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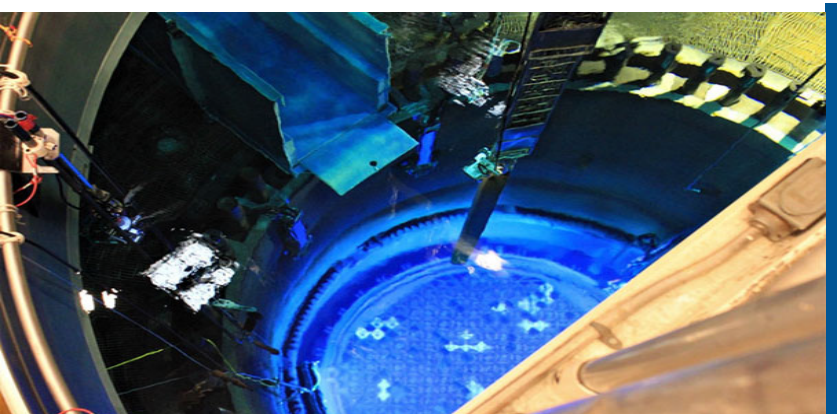
Highlights on NRC Activities

(ML22208A288)

Meena Khanna, Deputy Division Director
Division of Risk Assessment
Office of Nuclear Reactor Regulation

2022 NEI Radiation Protection Forum

August 2, 2022



NRC Attendees

- Meena Khanna, Deputy Division Director (NRR)
- Kevin Hsueh, Branch Chief (NRR)
- Steve Garry, Sr. Health Physicist (NRR)
- Dave Garmon, Health Physicist (NRR)
- Bill Rautzen, Health Physicist (NRR)
- Harry Anagnostopoulos, Sr. Health Physicist (RI)
- Bryan Edwards, Health Physicist (RI)
- Bill Pursley, Health Physicist (RII)
- Valerie Myers, Sr. Health Physicist (RIII)
- Geoffrey Edwards, Health Physicist (RIII)
- John O'Donnell, Sr. Health Physicist (RIV)
- Bernadette Baca, Health Physicist (RIV)

NRC Strategic Goals

- ✓ Ensure the Safe and Secure Use of Radioactive Materials
- ✓ Continue to Foster a Healthy Organization
- ✓ Inspire Stakeholder Confidence in the NRC

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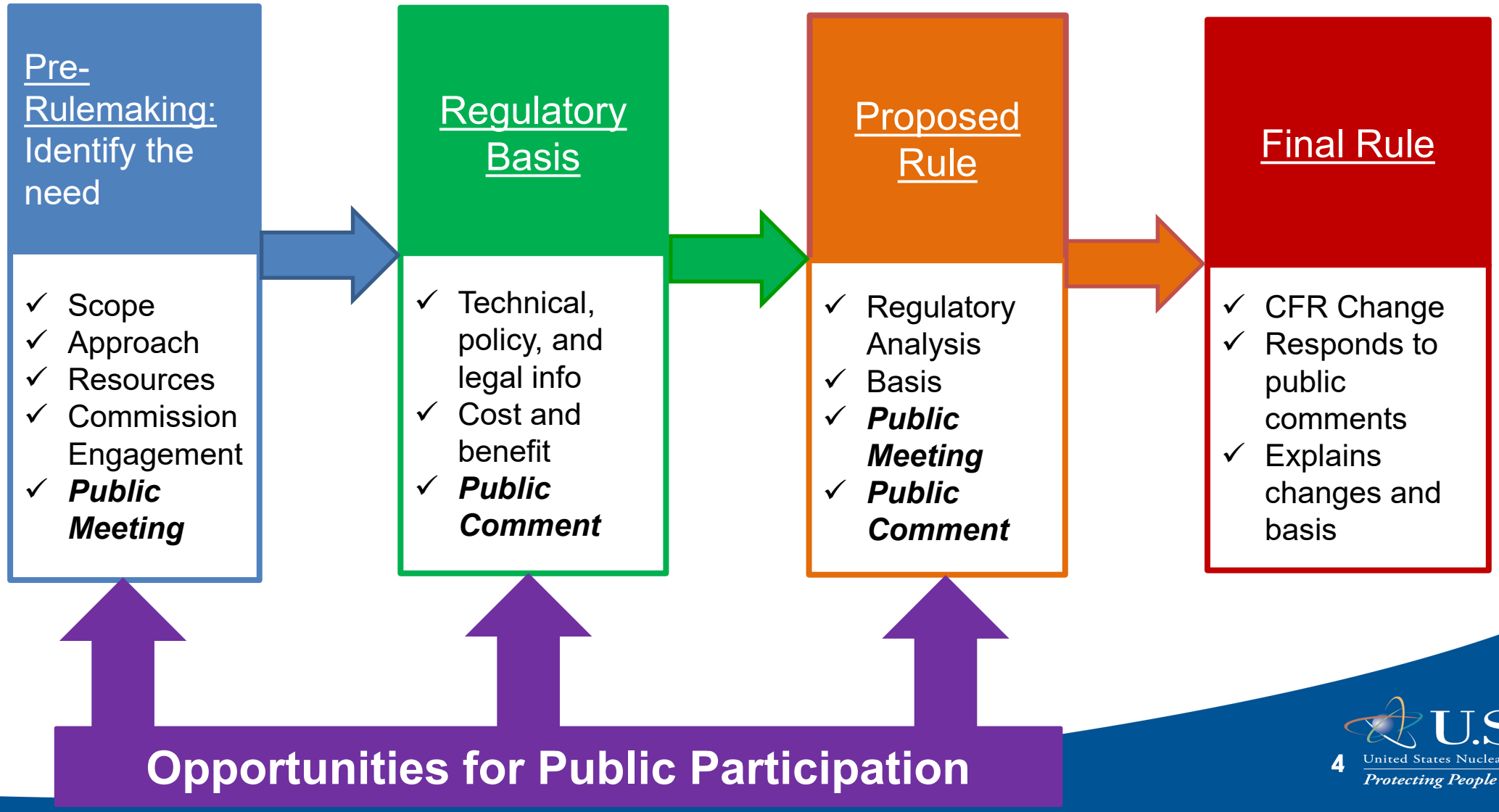
NRC Rulemaking Process



