

June 15, 2011

MEMORANDUM TO: Andrew Persinko, Deputy Director
Environmental Protection and Performance
Assessment Directorate
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

FROM: Gregory F. Suber, Chief **/RA by M. Lee Acting for/**
Environmental Protection and Performance
Assessment Directorate
Low-Level Waste Branch
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

SUBJECT: PUBLIC MEETING SUMMARY FOR 10 CFR PART 61:
SITE-SPECIFIC ANALYSIS FOR DEMONSTRATING COMPLIANCE
WITH SUBPART C PERFORMANCE OBJECTIVES
(DOCKET NO. NRC-2011-0012)

On May 18, 2011, staff from the Office of Federal and State Materials and Environmental Management Programs conducted a Public Meeting at the Legacy Hotel and Meeting Centre in Rockville, Maryland, to discuss 10 CFR Part 61: Site-Specific Analysis for Demonstrating Compliance with Subpart C Performance Objectives. The purpose of the meeting was for the U.S. Nuclear Regulatory Commission (NRC) staff to outline proposed rulemaking language intended to specify explicit requirements for licensees to conduct a site-specific performance assessment and intruder assessment to demonstrate compliance with the post-closure performance objectives of Subpart C to 10 CFR Part 61. Another meeting purpose was to solicit early public input from stakeholders that may be affected by the rulemaking.

Approximately 50 people attended the meeting including individuals representing the U.S. Department of Energy, the U.S. Environmental Protection Agency, NRC Agreement States of South Carolina and Utah, commercial low-level waste (LLW) disposal facility operators, the Electric Power Research Institute, and public interest groups. Additional stakeholders participated electronically via webinar. NRC staff delivered presentations providing background on the proposed rulemaking action, proposed new rule language to Part 61, and a proposed

CONTACT: Priya Yadav, FSME/DWMEP
(301) 415-6667

period of performance that would be applied to the new site-specific performance assessment and intruder assessment requirements. Members of the public were also given the opportunity to provide comments for the record. The workshop was transcribed and the official meeting transcript is available at <http://www.nrc.gov/about-nrc/regulatory/rulemaking/potential-rulemaking/uw-streams.html>. Significant stakeholder comments included: (1) the proposed period of performance (20,000 years) is more appropriate for waste streams containing large volumes of highly-concentrated depleted uranium than the majority of LLW which contains mostly short-lived radionuclides; (2) "reasonably foreseeable" exposure scenarios should be specified for the intruder assessment; and (3) the compatibility Category A, requiring Agreement States to adopt essentially identical regulations should be assigned for the proposed performance objectives. Staff will review the transcript and consider comments made at the meeting during the development of the proposed rule language to be issued later this year.

Docket No.: NRC-2011-0012

Enclosures:

1. Agenda
2. Attendee List
3. NRC Presentations

cc: T. Magette
W. Dornsife
J. Greeves
L. Edwards
R. Haynes
S. Jablonski
D. Finerfrock
D. Thatcher
T. Hardesty

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DATE	06/9/11	06/14/11	06/15/11

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PROPOSED AGENDA FOR PUBLIC MEETING (REVISED)
10 CFR Part 61: Site-Specific Analysis for Demonstrating Compliance with Subpart C
Performance Objectives
 (see Federal Register 76 FR 24831)
 Wednesday, May 18, 2011
 8:30 am – 4:30 pm

The Legacy Hotel and Meeting Centre
 1775 Rockville Pike, Rockville, MD 20852

Time	Agenda Item	Led By
8:30am – 8:40am	Welcome and Orientation	NRC Meeting Facilitator
8:40am – 8:50am	Opening Remarks	Larry Camper/FSME
8:50am – 9:05am	Background of the 10 CFR Part 61 Site-Specific Analysis Rulemaking	Priya Yadav/FSME
9:05am – 9:30am	Part 61 Proposed Rule Text	Andrew Carrera/DILR
9:30am – 10:30am	Period of Performance Discussion	Dr. David Esh/FSME
10:30am – 10:45am	BREAK	
10:45am – 12:00 noon	Stakeholder Feedback on Draft Proposed Rule Text	NRC Meeting Facilitator
12 noon – 1pm	LUNCH	
1pm – 4:15pm	Stakeholder Feedback Concerning the Specification of a Period of Performance in 10 CFR Part 61	NRC Meeting Facilitator
4:15pm	Closing Comments	Larry Camper/FSME

Teleconference Information

Dial in Toll Free Number	Participant Passcode:
888-566-9959	56590

Restrictions may exist when accessing freephone/toll free numbers using a mobile telephone.

Webinar Information

Click this Link to Join the Webinar	Participant Passcode/ ID:
https://www1.gotomeeting.com/pjoin/546376344/105633959	546-376-344

**NRC Public Meeting on 10 CFR Part 61: Site-Specific Analysis for Demonstrating
Compliance with Subpart C Performance Objectives**

Participant List

The Legacy Hotel and Meeting Centre
1775 Rockville Pike, Rockville, MD 20852
May 18, 2011

Name	Affiliation
Anna Bradford	NRC/OCM
Rebecca Tadesse	NRC/OCM
Tison Campbell	NRC/OGC
Lisa London	NRC/OGC
Michelle Albert	NRC/OGC
Larry Camper (Speaker)	NRC/FSME
Priya Yadav (Speaker)	NRC/FSME
David Esh (Speaker)	NRC/FSME
Andrew Carrera (Speaker)	NRC/FSME
Brett Leslie (Facilitator)	NRC/NMSS
George Smith (Facilitator)	NRC/Region 1
James Danna	NRC/FSME
Christopher Grossman	NRC/FSME
Christopher McKenney	NRC/FSME
Andrew Persinko	NRC/FSME
Gregory Suber	NRC/FSME
Jean Trefethen	NRC/FSME
Deborah Jackson	NRC/FSME
Juan Montesinos	NRC/FSME
David McIntyre	NRC/OPA
Sarah Anderson	FM Pubs
Martin Schneider	FM Pubs
Jerry Bonanno	NEI
Andrew Mauer	NEI
Elizabeth Fornash	DOE
Thomas England	DOE Savannah River
Maureen O'Dell	DOE
Lisa Phillips	DOE
Danny Smith	DOE
Linda Suttora	DOE
Edward Regnier	DOE
Ward Brunkow	URENCO
Ginger Dickert	Savannah River Remediation
Thomas Frank England	Savannah River Remediation
William Dornsife	Waste Control Specialists
Lisa Edwards	EPRI
John Greeves	JTG Associates
Rich Javati	Pennsylvania Dept. of Environmental Prot.

Susan Jenkins	State of South Carolina
Michael Klebe	State of Illinois
Rusty Lundberg	Utah Div. of Radiation Control
Thomas Magette	EnergySolutions
Sean McCandless	EnergySolutions
Dan Schrum	EnergySolutions
Corey Myers	Studsvik, Inc.
Dan Schultheisz	EPA
Roger Seitz	Savannah River National Laboratory
Liz Woodruff	Snake River Alliance

Enclosure 3
NRC Presentations

10 CFR PART 61: SITE-SPECIFIC ANALYSES FOR DEMONSTRATING COMPLIANCE WITH SUBPART C PERFORMANCE OBJECTIVES

Public Meeting on Proposed Rule Language

Legacy Hotel and Meeting Centre

May 18, 2011

Introductory Remarks and Welcome

Larry W. Camper, Director

Larry.Camper@nrc.gov

Division of Waste Management and
Environmental Protection

Legacy Hotel and Meeting Centre

May 18, 2011

Background: Unique Waste Streams

- 10 CFR Part 61 Based on Certain Assumptions
 - 37 waste streams and 24 radionuclides
 - Defined waste volumes and concentrations
- Original Part 61 Assumptions Changing
 - Uranium enrichment: Disposition need for large quantities of highly concentrated waste
 - DOE use of commercial LLW facilities
 - Commercial SNF reprocessing initiative
 - Changes in power reactor LLW management practices, including blending



