

# PRA QUALITY IN REGULATORY DECISIONS



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# OUTLINE



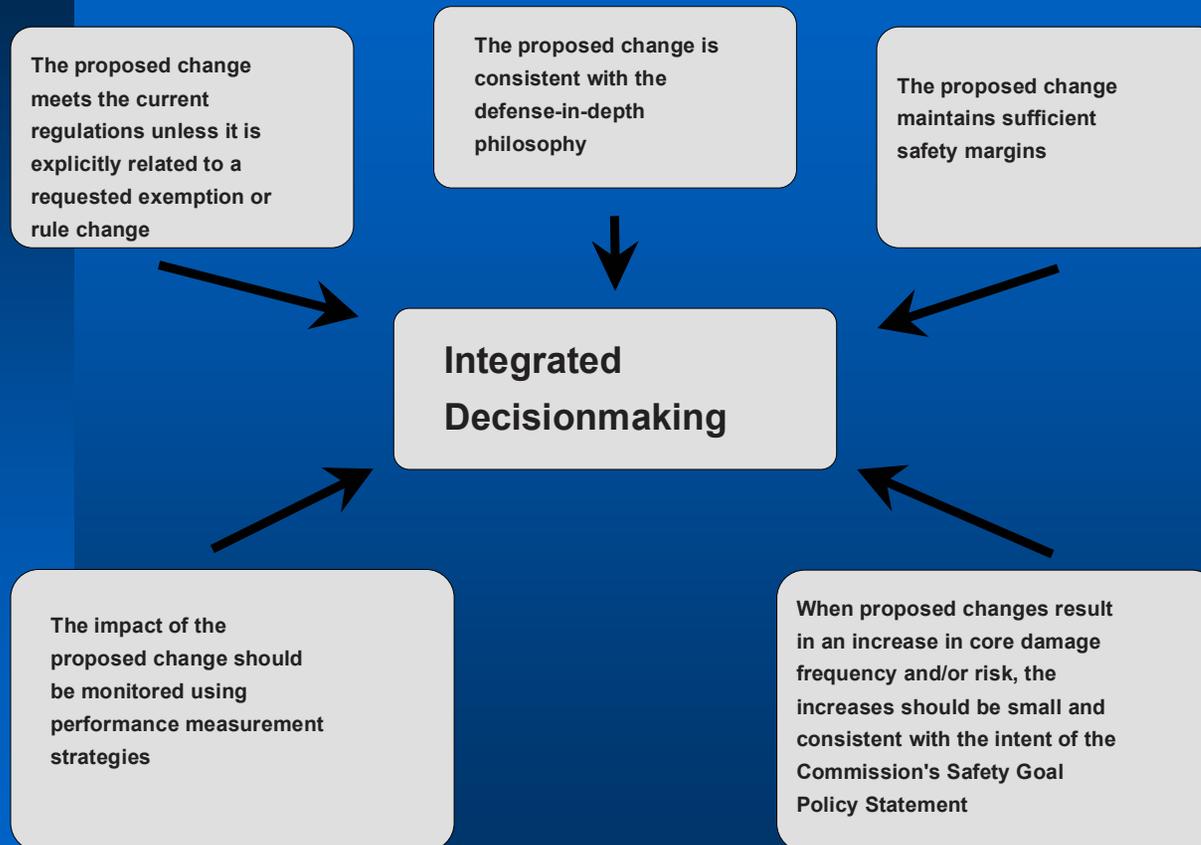
- **Quality of PRA input to decision-making**
- **Development and use of PRA Standards and industry peer review program (NEI-00-02)**
- **Phased approach to achieving PRA quality**

# USE OF PRA RESULTS IN REGULATORY APPLICATIONS



- **NRC has adopted a risk-informed approach to use of PRA in regulatory decision-making**
- **The philosophy is discussed, in the context of changes to the licensing basis, in RG 1.174**
- **PRA analyses are one, but not the only, input to the decision**

