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United States Nuclear Regulatory Commission
Protecting People and the Environment

Reactor Oversight Process (ROP) Enhancement
Radiation Safety Cornerstones

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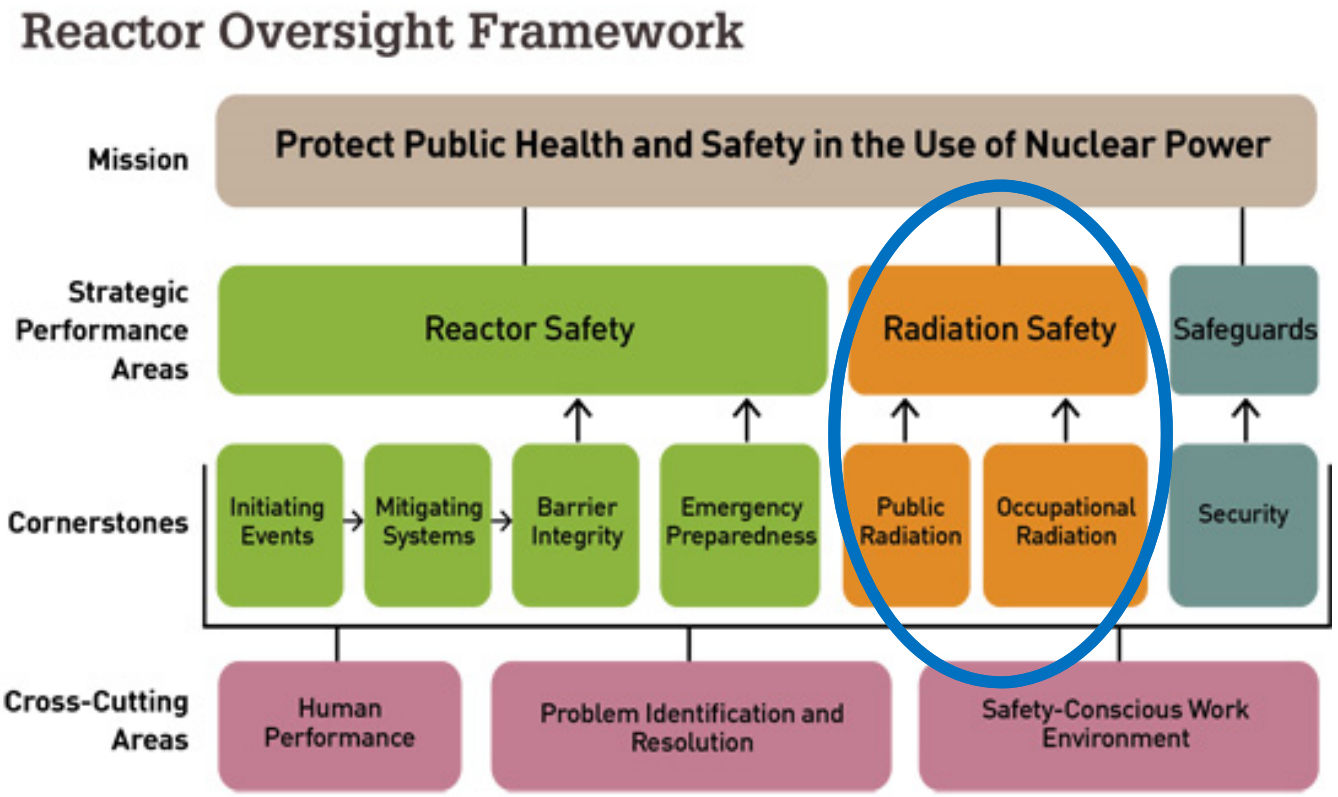
Agenda

