



Protective Action Guides Manual

Transition to Recovery

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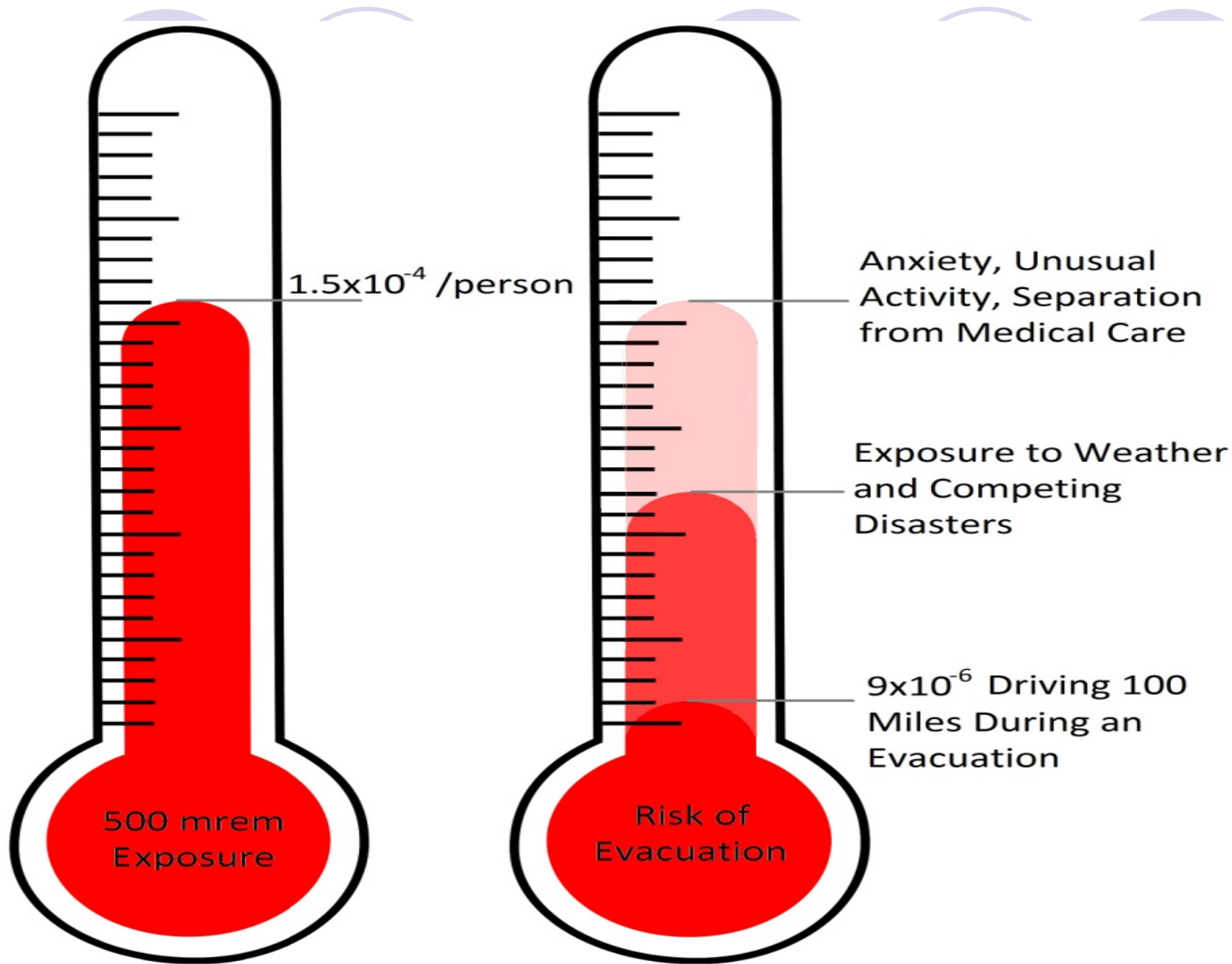
Topics I'll Cover

- Basis for setting the Protective Action Guide (PAG) levels
- Reentry and reoccupancy: New guidance in 2013 PAG Manual
- Cleanup: PAG Manual describes a process, does not set levels



Basis for Setting the Evacuation PAG

- Assuming that 50% of the dose can be avoided by taking a protective action...
- Then the dose at which protective actions should be taken to protect the public from delayed health effects is:
 - 1 rem
- Extenuating circumstances (severe weather, secondary disasters, institutionalized people, etc.) may warrant using 5 rem or even 10 rem.



