Evolving Section III Construction to Recognize Safety and Risk

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Chair, Section III Subgroup Design Methods

MPR
CELEBRATING 60 YEARS

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Promise of Advanced Nuclear

Reliable, safe, carbon-free energy that is competitive

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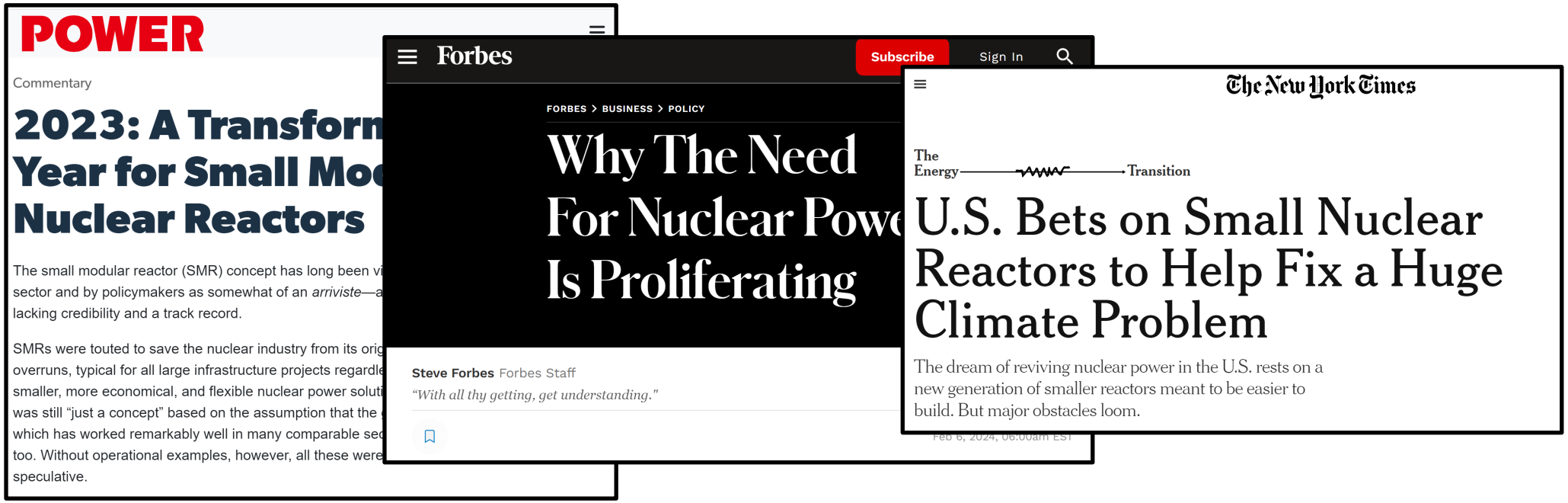

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Promise of Advanced Nuclear

Reliable, safe, carbon-free energy that is competitive

Cost of Hinkley Point nuclear plant backed by France, China spirals to US$38.5 billion

- EDF and its partner in the project, China General Nuclear Power, will be asked to provide additional funding, but it's unlikely the Chinese will agree, EDF said
- French energy giant has increased the UK-based project budget multiple times

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How to be competitive?

- Capital costs
- Plant operating costs
- Construction time

Dictionary

Definitions from Oxford Languages · Learn more

com·pet·i·tive

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adjective

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  - Focus resources on areas with highest value
  - Decisions informed by safety and risk

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How to be competitive?

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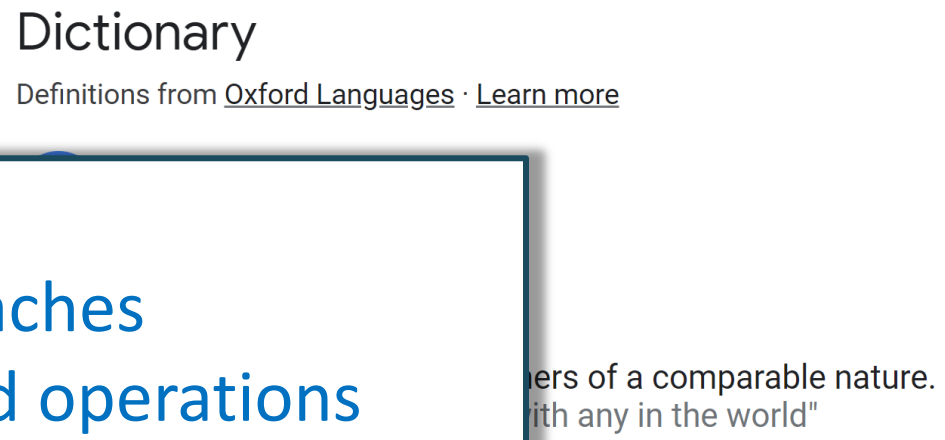
Evolve legacy approaches
for nuclear construction and operations
to make advanced nuclear competitive



