

What Society Needs in 10 CFR Part 53

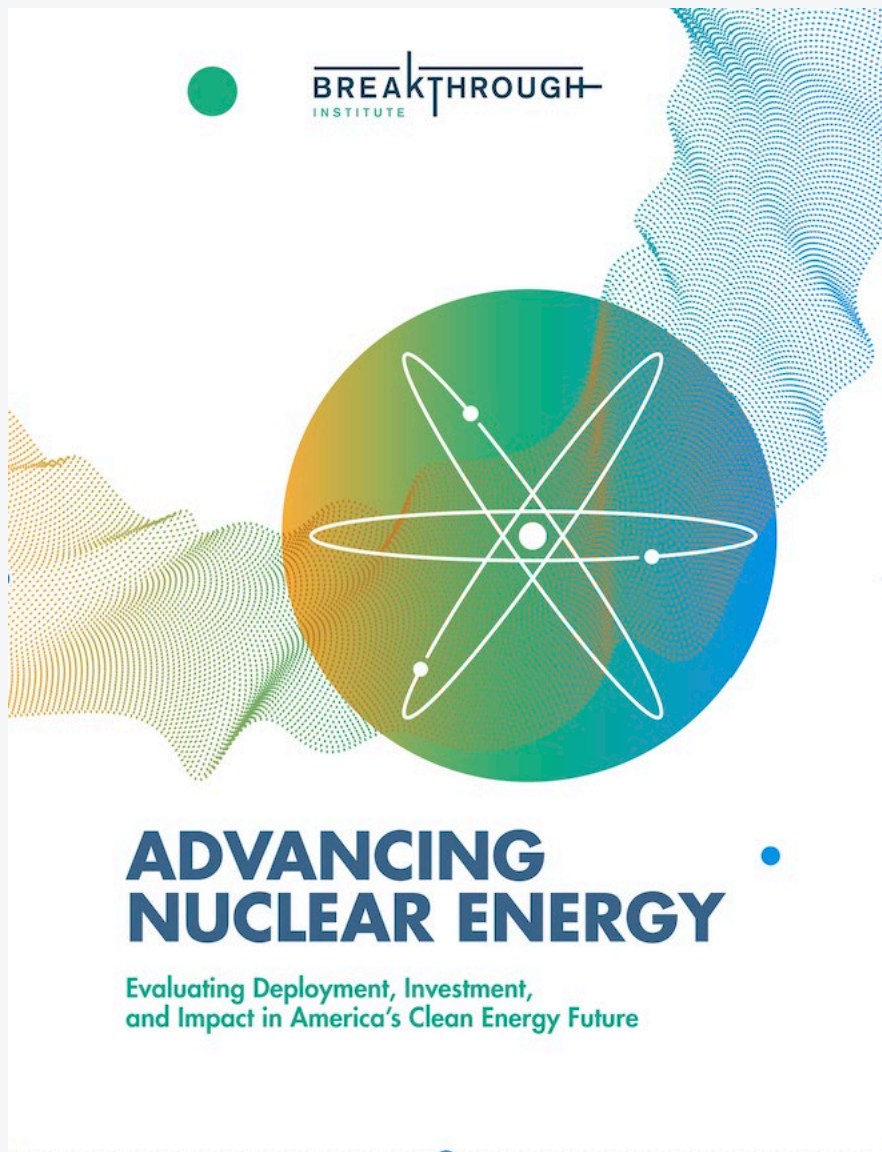
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Nuclear Energy Innovation

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The Breakthrough Institute

- Independent research center
- Identifies and promotes technological solutions to environmental and human development challenges
- Represents public interests
- Does not receive funding from industry



Report Overview

- Technology-neutral study that chooses optimal technologies for least cost
 - Utilizes a high-resolution nationwide model of the United States (WIS:dom-P)
- Investigates the bounds of the potential role of advanced nuclear energy in a future U.S. clean energy system
- Evaluates the potential impact through
 - Deployment
 - Investment and opportunities
 - Barriers
 - Supporting policies
 - Economics and employment
 - Fossil to nuclear energy transition potential
- Contributes to literature on methods and best practices for modeling advanced nuclear energy

Realizing a Technology-inclusive Rule

A technology-inclusive rule is defined in the Nuclear Energy Innovation and Modernization Act (NEIMA) of 2019 as a regulatory framework developed using methods of evaluation that are flexible and practicable for application to a variety of reactor technologies, including, where appropriate, the use of risk-informed and performance-based techniques and other tools and methods.

