Outline of the NRC Health Physics Review Process

Health Physics Review Areas

- Radiological Status of the Facility
- Planned Decommissioning Activities
- Facility Radiation Surveys
- Environmental Radioactivity Data
- Details of DCGL Development and Integrated Dose Analysis

NRC Staff Actions

- NRC staff reviewed the West Valley Phase 1 Decommissioning Plan (DP) and determined that sufficient information was present to begin a technical review.
- A request for additional information (RAI) was submitted to the U.S. Department of Energy (DOE) in May of 2009.
- NRC staff are currently reviewing RAI responses that have been received from DOE.

Remaining Actions

- After all of DOE's responses to the RAI are received, the NRC will develop a Technical Evaluation Report (TER) to evaluate the West Valley DP.
- NRC will provide oversight and monitoring during the decommissioning and remediation process (i.e. split sampling analyses, independent surveys, etc.).
- NRC, or its contractor, will complete a confirmatory survey to ensure that the NRC cleanup criteria for unrestricted release have been adequately met and demonstrated by DOE's Final Status Survey.

Overview of West Valley Site Decommissioning and the Radiation Survey and Site Investigation Process

The West Valley Decommissioning Plan (DP) was submitted to the U.S. Nuclear Regulatory Commission (NRC) in December 2008, and it is currently undergoing an informal review process per the West Valley Demonstration Project (WVDP) Act of 1980. NRC staff have reviewed the West Valley DP and determined that sufficient information was present to begin a technical review. As a part of the technical review, a request for additional information (RAI) was submitted to the U.S. Department of Energy (DOE) in May of 2009. After DOE's responses to the RAI are received the NRC will develop a Technical Evaluation Report (TER) to evaluate the West Valley DP. Under the WVDP Act and a subsequent memorandum of understanding, DOE will review and consider NRC's comments on the DP before initiating Phase 1 decommissioning activities.

The NRC will provide oversight during decommissioning activities at the West Valley site. Radiological surveys will be performed throughout the decommissioning process, and NRC staff recommends using a series of surveys to ensure that certain quality objectives are met. The Radiation Site Survey and Investigation (RSSI) process is an example of surveys designed to demonstrate compliance with the decommissioning regulations of 10 CFR 20, Subpart E. (*NUREG-1757, Vol. 2, Rev. 1, Chapter 4 – Facility Radiation Surveys)*

What are the principal steps in the Radiation Survey and Site Investigation Process?

- Site Identification
- Historical Site Assessment
- Characterization Survey
- Remedial Action Support Survey
- Final Status Survey

Six Survey Types Used For Compliance with the Radiological Criteria for Unrestricted Release:

- Background Survey
- Scoping Survey
- Characterization Survey
- Remedial Action Support Survey
- Final Status Survey
- Confirmatory Survey

What role does the NRC play in Site Decommissioning and in the Radiation Survey and Site Investigation Process?

- **Decommissioning Plan** - The NRC reviews and comments on the Decommissioning Plan per the West Valley Demonstration Project Act and DOE-NRC Memorandum of Understanding.

- **Characterization Surveys** - The NRC reviews characterization surveys to ensure the radiological condition of the site is sufficiently established to permit planning for site remediation. The NRC may elect to perform independent surveys and split sampling analyses to verify performance.

- **Remedial Action Support Surveys** – The NRC reviews remedial action survey plans to ensure that they are adequate to determine when remediation actions have been successful, so that a Final Status Survey may begin. NRC staff may provide oversight during the remedial action process through monitoring and in-process split sampling analyses of remediated areas.

- **Final Status Survey Design** – The Final Status Survey design is provided as a part of the Decommissioning Plan. During the Decommissioning Plan review process NRC staff determines if the Final Status Survey design is adequate to demonstrate compliance with the NRC cleanup criteria for unrestricted release.

- **Final Status Survey** - During the implementation of the Final Status Survey NRC staff may provide oversight through in-process monitoring and split sampling analyses.

- **Confirmatory Survey** – The confirmatory survey is performed by the NRC (or its contractor) to provide data to substantiate the results of the Final Status Survey.

- **Final Status Survey Report** - Once the Final Status Survey is complete, NRC staff will review the Final Status Survey report to determine if the survey results demonstrate that the site meets the radiological criteria for unrestricted release.

