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PRA Configuration Control Workshop

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U.S.NRC
United States Nuclear Regulatory Commission
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Purpose

- Discuss Safety Enhancement to Reactor Oversight Process (ROP) baseline inspection program.
- Discuss Potential Gaps with ROP PRA Configuration Control Oversight in the baseline inspection program.
- Discuss Proposed PRA Acceptability Framework.
- Obtain feedback and comments.

Agenda

- Key Messages & Background:
  - ROP Safety Enhancement
  - PRA Configuration Control Oversight Gap
  - PRA Acceptability:
    - Licensing
    - Oversight
  - Proposed PRA Acceptability Framework
    - Tiered Approach Concept for Future Oversight of PRA Risk-Informed Programs & PRA Configuration Control
    - PRA Configuration Control Inspection Guidance Concept
    - Information Gathering & Guidance Development Effort
- PRA Configuration Control Workshop

Key Messages

- NRC believes the existing oversight process is adequate to ensure implementation of programs informed by PRA models.
- However, we believe that there is a current gap in the oversight of PRA Configuration Control programs.
- Focused inspections/safety enhancement within existing ROP baseline inspection program of PRA changes and upgrades are being proposed to monitor continued acceptability through configuration control programs of licensees PRA models that support risk-informed decision-making.
- PRA Acceptability framework will be informed by interactions with industry and the public through multiple public meetings and the information gathering and guidance development efforts.

Safety Enhancement ROP 10 CFR 50.69

- Ensure appropriate application of risk for decision-making:
  - 10 CFR 50.69: Potential misclassification of safety-related/risk-significant components.
    - Categorization Process per NEI 00-04, “10 CFR 50.69 SSC Categorization Guideline:”
      - Risk Characterization
      - Defense-in-Depth
      - Risk Sensitivity Study
      - Integrated Decision-making Panel (IDP)
    - NEI 00-04, Section 1.5, “Categorization Process Summary,” Conclusion, states: “In terms of the scope of the PRA used in risk assessment portion of the categorization process, a reasonable degree of confidence that *risk significant SSCs will be appropriately identified* can be maintained *with a quality internal events at power PRA*.”

Safety Enhancement ROP 10 CFR 50.69

- PRA Configuration Control Requirements:
  - 10 CFR 50.69(e)(1): RISC-1, RISC-2, RISC-3 and RISC-4 SSCs. The licensee shall review *changes to the plant, operational practices, applicable plant and industry operational experience*, and as appropriate, *update the PRA and SSC categorization and treatment process*. The licensee shall perform this review in a timely manner but no longer than once every two refueling outages.
  - RG 1.200 Risk-Informed Application - ASME/ANS PRA Standard licensed self-imposed standard.
- Performance Monitoring Requirements:
  - 10 CFR 50.69(e)(2): RISC-1 and RISC-2 SSCs. The licensee shall *monitor the performance* of RISC-1 and RISC-2 SSCs. The licensee shall make adjustments as necessary to the categorization process so that the categorization process results are maintained valid.
  - 10 CFR 50.69(e)(3): RISC-3 SSCs. The licensee shall consider data collected in 50.69(d)(2)(i) for RISC-3 SSCs to *determine* if there are any *adverse changes in performance* such that the SSC unreliability values approach or exceed the values used in the evaluations conducted to satisfy 50.69(c)(1)(iv). The licensee shall *make adjustments* as necessary to *the categorization or treatment processes* so that the categorization process and results remain valid.

Safety Enhancement ROP RICT

- RICT: Potential for miscalculation of LCO completion times and mismanagement of RMAs.
  - Technical Specifications Task Force (TSTF) – 505, “Provide Risk-Informed Extended Completion Times,” Revision 2:
    - ADMIN Technical Specification (TS) Section:
      - This program provides controls to calculate Risk Informed Completion Time (RICT) and must be implemented in accordance with NEI 06-09-A, Revision 0, “Risk-Managed Technical Specifications (RMTS) Guidelines.”
  - NEI 06-09-A, Rev 0, Section 2.1, Applicability, states: “A RMTS is designed to apply the *risk insights* and results obtained *from a plant PRA* to *identify* appropriate *Technical Specifications completion times* (CTs) and appropriate *compensatory risk management actions* associated with plant SSCs that are inoperable.”