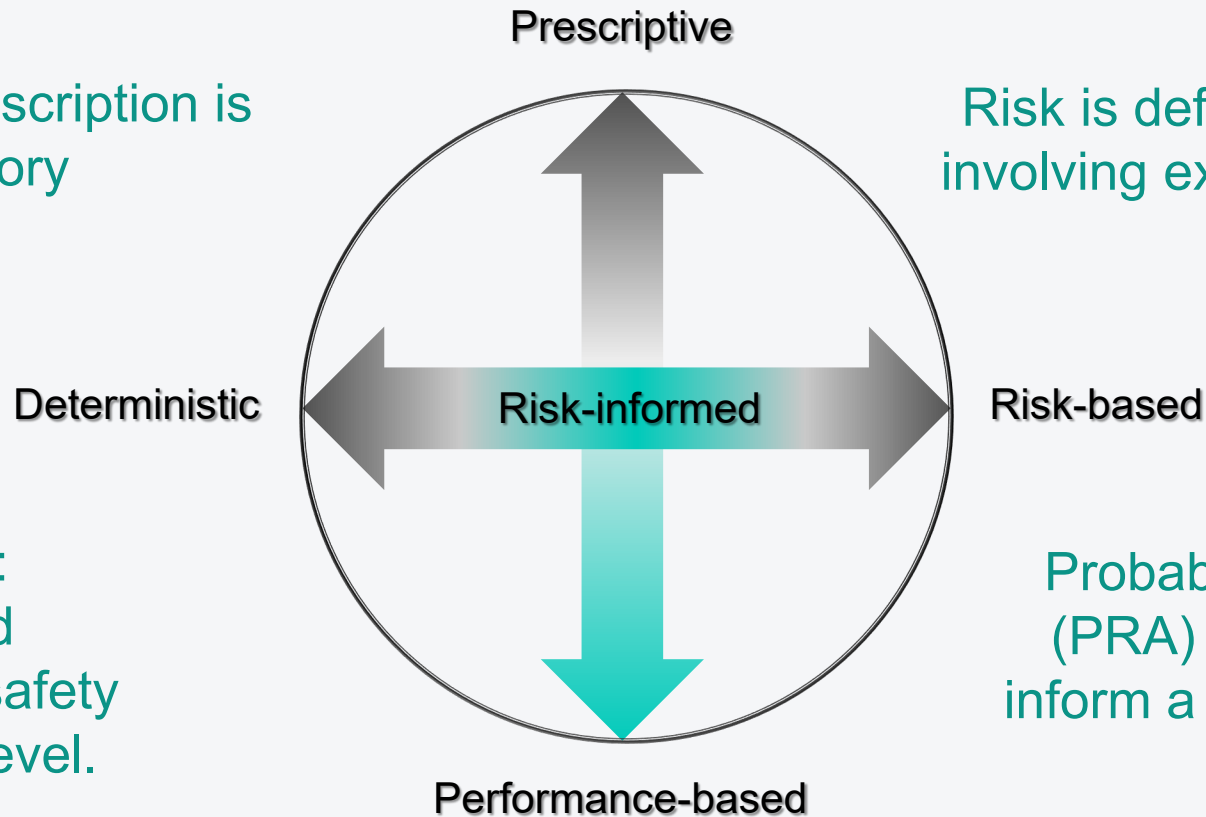
Concerns and Opportunities

- Part 53 is necessary to improve the general public welfare by enabling both innovation and commercialization of advanced nuclear reactors.
- It remains unclear how either Framework A or Framework B conforms with NEIMA or meets the needs of Society.
- NRC is crafting rule language and frameworks that could constrain development of emerging technologies vital to climate change mitigation, energy security and other pressing concerns in Society.
- A 1000-page proposed rule package that industry will not use will not be responsive to NEIMA.
- Part 53 should establish high-level safety goals and allow greater flexibility for a wide range of diverse and emerging technologies.
- Frameworks A and B could represent acceptable methods and should be relocated to guidance documents, which offer both clarity and flexibility.

The Mandated Regulatory Approach

Some amount of prescription is necessary in regulatory requirements.

