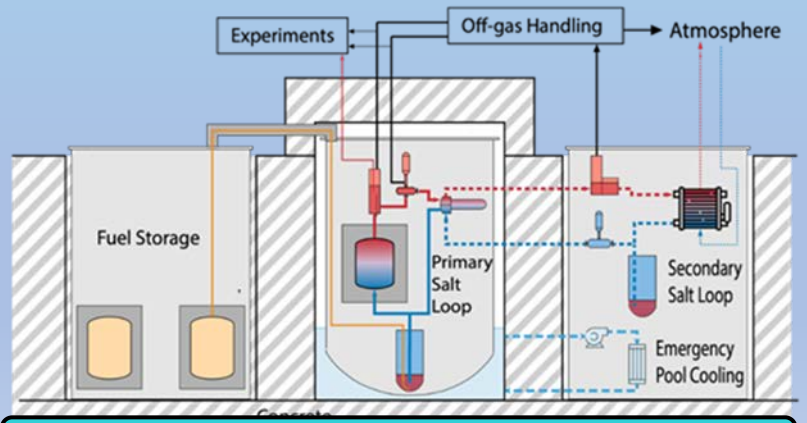
Adv Rx Demo Program - Risk Reduction



Kairos Hermes



Kairos KP-FHR



Abilene Christian University MSRR

Terrestrial IMSR

Micro-reactors

Transportable, TRISO fueled

- Westinghouse eVinci - preapplication
- BWX Technologies
- X-energy
- Radiant | RTR