Safety Enhancement ROP RICT

- PRA Configuration Control requirements:
  - TSTF 505 Admin TS 5.5.XX.e, states in part: “The plant PRA shall be based on the as-built, as-operated and maintained plant; and reflect the operating experience at the plant, as specified in RG 1.200, Revision 2.”
  - RG 1.200 risk-informed application – ASME/ANS PRA Standard licensed self-imposed standard.

Safety Enhancement ROP SFCP

- SFCP: Potential for inappropriate changes to surveillance frequencies.
  - TSTF 425, “Relocate Surveillance Frequencies to Licensee Control,” Revision 3:
    - ADMIN TS Section:
      - Changes to the Frequencies listed in the Surveillance Frequency Control Program shall be made in accordance with NEI 04-10, “Risk-Informed Method for Control of Surveillance Frequencies,” Revision 1.
  - NEI 04-10, Revision 1, SFCP, 20 step process. Pertinent steps:
    - RG 1.200 PRA Technical Adequacy
    - Associated Surveillance Test Interval (STI) SSC Modeled in PRA
    - Cumulative Effect CDF & LERF
    - Perform Sensitivity Studies
    - Independent Decision-making Panel (IDP)
    - Monitoring & Feedback
    - Periodic Re-assessment

Safety Enhancement ROP SFCP

- PRA Configuration Control Requirement:
  - NEI 04-10, Revision 1, requires PRA technical adequacy to be addressed through RG 1.200, Rev 1.
  - RG 1.200 risk-informed application – ASME/ANS PRA Standard licensed self-imposed standard.

Safety Enhancement ROP NFPA 805

- NFPA 805: Potential to change Fire Protection Programs without NRC's review.
  - 10 CFR 50.48(c), National Fire Protection Association Standard NFPA 805.
    - 10 CFR 50.48(c)(1), incorporates by reference NFPA 805.
  - NFPA 805, Section 2.4.4, Plant Change Evaluation:
    - Integrated assessment of the acceptability of risk
    - Defense-in-depth
    - Safety margins

Safety Enhancement ROP NFPA 805

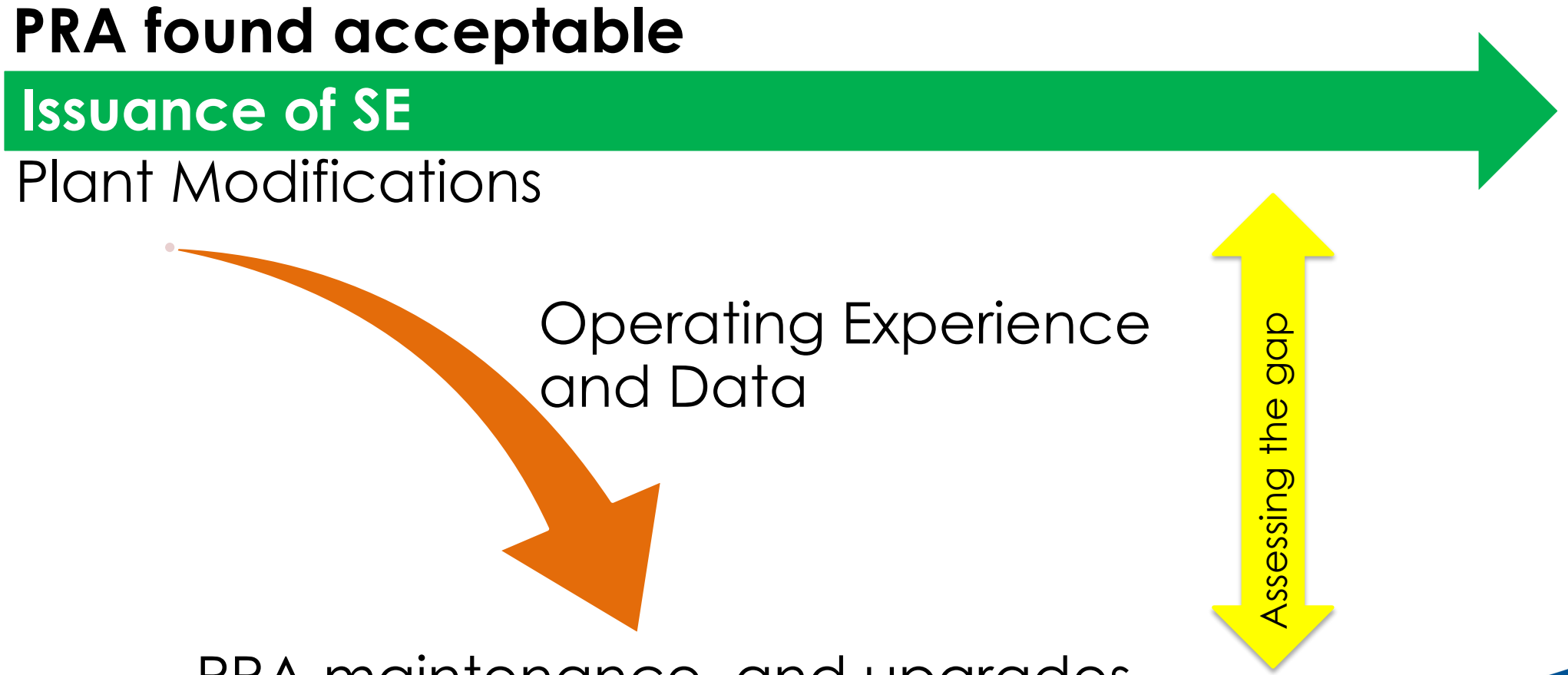
- PRA Configuration Control Requirements:
  - License condition: Changes to the fire protection program without NRC approval based *on risk assessments that are based on the as-built, as-operated, and maintained plant, and reflect the operating experience of the plant*.
  - NFPA 805, Section 2.4.3.3, states: " The PSA approach, method, and data shall be acceptable to the authority having jurisdiction (AHJ - NRC). They shall be appropriate for the nature and scope of the change being evaluated, be based on the as-built and as-operated and maintaining plant, and reflect the operating experience at the plant."
  - RG 1.200 risk-informed application – ASME/ANS PRA Standard licensed self-imposed standard.