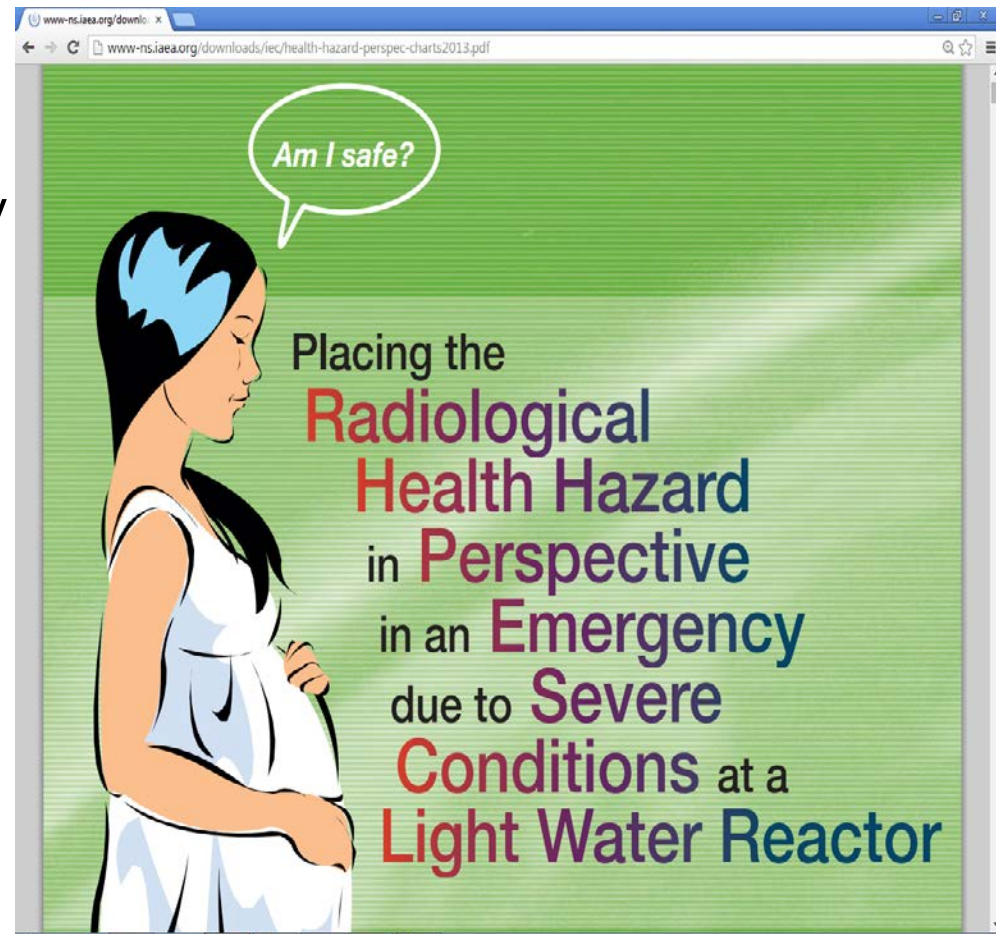


Basis for Setting the Evacuation PAG

- EPA considered the acceptable range of costs for avoiding a statistical death from pollutants other than radiation
- And using BEIR III risk of 3×10^{-4} cancer deaths per person-rem, that range equates to:
 - \$120 to \$2100/person-rem
- Evaluation of the costs associated with implementing various protective actions results in an upper bound of:
 - 1-10 rem with most values being 5 rem
- And a lower bound of
 - 0.15 to 0.8 rem with 0.5 rem being representative of most situations

