

COMMISSION BRIEFING SLIDES/EXHIBITS

**BRIEFING ON RISK-INFORMED,
PERFORMED-BASED REGULATION**

AUGUST 2, 2007



Status of Risk-Informed and Performance-Based Regulation for Nuclear Power Plants

August 2, 2007

Gary Holahan, PRA Steering Committee

Farouk Eltawila, Nuclear Regulatory Research

Mark Cunningham, Nuclear Reactor Regulation

Charles Ader, New Reactors

Acronym Slide

- ANS – American Nuclear Society
- ASME – American Society of Mechanical Engineers
- COL – Combined License
- EPRI – Electric Power Research Institute
- LERF – Large Early Release Frequency
- MOU – Memorandum of Understanding
- PRA – Probabilistic Risk Assessment
- RG – Regulatory Guide
- RPP – Risk-Informed and Performance-Based Plan

Agenda

- Introduction
- PRA quality activities
- Risk-informed activities for operating reactors
- Risk-informed activities for new reactors
- Summary

Introduction

- Risk-informed activities since Commission Briefing of May 2006
- RPP – integrated plan addressing operating reactors, new reactors, materials, waste, and security activities
- Communication
 - PRA Steering Committee
 - PRA Leadership Team
 - NRC web site

PRA Quality Recent Accomplishments

- Phased Approach to PRA Quality
- Revision 1 to RG 1.200 and Standard Review Plan Section 19.1
- Internal fire PRA standard
- Level 1/LERF integrated standard
- Collaborative effort with ASME on training

PRA Quality Near Term Activities

- Treatment of Uncertainties
- Revision 2 to RG 1.200
 - endorsement of ASME/ANS Integrated Standard
- PRA training
- ~~Revisions to RG 1.17x series (e.g., 1.174)~~
- MOU with EPRI on PRA technical issues

Operating Reactors Recent Accomplishments

- Technical specification initiatives
- Fire protection
- Special treatment requirements
- Reactor oversight process improvements

Operating Reactors Near Term Activities

- Implementation of fire protection requirements
 - Clarification of maintenance rule PRA scope
 - Emergency core cooling system requirements
 - Pressurized thermal shock
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New Reactors Recent Accomplishments

- Revised 10 CFR Part 52
- Regulatory Guide (RG 1.206) and Standard Review Plan (Section 19.0) issued to reflect PRA requirements for new reactors
- Public meeting held on PRA information to support design certifications and COLs

New Reactors Near Term Activities

- PRA reviews for design certification and COL applications
- PRA/risk insights being used to enhance staff's review process including:
 - Acceptance review
 - Design certification and COL reviews

Summary

- Steady progress continues to be accomplished in implementing Commission PRA policy and directions
- The new Risk-Informed and Performance-Based Plan will provide:
 - specific objectives and goals in each regulatory arena for achieving Commission policy and direction
 - enhanced communication via an improved website