Safety Enhancement ROP

- Conclusion:
  - Oversight of PRA conf controls ensures that the models used reflect the as built as operated plant and the changes made to the model are completed IAW approved endorsed PRA consensus standard. Inappropriate configuration controls can factor to erroneous decisions due to the leveraging of PRAs for use in the below areas:
    - Classification of SSCs
    - LCO Completion Times
    - Surveillance Frequencies
    - Fire Protection Programs
    - 10 CFR 50.65(a)(4)
  - ROP cornerstones of safety impacted by risk-informed programs:
    - Initiating Events: To limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. RICT, SFCP, NFPA 805, 10 CFR 50.69.
    - Mitigating Systems: To ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). RICT, SFCP, NFPA 805, 10 CFR 50.69.
    - Barrier Integrity: To provide reasonable assurance that physical design barriers (fuel cladding, reactor coolant system, and containment) protect the public from radionuclide releases caused by accidents or events. RICT, SCFP NFPA 805, 10 CFR 50.69.

PRA Configuration Control Oversight Gap Analysis

PRA Configuration Control Oversight Gap



ROP Baseline PRA Conf. Control Oversight Gap Analysis

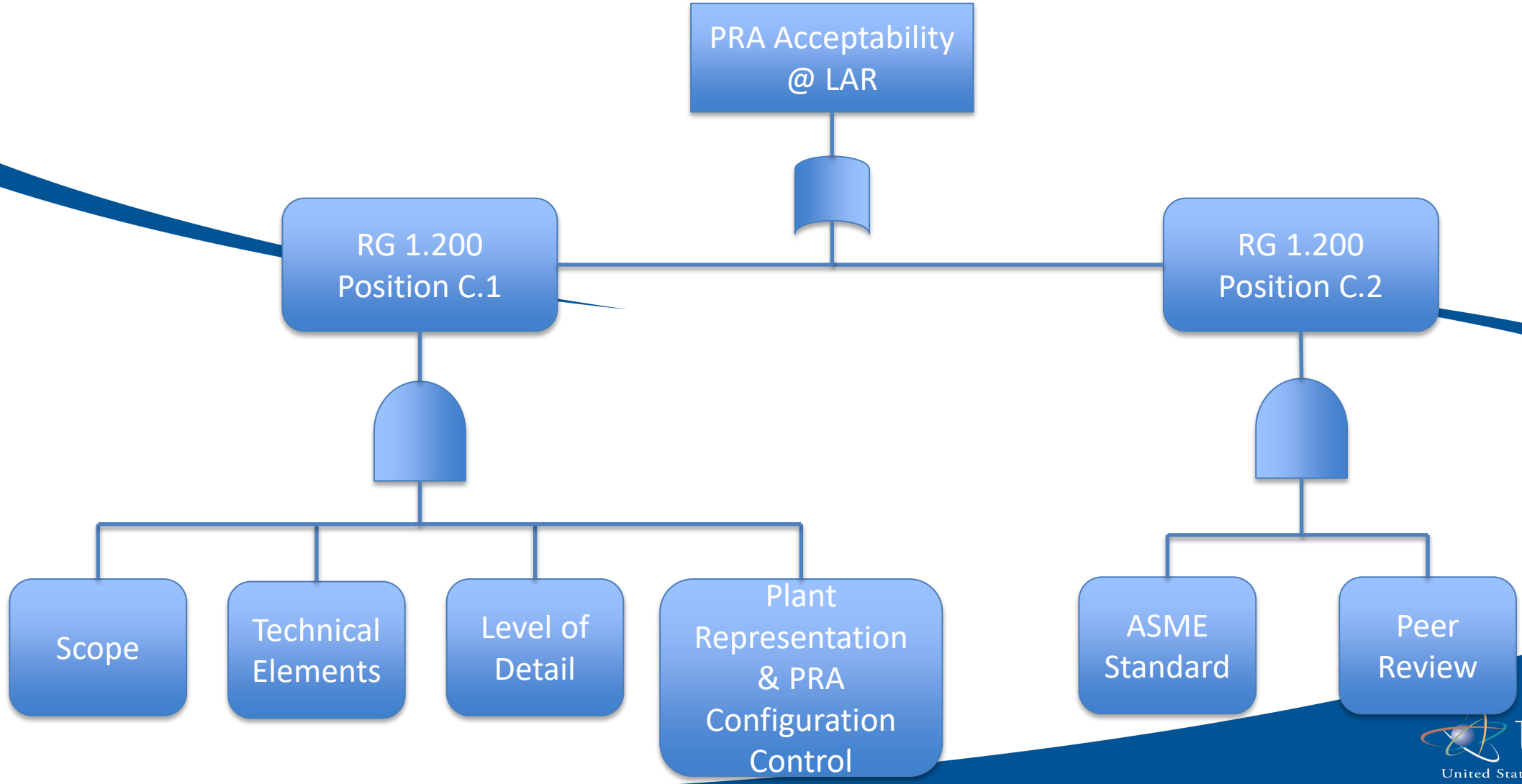
- Baseline Risk-Informed Programs Implementation Procedures:
  - IP 71111.05, Fire Protection: NFPA 805
  - IP 71111.12, Maintenance Effectiveness: 10 CFR 50.69
  - IP 71111.13, Maintenance Risk Assessment and Emergent Work Control: RICT
  - IP 71111.18, Plant Modifications: 10 CFR 50.69/SFCP/RICT
  - IP 71111.21N.05, Fire Protection Teams: NFPA 805
  - IP 71111.22, Surveillance Testing: SFCP

ROP Baseline PRA Conf. Control Oversight Gap Analysis Conclusion

- ROP Risk-Informed Programs IPs:
  - Verify implementation.
  - Do not verify technical adequacy and plant representation of PRA Hazard Group Models approved for risk-informed programs.
- Proposed PRA Acceptability Framework intends to close this oversight gap and establish a long-term regulatory footprint.