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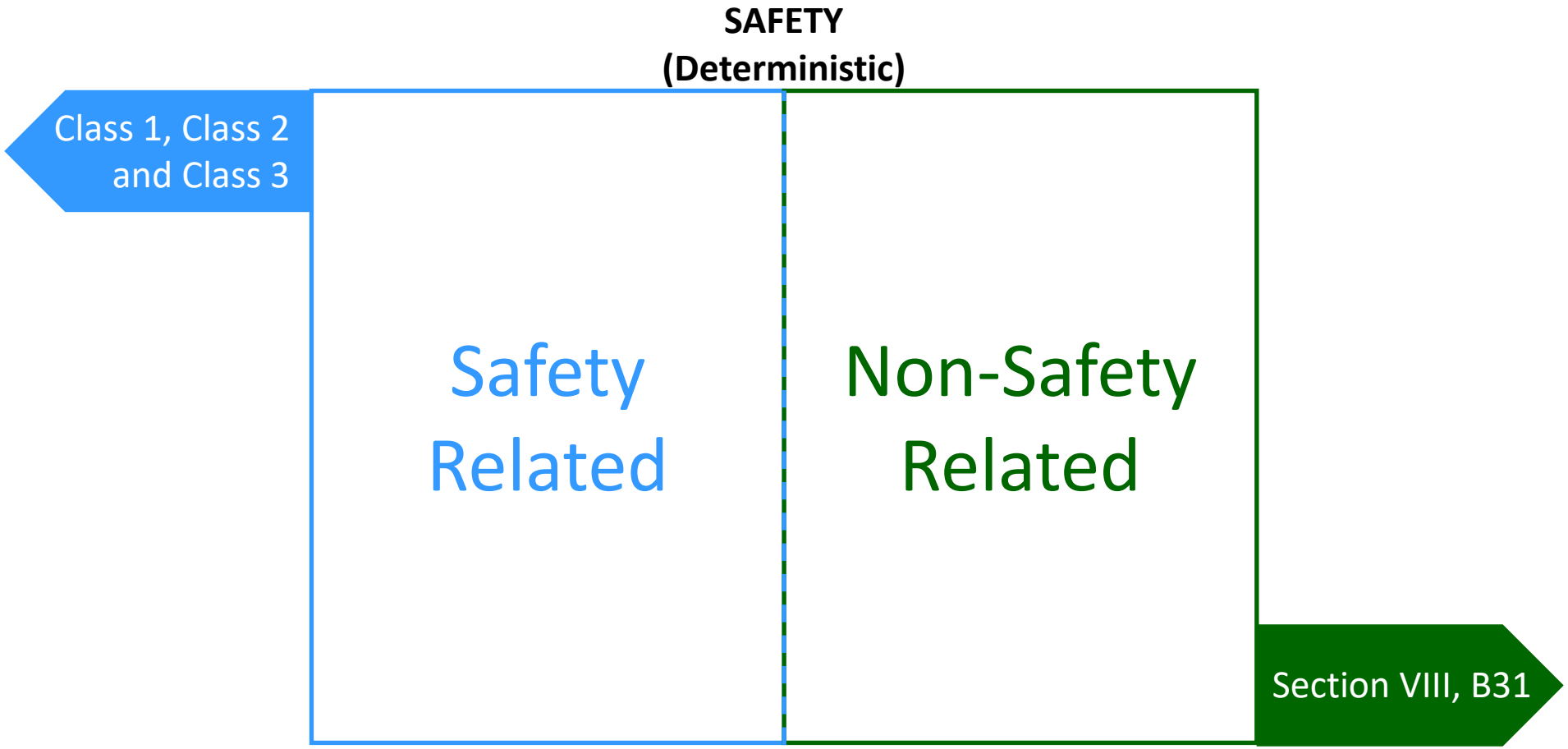
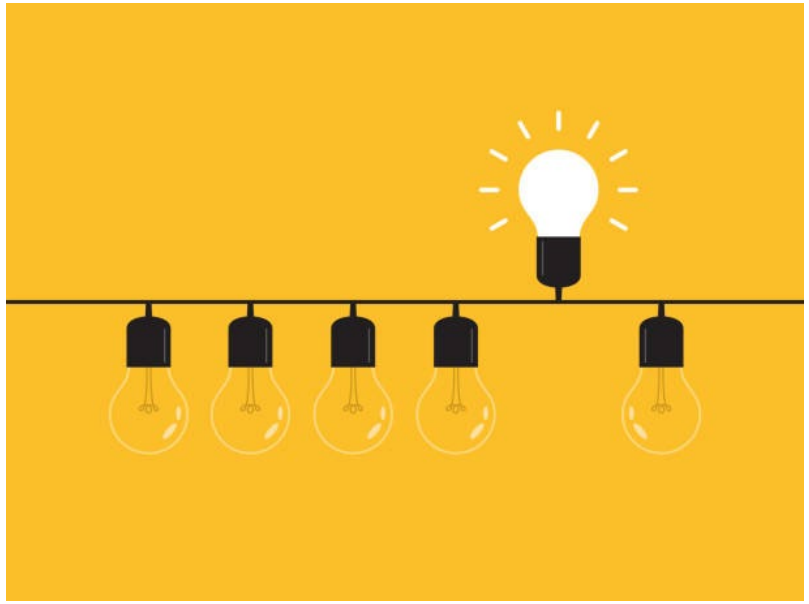
Historical Plant Design

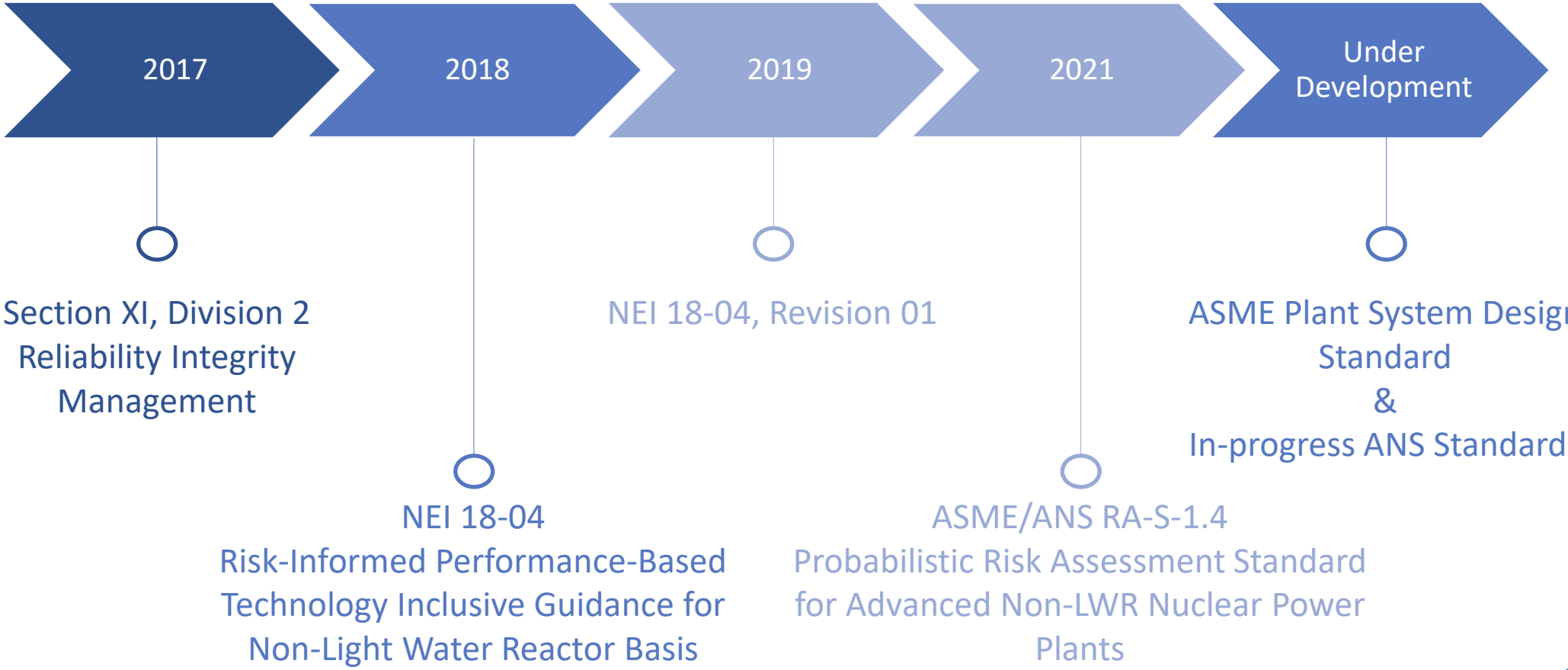


The Paradigm Shift

Incorporate probabilistic approaches to appropriately capture safety and risk associated with advanced nuclear



