U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Updates to Radiation Safety Cornerstones

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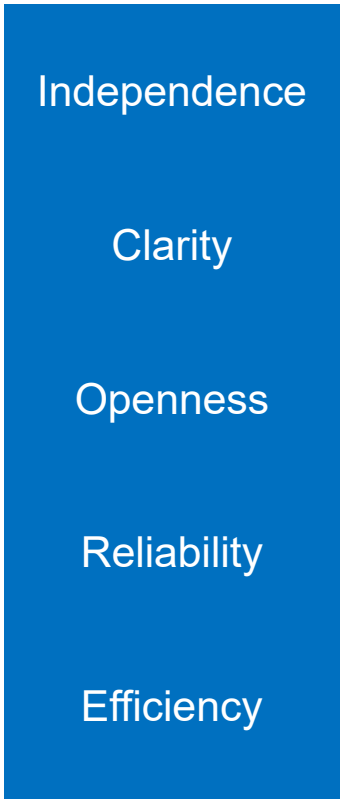
Agenda

- Background
  - Reactor Oversight Process
  - Inspections
- Changes to Radiation Safety Cornerstones
  - Changes to ALARA Inspections
  - Changes to Radiological Effluents and Environmental Monitoring Inspections
  - Implementation of Inspection Guidance Applicable to 10 CFR Part 37
    - Part 37 Background
    - Overview of Inspection Guidance
  - More-than-Minor Screening Examples
  - SDP Revisions
- Looking Forward to 2020

Why Change?

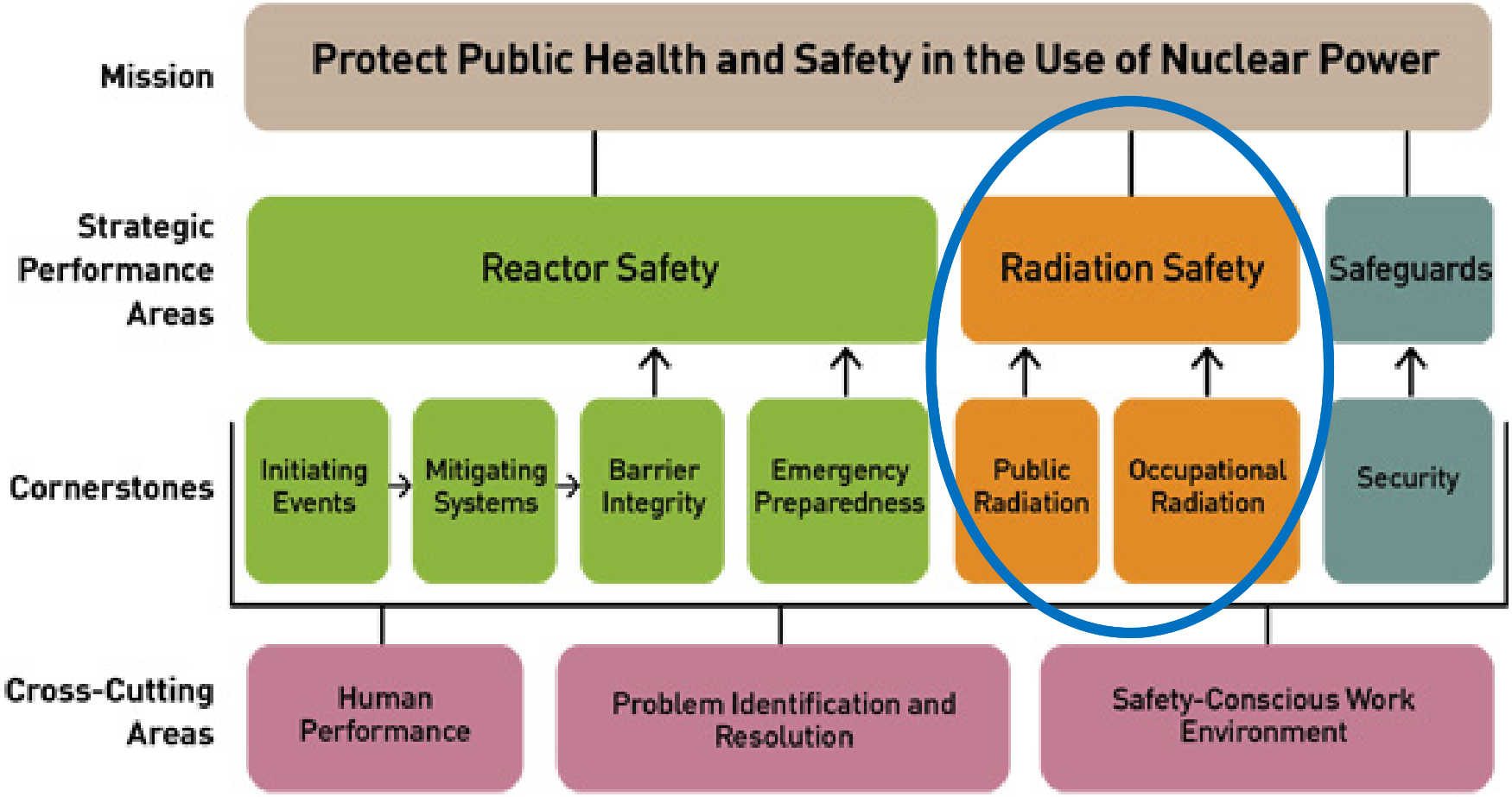
- Part of continuous self-assessment process that is fundamental to the ROP
- ROP Enhancement provided excellent opportunity for program improvement
- Apply lessons from regulatory and operating experience
- Maintain focus on those issues having the most impact on public health and safety



