

Planning for Future Probabilistic Risk Assessment Research and Development

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Presentation Outline

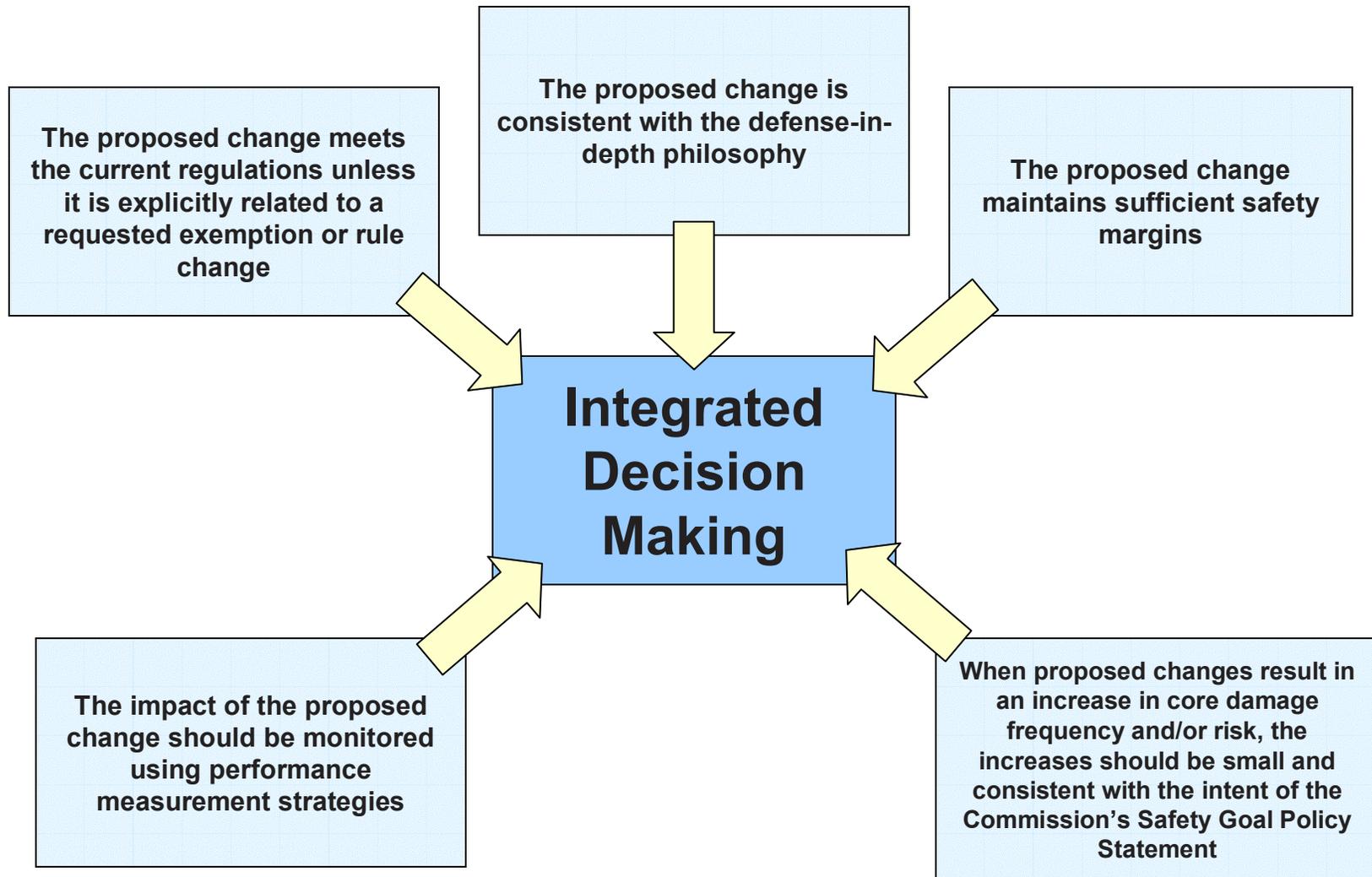
- **Background**
- **Probabilistic Risk Assessment (PRA) Research & Development (R&D) planning activity parameters**
- **Current NRC PRA R&D activities**
- **Concluding remarks**