# Principles of Risk-Informed Decisionmaking

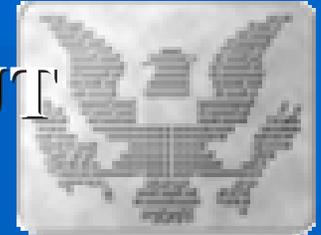


# “QUALITY” OF PRA



- **NRC is less concerned with the quality of the PRA in its own right than with the quality of the decisions made**
- **The PSA must be capable of supporting the results used in the application in terms of scope, level of detail**
- **Different applications require use of different PRA elements: some, e.g., categorization of SSCs by risk significance, use the complete PRA; others, e.g., a simple tech spec change, require only a portion of the PRA**
- **Those elements of the PRA required for an application must be performed in a technically competent manner consistent with industry good practices**

# TECHNICAL ADEQUACY OF PRA INPUT FOR A REGULATORY APPLICATION



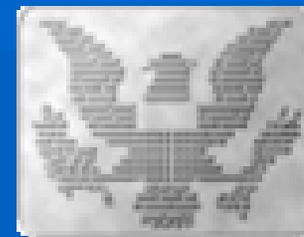
- In the USA, the technical adequacy of licensee PRAs varies widely
- NRC and industry goal is to minimize and focus the review of underlying PRA
- PRA Standards and industry peer review process either have been or are being developed, and can be used to provide an understanding of the strengths and weaknesses of a PRA

# NRC STAFF GUIDANCE ON ADEQUATE PRA QUALITY FOR APPLICATIONS



- NRC issued RG 1.200 for trial use in February 2004 (and supporting SRP Chapter 19.1 that provides “An Approach for Determining the Technical Adequacy of PRA Results for Risk-Informed Activities” for trial use.

# REGULATORY GUIDE/SRP



- Main body of RG provides general guidance to licensees on how to use PRA standards (or industry peer review program) to demonstrate and document that the PRA input to a decision is supported by a PRA of sufficient quality
- Appendixes to RG provide Staff regulatory position on the individual Standards or peer review process guidance
- Staff review will focus on those areas where alternatives to the Staff regulatory position are used

# PRA QUALITY



- **Defined in RG 1.174 and RG 1.200**
  - **For a given application, PRA Quality is determined by the appropriateness of**
    - **Scope (internal and external initiating events, full power and low power and shutdown operating modes, CDF, LERF, level 2, level 3)**
    - **Level of detail**
    - **Technical adequacy**

## **STATUS AND SCOPE OF STANDARDS AND RELATED DOCUMENTS**



- **Standards have been or are being developed for CDF and LERF for:**
  - Internal events at full power (ASME)
  - External initiating events (ANS)
  - Low power and shutdown operation (ANS)
  - Internal fires (ANS)
- **Standards for level 2 and level 3 PRA (ANS) and an integrated level 1 PRA standard (ASME) are planned**

## STATUS OF ASME STANDARD



- **ASME: Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications (internal initiating events at full power) issued April, 2002, and Addendum A in December, 2003.**
- **Endorsed in Appendix A to RG 1.200**
- **Addendum B is anticipated to be available in July 2005, and will be endorsed in Rev 1 of RG 1.200**

# **STATUS OF INDUSTRY PEER REVIEW PROCESS**



- **NEI-00-02: PRA Peer Review Process Guidance, supported by “sub-tier criteria” and guidance for self assessment against the ASME Standard, submitted for NRC review in December, 2001**
- **Endorsed in Appendix B to RG 1.200**
- **Revision expected following issuance of Addendum B of ASME standard**

# STATUS AND SCOPE OF ANS STANDARDS



- **ANS: Standard for PRA for external hazards for plants at full power (seismic, wind, other) issued December 2003**
- **NRC position documented in draft Appendix C to RG 1.200**
- **Revision expected towards the end of 2005**
- **ANS: Standard for PRA for low power and shutdown modes of operation, expected late 2005**
- **ANS: Standard for PRA for internal fires, expected 2006**