What regulatory guidance is available on decommissioning?

*Some Useful References are***:**

- **NUREG-1757, Volume 1**, Revision 2, Consolidated Decommissioning Guidance: Decommissioning Process for Materials Licensees
- **NUREG-1757, Volume 2**, Revision 1, Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria
- **NUREG-1575, Revision 1**, Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)

Perspectives on Radiation Dose

The following sheet addresses some common questions the public may have on radiation and radiation dose, such as:

- *What is radioactivity?*
- *Where does radiation come from?*
- *What is radiation exposure?*
- *What is radiation dose?*

Measuring Radiation

There are four different, but interrelated, units for measuring radioactivity, exposure, absorbed dose, and dose equivalent. These can be remembered by the acronym **R**-**E**-**A**-**D**.

***R**adioactivity* refers to the amount of ionizing radiation released by a material.

***E**xposure* describes the amount of radiation traveling through the air. Many radiation monitors measure exposure.

***A**bsorbed dose* describes the amount of radiation absorbed by an object or person (that is, the amount of energy that radioactive sources deposit in materials through which they pass).

***D**ose equivalent* (or effective dose) combines the amount of radiation absorbed and the medical effects of that type of radiation. Units for dose equivalent are the roentgen equivalent man (rem) and sievert (Sv), and biological dose equivalents are commonly measured in 1/1000th of a rem (known as a millirem or mrem).

How much radiation does an average member of the public receive every year? Where does that radiation come from?

According to a 2009 report from the National Council on Radiation Protection and Measurements (NCRP), a non-governmental, not-for-profit, public service organization[a], 50% of the collective effective dose for all U.S. residents comes from ubiquitous background, 48% comes from patient medical exposure, and 2% is the result of consumer products and activities. Industrial and occupational doses both account for less than 0.1% each[b].

For additional information on doses received by the public, see Figure 1 "Percent contribution of various sources of exposure to the total collective effective dose and the total effective dose per individual in the U.S. population for 2006" and Table 1 "Comparison of doses received by the public to the NRC cleanup criteria for site decommissioning/unrestricted release." A personal annual dose estimate can also be calculated using the worksheet provided in Attachment 1.

a. NCRP's mission is to formulate and widely disseminate information, guidance and recommendations on radiation protection and measurements which represent the consensus of leading scientific thinking. The Council's mission also encompasses the responsibility to facilitate and stimulate cooperation among organizations concerned with the scientific and related aspects of radiation protection and measurements.
b. Based on the U.S. population in 2006. Source: National Council on Radiation Protection and Measurements, Ionizing Radiation Exposure of the Population of the United States, NCRP Report No. 160, 2009.

