

International Atomic Energy Agency



Risk-Informed Applications

- 1) Risk-Informed Technical Specification**
- 2) Justification for Continued Operation**
- 3) Special Treatment Requirements**

IAEA Expert Mission
Risk Management, Risk Monitor Development
and Risk-Informed Applications

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Presentation Outline

- ❖ Risk-Informed Technical Specification (RI-TS)
 - Example of Risk-Informed Technical Specification Change
- ❖ Justification for Continued Operation (JCO) ~ Notice of Enforcement Discretion (NOED) Process
- ❖ Special Treatment Requirements ~ 10 CFR 50.69

Risk-Informed Application I

Risk-Informed Technical Specification (RI-TS)

Risk-Informed Technical Specification (RI-TS)

- One of the most successful risk-informed applications in the US
- All licensees have implemented some aspect of RI-TS

Risk-Informed Technical Specification (RI-TS)

- General Philosophy: Apply risk insights from PSA to establish and manage plant operational limits and requirements
- Regulatory Guide 1.177 used in conjunction with Regulatory Guide 1.174 for NRC position on RI-TS programs
- Joint Industry/NRC initiatives to establish methods to apply PSA to Technical Specifications
- Benefits:
 - Improved safety focus on risk-significant items/issues
 - Flexibility/relaxation of requirements when appropriate

RI-TS Initiatives

- Initiative 1: Modified End States – justify remaining in a mode other than cold shutdown when equipment is inoperable
- Initiative 2: Missed Surveillance Test – justify additional time to complete a missed test
- Initiative 3: Modify existing mode restraint logic to allow entry into higher mode limiting conditions for operation (LCOs)
- Initiative 4a: TS Completion Time (CT) Extensions – justify extensions of selected system CTs
- Initiative 4b: Risk Managed TS – allow flexible CTs based on configuration-specific risk calculations and risk management actions using NRC approved methodology

RI-TS Initiatives

(Continued)

- Initiative 5: Extension of Surveillance Test Intervals - staff approved risk-informed methodology to allow licensee control of test intervals
- Initiative 6: Modification of LCO 3.0.3 (shutdown) – changes to required actions and times
- Initiative 7a: Snubbers - delay LCOs entry due to removal of snubbers for testing/maintenance
- Initiative 7b: Hazard Barriers - delay LCO entry due to removal of hazard barriers to support maintenance
- Initiative 8: Removal of non risk-significant LCOs from TS scope

Risk-Informed Technical Specifications

- Each initiative can involve some combination of:
 - Topical Report approving the generic change
 - Standard Technical Specification change proposal with a Technical Specification Task Force designator
 - Pilot plant submittal to test the change
 - A Consolidated Line Item Improvement Process (CLIP) package
 - Described in NRC Regulatory Issue Summary 2000-06, “Consolidated Line Item Improvement Process for Adopting Standard Technical Specifications Changes for Power Reactors,” for reviewing and implementing improvements to the Standard Technical Specifications