Background: *continued*



- Renaissance of Interest in LLW Arena
 - New disposal site operating (Texas)
 - NRC LLW Strategic Assessment: SECY-07-0180
 - Industry innovation to address Class B & C LLW
- Ongoing NRC LLW Staff Initiatives
 - Risk-inform § 61.55 tables
 - Update concentration averaging Branch Technical Position (BTP)
 - Revise Volume Reduction Policy Statement (VRPS)
 - Part 61 site-specific analysis rulemaking* (SECY-08-0147)
 - Public outreach effort in connection with SECY-10-0165
- Site-Specific Analysis Rulemaking
 - Introduce an explicit performance assessment requirement
 - Specify human intrusion calculation
 - Provide technical guidance

SECY-08-0147

Today's Meeting



- Purposes ...
 - Provide an opportunity for enhanced stakeholder feedback/input on proposed draft rulemaking language
 - Staff seeks early feedback on draft proposed rule text before draft proposed rule goes to the Commission

- Timetable
 - Comments sought by **June 18, 2011**
 - Advisory Committee on Reactor Safeguards Briefings: **June and July 2011**
 - Final Draft Rulemaking Package (including Guidance) due to Commission: **October 2011**



Public Outreach Opportunities*

LLW ACTIVITY	MILESTONE	DATE
Site-Specific Analysis Rulemaking (SECY-08-0147)	Public meeting (Rockville)	May 18, 2011*
	Brief ACRS Waste Management Subcommittee (Rockville)	June 2011
	Brief ACRS Full Committee (Rockville)	July 2011
	Rulemaking package due to the Commission	October 2011
Concentration Averaging (CA) BTP	Brief ACRS Full Committee (Rockville)	June 2011
	Issue draft CA BTP for public comment	October 2011*
	Conduct public workshop (New Mexico)	October 2011*
	Issue final CA BTP	June 2012
Volume Reduction Policy Statement (VRPS)	Complete Draft	August 2011
	Issue draft for public comment	October 2011*
	Issue Commission Paper with proposed final VRPS	December 2011
SECY-10-0165: Potential Revisions to 10 CFR Part 61	Docket opened for public comments	March 2011*
	DOE/NRC workshop on Part 61 (Phoenix)	March 2011*
	EPRI International LLW Conference (New Orleans) – NRC Presentation	June 2011
	LLW Forum Meeting (Santa Fe) – NRC Presentation	October 2011
	Conduct public workshops (Locations TBD)	Mid CY 2012*

Background of the 10 CFR Part 61 Site-Specific Analysis Rulemaking

Public Meeting

Priya Yadav, Project Manager
Division of Waste Management and
Environmental Protection
May 18, 2011



Overview

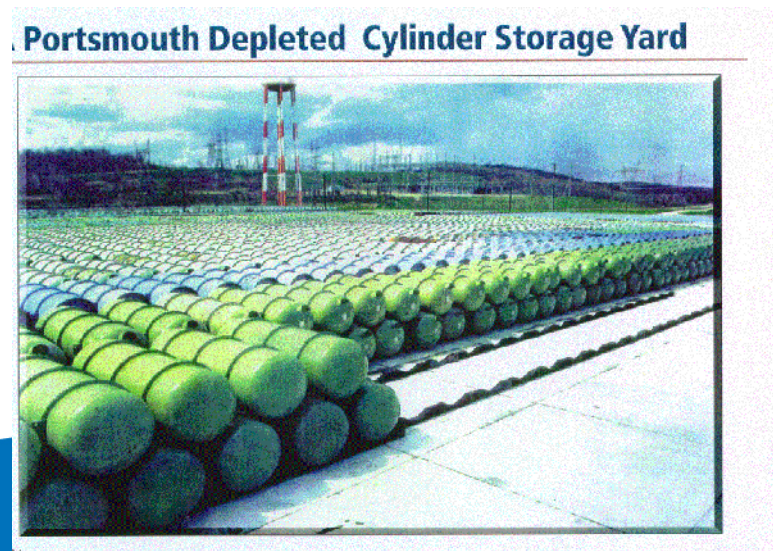


- Background
- Recent Activities
- Regulatory Basis
- Guidance Document



Background

- Landscape for LLW is changing
 - Emerging commercial enrichment today
 - More than 1 million metric tons of depleted uranium (DU) require disposal
 - Shortage of disposal options for Class B and C waste
 - Industry contemplating large-scale blending



Commission Direction



- Memorandum and Order CLI-05-20, 10/19/05
 - Commission directed staff, “outside of the LES adjudication, to consider whether the quantities of depleted uranium at issue in the waste stream from uranium enrichment facilities warrant amending section 61.55 (a)(6) or the section 61.55 (a) waste classification tables.”



Chairman Memorandum



- Memorandum to Staff, 10/08/09
 - Provide a vote paper to clarify Agency's position on blending:
 - Recommendations for revisions, if necessary, to existing regulations, requirements, guidance, or oversight related to blending of LLW



Commission Papers

- SECY-08-0147, “Response to Commission Order CLI-05-20 Regarding DU” (ML081820814)
 - Range of options informed by technical analysis
- SECY-10-0043, “Blending of LLRW” (ML090410246)
 - Range of options to address policy, technical, and regulatory issues

SECY-08-0147
October 2008

SECY-10-0043
April 2010

Site-Specific
Analysis
Rulemaking

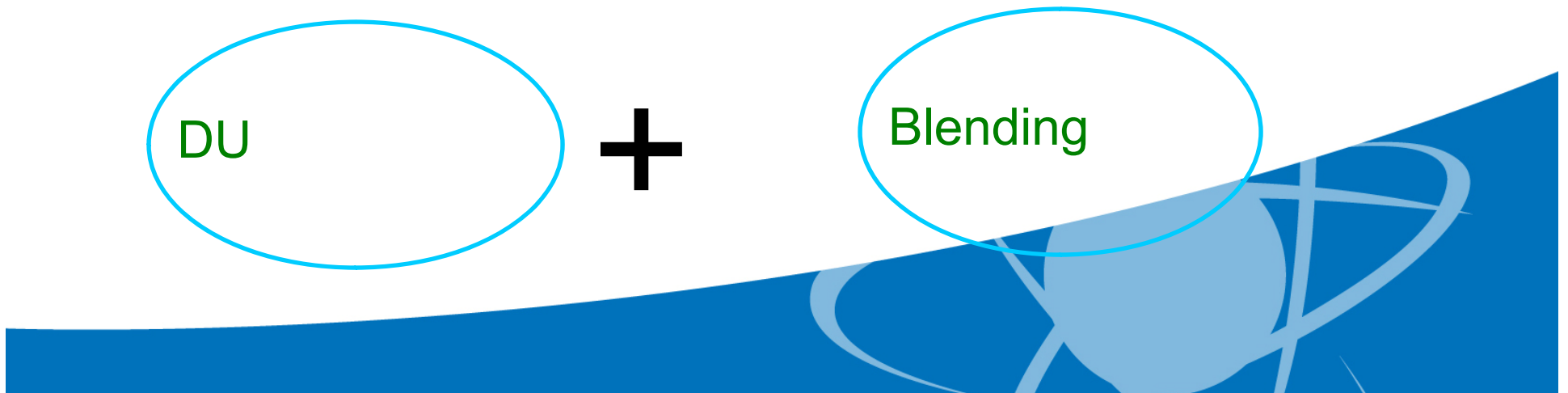
Staff Requirements Memorandums

- SRM-SECY-08-0147:
 - Require site-specific analysis
 - Meet performance objectives
 - Specify criteria needed for analysis
 - Develop supporting guidance
- SRM-SECY-10-0043:
 - Incorporate blending issue into the existing rulemaking for DU