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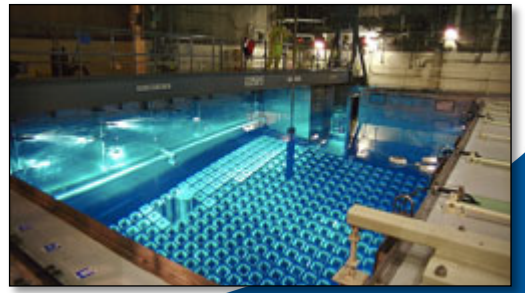
10 CFR Part 53 Rulemaking

- ✓Nuclear Energy Innovation and Modernization Act
- ✓Technology-inclusive, risk-informed and performance based regulatory framework
- ✓Significant stakeholder outreach

Rulemaking on Increased Enrichment of Conventional and Accident Tolerant Fuel Designs for Light-Water Reactors

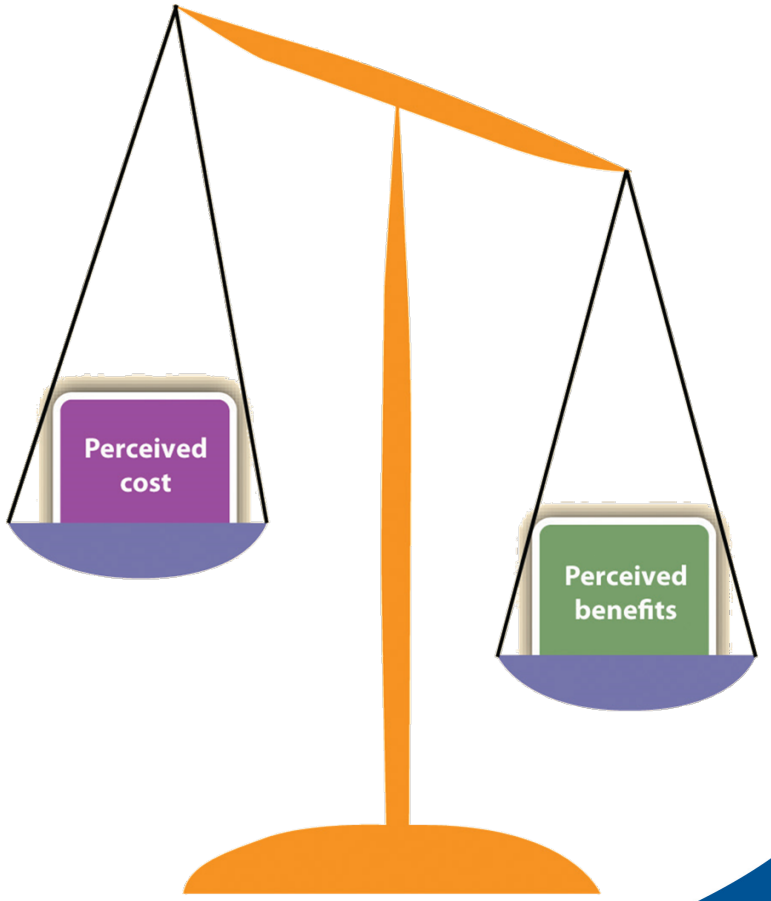
- ✓Current licensing framework allows for the use of up to 5 weight % uranium-235; therefore, technology developments may require exemptions from current rules to use fuels enriched above 5 weight percent

