

Risk-Informed Performance Based Regulation

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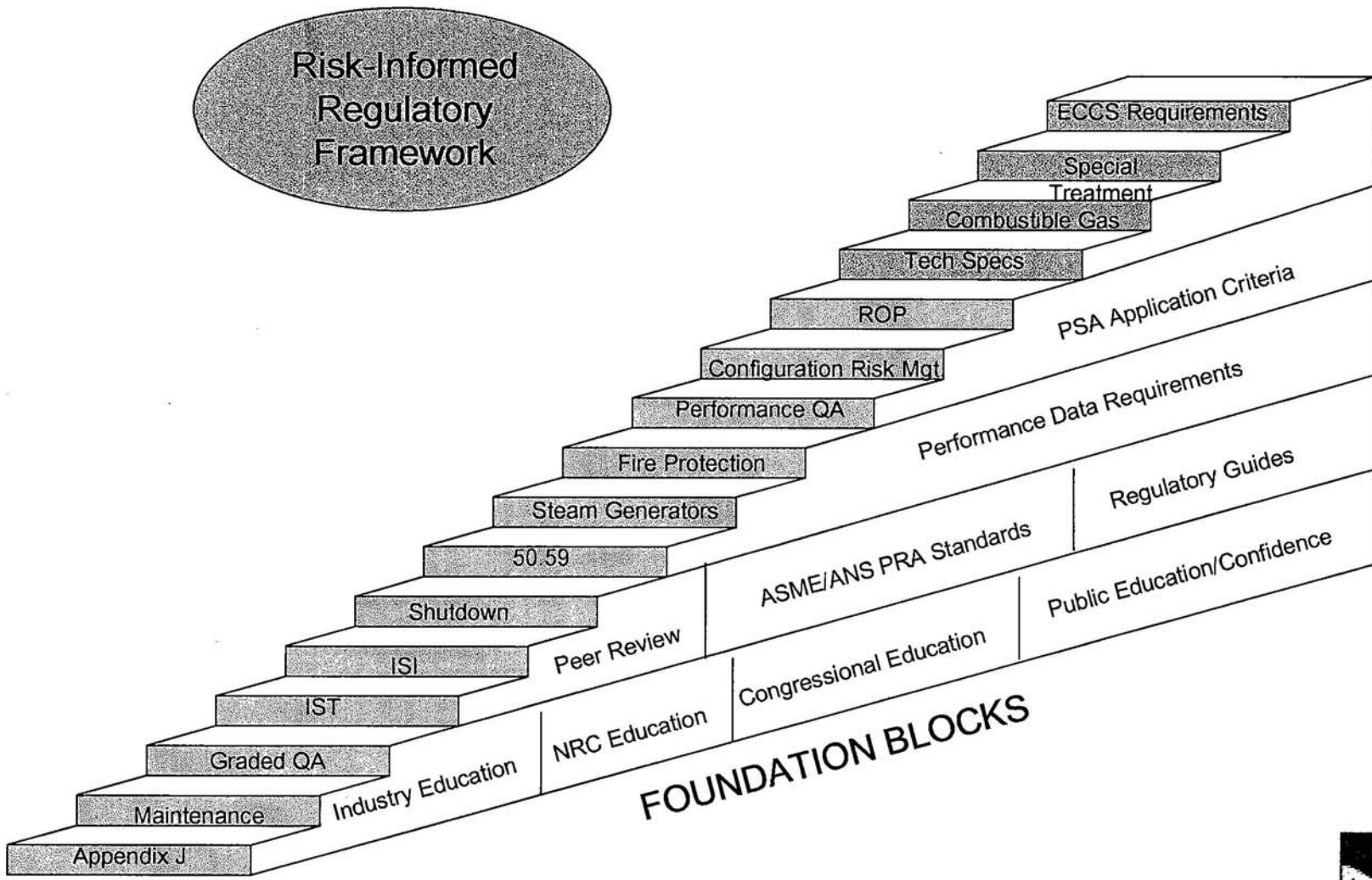
Greg Krueger, Exelon

