Perspectives on Risk-Informed Licensing of Advanced Reactors

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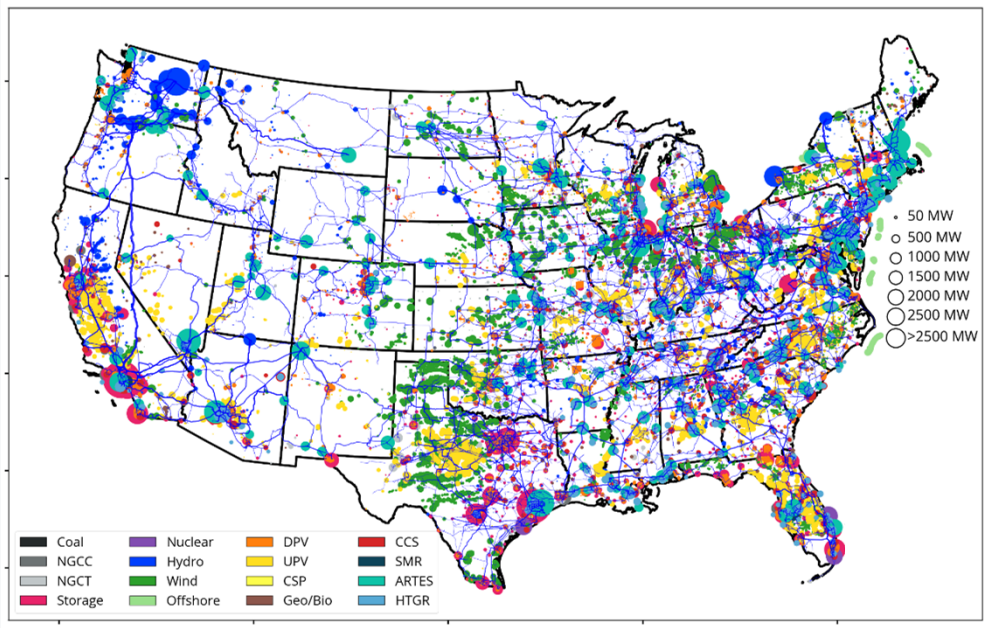
- The Breakthrough Institute does not receive funding from industry



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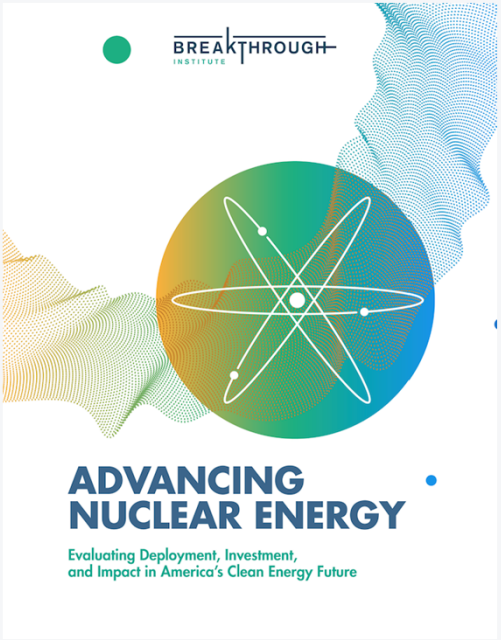
Strong Public Interest in Nuclear Energy

- Strong consensus that nuclear energy is needed
  - Meet climate goals
  - Reduce health and safety impacts from energy system
  - Just energy transition
- Improves safety, reliability, energy security, and enable environmental justice goals
  - Significant potential to transition fossil fuel power plants to advanced nuclear in nearly all states
- Significant deployment needed to achieve goals
  - Approximately 50-150 GW (9-22% of capacity) by 2040
  - HUNDREDS of reactors in coming decades
- The NRC must be ready to effectively and efficiently license



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* Refer to Breakthrough Institute Report: Advancing Nuclear Energy

Commitment to public welfare

- The NRC needs to consider what is in the general welfare of the public
- The Atomic Energy Act states
  - that the U.S. should use nuclear power to **"make the maximum contribution to the general welfare"**
  - The Energy Reorganization Act of 1974 moved the "licensing and related regulatory functions" to the NRC, but didn't change the to purpose from general welfare
- The NRC Safety Goals state
  - "Societal risks to life and health from nuclear power plant operation should be comparable to or less than the risks of generating electricity by viable competing technologies and should not be a significant addition to other societal risks."
  - The NRC doesn't make this comparison, to the detriment of the general welfare of the public.

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Proposed Part 53 Draft Rule Package

- Presents once in a generation opportunity for regulatory innovation that considers public interests
- Must meet the mandate of NEIMA to enable innovation and commercialization
- Public very recently – March 6th
- Some benefits
  - Risk-informed seismic requirements
  - Improvements to operator licensing
  - Mostly technology-inclusive, plans for further work on Manufacturing Licenses
- Evolutionary not revolutionary
  - Based largely on existing licensing pathways
  - Uses existing license structures (ESP, DC, COL, etc) and doesn't consider a new approach appropriate for larger-scale deployment
- Efficiency – NRC Regulatory Analysis shows cost savings
  - Represents a small 5-6% savings compared to recent licensing
- Includes features with major issues (e.g., QHOs and AERI frequency)*

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* Refer to Breakthrough Institute QHO Whitepaper and AERI Whitepaper

