

# From Policy to Performance NRC Risk Policy for Waste Management

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### **Overview**



- Background
- NRC's 1995 PRA Policy Statement
- Risk Management Regulatory Framework
- Low-Level Waste Regulations

## Background



- Safety regulation is ultimately concerned with risk.
- Must address the "risk triplet"
  - What can go wrong?
  - How likely is it?
  - What are the consequences?
- Risk assessment is a tool for evaluating the risk triplet.

## Background (cont'd)



- Most of the original regulations, guidance and requirements:
  - Based largely on deterministic analyses
  - Implemented by prescriptive requirements
- NRC objective of "no undue risk to public health and safety"
  - For reactors, probabilities not systematically quantified until 1975 (WASH-1400)
  - High-Level Waste and Transportation also had risk assessment in use in the '70s

# NRC's 1995 PRA Policy Statement Liver Regularor Commission

"The use of [Probabilistic Risk Assessment (PRA)] technology should be increased in all regulatory matters to the extent supported by the state of the art in PRA methods and data, and in a manner that complements the NRC's deterministic approach and supports the NRC's traditional defense-indepth philosophy." (60 Fed Register 42622)

## Risk Management Regulatory Framework

- Definition of terms in 1999 including:
  - Risk insights
  - Risk informed
  - Performance-based
- Several initiatives as guidance was updated or regulations were modified to make them more risk-informed, performance-based (e.g., the regulations for the decommissioning criteria)

## Risk Management Regulatory Framework (cont'd)



- NUREG-2150 (2012), "A Proposed Risk Management Regulatory Framework" evaluates the progress in most arenas.
- For low-level waste, the following major findings were provided in NUREG-2150:
  - IMPLICIT use of risk-informed, performance-based
  - Applying comprehensive risk management techniques challenging due to events in the future
  - IMPLICIT consideration of defense-in-depth

## Risk Management Regulatory Framework (cont'd)



#### Mission

Ensure adequate protection of public health and safety, promote the common defense and security, and protect the environment

#### Objective

Manage the risks from the use of byproduct, source and special nuclear materials through appropriate performance-based regulatory controls and oversight

#### **Risk Management Goal**

Provide risk-informed and performance-based defense-in-depth protections to:

- Ensure appropriate barriers, controls, and personnel to prevent, contain, and mitigate exposure to radioactive material according to the hazard present, the relevant scenarios, and the associated uncertainties; and
- Ensure that the risks resulting from the failure of some or all of the established barriers and controls, including human errors, are maintained acceptably low

#### **Decisionmaking Process**

Use a disciplined process to achieve the risk management goal:



Figure 5-1 A Proposed Risk Management Regulatory Framework

## Risk Management Regulatory Framework (cont'd)

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- NUREG-2150 recommendations emphasized:
  - More explicit use of risk-informed, performance-based approach
  - More explicit use of defense-in-depth
  - Consideration of uncertainties
  - Stakeholder involvement in establishing Risk Management policy

# Low-Level Waste Regulations

- Originally promulgated in 1981
- Concepts section 10 CFR 61.7 provides overview of regulatory strategy
- Mix of prescriptive and performance-based regulations
- Early guidance was either deterministic or prescriptive
- NUREG-1573 provides guidance on the performance assessment aspects for the off-site dose performance objective

# Low-Level Waste Regulations (cont'd)

- Utilization of 10 CFR Part 61 in Waste Incidental to Reprocessing
- Guidance in NUREG-1854 for staff to focus reviews on those assumptions (scenarios, radionuclide inventories, features, events, processes, etc.) that drive the risk.
- Criteria of Waste Incidental to Reprocessing points to risk-informed approach with practical approach of "highly radioactive radionuclides"

# Low-Level Waste Regulations (cont'd)

- Revisions to 10 CFR Part 61:
  - More explicit use of risk-informed, performance-based approaches
  - Explicit consideration of defense-in-depth
  - Incorporation of the safety case concept
  - Require an inadvertent intruder assessment
  - Allow site-specific waste-acceptance criteria
  - Require performance assessments and inadvertent intruder assessments be updated at closure

# Low-Level Waste Regulations (cont'd)

- NUREG-2175 expands on guidance in NUREG-1573 and NUREG-1854
- Addresses the changes in the rule
- Will be published final with the rule

## **Concluding Remarks**



- Low-level waste is one area that has had risk assessment implicit from the start
- Work can always be done to more explicitly utilize the tools in decision-making