DU

+

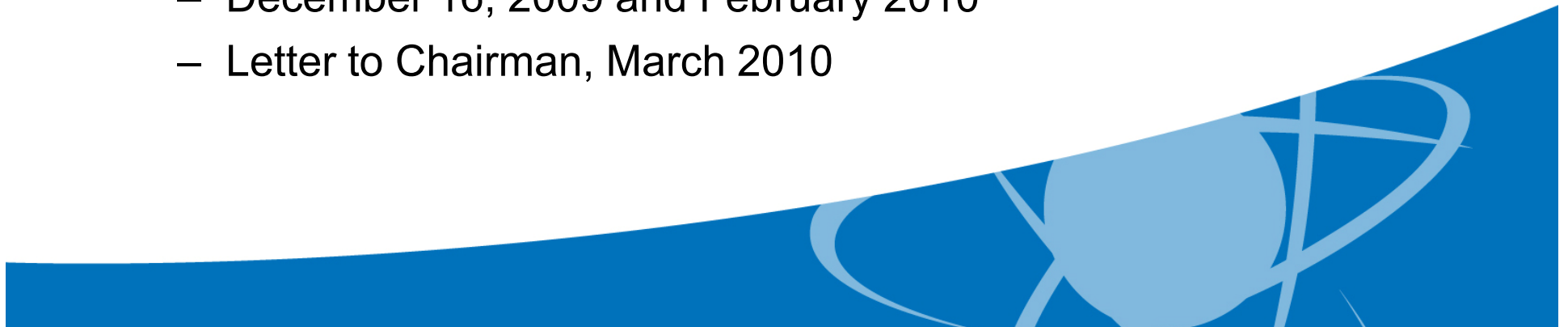
Blending



Recent Activities



- 2009 Unique Waste Streams Workshops
 - Workshop 1: September 2-3, 2009
 - Approximately 75 people attended in Bethesda, MD
 - Transcripts: ML092580469 and ML092580481
 - Workshop 2: September 23-24, 2009
 - Approximately 90 people attended in Salt Lake City, Utah
 - Transcripts: ML092890511 and ML092890516
- ACRS Briefing
 - December 16, 2009 and February 2010
 - Letter to Chairman, March 2010



Recent Activities



- Interim guidance, April 13, 2010
 - Letter to Agreement States
 - “Summary of Existing Guidance That May be Relevant for Reviewing Performance Assessments Supporting Disposal of Unique Waste Streams” (ML100250501)
- Public Workshop, June 24, 2010
 - Demonstrated GoldSim application of screening model supporting SECY-08-0147
 - Approximately 30 people attended
 - Summary (ML101790484)



Regulatory Basis



- “Technical Basis for Proposed Rule to Amend 10 CFR Part 61 to Specify Requirements for the Disposal of Unique Waste Streams, Including Large Quantities of Depleted Uranium”, April 2011, (ML111040419):
 - Describes existing regulatory framework
 - Identifies regulatory issues
 - Outlines basis for requested change
 - Stakeholder interactions
 - Alternatives considered



Regulatory Basis



- Proposed changes:
 - Amend §61.41 to require Part 61 licensees to conduct a site-specific performance assessment for LLW disposal facilities
 - Amend §61.42 to require Part 61 licensees to conduct an inadvertent intruder assessment that considers the time period after the end of the period of active institutional controls



Regulatory Basis



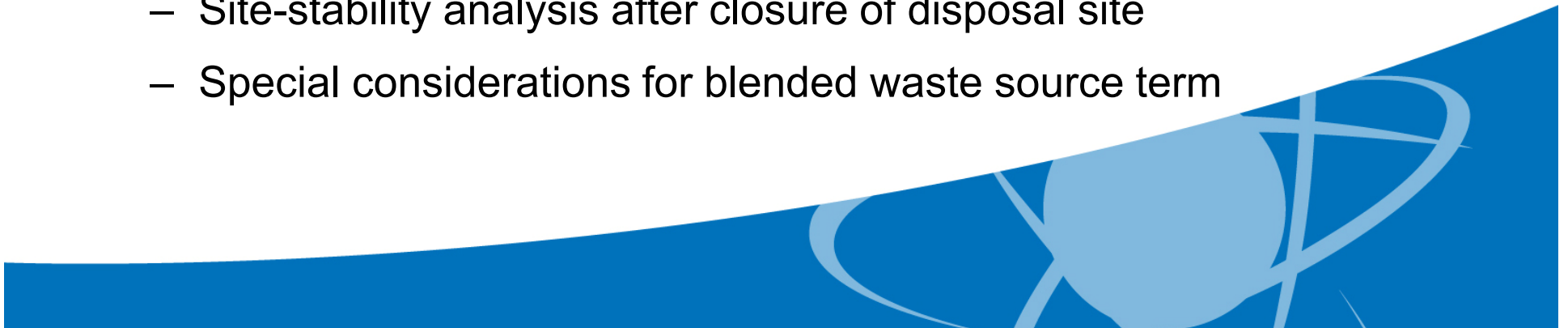
- Proposed changes:
 - Provide additional changes that will reduce ambiguity and facilitate implementation of Part 61:
 - Provide a period of performance
 - Update the radiation safety standards to Total Effective Dose Equivalent (TEDE)
 - Provide a dose limit for §61.42
 - Provide a requirement for long-term analyses
 - Modify concepts §61.7



Guidance Document



- Draft published for comment in Federal Register at same time as Proposed Rule (expected Fall 2011)
- Detailed guidance on:
 - General performance assessment modeling
 - Intruder assessment methodology
 - Risk-informed, performance based implementation of period of performance
 - Long-term analysis beyond compliance period
 - Site-stability analysis after closure of disposal site
 - Special considerations for blended waste source term



Preliminary Proposed Rule Language

Public Meeting on Part 61 Preliminary Proposed Rule
Language

Andrew Carrera

Division of Intergovernmental Liaison and Rulemaking

Legacy Hotel and Meeting Centre

May 18, 2011



Working group



Office	Working Group Members
FSME/DILR/RB-A	Andrew Carrera, Gary Comfort
FSME/DILR/RB-B	Jeffrey Lynch
FSME/DWMEP/EPPAD	Priya Yadav, Mike Lee, James Kennedy
FSME/DWMEP/EPPAD	Christopher Grossman, David Esh
FSME/DWMEP/ERB-A	Stephen Lemont
ADM/DAS/RADB	Angella Love-Blair
OGC	Lisa London, Tison Campbell
NRR	Shawn Harwell
OIS	Kristen Benney
NMSS	Yawar Faraz
OAS/CRCPD	Devane Clark



Purpose of the Rule



- Specify site-specific analyses requirements
- Strengthen and clarifying existing regulations to reduce ambiguity and facilitate implementation
- Better align the requirements with current health and safety standards.



Proposed Amendments to Part 61 Regulations



- Waste Stream Neutral
 - Site specific analyses requirements would apply to all wastes
- Site-Specific Analyses:
 1. Performance assessment (§ 61.41)
 2. Intruder assessment (§ 61.42)
 3. Long-Term analysis (§ 61.13(e))
 4. Update analyses at facility closure (§§ 61.28 and 61.52)



Proposed Amendments to Part 61 Regulations (cont.)



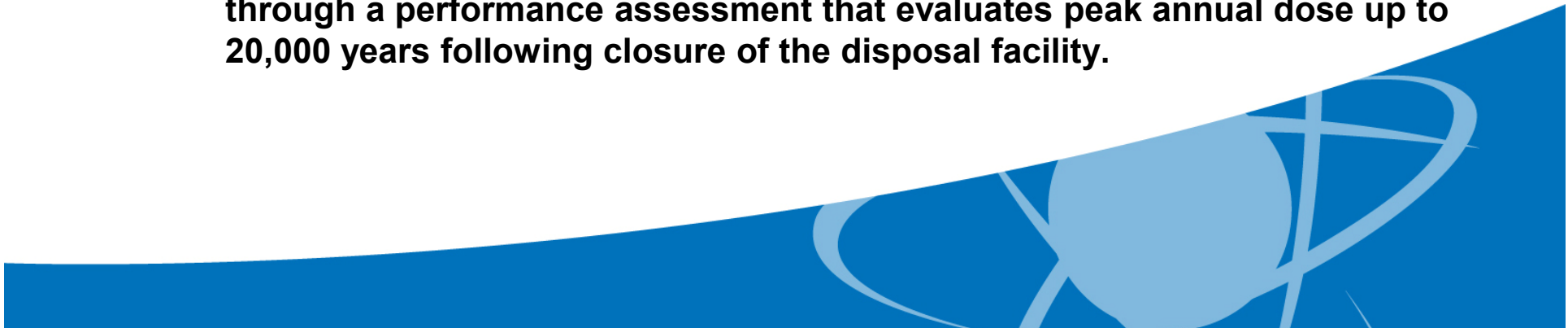
- Other Supporting Changes:
 1. New definitions, concepts, and long-term analysis (§§ 61.2, 61.7, and 61.13)
 2. Use of total effective dose equivalent (TEDE) (§ 61.41)



Site-Specific Analyses: Performance Assessment



- § 61.41 Protection of the general population from releases of radioactivity.
 - (a) Concentrations of radioactive material **that** may be released to the general environment in ground water, surface water, air, soil, plants, or animals must not result in an annual dose exceeding an equivalent of 25 millirems **total effective dose equivalent to any member of the public**. Reasonable effort should be made to maintain releases of radioactivity in effluents to the general environment as low as is reasonably achievable.
 - (b) Compliance with paragraph (a) of this section must be demonstrated through a performance assessment that evaluates peak annual dose up to 20,000 years following closure of the disposal facility.



