

# U.S. Nuclear Regulatory Commission Nuclear Power Plant Licensing Overview



Nuclear Energy Tribal Working Group Meeting

**Mallecia Sutton**

**March 15, 2022**

# What is a Licensing Project Manager?

## What I Do:

- Lead, manage, and facilitate advanced reactor licensing through:
  - Project management of application reviews.
  - Pre-application engagement with prospective applicants.
  - Developing and maintaining guidance and infrastructure.
  - Interacting with stakeholders, such as applicants, the public, industry groups, Congress, the Commission, the Advisory Committee on Reactor Safeguards, Tribes, and other government agencies.

# Outline

- Licensing under Title 10 of the Code of Federal Regulations (10 CFR)
  - Part 50, “Domestic Licensing of Production and Utilization Facilities”
  - Part 52, “Licenses, Certifications, and Approvals for Nuclear Power Plants
- Licensing & Pre-application Review Status
- Required NRC Licensing Documents
- Review Duration

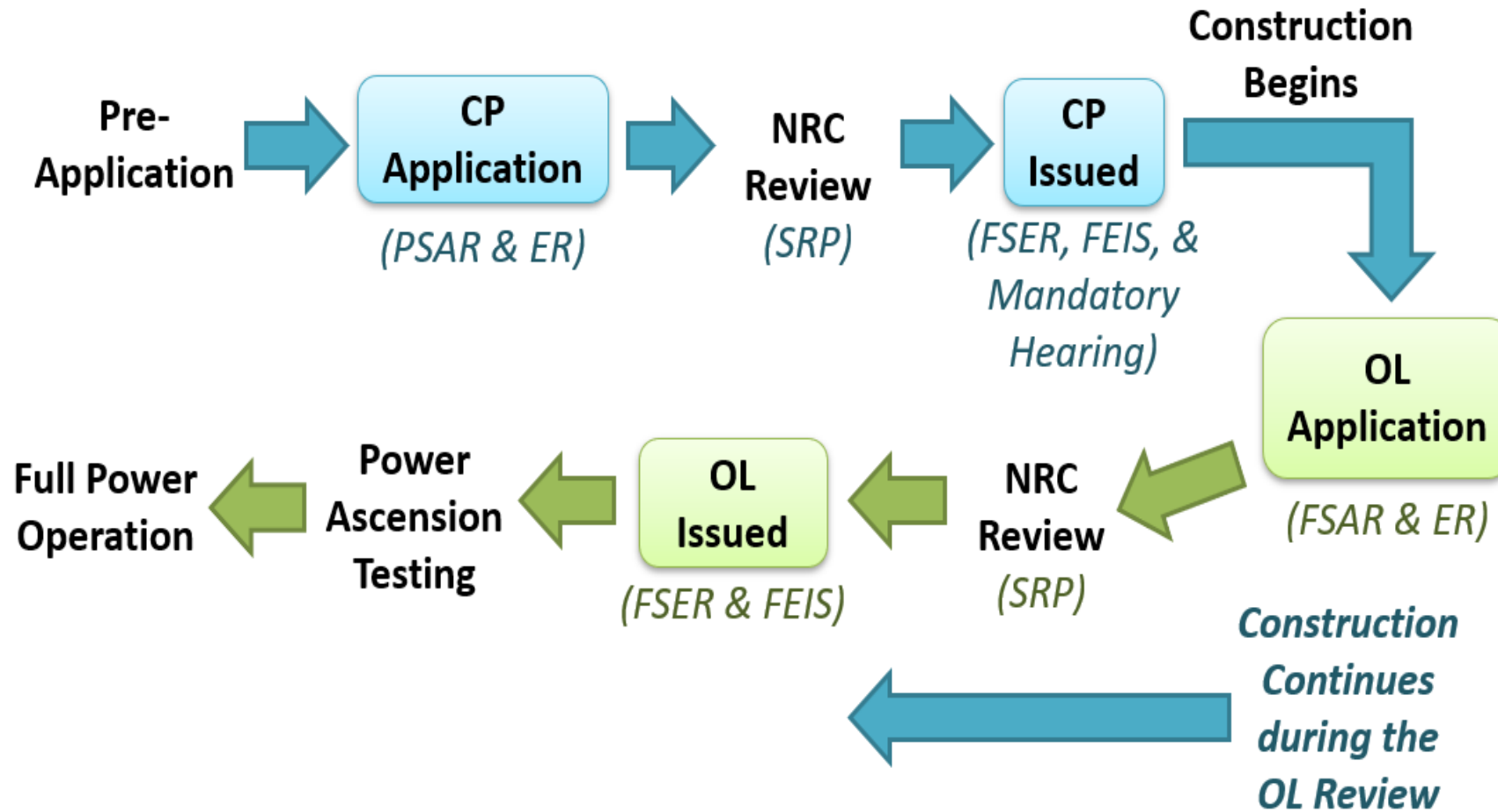
# NRC New Reactor Licensing

- The NRC licenses new reactors under 10 CFR Part 50 or Part 52
- All currently operating reactors have Part 50 licenses
- All of the recent new reactor applications were filed using Part 52
- Several advanced reactor developers plan to use Part 50, while others plan to use Part 52
- The NRC staff is currently evaluating a Part 50 construction permit application for the “Hermes” test reactor

# Part 50 Licensing Process

- 10 CFR Part 50 licensing process is a two-step licensing process:
  1. Construction Permit
  2. Operating License
- Requires two reviews: one for the construction permit and then another for the operating license
- Final design information and plans for operation are developed during the construction of the plant