Quantitative Health Objectives in Part 53

- Example of major policy issue that has received extensive stakeholder feedback
- The Quantitative Health Objectives should not be in the rule *
  - Measure of cumulative cancer risk decoupled from qualitative Safety Goals
  - QHOs are not a viable performance metric
  - Licensee cannot demonstrate they are meeting this requirement
  - The Commission has affirmed that the Safety Goals should not be in a rule — high-level guidance to the NRC staff on how new regulations should be considered
- Does this support a risk-informed approach?
  - If QHO limit reached with single event (e.g. AERI) effects still unobservable in population
  - NRC regulatory analysis shows increased efficiency with AERI vs Part 53 Framework A focused on PRA. Suggests that further complexity is not needed to meet Safety Goals
  - Focus on detectable risks and consider impacts relative to other forms of energy

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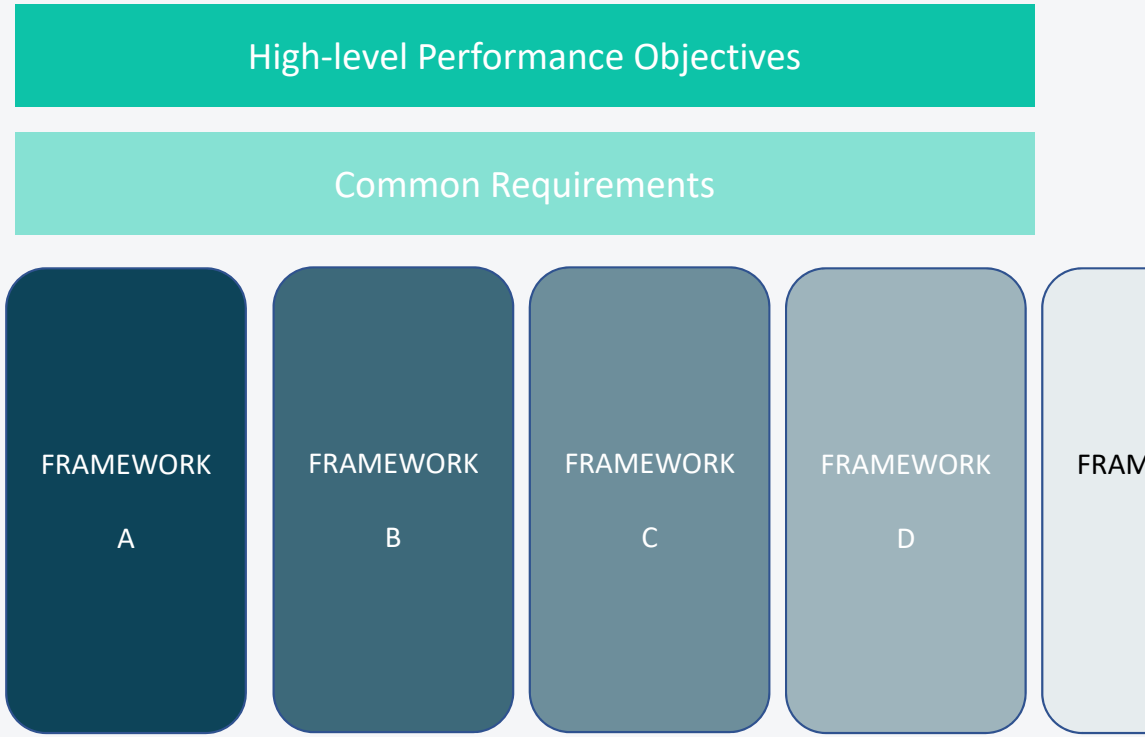
* Refer to Breakthrough Institute Comments and Whitepaper submitted 2/4/2022 for detailed analysis and discussion

Part 53 Rule Structure

- High-level performance objectives allow flexibility for innovative pathways in the future
  - Existence of Framework A & B in draft makes it obvious there could be a C, D, E….
- Methods for meeting rule requirements should be guidance
  - Example – LMP is one way to meet requirements in Part 50 and is guidance



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Forward Looking – Forward Moving

- Proactive – Areas for improvement must be identified and solutions need to be proposed and implemented in a timely manner
- Example – NRC Part 53 regulatory analysis found a significant savings by averting 35 exemption request per applicant vs. existing frameworks
  - Identified as benefit of Part 53, but actually is a challenge with existing frameworks
  - No recommendation was given to solve this problem
- Example – NRC Part 53 regulatory analysis found AERI approach could require half the resources as a PRA.
  - ACRS recommended this approach be available in other frameworks
  - NRC staff said it is out of scope
- Example – Review timelines do not show improvement with experience
  - LWRs (majority of NRC experience) – 42 months
  - Non-LWRs – 36 months
- Example – Rulemaking timelines
  - Emergency Preparedness for SMRs and ONTs. Delivered to Commission 1/2022. Expected finalization 7/2023 – 18 months
  - NuScale Design Certification finalizes SER 8/20, Effective 2/23 – 30 months

What can be solved now?

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Closing Remarks

- The public has a vested interest in a timely and effective licensing of nuclear reactors
- The NRC should consider
  - How does the safety nexus support the appropriate level of safety relative to other sources of energy
  - How does the rule enable an efficient review
  - How does the rule enable innovation
- Open discussion is critical
  - Public meetings where comments are gathered does lead to mutual understanding
- Breakthrough Institute to host a stakeholder workshop on Part 53 to reach understanding and consensus on a Part 53 framework that reflects the public interest

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