Risk-Informed Performance Based Regulation

Tony Pietrangelo, NEI

Richard Rosenblum, Southern California Edison

Mark McBurnett, South Texas Project

Greg Krueger, Exelon

August 2, 2007



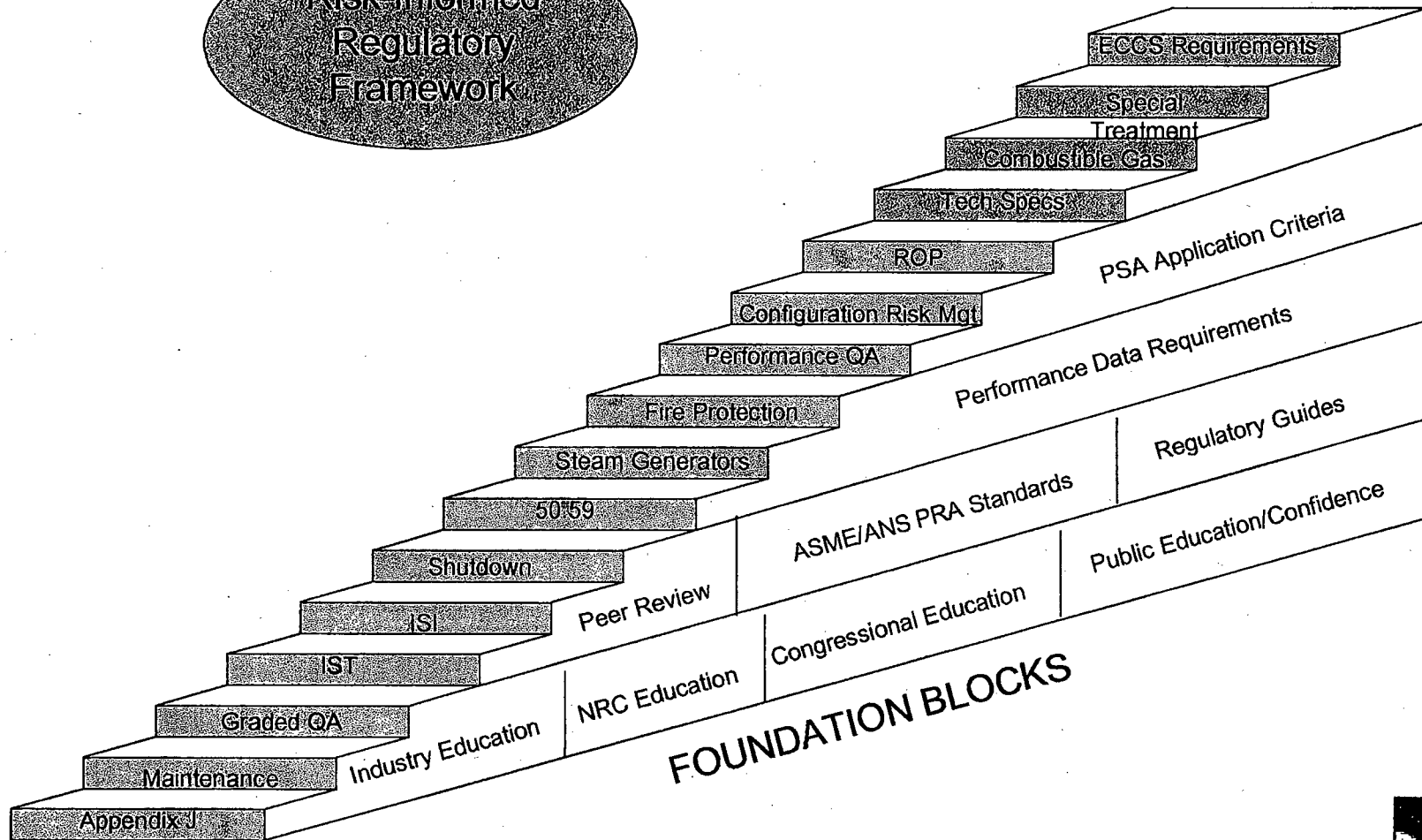
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Overview

- Historical perspective
- Progress since last briefing – May 2006
- Safety benefits of risk-informed regulation
- Success paths
- Conclusions

