Exelon

Preliminary Screening of Regulations

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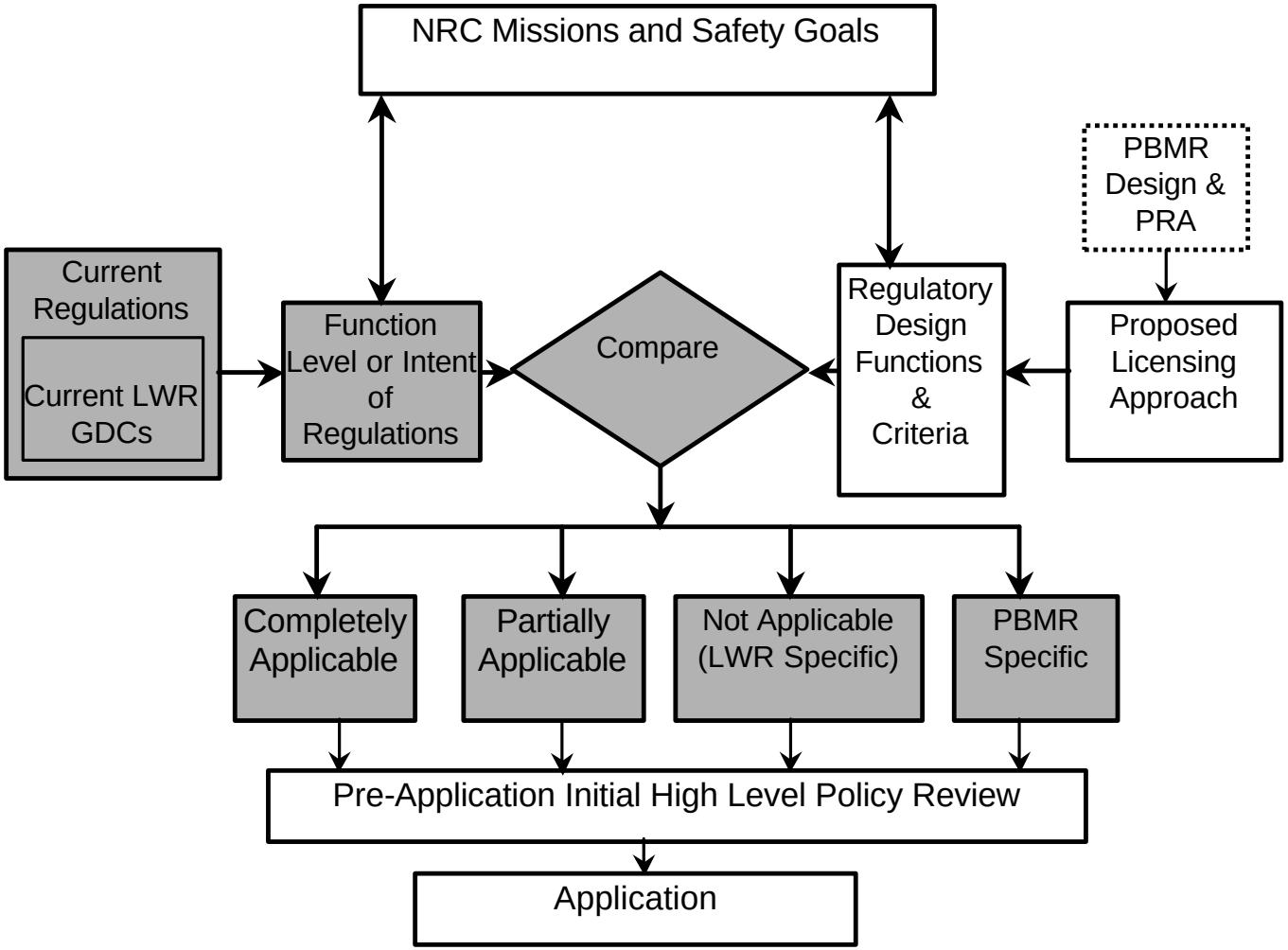
Licensing Approach



Deterministic Evaluation of Regulatory Applicability

Purpose:

- To conduct a pilot project that will develop an initial categorization of a large sample of regulations that apply to the licensing of the PBMR in the US.
- Also provide: A greater sense of the number of exemptions that could be required in the process of reviewing the PBMR design;
- A greater sense of what the key questions and logic for making decisions regarding applicability of current regulatory guidance documents,
- A beginning point for applying risk-informed insights to help shape the changes or interpretations that will be needed to address partially applicable regulations, and
- Confidence that a logical, repeatable, reliable and defendable decision process can be defined for addressing the remaining set of regulatory guidance in existence today.

