Introduction to Nuclear Regulation

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Problem

Decarbonizing with nuclear energy comes with regulation

- Nuclear facilities require a license from the Nuclear Regulatory Commission (NRC) – the lead federal agency for nuclear safety and environmental regulation.

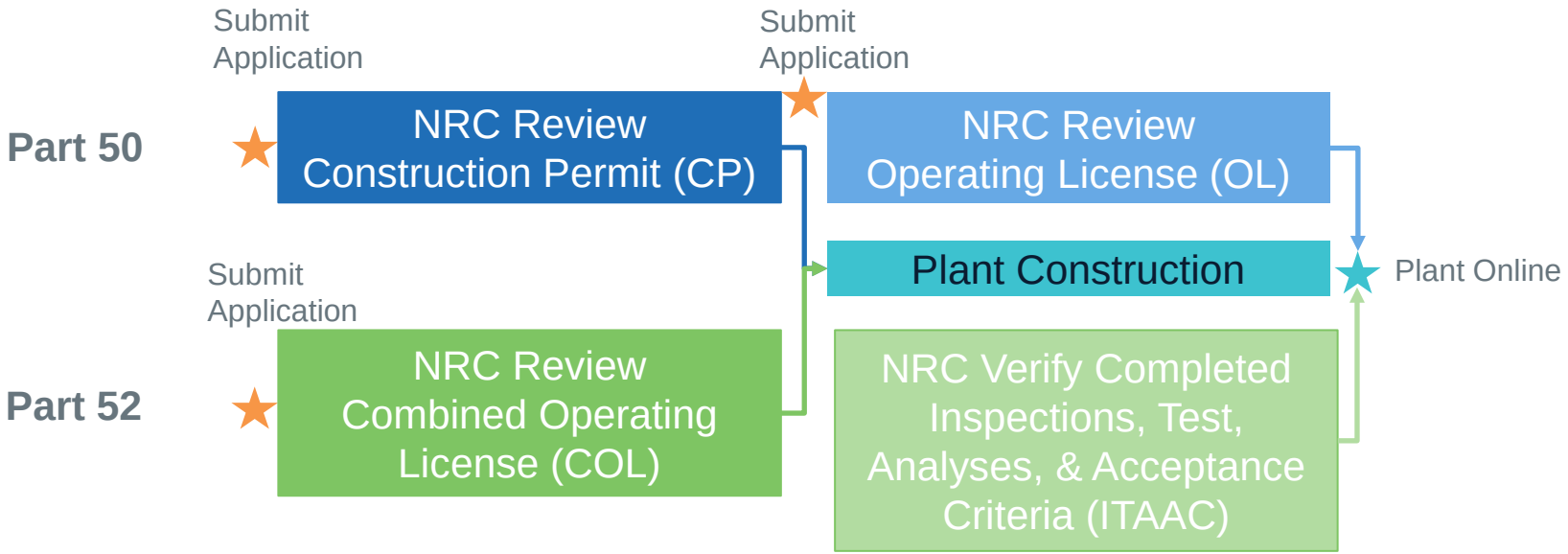
What does this mean for district energy?

- NRC coordinates with other federal and state regulators for the construction and operation of nuclear facilities.
- This will impact deployment timelines and operational oversight.

Current state of regulation by NRC

Safety Review	Application reviewed for technical safety
Environmental Review	Review per National Environmental Policy Act
Construction Oversight	NRC conducts inspections throughout construction
Reactor Operator Licensing	NRC conducts exams and issues licenses to individuals
Operational Oversight	NRC Resident Inspectors located at current commercial reactors

NRC Licensing Processes



Differences between Part 52 and Part 50

Part 52	Part 50
License before you build	Build before you license
COL (FSAR)	CP – OL (PSAR – FSAR)
Issues resolved up-front before construction investment	Lack of up-front issue resolution puts capital at risk
DC, SDA and ESP options can minimize COL application review time and cost	Potentially fastest path to deployment
Clear choice for N^{th} of kind	Potentially better for FOAK
“Push market”	“Pull market”
Requires greater design completion prior to construction	Allows construction with less design completion
Regulatory infrastructure in place & understood	Regulatory infrastructure undergoing update
Change control during construction	Unfettered changes during construction
ITAAC prior to operation	OL prior to operation

Evolving regulation by NRC

Initial Licensing

- Reflecting the characteristics of advanced reactors
- Adjusting to more performance-based requirements
- Streamlining environmental reviews through use of generic environmental impact statement

Deployment Oversight

- Considering manufacturing
- Considering fleet operations

  Potential regulatory separation of reactor and balance of plant
- Considering operational oversight model

End-users' involvement with the NRC

Depends on ownership, operations & maintenance model

- End-user owns & operates reactor – significant NRC interactions
- End-user owns reactor; contract for O&M – limited NRC
- End-user has off-take agreement for reactor energy – no NRC*

  * If the reactor is located at the end-user's site, NRC inspectors would require access for inspections.