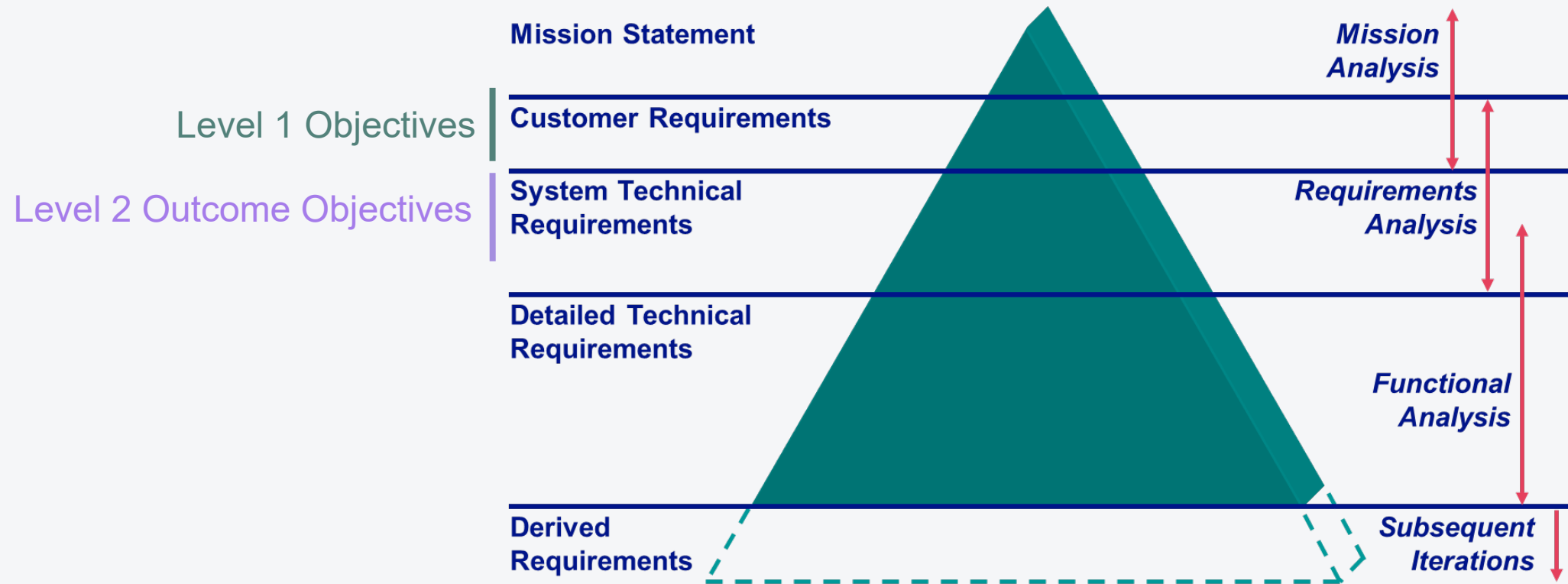
Risk is defined as a situation involving exposure to danger.



Objectives Hierarchy:
A performance-based regulation identifies safety objectives at a high level.