Select Key Industry Initiatives for Plant Design



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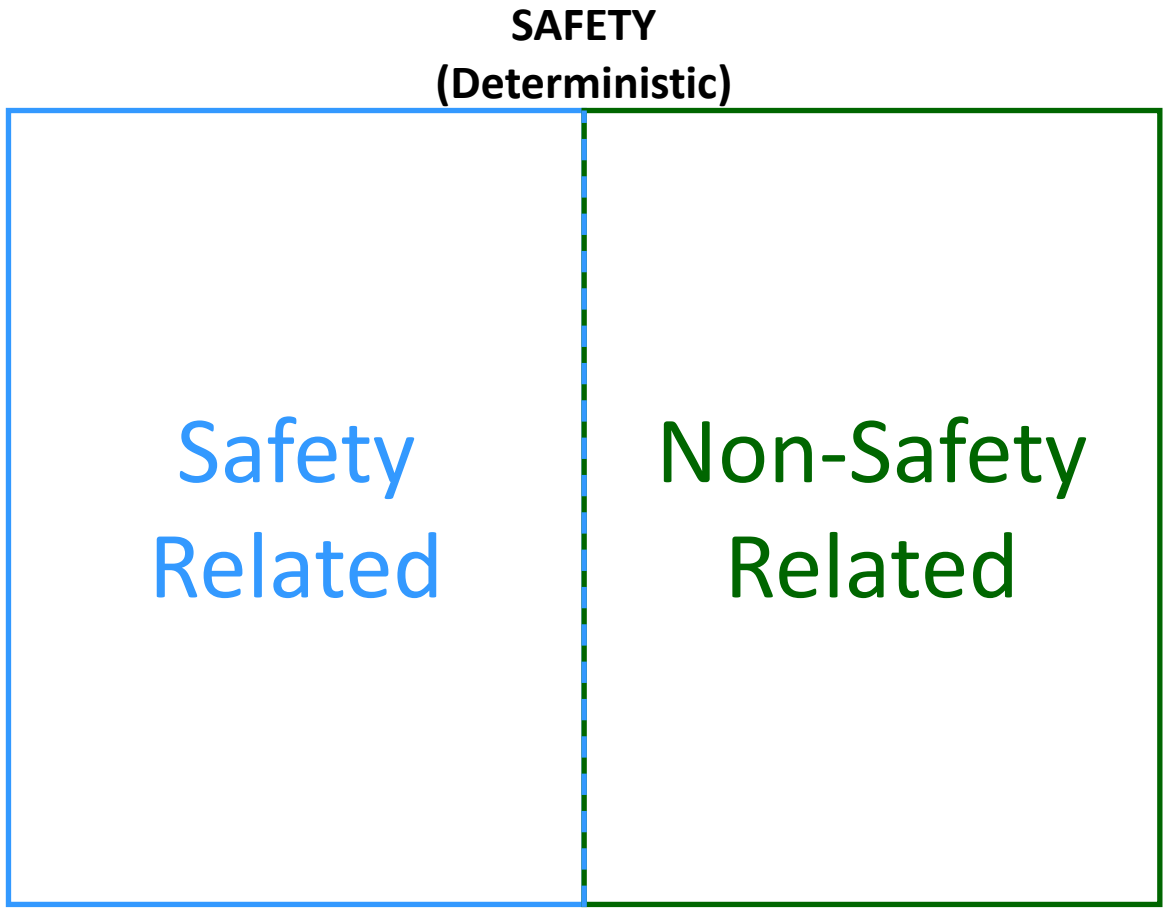
Probabilistic Approach to Plant Design



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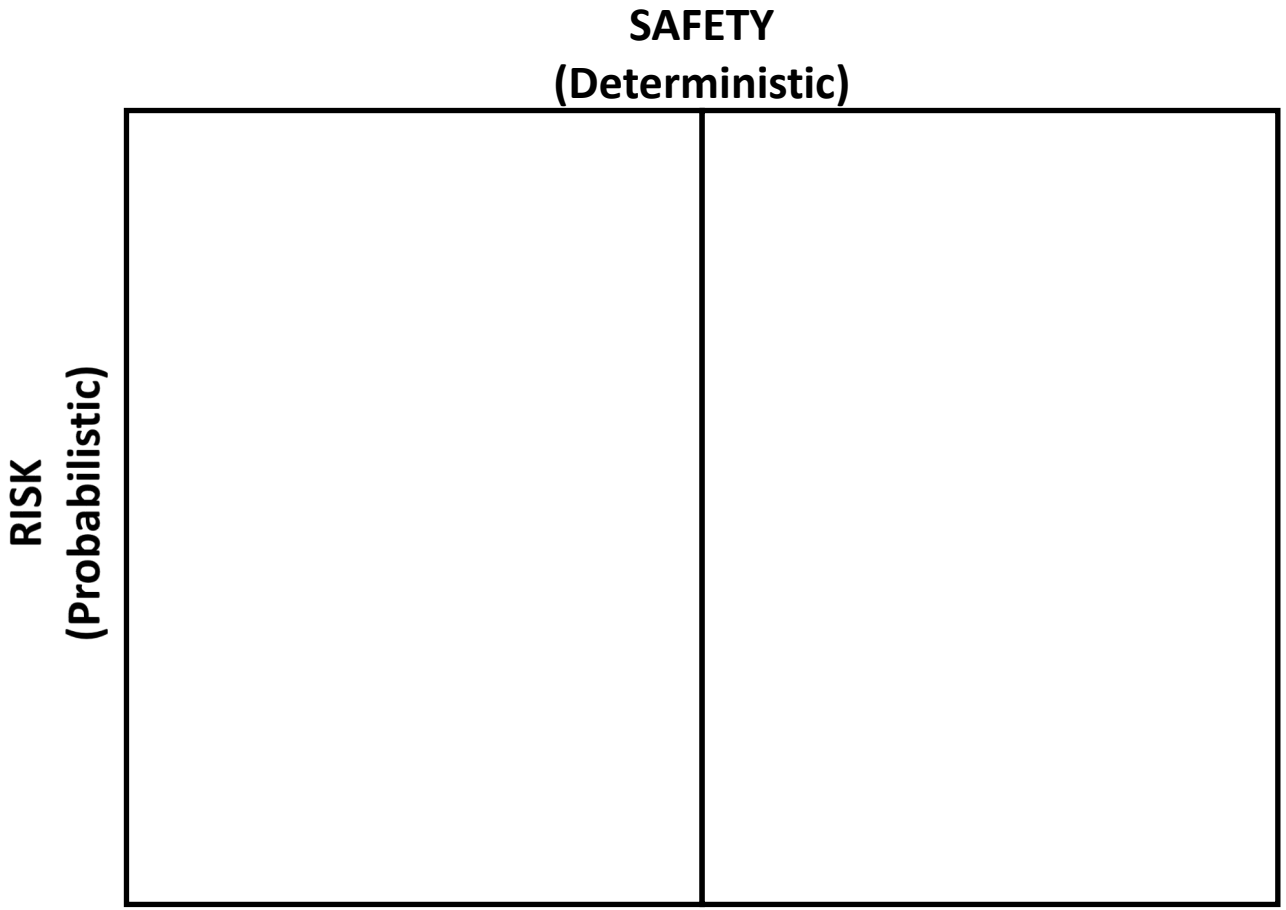