Staff Actions are Guided by the Principles of Good Regulation

Background

Reactor Oversight Framework



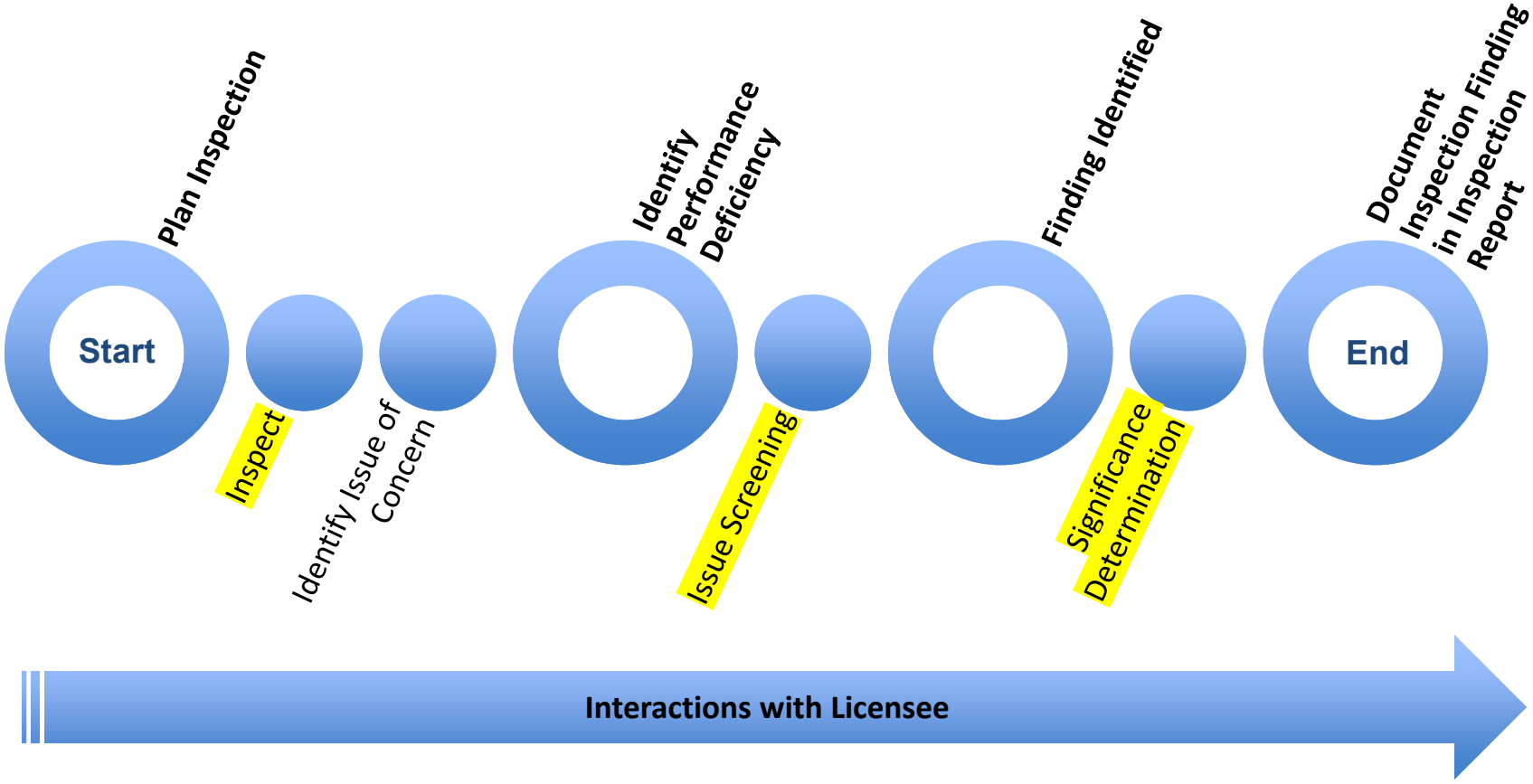
What is an NRC Inspection?

- Examination of the licensee's activities to assist in determining…
  - Whether the licensee is meeting the cornerstone objectives, and
  - If further engagement by the NRC is necessary before the objectives of the cornerstones are compromised
- Trained and qualified inspectors…
  - Review key licensee documentation
  - Observe licensee activities
  - Evaluate licensee actions

An NRC inspector observes a licensee technician during an environmental monitoring inspection

Inspection is a Key Input in Verifying Reasonable Assurance of Adequate Protection of Public Health and Safety