Stationary, TRISO fueled

- UIUC / Ultra Safe | RTR - preapplication

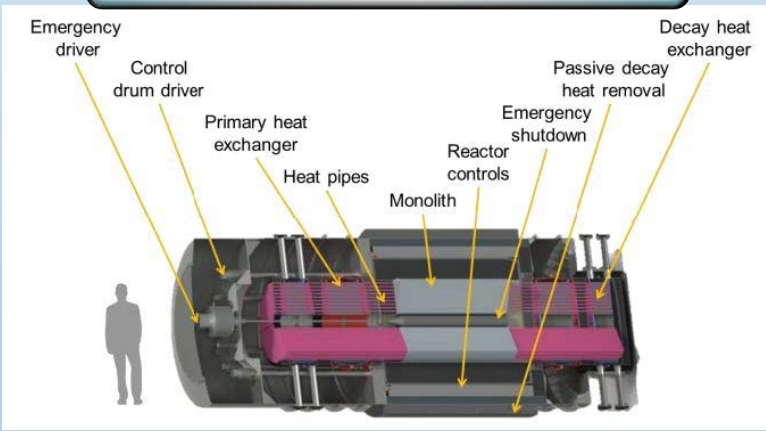
Stationary, metallic fuel

- Oklo - preapplication

Adv Rx Demo Program - Risk Reduction

Westinghouse eVinci -

Oklo

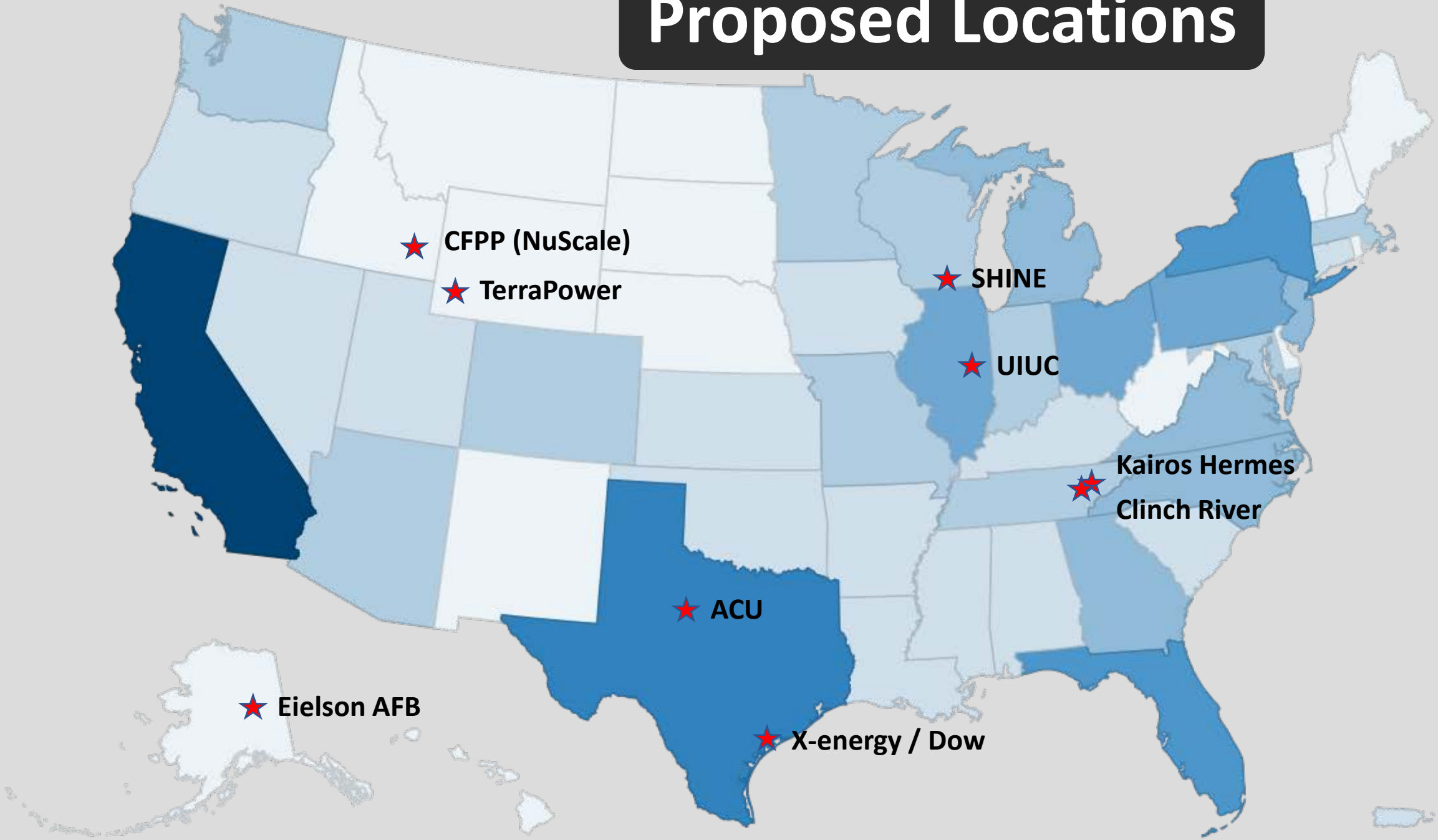


University of Illinois at Urbana-Champaign / Ultra Safe

Licensing and Deployment of Factory Fabricated and Transportable Micro-Reactors

- The NRC staff is continuing to develop topics related to licensing and deployment of factory-fabricated transportable micro-reactors to identify policy issues and options to address them:
  - Loading fuel and performing low-power testing at a manufacturing facility
  - Timelines for ITAAC closure, hearings, and 52.103(g) findings
  - Licensing replacement of reactor modules
  - Transportation of fueled reactor modules
  - Remote and autonomous operations and related cybersecurity considerations
  - Decommissioning process/funding assurance

Proposed Locations



10 CFR Part 50: Two-Step Licensing Process

Construction Permit

Construction Permit Application → Public Hearing → Construction Permit → Construction Begins