1995 PRA Policy Statement

“The use of PRA technology should be increased in all regulatory matters to the extent supported by the state-of-the-art in PRA methods and data and in a manner that complements the NRC’s deterministic approach and supports the NRC’s traditional defense-in-depth philosophy”

- Federal Register, 8/16/95

Principles of Risk-Informed Decision Making



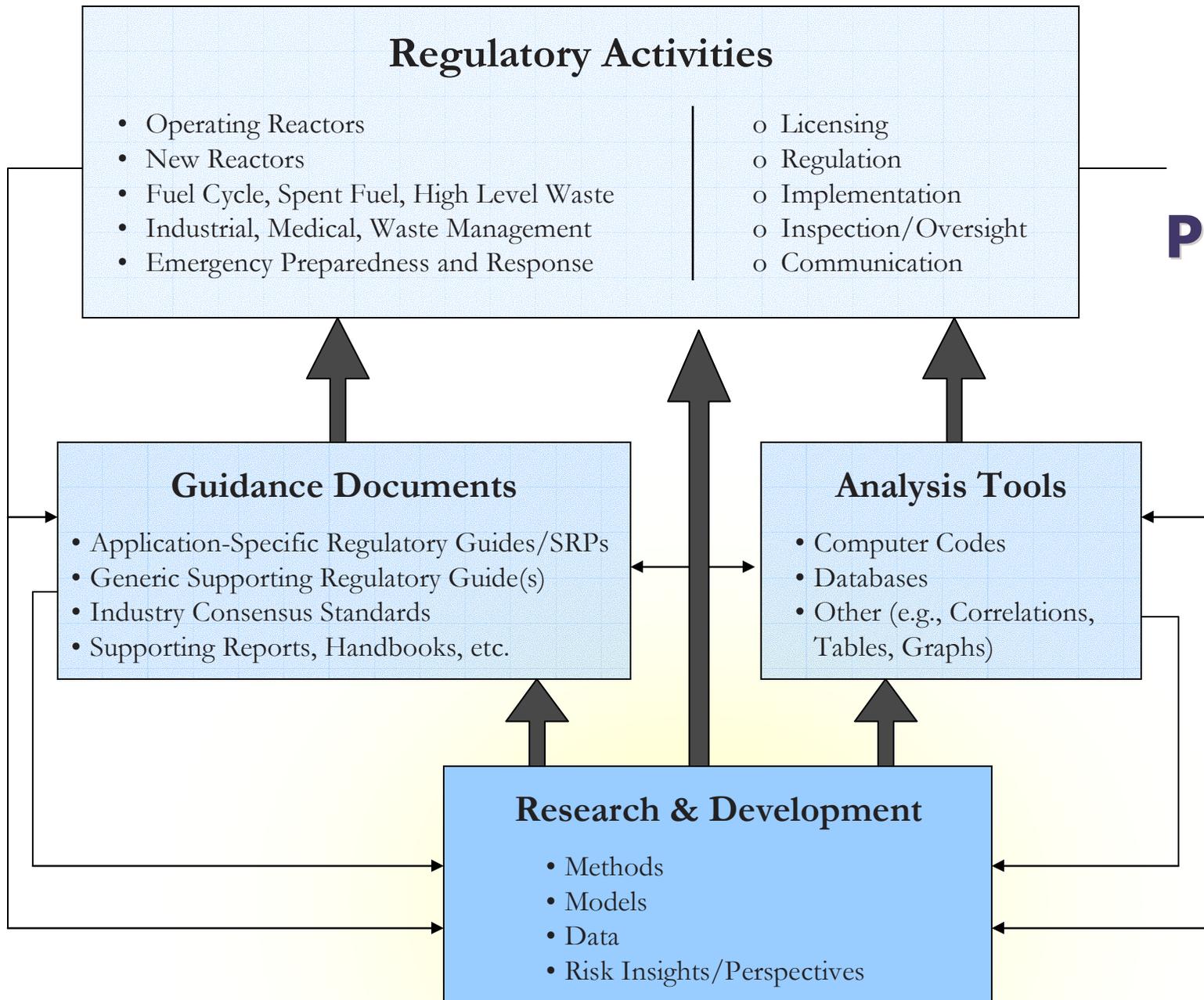
Examples: Risk-Informed Regulatory Activities