- ✓Rulemaking would provide for a generically applicable standard informed by public input, providing consistent and transparent communication, rather than individual licensing requests

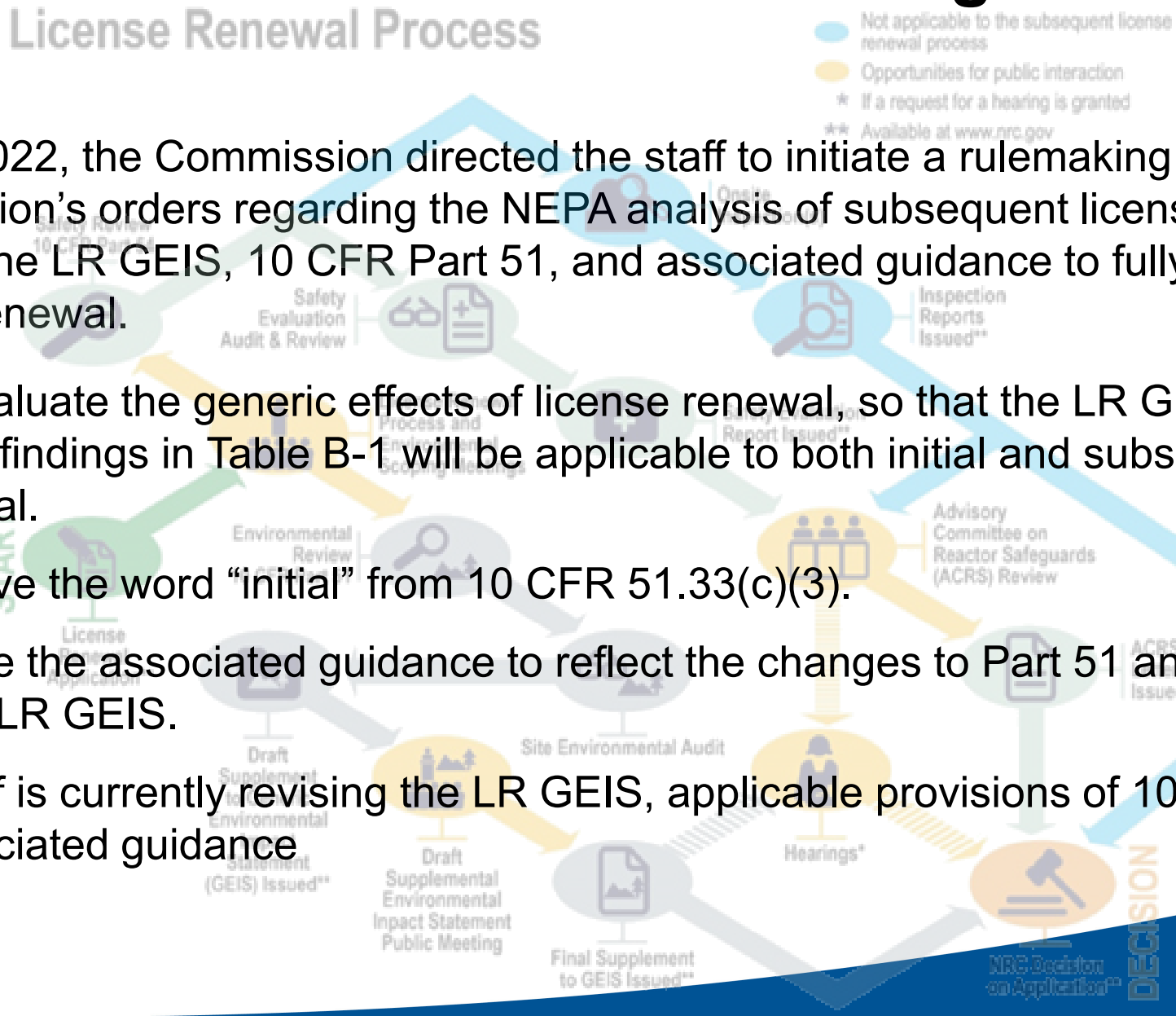


10 CFR Part 50 Appendix I, Cost Benefit Analysis Rulemaking

- ✓ Appendix I, provides numerical design objectives for meeting ALARA in plant effluents.
  - Section II, Paragraph D, currently requires that an applicant include in the radwaste systems all items to ensure that the population dose within 50 miles of the reactor not exceed $1,000 per total body man-rem and $1,000 per man-thyroid-rem.
- ✓ The Commission directed the staff to engage in rulemaking to revise the cost benefit analysis in Paragraph D, consistent with the criteria in NUREG-1530, “Reassessment of NRC’s Dollar Per Person-Rem Conversion Factor Policy,” Revision 1.



