

# Challenges with 10 CFR Part 53

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World Nuclear Association's Law Working Group  
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# The Breakthrough Institute

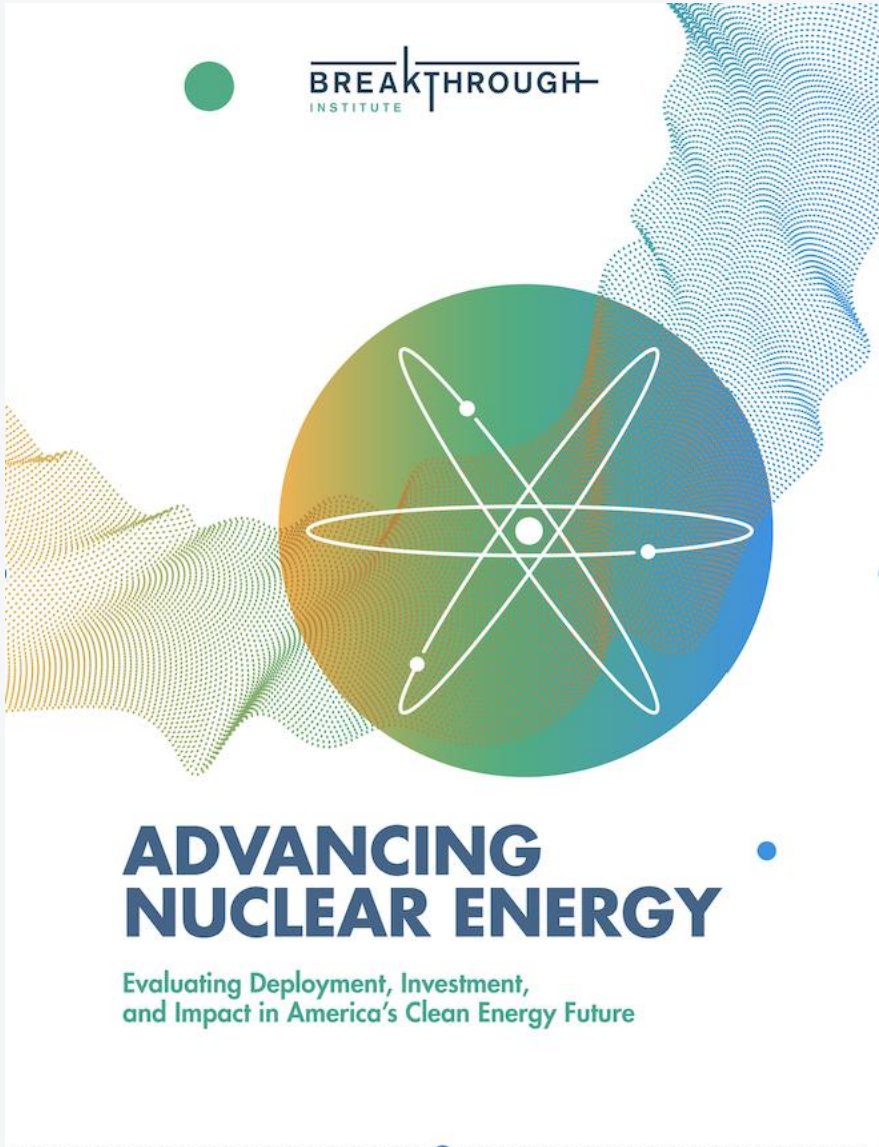
- Independent research center
- Represents public interests
- Identifies and promotes technological solutions to environmental and human development challenges
- Does not receive funding from industry

# Congressional Mandates

- Atomic Energy Act of 1954
  - Established the Atomic Energy Commission (AEC)
- Energy Reorganization Act of 1974
  - Nuclear Regulatory Commission (NRC)
  - Energy Research and Development Administration (ERDA, DOE)
- Congressional Hearings and Calls for Regulatory Reform (1998)
  - Systematic Assessment of Licensee Performance (SALP), before 2000
  - Reactor Oversight Process (ROP), 2000 to present
- Nuclear Energy Innovation and Modernization Act (NEIMA) (2019)
  - Develop the expertise and regulatory processes necessary to allow innovation and the commercialization of advanced nuclear reactors.