PRA Acceptability Licensing

PRA Acceptability RG 1.200 Rev 3



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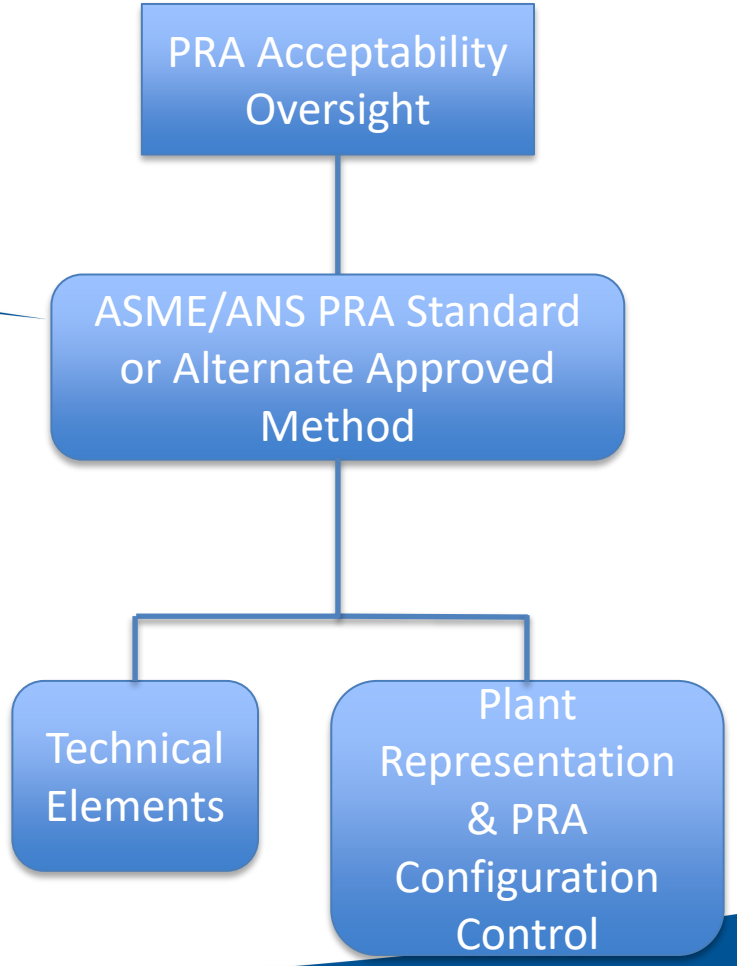
PRA Acceptability Oversight

