ADVANCED REACTOR SAFEGUARDS

University Advanced Reactor Activity Assessment

PRESENTED BY

Azaree Lintereur (Collin McDowell)

Los Alamos National Laboratory

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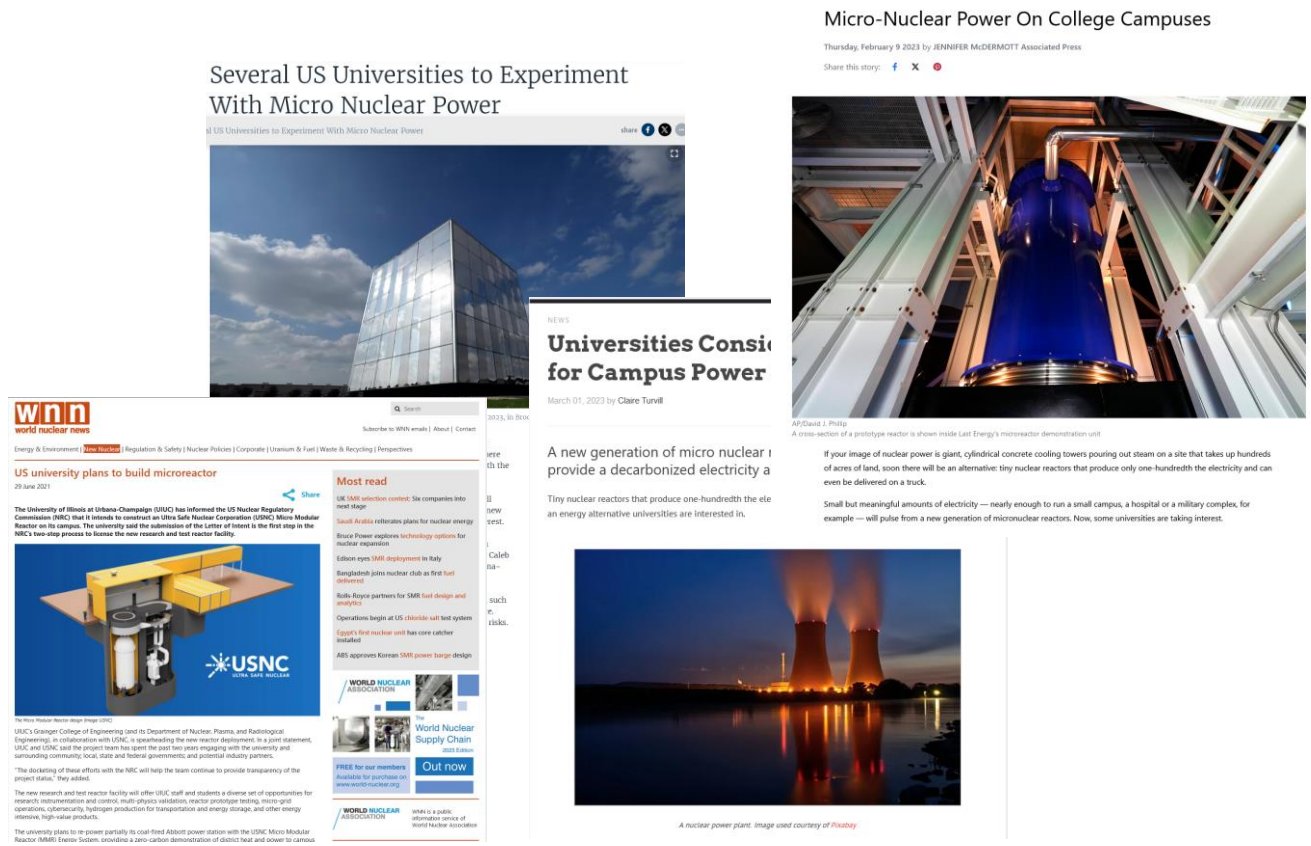
U.S. DEPARTMENT OF ENERGY