- **Risk-Informing 10 CFR 50, e.g.,**
 - **Fire protection – 50.48(c)**
 - **Pressurized thermal shock – 50.61**
 - **Special treatment requirements – 50.69**
- **Risk-Informed Licensing Actions (RG 1.174)**
- **Reactor Oversight Process**
 - **Risk-informed baseline inspections**
 - **Significance determination process**
 - **Performance Indicators (recent enhancement: Mitigating Systems Performance Index – MSPI)**

PRA R&D Planning Activity

- **Objectives**
 - **Support decision making regarding resource allocation**
 - **Support detailed planning of specific R&D activities**
 - **Support communications with stakeholders**
- **Level of Detail**
 - **Topic areas**
 - **Activities (as examples)**
- **Interfaces**
 - **Risk-Informed Regulation Implementation Plan (RIRIP)**
 - **NRC Office of Nuclear Regulatory Research Operating Plan**
 - **Detailed, topic-specific R&D plans**
- **Initial Time Period: FY 2007-2012**

**PRA
R&D
Program
Focus**



Types of R&D Activities Considered

Development of methods, models, tools, and information to support (as needed) regulatory decision making regarding:

- **“New” topic areas, e.g.,**
 - **New applications (e.g., advanced reactors, fuel cycle facilities)**
 - **New phenomena (e.g., digital systems, passive systems)**
 - **New scope/boundary conditions (e.g., multiple units, long-duration events, offsite organizational response)**
- **Existing topic areas requiring**
 - **Increased realism**
 - **Reduced uncertainty**
 - **Improved efficiency**

Includes potential work to address reviewer needs (e.g., tools to support efficient review, evaluate models, and communicate uncertainties)

Plan Development Information Sources

- **Gap analysis**
 - **Ongoing NRC risk-informed activities and currently identified needs**
 - **Current R&D activities**
- **Case studies – operational events**
- **Other plans/prioritizations**
 - **U.S. industry**
 - **International**
- **Review committees and other stakeholders**
- **Technical Advisory Group**

Example Frameworks for Gap Analysis

- Classical PRA
 - Level 1
 - Level 2
 - Level 3
 - PRA infrastructure
- Regulatory applications
 - Licensing
 - Regulation
 - Implementation
 - Inspection/oversight
 - Communication
- Recognized topic areas, e.g.,
 - human reliability
 - external events
 - low power and shutdown
 - passive systems
 - common cause failure
 - computational methods
- Nuclear systems
 - Operating reactors
 - New reactors
 - Fuel cycle, spent fuel, high level waste
 - Industrial, medical, waste management
 - Emergency preparedness and response

RIRIP Examples: Recent/Current PRA R&D Topic Areas/Activities

Current Work

- **Industry trends program support (SA-3)**
 - Update generic estimates for initiating events and components
- **Digital systems PRA (SA-9)**
 - Case studies using classical and dynamic methods
- **Improved methods for calculating risk (SA-13)**
 - HERA database
 - HRA good practices
- **SPAR model development (EF-21)**
 - Model benchmarking
 - Extensions for LERF, external events, low power/shutdown
- **Technical requirements of 10 CFR 50.46 (EF-22)**
 - LOCA frequency expert elicitation

Concluding Remarks

- **Planning activity has been initiated**
- **Technical Advisory Group (TAG) has been formed**
- **Ongoing and upcoming activities:**
 - **Review/classification of current PRA-related activities (NRC and industry)**
 - **Review PRA state-of-the-art (selected areas)**
- **Current goal: initial plan finalized by December 2006**