Regulatory & Licensing Challenges

Microreactor Workshop

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Objectives for Microreactor Regulatory Development

- Address and resolve key regulatory framework and licensing technical issues that directly support the “critical path” to advanced reactor demonstration and deployment
- Provide recommendations and solutions to regulatory issues associated with the program
- Develops licensing and regulatory strategies to enable future microreactor deployments
- Program activities include a particular focus on addressing and resolving regulatory uncertainties in the next 1-2 years that challenge near-term (5-7 years) deployments
- In essence, the program is seeking ways to provide impactful DOE funding for cross-cutting industry-identified experimental work at DOE complex labs that will support the near-term licensing of micro-reactors.

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FY21 Milestone Report

- Regulatory Research Plan:
  - In collaboration, INL and ORNL are developing a Regulatory Research Plan (RRP) for the Microreactor Program
  - This work links major research activities in microreactor technologies, as sponsored by DOE Office of Nuclear Energy's (DOE-NE), to key regulatory requirements and licensing challenges likely to affect deployments in the domestic commercial energy market
  - The RRP examines and prioritizes key research and development opportunities and recommends activities to DOE-NE R&D planners and investigators concerning the expected impact of such work to the microreactor licensing critical path
  - Initial report was completed March 5, 2021

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Identifying Areas of Regulatory Development Need

- To determine the areas of R&D need, INL and ORNL staff:
  - Met with NEI's Microreactor Working Group to solicit input from developers
  - Interviewed multiple developers to better define the initial R&D need
  - Developed a survey that was sent to the NEI Microreactor Working Group to identify additional areas of need
  - Combined and reviewed survey results to help identify specific R&D projects and their impact on the critical path
  - Attended NRC Public Meetings, GAIN Workshops, and NEI Working Group Meetings
  - Reviewed recent NRC reports, including NRC SECY-20-0093 (ADAMS no. ML20129J985, ML20254A365, and ML20254A366)

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Industry Survey

- Industry Survey was sent to members of the Advanced Reactor and Microreactor NEI Working Groups
- Stakeholders were asked to rank the following items by criticality:
  - Autonomous and Remote Control/Monitoring
  - Grid Interaction
  - Factory Assembly
  - Transportation
  - Staffing
  - Digital Controls
  - Instrumentation
  - Modeling and Simulation
  - Siting and Environmental Impact
  - Security and Safeguards

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Industry Survey (Cont'd)

- In addition to the rankings, stakeholders were asked:
  - Is this list complete? If not, what subject areas should be added?
  - Please provide any specific R&D items that DOE can support through funding and laboratory expertise, technology, and assistance, and that would benefit the licensing of microreactor designs.

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Initial Survey Results

- The initial survey results were grouped into bands based on importance and time criticality
- The areas of highest priority are band 1 and are needed before subsequent bands

Band	Topic Area
1	Autonomous and Remote Control/Monitoring
	Modeling and Simulation
2	Transportation
	Siting and Environmental Impact
	Security and Safeguards
	Factory Assembly
3	Operations, Maintenance, and Security Staffing
	Grid Interaction
	Digital Controls
	Instrumentation

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Items with Multiple Areas of Regulatory Need

- Transportation:
  - There are multiple stages of transportation throughout the life of a microreactor
    - From factory to use site (fueled but not yet operational)
    - Between use sites (post-operation)
    - From use site to disposition process facility (spent fuel for disposal)
  - Each of these stages of transport are unique and will require the applicant to meet different regulations, such as:
    - Transport Container Design
    - Shielding for each operational stage
    - Shipping Type (air, train, ship, truck)
    - Emergency response

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Items with Multiple Areas of Regulatory Need (cont'd)

- Autonomous and Remote Control/Monitoring
  - Many consider this to be one area
  - This encompasses many different licensing areas
    - Autonomous reactor operation
    - Remote Control/Monitoring
    - Cyber Security
    - Digital Controls
    - Operator Licensing
    - Number of Operators per Reactor
  - Most of these areas are new or would require new licensing approaches

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Additional Survey Results

- Other areas of regulatory framework development need identified by stakeholders include:
  - Aircraft Impact Assessment
  - Emergency Planning (currently an NRC rulemaking in progress-see 10CFR 50.160)
  - Control Room Design
  - Siting and Environmental concerns
  - Radiation Protection
  - Waste Management
  - Regulatory Oversight (including oversight of remote and autonomous reactors)
  - Manufacturing Licenses (including fueling and defueling in a factory setting)

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Path Forward

- INL and ORNL staff will continue to expand on the survey results to better identify specific R&D projects to recommend
  - This may include contacting survey responders for more detailed descriptions
- Continue to solicit input from stakeholders
- Revise the RRP completed in March 2021 to include recommended regulatory framework and supporting R&D activities

- Final Regulatory Research Plan draft will be complete to support FY22 DOE Regulatory Development Planning
- This planning will directly impact R&D performed and funded by DOE in FY22 and beyond

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Conclusions

- INL and ORNL staff continue to seek new and updated needs to support the development and deployment of microreactors
- For more information, request a survey, or to provide specific research input, please contact:

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