
DOE Accelerator Workshop

U.S. Department of Energy
Radiation Protection of the Public
and Environment
&
Radiological Control and
Clearance of Property

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**Office of Environmental Protection, Sustainability Support
and Corporate Safety Analysis**

Control and Clearance of Property

Objective of Presentation

Encourage the integration of property control and clearance needs into management systems

- Consider early
- Review periodically
- Confirm implementation
- Openly communicate and document

Principal Requirements for Control and Clearance of Property

- More emphasis on process or historical knowledge
- Survey or characterize radiological condition
- Evaluate dose
- Establish authorized limits with ALARA
- Document limits, radiological condition and any clearance conditions
- Verify and QA clearance process
- Keep public informed
- Maintain records and report property clearance

General Requirements for the Control and Clearance of DOE Property

ALARA dose constraints for clearances

- **Real property** is 25 mrem/yr, w/ goal of a few mrem/yr (actual or likely use)
- Contingency analysis (worst plausible use <100 mrem/y)
- **Personal property:** FEM approval for <1mrem/yr and <10 person-rem
- Clearance at higher doses possible up to few mrem/yr should be for a restricted or specified clearance

Control and Clearance of Property

Pre-approved Authorized Limits

- Use instead of developing specific authorized limits; Order also provides for “pre-approved limits”
- Existing pre-approved limits included are:
 - radium-226 (or thorium-230) soil concentrations
 - radium-228 (or thorium-232) soil concentrations
 - Surface guidelines in G 441.1-xx (until replaced)
 - already approved, authorized limits

DOE Approvals for Authorized Limits

Action or Condition	Organization Approval
Authorized Limits for Real Property (includes land and structures)	Approved by Field Element Manager (FEM) in consultation with Cognizant Secretarial Officer (CSO)
Authorized Limits for Personal Property	FEM with no objection from CSO and the Chief, Health, Safety and Security Officer (HS-1) if specific conditions are met; otherwise approved by CSO in consultation with HS-1
Pre-Approved Authorized Limits	Approved by FEM under paragraph 4.k(6)(f) of DOE O 458.1
Other Pre-Approved Authorized Limits	Approved by HS-1 or responsible CSO in consultation with HS-1

DOE O 458.1, Radiation Protection of the Public and the Environment (cont.)

- Radiological Monitoring or Surveys:
 - All monitoring or surveys performed to support clearance of property must:
 - Use methodologies such as those in the MARSSIM, the MARSAME or other DOE-approved methodologies,
 - Meet measurement or data quality objectives (i.e., MQOs or DQOs)
 - Use DOE-approved sampling and analysis techniques, and
 - Include an evaluation of non-uniformly distributed residual radioactive material, if applicable
 - Instrumentation must be capable of detecting and quantifying residual radioactive material, consistent with the applicable Authorized Limits

DOE O 458.1, Radiation Protection of the Public and the Environment (cont.)

- **Documentation and Verification:**
 - Documentation of property clearance and Authorized Limits must be made available to the public
 - FEM is responsible for oversight of clearance and Independent Verification (IV)
 - IV must use a graded approach commensurate with the scope of the clearance action as determined by the FEM who is accountable for ensuring adequacy of clearance process and procedures
 - Minimum IV activities are specified in Order for personal and real property

Control and Clearance of Property

Examples of Material & Equipment Approved for Clearance

- Surficial and Volumetric Limits for operations
- Hard -to-detect (HTD) radionuclides
- 25-ton locomotive
- PCB capacitors
- Polychlorinated Biphenyl Dielectric Fluid
- Lubricating oil from process buildings
- Roofing waste
- Septic tank
- Lithium hydroxide monohydrate drums
- Hydrofluoric acid and calcium fluoride
- River soils and sediments
- Water with residual radioactivity
- Gravel containing residual radioactivity
- Soil and debris waste
- Vegetation /tree wood
- Concrete/soil rubble
- Concrete pad

Specific Areas

- Greater attention to process knowledge
- Well-defined and documented control and release criteria
- Line management, in particular Field Offices, have the responsibility to ensure that contractors and DOE personnel comply with release requirements
 - Internally review property release and control systems
 - Appropriate independent verification

DOE Property Release Limitation: Metal

- Secretarial moratorium — release of volumetrically contaminated metal (January 2000)
 - Metal with volumetric residual radioactivity
 - Then, no release into commerce
- Secretarial suspension — recycle of scrap metal (July 2000, modified January 2001)
 - If scrap metal in radiological area (per 10 CFR 835)
 - Then, no release for recycle into commerce

DOE Property

Release Limitation: Metal (cont)

- In general DOE O 458.1 provides a more detailed explanation of DOE expectations for control and clearance of property that are consistent with previous requirements and guidance.
- The added detail ensures that clearance process and programs that comply with the Order will satisfy the improvements called for in the Secretarial memoranda of January 19, 2001, that indicated:
 - “There is a need to improve radiation monitoring, independent verification, and record keeping and reporting. We must also better engage the public in our decision making and help them better understand our release practices.”