Risk-Informed Technical Specifications

~ Challenges

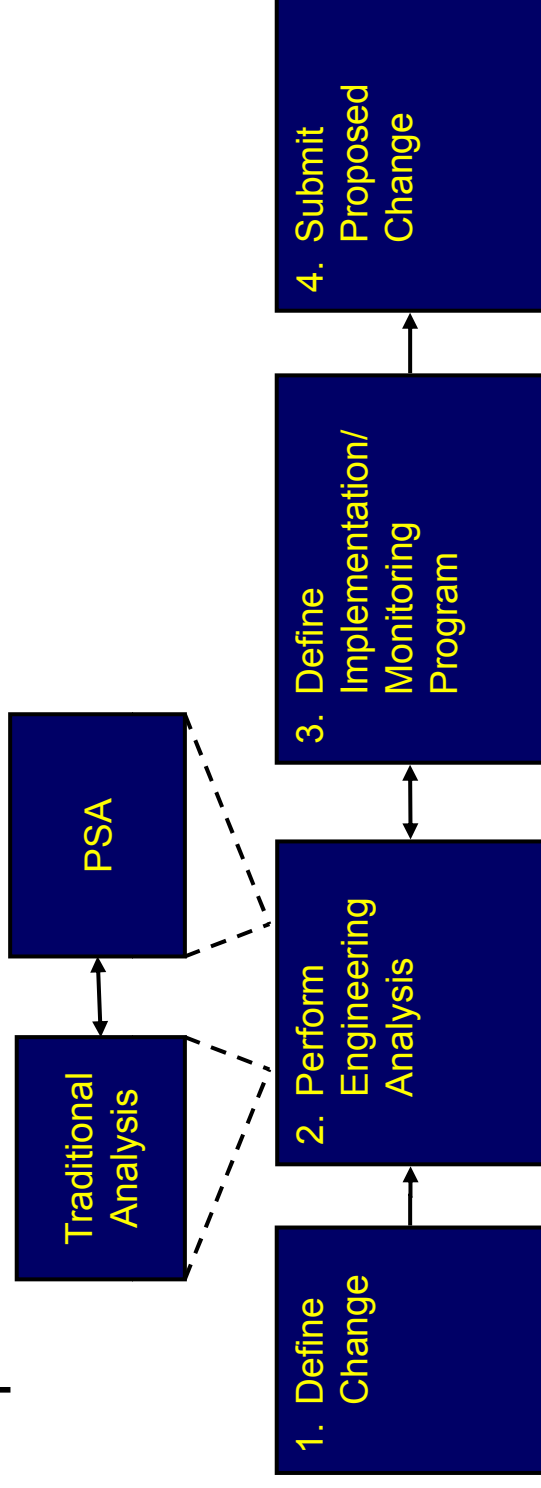
- Establishing the appropriate level of PSA quality to support each application
- Scope of PSA models needed for specific changes
 - e.g., lack of detailed fire models may make some applications not possible
- Addressing model assumptions and uncertainties

Example ~ Risk-Informed Technical Specification License Amendment Request

- Request: Extend the current Technical Specification (TS) emergency diesel generator (EDG) Completion Time (CT) from 3 days to 14 days
 - Allows extended maintenance at-power instead of during refueling outage
- Since submittal is a risk-informed license amendment, the licensee referenced:
 - RG 1.174, “An Approach for Using PRA in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis”
 - RG 1.177, “An Approach for Plant-Specific, Risk-Informed Decision making: Technical Specifications”

Example ~ Risk-Informed Technical Specification License Amendment Request

- Process for review of risk-informed license amendment requests:

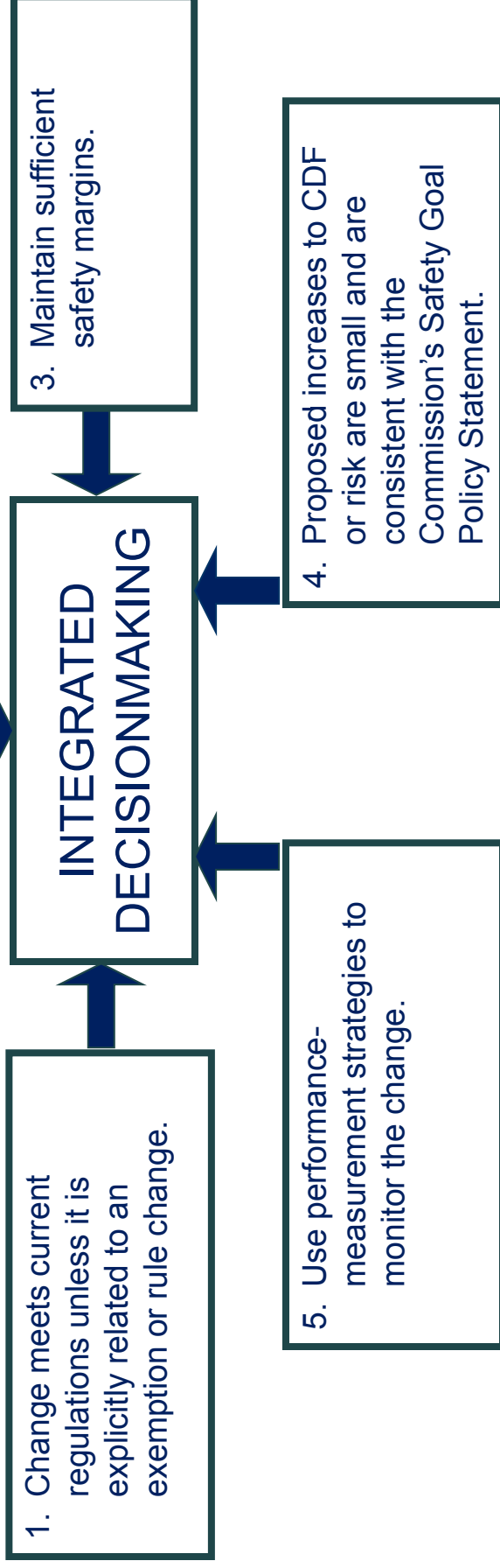


- Uses the 5 key principles
- Risk acceptance guidelines

* RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis"

Example ~ Risk-Informed Technical Specification License Amendment Request

5 Key Principles



Example ~ Risk-Informed Technical Specification License Amendment Request

- **Required information in licensee submittal**
 - 1) List of applicable regulations and how are the regulations being met
 - 2) Impact of the change on defense in depth
 - 3) Impact of the change on safety margins
 - 4) Risk assessment
 - 5) Performance measurement strategies
- **Deterministic analysts review items # 1, 2, 3, & 5**
- **PSA analysts review items # 4 & 5**

Example ~ Risk-Informed Technical Specification License Amendment Request

■ Part 1: Applicable Regulations

- Licensee confirmed that the change meets the applicable regulations:
 - General Design Criterion 17, Electric Power Systems
 - Onsite and offsite electric power systems will still provide capacity and capability to assure fuel and RCS design limits are not exceeded and vital functions are maintained
 - General Design Criterion 18, Inspection and Testing of Electric Power Systems will still be met
 - 10 CFR 50.63 – Station Blackout coping analysis not impacted
 - 10 CFR 50.65 – Will satisfy current Maintenance Rule reliability and availability goals

Example ~ Risk-Informed Technical Specification License Amendment Request

■ Part 2: Defense in Depth

- Licensee stated that there is no actual impact on defense in depth as a result of the change:
 - Fission product barriers not impacted
 - Equipment redundancy not impacted
 - Current license allows a period of time when the plant does not meet the single failure criterion
 - Requested change involves only the extension of the time period

Example ~ Risk-Informed Technical Specification License Amendment Request

■ Part 3: Safety Margins

- RG 1.177 states that sufficient safety margins are maintained when:
 - Applicable industry codes and standards are met
 - Safety analysis acceptance criteria in the UFSAR are met
- The licensee states that extending the EDG Completion Time (or Allowed Outage Time):
 - Does not modify or affect compliance with any industry standards
 - Does not reduce requirements for redundant equipment to be operable during the extended Completion Time
 - Sufficient redundancy will be maintained to ensure the accident analyses in the Updated FSAR remain valid