Expert Panel Process

- Panel Members
  - Seven participants
  - Owner, regulator, designer, legal perspectives included
  - Backgrounds include experience in LWR design, operations, maintenance, construction, licensing, reactor regulation, risk assessment, and gas reactor design
- >180 years of nuclear industry experience total

Expert Panel Process (continued)

- Sample Set Selection
  - 10CFR50 including Appendices plus selected other regulations
  - 163 total regulations / GDCs reviewed
- Process
  - Vote types
    - Applies; Partially Applies; Not Applicable
  - Process Definitions
    - Specific meaning for rules / regulations developed that differ from guidance documents
      - Literal reading for rules / regulations
      - Intentions or purpose for guidance
  - Technical Definitions

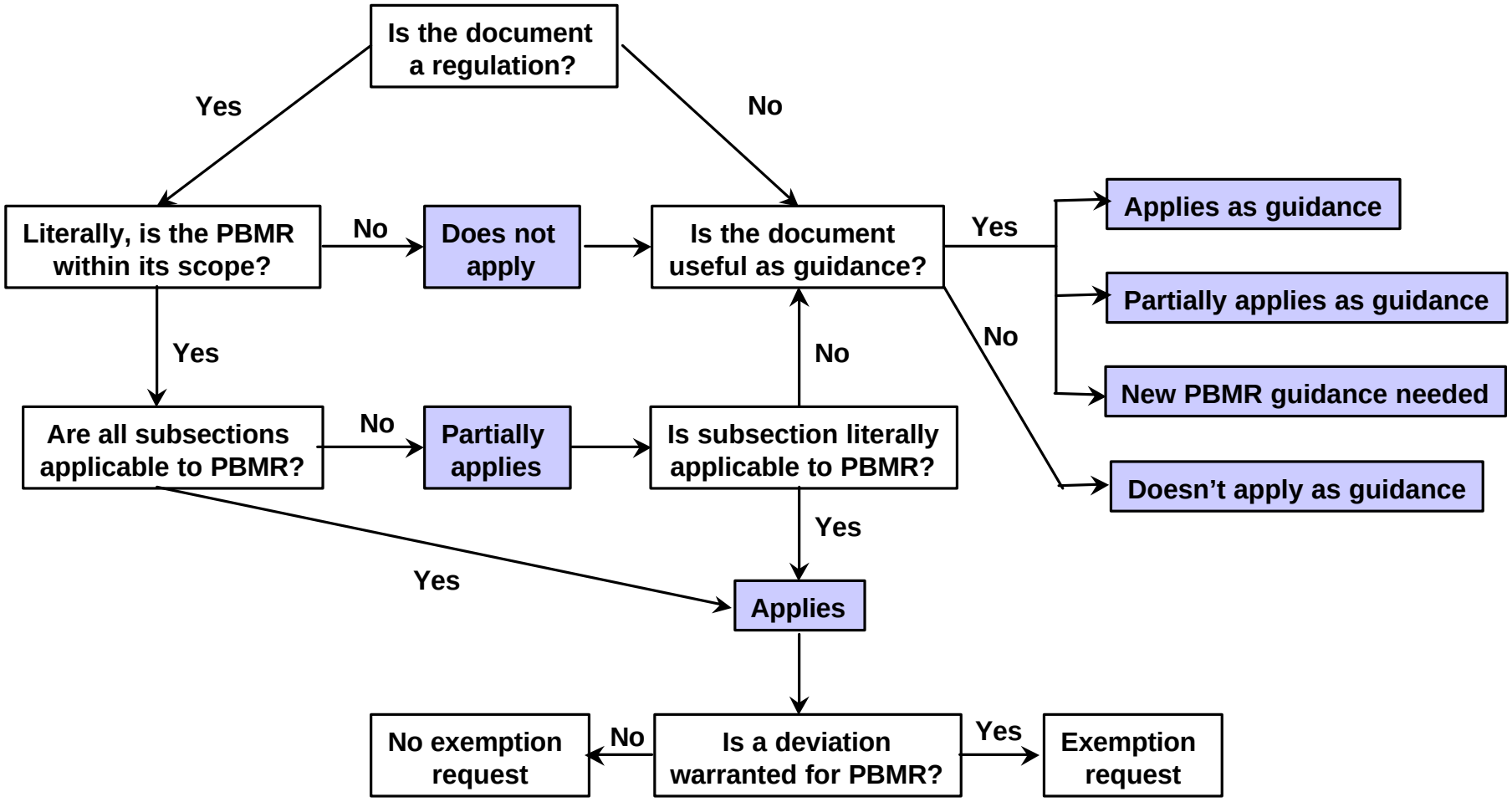
Technical Definitions

- Primary Pressure Boundary
  - Use in lieu of Reactor Coolant Pressure Boundary
  - Fission Product Retention
  - Core Geometry for Residual Heat Removal
- LOCA
  - Evaluation models and other regulatory requirements only when needed to support PBMR specific LBE and Safety Outcomes
- Containment
  - One of defense-in-depth barriers in PBMR design
  - PBMR design requirements appropriate for advanced gas reactor
    - Performance parameters driven by LBE scenarios
    - Performance parameters risk-informed
- Merchant Plant
- Modular Reactor

Results Summary

- Developed logic diagram reflecting the consensus decision-making process
- 114 Apply
- 23 Partially Apply
- 26 Not Applicable
- Key process observations
  - Common definitions of both plain English terms and key technical terms needed to reach consensus
  - Considerations of actual design and PRA insights important

Logic Chart for Regulatory Document Review



Use of Design Type and PRA Insights in Determining Applicability of Regulatory Documents

- Based on current knowledge of PBMR design
- Used early risk insights to determine LBEs
- Based on knowledge of LBEs, concluded what functional capabilities are necessary
- Compared the functional capabilities against regulatory criteria to determine level of applicability