# NEIMA Terminology

- **Technology-inclusive**
  - Defined in NEIMA
  - A regulatory framework that is flexible and practicable for a variety of reactor technologies
  - Includes use of risk-informed and performance-based techniques and other tools and methods where appropriate.
- **Risk-informed and Performance-based decision-making**
  - Defined by the Commission in 1999 policy paper (SRM-SECY-1998-0144)
  - Risk-informed regulation
    - Focused on those things most important to safety
  - Performance-based regulation
    - Focused on safety performance and results
    - Affords licensees flexibility in meeting established performance criteria
    - Encourages and rewards improved safety performance outcomes



## 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

# Advanced Reactor Rule Progress

- Licensing Modernization Project (LMP) (2016–2019)
- NEI 18–04 Submits for NRC Approval, Part 50 (August 2019)
  - “Risk-Informed Performance-Based Technology Inclusive Guidance for Non-Light Water Reactor Licensing Basis Development”
- NRC issues Reg Guide 1.233, Endorses NEI 18–04, Parts 50 and 52 (June 2020)
  - “Guidance for a Technology-inclusive, Risk-informed and Performance-based Methodology to Inform Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors”
- NRC Extends Rulemaking Schedule by Nine Months (November 2021)
- NRC Unveils Preliminary Language for Part 53 (February 2022)
- Industry Survey Shows Respondents Unlikely to Use Part 53 (April 2022)
- NRC Unveils Frameworks A and B for Part 53 (June 2022)



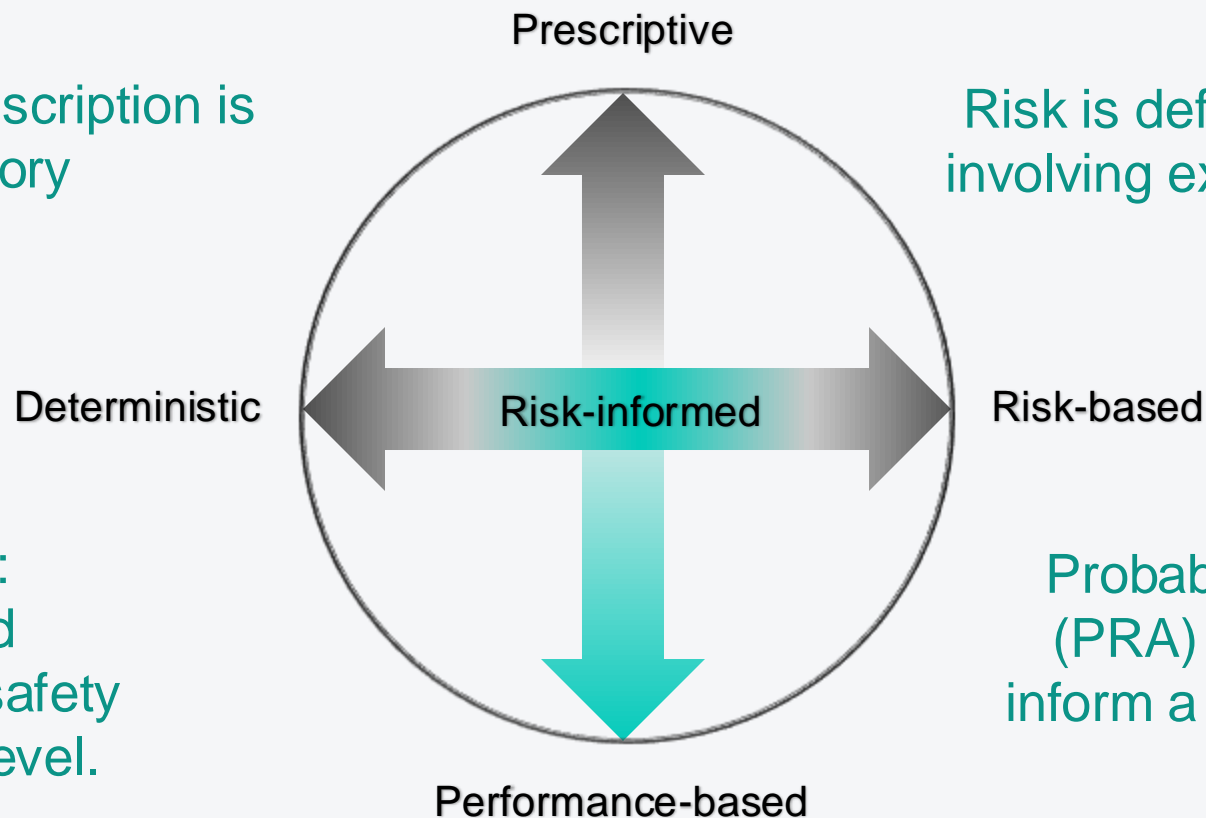
# Challenges with Part 53

- Insufficient collaboration with external stakeholders
- Ineffective and inefficient use of nine-month extension to resolve disagreements and achieve alignment with stakeholders
- Unlikely to be used
- Creates regulatory burden and unnecessary operating costs
- Does not provide incentives for improved safety performance
- Is not technology-inclusive
- Undermines regulatory agility

# The Mandated Regulatory Approach

Some amount of prescription is necessary in regulatory requirements.