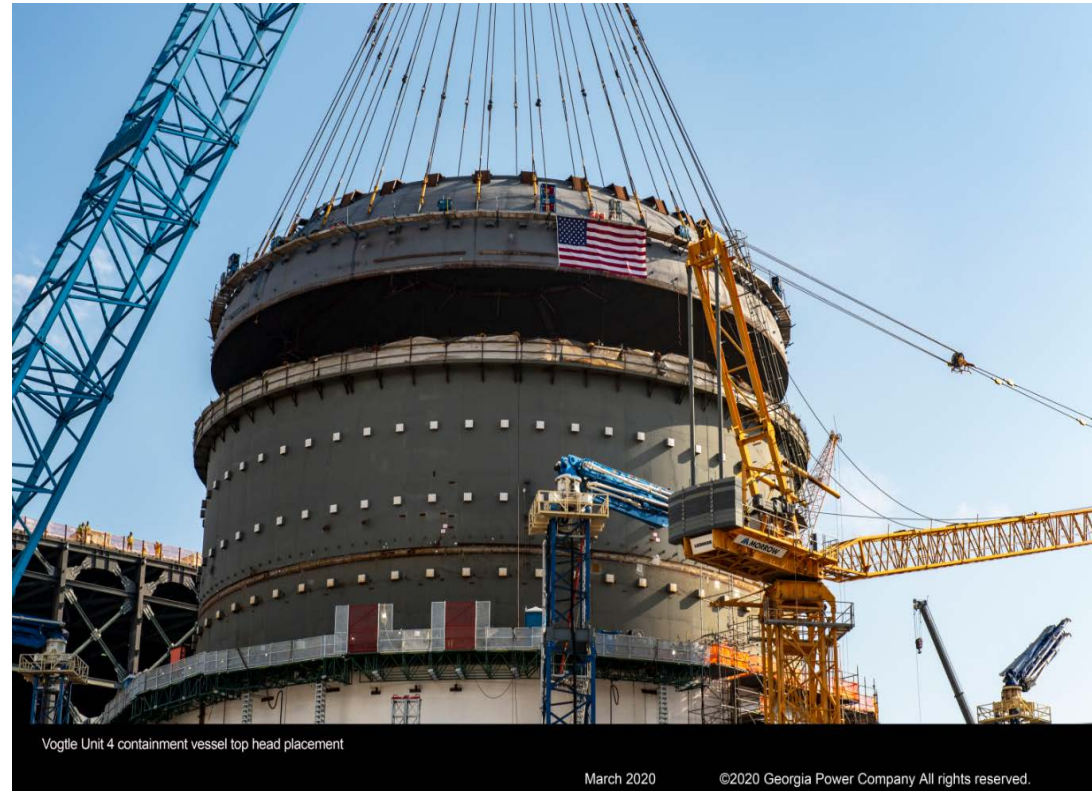
# Part 50 Licensing Process



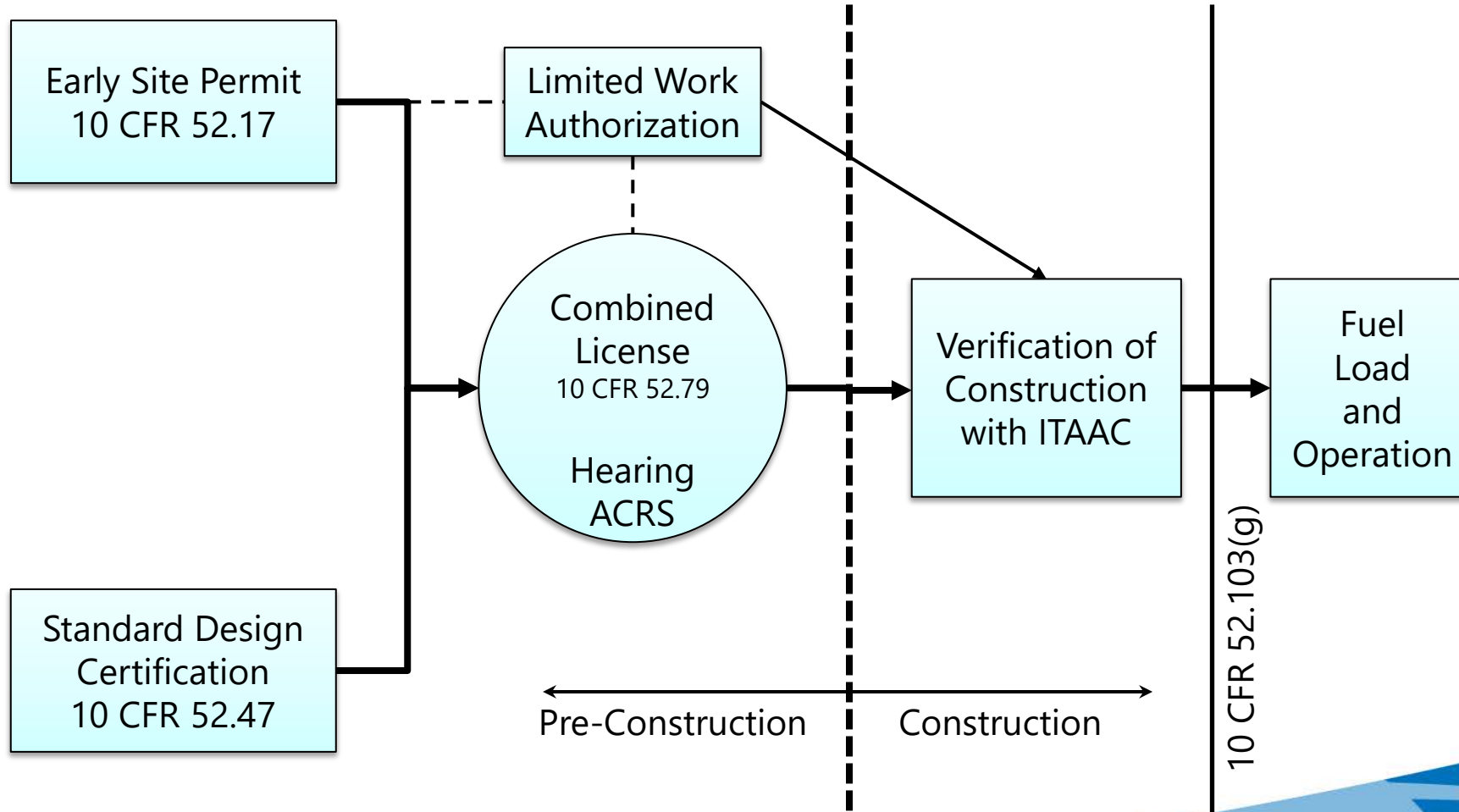
# Part 52 Licensing Process

Part 52 provides several options for various approvals

- Early Site Permit
- Standard Design Certification
- Combined License
- Standard Design Approval
- Manufacturing License



