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

Determining Remediation Goals for Nuclear Power Plants

Christepher McKenney
Division of Waste Management and Environmental Protection
Office of Federal and State Materials and Environmental Programs

Waste Management 2014; March 2-6, 2014

Outline

- Regulations
- Graded Modeling Approach
- Parameterization
- Surveys
- Impacts of Survey Techniques

Regulations

- 10 CFR Part 20 Subpart E (20.1401 – 20.1406)
- Time of Compliance: 1000 years
- Dose Limits:
  - Unrestricted Use: 25 mrem/y (0.25 mSv/a)
  - Restricted Release:
    - 25 mrem/y (0.25 mSv/a) with institutional controls in place
    - 100 mrem/y (1 mSv/a) or 500 mrem/y (5 mSv/a) if institutional controls fail
  - Alternate Criteria

Graded Approach to Modeling

- NRC Guidance: NUREG-1757, Vol 2, Rev. 1 "Consolidated Decommissioning Guidance: Characterization, Survey and Determination of Radiological Criteria"
- NRC Screening Tables (Appendix H)
  - Look up tables for Building Surface Contamination
  - Look up tables for Soil Contamination
- Site-Specific Modeling (Appendix I-M)

Model Selection

- Models need to be fit for purpose
- Screening tables based on DandD v. 2.0
- Majority of Site-Specific Modeling use RESRAD or RESRAD-Build
- Alternate models have included hand/spreadsheet calculations, groundwater models, MicroShield®, etc

Parameterization

- Licensee must justify parameters used
- NRC Guidance:
  - Start with a probabilistic approach (e.g., RESRAD using the NONNUC.TEM template)
  - Identify parameters most affecting results
  - Focus justification on these parameters
- Several licensees have developed a deterministic data set from probabilistic sensitivity analyses to simplify derived concentration guideline level (DCGLs) development

Surveys

- Survey results compared to DCGLs
- Appendix A of NUREG-1757 uses MARSSIM (NUREG-1575)
- Uses full surface scan coupled with random sampling
- Uses statistical methods to determine minimum number of samples
- If your estimated residual levels are close to the DCGLs ⟹ more samples required

Impacts of Survey Techniques

- Survey technique reduces upper bound on dose estimates
- DCGLs assume site average contamination = 25 mrem/y (0.25 mSv/a)
- However, due to uncertainty in survey measurement, actual average has to be lower than DCGL value