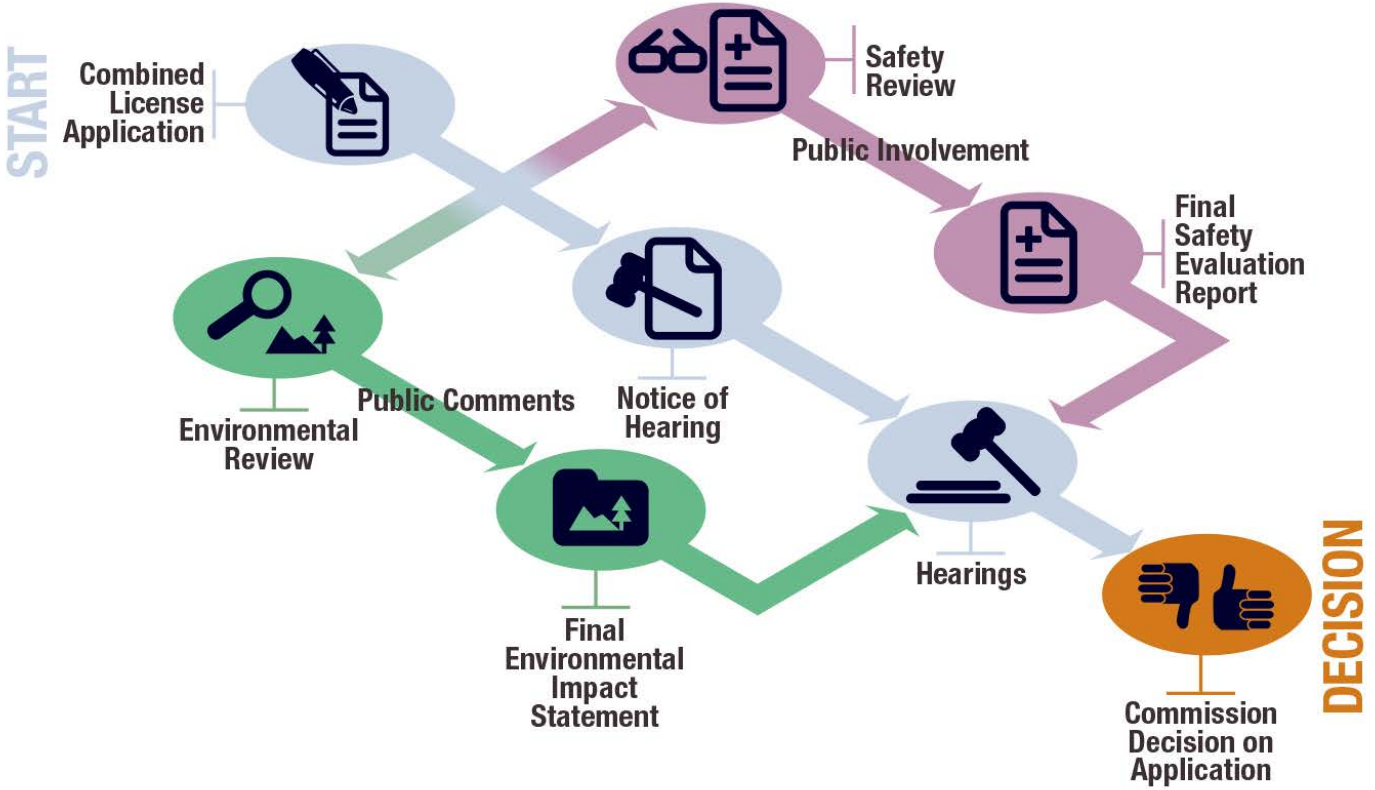
Operating License

Operating License Application → Public Hearing Opportunity → Operating License → Operation Begins

10 CFR Part 52: New Reactor Licensing Process

This process may involve the following:

- Combined License (COL)
- Early Site Permit (ESP)
- Design Certification (DC)
- Standard Design Approval (SDA)
- Manufacturing License



Part 53: Transformative Regulatory Frameworks

- **Technology-Inclusive**: Can be used for any new light water small modular reactor or non-light water reactor technology.
- **Risk-Informed**: Requirements scaled to risk and consequences of the facility
- **Performance-Based:** Establishes clear and objective criteria to assess performance

Framework A

- Probabilistic Risk Assessment in leading role to develop licensing basis and safety case

Framework B

- Probabilistic Risk Assessment in a supporting role
- Align with IAEA Safety Standards

More Information and Updates

New Reactors

https://www.nrc.gov/reactors/new-reactors.html

Licensing Activities for Advanced Reactors (Non-LWR)