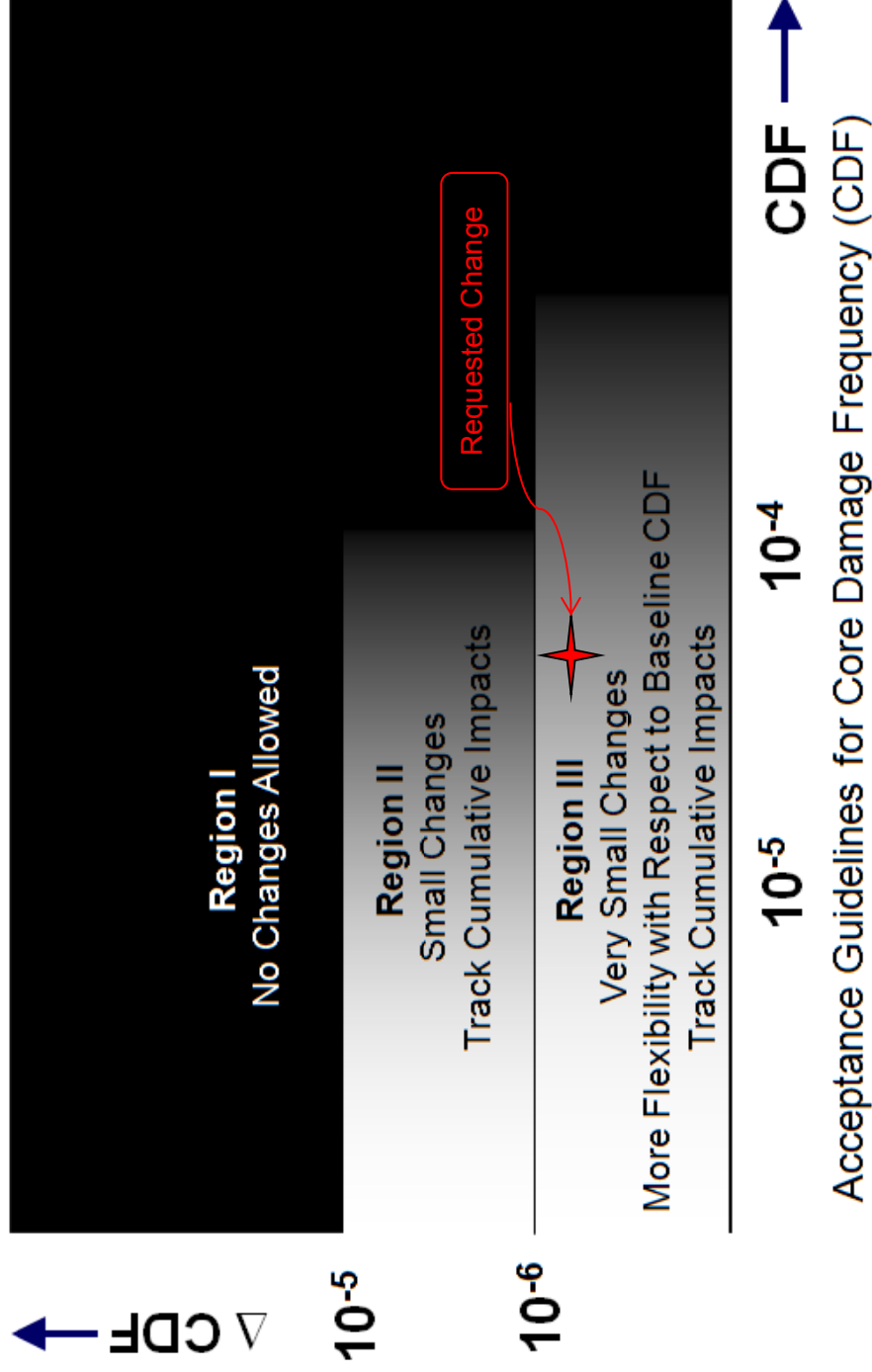
Example ~ Risk-Informed Technical Specification License Amendment Request

- **Part 4: Risk Assessment**
 - **RG 1.177 3-tier approach:**
 - Assess risk, both average and configuration-specific
 - Preclude potentially high-risk plant configurations
 - Have adequate programs/procedures in place to
 - identify risk-significant plant configurations resulting from maintenance or other operational activities
 - take appropriate compensatory measures to avoid such configurations

Example ~ Risk-Informed Technical Specification License Amendment Request

- Part 4, Tier 1 – Assess Risk
 - Technical adequacy of the PSA used for this request
 - Model scope
 - Industry peer review
 - Conformance to RG 1.200
 - Evaluation of the PSA results and risk insights for this request
 - Compare impact on risk to acceptance guidelines of RG 1.174 and RG 1.177 since this is a TS change