Part 51 License Renewal Rulemaking



- ✓ In April 2022, the Commission directed the staff to initiate a rulemaking that aligns with the Commission's orders regarding the NEPA analysis of subsequent license renewal applications by revising the LR GEIS, 10 CFR Part 51, and associated guidance to fully support subsequent license renewal.
  - Re-evaluate the generic effects of license renewal, so that the LR GEIS and the NEPA findings in Table B-1 will be applicable to both initial and subsequent license renewal.
  - Remove the word "initial" from 10 CFR 51.33(c)(3).
  - Update the associated guidance to reflect the changes to Part 51 and the update to the LR GEIS.
- ✓ NRC staff is currently revising the LR GEIS, applicable provisions of 10 CFR Part 51, and associated guidance

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Update on NRR Radiation Protection Activities – Overview

Kevin Hsueh, Chief

Radiation Protection and Consequence Branch
Division of Risk Assessment
Office of Nuclear Reactor Regulation

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Radiation Protection and Consequence Branch

- ✓ NRR program office for radiation protection and radiological consequence analyses
- ✓ Guidance development and technical reviews of licensing actions
- ✓ NRR Reactor Oversight Process (ROP) implementation for occupational and public radiation safety cornerstones

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Oversight Activities

- ✓ Continues to meet our mission during the COVID Public Health Emergency
  - Agency continues to evaluate lessons learned
- ✓ Updates to NRC inspection guidance
  - Public Radiation Safety Significance Determination Process update
  - Refinement of inspection procedures based on operating experience and risk significance
- ✓ Areas of continued interest
  - Supplemental RP Techs
  - RP instrument calibrations

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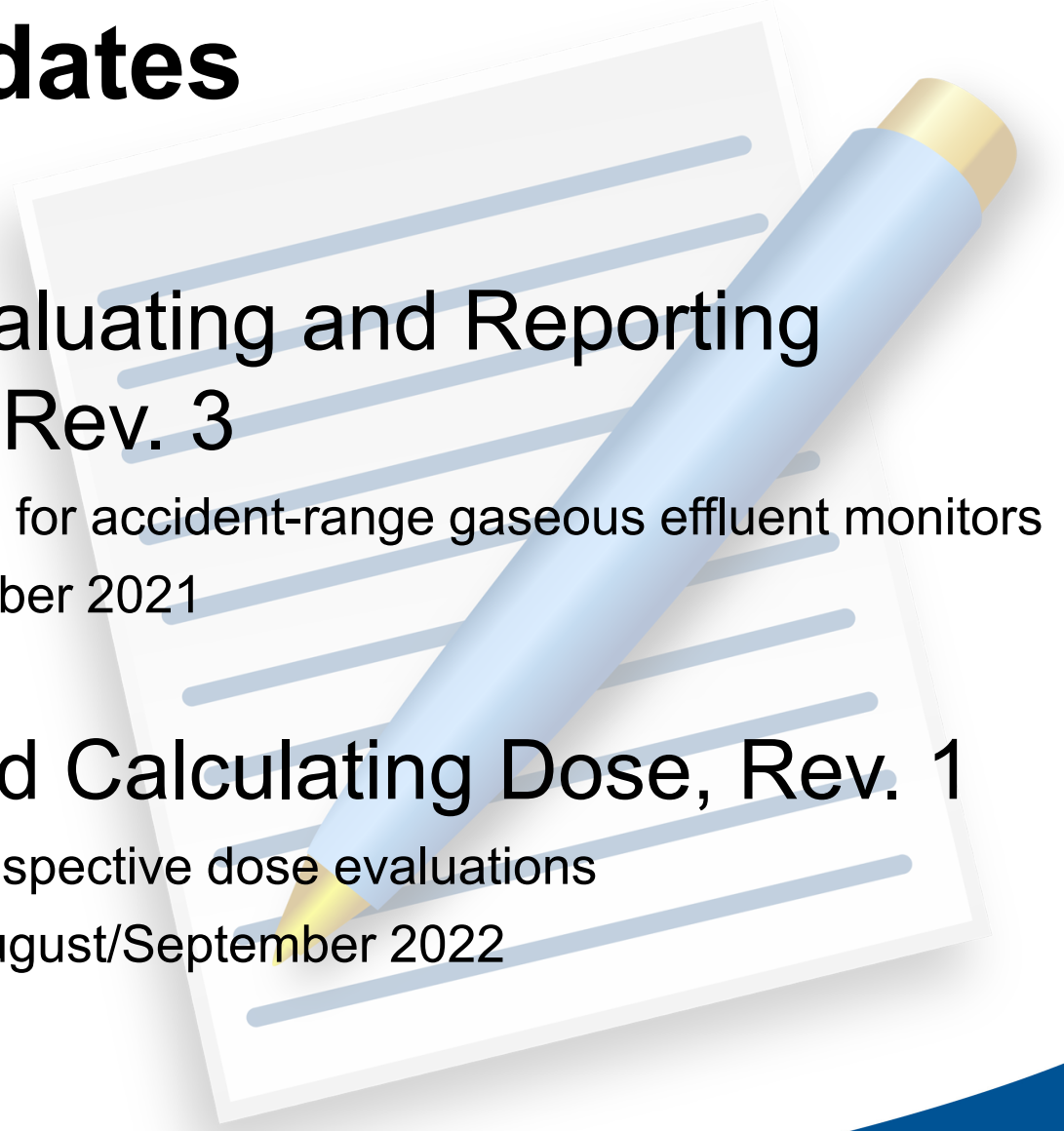
Regulatory Guide Updates