Site-Specific Analyses: Intruder Assessment



- § 61.42 Protection of **inadvertent intruders**.
 - **(a)** Design, operation, and closure of the land disposal facility must ensure protection of any **inadvertent intruder** into the disposal site who occupies the site or contacts the waste at any time after active institutional controls over the disposal site are removed. **The annual dose must not exceed 500 millirems total effective dose equivalent.**
 - **(b)** Compliance with paragraph (a) of this section must be demonstrated through an intruder assessment that evaluates peak annual dose up to 20,000 years following closure of the disposal facility.



Site-Specific Analyses: Intruder Assessment



- § 61.55 Waste Classification

(a)

(6) Classification of wastes with radionuclides other than those listed in Tables 1 and 2 **of this section**. If radioactive waste does not contain any nuclides listed in either Table 1 or 2 **of this section**, it is Class A. **Any waste classified under this subparagraph must be analyzed in the intruder assessment required by § 61.42.**



Site-Specific Analyses: Long-Term Analysis



- § 61.13 Technical analyses
 - (e) (1) Analyses that discuss how the design of the facility considers the potential long-term radiological impacts, consistent with available data and current scientific understanding. The analyses must identify and describe the features of the design and site characteristics that will reduce long-term impacts.
 - (2) Analyses of long-lived waste must calculate the peak annual dose that would occur 20,000 or more years after site closure. No dose limit applies to the results of these analyses, but the analyses must be included to indicate the long-term performance of the land disposal facility.



Site-Specific Analyses: Updated Analyses



- § 61.28 Contents of application for closure.
 - (a) * * *
 - (2) The results of tests, experiments, or any other analyses relating to backfill or excavated areas, closure and sealing, waste migration and interaction with emplacement media, or any other tests, experiments, or analysis pertinent to the long-term containment of emplaced waste within the disposal site, **including revised analyses for § 61.13 using the details of the final closure plan and waste inventory.**
- § 61.52 Land disposal facility operation and disposal site closure.
 - (a) * * *
 - (12) **Waste will be disposed of consistent with the description provided in § 61.12(f), and the technical analyses required by § 61.13.**

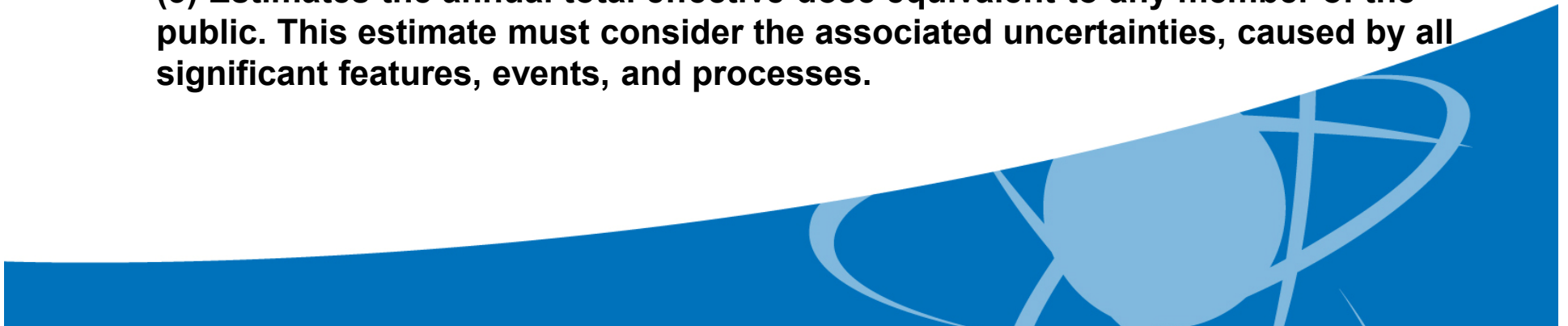
Other Supporting Changes:

- § 61.2 Definitions.
- Intruder assessment is an analysis that:
 - (1) Assumes that an inadvertent intruder occupies the site at any time during the compliance period after institutional controls are removed and engages in activities (e.g., agriculture, dwelling construction, and resource exploration) that might unknowingly expose the inadvertent intruder to radiation from the waste;
 - (2) Examines the capabilities of intruder barriers to inhibit contact with the waste by an inadvertent intruder or to limit the inadvertent intruder's exposure to radiation; and
 - (3) Estimates the potential annual total effective dose equivalent, considering associated uncertainties, to an inadvertent intruder engaging in activities that might unknowingly expose the inadvertent intruder to radiation from the waste.



Other Supporting Changes: (cont)

- § 61.2 Definitions.
- **Long-lived waste means waste for which more than ten percent of the initial radioactivity remains after 20,000 years, or waste for which the peak activity from progeny occurs after 20,000 years.**
- **Performance assessment is an analysis that:**
 - (1) Identifies the features, events, and processes that might affect the disposal system;**
 - (2) Examines the effects of these features, events, and processes on the performance of the disposal system; and**
 - (3) Estimates the annual total effective dose equivalent to any member of the public. This estimate must consider the associated uncertainties, caused by all significant features, events, and processes.**



Other Supporting Changes: (cont)



- § 61.7 Concepts.

(a) *The disposal facility.* (1) Part 61 is intended to ...may also be satisfactory.

Technical requirements for alternative methods may be added in the future. **While there may not yet be detailed technical criteria established for all kinds of land disposal that might be proposed, alternative methods of disposal can be approved on a case-by-case basis as needed.**



Other Supporting Changes: (cont)

- § 61.7 Concepts.

b) *Performance assessment.* (1) Many features, events, and processes can influence the ability of a waste disposal facility to limit releases of radioactivity to the environment. Disposal system behavior is characterized by the disposal facility design, the characteristics of the waste, and the geologic and environmental characteristics of the disposal site. A performance assessment evaluates the behavior of a radioactive waste disposal system and the uncertainties in the system.

(2) The performance assessment identifies the specific characteristics of the disposal site (e.g., hydrology, meteorology, geochemical, biotic, geomorphology, etc.); degradation, deterioration, or alteration processes of the engineered barriers (including the waste form and container); and interactions between the site characteristics and engineered barriers that might affect the performance of the disposal facility. The performance assessment examines the effects of these processes and interactions on the ability of the disposal facility to limit waste releases and calculates the annual dose to a member of the public for comparison

with the appropriate performance objective of subpart C of this part.

Other Supporting Changes: (cont)

- § 61.7 Concepts.

(c)

(2) A cornerstone of the system is stability—stability of the waste ...over 300 years.

The stability of long-lived waste may be more uncertain and require a more robust technical evaluation of the processes that are unlikely to affect the ability of the disposal system to isolate short-lived waste. For long-lived waste and certain radionuclides prone to migration.....

(5) Waste that will not decay to levels.... 500 years. A maximum concentration of radionuclides is specified in **Tables 1 and 2 of § 61.55** so that at the end...



Other Supporting Changes: (cont)

- § 61.7 Concepts.

