NUCLEAR INNOVATION ALLIANCE

Policy Challenges of Technology-Inclusive, Risk-Informed, Performance-Based Regulation

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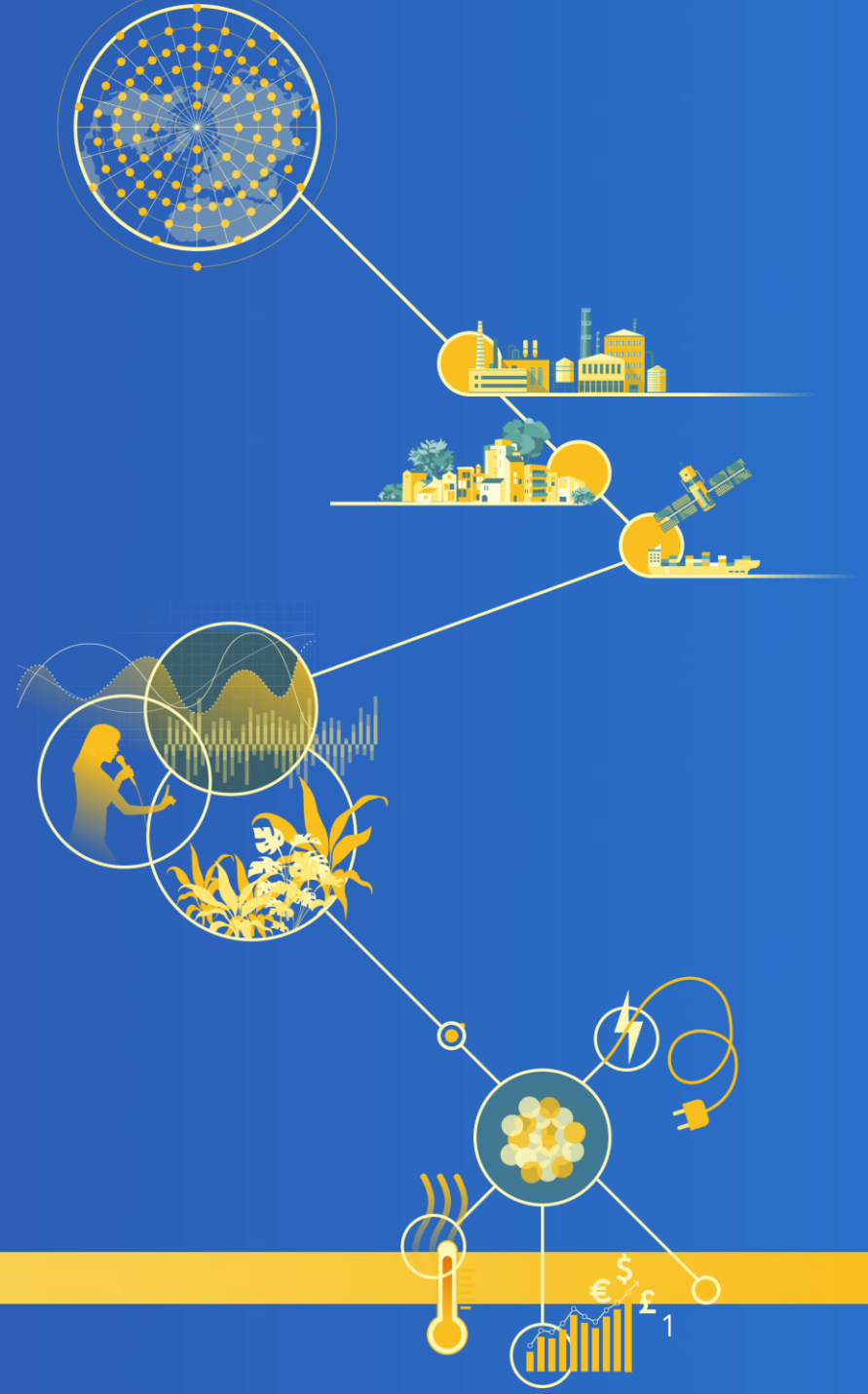
RP3C September Community of Practice (CoP)