PRA Acceptability Oversight

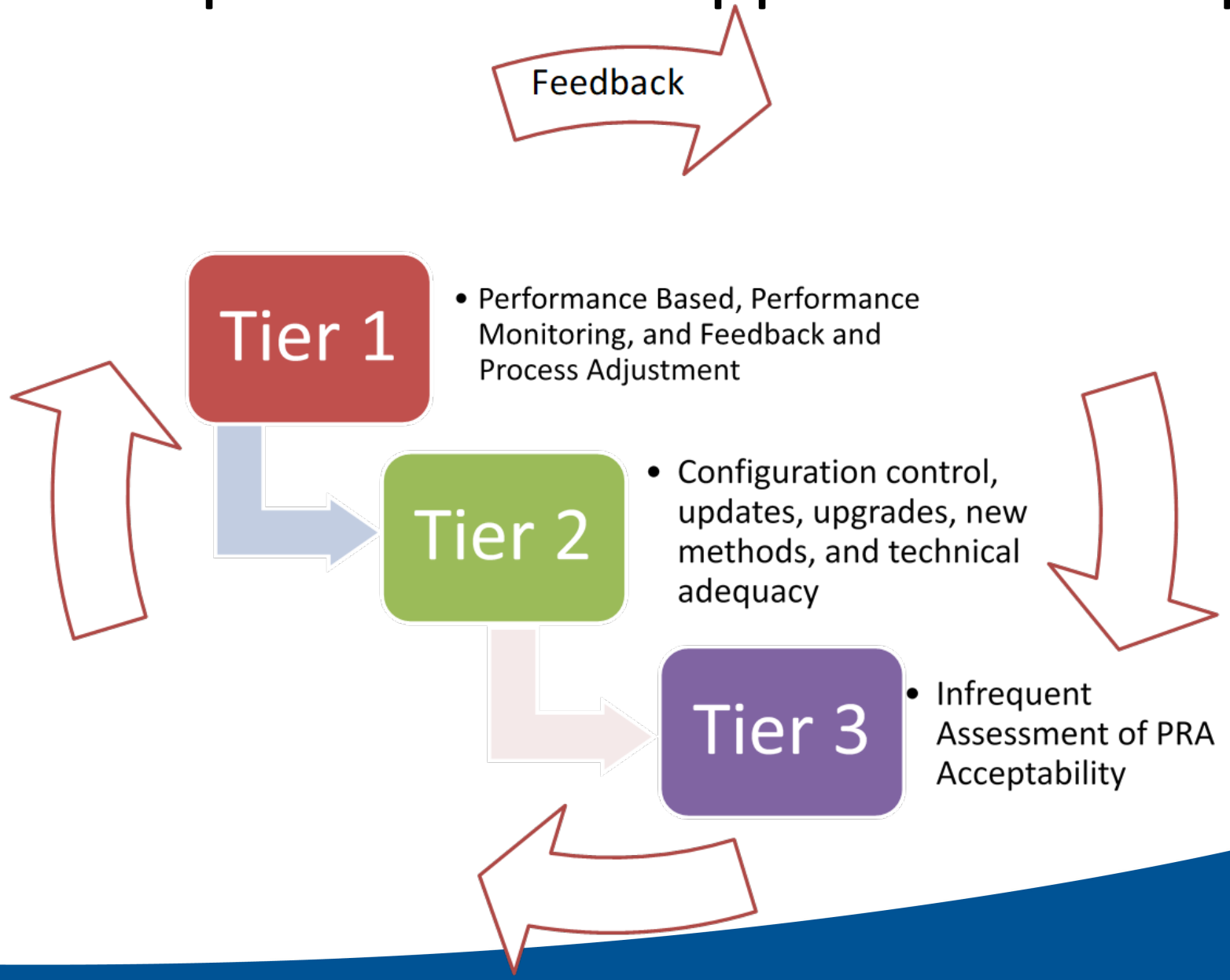


PRA Acceptability Framework

PRA Acceptability Framework

- Purpose:
  - Future oversight of risk-informed programs by establishing a regulatory footprint associated with PRA configuration controls.
- Objectives
  - Oversight tiered approach concept
  - PRA configuration control inspection guidance
  - Information gathering & guidance development

Proposed Tiered Approach Concept



PRA Configuration Control Guidance Concept

- RG 1.200 Technical Characteristics & Attributes – PRA Configuration Control:
  - Monitor PRA inputs and collect new information: Inputs monitoring & new information collection.
  - Identify when the PRA model should be updated based on new information or new models, techniques, and tools: PRA maintenance & upgrades.
  - Ensure cumulative impact of pending plant changes are considered: PRA pending changes cumulative impact.
  - Maintain configuration control of computer codes: PRA computer codes configuration control

PRA Configuration Control Guidance Concept

- Inputs monitoring & new information collection:
  - Monitored inputs and information for changes:
    - Design
    - Operations
    - Maintenance
    - Engineering
    - Industry and plant operating experience
    - Technology, methods or techniques, and tools
  - Independent verification of risk-significant inputs.

PRA Configuration Control Guidance Concept

- PRA Maintenance & Upgrades:
  - Identify the need to update the PRA based on new information, new models, techniques, and tools.