Risk is defined as a situation involving exposure to hazard.

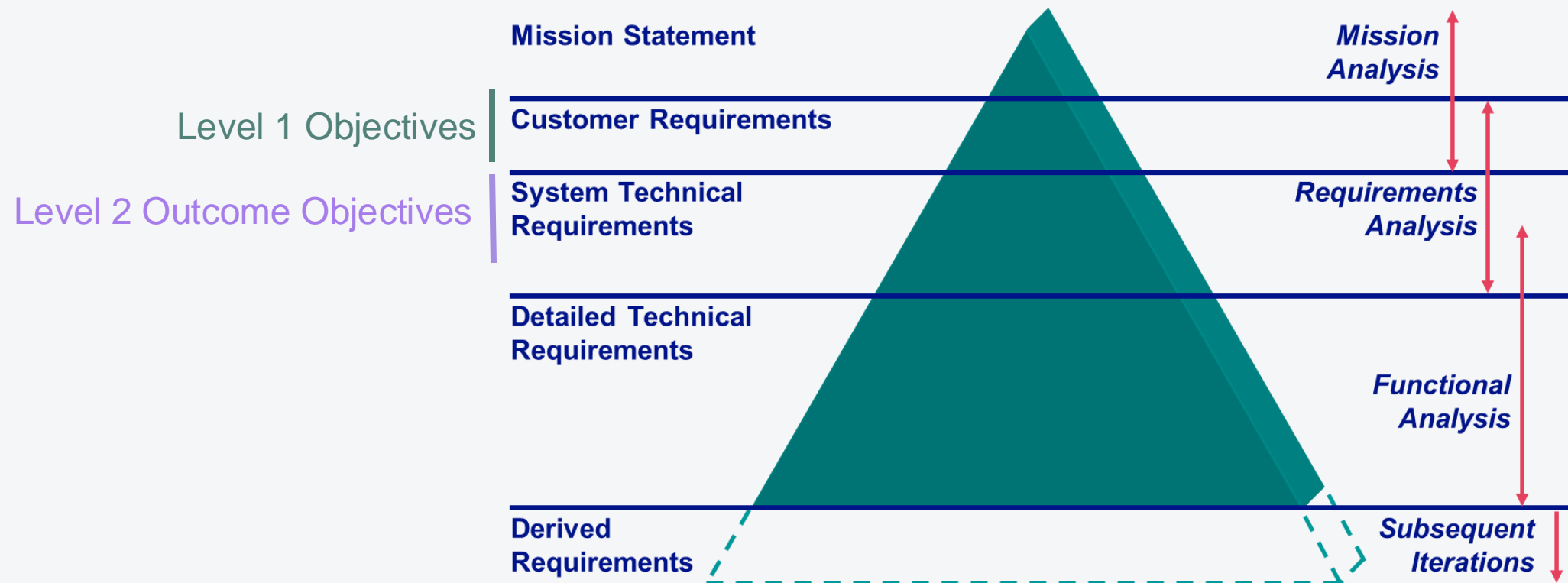


Objectives Hierarchy:  
A performance-based regulation identifies safety objectives at a high level.