(c)

(6) Regardless of the classification, some waste may require enhanced controls or limitations at a particular land disposal facility to provide reasonable assurance that the waste will not present an unacceptable hazard over the compliance period. A performance assessment and an intruder assessment are used to identify these enhanced controls and limitations, which are site- and waste-specific. Enhanced controls or limitations could include additional limits on waste concentration or total activity, more robust intruder barriers (such as burial below 30 meters), and waste-specific stability requirements. These enhanced controls or limitations could mitigate the uncertainty associated with the evolutionary effects of the natural environment and the disposal facility performance over the compliance period.

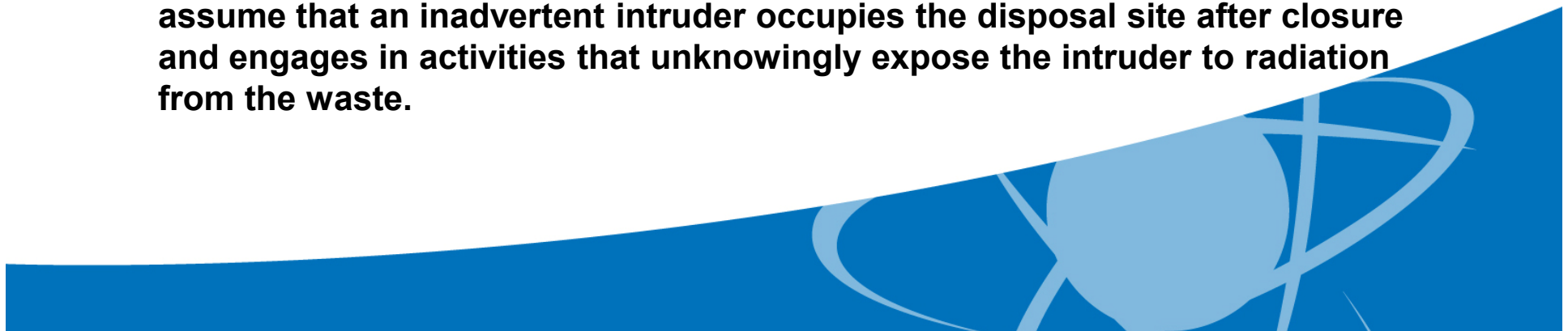


Other Supporting Changes: (cont)

- § 61.7 Concepts.

(c)

(7) An intruder assessment quantitatively estimates the radiological exposure of an inadvertent intruder at a disposal facility following the loss of institutional control. The results of the intruder assessment are compared with the appropriate performance objective. The intruder assessment must identify the intruder barriers and examine the performance of the barriers. The intruder assessment must also address the effects of uncertainty on the performance of the barriers. The barriers must inhibit contact with the disposed waste or limit the radiological exposure of an inadvertent intruder over the duration of the compliance period. An intruder assessment can employ a similar methodology to that used for a performance assessment, but the intruder assessment must assume that an inadvertent intruder occupies the disposal site after closure and engages in activities that unknowingly expose the intruder to radiation from the waste.



Other Supporting Changes: (cont)

- § 61.13 Technical analyses
 - (a) **A performance assessment must represent features, events, and processes that can influence the ability of the waste disposal facility to limit releases of radioactivity to the environment. The features, events, and processes considered in the performance assessment must represent a wide range of both beneficial and potentially adverse effects on performance. The performance assessment must consider the specific technical information provided in § 61.12(a) through (i). The performance assessment must evaluate uncertainties in the projected behavior of the facility. The performance assessment must identify the specific characteristics of the disposal site that are necessary to demonstrate compliance with the performance objectives in subpart C of this part consistent with the specific technical information found in § 61.12. The performance assessment must also identify the degradation, deterioration, or alteration processes of the engineered barriers (including the waste form and container) and interactions between the site characteristics and engineered barriers that might affect the performance of the disposal facility. Pathways analyzed**

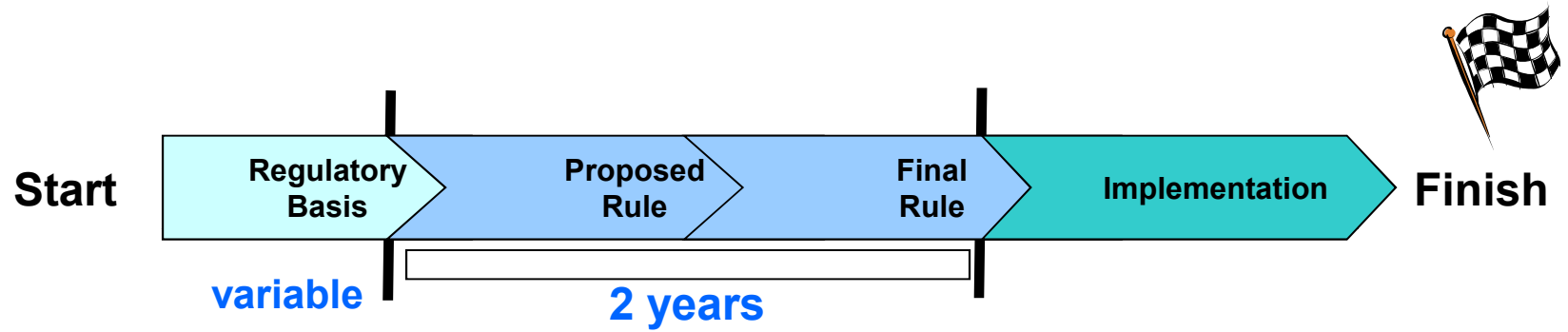
Other Supporting Changes: (cont)



- § 61.13 Technical analyses
 - (b) Analyses of the protection of individuals from inadvertent intrusion must demonstrate that there is reasonable assurance that the waste classification and segregation requirements will be met, that adequate barriers to inadvertent intrusion will be provided, **and that the exposure to any inadvertent intruder will not exceed the limits set forth in § 61.42 as demonstrated in an intruder assessment.**



Rulemaking Timeline



Questions/Comments?

Contact Information:

Andrew Carrera
Division of Intergovernmental Liaison
and Rulemaking

301-415-1078

Andrew.Carrera@nrc.gov



Proposed Period of Performance for LLW Disposal

David W. Esh

Division of Waste Management and
Environmental Protection
US Nuclear Regulatory Commission
david.esh@nrc.gov, (301) 415-6705

May 18, 2011

Background



- **SRM-SECY-08-0147 (ML090770988)** - proceed with the proposed rulemaking in 10 CFR Part 61 to specify a requirement for a site-specific analysis for the disposal of large quantities of DU and the technical requirements for this analysis.
- **2009 Public Workshops (ML092580469, ML092580481, ML092890511, ML092890516)** - participants argued that NRC should specify a period of performance in the regulations.
- **Purpose of proposed rule** - to specify site-specific analysis requirements to demonstrate compliance with performance objectives in 10 CFR Part 61 and to strengthen and clarify existing regulations to reduce ambiguity, facilitate implementation, and to better align the requirements with current health and safety standards.



Background



- Period of performance is one of many important elements in the safety evaluation of low-level waste (LLW) disposal.
- Different approaches are used within the US and internationally for LLW.
- Diverse views among stakeholders.



NRC Background



- The Advisory Committee on Nuclear Waste (ACNW) commented on the period of performance on numerous occasions (since 1994).
- ACNW communicated basic principles.
- Commission direction (SRM-96-103).
- NUREG-1573: Performance Assessment Working Group (PAWG) recommended 10,000 years with longer-term impacts in site environmental assessment.