  - Plant Representation & Technical Elements Analysis for Approved Hazard group(s):
    - Review need for update evaluations for sampled input changes.
      - Industry Operating Experience (e.g., Open Phase Condition (OPC))
    - Review evaluations performed for PRA maintenance to the model of record (MOR).
      - Newly Developed Methods
    - Review PRA maintenance evaluations for potential risk-significant inputs missed.
    - Verify PRA maintenance to the MOR do not meet upgrade definition.

PRA Configuration Control Guidance Concept

- PRA Pending Changes Cumulative Impact
  - Ensure cumulative impact of pending plant changes are considered.
  - Review implementation of process for sampled items or risk-informed applications license amendment request.
- PRA Computer Code Configuration Control
  - Maintain configuration control of computer codes.
  - Review implementation of computer code configuration control.

Information Gathering & Guidance Development Effort – Why?

- Lack of familiarization with licensee's configuration control programs and technical element notebooks.
- Unknowns:
  - Inspection level of effort
  - Inspection technical knowledge, training and qualifications
  - Stand alone or revision
  - Implementation of configuration control programs
  - PRA maintenance drivers

Information Gathering & Guidance Development Effort - Scope

- Inform the Proposed PRA Acceptability Framework in the following areas:
  - PRA Configuration Control Inspection
    - Inspection guidance
    - Level of effort
    - Sample selection
  - Applicable inspection tiered approach