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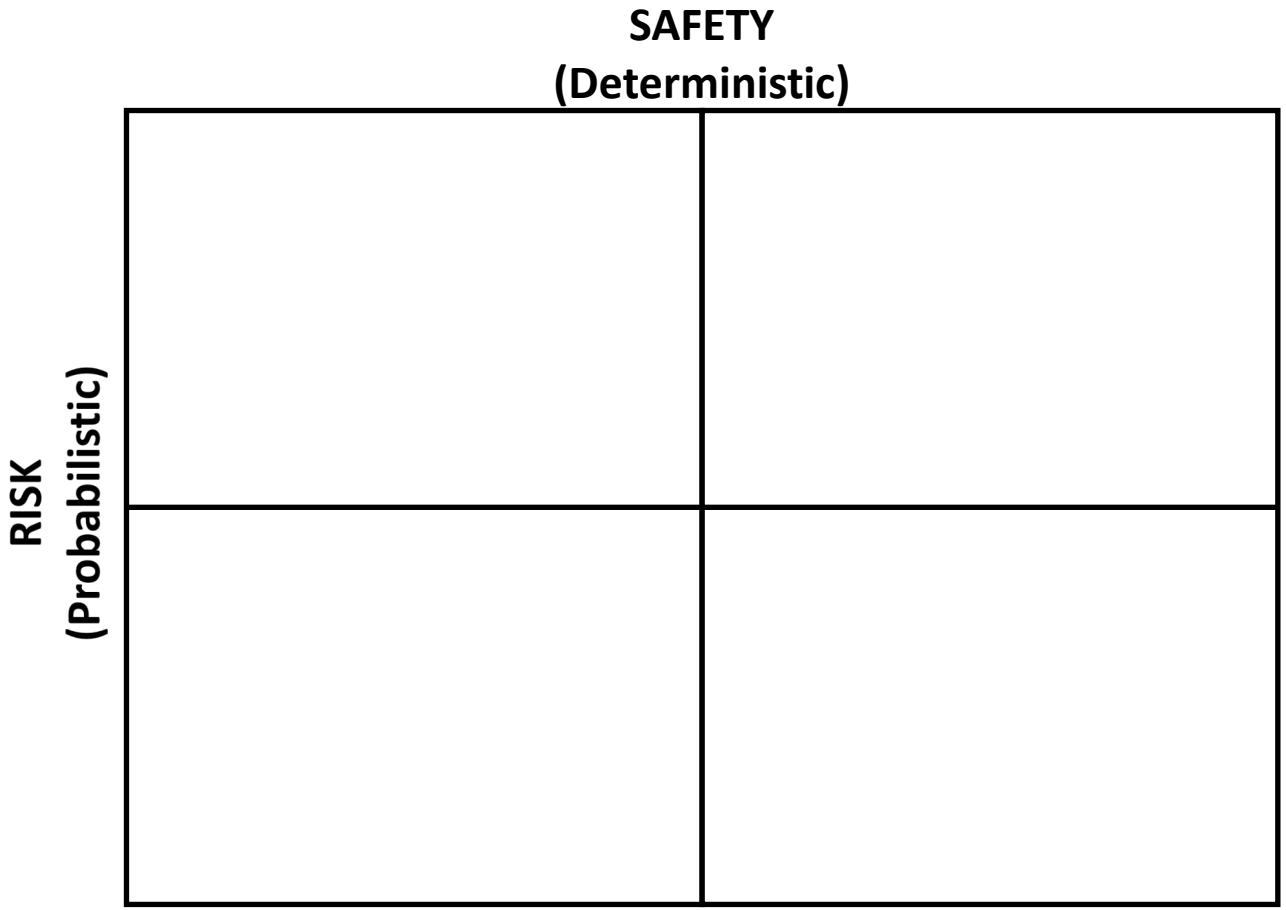

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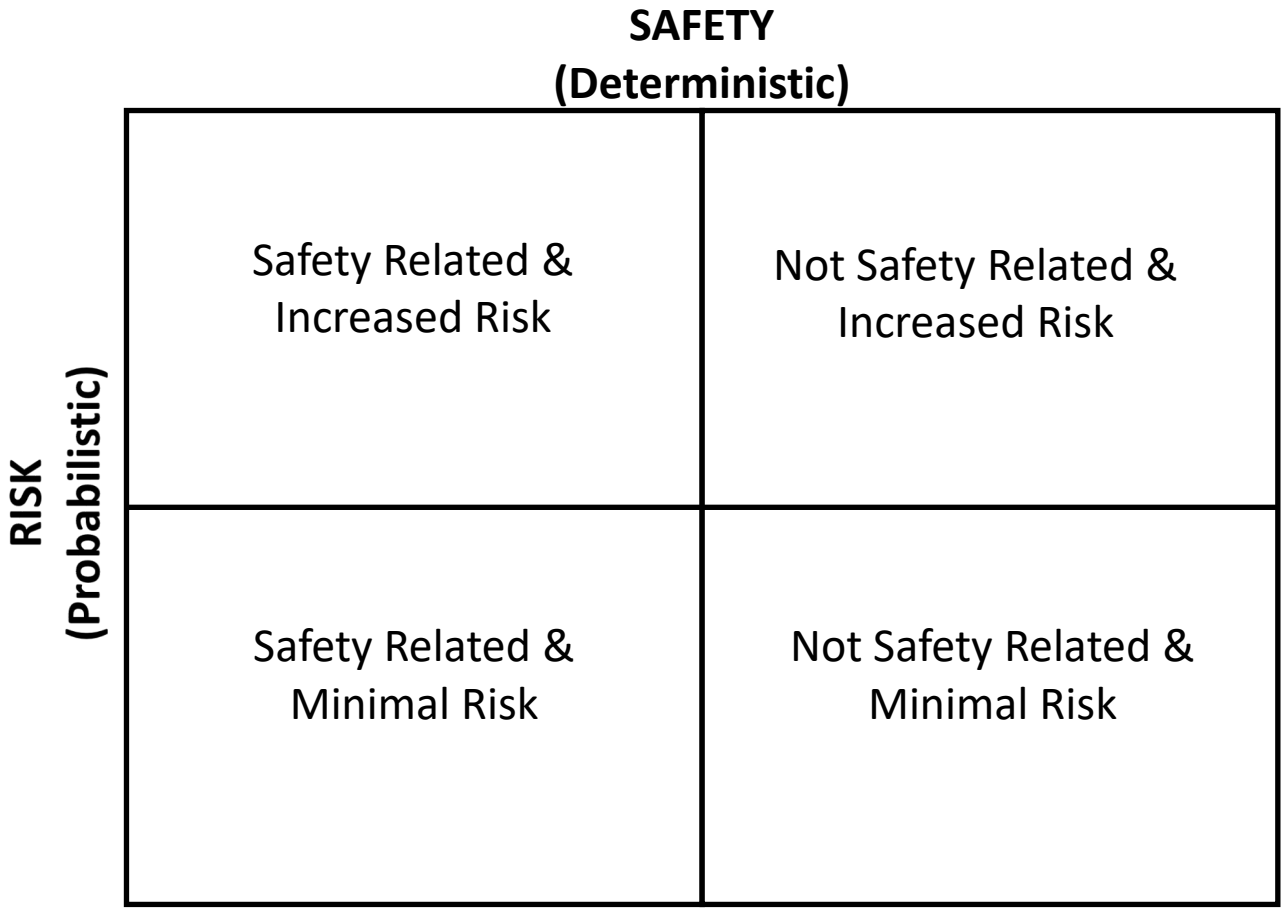