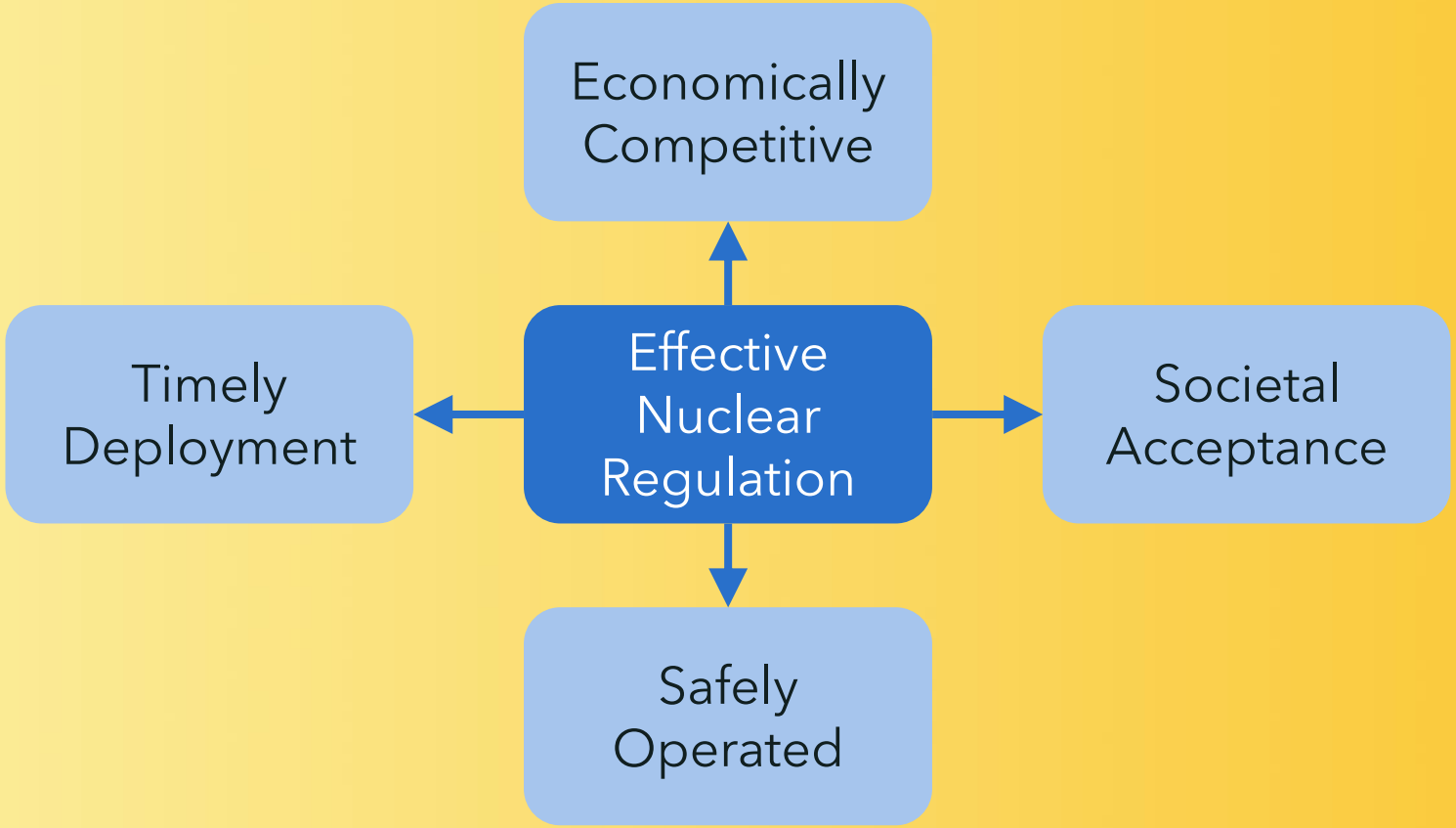
September 30, 2022



Who is Nuclear Innovation Alliance (NIA)?

- NIA is a "think-and-do" tank working to ensure advanced nuclear energy can be a key part of the climate solution.
- NIA identifies barriers, performs analysis, engages with stakeholders and policy makers, and nurtures entrepreneurship through its Nuclear Innovation Bootcamp.

Developing modern and effective regulatory frameworks is critical to advanced nuclear energy



NIA is addressing wide variety of factors contributing to the predictability and timeliness of advanced reactor licensing

Nuclear Regulatory Commission

- Existing Regulatory Frameworks and Requirements
- New Regulatory Frameworks and Guidance
- NRC Management and Staff Culture
- NRC Commission Leadership on Policy Questions

Advanced Reactor Applicants

- Applicant Reactor Licensing Strategies
- Best-Practices for Licensing Applications
- Public Stakeholder Engagement

Congress

- Legislative Oversight and Direction

NIA is working to improve or develop both near-term and longer-term licensing frameworks for advanced reactors

Near-term licensing reform:
10 CFR Part 50 and Part 52

Longer-term licensing development:
10 CFR Part 53

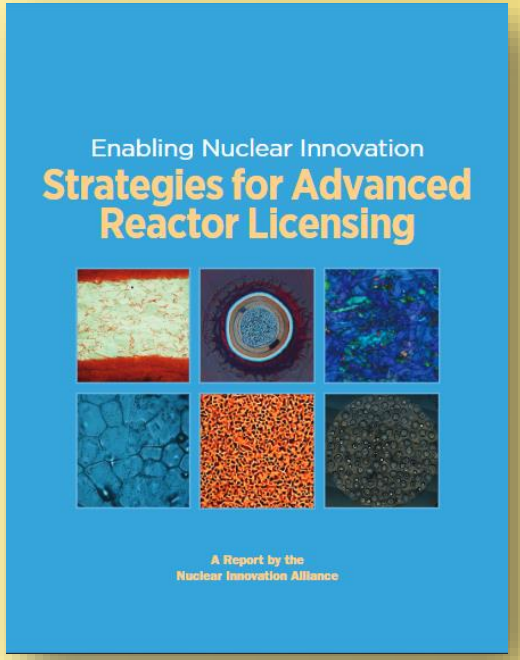
Ensure effective use of existing licensing processes for first-of-a-kind advanced reactor projects