Example ~ Risk-Informed Technical Specification License Amendment Request



Example ~ Risk-Informed Technical Specification License Amendment Request

- **Part 4, Tier 2 – High Risk Configurations**
 - Licensee identified, up-front, potentially high-risk plant configurations or activities when the proposed CT is entered
 - Licensee imposed appropriate restrictions on these configurations or activities associated with the CT extension are in place

Example ~ Risk-Informed Technical Specification License Amendment Request

- Part 4, Tier 3 – Risk Management Program
 - The licensee stated that its Maintenance Rule (a)(4) program satisfies the intent of Tier 3 because the licensee:
 - Assesses and manages risk of equipment removed from service prior to or during the proposed extended AOT period
 - Identifies risk-significant plant configurations resulting from maintenance or other operational activities
 - Takes appropriate compensatory measures
 - Reviewers must determine whether the (a)(4) program meets the intent of RG 1.177 Tier 3

Example ~ Risk-Informed Technical Specification License Amendment Request

- **Part 5: Performance Measurement**
 - The licensee should ensure that when equipment does not meet its performance criteria, the evaluation required under the Maintenance Rule (MR) includes prior related TS changes in its scope
 - Licensee stated that:
 - The EDGs are monitored under the MR program in accordance with 10 CFR 50.65
 - EDGs are currently designated “category (a)(2) – meeting established reliability and unavailability goals”

Example ~ Risk-Informed Technical Specification License Amendment Request

- **Outcome**
 - License amendment issued
 - **Safety Evaluation excerpt:**
 - “The NRC staff finds that the licensee’s proposed change to revise the TS to permit extending the CT from 3 days to 14 days for an inoperable EDG is acceptable because the five key principles of risk-informed decision making identified in RG 1.174 and RG 1.177 have been satisfied.”

Risk-Informed Application II

Justification for Continued
Operation (JCO)
~ Notice of Enforcement
Discretion (NOED) Process

Justification for Continued Operation (JCO)

~ Notice of Enforcement Discretion (NOED) Process

- Licensee Requests Regulatory Action When:
 - Circumstances where compliance with a Technical Specification (TS), or other requirement, would result in inappropriate plant conditions that could affect the health and safety of the public
- The NRC staff determines whether to allow the licensee to violate the TS without issuing a violation for violating the TS via one of two ways:
 - Emergency amendment
 - **Notice of Enforcement Discretion (NOED)**

Notice of Enforcement Discretion (NOED)

~ What is it?

- NRC is exercising its discretion to NOT enforce compliance with the operating license for a specified time period
 - To promote safety by not imposing unnecessary transients or shutdowns of an operating reactor or unnecessary delays in plant startups without a corresponding health and safety benefit
- NOEDs are not appropriate for non-conformances with regulations, Updated Final Safety Analysis Reports (UFSARs), or codes.
- NOED is for temporary and nonrecurring request - it should not be used on a regular basis as a substitute for compliance

Notice of Enforcement Discretion (NOED)

~ What types of NOEDs?

- Regular NOED
 - Situations involving radiological safety
 - Applicable for plants at power, in shutdown, or attempting to start up
- Natural Event NOED
 - Severe weather
 - Electrical grid instability
 - Pandemic conditions
 - Other natural phenomena
 - Public emergencies unrelated to natural events

Notice of Enforcement Discretion (NOED)

~ Implementation Process

- NRC Inspection Manual Chapter 0410, “Notices of Enforcement Discretion,” March 2013.
- NOED Process
 - Communication between licensee and NRC staff
 - Informal discussions for information gathering and understanding of the situation
 - Formal discussion to hear technical bases to support the regulatory decision making
 - Process Considerations
 - Used when less than 72 hours until the TS requirements requires a shutdown
 - Licensee may NOT wait until the last minute so that they can avoid a license amendment
 - NOT allowed for planned entries into TS Required Actions to perform maintenance, troubleshooting, or other activities

Notice of Enforcement Discretion (NOED)

~ Risk-Informed Basis for Approval

- Demonstrate “no net increase in risk,” either in a quantitative assessment , or in a defensible qualitative manner
 - Numerical goals of 5E-7 and 5E-8 for ICCDP and ICLERP respectively (per RG 1.177), using zero maintenance baseline PSA model
 - Dominant contributors with summary of risk insights
 - Compensatory measures credits (quantitative & qualitative) with focus on:
 - Initiating events likelihood
 - Unavailability of redundant trains
 - Human error
 - Extent of condition review and common cause factors adjustments
 - External event risk contributions (e.g., severe weather, grid stability, etc.)