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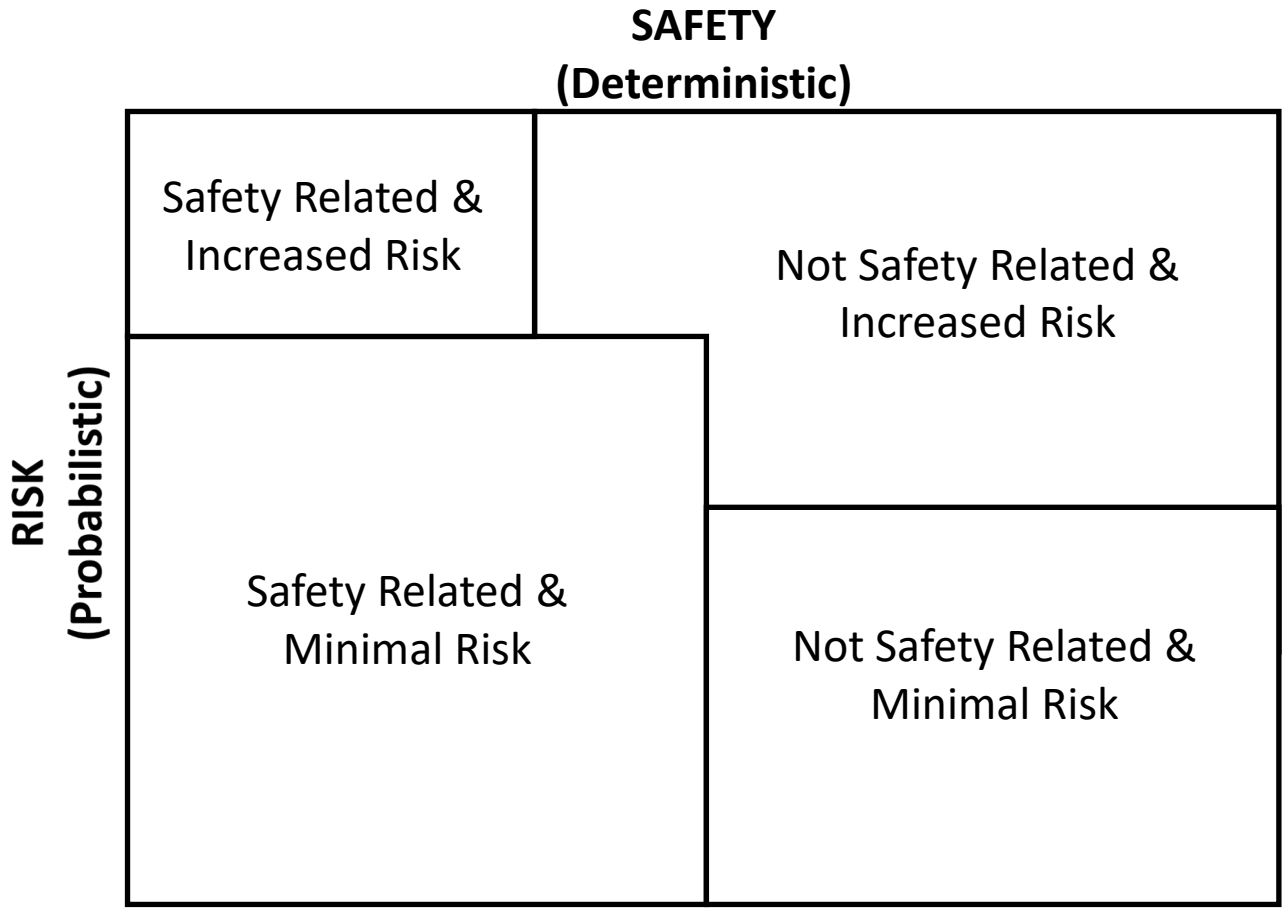

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Codes and Standards for Construction

- All requirements of a Code or Standard must be met
  - Can add requirements
  - Cannot subtract requirements

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- All requirements of a Code or Standard must be met
  - Can add requirements
  - Cannot subtract requirements
- Codes and Standards are essentially deterministic
  - Rules to ensure design intent and safety are met
  - Require repeatable and predictable processes
  - Provide requirements for manufacturing (e.g., welding, bending)

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  - Can ac
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Codes and Standards Problem Statement:
Codes and Standards have not evolved to align with safety and risk requirements for advanced reactors

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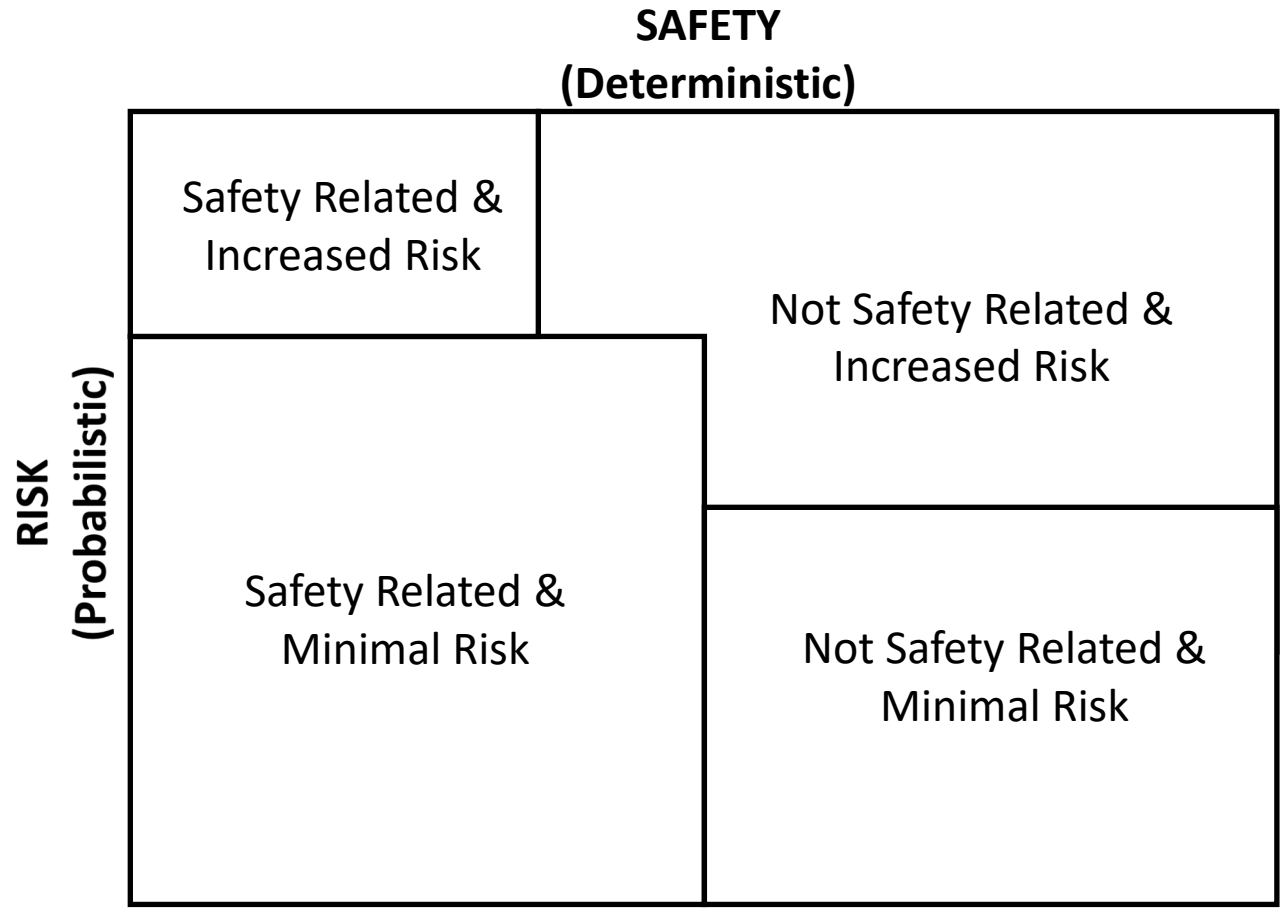
Now I want to build the plant



