PRA Quality for Risk-Informed Decision Making

U.S. Nuclear Regulatory Commission • Office of Nuclear Regulatory Research • Division of Risk Assessment and Special Projects

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Why is PRA Quality Important?

The Commission adopted the following **policy statement** in 1995:

1. "The use of PRA technology should be increased in all regulatory matters to the extent supported by the state-of-the-art…and supports the NRC's traditional defense-in-depth philosophy."
2. "PRA...should be used in regulatory matters...to reduce unnecessary conservatism..."
3. "PRA evaluations in support of regulatory decisions should be... realistic... and appropriate supporting data should be publicly available for review."
4. "The Commission's safety goals… and subsidiary numerical objectives are to be used with appropriate consideration of uncertainties in making regulatory judgments..."

"Implementation of the [PRA] policy statement will **improve the regulatory process** in three ways:

- Foremost, through safety decision making enhanced by the use of PRA insights;
- Through more efficient use of agency resources; and
- Through a reduction in unnecessary burdens on licensees."

PRA Results and Insights

Licensing
- **Regulatory Guide 1.174** An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis
- **Technical Specifications**
- Etc.

Rulemaking
- **10 CFR 50.69** Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors
- **10 CFR 50.48** Fire Protection
- Etc.

Oversight
- **Reactor Oversight Process**
- **Mitigating Systems Performance Index**
- Etc.

PRA Quality is an essential aspect of risk-informed regulatory decision making.

How is PRA Quality Defined?

Five **elements** need to be addressed in **defining PRA Quality**:

1. The **Scope** and the **Technical Elements** define the completeness of a PRA.

Metrics Used to Characterize Risk	• Level 1: Core Damage Frequency • Level 2: Radionucide Release Frequency • Level 3: Health Effects and Economic Impacts
Plant Operational States Evaluated	• Full Power • Low Power • Shutdown
Initiating Events Challenging Plant Operation	• Internal Events (transients, LOCAs, floods) • Fires • External Hazards

2. The PRA must **represent** the as-built, as-operated **plant**.

Plant Design Information

Plant Testing and Maintenance

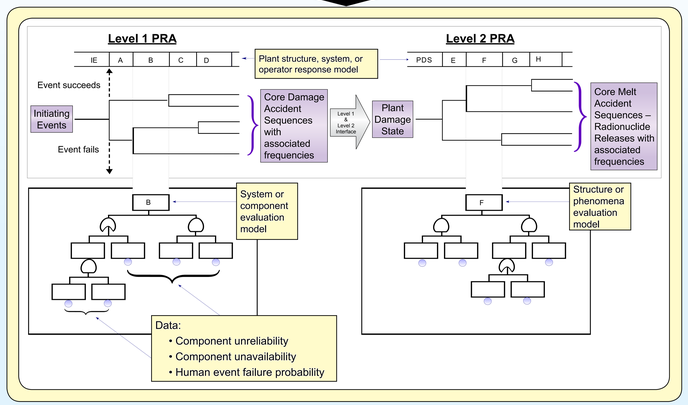
Engineering Aspects

Plant Operations Information

3. **Standards** are used to define the technical requirements.

4. An **Independent Peer Review** obviates the need for an in-depth staff review.

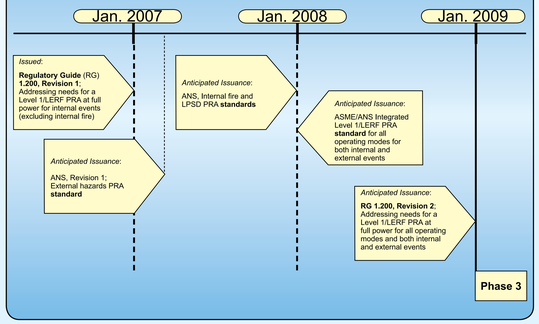
5. The quality needed for a PRA is commensurate with its **application**.



When is PRA Quality Achieved?

PRA Quality is achieved through a **Phased Approach**.

- Not all PRA standards and associated guidance documents defining PRA Quality are available.
- A phased approach can be implemented while the needed documents are developed.
- Each phase is characterized in terms of the available guidance documents relative to the risk-informed activities.

Phase 1: "Application-Specific" PRA technical guidance available for limited regulatory applications. → **Phase 2: "Application Type"** PRA technical guidance available for selected regulatory applications. → **Phase 3: "All-Applications"** PRA technical guidance available for all envisioned regulatory applications.

Timeline