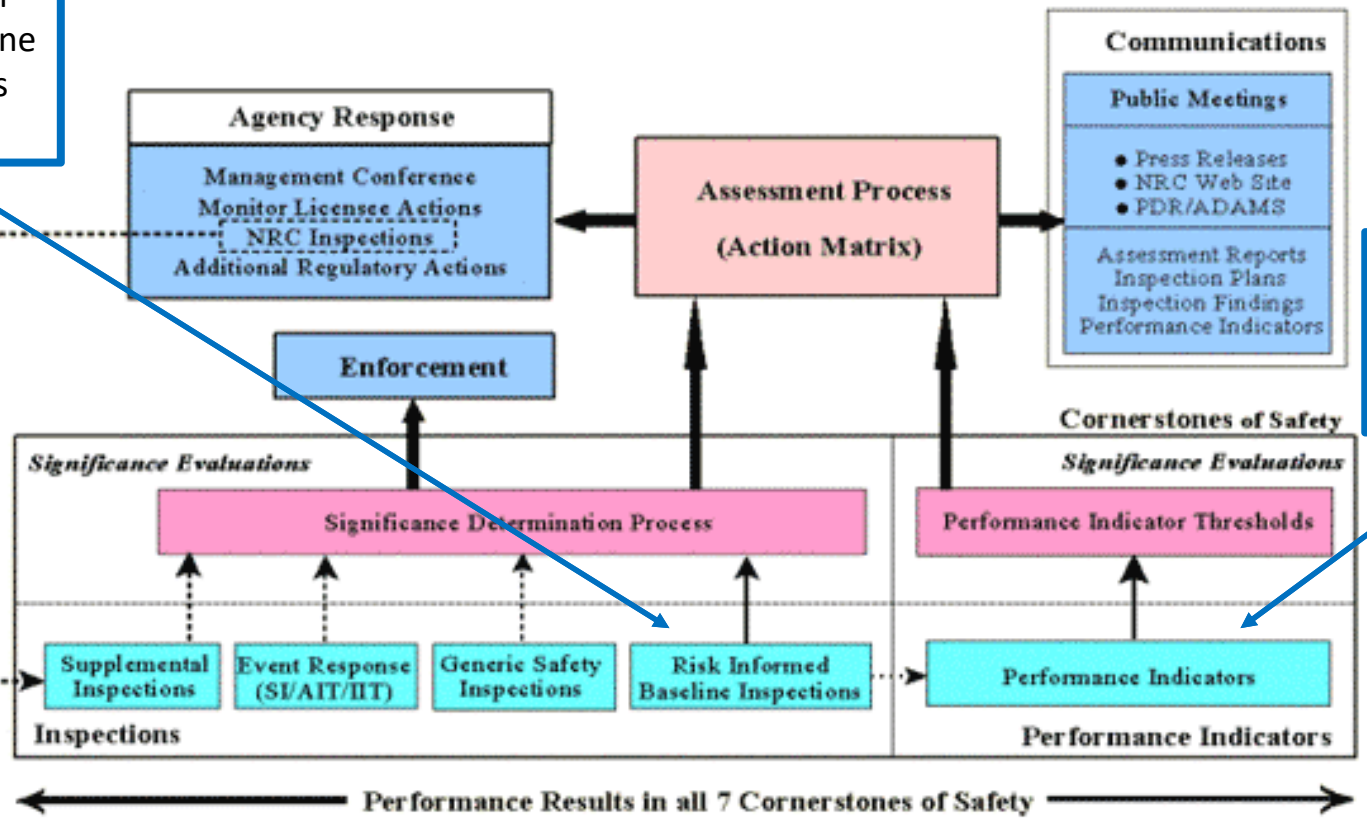
- Radiation Safety Cornerstones Background
- ROP Enhancement Overview
- Industry Recommendations
- Staff's Approach
- ALARA
- Self-Assessments
- Additional Initiatives
- Path Forward
- Feedback/Discussion

Radiation Safety Cornerstones



Radiation Safety Oversight and Assessment

8 Radiation Safety Baseline Inspections (IP 71124)



2 Radiation Safety Performance Indicators

Baseline Inspection Procedures

IP Number	Title (%PRS/%ORS)*	Average Hours	Inspection Samples
71124	Radiation Safety-Public Occupational	N/A	N/A
71124.01	Radiological Hazard Assessment and Exposure Controls (0%/100%)	36 +/- 4 (annual)	6
71124.02	Occupational ALARA Planning and Controls (0%/100%)	46 +/- 14 (biennial)	4
71124.03	In-Plant Airborne Radioactivity Control and Mitigation (0%/100%)	16 +/- 4 (biennial)	3
71124.04	Occupational Dose Assessment (0%/100%)	20 +/- 4 (biennial)	4
71124.05	Radiation Monitoring Instrumentation (20%/80%)	32 +/- 4 (biennial)	2
71124.06	Radioactive Gaseous and Liquid Effluent Treatment (100%/0%)	35 +/- 4 (biennial)	5
71124.07	Radiological Environmental Monitoring Program (100%/0%)	29 +/- 4 (biennial)	2
71124.08	Radioactive Solid Waste Processing and Radioactive Material Handling, Storage and Transportation (80%/20%)	34 +/- 4 (biennial)	5