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

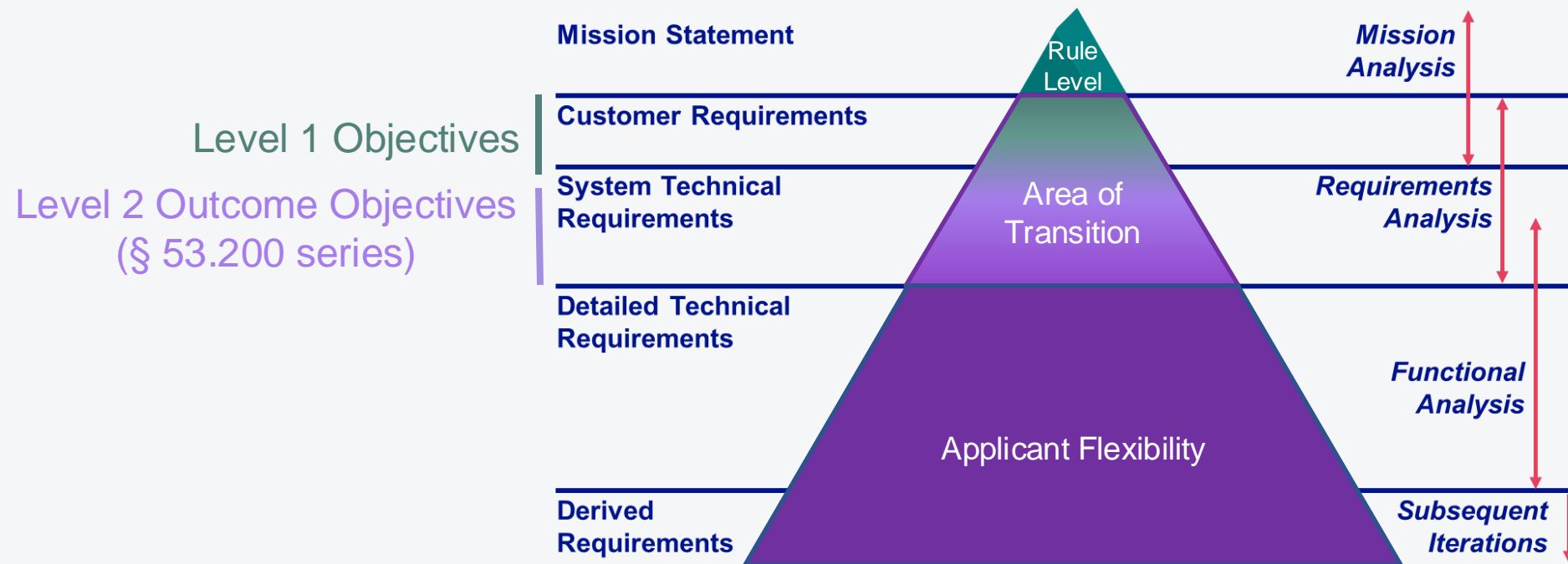


# Typical Requirements Management Structure\*



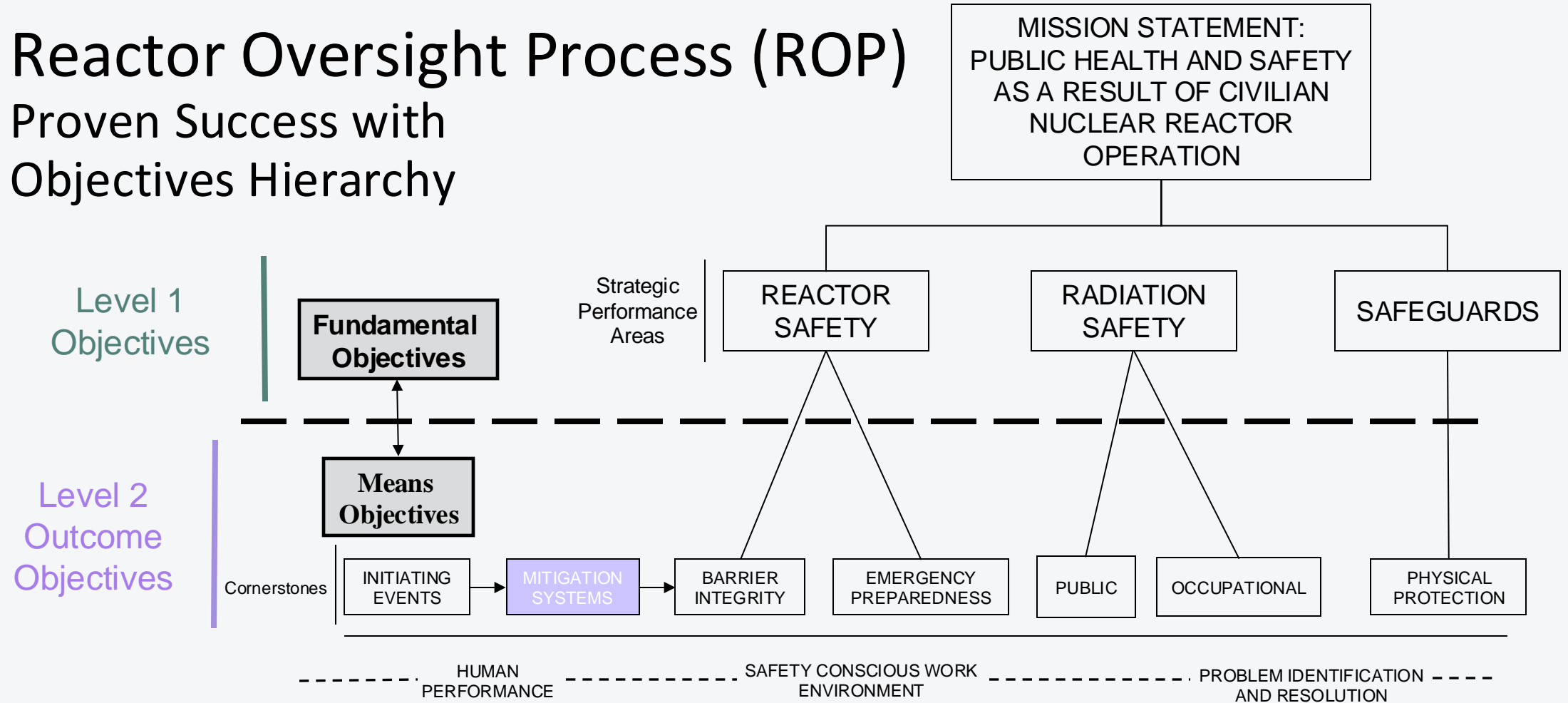
\* Attribution: <https://www.ans.org/file/980/RIPB+CoP+2-28-20+Presentation+Systems+Engineering.pdf>, Slide 8

