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Considering Radioactivity Thresholds Based on Security Risk

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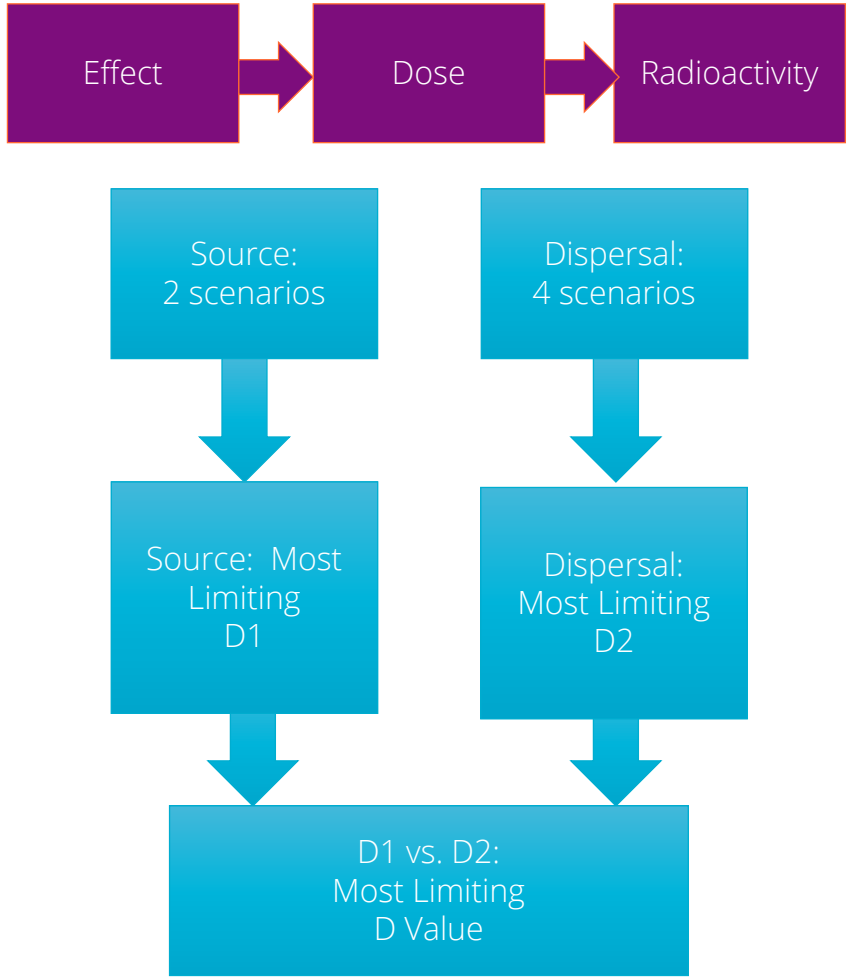
Current radiation source requirements and categorization are provided in the Code of Conduct.

- Category 1: likely to cause permanent injury to a person who handled them for more than a few minutes and probably fatal to be close to unshielded material for a few minutes to an hour (1000 × D-value)
- Category 2: could cause permanent injury to a person who handled them for a short time– minutes to hours, possibly be fatal to be close to unshielded material for hours to days (10 × D-value)
- Category 3: could cause permanent injury to a person who handled them for some hours, possibly fatal to be close to unshielded material for days to weeks (D-value)

The D-value methodology starts with deterministic effects and ends with limiting radioactivity amounts.

1) Consider a set of deterministic effects.
   - "Fatal effects are those that, if developed, lead to death"
   - "Non-fatal effects are those that reduce the quality of life and are organ or tissue specific"
2) Determine from literature threshold radioactivity values for each of those effects.
3) Using a set of scenarios, calculate amounts of radioactivity for each scenario that meet the threshold values.
4) Determine the D1 threshold as the minimum radioactivity meeting the two source exposure scenarios.
5) Determine the D2 threshold as the minimum radioactivity meeting the four dispersion exposure scenarios.
6) Determine the D-value as the minimum radioactivity threshold between D1 and D2.



D-value methodology focuses on accident scenarios.

D1 – non-dispersal scenarios
- “pocket” – source found and placed in pocket (266)
- “room” – source left out in a room for several hours (5)

D2 – dispersal scenarios
- “inhalation” – fire or explosion (65)
- “ingestion” – leaking source or water contamination (1)
- “contamination” – leaking source on skin (8)
- “immersion” – noble gases (0)

This technique does not consider:
- Stochastic cancer risk
- Extended inhalation (groundshine) or exposure (inhalation)

	1000 × D (TBq)	D Value	Limiting D1, D2	Limiting Scenario
Am-241	60	0.06	D2	Inhalation
Am-241/Be	60	0.06	D2	Inhalation
Cf-252	20	0.02	D1	Pocket
Cm-244	50	0.05	D2	Inhalation
Co-60	30	0.03	D1	Pocket
Cs-137	100	0.1	D1	Pocket
Gd-153	1000	1	D1	Pocket
Ir-192	80	0.08	D1	Pocket
Pm-147	40,000	40	D2	Inhalation
Pu-239	60	0.06	D2	Inhalation
Pu-239/Be	60	0.06	D2	Inhalation
Se-75	200	0.2	D1	Pocket
Sr-90 (Y-90)	1000	1	D1	Pocket
Tm-170	20,000	20	D1	Pocket
Yb-169	300	0.3	D1	Pocket

IAEA CRP J02011 is designed to review the IAEA's system of radioactive source control and make recommendations.

Improving the Security of Radioactive Material throughout its Lifecycle, Associated Facilities, and Associated Activities

Three tasks:

- Develop guidance or procedures to address gaps where radioactive material may fall out of regulatory control or protection is reduced.
- Identify strengths and weaknesses within existing security measures for fixed and mobile radiation source applications.
- Verify that international guidance in the Category system of thresholds provides an appropriate basis and, if not, devise new security-based thresholds and a new list of radionuclides if warranted.

This work falls under the third task.

The purpose of task 3 is specifically to review the category system and underlying D-values

Participants on this task from US, UK, Greece

Task 3: *Verify that international guidance in the Category system of thresholds provides an appropriate basis and, if not, devise new security -based thresholds and a new list of radionuclides if warranted.*

- Review process and parameters for determining D-values
- Recommend changes to the system

Are the effects considered appropriate for security risk?

- Deterministic vs. stochastic (i.e., cancers)

Do the scenarios include those expected from attack threats?

- Accident based vs. continuous for weeks or months

Is the D1 vs. D2 comparison appropriate?

- Source exposure vs. dispersed material

Does it do the job?

- Provide adequate security thresholds regardless