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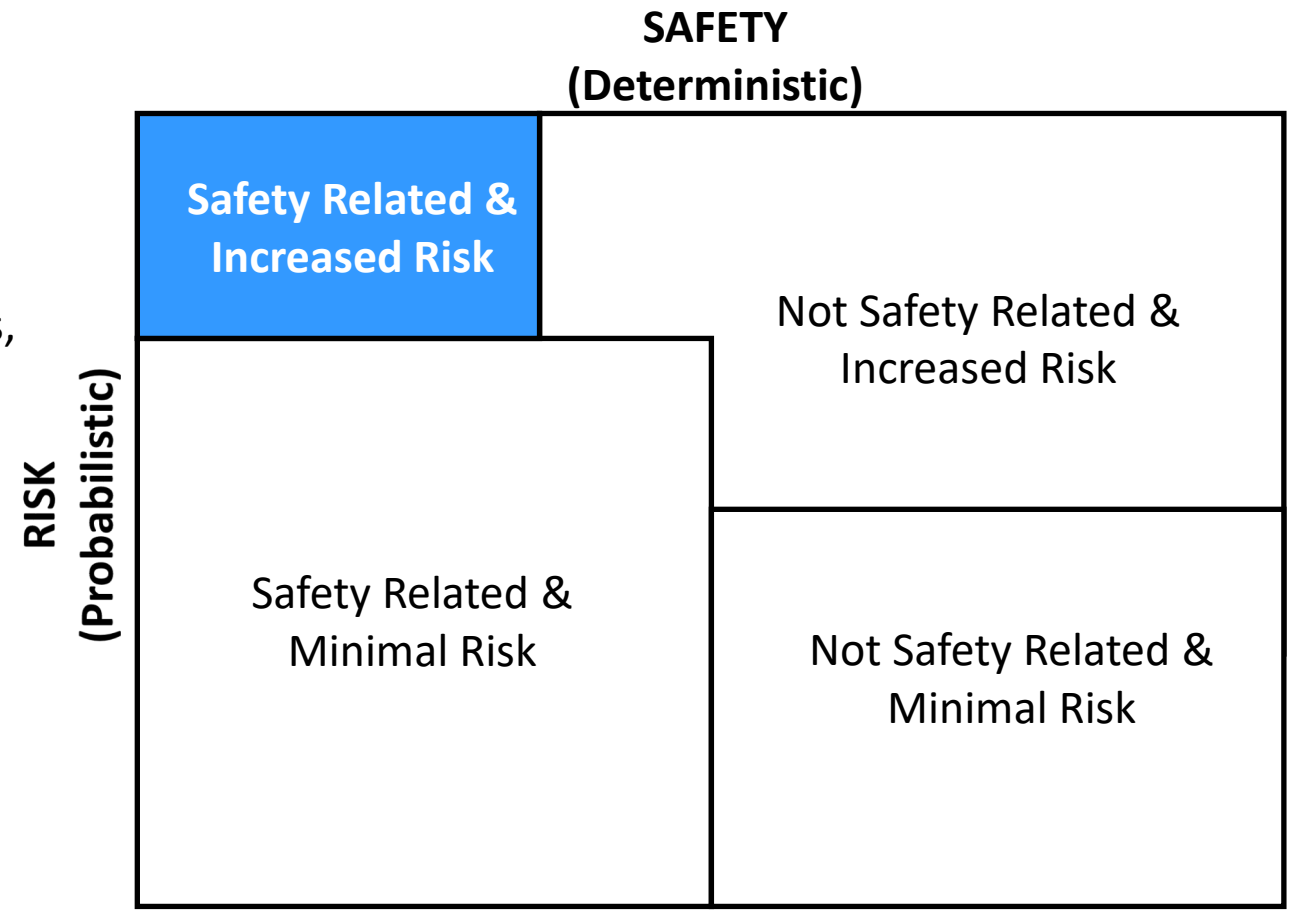
Nuclear Codes

- Section III: pressure vessels, pumps, valves, piping, core supports, containments
- ACI 349 Concrete
- N690 Steel Structures
- NQA-1 Quality Assurance



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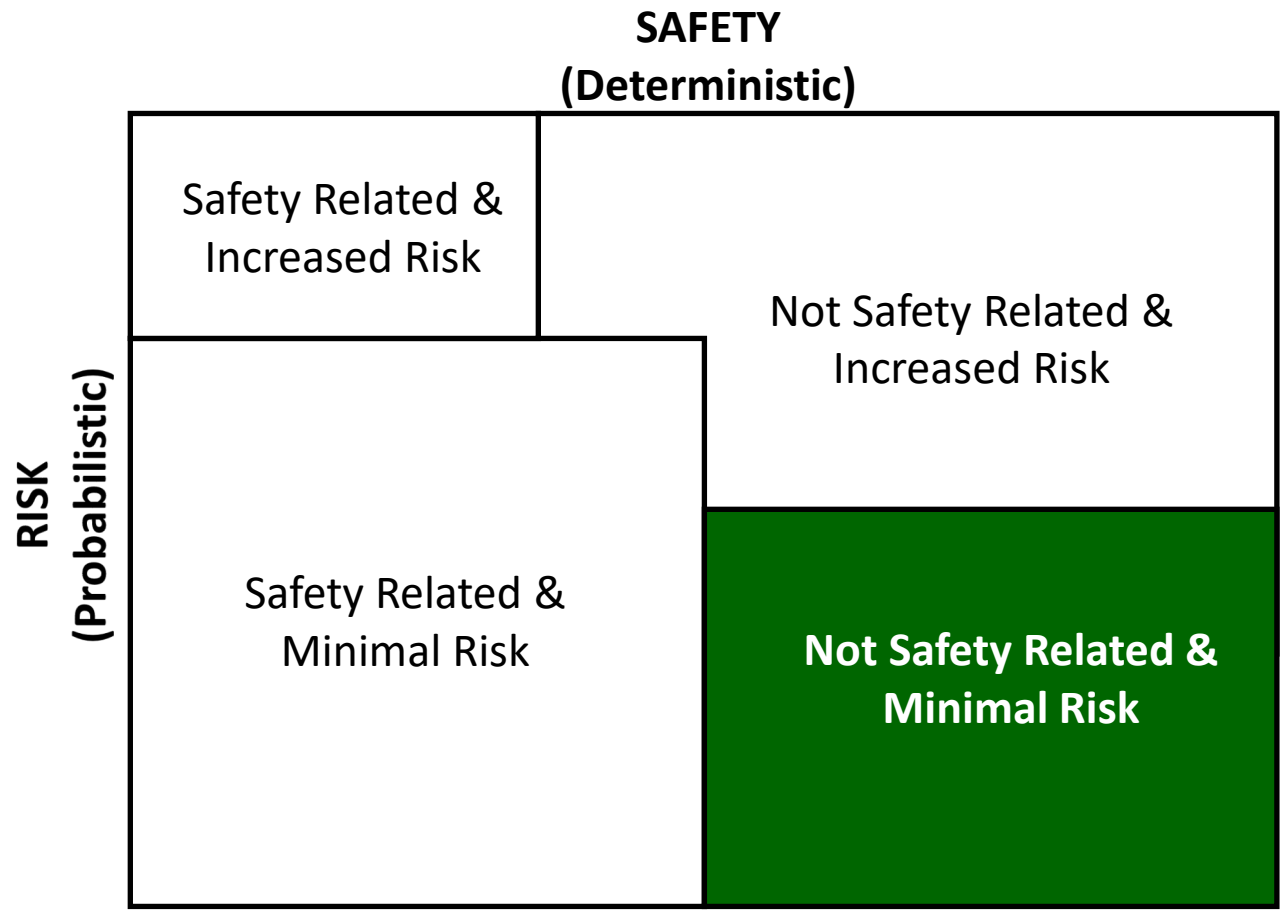