# Part 52 Licensing Process





# NRC Licensing Documents

- Final Safety Evaluation Report
  - Documents the NRC staff's safety assessment of design and operation
- Final Environmental Impact Statement
  - Documents National Environmental Policy Act (NEPA) requirements for impact assessment of licensing

# What is the Purpose of the Final Safety Evaluation Report?

- Document the bases for the NRC staff's safety decisions
- Provides the standards and regulations to which the review was conducted
- Describes how and why the application meets the standards and regulations
- Summarizes the NRC's safety findings

# Areas of Review - Safety

- Site Characteristics and Site Parameters
- Systems, Structures, Components, and Equipment Design
- Reactor Internals
- Reactor Coolant and Connected Systems
- Engineered Safety Features
- Digital Instrumentation and Controls/Electrical Power
- Auxiliary Systems
- Steam and Power Conversion Systems
- Radioactive Waste Management and Radiation Protection
- Conduct of Operations
- Initial Test Program and Integrated Testing, Analysis, and Acceptance Criteria
- Transient and Accident Analysis
- Technical Specifications
- Quality Assurance Program
- Human Factors Engineering
- Severe Accidents

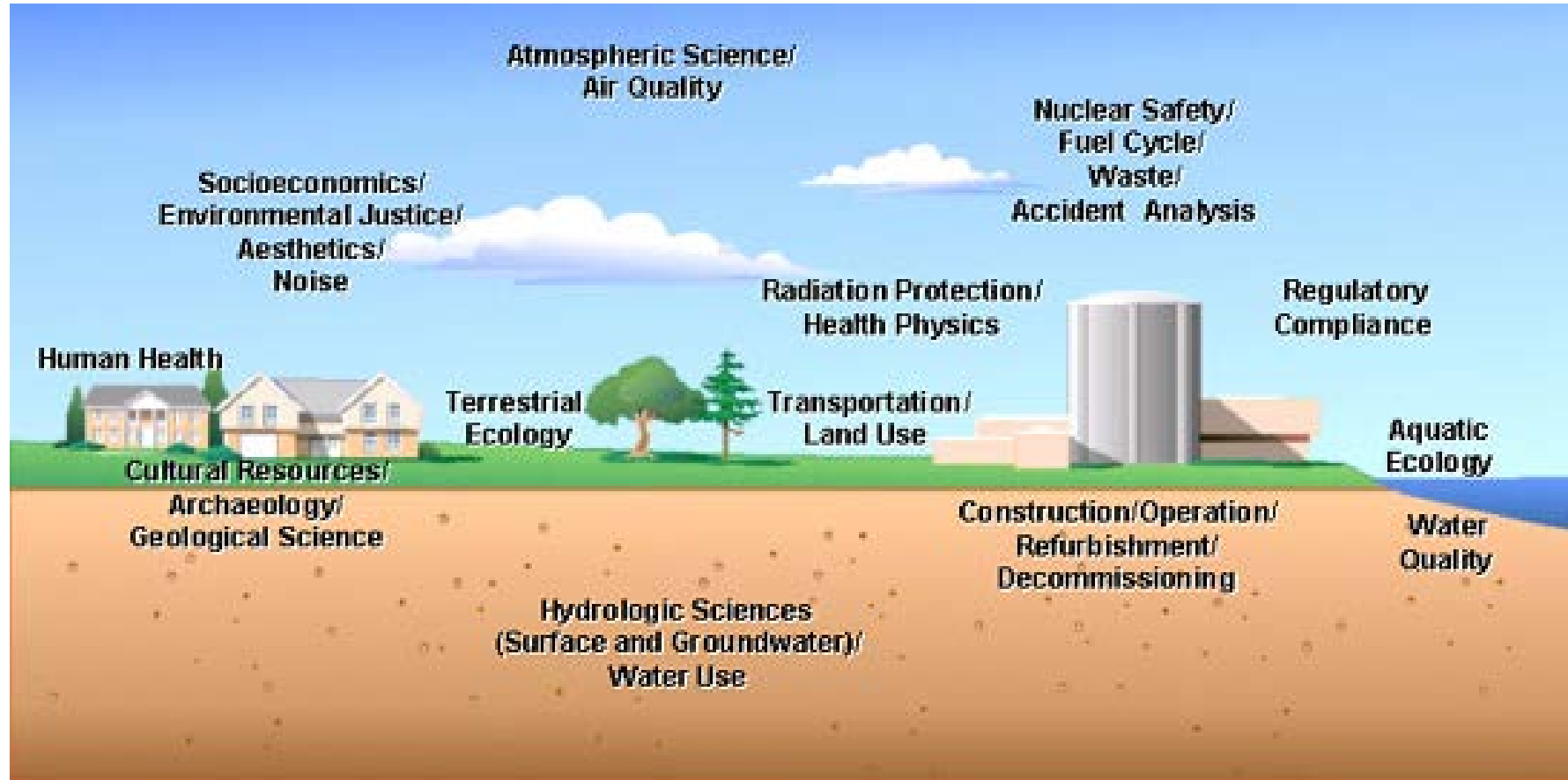
# What is the Purpose of a Final Environmental Impact Statement?