Risk-Informed Application III

Special Treatment Requirements

~ 10 CFR 50.69

10 CFR 50.69

~ Background

- **10 CFR 50.69 is a voluntary alternative regulation:**
 - To risk-inform the scope of special treatment requirements (“assurance requirements”)
 - Not changing design basis or technical functional requirements
 - Enable NRC and licensee to better focus resources on regulatory issues of greater safety significance, while continuing to provide reasonable assurance of adequate protection to public health and safety

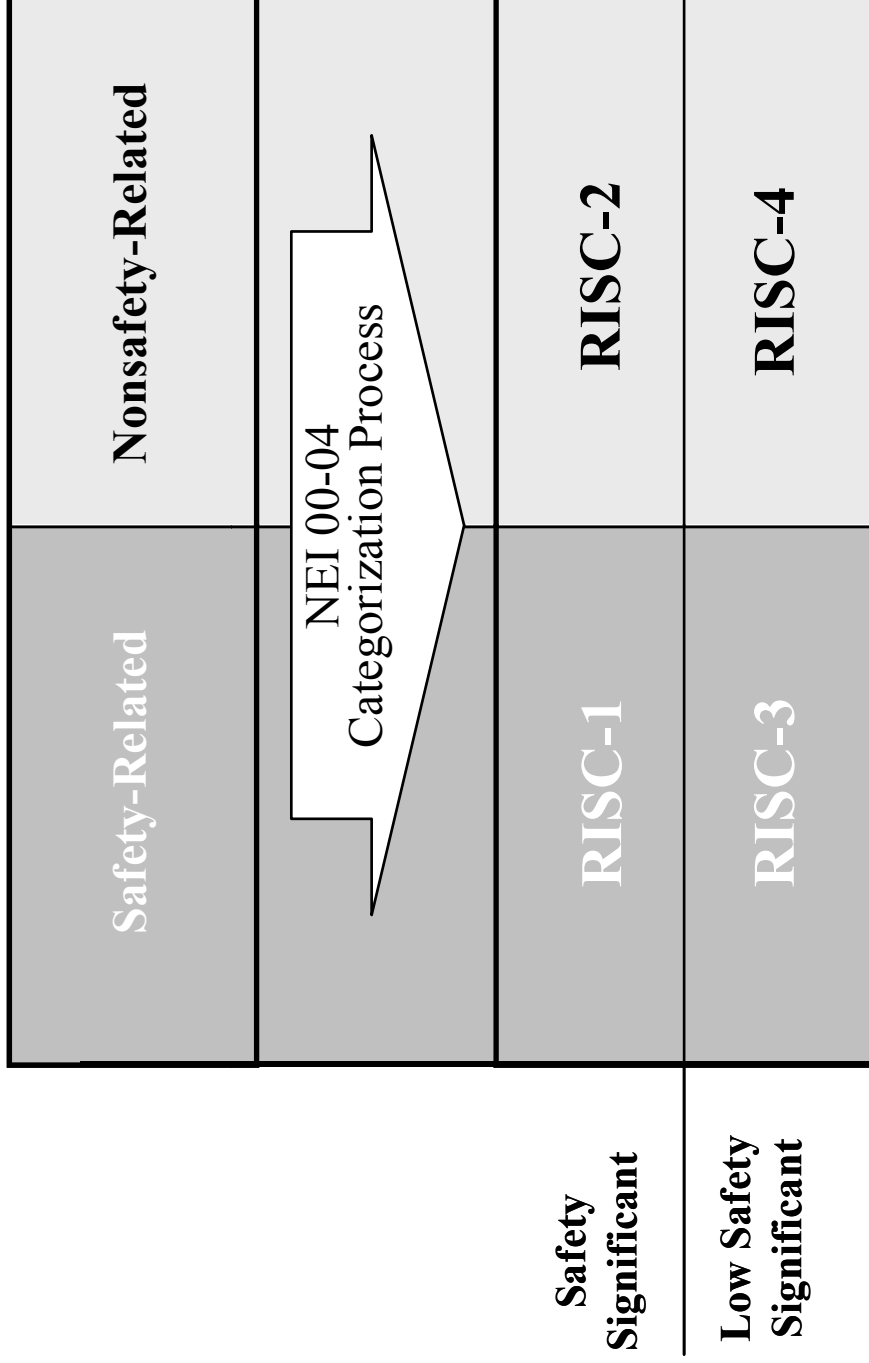
- **Basic structure of section 50.69:**
 - Built around categorization (paragraph (c)), which includes:
 - Internal events PSA at full power that has been peer reviewed
 - Expert panel (Integrated Decision-making Panel)
 - Apply treatment requirements (paragraph (d)) as a function of RISC bin
 - Implemented via license amendment with NRC staff reviews/approves categorization process