Steps for Achieving Enhanced Safety and Reliability

Risk-Informed
Regulatory
Framework



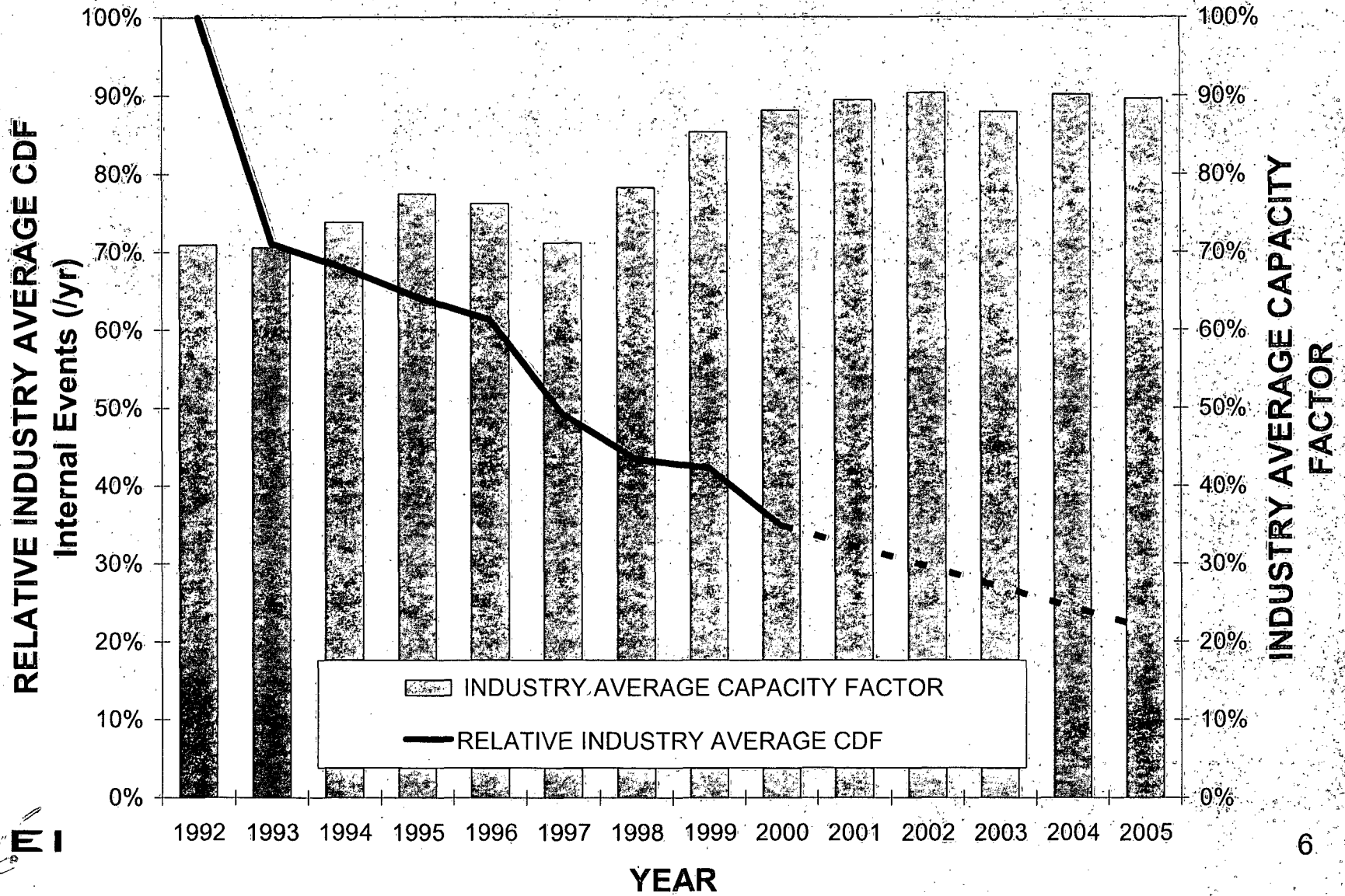
Progress Since Last Briefing

- Regulatory Guide 1.200 issued addressing ASME at power internal events standard
 - Industry workshop with NRC participation - March
- Significant risk-informed Technical Specification applications approved at pilot plants
- MSPI implementation has proceeded successfully
- Continued major industry effort towards fire PRA, NFPA 805
- 10 CFR 50.46a ?

Safety Benefit of PRA

- Risk-informed insights provide guidance to plant operation and decision making and help set priorities for safe operation
- Historically, safety and operational improvements as well as PRA model improvements have been driven by licensee applications
- 2001 EPRI paper, *The Safety Benefit of PRA*, recently updated at request of Commission, demonstrates that:
 - Trend of decreasing industrywide CDF is continuing
 - There is a safety and operational benefit from licensee applications

CDF vs. Capacity Factor



Insights

- Industry average internal events CDF continues to drop due to:
 - Plant performance
 - Equipment performance
 - Risk-informed plant enhancements
 - PRA model improvements
 - Better risk insights from improved PRA models

- Risk informed approaches have been demonstrated to improve both safety and operational performance

Current Status

- Applications
 - Mark McBurnett, STP
 - Greg Kreuger, Exelon

- Success Paths

Tech Spec Initiative 4B at STP

- **Approved and implemented on July 13, 2007**
 - **Pilot for 7 year industry - NRC initiative**
 - **Applies to power operation**
 - **Allows operators the option to extend the existing allowed outage time to a risk-informed completion time**
 - **30 day backstop**
 - **Risk management actions when in extended completion time**

Tech Spec Initiative 4B at STP

■ Benefits

- Improved safety by maintaining focus on risk-significant activities
- Operational flexibility
- Fewer challenges to LCO ACTION times

■ Conducted training on application of new Tech Specs for plant personnel with emphasis on an effective risk management culture

- Operations
- Work Control
- Engineering
- Management

South Texas Project Perspective

- **STP has been a strong proponent and industry pioneer of risk-informed applications**
 - Exemption from certain special treatments (50.69-type pilot)
 - Risk-managed Tech Specs (industry pilot)
 - Risk-informed surveillance test intervals (submit by end of '07)

- **Risk applications have enhanced our nuclear safety oversight and strengthened our risk culture**
 - Ownership resides with implementing organizations
 - Focus placed on safety significant systems/components
 - Risk considerations woven into fabric of decision-making

South Texas Project Perspective

- **Safety benefits have been complemented by performance improvements**

- **STP's experience shows that risk tools should be strategically implemented throughout the industry**
 - **Efficiencies to be noted in current licensee operations**
 - **Strengthens confidence in viability of new plant construction**

- **Risk applications are beneficial to safety:**
 - **Clear feedback needed from current Commission on risk application support**
 - **Strategic approach needed to broadly apply beneficial applications**