Inform NRC rulemaking on new licensing process for future advanced reactors

Inform NRC activities on fees, environmental rules, and siting

Cross-cutting regulatory reform:
Risk-informed, performance-based regulations
Effective and efficient reviews by NRC staff

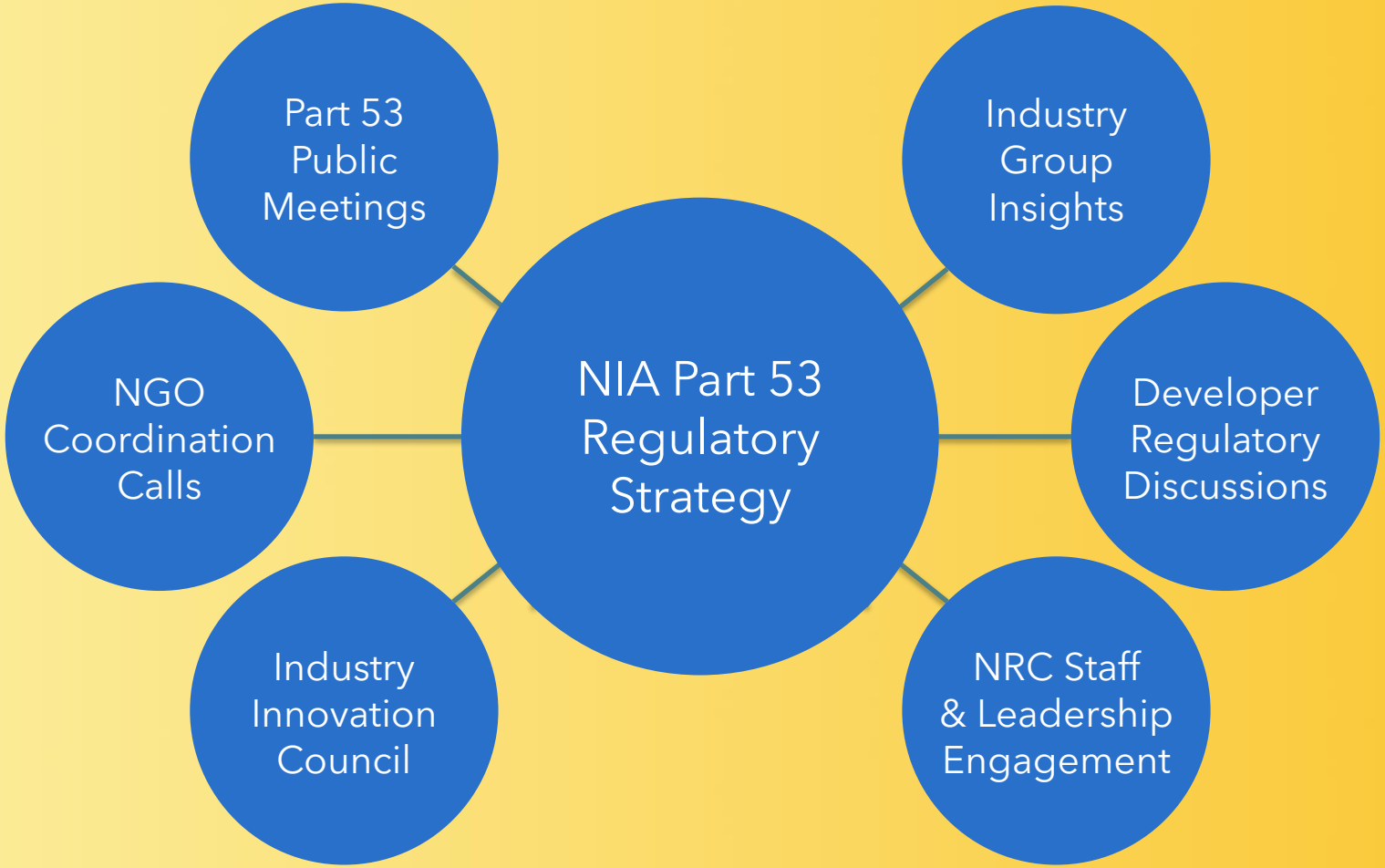
NIA has historically advocated for use of TI-RIPB frameworks for the licensing of advanced reactors



Strategies for Advanced Reactor Licensing (April 2016)

"…the NRC should designate a special technical team to develop a plan to implement a technology-inclusive licensing and regulatory framework for advanced reactors based on risk-informed and performance-based principles. The technical team should propose a roadmap for putting the new framework into practice by 2025, and then be given the administrative flexibility and resources to succeed."