Industrial Codes

- Section VIII pressure vessels
- API Standards pumps
- B16.34 valves
- B31 series piping
- AISC steel
- ACI 318 Concrete
- ISO-9000 Quality

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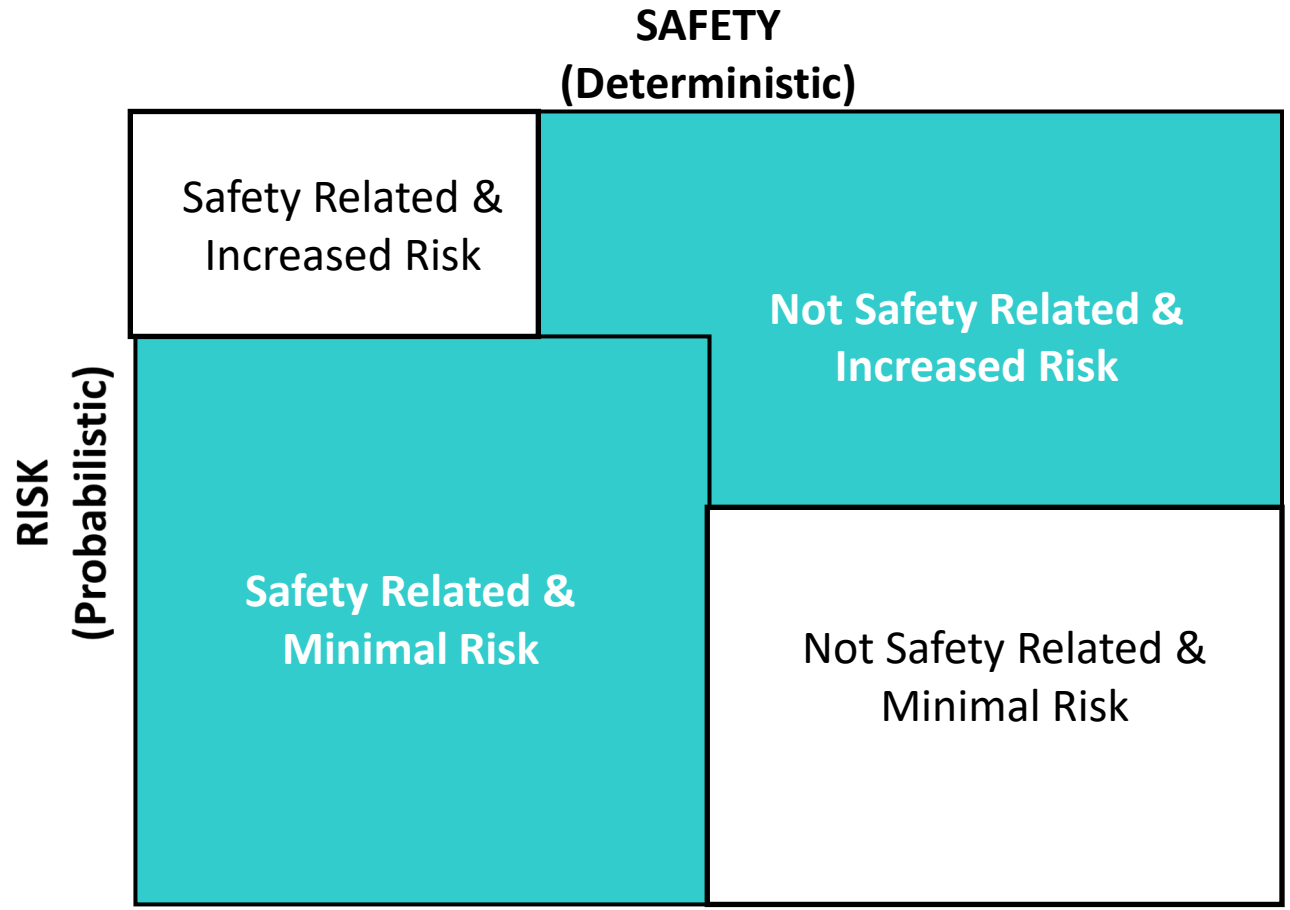
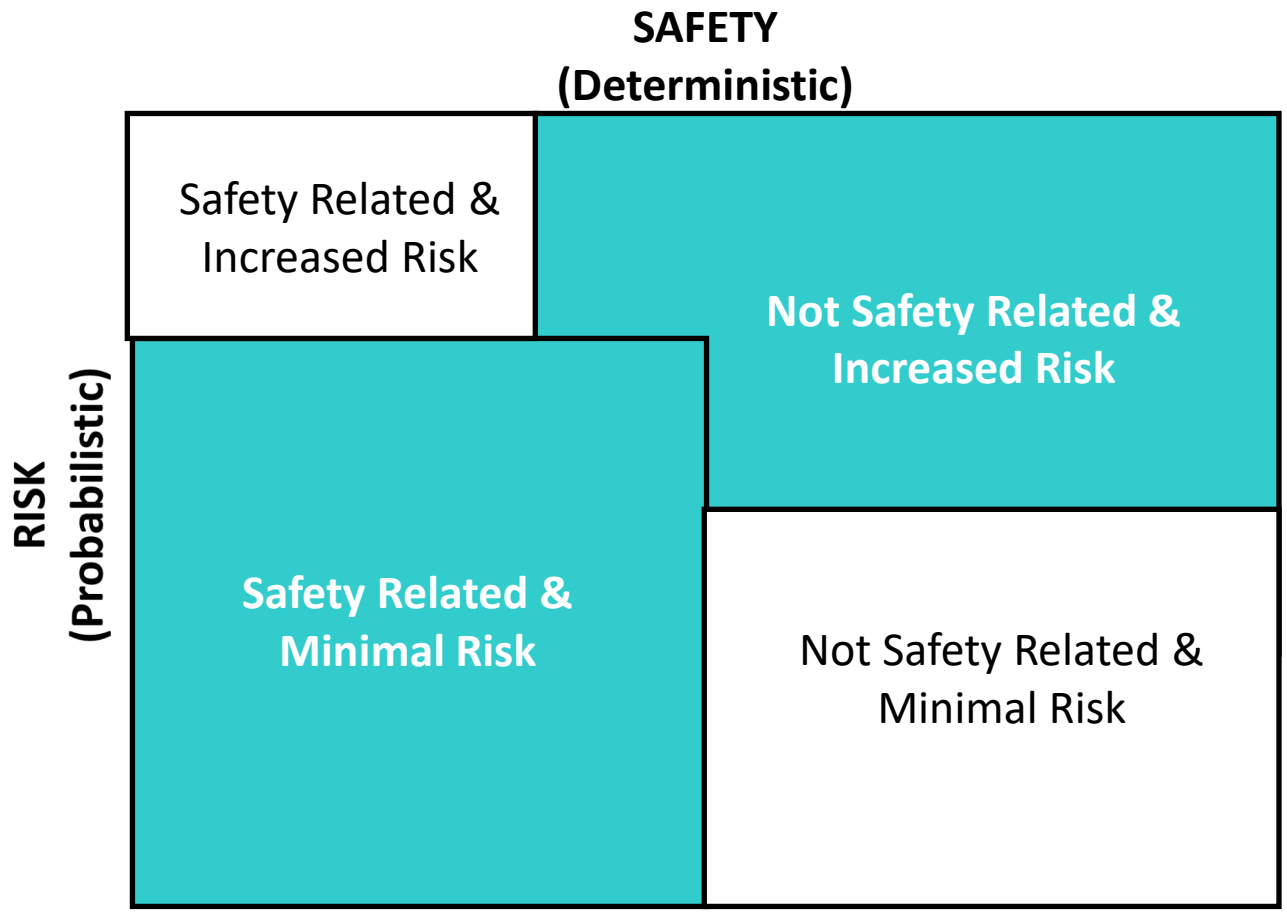