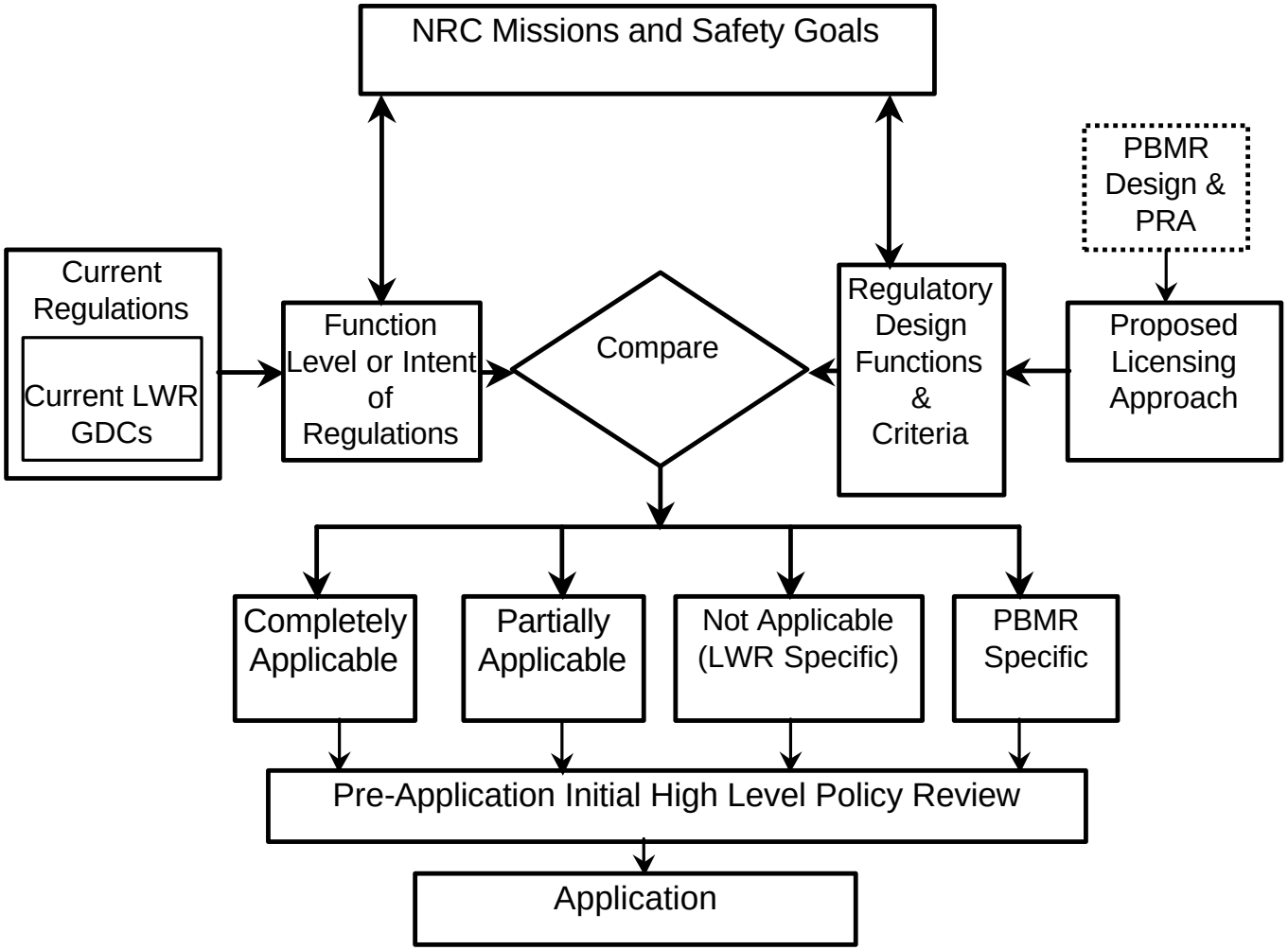
Process Example Demonstrations

- Regulations / Rules
  - Straight Forward
    - applies [50.59 “changes, tests, and experiments”]
    - partially applies [50.54(o) “primary rector containments”]
    - does not apply [50.44 “standards for combustible gas”]
  - Requires Judgement and Insight
    - applies [50.75 “recordkeeping for decommissioning”]
    - partially applies [50.49 “environmental qualification for electric equipment important to safety”]
    - does not apply [50.46 “criteria for emergency core cooling systems”]

Process Example Demonstrations

- Guidance
  - Applies [GDC 13 “Instrumentation and control”]
  - Partially Applies [Appendix A preamble; GDC 30 “Quality of reactor coolant pressure boundary”]
  - Not Applicable [GDC 55 “Reactor coolant pressure boundary penetrating containment”]

Licensing Approach



Looking Forward

- Screen the entire set of NRC regulations, not just sample
- Continue to validate the logic chart
- Begin application of PBMR specific risk-insights to applicable or partially applicable regulations
- Iterate the assessment of applicability
- Expand the effort to non-regulation regulatory documents (i.e., Regulatory Guides, Standard Review Plans)
- Provide results to NRC on on-going basis and achieve outcomes

Outcome Objectives from NRC to Exelon

- Comments and feedback on “left side” portion of approach for developing regulatory set of requirement and guidance documents
- Agreement on using the logic process developed as a decision tool for preliminary screening of the regulatory set
- Agreement on the development of key definitions for the purposes of regulatory screening effort
- Early agreement on the set of “not applicable” regulations
- Agreement on the plan for use of the screening process for the lower-tier regulatory documents.
- Development of the complete set of regulatory documents that will drive the application content during the pre-application period using this licensing approach.