DOE HQ Perspectives on Performance Assessments

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Introduction

- Why a PA CoP?
- Purpose?
- Future?
- Concerns?

Introduction (continued)

- DOE M 435.1 requires performance assessments (PAs) for disposal facilities and HLW closures
- High-profile closure activities requiring more detailed PA-like analyses
- Low-Level Waste Disposal Facility Federal Review Group (LFRG) chartered to provide review function
- Community of Practice envisioned as means to foster improved consistency at individual sites and across the DOE Complex

Background

- PAs have been required since 1988
  - Traditionally for disposal facilities, now other applications
- First CoP was the Peer Review Panel/Performance Assessment Task Team
- DNFSB Recommendation 94-2 / 435.1 added:
  - detailed requirements & guidance
  - LFRG & processes and procedures
- All LLW Disposal facilities on 2nd, 3rd, or 4th iteration PAs

Example EM PA and PA-like Analysis Applications

CERCLA Disposal Cell

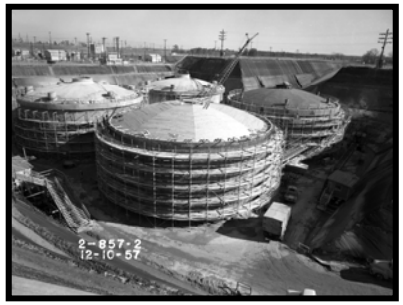
LLW Disposal Engineered Trench

LLW Disposal in Vaults

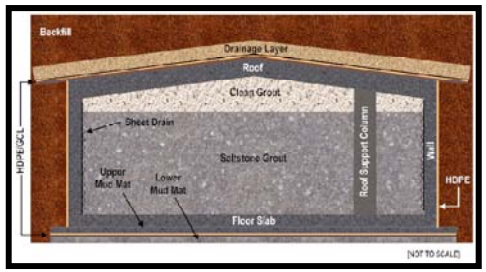
LLW Disposal Grouted in Vault

Reactor D&D

Large Facility Closure



Tank Closure



Saltstone Vault Disposal

<u>Engineered materials assessed</u> – grout waste form and fill, concrete containers and walls, metal tanks and containers, activated metal waste, vitrified waste, tank residual solids, contaminated soils and debris, resins,…

Background (continued)

- LFRG has attempted to fill the CoP need in past
  - HQ PA training workshop
  - Probabilistic uncertainty analysis workshop
  - Distribution development workshop
  - Lessons learned & issue papers
- Much discussion and comment regarding need for PA consistency

Background (continued) -- Evolution of PAs

Past (Generation I)	Present (Generation II)
Deterministic	Hybrid (combination of probabilistic and deterministic methods)
Reliance on conservative-bias, less consideration of engineered features	Balance between realism and conservative-bias (probabilistic interpretation of compliance in some cases)
Conduct PA, send to regulator for review	Increased involvement with regulators and reviewers during development of PA (scoping)
Deterministic sensitivity analysis (One-Offs)	More comprehensive sensitivity and uncertainty analysis using deterministic and probabilistic methods
Minimal interaction with closure assessment modeling	Increasing coordination with closure assessment modeling efforts

HQ Perspective

- Senior Managers do not really understand what a PA is or how it is used
- LFRG still tends to “fly below the radar”
- PAs a key part of what is one of DOE’s last bastions of self-regulation

Self-Regulatory Authority under the AEA

- Establish by rule, regulation, or order, such standards and instructions to govern the possession and use of special nuclear material, source material, and byproduct material as the Commission* may deem necessary or desirable to promote the common defense and security or to protect health or to minimize danger to life or property.

*In this context "Commission" refers to the Atomic Energy Commission which later evolved into the Energy Research and Development Administration and then the Department of Energy (for promotion of uses of nuclear energy) and the Nuclear Regulatory Commission (for regulation of commercial nuclear energy uses).

HQ Perspective (continued)

- Self-regulation does not mean everyone gets to do whatever they want
- Responsibilities and authorities under the Atomic Energy Act implemented through directives and orders.
- Legal requirement to protect members of the public from all sources of radiation, not to exceed 100 mrem.

Dose Perspectives

100,000 mrem – Dose leading to ~5% chance of Fatal Cancer (UNSCEAR)

10,000 mrem/yr – IAEA mandatory intervention

5,000 mrem/yr – Worker dose standard

1,000 mrem/yr – IAEA reference level for intervention for cleanup situations

360 mrem/yr – US Average dose all sources (NCRP)

100 mrem/yr – All sources limit (IAEA practices, DOE)

25 mrem/yr – NRC and DOE LLW

15 mrem/yr – EPA Radiation (40 CFR 191)

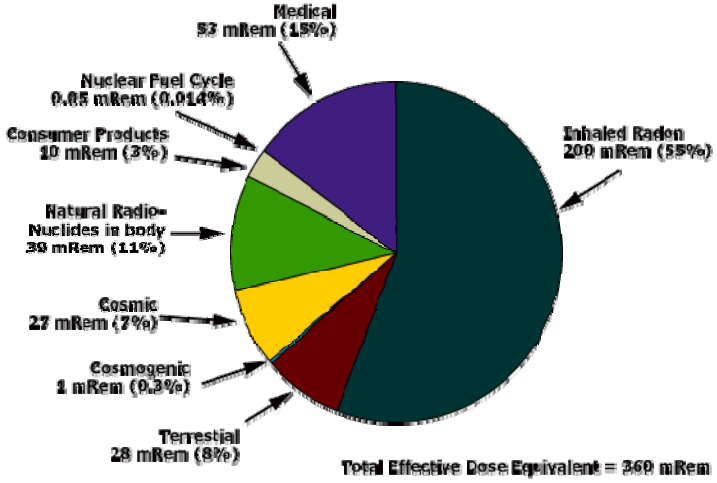
10 mrem/yr – Air (atmospheric) (40 CFR 61)