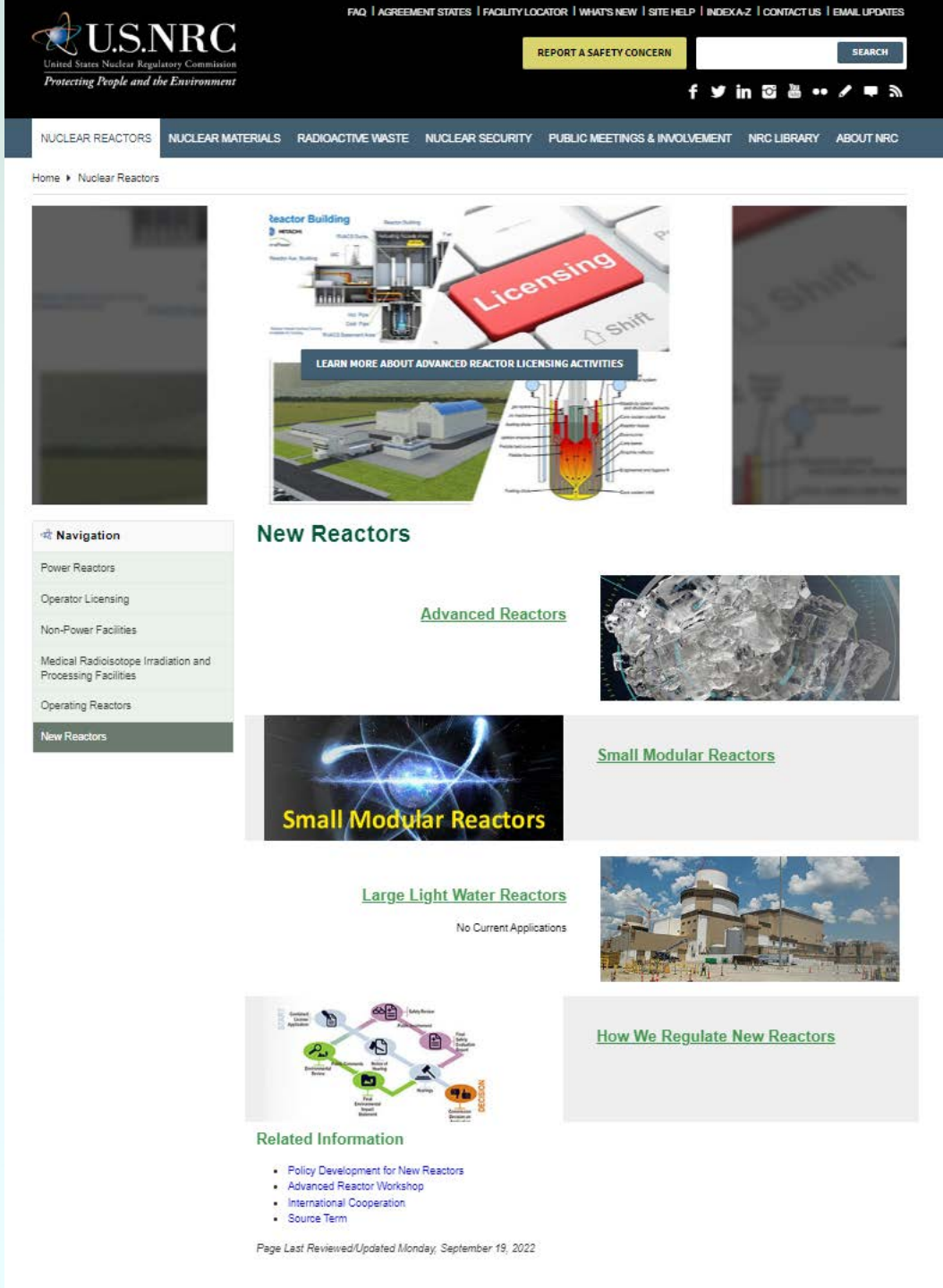
https://www.nrc.gov/reactors/new-reactors/advanced/licensing-activities.html