Background

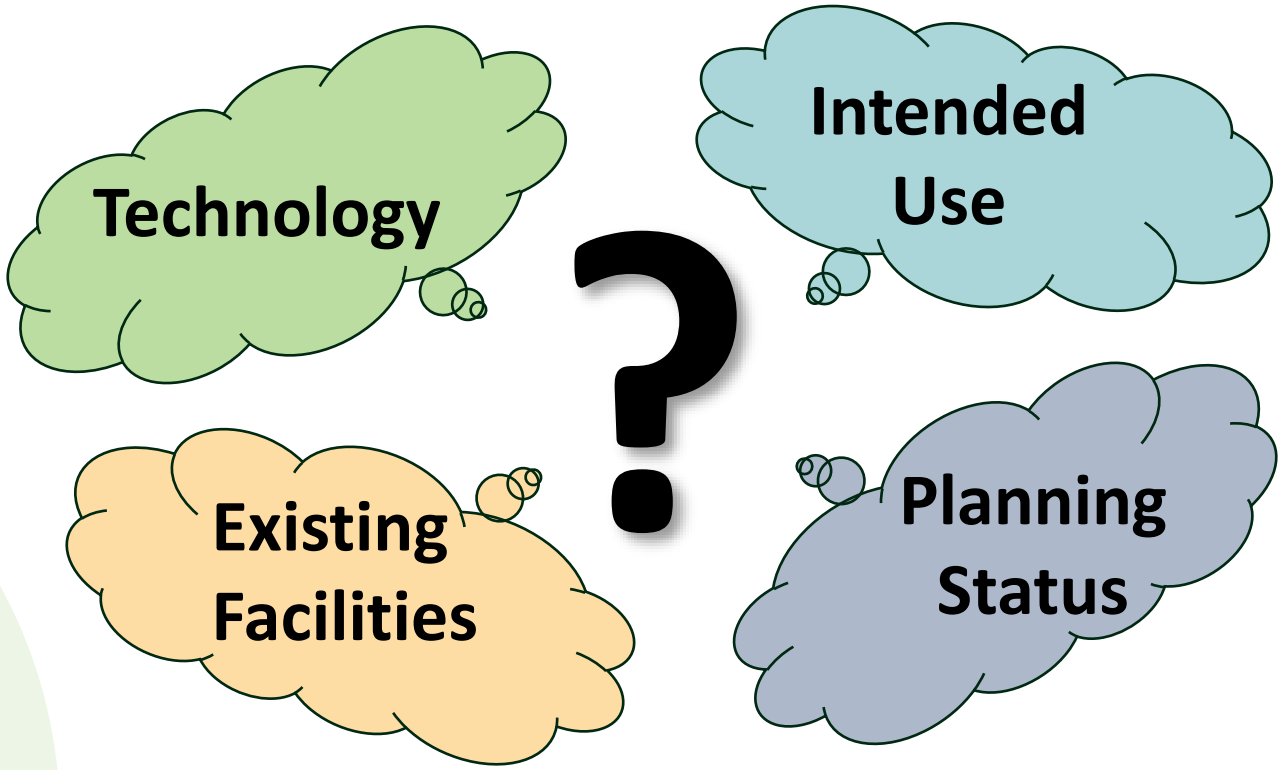
- Advanced reactor/microreactor technology is gaining interest for an increasing variety of applications.
  - Local power
  - Remote locations
  - Isotope production

- Universities in the United States represent a growing user base exploring the feasibility of siting advanced/microreactors on college campuses.



Project Overview

- The goal of the proposed effort is to perform a preliminary scoping study of domestic universities' advanced/microreactor activities.



Project Overview

- Project Status
  - Started September 2023

- Tasks
  - University Engagement
    - Preliminary assessment
    - Questions/topics for engagement
    - Outreach
  - Regulation Overview
    - Review regulations
  - Future Planning
    - Identify potential future activities
      - Reports; Focused workshops; Individual engagements; etc.

University Overview

- University nuclear department and program overview (visual example only!)