NIA has been re-thinking Part 53 and engaging with stakeholders build consensus on a path forward



NIA has actively engaged with NRC during Part 53 preliminary rule development process

- July 2021 – NIA leads joint NGO comment on Part 53: ML21207A223
- November 2021 - NIA provides detailed public comments on Part 53: ML21321A284
- December 2021 - NIA briefs Commissioners on Part 53: ML21337A139
- February 2022 - NIA provides Public Presentation at First NGO Meeting on Part 53: ML22038A000
- August 2022 - NIA provides final public comments on Part 53: ML22250A608

Figure from NRC February 8th Public Meeting Presentation

NIA advocates for a "rethink" of Part 53 towards a performance-based, technology-inclusive framework

- Part 53 draft text is being revised by NRC to incorporate increased licensing flexibility
- NRC is continuing stakeholder discussion on specific technical topics for Part 53 draft text
- NIA is focused on ensuring that the Part 53 framework is efficient and effective for all advanced reactor developers

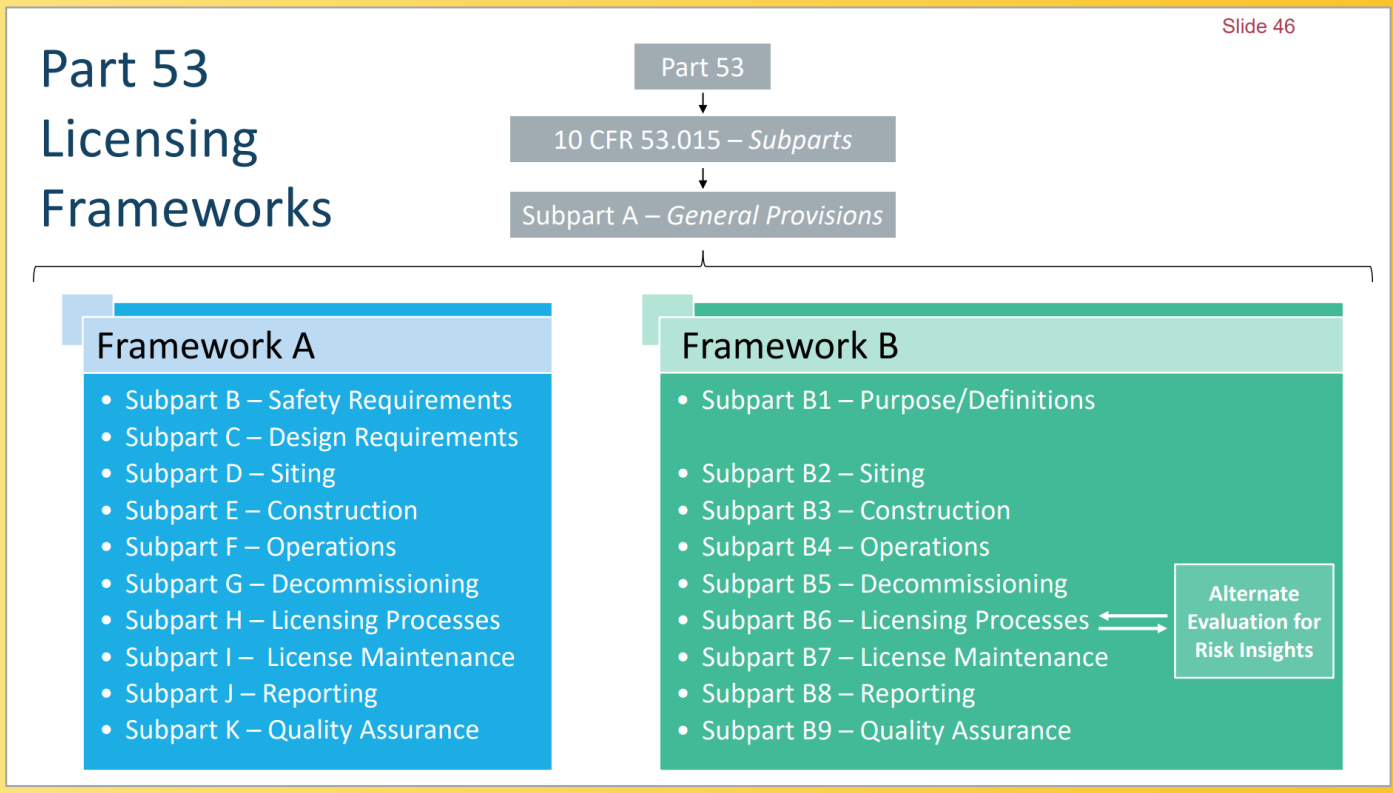


Figure from NRC March 16th Public Meeting Presentation

TI-RIPB regulatory frameworks could be used to regulate a wide range of advanced reactors