General Objectives



- Provide protection to present and future generations
- Consider uncertainties
- Communicate long-term impacts
- Facilitate decision making



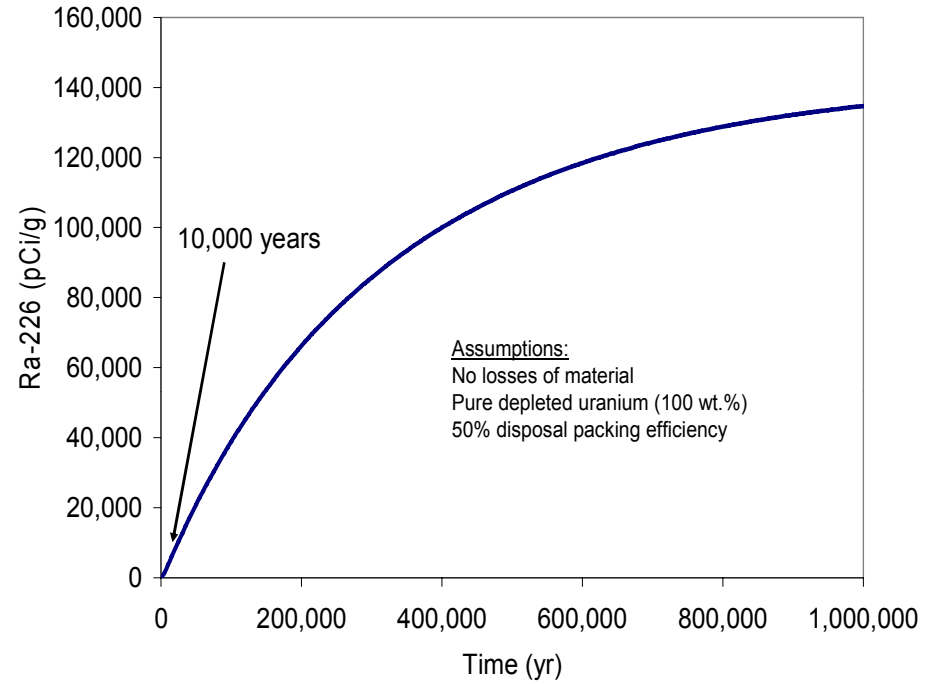
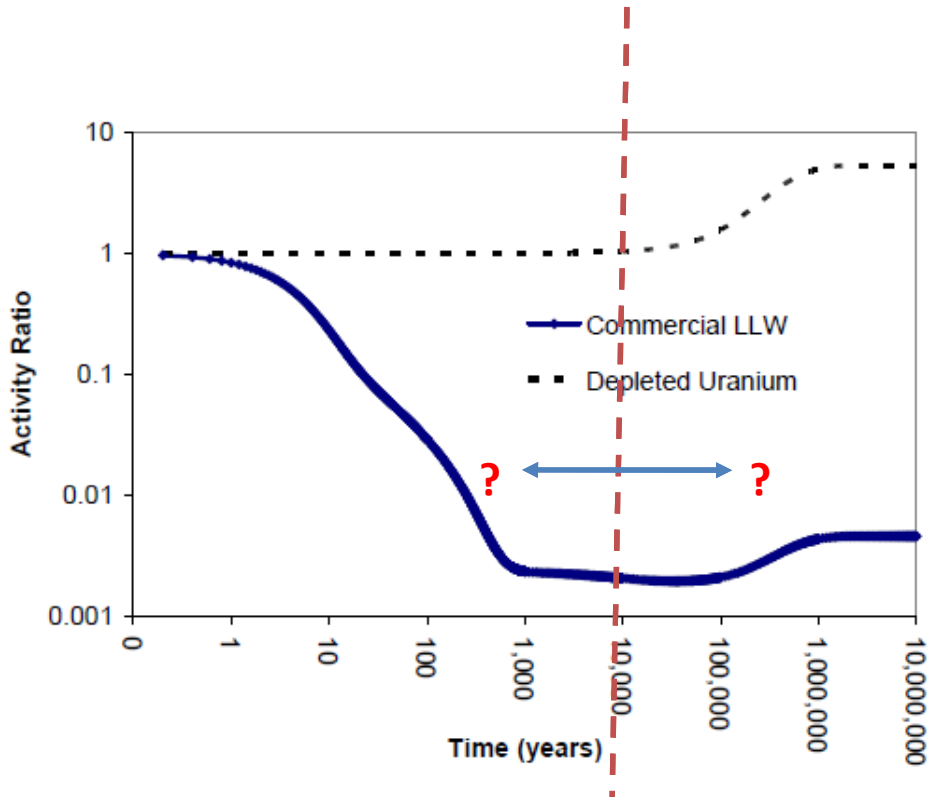
POP Selection Process



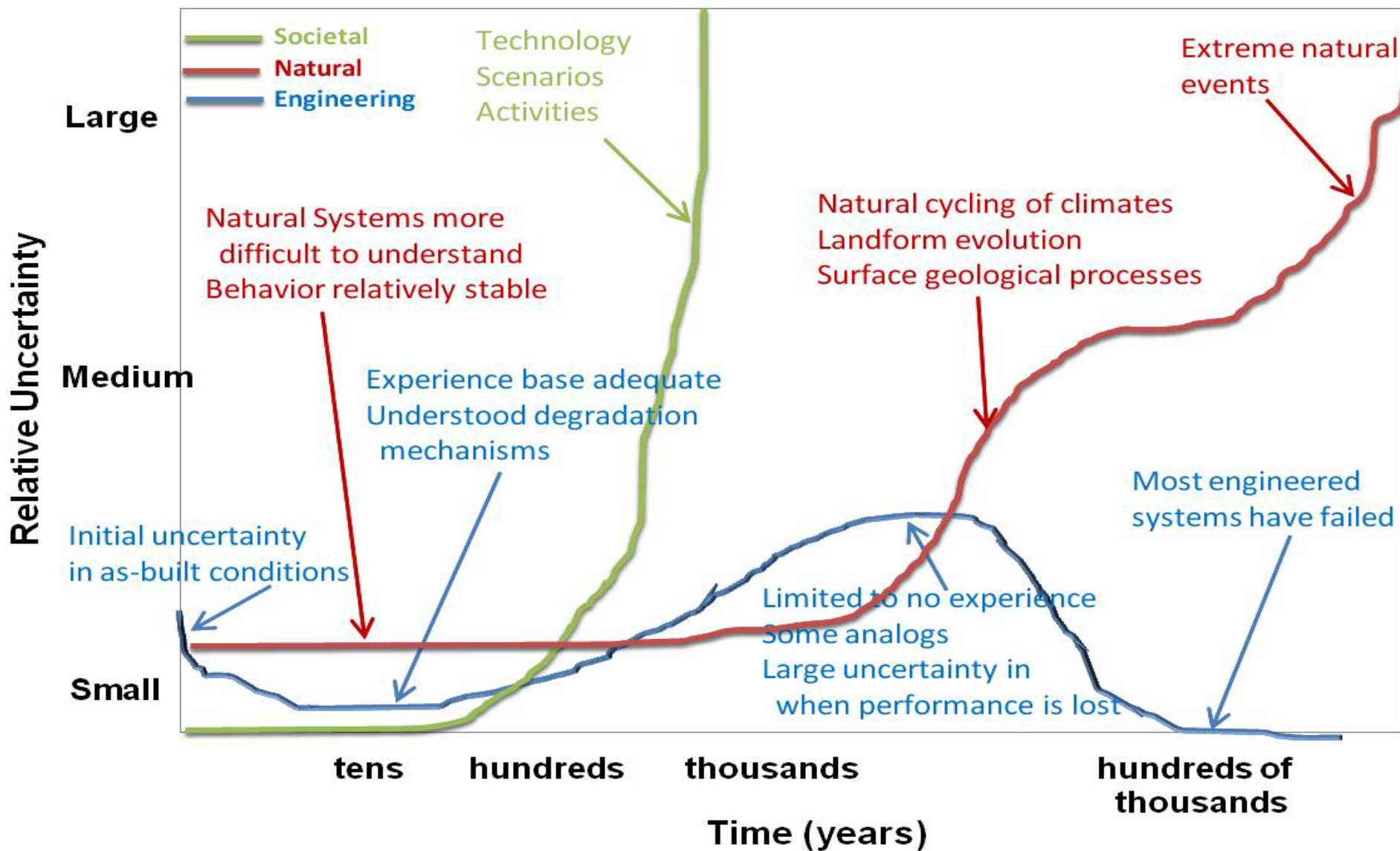
- Literature review:
 - Characteristics of waste
 - Analysis framework
 - Uncertainties (societal, natural, engineering, technology)
 - Socioeconomic considerations (transgenerational equity, discounting)