DOE Site Radiological Clearance Programs Self Assessment Tool



- This voluntary, easy-to-use tool was developed to assist DOE sites evaluate and improve their programs and processes for appropriate radiological clearance of materials and equipment.
- Recommends steps for an assistance team process, and identifies roles, responsibilities and expectations of review team and site personnel.
- Establishes lines of inquiry
- Attachments detail aspects of process

Available at:

[http://www.hss.doe.gov/nuclearsafety/
env/radprotection/](http://www.hss.doe.gov/nuclearsafety/env/radprotection/)

Primary Guidance and Tools

(<http://www.hss.energy.gov/nuclearsafety/env/>) Under “Radiation Protection”

- DOE-STD-1196-2011, “Derived Concentration Technical Standard,” April 2011
- Guide for “Control and Release of Property with Residual Radioactive Material,” April 2002
- EH Guidance Memorandum, November 1995
- ALARA Guidance, Volumes 1 and 2
- Modeling Tools:
 - RESRAD-OFFSITE & ONSITE
 - RESRAD-BUILD
 - RESRAD-RECYCLE
 - TSD Dose
- Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual (MARSAME) & Multi-Agency Site Survey and Investigation Manual (MARSSIM)

Summary

HSS staff are available to help the field **comply** with

DOE Order requirements:

- Gustavo Vázquez, 202-586-7629 gustavo.vazquez@hq.doe.gov
- Carlos Corredor, 202-586-8915 carlos.corredor@hq.doe.gov
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Thank You!

Questions?

Comments?

Surface Activity Guidelines

Allowable Total Residual Surface Activity (dpm/100 cm²)

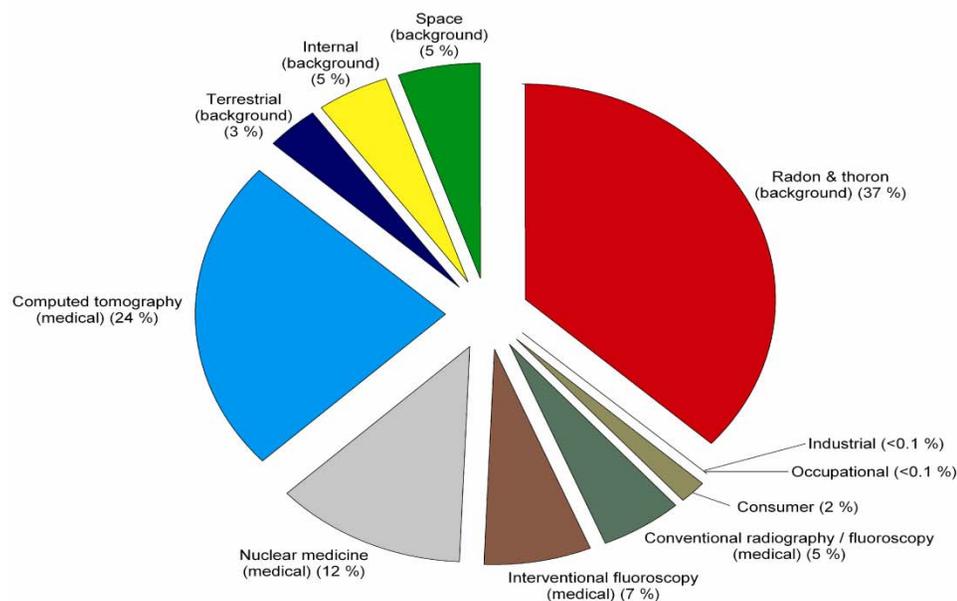
Radionuclides	Average	Maximum	Removable
Group 1 - Transuranics, I-125, I-129, Ac-227, Ra -226, Ra-228, Th-228, Th-230, Pa-231	100	300	20
Group 2 - Th-natural, Sr-90, I-126, I-131, I-133, Ra-223, Ra-224, U-232, Th-232	1000	3000	200
Group 3 - U-natural, U-235, U-238, and associated decay products, alpha emitters	5000	15000	1000
Group 4 - Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above	5000	15000	1000
Tritium (applicable to surface and subsurface)	N/A	N/A	10000