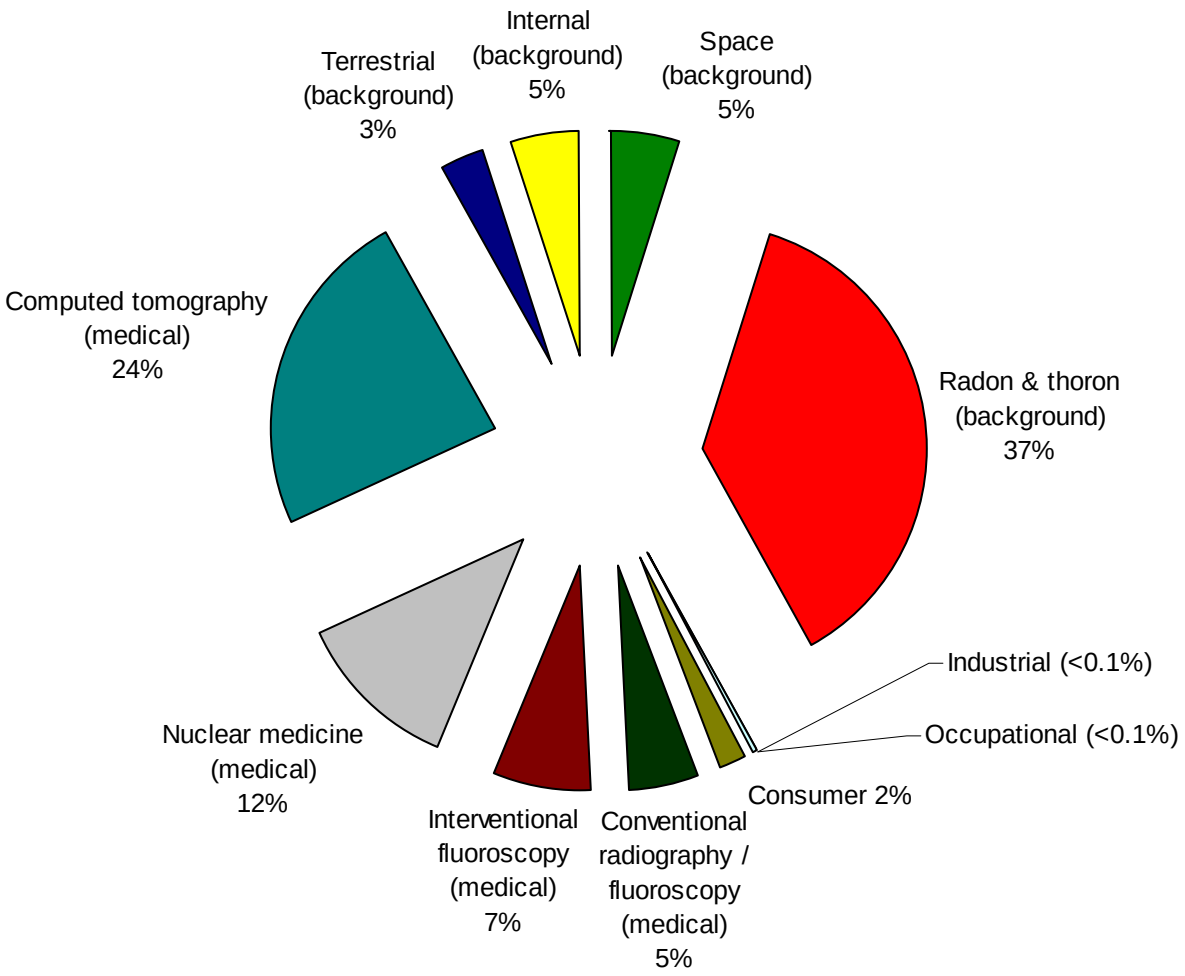

Figure 1: Percent contribution of various sources of exposure to the total collective effective dose and the total effective dose per individual in the U.S. population for 2006. *Source: National Council on Radiation Protection and Measurements, Ionizing Radiation Exposure of the Population of the United States, NCRP Report No. 160, 2009.*

Table 1: Comparison of doses received by the public to the NRC cleanup criteria for site decommissioning/unrestricted release

Description	mrem	Source
Living near a nuclear power station (annual)	<1	EPA, 2007[1]
Cosmic dose on an airplane flight from Washington, DC to Los Angeles, CA (single one-way trip)	1.9	NCRP 160[2]
Chest X-ray using modern equipment (single procedure)	8	NCRP 100[3]
Cosmic radiation living at sea level (annual)	24	EPA, 2007[1]
NRC cleanup criteria for site decommissioning/unrestricted release (annual)	**25**	NRC[4]
Cosmic radioactivity (annual)	27	EPA, 2007[1]
Terrestrial radioactivity (annual)	28	EPA, 2007[1]
Mammogram (single procedure)	30	EPA, 2007[1]
Natural radioactivity in the body (annual)	40	EPA, 2007[1]
Estimate of the largest dose any off-site person could have received from the March 28, 1979, Three Mile Island nuclear accident	46	ANS, 1988[5]
Diagnostic radiology (annual)	50	EPA, 2007[1]
Cosmic radiation living in Denver (annual)	50	EPA, 2007[1]
NRC annual dose limit for the public (due to operations from licensed nuclear facilities)	100	NRC[6]
Average occupational dose received by U.S. commercial radiation workers in 1980	110	NCRP 101[7]
Average dose to an airline flight crew member, from cosmic radiation and transport of radioactive materials by air (annual)	170	NCRP 101[7]
Radon in average home (annual)	200	EPA, 2007[1]
Average dose to people in the U.S. from all sources of background radiation (annual)	310	NCRP 160[2]
Gastrointestinal series (single procedure)	1400	EPA, 2007[1]
Limit for occupational exposure of radiation workers set by the U.S. NRC and DOE (annual)	5000	NRC[6], DOE[8]