Westinghouse *AP1000*

1120 MWe
Water Cooled

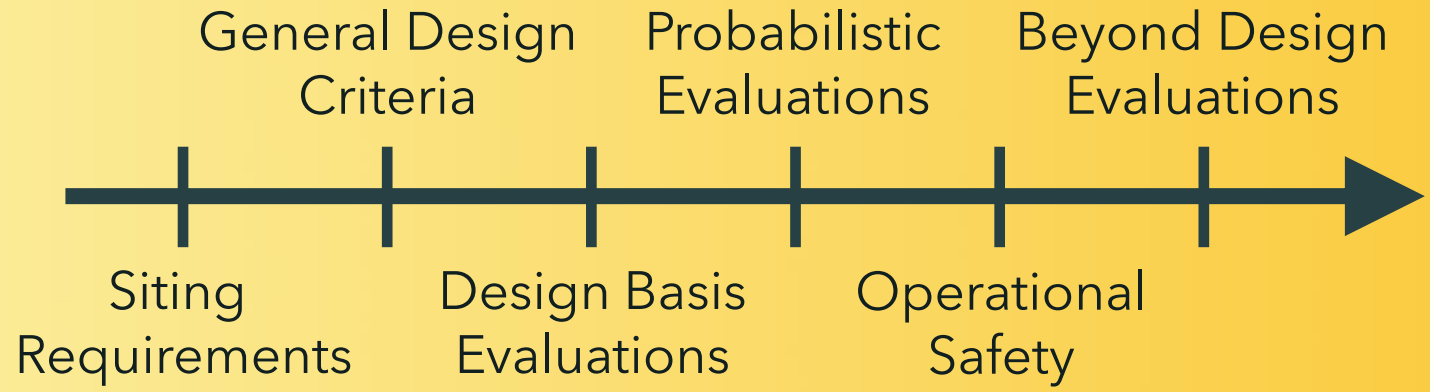
Regulatory paradigms

- Regulatory requirements
- Analysis methods
- Regulatory assumptions
- Reactor design criteria
- Risk assessments
- Organizational programs
- Operational requirements
- Equipment qualification
- Reactor siting

Westinghouse *eVinci*

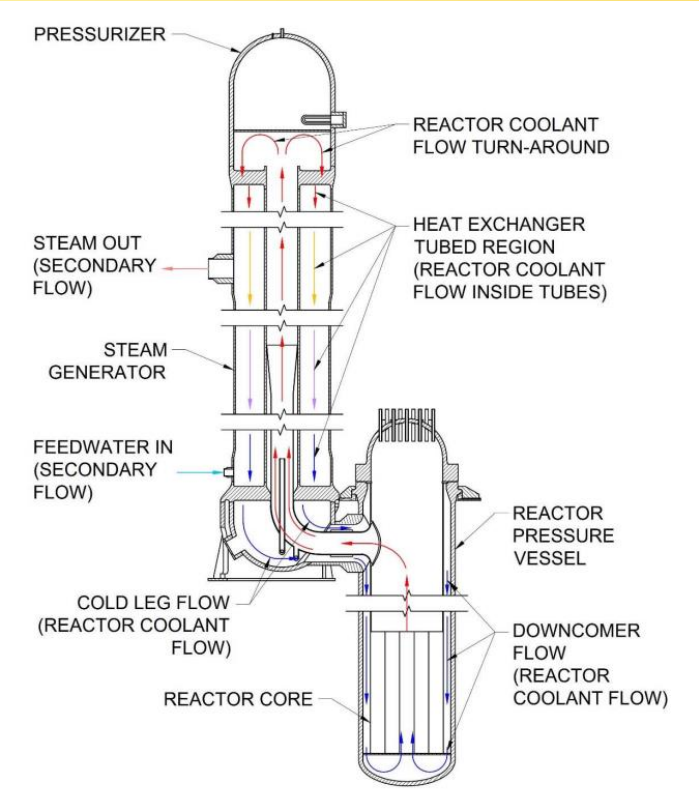
1 MWe
Heat Pipe Cooled

Policy challenge of TI-RIPB is overcoming perceived trade-off between regulatory predictability and flexibility



Increasing regulatory predictability but perceived decreased regulatory flexibility

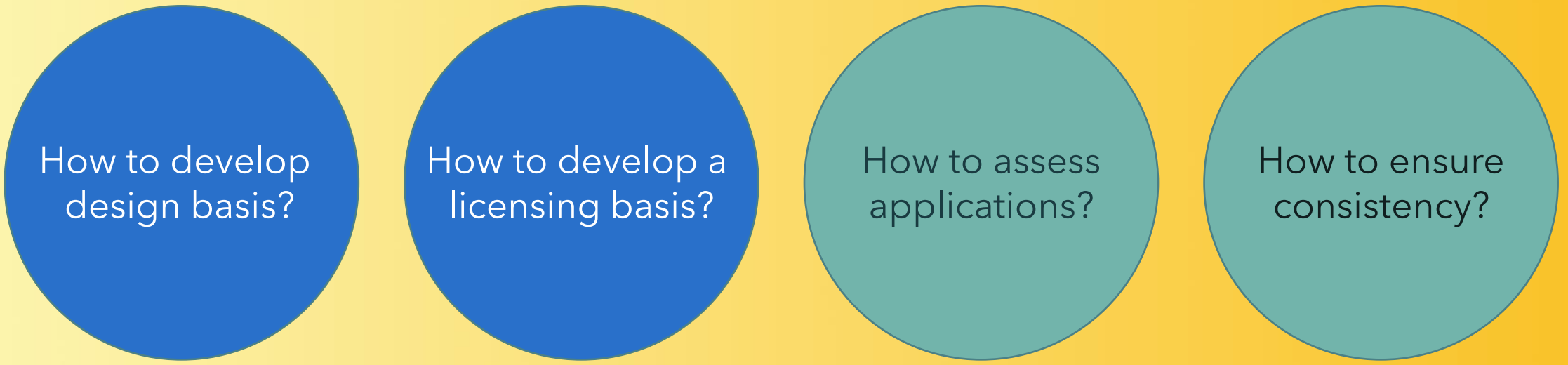
Existing licensing exemption process exemplifies regulatory predictability and flexibility trade-offs