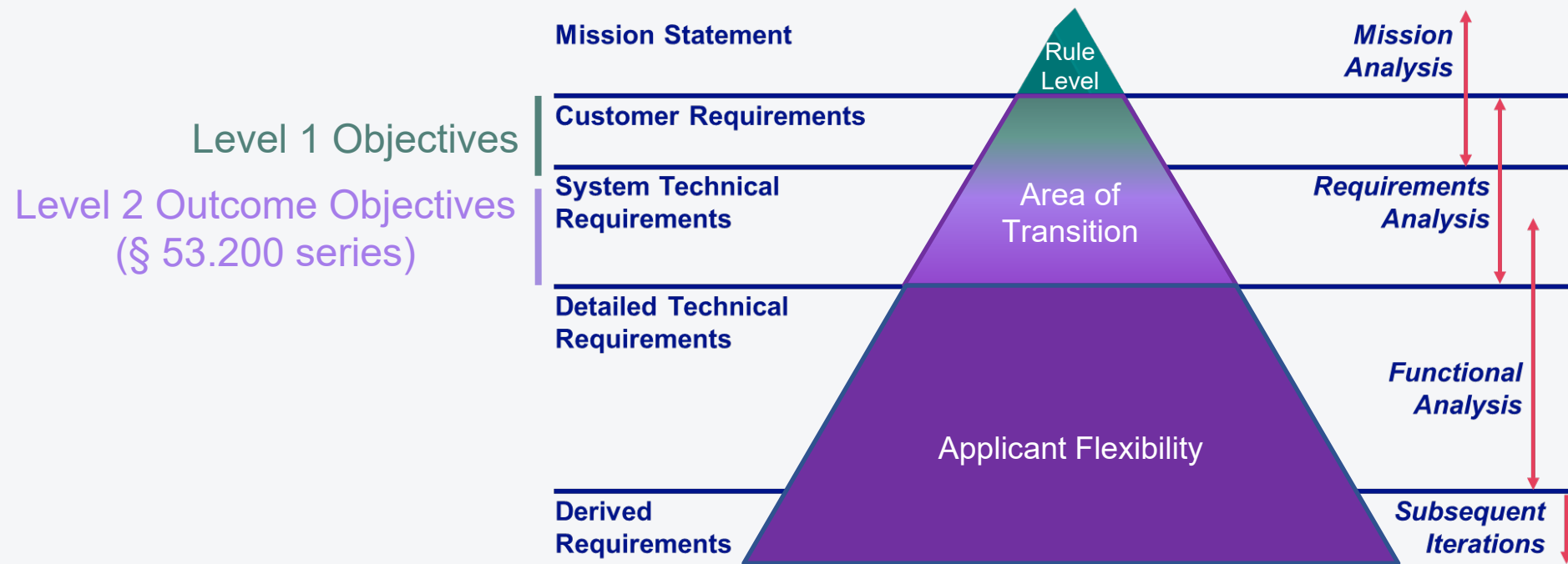
Probabilistic risk analysis (PRA) is one way to risk-inform a regulation, but not the only way.

Typical Requirements Management Structure*



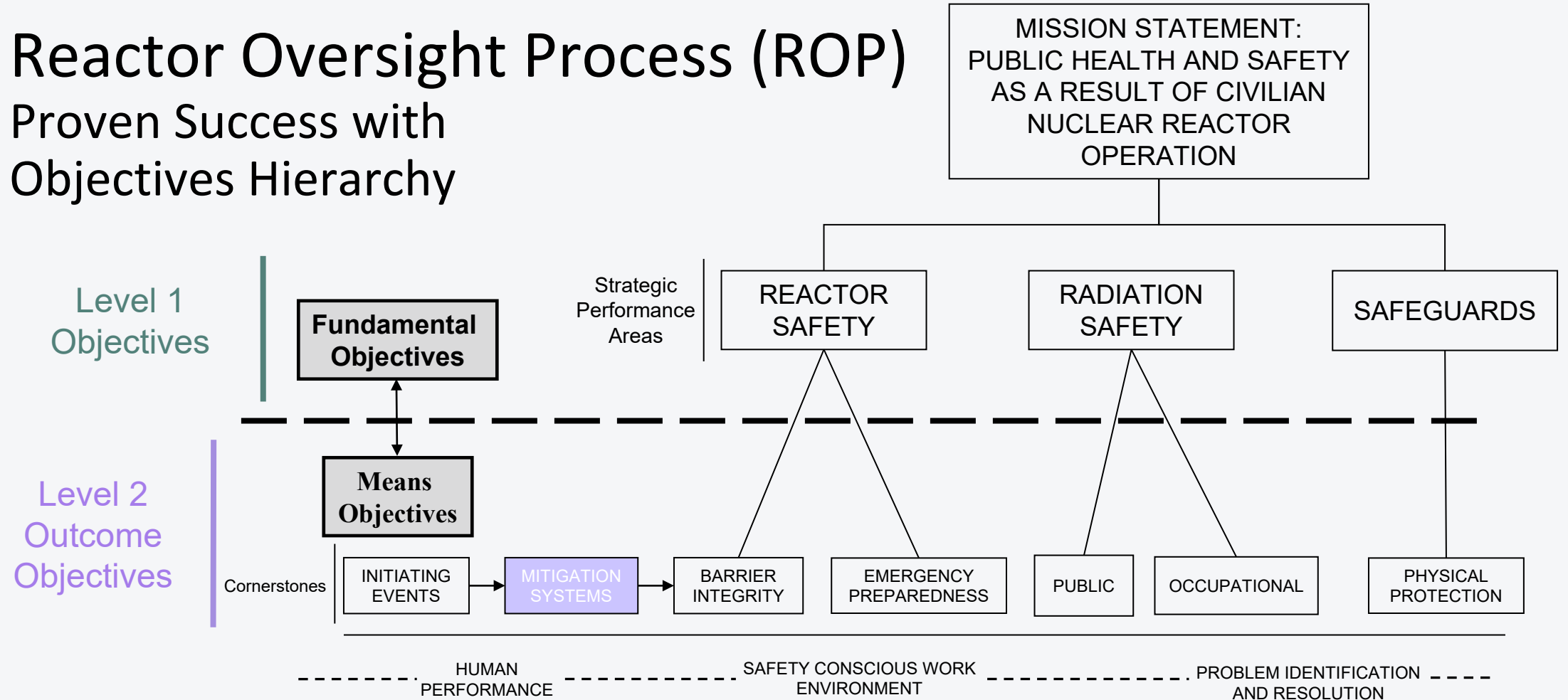
* Attribution: <https://www.ans.org/file/980/RIPB+CoP+2-28-20+Presentation+Systems+Engineering.pdf>, Slide 8