10 CFR 50.69

~ Status

- **10 CFR 50.69 published in Federal Register on November 22, 2004 (69 FR 68008)**
- **Implementation Guidance:**
 - NEI 00-04, Revision 0 dated July 2005
 - Regulatory Guide 1.201, Revision 1, issued for trial use in May 2006
 - Endorses NEI 00-04, Revision 0, with a number of clarifications, as an acceptable approach for categorizing SSCs for 10 CFR 50.69

Risk Categorization Process



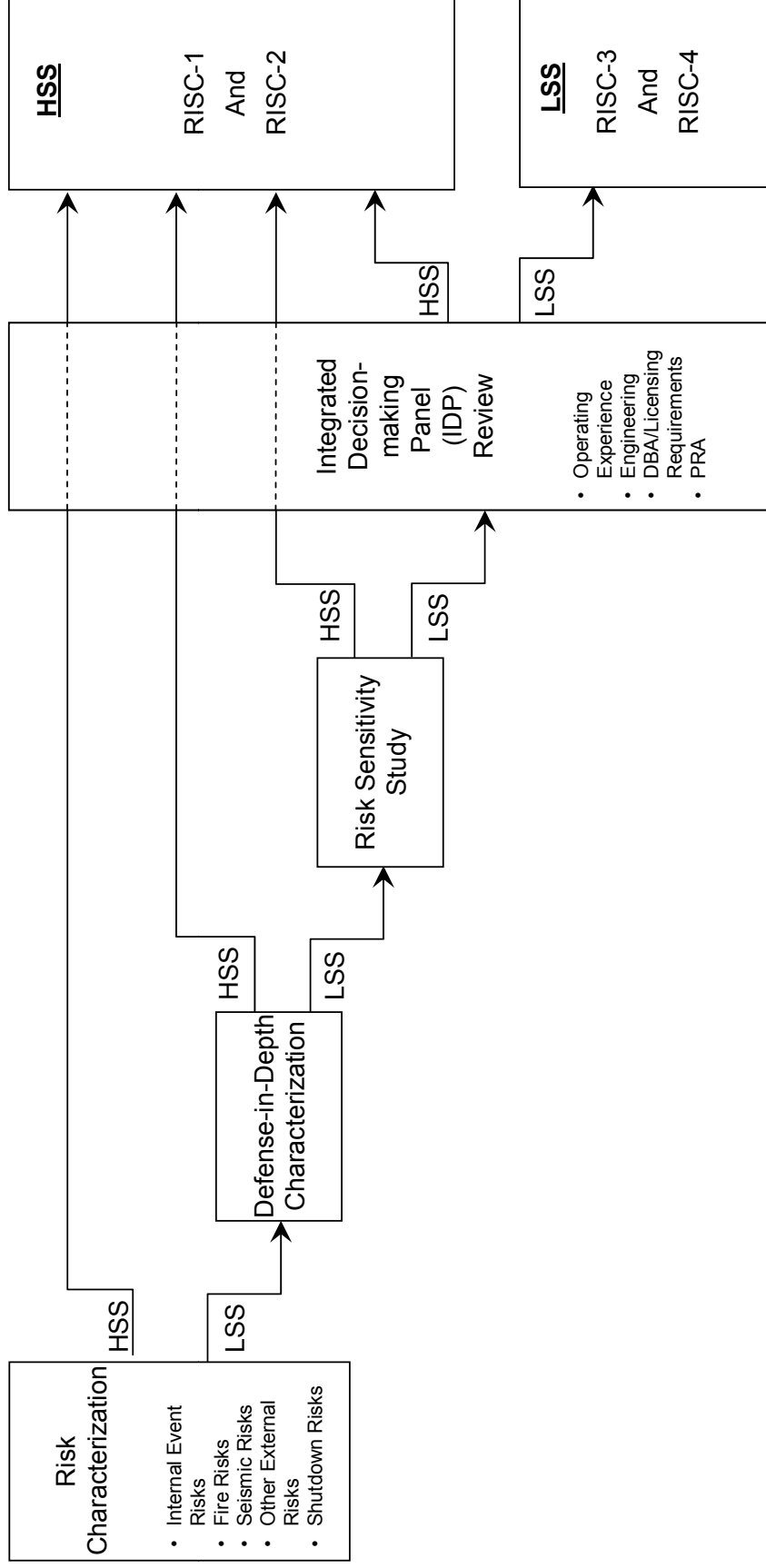
RG 1.201

General Staff Positions

- **Entire process described in NEI 00-04 is integral to providing reasonable confidence required by 10 CFR 50.69**
 - Sections 2 -7 & 10 describe the process used to determine the set of LSS SSCs
 - Section 8 describes the risk sensitivity evaluation used to confirm acceptably small risk impact from removal of special treatment
 - Section 9 describes the IDP function of reviewing and ensuring system functions and operating experience are considered
 - Sections 11 & 12 describe the processes for maintaining the validity of the categorization process

- **Degree of relief gained under 10 CFR 50.69 depends on the types of analyses used in the categorization process**

Risk Categorizations Considerations



RG 1.201

General Staff Positions

- **Technical adequacy needs to be addressed for full scope of the analysis (i.e., all modes & initiators)**
 - Only internal events at full power must use a PSA
 - Only endorsed PSA Standard is for internal events at full power
 - Must justify methods are technically adequate for this application
- **Mechanisms that could cause large risk increases that could potentially invalidate the assumptions underlying the categorization process would have to involve the emergence of extensive common cause failures and significant unmitigated degradation**
 - Approach relies on corrective action and feedback processes (described in NEI 00-04 Section 12.4) for addressing these issues and precluding reaching unacceptable SSC performance

RG 1.201

General Staff Positions

- **10 specific clarifications are presented**
 - Clarification of terminology
 - “important to safety,” “simultaneous”
 - Clarifying staff understanding of specific intent of NEI 00-04 discussion
 - Process “blends risk insights, new technical information, and operational feedback”
 - Recognizing alternative approaches can be proposed for specific NEI 00-04 areas
 - ASME Code Case N-660
 - Identifies need for license condition to address the methods relied upon for the categorization process

RG 1.201 Implementation Schedule

- **Trial application being performed**
- **Lessons learned from pilots will be used to:**
 - Support development of template of information and level of detail needed to support future 10 CFR 50.69 submittals
 - Ensure final guidance is sufficient to remove regulatory uncertainties and establish regulatory stability in the review, approval, and implementation of 10 CFR 50.69 categorization process
 - Enhance NEI 00-04 and RG 1.201 regulatory guidance

The End

Questions & Answers.....