*PRS = Public Radiation Safety Cornerstone; ORS = Occupational Radiation Safety Cornerstone

Performance Indicators

Occupational

- **Occupational Exposure Control Effectiveness (OR01)**—The PI for this cornerstone is the sum of the following:
  - Technical specification high radiation area occurrences
  - Very high radiation area occurrences
  - Unintended exposure occurrences

Occupational Radiation Safety Indicator	Thresholds		
	(White) Increased Regulatory Response Band	(Yellow) Required Regulatory Response Band	(Red) Unacceptable Performance Band
Occupational Exposure Control Effectiveness	> 2	> 5	N/A

Public

- **Radiological Effluent Technical Specifications/Offsite Dose Calculation Manual (RETSs/ODCM) (PR01)**—Radiological effluent release occurrences per reactor unit that exceed the values listed below:
  - Liquid Effluents
    - Whole Body—1.5 millirems per quarter (mrem/qtr)
    - Organ—5 mrem/qtr
  - Gaseous Effluents
    - Gamma Dose—5 millirads per quarter (mrad/qtr)
    - Beta Dose—10 mrad/qtr
    - Organ Doses from I-131, iodine-133, tritium, & particulates—7.5 mrem/qtr

Public Radiation Indicator	Thresholds		
	(White) Increased Regulatory Response Band	(Yellow) Required Regulatory Response Band	(Red) Unacceptable Performance Band
RETS/ODCM Radiological Effluents	> 1	> 3	N/A

ROP Enhancement Overview

- ROP is a mature program with over 18 years of implementation experience
- The ROP ensures that oversight of the commercial nuclear industry is objective, predictable, transparent, **risk-informed and performance based**
- Self-assessment and continuous improvement are part of the ROP
- Response to internal and external stakeholder recommendations on ways to improve the ROP

https://www.nrc.gov/reactors/operating/oversight/rop-enhancement.html

Industry Recommendations for Radiation Safety Cornerstones*

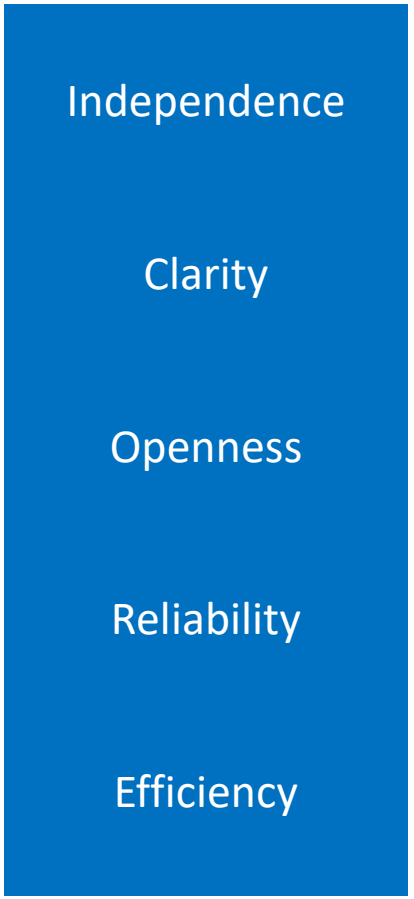
Recommendation 1A	Revise RP Inspections: Review radiation protection inspections to apply lessons learned from the Engineering Inspections Working Group to streamline them (following the stakeholder engagement process employed with engineering inspections); include credit for self-assessments.

Recommendation 3A.1	Expand 3A Approach to All Deterministic SDPs. The philosophy setting the policy for the EP SDP above* should be applied to all deterministic SDPs as much as practical.
* ”3A Approach”: Revise the EP SDP to consider the site’s performance in the Cornerstones of Initiating Events, Mitigating Systems, and Barrier Integrity. If performance in all three Cornerstones is clear of open White inputs, then defense-in-depth (DID) is robust and the safety significance of the EP performance deficiency is less than would otherwise be the case. The EP SDP should be constructed to consider licensee performance in the ROP cornerstones associated with other elements of reactor safety Defense-in-Depth (DID). This approach would risk-inform EP SDP outcomes with contemporaneous, site-specific information relevant to the maintenance of other reactor safety DID barriers for protection of public health and safety.	