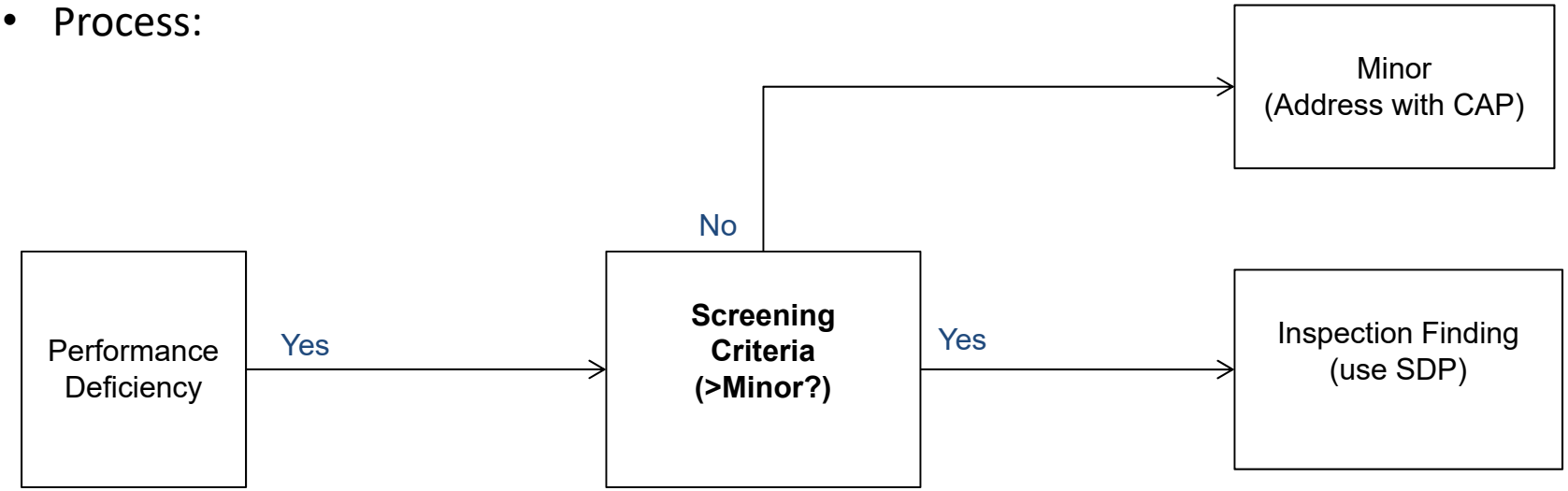
Inspection Finding Process



= Changes introduced or being introduced in the near future

More-than-Minor Screening

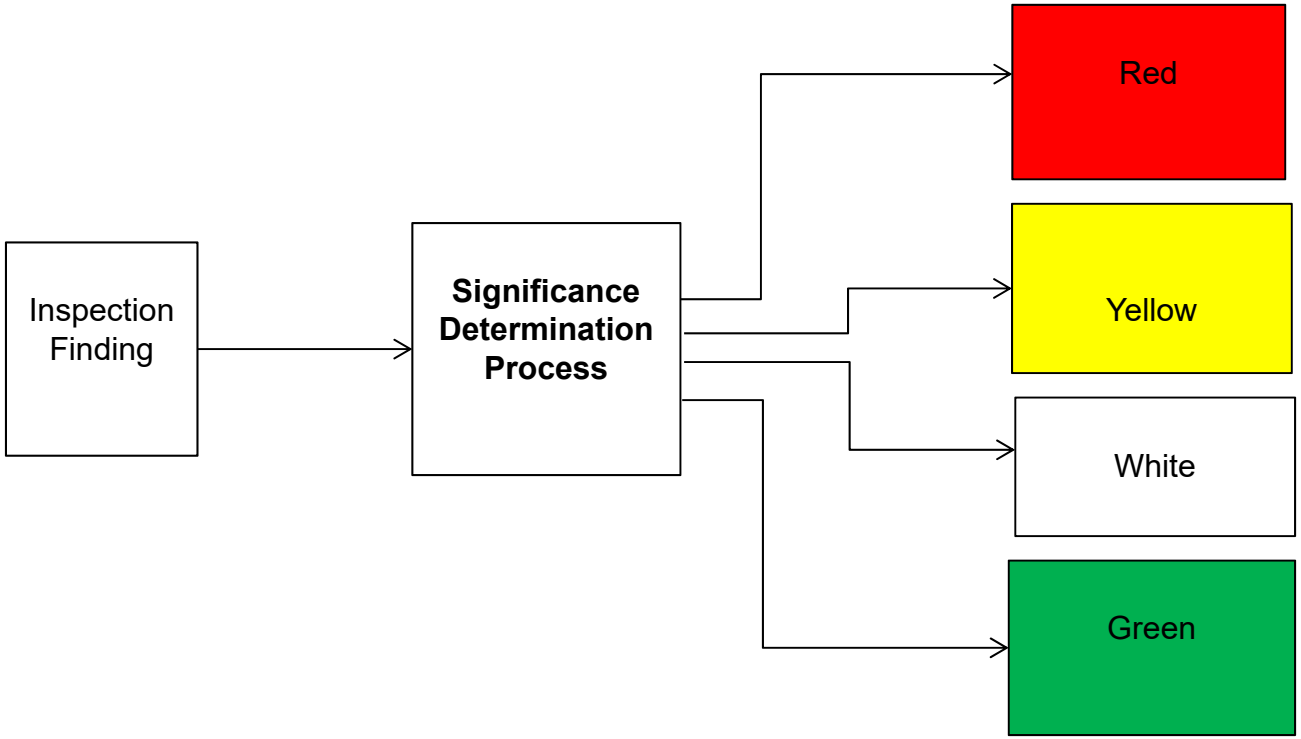
- Allows NRC to direct minor issues to the licensee for resolution
- Licensee addresses issues in a prioritized manner using NRC-inspected corrective action programs
- Process:



Key Point – All Violations of NRC Requirements Must be Corrected

Significance Determination

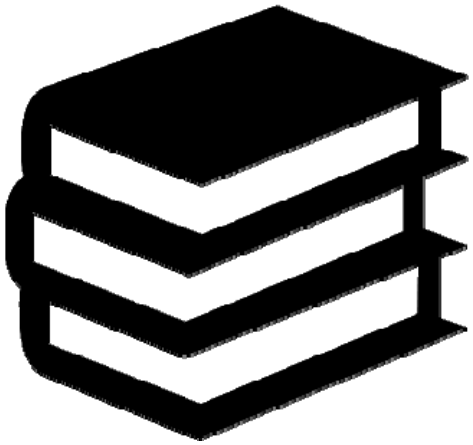
- Process used to determine the significance of the inspection finding
- Yields a color input for consideration during overall performance assessment



Changes within Radiation Safety Cornerstones

Summary of Changes – Updates to Inspection Manual

- Inspection Procedures
  1. Recommended retiring ALARA inspections*
  2. Changed frequency of radioactive effluents and environmental monitoring inspections from biennial to triennial
  3. Added guidance on how to inspect new requirements for the protection of radioactive material
- Inspection Manual Chapters
  1. Clarified more-than-minor screening guidance and added examples
  2. Near-future: will update significance determination process documents

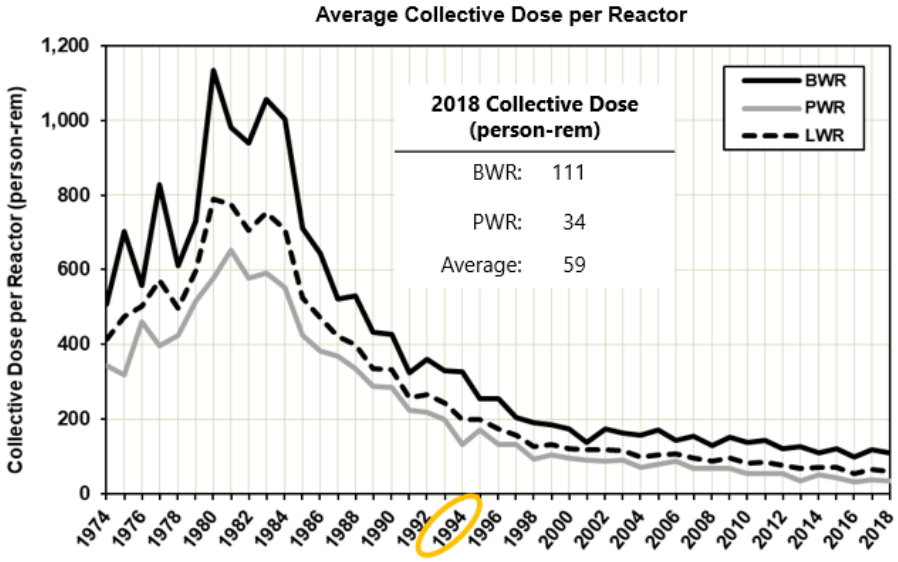


* Pending Commission approval, per SECY-19-0067

Changes to ALARA Inspections

(Pending Commission Approval)

- Persistent downward trend in dose per reactor
- Low safety significance associated with findings
- Staff observation that baseline inspections in the ALARA area can be reduced from a risk-informed, performance based perspective
- Discussed in detail during February 28, 2019 public meeting (ML19046A069)



Retiring ALARA-Focused Inspections and Continuing Oversight using Already Existing Inspections of Plant Work

Changes to Radiological Effluent and Environmental Monitoring Inspections*

- Considerations
  - Nuclear power plant effluents contribute negligibly to public dose
  - Since the advent of the ROP, nuclear power plant effluents have decreased or remained at very low levels
  - NRC inspections verify adequacy of licensee processes in tracking effluents and environmental monitoring
  - Licensees report outcomes to NRC annually (posted to our web site)
  - Performance Indicator tracks effluent performance
- Changing the frequency of inspection from biennial to triennial
- Inspection of effluent monitoring instrumentation will remain at biennial frequency

