QUALITY OF PRA FOR REGULATORY DECISION-MAKING

WHAT DO WE MEAN BY QUALITY OF A PRA?

- Quality means different things to different people
  - Scope
  - Level of detail
  - Technical adequacy
- Shall use the definition that quality is conformance with requirements
  - The term ‘quality PRA’ is under defined
  - Application driven

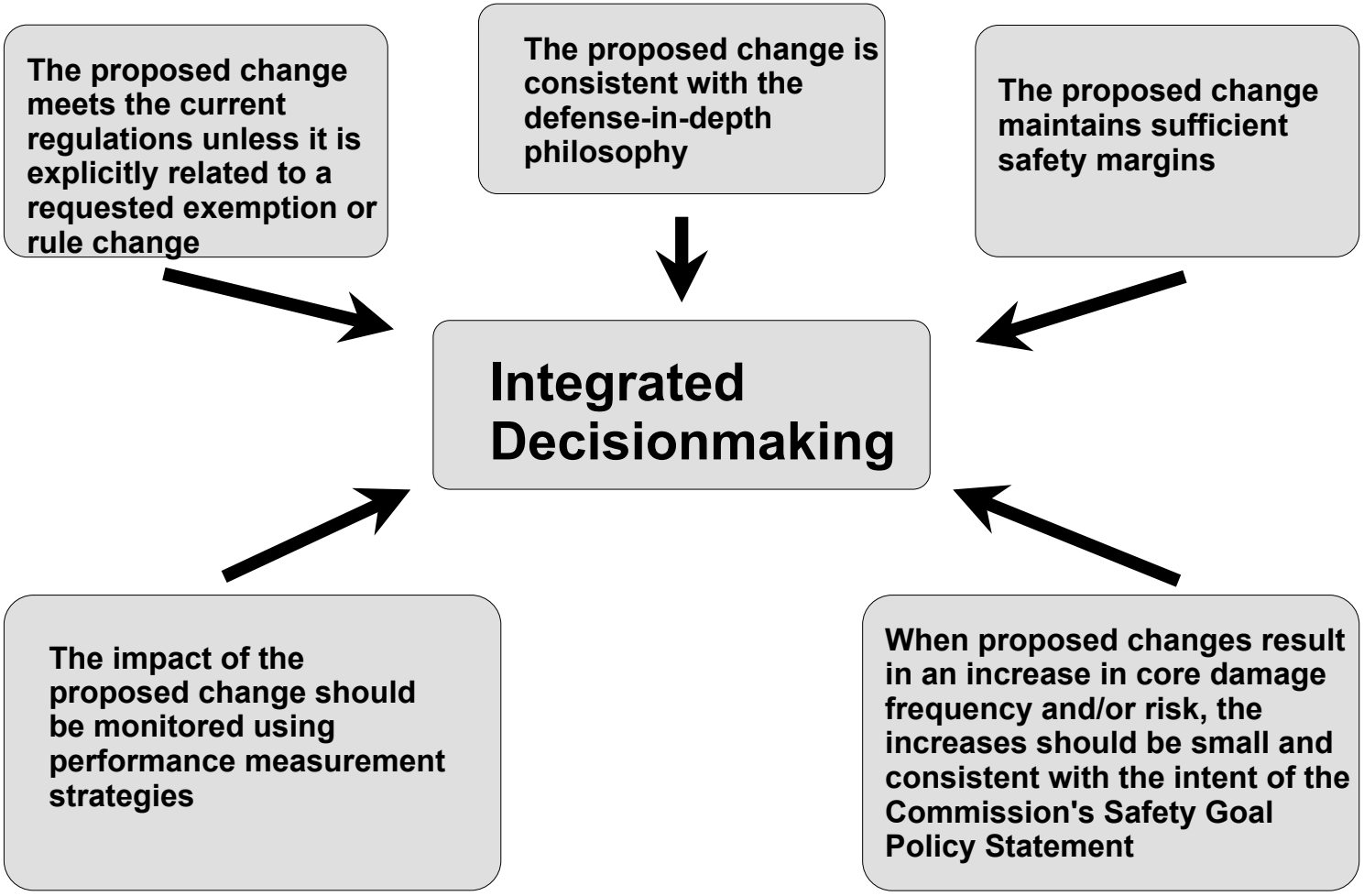
OUTLINE

- Use of risk assessments in regulatory applications
- Quality of PRA input to decision-making (SECY-00-0162)
- Status and plans for clarification of Staff position on use of PRA Standards (e.g., ASME) and industry peer review program (NEI-00-02)