Now I want to build the plant

Option:
Nuclear Codes
- Section III
- ACI 349
- N690
- NQA-1



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+ Additional Requirements

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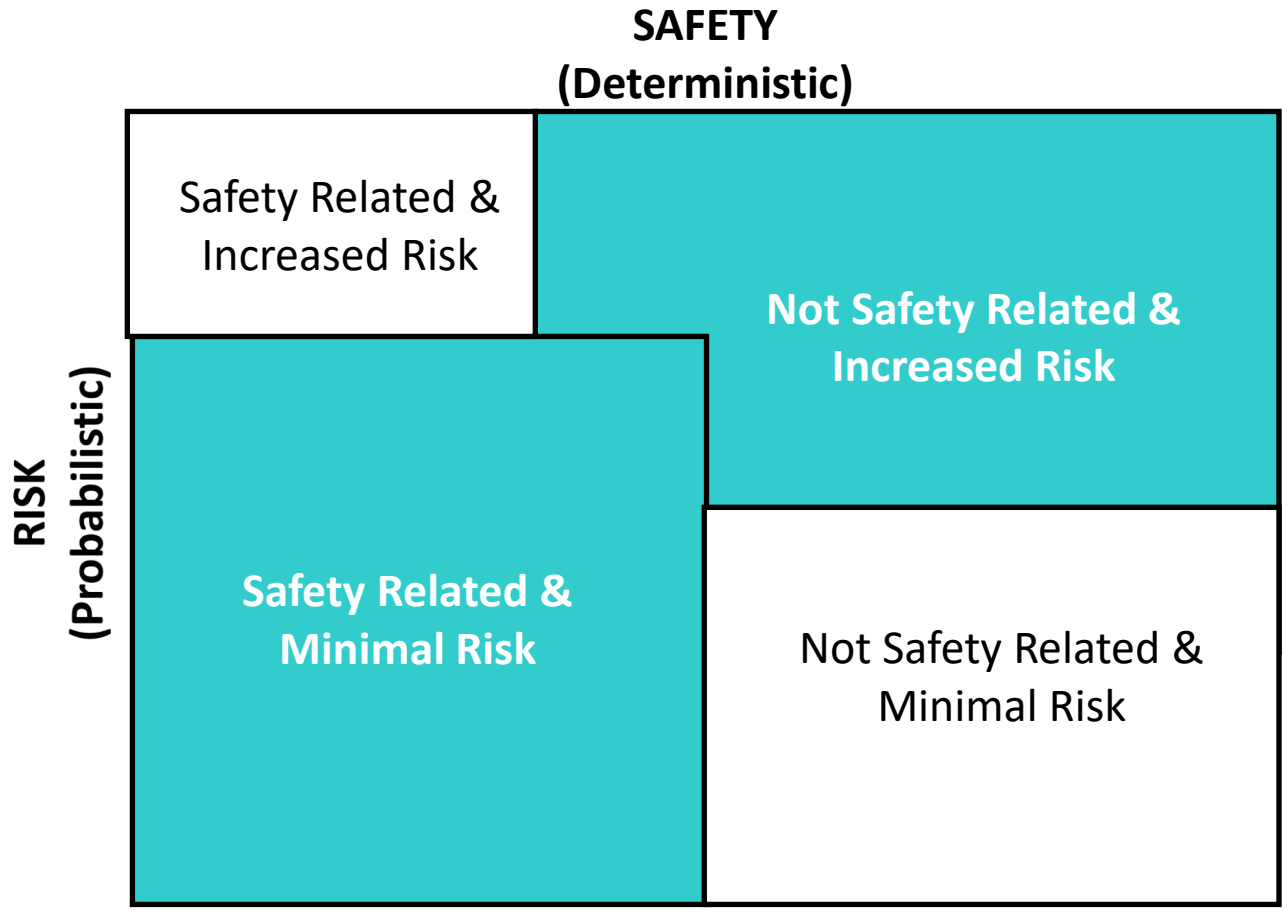

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Why Section III?

- Advantages
  - Nuclear Design Rules are well-understood and accepted by the Regulator
  - Service Levels allow appropriate consideration of infrequent events
  - Rigorous quality requirements

- Disadvantage
  - Not competitive on cost or schedule
  - Requirements may not be appropriate for components with minimal contribution to safety or risk

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Meeting the full nuclear code (Section III) does not provide value commensurate with safety or risk for these components

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A New Option for Section III Components

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  - Allow procurement of materials from commercial material suppliers

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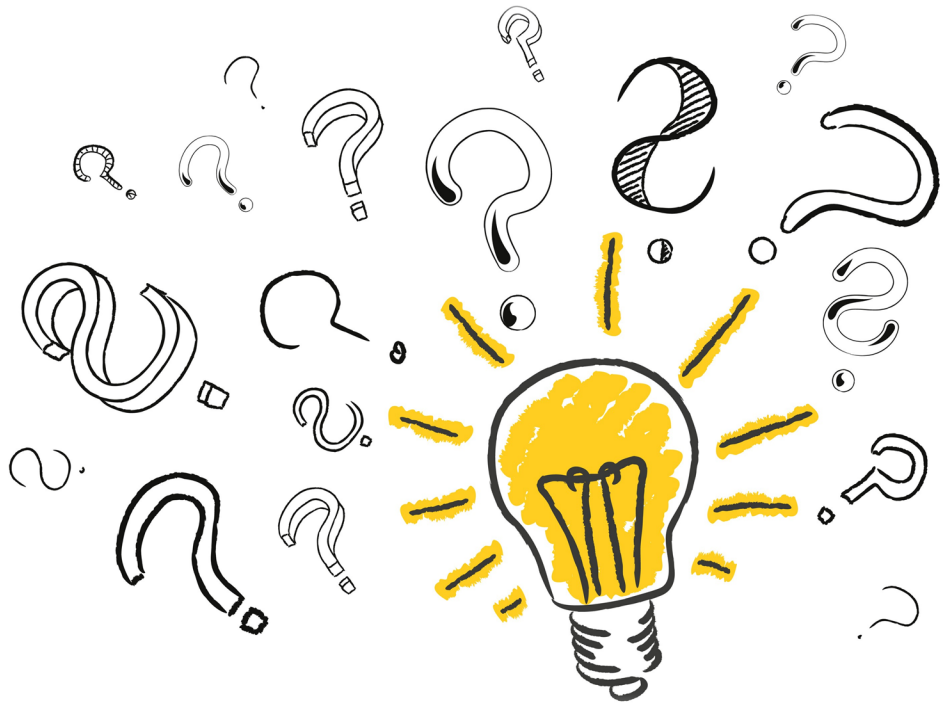
Section III Status

Challenge

How does the industry think differently to evolve Codes and Standards to make advanced reactors competitive?



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Summary

- Plant design approaches recognize unique aspects of advanced designs
- Codes and Standards have not evolved to align with safety and risk requirements for advanced reactors
- Section III is leading the industry in thinking differently
  - Alternatives are available or in-progress for items with minimal contribution to safety or risk
- Increase competitiveness of advanced nuclear