Part 53 Requirements Management Structure



Reactor Oversight Process (ROP)

Proven Success with Objectives Hierarchy

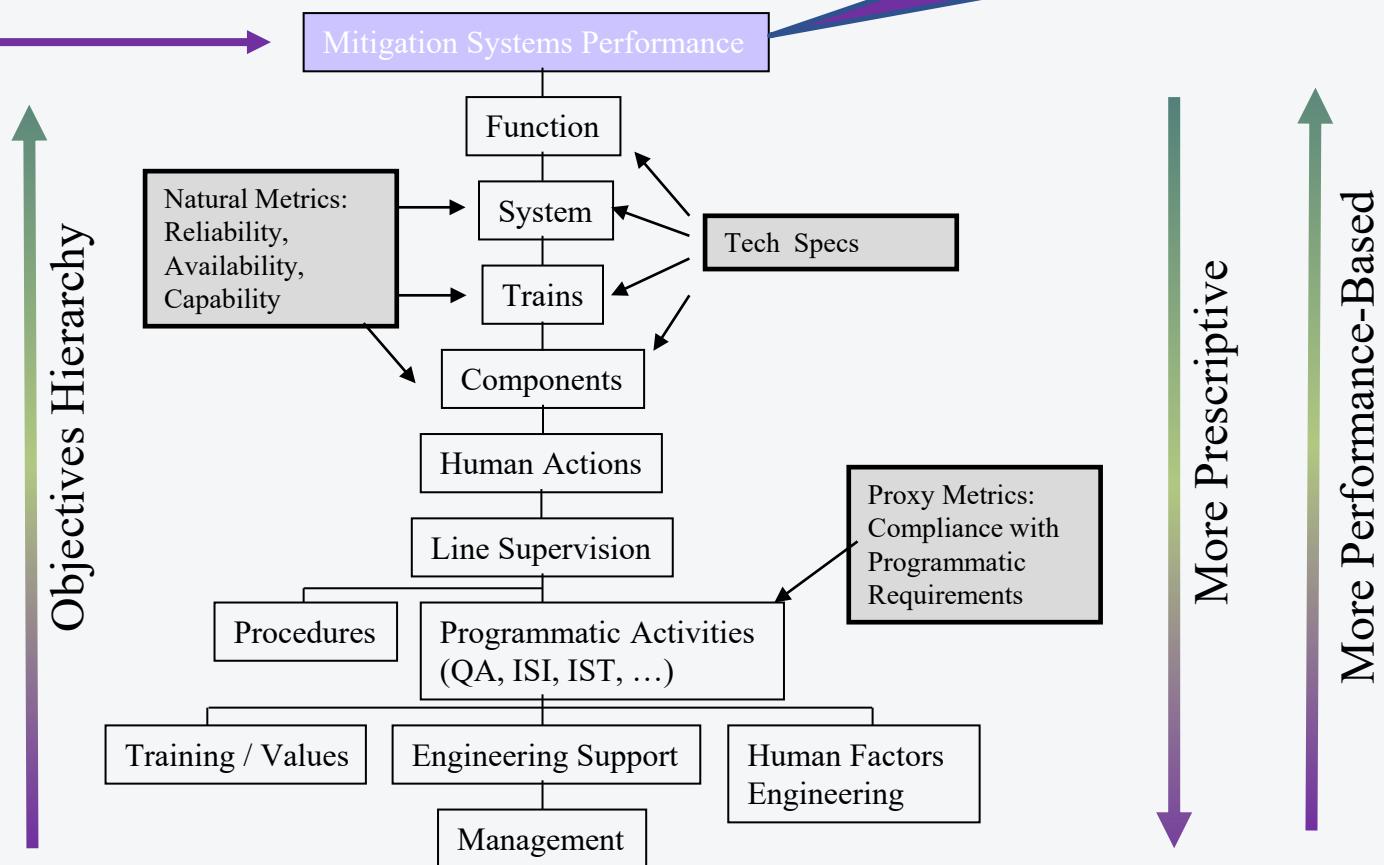


Means Objectives Hierarchy

Example ROP Cornerstone

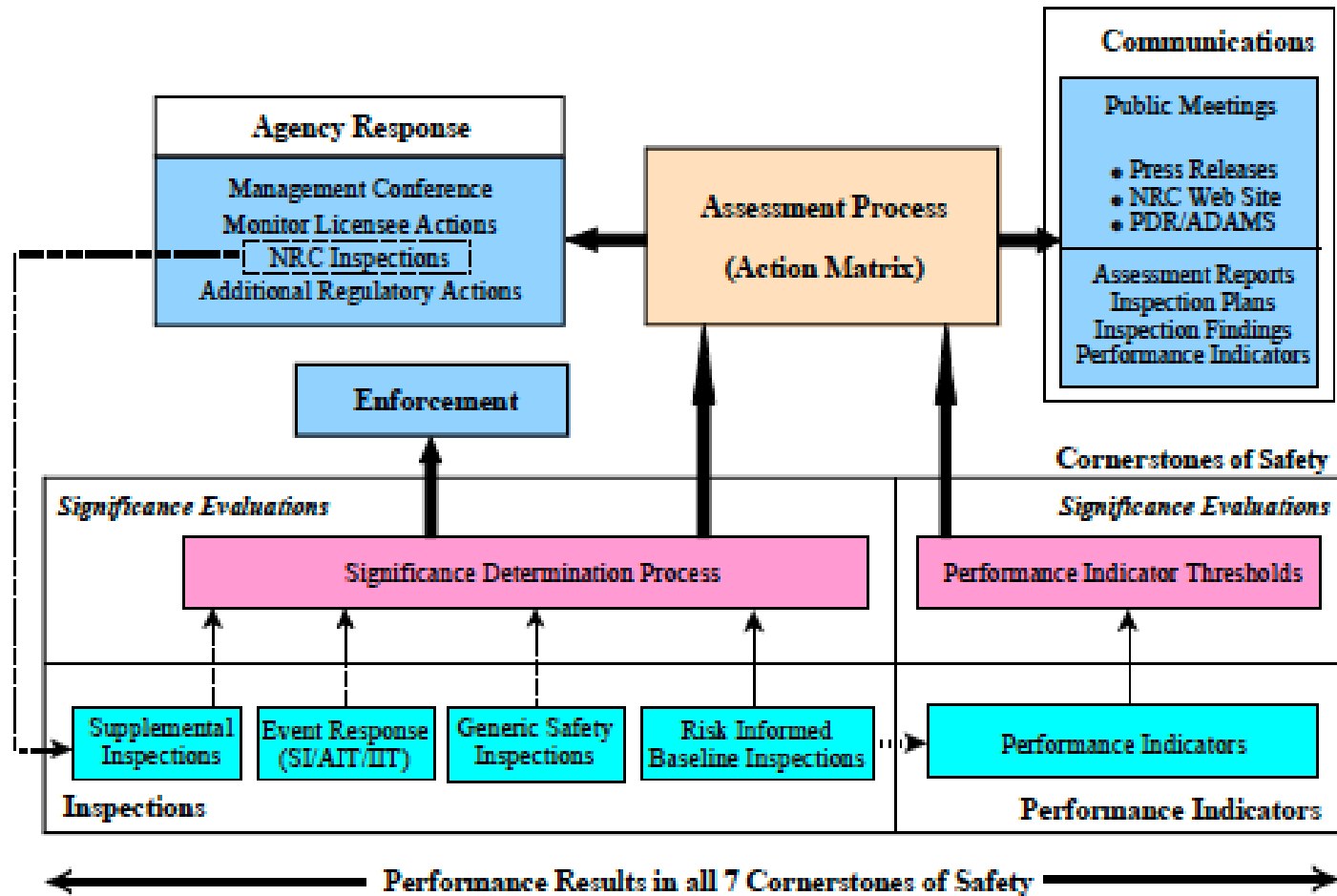
Performance Goal

Level 2 Objective



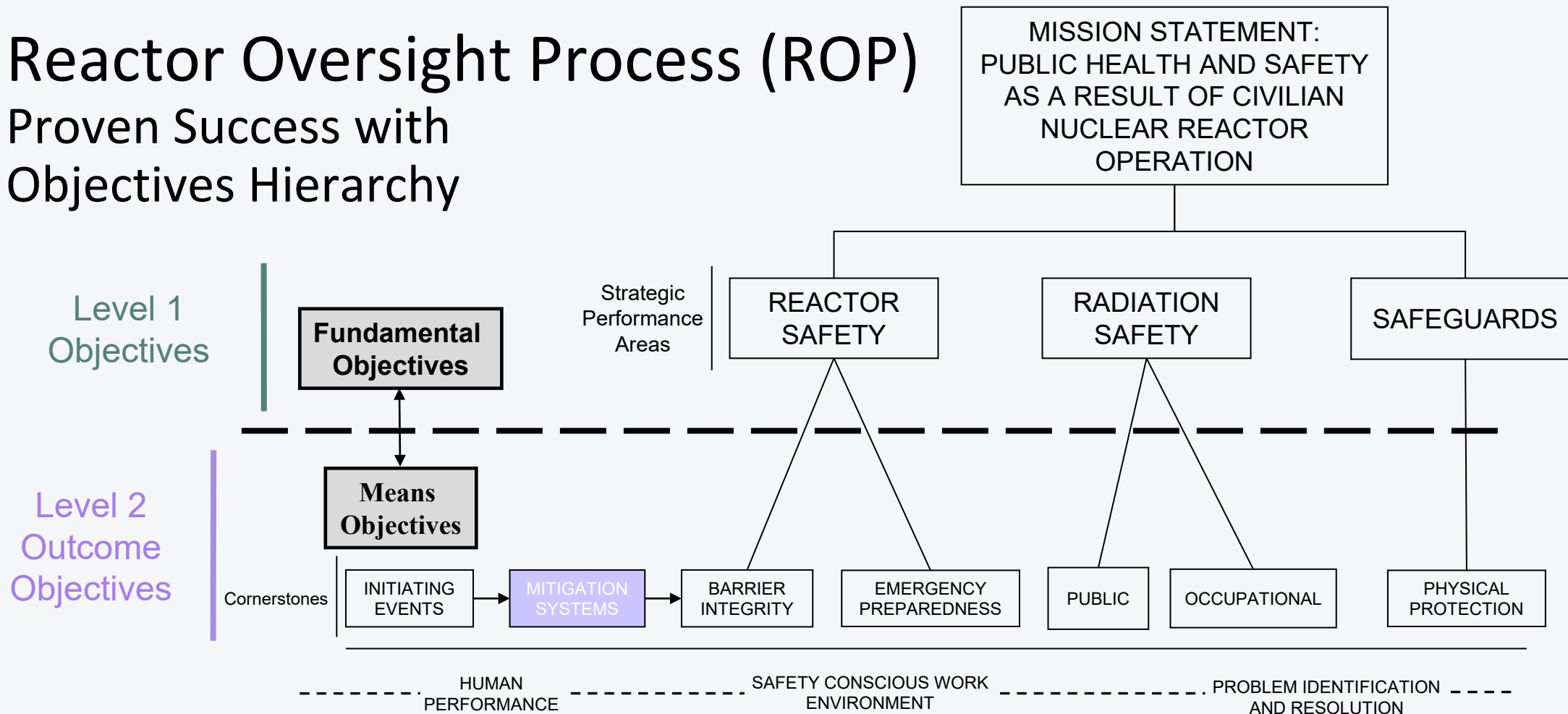
Oversight Decision