*Reactor Oversight Process Enhancement Letter from Nuclear Energy Institute, September 19, 2018 (ADAMS Accession No. ML18262A322)

Staff's Approach

- Principles of Good Regulation
- Solicited input from stakeholders
- Applied oversight experience
- Valued insights from inspectors
- Working group consisting of representatives from each NRC Region and headquarters
- Identified near-term activities for detailed discussion in SECY
- Identified long-term activities for future investment



Recommendation 1A

- Used industry recommendations to identify focus areas for staff assessment:
  - Use of industry self-assessments in oversight of…
    - As low as is reasonably achievable (ALARA)
    - Radiation monitoring instrumentation
    - Effluents

Self-Assessments

- Annual requirement per 10 CFR 20.1101(c)
- NRC position that it is acceptable for all phases of the radiation protection program to be reviewed and audited for content and implementation in a 2-3 year cycle (Health Physics Questions and Answers - Question 118*)
- Inspection experience shows that the quality of and approach to self-assessments varies significantly from licensee-to-licensee
- Conclusion: Need to establish an adequate basis to expand use of self-assessments in oversight activities

*https://www.nrc.gov/about-nrc/radiation/protects-you/hppos/qa118.html

Staff Recommendations
- Self-Assessments -

- Staff does not plan to take action to credit self-assessments in lieu of inspections in the near-term
- Staff plans to work to develop an adequate basis to incorporate the use of self-assessments in the oversight process
  - Work with industry to establish a standard for acceptable self-assessment of radiation protection programs
  - Determine inspection program areas that are acceptable for self-assessment credit
  - Develop methodology for crediting self-assessments in lieu of selected NRC inspections

ALARA Concept

- In order to minimize the risks associated with stochastic effects of radiation exposure, exposures should be kept ALARA
- Relies on the linear no-threshold (LNT) dose model, that risk decreases proportionally with the decrease in radiation exposure
- NRC dose limits exist within the context of individual doses being kept ALARA (56 FR 23363)

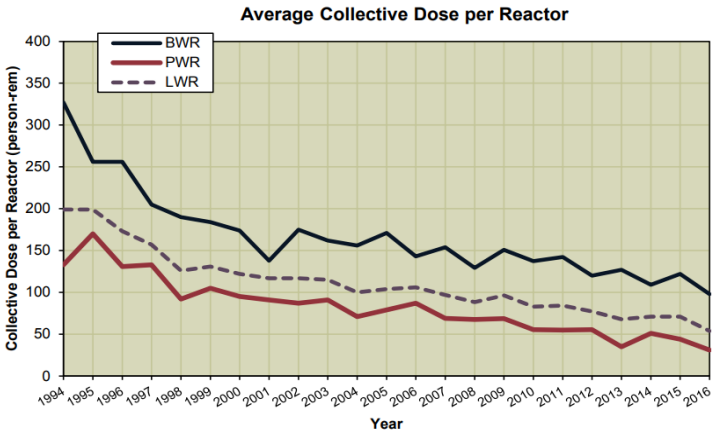
ALARA is fundamental to radiation safety and NRC regulations