Sources:

1. United States Environmental Protection Agency, *Radiation Risks and Realities,* EPA-402-K-07-006, May 2007.
2. National Council on Radiation Protection and Measurements, *Ionizing Radiation Exposure of the Population of the United States,* NCRP Report No. 160, 2009.
3. National Council on Radiation Protection and Measurements, *Exposure of the U.S. Population from Diagnostic Medical Radiation,* NCRP Report No. 100, 1989.
4. U.S. Nuclear Regulatory Commission, “Radiological criteria for unrestricted use,” Title 10 Code of Federal Regulations Part 20, Subpart E, Section 20.1402.
5. American Nuclear Society, *Nuclear Energy Facts Questions and Answers,* 1988.
6. U.S. Nuclear Regulatory Commission, “Standards for Protection against Radiation,” Title 10 Code of Federal Regulations Part 20.
7. National Council on Radiation Protection and Measurements, *Exposure of the U.S. Population from Occupational Radiation,* NCRP Report No. 101, 1989.
8. U.S. Department of Energy, “Occupational Radiation Protection,” Title 10 Code of Federal Regulations Part 835.

Attachment 1: Personal Annual Radiation Dose Calculation Worksheet

Where you live

1. Cosmic radiation at sea level (from outer space) 26

2. Select the number of millirems for your elevation (in feet)

   up to 1000 ft. = **2**
   1000-2000 ft. = **5**
   2000-3000 ft. = **9**
   3000-4000 ft. = **9**
   4000-5000 ft. = **21**
   5000-6000 ft. = **29**
   6000-7000 ft. = **40**
   7000-8000 ft. = **53**
   8000-9000 ft. = **70**

   Elevation of some U.S. cities (in feet): Atlanta, 1050; Chicago, 595; Dallas, 435; Denver, 5280; Las Vegas, 2000; Minneapolis, 815; Pittsburg, 1200; Salt Lake City, 4400; Spokane, 1890; Washington, DC, 25.

   add this number: .....

3. Terrestrial (from the ground):
   If you live in states that border the Gulf or Atlantic Coast, **add 23** .....
   If you live in the Colorado Plateau area (around Denver), **add 90** .....
   If you live in middle America (rest of the U.S.), **add 46** .....

4. House construction:
   If you live in a stone, brick, or concrete building, **add 7** .....

What you eat and drink

5. Internal radiation (in your body):*
   From food and water 40
   From air (radon) 200

Other sources

6. Weapons test fallout (less than 1):** 1

7. Jet plane travel:
   For each 1,000 miles you travel, **add 1** .....

8. If you have porcelain crowns or false teeth, **add 0.07** .....

9. If you use gas lantern mantles when camping, **add 0.003** .....

10. If you wear a luminous wristwatch (LCD), add **0.006** .....

11. If you use luggage inspection at airports (using typical x-ray machine), **add 0.002** .....

12. If you watch TV**, **add 1** .....

13. If you use a video display terminal**, **add 1** .....

14. If you have a smoke detector, **add 0.008** .....

15. If you wear a plutonium-powered cardiac pacemaker, **add 100** .....

16. If you have had medical exposures:*
    Diagnostic X-rays (e.g., upper and lower gastrointestinal, chest), **add 40** .....
    If you have had nuclear medical procedures (e.g., thyroid scans), **add 14** .....

17. If you live within 50 miles of a nuclear power plant (pressurized water reactor), **add 0.0009** .....

18. If you live within 50 miles of a coal-fired electrical utility plant, **add 0.03** .....

My total annual mrems dose: .....

Some of the radiation sources listed in this chart result in an exposure to only part of the body. For example, false teeth result in a radiation dose to the mouth. The annual dose numbers given here represent the "effective dose" to the whole body.

*These are yearly average dose.
**The value is actually less than 1.

Visit the online Personal Annual Radiation Dose Calculator:
http://www.nrc.gov/about-nrc/radiation/around-us/calculator.html