- ✓ RG 1.21 on Measuring, Evaluating and Reporting Effluents and Solid Waste, Rev. 3
  - Include acceptable calibration methods for accident-range gaseous effluent monitors
  - Final RG 1.21 Rev. 3 issued in September 2021
- ✓ RG 8.34 on Monitoring and Calculating Dose, Rev. 1
  - Guidance on dose calculations and prospective dose evaluations
  - Final RG 8.34 Rev. 1 to be issued in August/September 2022

NRC Staff Training

- ✓ Revisions to RG 1.21 and RG 8.34 – July 2022
  - Training slides are to be made publicly available

- ✓ Calibration of Containment and Drywell Ion Chamber High Range Radiation Monitor – 2021
  - Training slides are publicly available at ML21327A271

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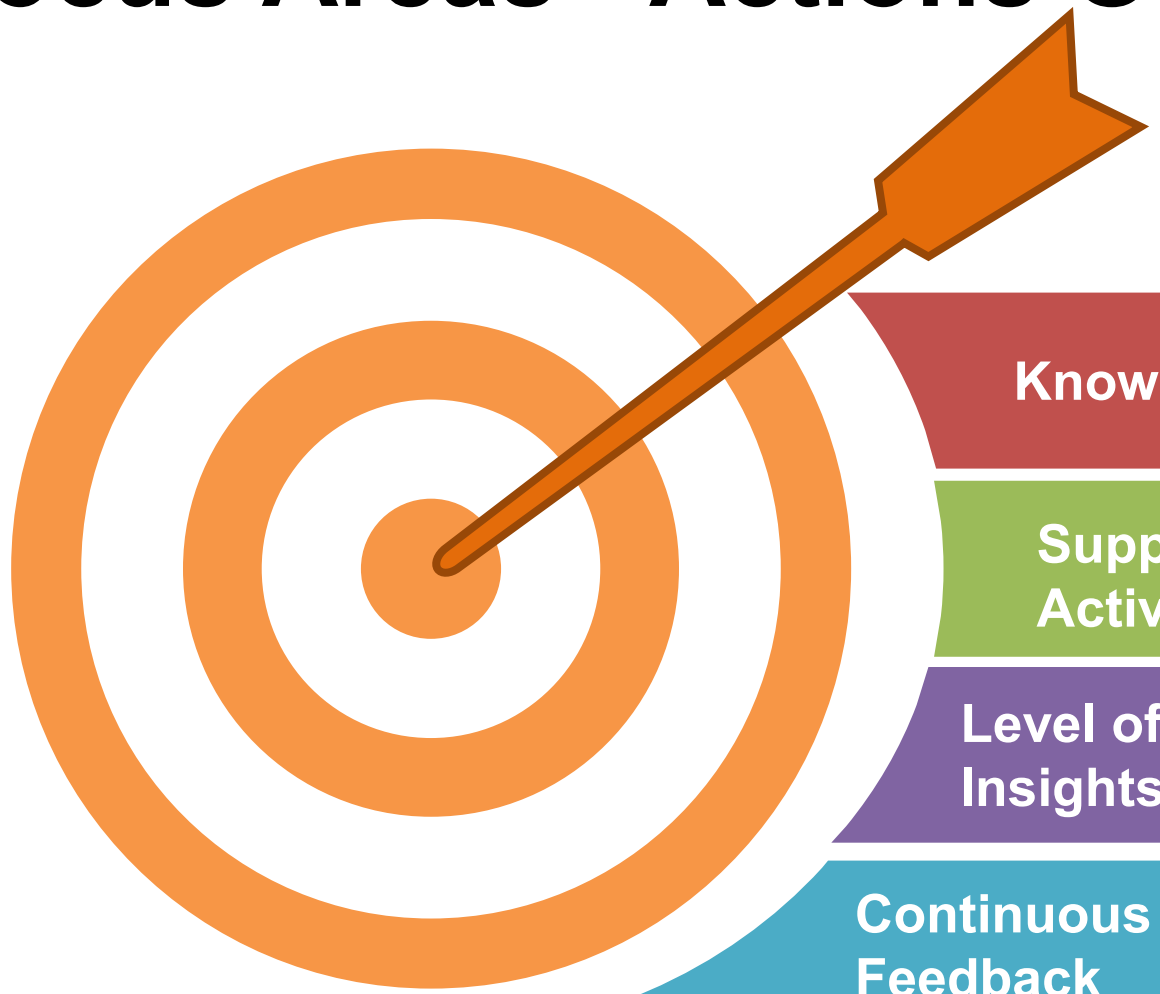
Focus Areas - Actions Ongoing