Ex. Holtec SMR-160 LOCA Exemptions

- 10 CFR 50.12 provides for exemptions to specific regulatory requirements
- Burden of proof for exemptions can be highly uncertain
- Significant effort can be expended by applicants without clear pathway to final regulatory decision

Stakeholders may be wary of highly flexible regulation due to perceived predictability and review challenges

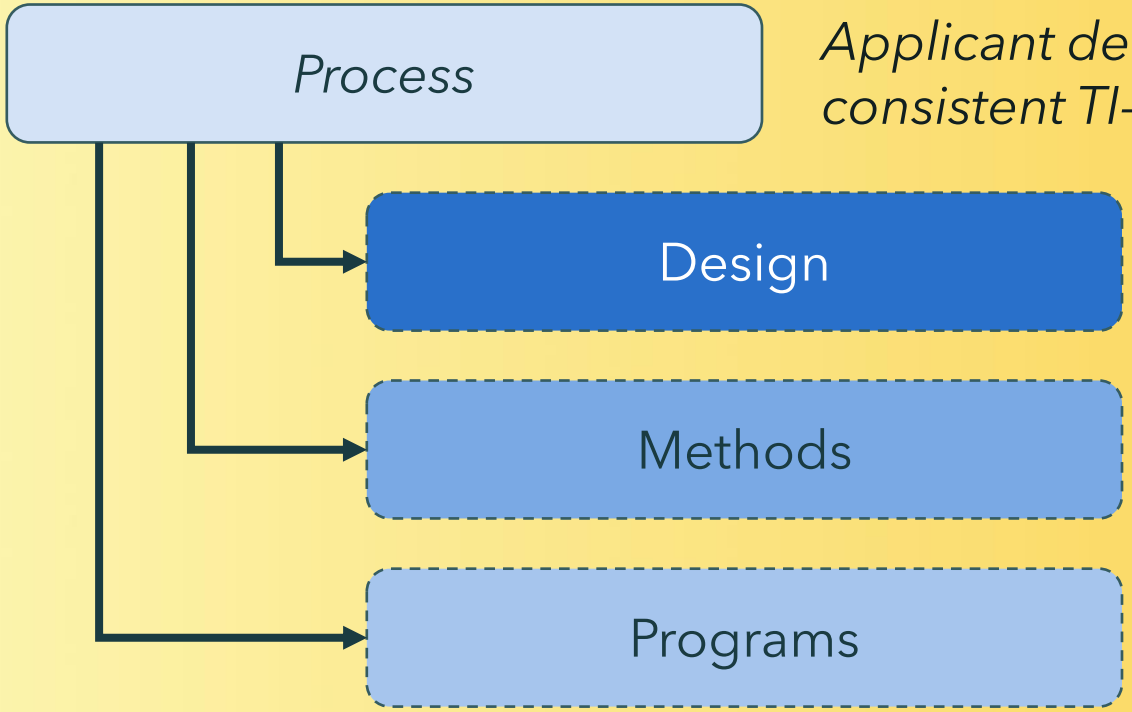


Poor predictability increases licensing risk for both applicant, regulator

Regulatory predictability can be introduced to regulation using a variety strategies

	Regulatory Example
Design	*Emergency Core Cooling Systems (10 CFR 50.46)*
Methods	*Probabilistic Risk Assessments (10 CFR 52.47)*
Programs	*Facility Safety Program (10 CFR 53.890)*
Process	*Evaluation against TI-RIPB requirements?*