# Part 53 Requirements Management Structure



# Reactor Oversight Process (ROP)

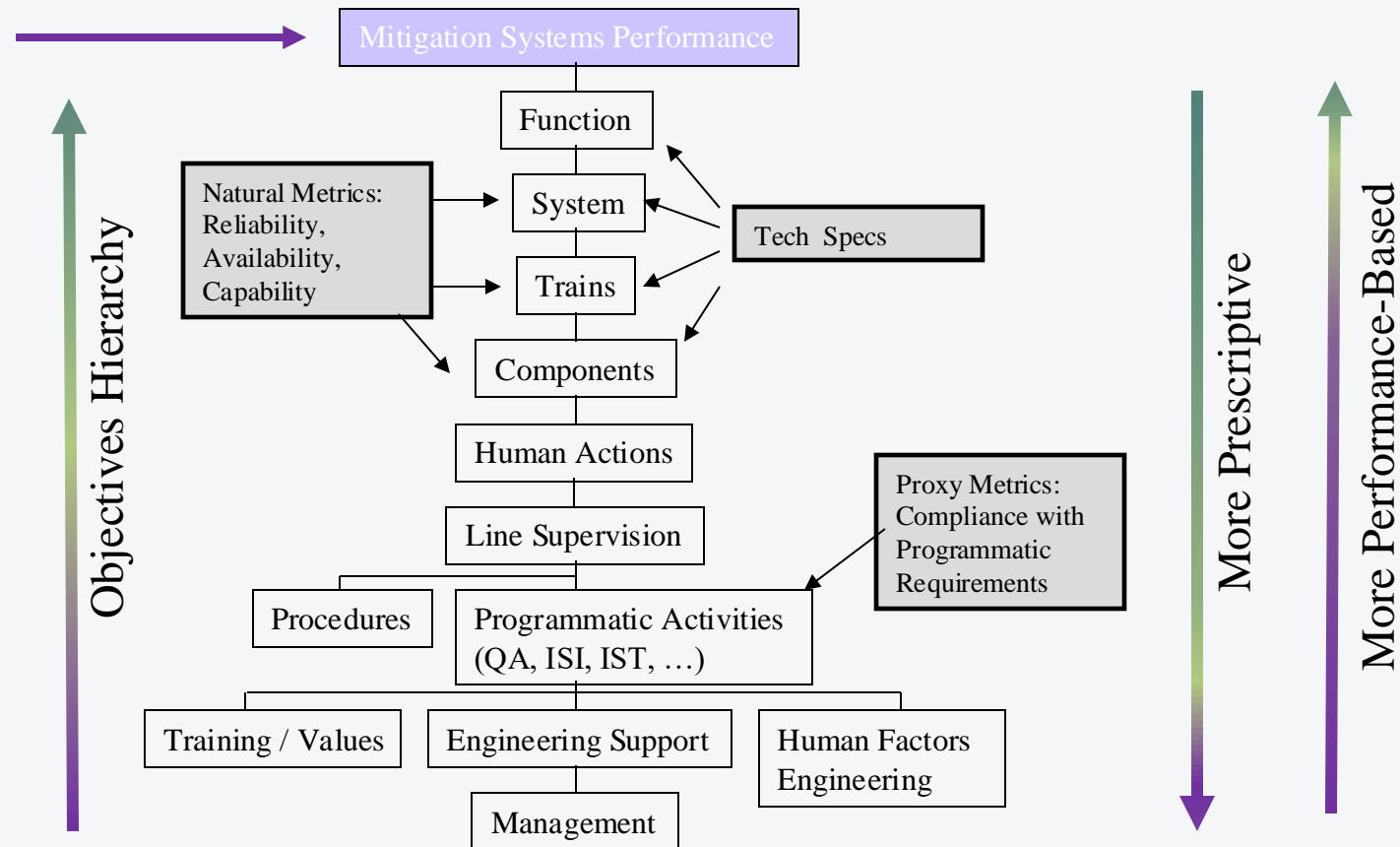
## Proven Success with Objectives Hierarchy