Risk-informed Tech Spec Initiative 5b – Surveillance Frequency Control Program

- Limerick pilot for the Industry
- Tech Spec surveillance frequencies moved to a *Surveillance Frequency Control Program*
- Surveillance frequencies optimized using risk input
- Uses NEI 04-10 risk-informed methodology
- Scope includes any periodic surveillance
- NRC approved on September 28, 2006

Required PRA Infrastructure for 5b

- **PRA insights are one input into integrated decision-making process**
- **Gap analysis to Regulatory Guide 1.200 and ASME PRA standard**
- **Considerable investment in PRA model improvement (capability and documentation)**
- **External events considered qualitatively (fire, seismic)**

Specific Safety Benefits of Initiative 5b

- Potential to affect all aspects of plant operation
 - Reduced reactivity management events
 - Dose reduction
 - Resource optimization
 - Work management simplification
 - Planning
 - Configuration risk
 - Reduced production risk (initiating events)

The Changing Role of Risk Management

- **Application of risk insights has progressed at an increasing rate during the last 7 years**
- **In the 90's, the PRA was a tool applied mostly to design or engineering programmatic issues (MOVs and other ranking applications, MRule, etc.)**
- **Today, the PRA is applied 24/7 in operational decision-making and support**
- **PRA resources stretched to support broad range of risk-related regulatory, licensing and operational activities**

Success Paths

- Recognition of industry and NRC PRA infrastructure capabilities
- Improvements to risk-based decision making processes
- Realistic expectations

Infrastructure

- **Industry PRA infrastructure is saturated for next several years**
 - RG 1.200 internal events assessment, peer reviews, model revisions
 - NFPA 805 fire PRA development
 - Ongoing applications support activities
 - New plant PRA development
- **Challenge for NRC to maintain SPAR models**
- **Industry training and personnel development underway, but will take several years to achieve large numbers of additional qualified PRA personnel**

Capability versus Expectations

- **Expectation**
 - NRC endorsed standards by 12/2008
 - SRM states NRC staff may reject or de-prioritize submittals absent PRA meeting standards for significant contributors
- **Need to heed lessons from internal events standard development**
- **Internal events and fire remain industry PRA priority and are most significant contributors to manageable risk**

Risk-Based versus Risk-Informed

- The Significance Determination Process is risk-based
 - $1E-6$ Δ CDF threshold (green/white) is within uncertainty bands of PRA
 - Consumes PRA resources on de minimus risk evaluations
 - Impact on operating companies disproportional to risk significance
- Process improvements are warranted

Realistic Regulatory Expectations

- Long development period was needed for usable internal events standard and NRC endorsement (see *July Federal Register Notice*)
- Now large effort to quickly develop fire PRA in advance of standard
- PRA endorsement and implementation schedules are not in sync

Outlook/Conclusion

- **Near term focus for industry will be:**
 - At power internal events PRA
 - Fire PRA
- **PRA development is a long term proposition**
 - Should be tempered by experience and priorities
- **Processes should focus on safety significance and not on residual risk levels**
- **Industry continues to support 10 CFR 50.46a**
- **Risk informed Tech Spec initiative approvals demonstrate value and should be supported by Commission**

Acronyms

- PRA - probabilistic risk analysis
- MSPI - mitigating systems performance index
- NFPA - National Fire Protection Association
- EPRI - Electric Power Research Institute
- CDF - core damage frequency
- LCO - limiting condition for operation
- MOV - motor operated valve
- MRule - maintenance rule
- SDP - significance determination process
- SPAR - Standardized plant analysis risk

PRA STANDARDS DEVELOPMENTS

August 2, 2007

Kenneth R. Balkey, P.E.

Vice President, ASME Nuclear Codes
& Standards



ASME PRA Standard

- ASME RA-S-2002 “Standard For Probabilistic Risk Assessment For Nuclear Power Plant Applications”
- Addenda issued to address public inquiries and NRC staff comments related to RG 1.200 endorsement
- PRA standards training

ASME/ANS PRA Standard

- Combines ASME/ANS Level 1 standards
- Issue standard with ASME/ANS logo's
- Consistency in format and language
- Provides stability in standard over time
- Allows endorsement of single standard
- Combined standard issued in phases

Related Developments

- Applications
 - Risk-informed ISI / IST
 - Risk-informed repair / replacement
- New and future reactor initiatives
 - Working groups address PRA needs
 - Risk-informed safety classification
 - Probabilistic design developments

Summary

- ASME has coordinated with NRC and global industry on risk-informed, performance-based standards for over 20 years
- While these standards efforts are beneficial to stakeholders, they are long term initiatives