- Knowledge Management
- Supporting NRC Rulemaking Activities
- Level of Efforts Informed by Risk Insights and Safety Significance
- Continuous Improvements/Open to Feedback

Update on NRR Radiation Protection Activities – Selected Topics

Steven Garry, Sr. Health Physicist
Radiation Protection and Consequence Branch
Division of Risk Assessment
Office of Nuclear Reactor Regulation

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RG 1.21, “Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste”

- ✓ Significant changes to RG 1.21
  - Updating long-term, annual average χ/Q and D/Q values
  - Environmental monitoring for Iodine-131 in drinking water
  - Offsite Dose Calculation Manual (ODCM) - making changes to effluent and environmental programs
  - Incorporates Regulatory Issue Summary 2008-03, “Return/Reuse of Previously Discharged Radioactive Effluents”
  - Calibration of accident-range radiation monitors (to be discussed tomorrow)

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RG 1.21 - Revising ODCMs

- ✓ ODCMs need to be kept current
- ✓ Plant changes affecting ODCMs:
  - Failed fuel impacts – noble gas mix changes
  - Plant operating status (operating status, extended shutdowns or decommissioning where noble gas and iodine have been eliminated)
  - Installation of new or removal of out-of-service radwaste processing equipment
  - Effluent monitoring setpoints

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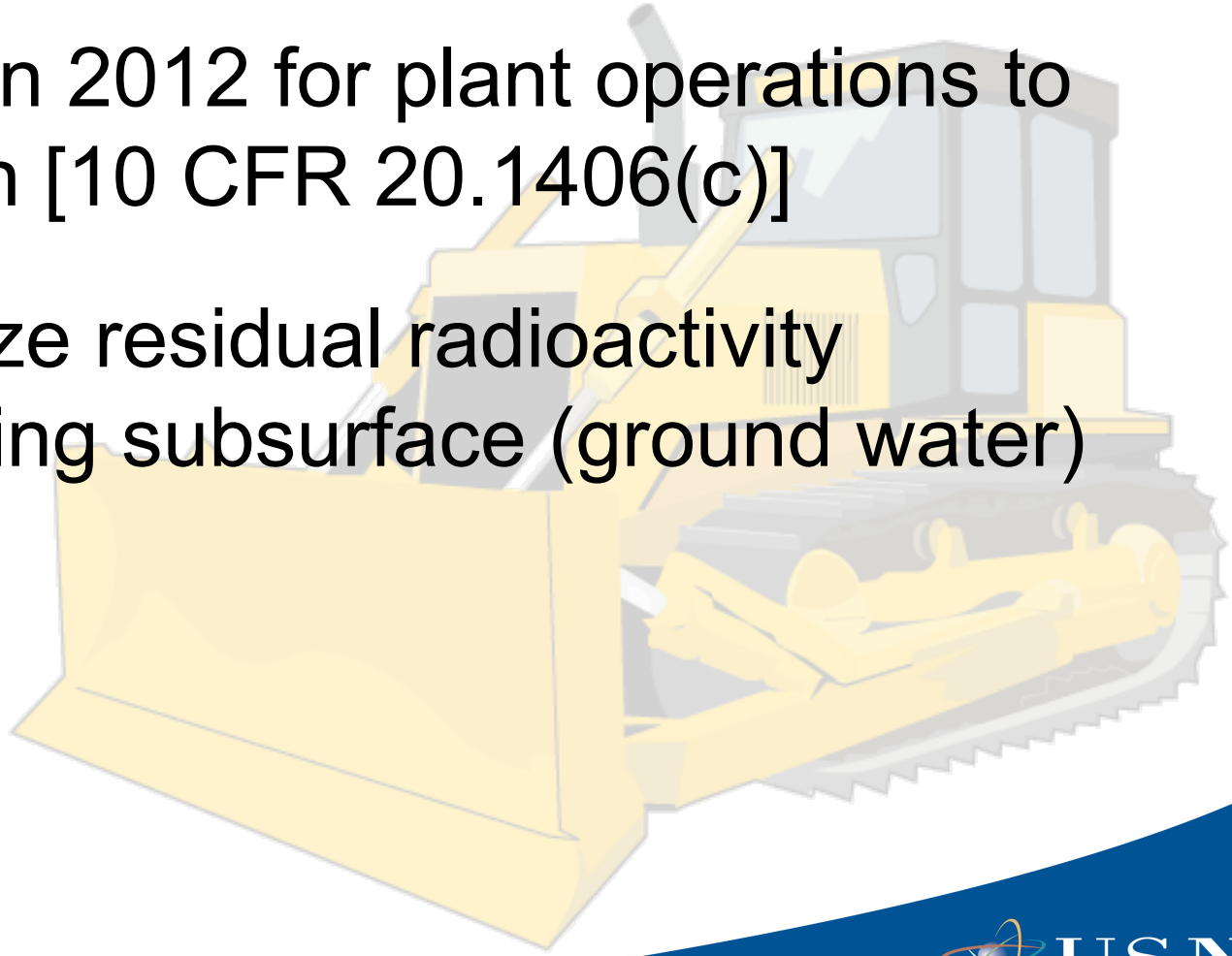
Decommissioning Planning Rule (DPR)*