Considerations

- Include staffing for regulatory interface in planning process

Examples

- University of Illinois – Urbana Champaign will own/operate
- Integrate with current campus district energy system

FOR IMMEDIATE RELEASE

University of Illinois at Urbana-Champaign and USNC Will Collaborate to License and Construct Next-Generation Micro Modular Reactor

Submittal of Construction Permit Application to U.S. NRC Will Kick Off Two-Step Licensing Process

URBANA, Ill. – June 28, 2021 – The University of Illinois at Urbana-Champaign (UIUC) has submitted a Letter of Intent to the U.S. Nuclear Regulatory Commission (NRC) to apply for a license to construct a research and test reactor facility on the UIUC campus. The submission of the Letter of Intent (Project No. 99902094) is the first step in NRC's two-step process to license a new reactor, including a process of public hearings on the proposed project for full transparency.

Request for proposal released for Eielson Air Force Base Micro-Reactor Pilot Program

Published Sept. 26, 2022

By Secretary of the Air Force, Public Affairs

Eielson Air Force Base, Alaska -- Eielson Air Force Base, Alaska -- The Department of the Air Force, in partnership with the Defense

- To be sited at Eielson AFB
- Government will purchase power and heat
- Long-term fixed price contract

Advanced Nuclear Versatility

Spectrum of Sizes and Options

Micro

Small

Large

Variety of Outputs

Electricity

Hydrogen

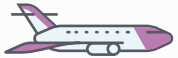
Process Heat

Multitude of Uses

Homes

Vehicles

Businesses



Aviation

Rail

Shipping

Concrete

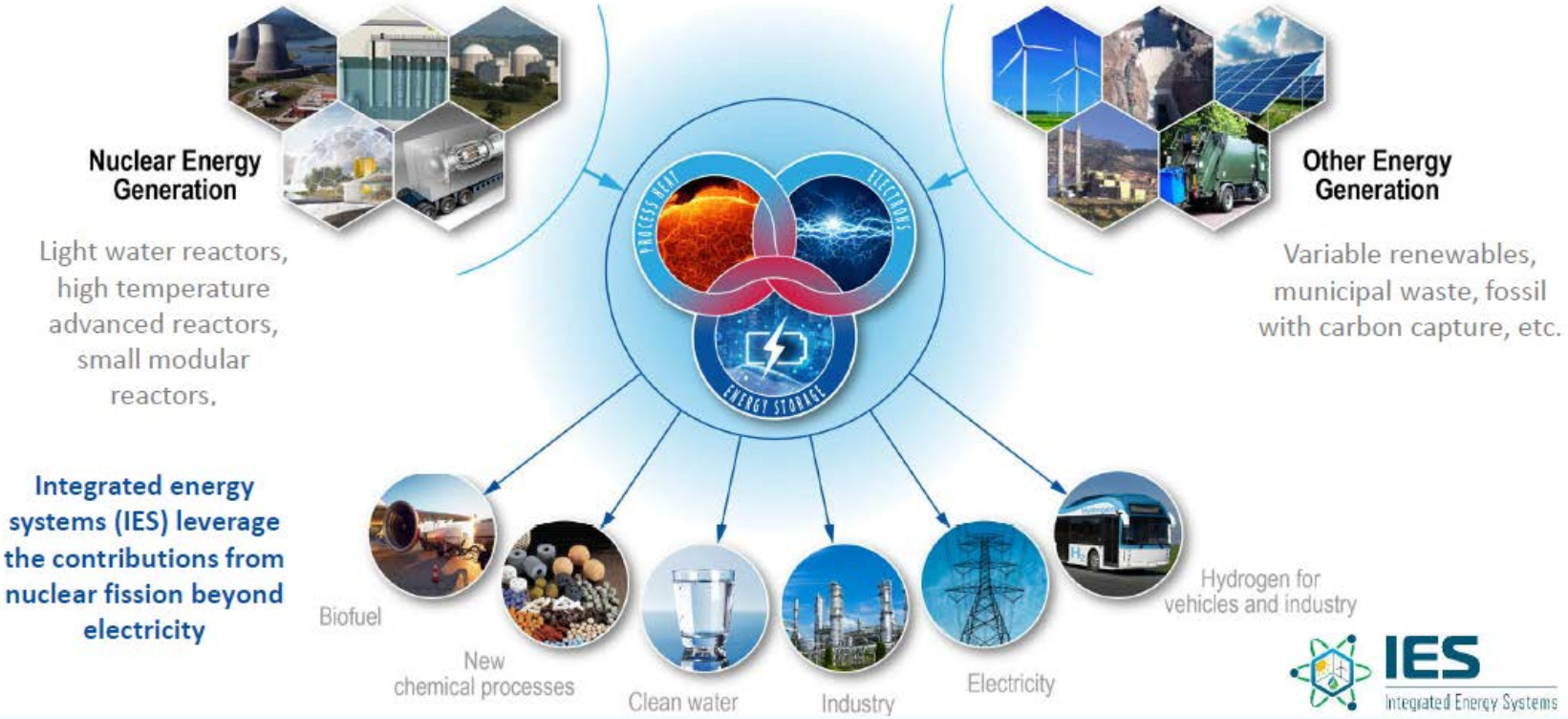
Steel

Factories

Water

Space

Future clean energy systems – transforming the energy paradigm



Source: Idaho National Laboratory https://ies.inl.gov

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