Waste Characteristics



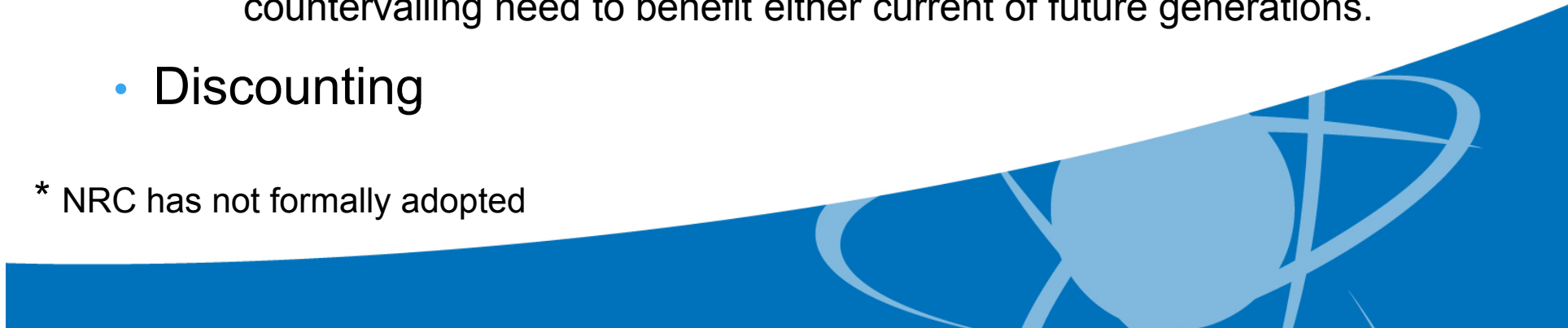
Uncertainty



Socioeconomic

- National Academy of Public Administration (NAPA) recognized that intergenerational decision-making involves a number of variables (NAPA 1997)*
 - 1) Every generation has obligations as trustee to protect the interests of future generations.
 - 2) No generation should deprive future generations of the opportunity of a quality of life comparable to its own.
 - 3) Each generation's primary obligation is to provide for the needs of the living and succeeding generations. Near-term concrete hazards have priority over long-term hypothetical hazards.
 - 4) Actions that pose a realistic threat of irreversible harm or catastrophic consequences should not be pursued unless there is some countervailing need to benefit either current or future generations.
- Discounting

* NRC has not formally adopted



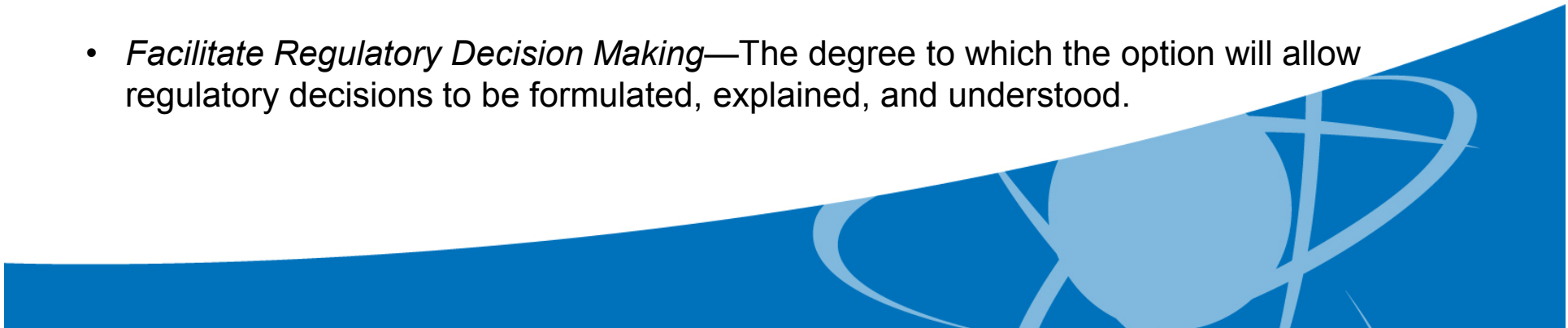
Options Considered

- 1) No Change
- 2) Peak Dose
- 3) Regulatory Precedent (two tiers)
- 4) Uncertainty Informed Approach – three tiers,
Compliance, Assessment, Performance (CAP)
- 5) Industrial Metals



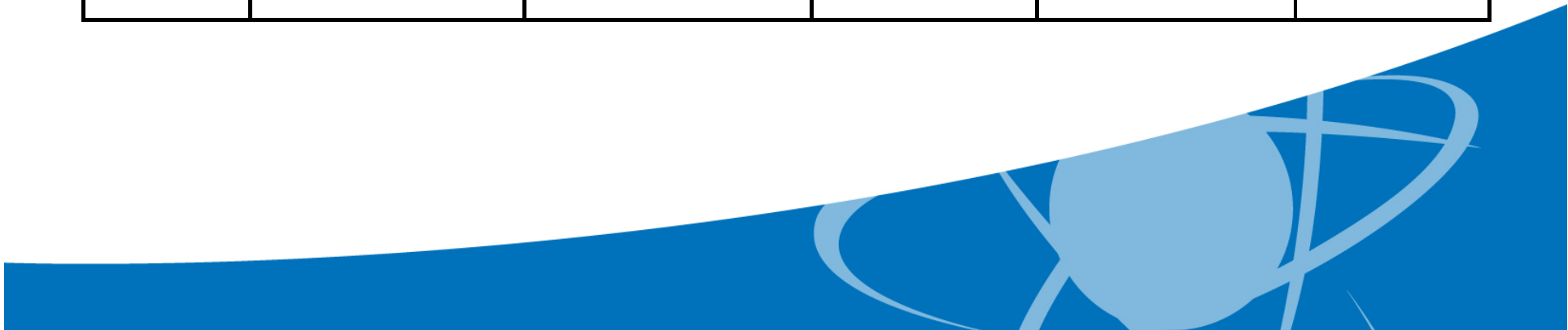
Rating Factors

- *Protectiveness of Public Health and Safety*—The level of protection afforded to current and future generations. A low rating does not mean that the option considered does not provide adequate protection of public health and safety; a low rating means that on a relative basis that option could provide less protection than other options.
- *Consistency with Intergenerational Principles*—The degree to which the option would account for the intergenerational decision making principles listed in this section. Ratings were assigned based on the ability of the option to satisfy all five principles.
- *Consistency with Current NRC Policy*—The degree of consistency with current NRC policy with respect to assignment of a period of performance in waste disposal and decommissioning activities.
- *Treatment of Uncertainty*—The rigor with which the option considers uncertainty. The consideration of uncertainty has technical and socioeconomic components.
- *Facilitate Regulatory Decision Making*—The degree to which the option will allow regulatory decisions to be formulated, explained, and understood.



Rating Factors

Option #	Protectiveness of Public Health and Safety	Consistency with Intergenerational Principles	Consistency with Current NRC Policy	Treatment of Uncertainty	Facilitate Regulatory Decision Making
1	L to H	L to H	H	M	L to H
2	H	L to H	M	L to H	L
3	M to H	M	H	L to M	M to H
4	H	M to H	L to M	H	H
5	H	H	L	L	H



Recommendation

- Option #3 – Regulatory Precedent (two-tiered approach with elements selected for the problem)
- Option #3 provides the best balance considering all factors and stakeholder views (at the current time)



Recommendation

Tier 1

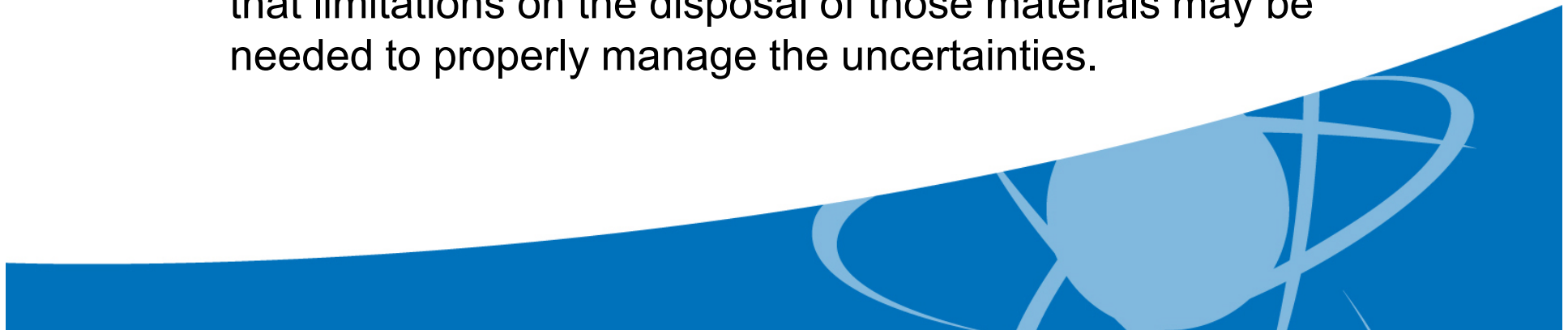
→ • A compliance period of no less than 20,000 years, with a peak annual dose limit of 25 mrem TEDE.