USE OF RISK ASSESSMENT 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
- All contributors to risk are to be considered
- PRA analyses are one, but not the only, input to the decision

Principles of Risk-Informed Decisionmaking



ISSUES THAT IMPACT THE VALUE OF PRA INPUT

- Scope of PRA model (internal and external initiating events, operating modes)
- Technical adequacy of PRA model
- Treatment of uncertainty
  - Parameter (e.g., component failure probability, initiating event frequency) uncertainty
  - Model uncertainty (e.g., success criteria)
  - Completeness (e.g., missing initiating events or modes of operation, errors of commission)

QUALITY OF DECISION

- NRC's main concern is with the quality of the decisions made (SECY-00-0162)
- The quality of a PRA for a particular decision must be commensurate with the role the PRA plays in the decision
- Current guidance allows the use of approaches other than PRA (e.g., bounding analyses, qualitative arguments) to address missing scope items such as external events
- The expectation is that the use of non-PRA methods results in more conservative decisions with respect to relief for licensees

QUALITY OF PRA

- 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 plant specificity, level of detail, and scope of licensee PRAs varies widely
- Some NRC Staff review of the underlying PRA will generally be required
- 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

STATUS AND SCOPE OF STANDARDS AND RELATED DOCUMENTS

- ASME: Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications (internal initiating events at full power) issued April, 2002
- 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

STATUS AND SCOPE OF STANDARDS AND RELATED DOCUMENTS (Cont'd)

- ANS: Standard for PRA for external hazards for plants at full power (seismic, wind, other) expected to be issued late 2003
- ANS: Standard for PRA for low power and shutdown modes of operation, expected 2004
- ANS: Standard for PRA for internal fires, TBD

ASME PRA STANDARD FOR PRA FOR NPP APPLICATION

- Provides a Standard for performing and using a PRA
- The Standard is a “what to do” but not a “how to do” Standard – it does not prescribe specific methods or standard assumptions
- One requirement of the Standard is that a peer review be performed.
- One objective of the peer review is to assess the appropriateness of significant assumptions

NRC STAFF GUIDANCE ON USE OF STANDARDS

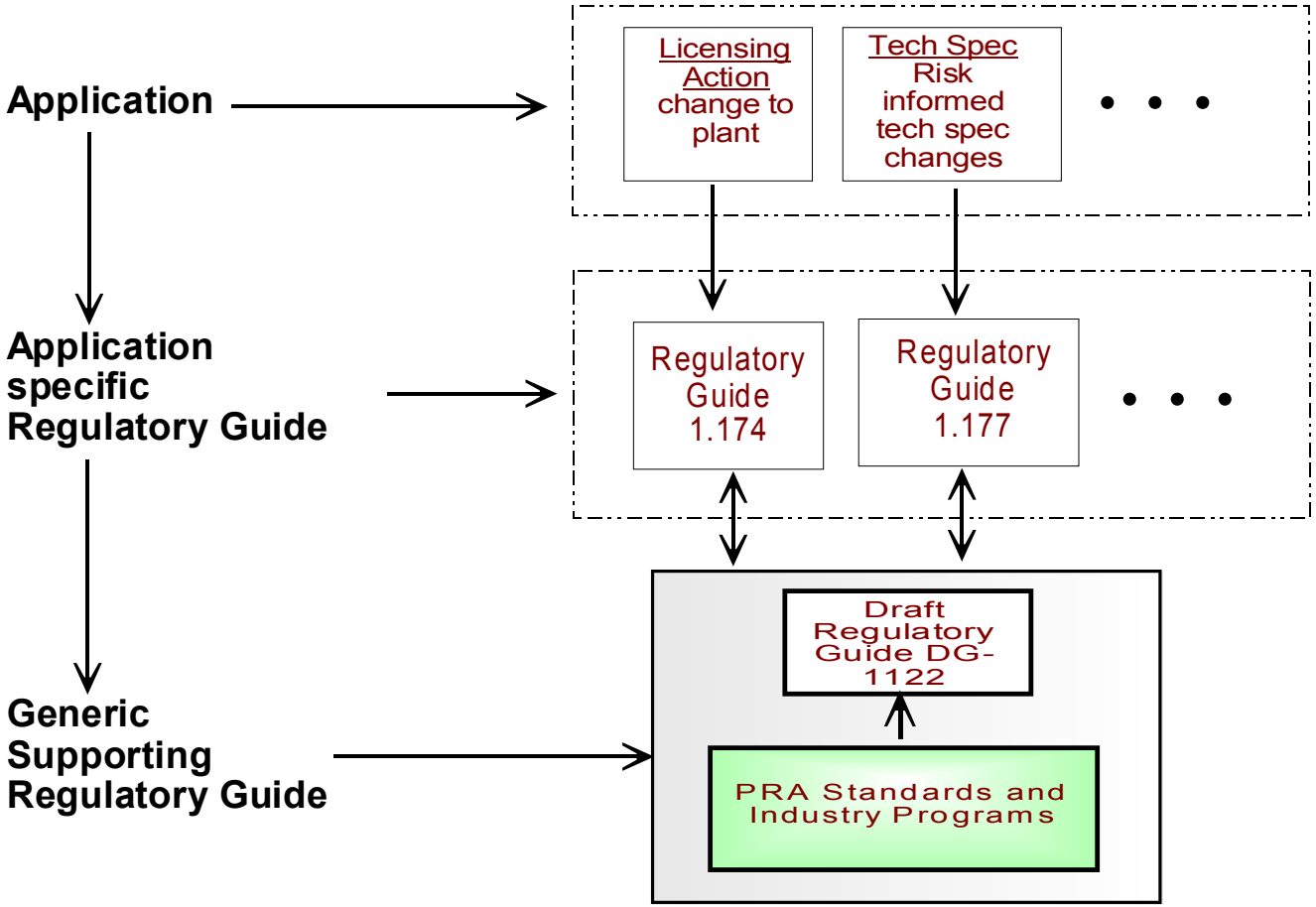
- NRC in November 2002 issued a draft regulatory guide, DG-1122 (and supporting SRP Chapter 19.1), independent of application, that provides “An Approach for Determining the Technical Adequacy of PRA Results for Risk-Informed Activities”.