- An Environmental Impact Statement is required for major Federal actions that may significantly affect the quality of the human environment
- Provides public disclosure of potential environmental impacts
- Identifies alternative actions and appropriate mitigation of potential environmental effects
- Involves all stakeholders in government's decisions

# Areas of Review - Environmental

- Seismology
- Geology
- Hydrology
- Meteorology
- Geography
- Demography (population distribution)
- Site Hazards Evaluation
- Radiological Effluent Releases
- Radiological Dose Consequences
- Emergency Preparedness (with FEMA)
- Security Plan Feasibility

# Environmental Impact Statement – Resource Areas



# Other Approvals & Licenses

- **Standard Design Approvals**
  - May cover an entire facility or a portion of it
  - May be referenced in a combined license
  - No hearing or Commission review
  - Design approval is NRC staff-level review
- **Manufacturing License**
  - License to manufacture nearly complete plant
  - Does not include review of specific reactor sites
  - License does not authorize transport & installation of the manufactured reactor

# 10 CFR Part 53

## Pathway to New Regulatory Framework

### “Part 53” Rulemaking by July 2025

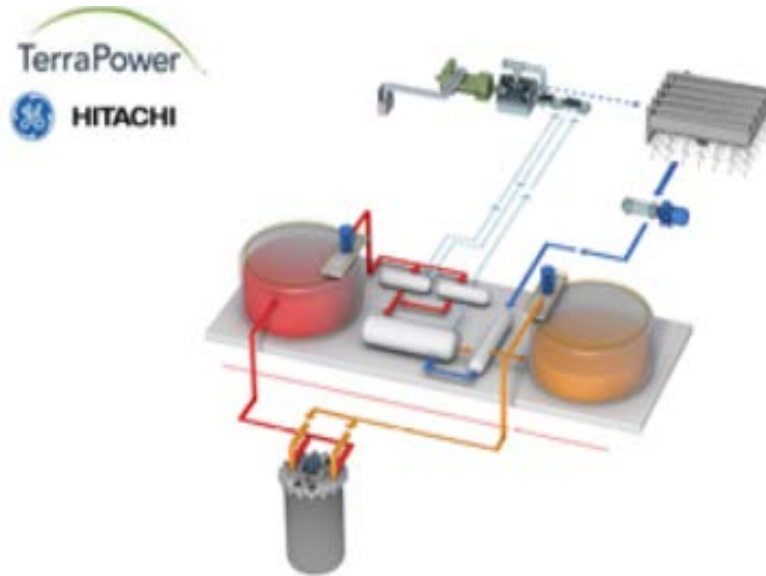
- Nuclear Energy Innovation and Modernization Act (NEIMA) requirement
- Technology-inclusive, risk-informed and performance based regulatory framework
- Commission direction SRM-SECY-20-0032
- Builds on current activities, including the Licensing Modernization Project
- Significant stakeholder engagement