Scope of Effluent and Environmental Monitoring Inspections is Unchanged

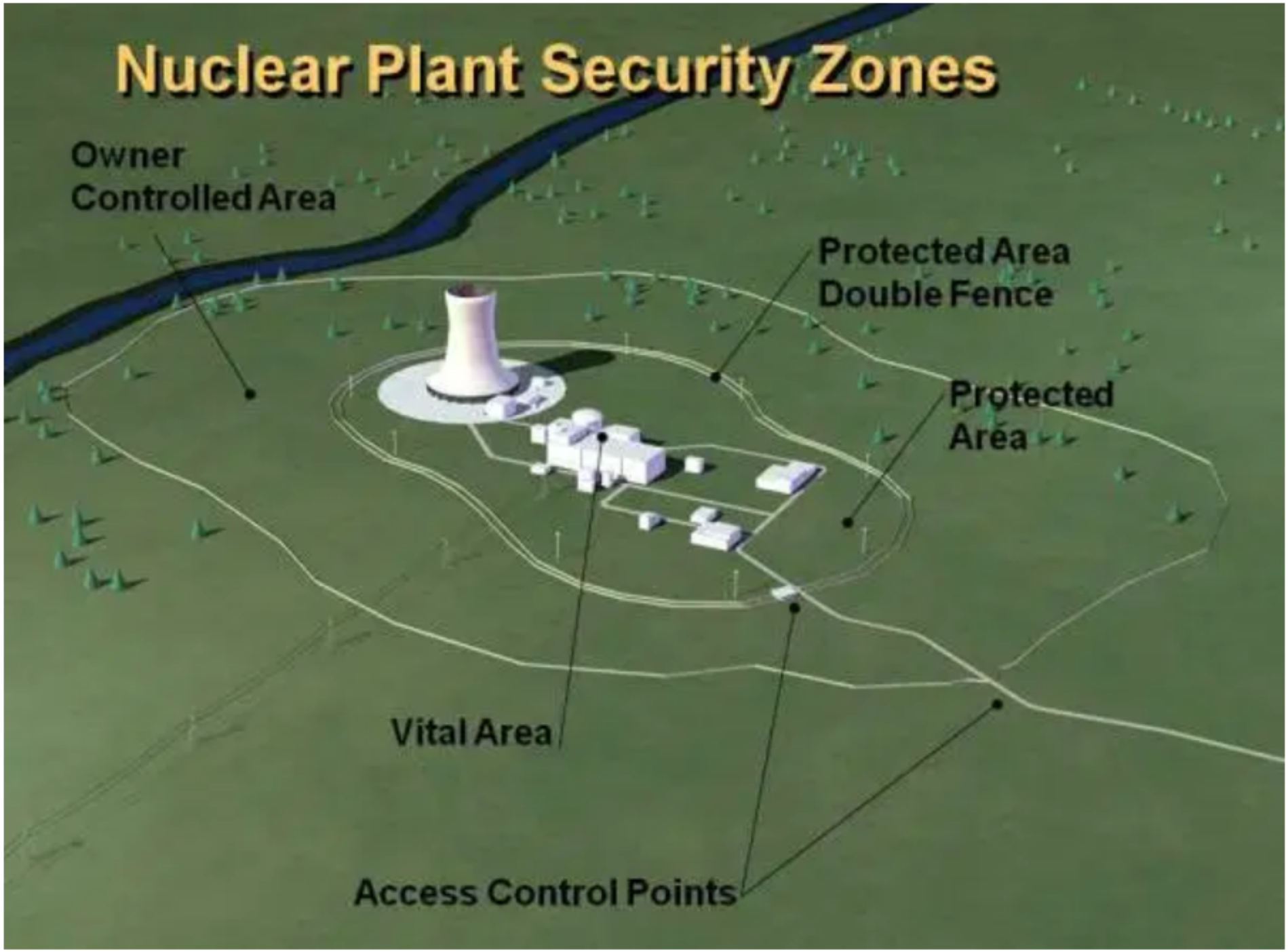
*Discussed in detail during July 23, 2019 public meeting (ML19189A035)

Part 37 Oversight Framework for Power Reactor Licensees

Background for 10 CFR Part 37

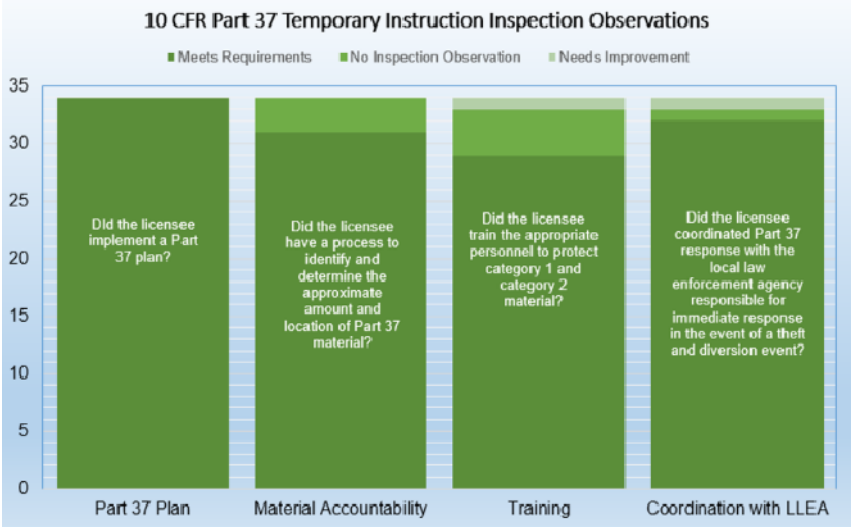
- Provides requirements for physical protection of category 1 or category 2 quantities of radioactive material (i.e. “Part 37 material”)
- Specific guidance applicable to power reactors
- Radioactive materials are categorized based on risk
- Initial reactor inspections completed in January 2018
- Inspections revealed no risk-significant safety or security issues associated with licensee implementation of programs
- Staff has concluded that implementation of the requirements of Part 37 at reactors is adequate

Radioactive Material is Secure at U.S. Nuclear Power Plants


Nuclear Plant Security Zones
Owner
Controlled Area
Protected Area
Double Fence
Protected
Area
Vital Area
Access Control Points

Considerations in Developing Part 37 Oversight Framework

- Part 37 protects against high consequence, low likelihood events
  - Loss of category 1 or 2 material through theft or diversion
- Observations from 34 site inspections
- Appropriately risk-informing inspection and significance determination
- Accounting for specifics of power plant materials, for example:
  - Physical form of material
  - Risk mitigation from Part 73 features in OCA