University Overview

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University Overview – Advanced/Micro Reactors

- Universities interested in advanced reactors are not limited to those with nuclear programs

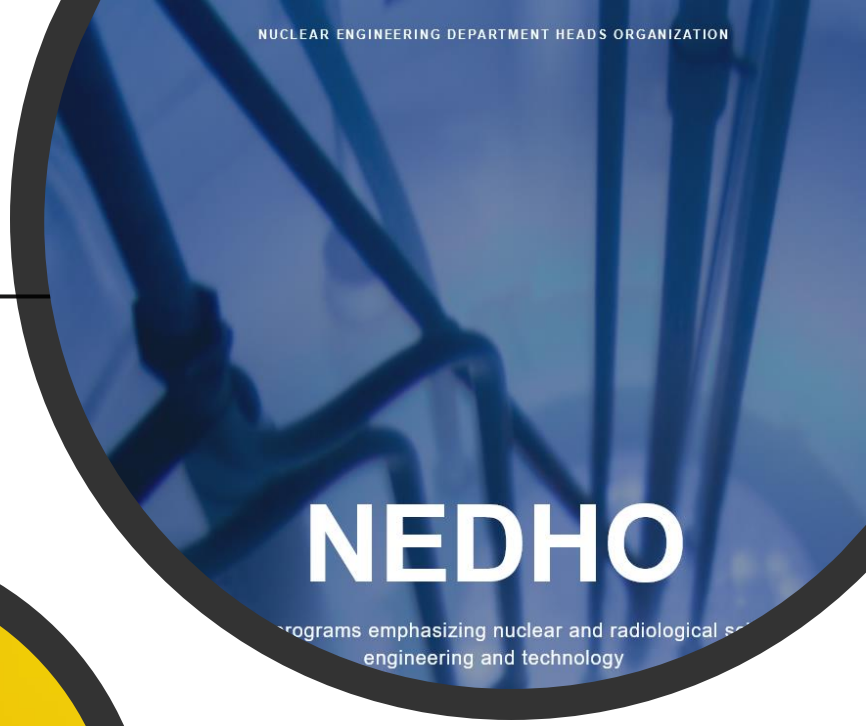
Example

Activity Overview

- Different stages of planning
  - Assessment
  - Memorandum of Understanding
  - Preparing for license application
  - Current application
- Different technologies
- Different use cases
  - Demonstration
  - Research reactor
  - Power

Approach

- NEDHO
- TRTR
- University Consortia
- Professional Societies and Conferences
- Direct Engagement



University Assessment and Engagement

- Universities were contacted directly to gain increased awareness of their current activities and planning status
  - Topics
    - Advanced/microreactor technology that is being pursued
    - Proposed use
    - Current stage of planning
      - License pathway
    - Status of security planning
    - Status of safeguards (MC&A) planning

University Overview – Advanced/Micro Reactors

Example

Abilene Christian University (ACU)

- Technology
  - Liquid fueled molten salt (1 MWth)
    - Online feed and removal
    - Onsite analytical lab
  - Vendor: NATURA
- Status
  - Construction permit submitted
- Licensing Pathway
  - Research reactor (Class 104(c))
- Safeguards and Security
  - Engaged with:
    - Sandia National Laboratories
    - Oak Ridge National Laboratory
    - NRC

University of Illinois Urbana Champaign (UIUC)

- Technology
  - High-temperature gas-cooled reactor
  - Vendor: Ultra Safe Nuclear Corporation
- Status
  - Preapplication materials submitted
- Licensing Pathway
  - Research reactor (Class 104(c))
- Safeguards and Security
  - Safeguards Information Protection Plan

Penn State University (PSU)

- Technology
  - Heat pipe microreactor (eVinci)
  - Vendor: Westinghouse
- Status
  - Preparing for license application
- Licensing Pathway
  - Research reactor
- Safeguards and Security
  - To be determined