Tier 2

→ • A requirement to perform a calculation of peak annual dose that occurs after 20,000 years as an indicator of long-term facility performance. No dose limit would apply to this analysis.

→ • A requirement to provide analyses that demonstrate how the facility was designed to mitigate long-term impacts.

• Associated changes to the regulations to highlight the uncertainties associated with disposing of long-lived waste and that limitations on the disposal of those materials may be needed to properly manage the uncertainties.



Basis for 20,000 years



- Near-surface disposal is not geologic disposal – the stability issues are much more challenging.
- Natural cycling of climate is known/expected.
- A value of 10,000 years is much more likely to be in the period of climate transition.
- Including climate cycling within the compliance period will encourage disposal of long-lived waste at more stable sites.



Basis for 20,000 years



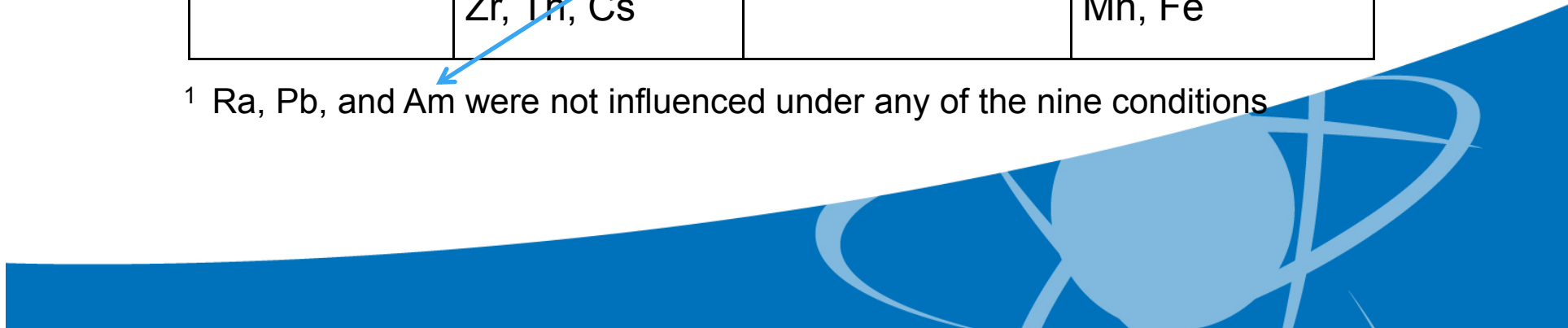
- While 20,000 years does not capture peak risk for all wastes, it captures more than shorter values. Possibly within 10x for DU.
- A value of 20,000 years better captures radionuclide transport characteristics (compared to 10k).
- Diminishing returns for longer periods (affected by increasing uncertainty).



Radionuclide Transport and Period of Performance

Depth (Horizontal)	Shallow	Moderate	Deep
Climate (Vertical)			
Arid	Se, Sn, Eu, Nb, Mn, Fe	U, Np, C, Sr, I	U, Np, C, Sr, I, Tc, H, Cl
Semi-arid	Pu, Ac, Co, Pa	Se, Sn, Eu, Nb, Mn, Fe	U, Np, C, Sr, I
Humid	Pu, Ac, Co, Pa, Zr, Th, Cs	Pu, Ac, Co, Pa	Se, Sn, Eu, Nb, Mn, Fe

¹ Ra, Pb, and Am were not influenced under any of the nine conditions



Basis for No Dose Limit for Second Tier



- Impacts can be better placed in proper context (NRC would complete environmental analysis of impacts for disposal licensing actions taking place in non-Agreement States).
- Approach better aligned with long-term decision making in other programs (e.g. disposal of industrial metals).
- Impacts better aligned with uncertainties.



Guidance on POP

- Risk-informed, performance-based guidance:
 - Would allow flexibility for short-lived waste or low concentrations of long-lived waste.
 - Would allow to go longer for high-concentrations of long-lived waste.
- Expectations for long-term analysis.



Questions?



NRC Background - Backup



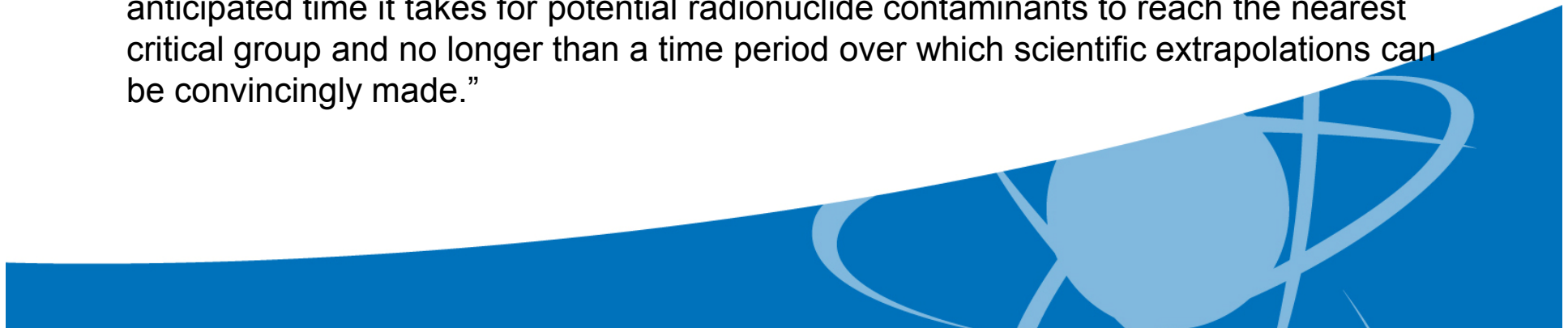
- From the ACNW, June 3, 1994: “The committee believes that there is significant uncertainty about the required time frame for PA. The presently used arbitrary numerical values (e.g., 10,000y) lack bases in either standards or regulations.”
- From the ACNW, June 28, 1995:“.. We believe the application of peak dose calculations to be an important issue...”

- From the ACNW, June 7, 1996:

“The maximum climate change is not predictable with our present science, but all evidence from extrapolations indicates that the principle effect will occur prior to ca. 20,000 years.”

“On the basis of currently available information, the ACNW anticipates that the appropriate compliance period will be somewhat greater than the present standard of 10,000 years.”(for Yucca Mountain)

“The time span for the compliance period should be no shorter than an estimate of the anticipated time it takes for potential radionuclide contaminants to reach the nearest critical group and no longer than a time period over which scientific extrapolations can be convincingly made.”



NRC Background - Backup



- SRM-96-103 “*The staff should provide to the Commission the technical basis used to support the truncation of the performance assessment at 10,000 years..*”
- SECY-00-0182 “*...therefore, PAWG is not recommending that the dose calculations be truncated at 10,000 years, if doses are still increasing at 10,000 years.*”
- NUREG-1573 – PAWG recommended 10,000 years for LLW performance assessment and a qualitative consideration of longer-term impacts in the site environmental assessment.
- From the ACNW, March 18, 2010: Don’t specify a period of performance in the regulation (case by case basis).