# Preapplication Engagement Activities

- NRC Draft white paper on pre-application engagement ([ML21145A106](#))
- Industry guidelines for a regulatory engagement plan ([ML18122A293](#))
- Formal NRC staff evaluation of topical reports
- Informal NRC staff feedback on white papers
- Public meetings to discuss additional topics, including new and novel design features
- Pre-application audits to support a high-quality application.

# TerraPower - Sodium Power Reactor



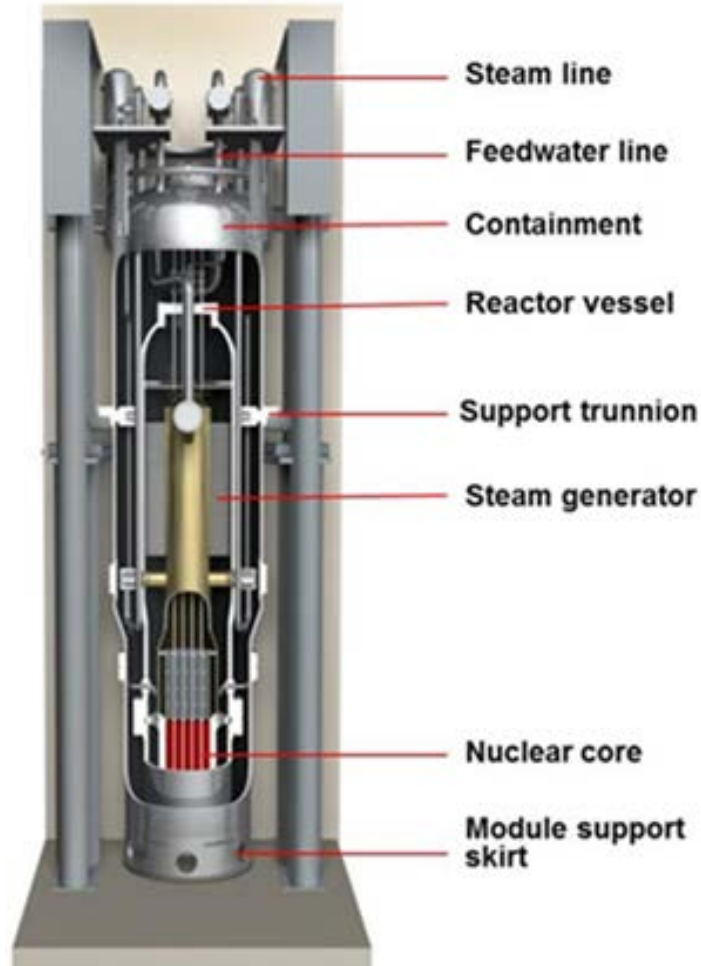
- TerraPower and GE Hitachi Sodium design is a pool type sodium fast reactor with metal fuel.
- Each reactor generates ~345 MWe
- Recipient of DOE ARDP Award.
- Tribal Outreach conducted by TerraPower
- 12 Tribes Identified
- Letters sent to Tribal Nations December 2021
- Cultural Resources Survey, Spring 2022
- Tribal Summit following completion of the Cultural Resources Survey