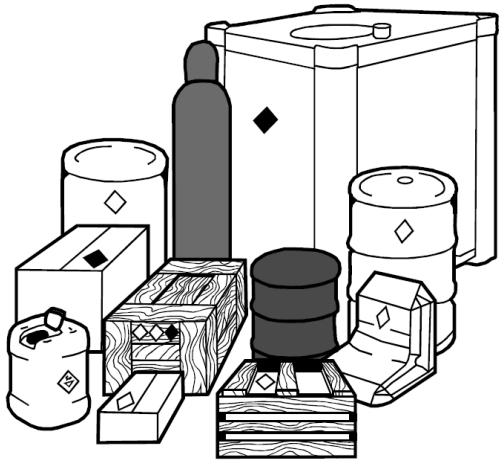
Risk Communications to Stakeholders Should be Consistent with Current Reactor SDP

Selection of Public Radiation Safety Cornerstone

- Two options considered
- Physical Security
  - Focuses on protection of special nuclear material
  - Significant changes to cornerstone required
- Public Radiation Safety
  - Concerned with protecting the public health from exposures to radioactive material that result from routine reactor operations
  - The impact of deficiencies in licensee performance fall within the cornerstone description (i.e., potential impact to public through exposures)
  - Material control is already part of the public radiation safety cornerstone
  - Already existing material security requirements stemming from 10 CFR Part 20
  - Health physics inspectors are most qualified to identify material

IP 71124.08 Revision Part 37 Inspection Guidance (Material Security)

- Inspection guidance* includes:
  - Consideration of category 1 and 2 material during inspections
  - Consideration of events where unauthorized personnel are granted unescorted access to category 1 and 2
  - Training of personnel who have Part 37 responsibilities
  - Review of licensee's annual access control program review for certain deficiencies occurring outside of the security protected area
  - Review of licensee's annual security program review for certain deficiencies occurring outside of the security protected area



- Inspection issues that potentially impact Part 73 security plan will be turned over and dispositioned by NRC security inspectors

Risk-Informed, Performance-Based Approach Includes Inspection of Selected Areas

*Discussed during July 23, 2019 public meeting (ML19189A035) and July 29, 2019 industry conference (ML19207A112)

IP 71124.08 Revision Part 37 Inspection Guidance (Transportation)

- Inspection guidance* includes:
  - Observations of actual shipment preparation when possible
  - Review of shipping preplanning and coordination
  - Different requirements for category 1 and category 2 materials
  - Consideration of license verification requirements prior to shipping material

An NRC inspector verifies radiation levels from a radioactive material shipment being prepared for transport

Risk-Informed, Performance-Based Approach Includes Inspection of Selected Areas

*Discussed during July 23, 2019 public meeting (ML19189A035) and July 29, 2019 industry conference (ML19207A112)

More-Than-Minor (MTM) Screening Guidance

- The screening process involves consideration of several factors (i.e., screening questions) to determine if a performance deficiency is more-than-minor

- The revision to the guidance…
  - Clarifies how examples relate to the screening questions
  - Adds examples based on stakeholder feedback
    - For example, allows conservative use of alarming dosimeters to be considered during screening
  - Adds a section to address performance deficiencies concerning Part 37

Significance Determination Process Updates

SDP – Radiation Protection Cornerstones

- Two SDPs
  - Occupational Radiation Safety SDP
  - Public Radiation Safety SDP

- An SDP is a risk-informed process for determining safety significance of inspection findings

- Objectives of an SDP
  - Characterize significance using best available risk insights
  - Provide an objective and common framework for communicating significance
  - Provide basis for timely assessment and enforcement
  - Used to risk-inform the inspection program

NRC uses SDPs to Communicate Risk to Stakeholders

SDP - Updates Needed

- Occupational Radiation Safety SDP
  - Administrative updates to reflect current program

- Public Radiation Safety SDP
  - Administrative updates to reflect current program
  - Transportation SDP does not address the possibility of incorrect packaging being used for radioactive material shipments
    - Assumption that correct packaging is used and then a performance deficiency occurs
    - Leads to undesired reliance on IMC 0609 Appendix M (Qualitative Criteria) to determine significance
  - Update to address issues pertaining Part 37-related inspection findings

Notional SDP Thresholds for Part 37

Category 1 material	Red Finding
Category 2 material	Yellow Finding
Performance Deficiency Contributes to Actual Theft and Diversion Event	
Not establishing, or maintaining required program elements in effect, and other risk-significant issues (e.g., significant failure to protect mobile material)	White Finding
Deficiencies in implementation of required program elements	Green Finding

- - - Actual Green/White threshold to be developed with stakeholder input in CY2020

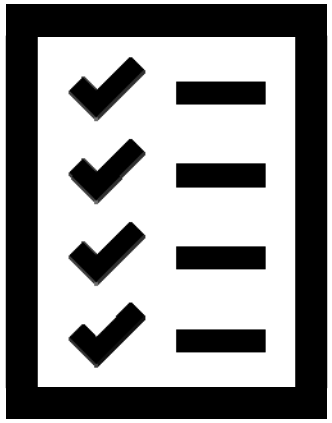
Process for Updating SDP

- Described in IMC 0609
  - Similar to the original development of the SDP
  - Input considered from multiple stakeholders
    - NRC Staff
    - Public
    - Licensees

- Participation will be primarily through internal workshops, public meeting(s) and letters
  - Leverage ROP Monthly meeting for efficiency

Looking Forward to 2020

- Inform Commission of changes to radiological effluents, environmental monitoring and Part 37 inspections
- Inspection procedure attachments 01 – 04
  - Publish in early Jan 2020
- Inspection procedure attachments 05 – 08
  - Publish 14 days after Commission notification (per MD 8.13)
- More-than-Minor Guidance
  - Publish in early January 2020
- Provide inspector training on Part 37 inspections
- Significance Determination Process
  - Start dialog during February ROP Monthly
  - Goal to publish by summer 2020



Questions/Comments?