4 mrem/yr – Drinking Water (40 CFR 141)

1 mrem/yr – IAEA Exemption/Clearance

Note: Air crew average (300 mrem/yr)
From UNSCEAR (2000)

Typical Annual Sources of Public Exposure



Graphics from NCRP Report No. 93

More HQ Perspective

- Cannot prove
  - Reasonable assurance/expectation
- Iterative
- Graded approach – analysis and effort commensurate with need
  - Requirements to avoid sites that are difficult or cannot be modeled
- Tie to operations and limits

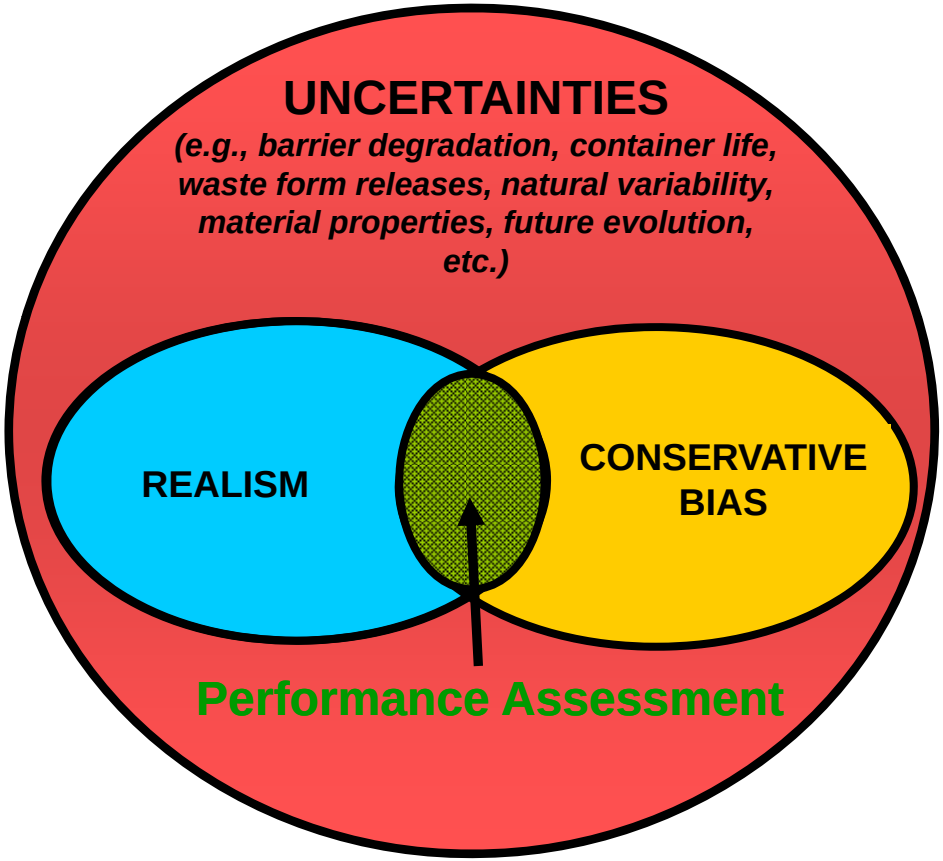
Authorization Requirements (e.g., IAEA Safety Case)

- Approved Disposal Authorization Statement (DAS)
- Approved Performance Assessment (PA)
- Approved Composite Analysis (CA)
- Preliminary Closure Plan
- Monitoring Plan
- PA/CA Maintenance Plan
- Annual Summaries
- Radioactive Waste Management Basis

More HQ Perspective (continued)

- PAs inherently conservative
  - Conservatism built in at many layers
  - Defense in depth
- More "realistic" modeling *CAN* (but does not have to) reduce defense in depth
  - Increases needs for data, granularity, and reductions in sensitivity and uncertainty

Realism and Conservative-Bias in PAs



- Conservative Bias
  - Proven to be efficient and appropriate in many cases
  - Provides defense-in-depth and safety margin, may be overly restrictive
  - Must defend that bias is indeed conservative
- Realism
  - Provides more detailed understanding and credit for specific features
  - Data and models needed, can be used as support for simplified models
  - Need to focus detailed efforts where most beneficial and defensible

Still More HQ Perspective

- Future potential PA CoP activities include:
  - Participation in 435.1 update activities
  - More workshops, lessons learned, technology transfer
- Consistency does not mean uniformity
  - Continued ability to defend our analysis is paramount
- A true Community of Practice should benefit all

PA Community of Practice Path Forward

- Provide means to address consistency early and throughout PA process
- Foster early and sustained communication among LLW, Tank Closure, NEPA, CERCLA, and D&D assessors
- Provide forum to share information regarding state of the art and specific models, data and approaches
- Serve as an enduring data and modeling resource to minimize duplication of effort across DOE and train future generation of PA professionals
- Allow LFRG to focus on its original mission