# X-energy - Xe-100 Power Reactor



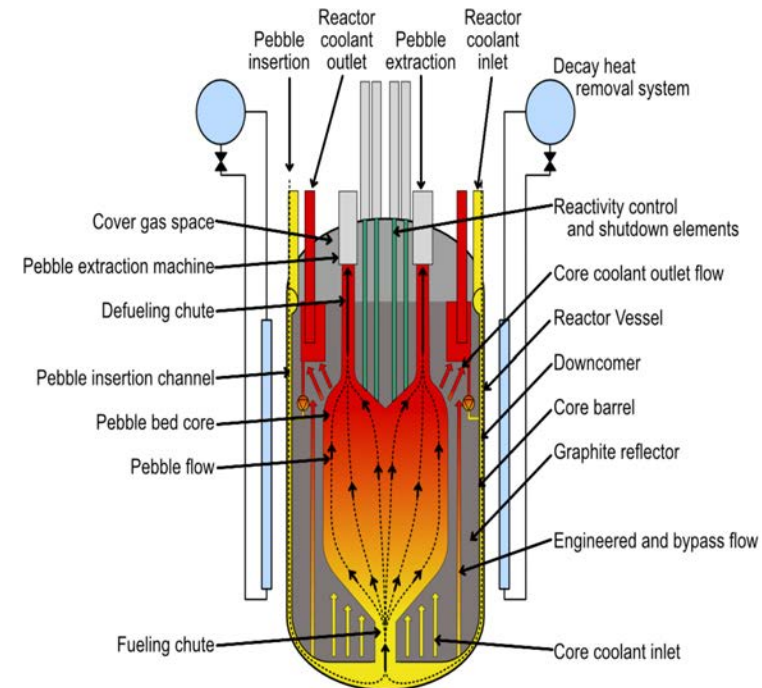
- X-energy's Xe-100 design is a pebble-bed, high-temperature gas-cooled reactor using TRISO-X fuel.
- Each reactor generates ~80 MWe and a standard four-unit plant generates ~320MWe.
- Recipient of DOE ARDP Award.

# UAMPS Carbon Free Power Project



- Utah Associated Municipal Power Systems (UAMPS) is an interlocal agency representing 50 members.
- UAMPS' Carbon Free Power Project (CFPP) is a small modular reactor (SMR) nuclear plant to be located at the Idaho National Laboratory.
- The plant is expected to include 6 of NuScale's 77 MWe nuclear power reactors.
- Beginning preapplication engagement based on a letter of intent received in January 2022.
- Tribal outreach planned prior to submission of the licensing application.
- License application anticipated for submission to the NRC in early calendar year 2024.

# The Kairos Hermes Testing Facility



- Non-power test reactor (35 megawatts-thermal) to demonstrate key technologies of Kairos Power Fluoride Salt-Cooled, High Temperature Reactor design
- Tri-structural isotropic (TRISO) fuel in pebbles containing high assay low-enriched uranium (HALEU)
- Low pressure, large thermal inertia, slow transient response, TRISO and Flibe retention of radionuclides, and other features to ensure safety

# Generic Schedules

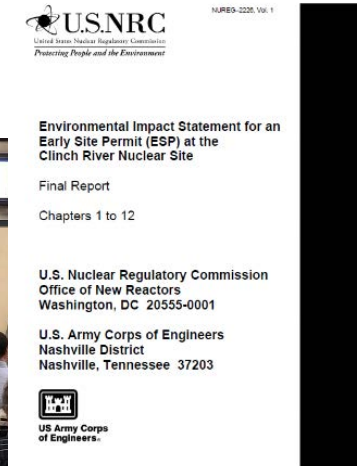
The NRC established generic schedules for completing final safety evaluations for various licensing actions

<b>Activity</b>	<b>Type</b>	<b>Milestone*</b>
Part 50-Construction Permit	All	36 months
Part 50-Operating License	Light Water SMR	42 months
	Non-LWR	36 months
Part 52 Early Site Permit	All	24 months
Part 52-Design Certification and Standard Design Approval	Light Water SMR	42 months
	Non-LWR	36 months
Topical Reports	All	24 months

\*Actual schedule is informed by application completeness and could be longer/shorter

# Licensing Advanced Reactors is a Multi-Year, Public Process

- Staff review of applicant-provided information
  - Safety Analysis Report
  - Environmental Report
- Public outreach
  - Publication of review findings
  - Public meetings
- Review by the Advisory Committee on Reactor Safeguards
- Hearings
  - Legal requirement
  - Opportunity for public to intervene
- Commission decision



# Questions?