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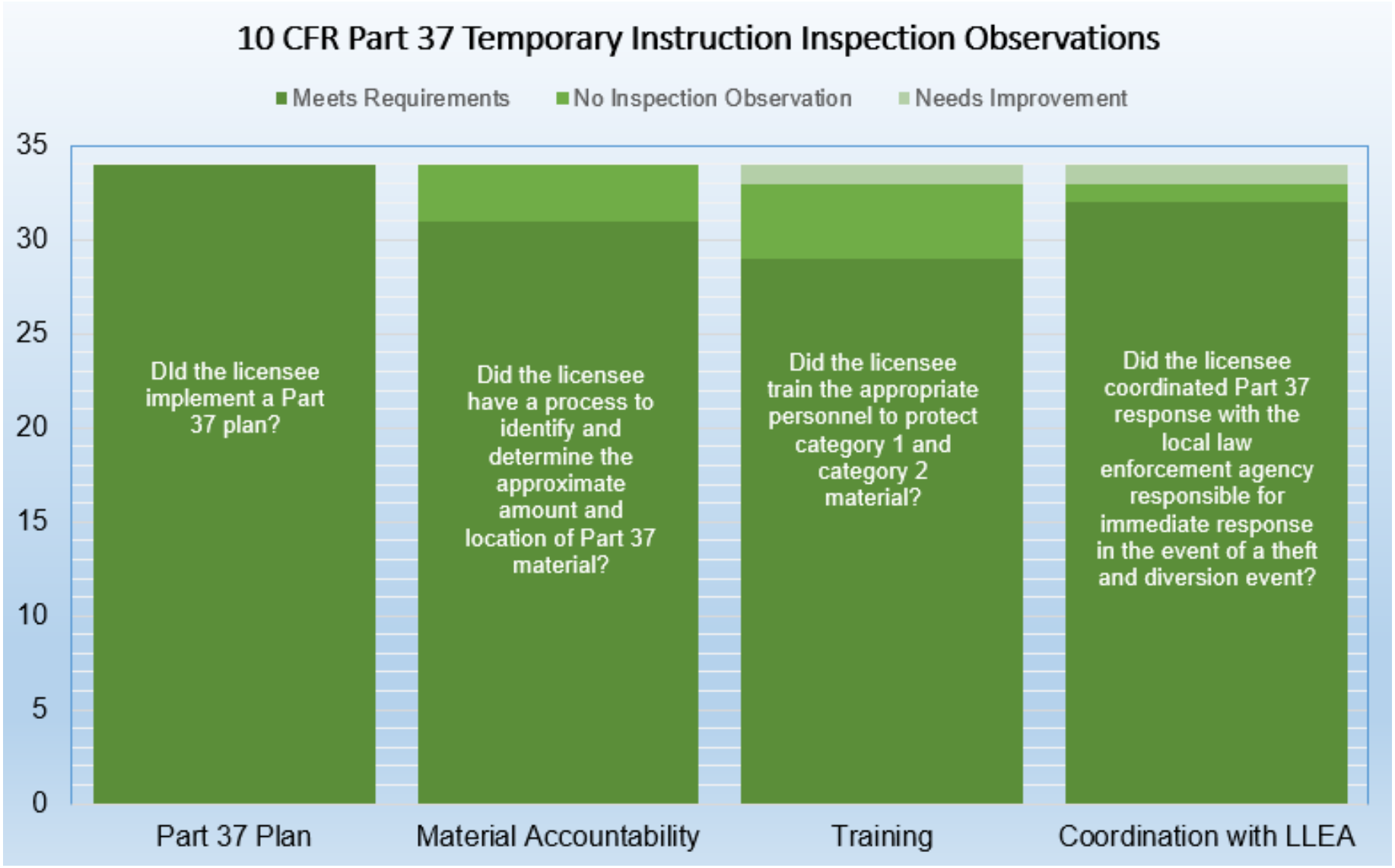
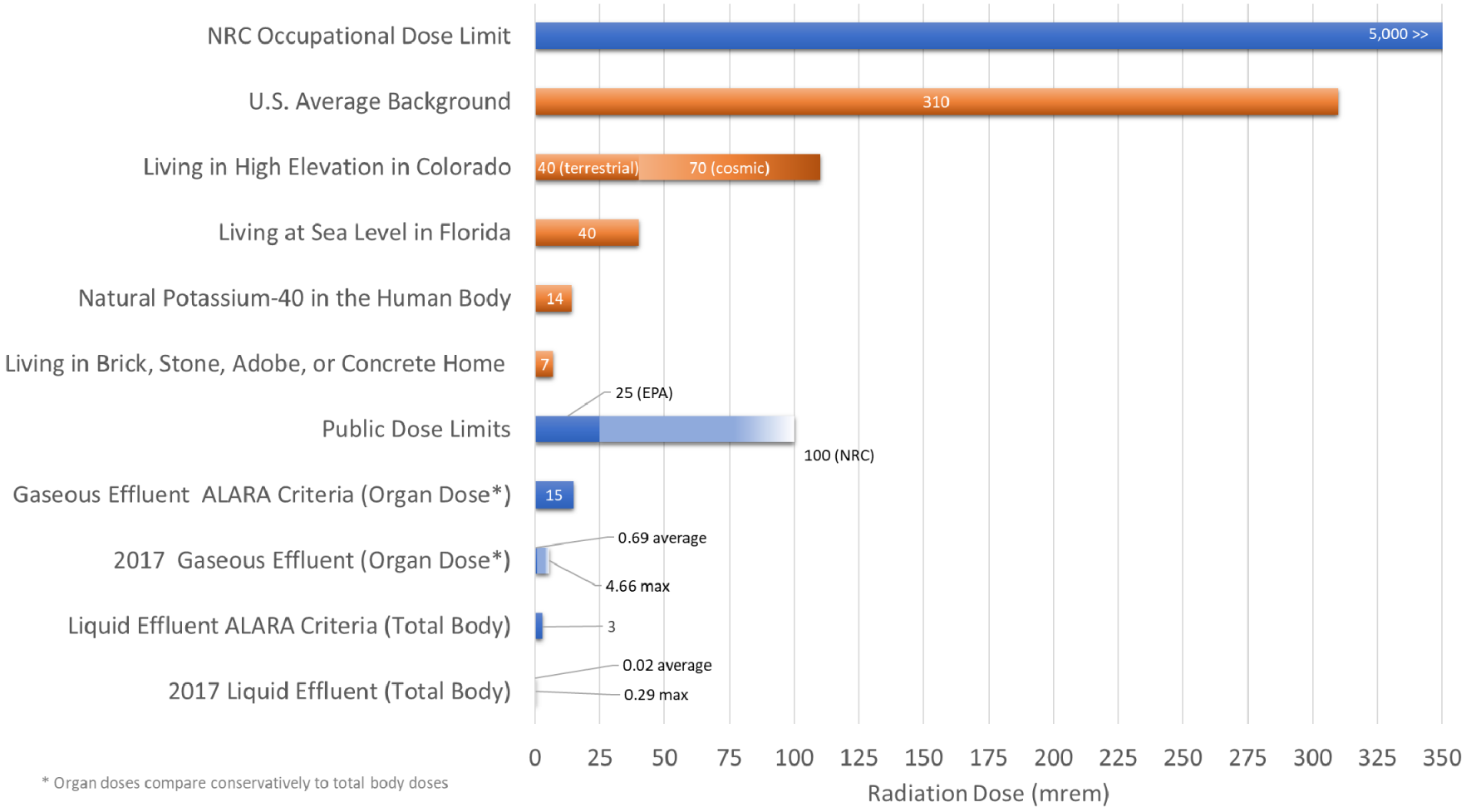
References