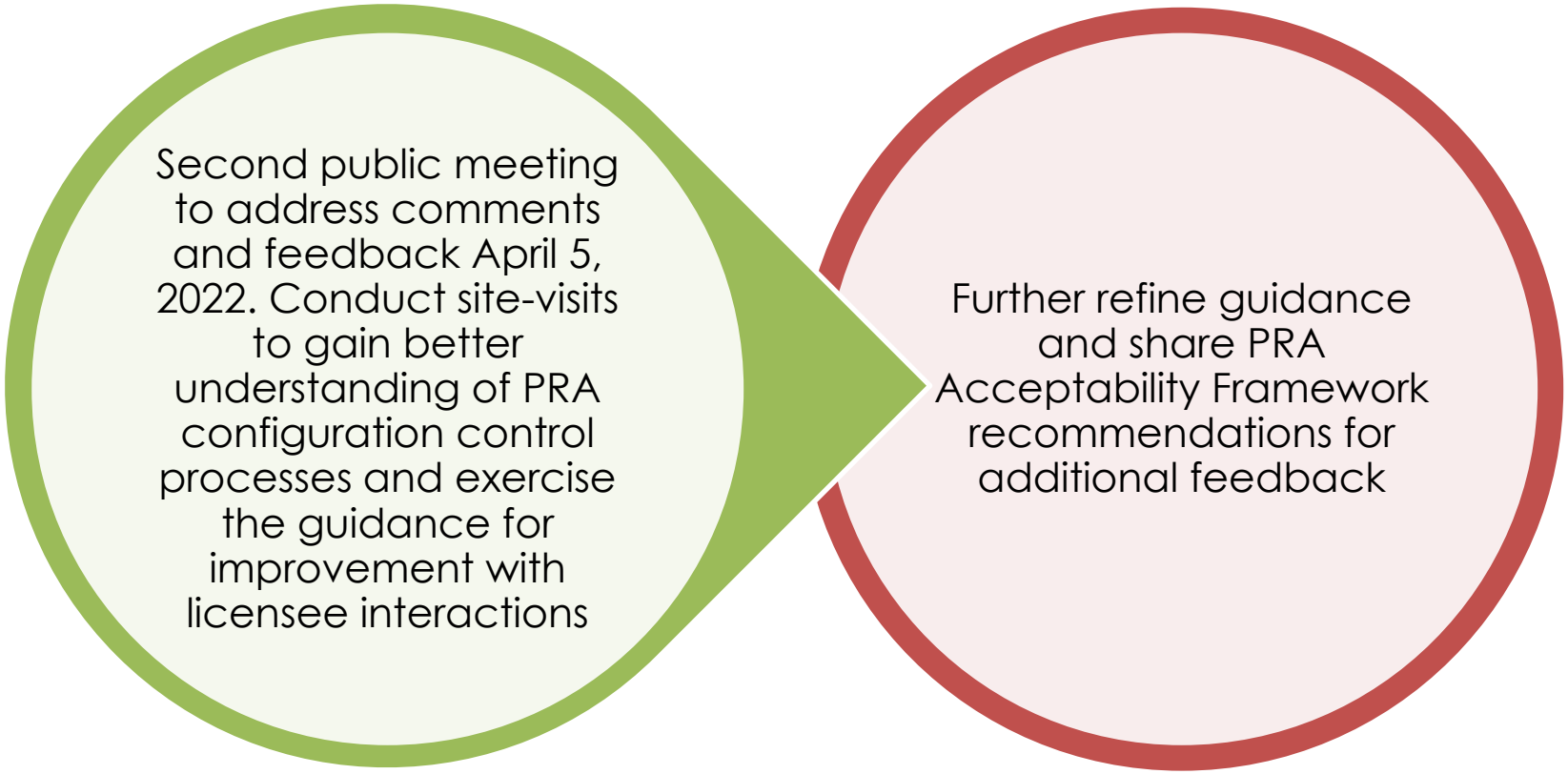
Information Gathering & Guidance Development Effort - Objectives

- PRA Configuration Control Inspection
  - Inspection Guidance
    - Improve guidance with licensee interaction and feedback.
  - Level of Effort
    - Correlation between approved hazard group(s) for implemented programs to hours spent per sample.
  - Sample Selection
    - Identify risk-significance classification of reviewed changes.
- Applicable inspection tiered approach
  - Provide proper implementation recommendations of the tiered approach concept for future oversight of PRAs.

Logistics

- Eight sessions:
  - Two SFCP - NFPA 805
  - Two SFCP & RICT – NFPA 805
  - Two SFCP & 50.69 – NFPA 805
  - Two SFCP, RICT, 50.69 – NFPA 805
- Two Teams
  - Regional SRA
  - Two Reliability & Risk Analyst
- Six to 12 months effort
  - 45 days to prep
  - 15 to 30 days to issue report to APOB BC
  - One final report to DRA & DRO DD

What's Next?



PRA Configuration Control Workshop

Workshop

- NEI's – Industry Perspectives on Oversight of PRA Configuration Control Presentation.