- ✓The DPR was revised in 2012 for plant operations to minimize contamination [10 CFR 20.1406(c)]
- ✓Licensees shall minimize residual radioactivity (contamination), including subsurface (ground water)



*76 FR (2012) pp. 35512, https://www.nrc.gov/reading-rm/doc-collections/fedreg/notices/

Voluntary Initiatives & 10 CFR 20.1501, Radiological Surveys and Monitoring

- ✓ Industry committed to a NEI Voluntary Initiatives
  - NEI 07-07 (~Ground Water Protection Initiative (GPI))
  - NEI 08-08 (~ FSAR template for minimizing contamination), and
  - NEI 09-14 (~ Underground Pipes) are used as guidance for the ground water monitoring program defining:
    - how to “minimize” (prevent) leaks into ground water
    - how to “survey” subsurface (ground water) 10 CFR 20.1501 was revised in 2012 to require surveys of the “**subsurface**” (i.e., soil and ground water)

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Decommissioning Programs

- ✓ Groundwater monitoring may need to be increased in support of license termination
- ✓ Licensees must maintain and update 10 CFR 50.75(g) record keeping files to include leaks and spills
- ✓ Decommissioning-related RGs
  - RG 4.22, “Decommissioning Planning During Operations”
  - RG 1.185, “Standard Format and Content for Post-Shutdown Decommissioning Activities Report”
  - NUREG-1757, Rev. 1, (2006) “Consolidated Decommissioning Guidance” and draft Rev. 2 (2020)

Responsibilities for Instrument Calibrations

- ✓ Plant staff:
  - Some plants have lost their rad-engineering expertise
  - Instrument and Control (I&C) staff may be doing calibrations without HP oversight and knowledge of radiological response characteristics
- ✓ Plant staff should know:
  - what equipment is installed
  - which department is in charge
  - how equipment works (vendor manuals and calibrations)
  - how calibration checks are performed
  - the basis for efficiency factors and detector specific factors
  - how monitor output interfaces with dose assessment codes

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RG 8.34, Calculating Occupational Dose

U.S. NUCLEAR REGULATORY COMMISSION

REGULATORY GUIDE 8.34, REVISION 1

Issue Date: TBD
Technical Lead: Steven Garry

MONITORING CRITERIA AND METHODS TO CALCULATE OCCUPATIONAL RADIATION DOSES

A. INTRODUCTION

Purpose

This regulatory guide (RG) describes an approach that is acceptable to the staff of the U.S. Nuclear Regulatory Commission (NRC) to meet the requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20, "Standards for Protection against Radiation" (Ref. 1), for monitoring and determining the radiation dose to occupationally exposed individuals.

Applicability

This RG applies to all NRC licensees (reactor and nonreactor) subject to 10 CFR Part 20.