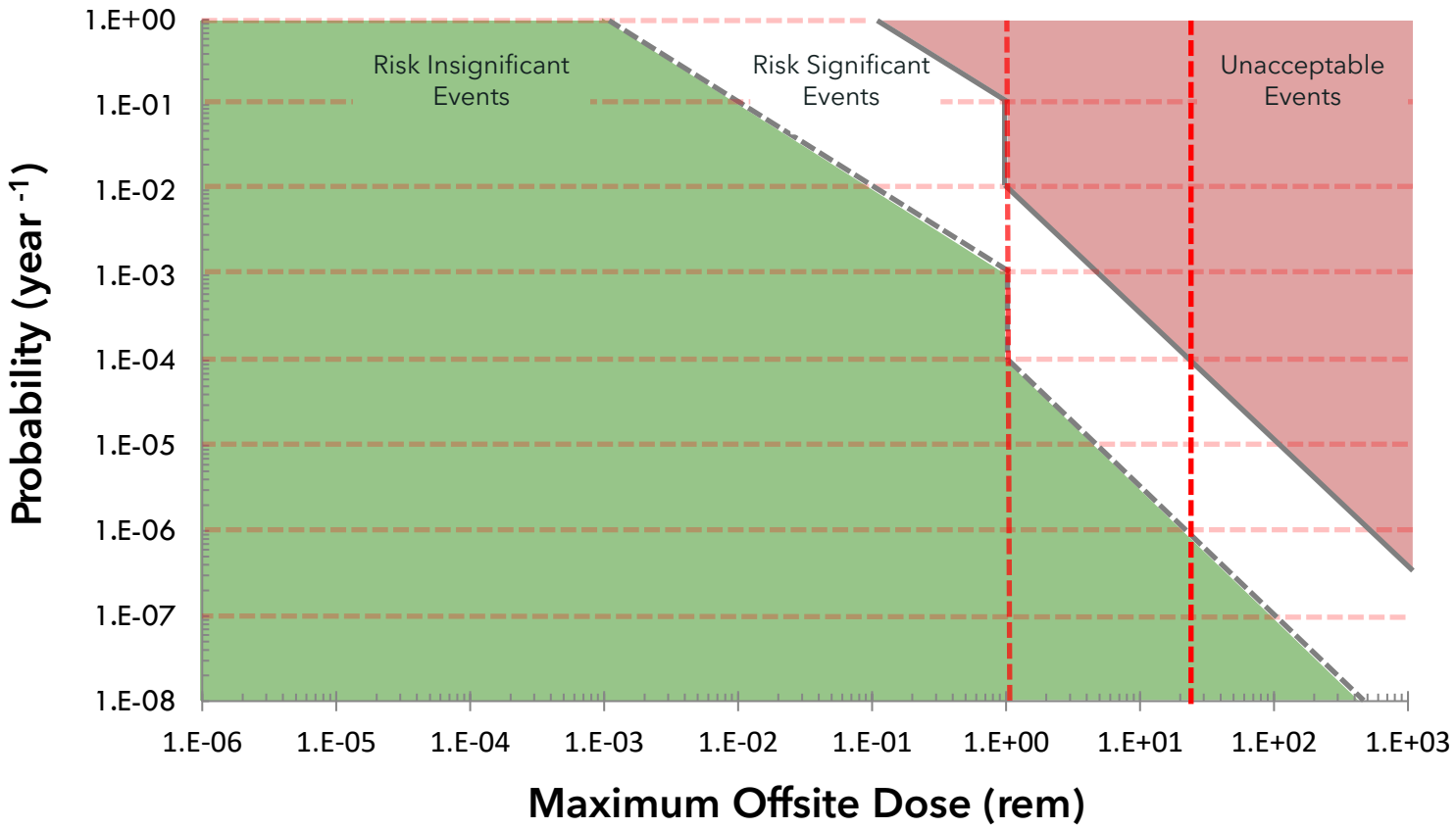
Flexible and predictable regulatory framework can be developed by basis on TI-RIPB requirements



Applicant demonstrates compliance with consistent TI-RIPB licensing requirements

Optional strategies can provide known acceptable methods for demonstrating compliance with TI-RIPB licensing requirements

Challenge in defining flexible TI-RIPB requirements that do not prescribe design, methods, or programs

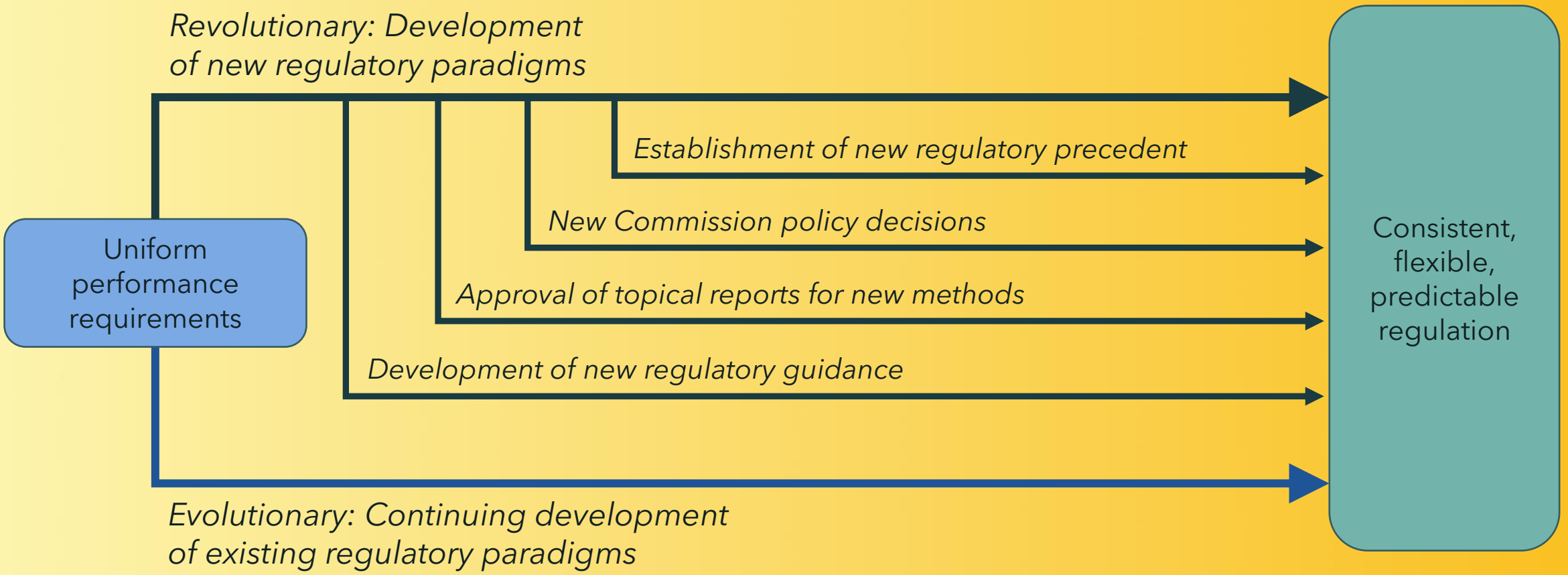


Example requirements:

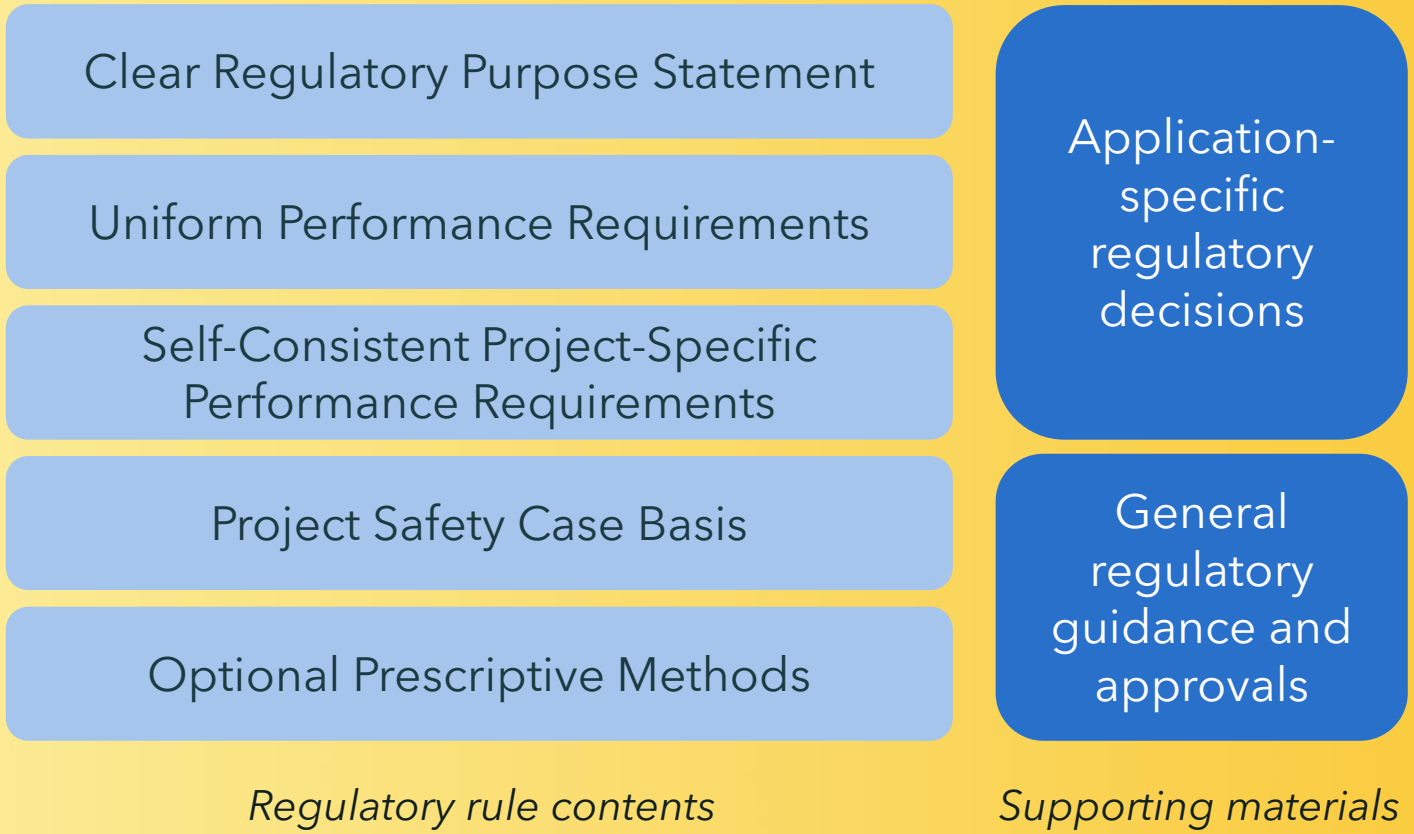
- Normal operation (10 CFR Part 20)
- Off-normal operation (10 CFR Part 100)
- Security requirements (10 CFR Part 73)
- *Other performance-based risk-informed requirements*
  (Quantitative health objective?)
  (Surrogate risk requirements?)

Need to work with NRC, stakeholders, policymakers to define TI-RIPB requirements for advanced reactors

Part 53 framework can be reimagined to facilitate both evolutionary and revolutionary regulations



Need to balance TI-RIPB regulatory requirements and processes between rule, guidance, and consensus codes



On-going technical and policy engagement is critical to success of TI-RIPB rules for advanced reactors