Industry and Public: Questions and Feedback

- PRA Acceptability Framework POCs:
  - Edgardo Torres: Edgardo.torres@nrc.gov
  - Antonios Zoulis: Antonios.zoulis@nrc.gov

Back-Up Slides

Key Messages – Additional Details

- Proposed safety enhancement to ROP – Ensure appropriate application of risk for decision making:
  - 50.69: Potential misclassification of safety-related/risk-significant components.
  - RICT: Potential for miscalculation of LCO completion times and mismanagement of risk-management actions (RMAs).
  - SFCP: Potential for inappropriate changes to surveillance frequencies.
  - NFPA 805: Potential to change Fire Protection Programs without NRC's review.
- PRA Risk-Informed Programs Approved:
  - NFPA 805: 45 of 93: 48%
  - SFCP: 92 of 93: 99%
  - RICT: 29 of 93: 31%
  - 10 CFR 50.69: 43 of 93: 46%
- PRA Risk-Informed Applications (In Progress):
  - NFPA 805: 0
  - SFCP: 1
  - RICT: 16
  - 10 CFR 50.69: 6

ROP Baseline PRA Conf. Control Oversight Gap Analysis

- IP 71111.05, Fire Protection: NFPA 805
  - Objectives:
    - Implementation of Fire Protection Program (FPP):
      - Material Condition & Operational Status:
        - » Fire Detection
        - » Suppression
        - » Barriers
    - Fire Brigade Performance & Training.
- No objective or guidance to verify PRA Configuration Controls for Internal Fire Hazard model approved for NFPA 805.

ROP Baseline PRA Conf. Control Oversight Gap Analysis

- IP 71111.12, Maintenance Effectiveness: 10 CFR 50.69
  - Objectives:
    - Supplement Performance Indicators (PIs)
    - MR SSCs scoped in MR:
      - Performance
      - Condition problems
  - 10 CFR 50.69 RISC-3 component guidance.
- No objective or guidance provided to evaluate PRA Configuration Controls for Hazard Groups approved for 10 CFR 50.69.

ROP Baseline PRA Conf. Control Oversight Gap Analysis

- IP 71111.13, Maintenance Risk Assessment and Emergent Work Control: RICT
  - Objectives:
    - Verify implementation during planned and emergent maintenance of:
      - 10 CFR 50.65(a)(4):
        - » Risk Assessments
        - » Corresponding work controls
        - » Risk management Actions
      - RICT:
        - » Risk Assessments
        - » Corresponding work controls
        - » Risk management Actions
- No objective or guidance provided to evaluate PRA Configuration Controls for Hazard Groups approved for RICT.

ROP Baseline PRA Conf. Control Oversight Gap Analysis

- IP 71111.18, Plant Modifications: 10 CFR 50.69, RICT, SFCP
  - Objectives:
    - Verify Modifications:
      - Impact on safety functions of important to safety systems
      - Do not degrade design basis, licensing basis, and performance capability
      - During increased risk-significant configurations do not result in an unsafe condition
    - Severe Accident Management Guidelines updates
  - General Guidance, Table-A: “The PRA model is appropriately updated to reflect plant modifications.”
- No objective nor instructions provided to evaluate PRA Configuration Controls to ensure the PRA remains technically adequate, reflecting the as-built, as-operated plant for Hazard Groups approved for RICT, SFCP, 10 CFR 50.69, NFPA 805.

ROP Baseline PRA Conf. Control Oversight Gap Analysis

- IP 71111.21.N.05, Fire Protection Team Inspection (FTPI): NFPA 805
  - Objectives:
    - Verify Fire Protection Program credited SSCs perform licensing basis function.
    - Licensing basis review of:
      - Aging management
      - Self- approved changes to program
      - Operating experience
      - Plant modifications
      - Procedure Changes
      - Risk Insights
    - Assess interdisciplinary interfaces and coordination among organizations to maintain program.
    - Guidance directs review of plant change evaluation process per NFPA 805, section 2.2.9 and section 2.4.4.
- No objective or guidance provided to evaluate PRA Configuration Controls for Internal Fire Hazard Group approved for NFPA 805.

ROP Baseline PRA Conf. Control Oversight Gap Analysis

- IP 71111.22, Surveillance Testing: SFCP
  - Objectives:
    - Verify testing provides objective evidence of:
      - Intended safety function
      - Operational readiness
  - Guidance to verify test frequency changes are adequate to demonstrate operability.
- No objective or guidance provided to evaluate PRA Configuration Controls for Hazard Groups approved for SFCP.