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RG 8.34 - Reasons for Revision:

- ✓ Update the definition of the total effective dose equivalent (TEDE) as the sum of the effective dose equivalent (for external exposure) (EDEX) and the committed effective dose equivalent (CEDE)
- ✓ Provide guidance on performing prospective dose evaluations
- ✓ Provide guidance on monitoring of unplanned, unintended doses
- ✓ Provide new guidance on calculating hot particle dose
- ✓ Define the term “dosimetry processing” and explain electronic dosimetry does not require processing by an accredited National Voluntary Laboratory Accreditation Program (NVLAP) processor
- ✓ Provide guidance on assessing dose from wound injuries
- ✓ Provide guidance on calculating soluble uranium intakes

RG 8.34 - Prospective Evaluation of Doses Not Likely to Exceed Monitoring Criteria

- ✓ Potential exposure scenarios involving small doses (e.g., not exceeding 10% of dose limits):
  - may be evaluated in the prospective dose evaluation
  - identify which doses are “not likely” to exceed monitoring criteria
    - TEDE exposures not exceeding 500 mrem
    - Intakes (not exceeding 10% of annual limits of intake (ALI))
    - Shallow-dose equivalent (skin) (not exceeding 5 rem)
    - Lens of the eye dose (not exceeding 1.5 rem)

Examples of “not likely to exceed” Monitoring Criteria

- ✓ If the prospective dose evaluation determined that:
  - small, unplanned, unintended extremity exposures may occur, but are not likely to exceed monitoring thresholds, or
  - that minor facial contamination or intakes may occur, but are not likely to exceed internal monitoring thresholds, then
- ✓ a follow up whole-body count or dose assessment is not considered required monitoring

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Responsibility for Controlling Intakes

- ✓ Licensees are still responsible for controlling internal exposure (10 CFR 20, Subpart H), regardless of whether a licensee is "monitoring intakes"
- ✓ Licensees must still use engineering controls to control airborne radioactive material (10 CFR 20.1701)
- ✓ Licensees must also use other controls (10 CFR 20.1702)
  - Control access & exposure times
  - Perform TEDE ALARA evaluations to determine the practicality/safety of using respiratory equipment

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RG 8.34 - Placement of Dosimeters

- ✓ Licensees can use passive (TLD/OSL) or electronic dosimetry
- ✓ Move dosimetry to highest exposed portion of the whole body if receiving substantially more dose.
  - Note: “Substantial” is a judgment call
- ✓ External dose may be calculated per 10 CFR 20.1201(c)
  - when exposure was not measured by dosimetry (e.g., from low energy gammas; e.g., Xe-133 at 81 keV) or radiation beams
  - dosimetry was not moved and a substantially higher dose was received to a different part of the body

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RG 8.34 - Determining EDEX

- ✓Use Deep Dose Equivalent (DDE) as equal to EDEX, unless…
  - EDEX is calculated by a method approved by NRC
  - RG 8.40 provides approved methods
  - Licensees may apply for use of other weighting factors, see 10 CFR 20.1003, footnote 2

[2] For the purpose of weighting the external whole body dose (for adding it to the internal dose), a single weighting factor, w_T=1.0, has been specified. The use of other weighting factors for external exposure will be approved on a case-by-case basis until such time as specific guidance is issued.

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RG 8.34 - Determining Skin Dose

- ✓ When exposure is uniform, the skin dose measured by a torso dosimeter is expected to be representative of the SDE
- ✓ If SDE is expected to differ substantially from SDE measured by the torso dosimeter, the SDE should be monitored separately
  Note: “Substantial” is a judgment call
- ✓ Extremity dosimeters may be worn under gloves
- ✓ Credit may be taken for protective equipment (gloves and safety glasses)

RG 8.34 – Calculating Hot Particle Dose

- ✓ A new version of computer code VARSKIN+, “A Computer Code for Skin Contamination and Dosimetry Assessments” has been developed (NUREG/CR-6918)
- ✓ VARSKIN+ has an improved skin dose model, and has added a wound model, eye dose model, and new alpha and neutron skin dose models
- ✓ VARSKIN+ is free to the industry on an NRC the website called “Radiation Protection Computer Code Analysis and Maintenance Program (RAMP)”
- ✓ The RAMP website has additional information on at https://ramp.nrc-gateway.gov/

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RG 8.34 - Wound Doses

- ✓ Decontamination and radiological assessment should not interfere with medical treatment
- ✓ Radiological wound injuries are considered “intakes” under 10 CFR 20.1202(d)
- ✓ ALIs (intake limits) do not apply since ALIs only apply to ingestion and inhalation exposures per Appendix B
- ✓ VARSKIN+ 1.0 has a wound, neutron dosimetry and eye dosimetry models) – see NUREG/CR-6918, Rev 4
- ✓ Potential types of wound doses
  - Tissue dose (volumetric)
  - Skin dose
  - Whole body dose from uptake

RG 8.34, Calculating Skin Dose from Wounds

- ✓Conclusion
  - Skin dose is likely the dominant wound dose limit
  - Other dose limits are not a major consideration in evaluation wound injuries
  - However, dose assessments should be performed for medical consideration

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Questions & Discussion

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