**Annual Estimate of
Collective Dose to the U.S.
Population:
1,870,000 person-Sv
(187,000,000 person-rem)**

**Annual Average Effective
Dose per Individual:
6.2 mSv
(620 mrem)**

All Exposure Categories
Collective Effective Dose (percent), 2006



A limited number of prepublication copies of Report No. 160 will be available during the NCRP annual meeting on March 2-3, 2009. The final Report will be available from the NCRP website, <http://NCRPpublications.org>, in both soft- and hardcopy formats. For additional information contact David A. Schauer, ScD, CHP at schauer@NCRPonline.org, 301.657.2652 (x20) or 301.907.8768 (fax).

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Background Radiation Dose to the Public

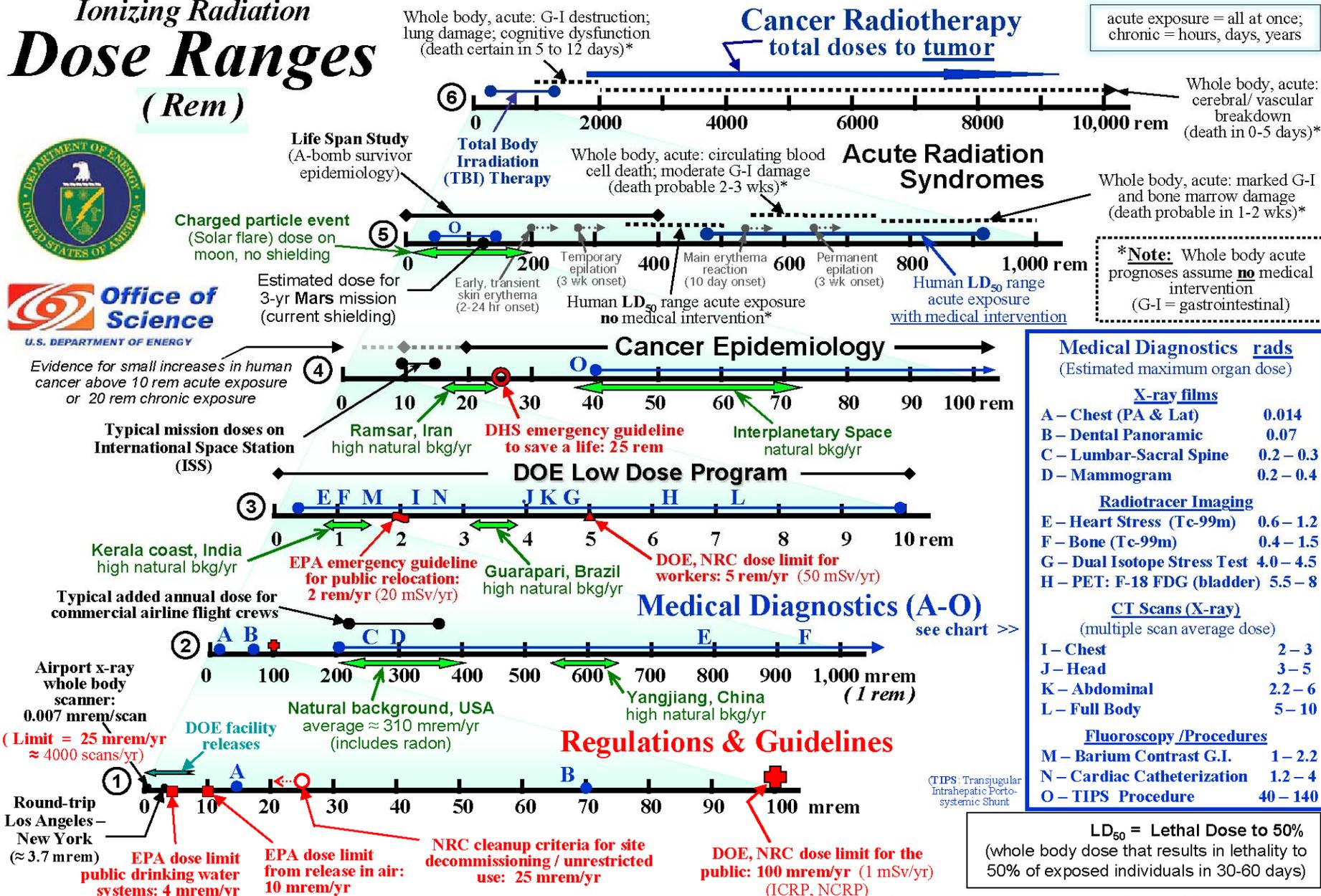
Magnitude of Changes in Collective Effective Dose and Effective Dose per Individual in the U.S. Population Between the Early 1980s (NCRP Report No. 93) and 2006 (NCRP Report No. 160)