# Means Objectives Hierarchy

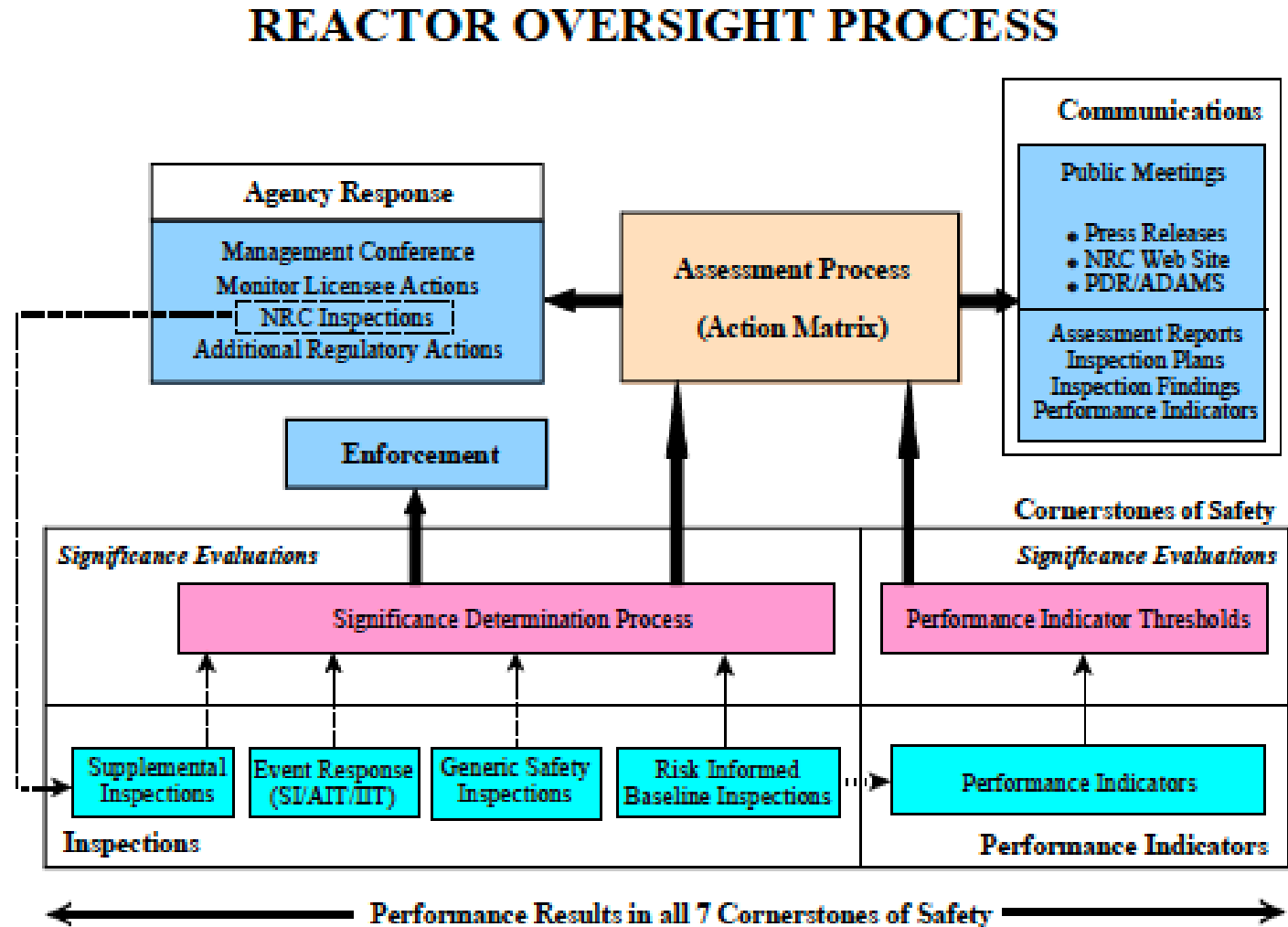
## Example ROP Cornerstone

Level 2 Outcome  
Objective