- IP 71124, “Radiation Safety—Public and Occupational”
- IP 71124.01, “Radiological Hazard Assessment and Exposure Controls”
- IP 71124.02, “Occupational ALARA Planning and Controls”
- IP 71124.03, “In-Plant Airborne Radioactivity Control and Mitigation”
- IP 71124.04, “Occupational Dose Assessment”
- IP 71124.05, “Radiation Monitoring Instrumentation”
- IP 71124.06, “Radioactive Gaseous and Liquid Effluent Treatment”
- IP 71124.07, “Radiological Environmental Monitoring Program”
- IP 71124.08, “Radioactive Solid Waste Processing and Radioactive Material Handling, Storage, and Transportation”
- IMC 0308 Attachment 3, Appendix C, “Technical Basis for Occupational Radiation Safety Significance Determination Process”
- IMC 0308 Attachment 3, Appendix D, “Technical Basis for Public Radiation Safety Significance Determination Process”
- IMC 0609 Appendix C, “Occupational Radiation Safety Significance Determination Process”
- IMC 0609 Appendix D, “Public Radiation Safety Significance Determination Process”
- IMC 0612 Appendix E, “Examples of Minor Issues”


10 CFR Part 37 Temporary Instruction Inspection Observations
Meets Requirements
No Inspection Observation
Needs Improvement
35
30
25
20
15
10
5
0
DId the licensee implement a Part 37 plan?
Did the licensee have a process to identify and determine the approximate amount and location of Part 37 material?
Did the licensee train the appropriate personnel to protect category 1 and category 2 material?
Did the licensee coordinated Part 37 response with the local law enforcement agency responsible for immediate response in the event of a theft and diversion event?
Part 37 Plan
Material Accountability
Training
Coordination with LLEA

Comparison of Doses from Power Plant Effluents to Common Public Doses



* Organ doses compare conservatively to total body doses

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Part 37 Material

Radioactive material	Category 1	Category 2
	(Ci)	(Ci)
Americium-241	1,620	16.2
Americium-241/Be	1,620	16.2
Californium-252	540	5.4
Cobalt-60	**810**	**8.1**
Curium-244	1,350	13.5
Cesium-137	**2,700**	**27**
Gadolinium-153	27,000	270
Iridium-192	**2,160**	**21.6**
Plutonium-238	1,620	16.2
Plutonium-239/Be	1,620	16.2
Promethium-147	1,080,000	10,800
Radium-226	1,080	10.8
Selenium-75	5,400	54
Strontium-90	27,000	270
Thulium-170	540,000	5,400
Ytterbium-169	8,100	81