REACTOR OVERSIGHT PROCESS

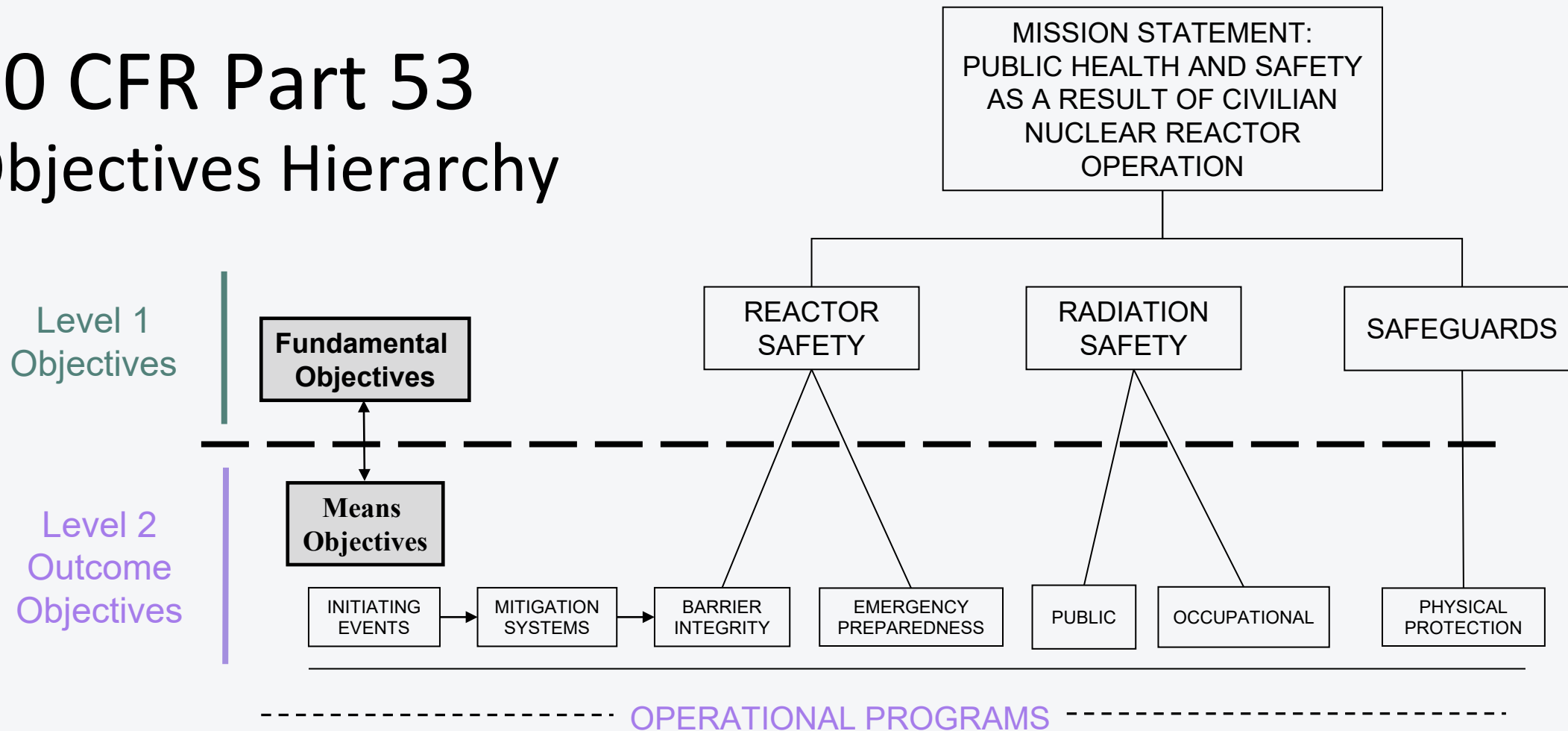


Reactor Oversight Process (ROP)

Proven Success with Objectives Hierarchy



10 CFR Part 53 Objectives Hierarchy



Operational Programs

Each applicant must describe operational programs that emphasize and reinforce industry best practices, for example in the following areas:

- Quality Management
- Human Performance
- Safety Conscious Work Environment
- Problem Identification and Resolution
- Radiation Management As Low as Reasonably Achievable
- Operator Training and Qualification

Closing Thoughts

- A technology-inclusive, risk-informed and performance-based approach licensing pathway should minimize the need for exemptions from regulatory requirements.
- The preliminary rule can be simplified by
 - retaining high-level performance goals; and
 - relocating prescriptive, deterministic criteria for how those goals can be accomplished to guidance.
- For Part 53 to be successful, it must be durable as new and advanced reactor technologies are developed in the decades to come.