Basis for PAG Levels: *Sensitive subpopulations*

- Special risk groups include fetuses, and persons who are not readily mobile...
- ...However, due to the difficulty of **rapidly** evacuating only pregnant women in a population, and the assumed higher-than-average risk associated with their evacuation, it is not considered appropriate to establish separate PAGs for pregnant women



Basis for Setting the Relocation PAG



- Considerations for selection of PAGs for the intermediate phase of a nuclear incident differ from early phase primarily with regard to implementation factors
- Specifically, they differ with regard to cost of avoiding dose, the practicability of leaving infirm persons and prisoners in the restricted zone, and avoiding dose to fetuses
- Although sheltering is not generally a suitable alternative to relocation, other alternatives (e.g., decontamination and shielding) are suitable

Re-entry: Going back in temporarily

- Public, workers re-entering Relocation area to work during cleanup
- Basis: Relocation 2nd year PAG
- Detailed exposure scenarios in Operational Guidelines
- Do it yourself: RESRAD-RDD software

PAG Manual for Interim Use and Comment 4-2-2013.pdf - Adobe Reader

File Edit View Window Help

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Tools Sign Comment

PAG Manual March 2013 Draft for Interim Use and Public Comment

Intermediate Phase (first 30 days and up to a year)	Reentry For Use of Critical Infrastructure	Public: 2,000 mrem (20 mSv) in first year (Preliminary Report on Operational Guidelines Developed for Use in Emergency Preparedness and Response to a Radiological Dispersal Device Incident, <i>Operational Guidelines Group C</i>). Dosimeters could be considered for the public.	removal is very effective, but requires specialized equipment and trained operators. Surface sealing is easier, but leaves the contamination in place, making it visible only in locations where the dose rates are low enough for occupation, or in low-occupancy areas. Repaving roads, lots and other paved surfaces is easy to implement, but can generate significant waste volumes. Unpaved areas can be further remediated by soil skimming (surface removal), deep plowing (turning the top foot or so of soil over) and appropriate chemical soil amendment methods like liming or chelating.
	Radiation Worker Protection	<p>Radiation Worker Protection: (dose not to exceed) 5,000 mrem (50 mSv) per year (<i>Radiation Protection Guidance to Federal Agencies for Occupational Exposure</i>, EPA 1987).</p> <p>Radiation workers have knowledge of the risks associated with radiation exposure, training to protect themselves and dosimeters to track their doses.</p> <p>During an incident response, workers (police, waste handlers) needed in contaminated areas could be trained and given dosimeters. The guidance for Radiation Workers applies throughout the response.</p>	As the Intermediate phase progresses, knowledge and experience increases and these methods can be re-applied, refined or customized for problem areas. Decisions about more difficult areas will benefit from professional judgment, additional analyses and application of more sophisticated technologies.
	Reentry For Use of Roads and Walkways	<p>Public: 2,000 mrem (20 mSv) first year, 500 mrem (5 mSv) per year in subsequent years (<i>Operational Guidelines, Group E</i>).</p> <p>While the dose values here are similar to those for Use of Critical Infrastructure above, the derived concentrations measured as triggers are different because the exposure conditions are different.</p>	
	Reentry For Access to the Relocation Zone	<p>Public: 500 mrem (5 mSv) over one year for temporary access with stay times dependent on reentry tasks and site-specific conditions (<i>Operational Guidelines, Group D</i>).</p> <p>'Stay time' is a term of art used in the radiation safety field. Stay times are the amount of time a person may access the contaminated area. These times vary based upon site-specific factors or incident characteristics such as indoor or outdoor work, sensitive populations and level of radioactivity.</p> <p>Section 7.1 of the Operational Guidelines, "Worker Access to Businesses for Essential Actions," provides tables and graphs of stay times at various limiting concentrations (see Figure 7.5 and Table 7.8). For example, if the maximum surface street</p>	

FIGURE 7.5 Limiting Concentrations of Cs-137 for Access to Business

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Reoccupancy during Cleanup Operations

- “Although it may take years to achieve the final cleanup goals for all land uses, reoccupancy of the affected area will be possible when interim cleanup can reduce short-term exposures to acceptable levels...
- “There may be institutional or engineering controls placed on some portions of the site to prevent excessive exposures until further active remediation, radioactive decay, or natural weathering allow the site to meet cleanup goals.”