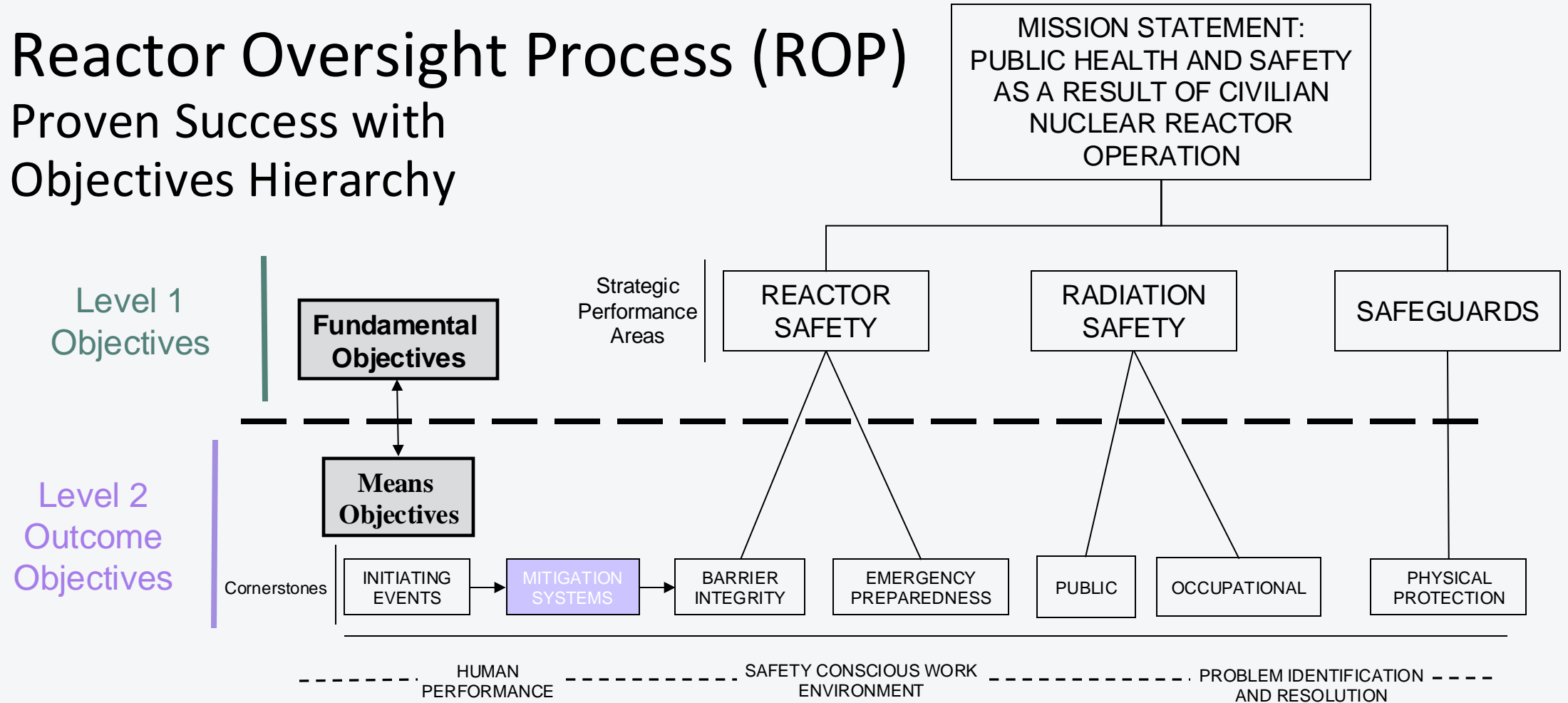
# Oversight Decision

Exhibit 1, NRC Inspection  
Manual Chapter 0308,  
“Reactor Oversight  
Process Basis Document”