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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



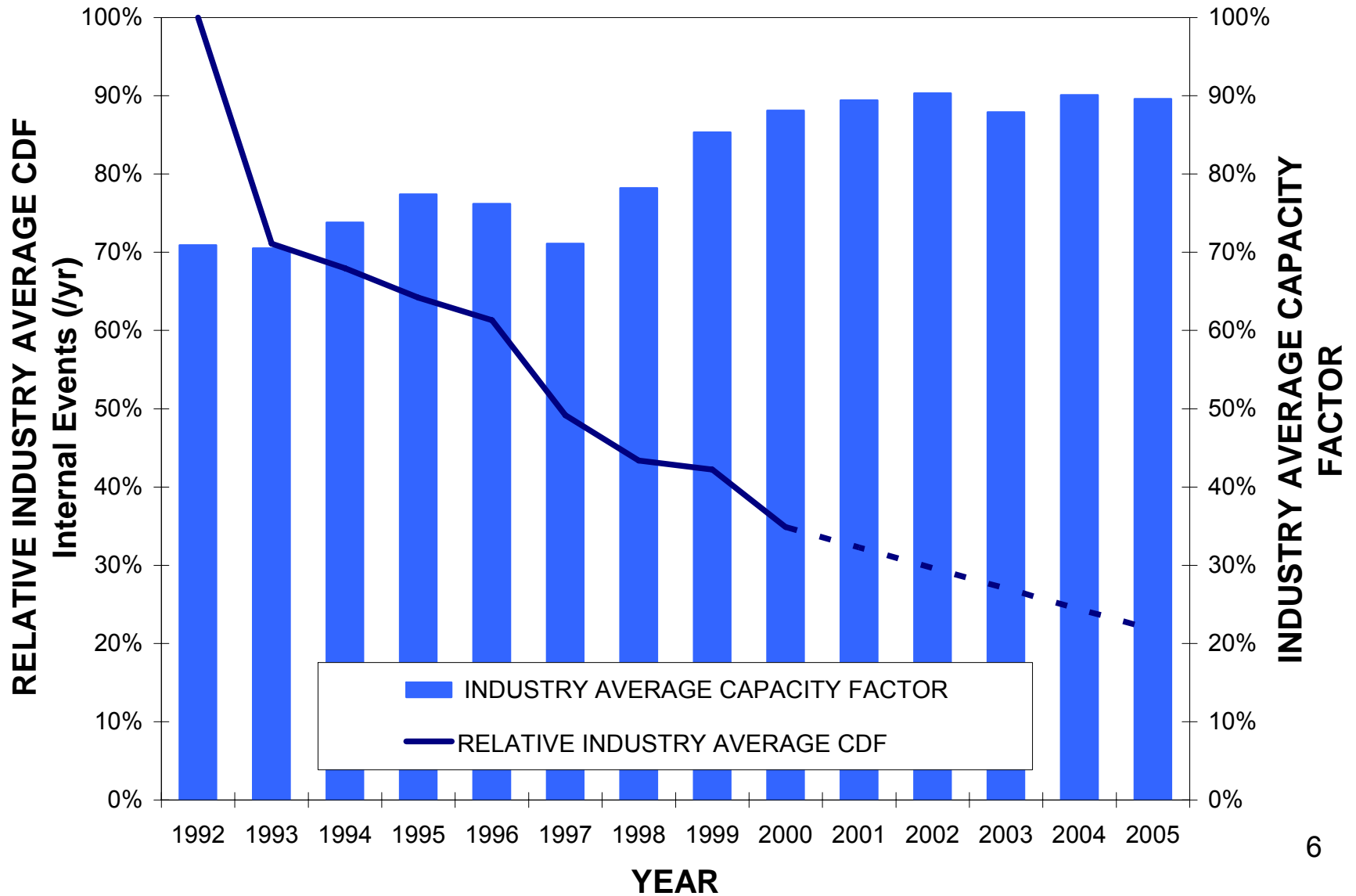
Progress Since Last Briefing

- 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