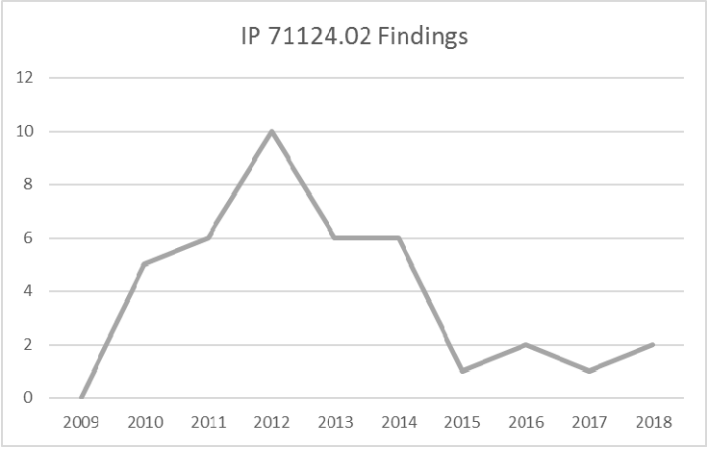
Oversight of ALARA

- Established as an inspectable area during advent of ROP
- "ALARA Planning and Controls" baseline inspection
  - Average is 46 biennial hours, modulated by licensee collective radiation exposure (CRE) performance, based on 3-year rolling average
  - 4 focus areas for inspection (i.e. "inspection samples")
    1. Radiological work planning
    2. Verification of dose estimates and exposure tracking systems
    3. Implementation of ALARA and radiological work controls
    4. Radiation worker performance
- CRE is used to facilitate risk-informed oversight
  - A measure of the challenges a program faces
  - Dose limits apply to individual doses not collective doses
- Industry performance characterized through a combination of inspection outcomes and CRE

ALARA Performance

- Persistent downward trend in CRE per reactor
- Low safety significance associated with findings
- Inspector observation that baseline inspections in the ALARA area can be reduced from a risk-informed, performance based perspective





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Staff Options Being Considered
- ALARA -

- Retire ALARA Planning and Controls as an independent inspectable area starting with the 2020 inspection cycle
- Option 1:
  - Transition planning aspects of ALARA oversight to a Performance Indicator
  - Incorporate performance-based aspects of ALARA oversight as part of other inspection activities
- Option 2:
  - Transition planning and performance-based aspects of ALARA oversight to other inspection activities in a scaled manner

NRC will continue risk-informed oversight of ALARA performance

ALARA Performance Indicator

- **Occupational Exposure Control Effectiveness (OR01)**—The PI for this cornerstone is the sum of the following:
  - Technical specification high radiation area occurrences
  - Very high radiation area occurrences
  - Unintended exposure occurrences
  - ALARA occurrences

Occupational Radiation Safety Indicator	Thresholds		
	(White) Increased Regulatory Response Band	(Yellow) Required Regulatory Response Band	(Red) Unacceptable Performance Band
Occupational Exposure Control Effectiveness	> 2	> 5	N/A

- Leading indicator to significant degradation in ALARA performance
- Potential Metrics:
  1. # of work activities of a certain radiological significance exceeding planned values over a span of time
  2. # of instances of ALARA planning/control deficiencies over a span of time
  3. Outage CRE performance exceeds planned performance by a certain amount
- Requires standardized definition of work activity scope and justifiable expansion in scope
- Apply ALARA-related lessons learned from establishment of ROP

Recommendation 3A.1 – Revise SDP

- Discussed with industry during December 14, 2018 public meeting
- Staff's position is that performance in the Reactor Safety Cornerstones of the ROP is not indicative of performance in the Radiation Safety Cornerstones, nor does good performance in the Reactor Safety Cornerstones mitigate performance issues in the Radiation Safety Cornerstones
- Industry feedback that current Radiation Safety Significance Determination Processes (SDP) are appropriate
- Staff will take no further action with respect to recommendation 3A.1

Additional Initiatives

- Outside of ROP Enhancement but with similar goals
- Update More-than-Minor guidance (IMC 0612, App E)
  - ROP-wide effort
  - Introduce risk perspectives where appropriate
    - e.g., credit conservative use of alarming dosimeters as a mitigating measure
- Revision of IP 71124 inspection procedure series
  - Consolidating inspection activities where appropriate (e.g., refueling outage procedure)
  - Removing redundant requirements
  - Applying inspection experience to improve effectiveness and efficiency

Looking Forward

- Removing inspectable area and developing Performance Indicators requires Commission authorization
- ROP Enhancement SECY (June 2019)
  - Industry feedback?
- IP 71124 Procedure revision
  - Draft procedures (Spring 2019)
  - Internal review (Summer 2019)
  - Preview (NEI Radiation Protection Forum)
  - NRC Staff Training (September 2019)
  - Final approval (December 2019)
- More-than-minor guidance
  - Currently developing draft for implementation (2019 or early 2020)

Requested Feedback

- ALARA-related performance indicator
  - Feasibility and interest
  - Timeframe for effort
- Self-assessments
  - Interest in developing a standard for RP self-assessments/radiation protection program audits
  - Interest in developing a methodology for crediting self-assessments in lieu of selected NRC inspections
  - Timeframe for effort
- Other areas of interest/concern

Questions/Comments?

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