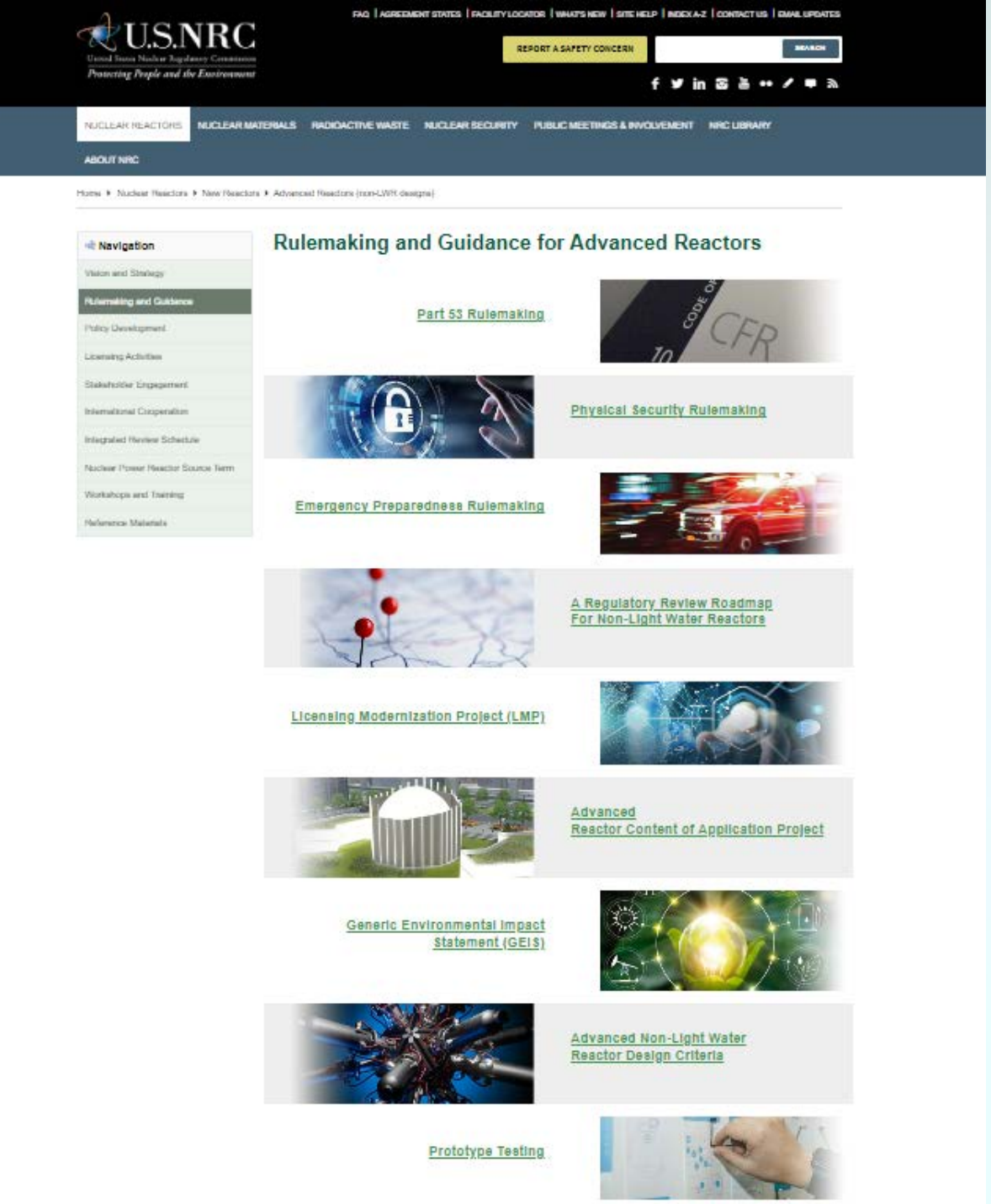
Licensing Activities for Small Modular Reactors

https://www.nrc.gov/reactors/new-reactors/smr/licensing-activities.html

Email Subscription Services

Follow through GovDelivery or Lyris





Rulemaking Updates

Rulemaking and Guidance for Advanced Reactors

https://www.nrc.gov/reactors/new-reactors/advanced/rulemaking-and-guidance.html

NRC Rules and Petitions

https://www.nrc.gov/about-nrc/regulatory/rulemaking/rules-petitions.html

Planned Rulemaking Activities - Rules

https://www.nrc.gov/reading-rm/doc-collections/rulemaking-ruleforum/active/ruleindex.html

thank you

FOR LISTENING