Exposure Category	Collective Effective Dose (person-Sv) ^a			Effective Dose per Individual in the U.S. Population (mSv) ^a		
	(1) 2006	(2) Early 1980s	Ratio (1) / (2)	(1) 2006	(2) Early 1980s	Ratio (1) / (2)
Ubiquitous background	933,000	690,000	1.35	3.11	3.00	1.04
Medical	899,000	123,000	7.3	3.00	0.53	5.7
Consumer	39,000	12,000 – 29,000	— ^b	0.13	0.05 – 0.13	— ^b
Industrial, security, medical, educational and research	1,000	200	— ^b	0.003	0.001	— ^b
Occupational	1,400	2,000	— ^b	0.005	0.009	— ^b
Total	1,870,000	835,000	2.2	6.2	3.6	1.7

^aThe quantities used in NCRP Report No. 93 were expressed in effective dose equivalent.

^bNot listed; disparate aggregated sources.

Ionizing Radiation Dose Ranges (Rem)

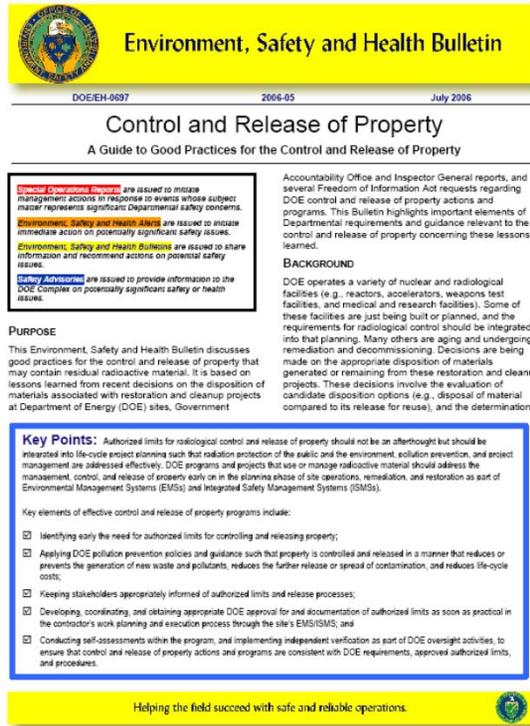


NOTE: This chart was constructed with the intention of providing a simple, user-friendly, "order-of-magnitude" reference for radiation exposures of interest to scientists, managers, and the general public. In that spirit, most quantities were expressed as equivalent dose* in the more commonly used radiation protection units, the rem and Sievert. Medical diagnostics are expressed as estimated maximum organ dose, they are not in "effective dose" - that is, they do not imply any estimation of risk. It is acknowledged that the decision to use this set of units does not address everyone's needs. (NRC = Nuclear Regulatory Commission, EPA = Environmental Protection Agency, DHS = Department of Homeland Security)
Disclaimer: Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information disclosed.

Chart compiled by NF Metting, Office of Science, DOE/BER. "Orders of Magnitude" revised June 2010 <http://www.lowdose.energy.gov/>
 Chart units are in Equivalent Dose: 100 rem = 1 Sievert
 Absorbed Dose units: 100 rad = 1 Gray
 100 mrem = 1 mSv
 1 rem ≈ 1 rad for x- and gamma-rays
 ("≈" stands for "approximately equal to")

Source: Office of Biological and Environmental Research (BER), Office of Science, U.S. Department of Energy <http://www.science.doe.gov/ober/>

A Guide to Good Practices for the Control and Release of Property



Authorized limits should not be an afterthought but should be integrated into life-cycle project planning.

Key elements include:

- Identifying needed authorized limits early;
- Applying DOE pollution prevention policies and guidance such that property is controlled and cleared in a manner that reduces or prevents the generation of new waste and pollutants, reduces the further contamination, and reduces life-cycle costs;
- Keeping stakeholders appropriately informed of authorized limits and clearance processes;
- Developing, coordinating, and obtaining appropriate DOE approval for and documentation as soon as practical in the contractor's work planning and execution process; and
- Conducting self-assessments within the program, and implementing independent verification as part of DOE oversight activities.

http://www.hss.energy.gov/CSA/csp/safety_bulletins/SB_2006-05.pdf