# ASME PRA STANDARD FOR PRA FOR NPP APPLICATION



- **Provides a Standard for performing and using a PRA**
  - Definitions
  - Risk assessment application process
  - Risk assessment technical requirements
  - PRA configuration control
  - Peer review
- **The Standard is a “what to do” but not a “how to do” Standard – it does not prescribe specific methods or standard assumptions**
- **One objective of the peer review is to assess the appropriateness of significant assumptions**

# SRM ON PHASED APPROACH TO PRA QUALITY



- In December, 2003, the Commission issued an SRM entitled, **Stabilizing the PRA Quality Expectations and Requirements**
- **Directs the staff to develop an action plan to:**
  - Define a practical strategy for implementation of a phased approach to achieving PRA quality
  - Address the resolution of technical issues, such as:
    - Model uncertainty
    - Seismic and other external events
    - Human performance issues

## APPROACH IN THE SRM



- **Defines a phased approach to achieving an appropriate quality for licensee PRAs for NRC's risk-informed regulatory decision-making**
- **Allows continued practical use of risk insights while progressing towards more complete, and technically acceptable PRAs**

# THE PHASED APPROACH



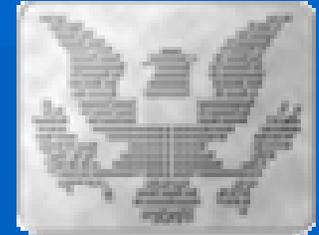
- The phases are differentiated by the availability of guidance documents for using PRA in regulatory applications, and for establishing that the PRAs are of sufficient quality. These include:
  - industry consensus standards
  - industry guidance documents
  - regulatory guides and other guidance documents (e.g., NUREGs)
- Staff guidance documents addressing performance of reviews are required for implementation.

# PHASE 1



- Phase 1 represents the status quo
- PRA quality judged only in the context of what is needed for the application - no requirement for the review of the base PRA
- All contributors to risk (operational modes and initiating event types) are considered
- Contributors to risk not in the scope of the PRA model are addressed in a number of ways including qualitative arguments, bounding analysis, and restricting the scope of application

## PHASE 2



- An application type (“issue-specific”) approach to PRA quality
- PRA quality demonstrated by comparison with an applicable consensus standard for those elements required by the application
- All contributors to risk (operational modes and initiating event types, internal, seismic, fire, etc.) are addressed
- All significant risk contributors applicable to the issue are included in the PRA scope
- Significance of a contributor is determined by whether taking it into consideration could change the decision substantially

## PHASE 2 (Cont'd)



- **To achieve Phase 2, guidance must exist for**
  - **Use of PRA in making the decision (e.g., regulatory guides), including definition of scope**
  - **Assessment of the quality of the base PRA for each scope item used to support the application (e.g., Standards, RG 1.200)**

## PHASE 3



- **Regulatory framework is in place that enables licensees to develop a base PRA to conform to all the existing Standards in sufficient depth to address all currently envisioned applications**
- **Phase 3 is scheduled to be completed by December 31, 2008**
  - **Consistent with schedule for Standards development**
- **A licensee enters Phase 3 when its base PRA conforms to all the existing Standards in sufficient depth to address all currently envisioned applications**

## **STAFF REVIEW OF BASE PRA**



- **Phase 1: currently at the discretion of the reviewer but after trial use completed, will rely on peer review in accordance with RG 1.200 with audit for each application**
- **Phase 2: reliance on RG 1.200 for all significant contributors**
- **Phase 3: as for Phase 2 but performed one time sufficient to address all applications**
- **Phase 4: staff review and approval of base PRA**

# RESOLUTION OF TECHNICAL ISSUES



- **Model uncertainty**
  - Guidance document (e.g., NUREG) being developed that addresses the issue of treatment of uncertainties (e.g., model) in both the PRA and in decision making
- **Seismic and other external events**
  - ANS standard on external events under staff review (preliminary staff position for public review and comment issued August 2004)
  - Above document (on uncertainties) also includes guidance for acceptable alternative methods (e.g., bounding, sensitivity analyses) to a PRA
- **Human performance issues**
  - NUREG 1792 on good HRA practices to supplement the PRA (HRA) standard issued for public review and comment