Late Phase: Cleanup Goal

- What is the community expectation of cleanup goal = background?
- Prescriptiveness versus flexibility
- Time, costs, risks, benefits
- Varied legal authorities and funding sources
 - Depends on the material
 - Terrorism or not
 - More than one legal authority may apply

A decorative graphic at the top of the slide features a horizontal purple line. Above this line, there are two groups of three circles. The first group on the left has a solid purple circle, a white circle with a purple outline, and another solid purple circle. The second group on the right has a solid purple circle, a white circle with a purple outline, and another solid purple circle. The text 'Step-wise Process' is positioned to the left of the first group of circles.

Step-wise Process

- Characterization and stabilization
- Establish cleanup goals based on options analysis
- Implementation and reoccupancy

Benchmarks as starting points

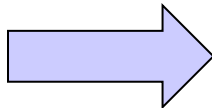
Regulation	Agency ^a	Standard/Numerical limits ^b
General public (10 CFR 20)	NRC	100 mrem/year
Uranium mill tailings (40 CFR 192; 10 CFR 40, App. A)	EPA	Ra-226/228: 5 pCi/g (surface) 15 pCi/g (subsurface) Rn-222: 20 pCi/m ² -sec
High-level waste operations (10 CFR 60)	NRC	100 mrem/year
Low-level waste (10 CFR 61)	NRC	25/75/25 mrem/year
Drinking water (40 CFR 141.15–16)	EPA	Radium: 5 pCi/L Gross alpha: 15 pCi/L (excludes Ra and U) Beta/photon: 4 mrem/year ^c Uranium: 30 µg/L
Uranium fuel cycle (40 CFR 190)	EPA	25/75/25 mrem/year
Air emissions (National Emission Standards for Hazardous Air Pollutants) (40 CFR 61, H)	EPA	10 mrem/year to nearest off-site receptor
Superfund (CERCLA) cleanup (40 CFR 300)	EPA	A risk range of 1:10,000 to 1:1,000,000 (10 ⁻⁴ – 10 ⁻⁶) excess lifetime risk of getting cancer or ARARs ^d
Decommissioning (10 CFR 20)	NRC	25/100/500 mrem/year
Occupational standards (29 CFR 1910; 10 CFR 20; 10 CFR 835)	OSHA; NRC; DOE	5,000 mrem/year



Decision-Making Organizations

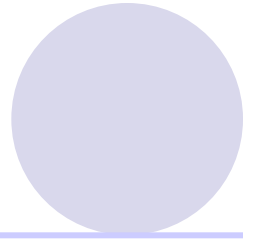
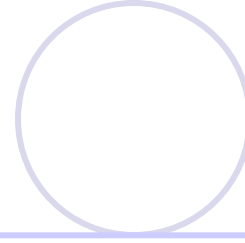
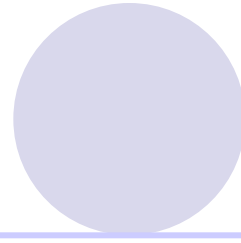
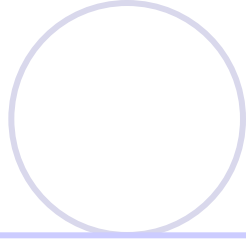
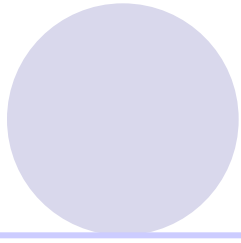
- Focus on process for reaching consensus:
 - Decision Team – might be requesting funding
 - Senior local, state and federal officials
 - Recovery Management Team
 - Senior leadership in the field recovery effort
 - Stakeholder Working Group
 - Community leaders, local businesses, nongovernmental representatives, members of the public
 - Technical Working Group
 - Select subject matter experts, communicators

Playing it out: Liberty RadEx

- Used Cleanup Advisory Forum process to prioritize cleanup activities and develop a long-term cleanup strategy
- Technical group 
- Community group



Technical Advisory Panel



Thank you!