REGULATORY GUIDE/SRP

- Main body of RG provides general guidance to licensees on how to use a standard (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 (currently only the ASME Standard and NEI-00-02)
- Staff review of base PRA will focus on those areas where alternatives to the Staff regulatory position are used

RELATIONSHIP OF RG TO OTHER REGULATORY DOCUMENTS

Examples:



USE OF DG-1122

- Standards do not prescribe methods
- Use of DG-1122 will assure that the underlying structure of the PRA model is appropriate
- Guidance for decision-making is found in other Regulatory Guides, and requires that the decision be tested for robustness against the key assumptions and uncertainties

STAFF REGULATORY POSITION ON ASME STANDARD

- Staff position on requirements of Standard characterized as:
  - No objection
  - No objection with clarification (requirements that are unclear or are ambiguous)
  - No objection subject to qualification (requirements for which the staff has a technical concern)
- The fraction of requirements for which there are clarifications or qualifications is relatively small

STAFF REGULATORY POSITION ON NEI-00-02

- NEI-00-02 describes a process for review
- It is supported by subtier criteria for allocation of grades for specific elements of PRA
- NRC staff has concerns with the subtier criteria particularly where they do not define minimum requirements for achieving a specific grade
- Most licensee PRAs have been reviewed in accordance with NEI-00-02
- NEI has performed a comparison of the subtier criteria of NEI-00-02 with ASME Standard, and prepared a process for licensee self assessment
- The Staff's final regulatory position is based on a review of these documents taken together

STATUS OF INDUSTRY PEER REVIEWS

- All but one of the PRAs have been reviewed following the NEI-00-02 process or its predecessor
- Only one (SONGS) used the ASME Standard
- Self assessment process of NEI-00-02 has yet to be tested
- Staff position in Appendix B of DG-1122 incorporates the staff position in Appendix A

CURRENT STATUS

Most comments on ASME standard have been accepted by ASME and will be included in an addendum, expected early fall

- Still some areas of disagreement
  - Quantitative definition of the terms significant (accident sequences, basic events), key (assumptions, sources of uncertainty)
  - Scope of peer review
- NRC will revise DG-1122 to reflect the changes and issue as a draft guide for trial use

CURRENT STATUS (Cont'd)

- The South Texas Project has indicated its intent to use DG-1122 in a pilot application, - a configuration risk management approach to the determination of technical specifications
- A recent trial application of the Standard as the basis for a peer review of the SONGS PRA highlighted several areas of clarification for the Standard, which will require to be addressed in future revisions of the ASME Standard and in DG-1122