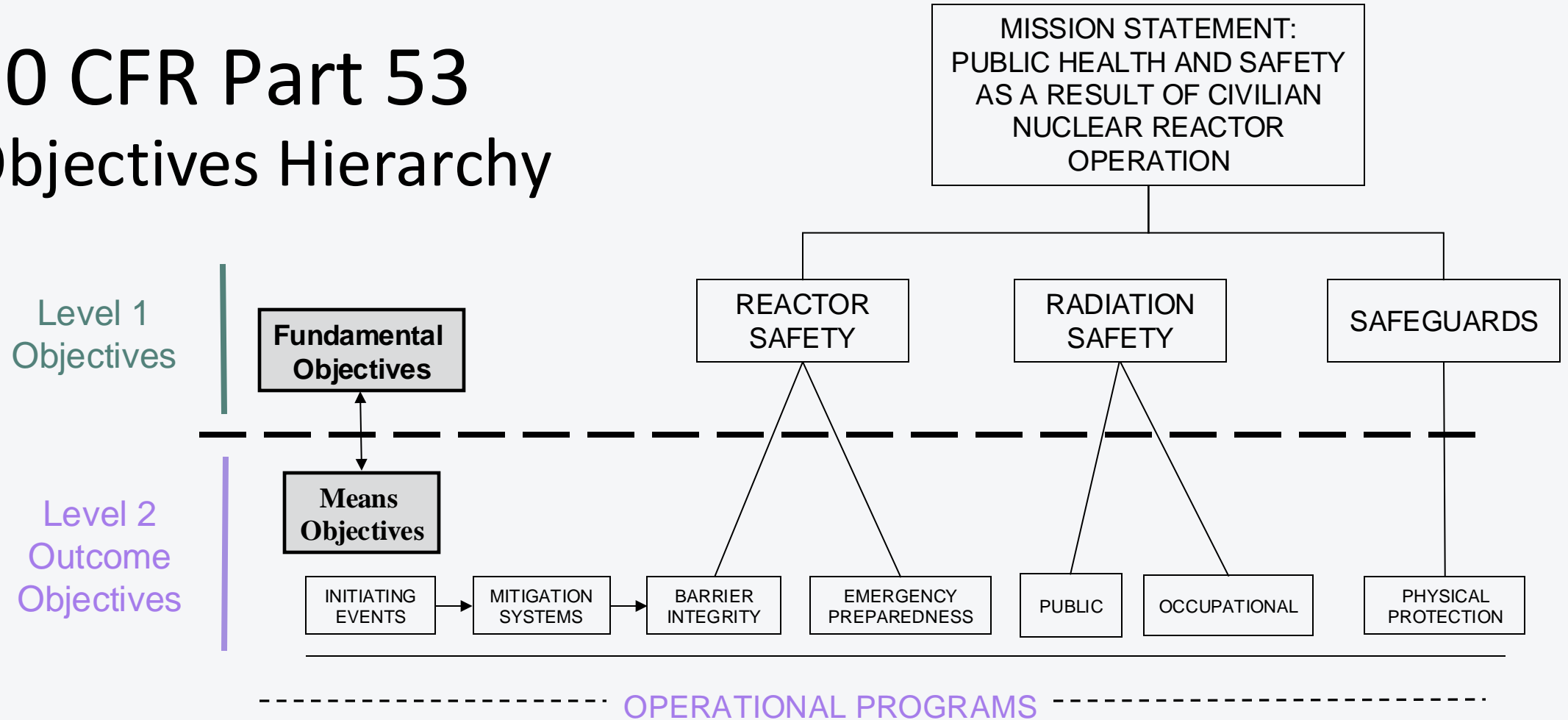


# Reactor Oversight Process (ROP)

## Proven Success with Objectives Hierarchy



# 10 CFR Part 53 Objectives Hierarchy





# Operational Programs

Each applicant should 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
- Fire Protection
- Inservice inspection
- Emergency Preparedness

# Solutions for Satisfying NEIMA

- Leverage open collaboration with external stakeholders in developing the rule
- Streamline Part 53 to establish high-level safety objectives
- Describe acceptable methods for achieving high-level safety objectives in standard review plans and other regulatory guidance
  - Offers clarity, regulatory reliability and flexibility
  - Allows greater flexibility for a wide range of diverse and emerging technologies
  - Frameworks A and B could represent acceptable methods
  - Other approaches to meeting a high-level rule could be equally acceptable
  - Acceptable methods can be described in technology-specific guidance
  - Guidance is nimble: can be developed, revised and updated outside the rulemaking process

# Summary

- 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 objectives; and
  - relocating prescriptive, deterministic criteria for how those objectives can be accomplished to guidance.
- For Part 53 to be successful, it must be durable and provide regulatory agility as new and advanced reactor technologies are developed in the decades to come.
- Domestic deployment must be demonstrated for large-scale, global commercialization of nuclear energy to successfully mitigate climate change and increase energy security.