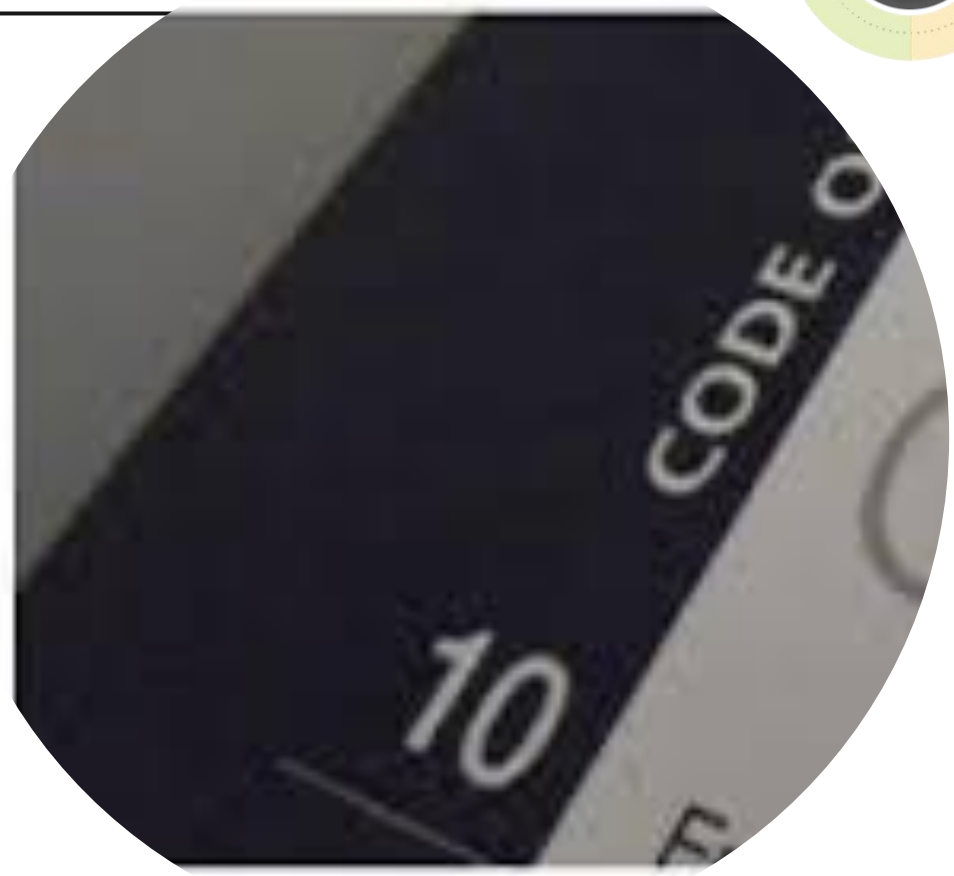
University Activity Summary

- Three universities moving forward with licensing
- Three different technologies
- Licensing as research reactors
  - One university is pursuing licensing a research reactor sited in an existing multipurpose facility, as allowed for in 10 CFR 50(a)(2)(x)
  - One university has an existing research reactor
  - One university previously had a research reactor

Regulations

- 10 CFR 50
  - Class 104

- Others?
  - 10 CFR 73
  - 10 CFR 74
  - 10 CFR 20
  - 10 CFR 51
  - 10 CFR 52
  - ~~10 CFR 53~~
  - NUREGs
  - SECY-22-0072
  - SECY-23-0021
  - Regulatory Guide 1.233



NRC Discussions

- Engage early
- RTRs: "Potential Scenarios"
  - Microreactors: MHA vs DBA
- Application of 10 CFR 53
  - RTRs will stay under 10 CFR 50
- Part 73.55a7 (alternative security measures)
- Consequence evaluation
- Part 74:
  - FNMC Plan + NMMSS

Regulatory Considerations

- Assumptions vs requirements
- HALEU (category)
  - Material attractiveness in fuel form
- Security "education"
- Law enforcement training
  - MOUs
  - Alarm Response Training through ORS
- Non-power production utilization facility
- Comparison to medical isotope facilities

Initial Recommendations and Requests

- One-on-one meetings
  - Developing MC&A processes
  - Establishing physical security procedures
- Physical and cyber security support
- Dedicated task force to explore the domestic-international safeguards interface
- Workshops
- Faculty – laboratory staff exchange program
- Research opportunities
- Course support
  - Cyber security
  - Physical protection
  - Instrumentation
- Training

Next Steps

Write final report…

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