Radioactive Waste Disposal Rulemaking Advisory Committee Oregon Admin Rules 345-050

RAC Meeting #1

October 19, 2021
Maxwell Woods, Assistant Director for Nuclear Safety and Emergency Preparedness
Jeff Burright, Radioactive Waste Remediation Specialist
Christopher Clark, Siting Policy Analyst and EFSC Rules Coordinator
Tom Sicilia, Hanford Hydrogeologist

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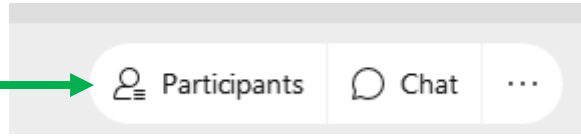
How to Raise Your Hand in Webex:

Webinar Participants

Click on “Participants” at bottom right of the main window



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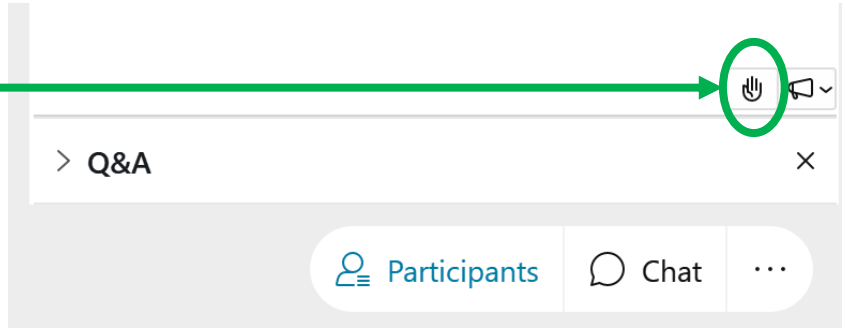

Phone Participants

Press *3 on your telephone keypad to raise/lower your hand.

Press *6 again on your telephone keypad mute/unmute.

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Today's Overview

- Welcome
- Rulemaking process and overview
- Background and objectives of rulemaking project, RAC discussion
- Overview of statute, rule, and recent legislation
- RAC discussion

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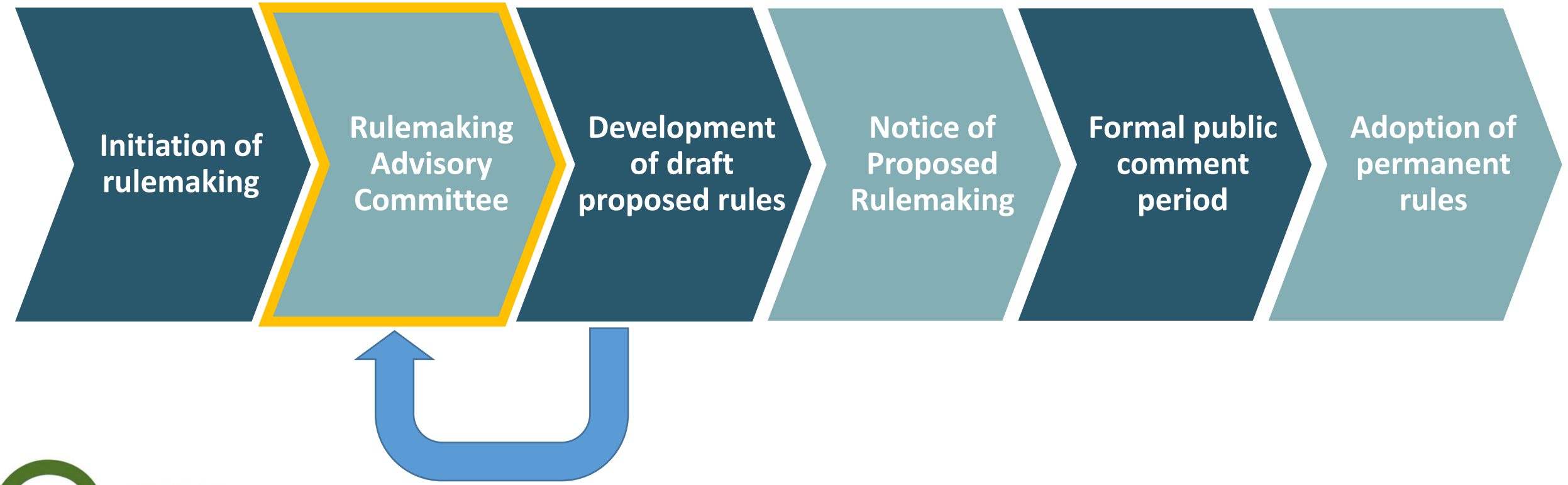
Rulemaking Process



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Rulemaking Process

- Rulemaking Advisory Committee
  - Expected to meet 3-6 times, between now and spring 2022
  - Identify issues, discuss policy alternatives, consider potential draft rule language and alternatives
  - Recommendations on potential fiscal impact of any proposed rules
  - Recommendations on potential impacts of any proposed rules to small businesses
  - Open and honest dialogue – no draft rules have been prepared
  - **Seeking advice as individuals - Not expecting consensus from the group**

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Rulemaking Process

- Role of Energy Facility Siting Council
  - Decision-making body for Division 50 rules
  - EFSC will consider draft proposed rules after RAC process, initiate formal rulemaking
  - Will hold written public comment period and oral comments at a public hearing
  - EFSC will consider public comments, and adopt final rules
  - Final rules expected summer 2022

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Background

- Increased ODOE engagement on radioactive waste disposal
- Oregon Senate Bill 246, becomes law Jan 1, 2022
- Feb 2021, EFSC updates enforcement and penalty rules (OAR 345, Division 29)
- Annual notices to landfills re radioactive waste rules
- ODOE increasing coordination with DEQ and Oregon Health Authority-Radiation Protection Services
- Reviewing Waste Management waste profiles for compliance
- Pathway Exemption requests

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Objectives

- Broad Rulemaking Project Objectives
  - Implement directives from Senate Bill 246
  - Evaluate whether changes to rules are needed to protect public health and safety
  - Consider what, if any, standards and rules are necessary to prevent disposal of radioactive waste in Oregon

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RAC Discussion

First Discussion Question:

- What are your organization's interests in this rulemaking?
  - How do you expect this rulemaking to affect those interests?
  - What do you hope the rulemaking will accomplish?

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RAC List

Organization	Representative
Association of Oregon Counties	Drenda Howatt
Confederated Tribes of the Umatilla Indian Reservation	Mason Murphy
Gilliam County Government	Lisa Atkin
League of Women Voters of Oregon	Shirley Weathers
Oregon Business and Industry	Sharla Moffett
Oregon Dept of Environmental Quality	Jamie Jones
Oregon Health Authority, Radiation Protection Services	Hillary Haskins
Oregon Metro	Kevin Six
Oregon Physicians for Social Responsibility	Damon Motz-Storey
Oregon Refuse and Recycling Association	Andrea Fogue Andy Lombardo
Oregon State University, Radiation Center	Steve Reese
Public at Large	Dave Smith
Public at Large	Wayne Lei
Waste Management	Jim Denson

Oregon Radioactive Waste Disposal Regulations

Division 50 Overview

Jeff Burright
Radioactive Waste Remediation Specialist

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Relevant units and terms

- **PicoCurie** – a measure of activity. One pCi is about one trillionth the activity of a gram of pure radium-226
- **Millirem** – a measure of dose. One millirem is a thousandth of a rem (roentgen equivalent man).
- **Leachability** - How much contamination will be passed to water when the water passes through a solid.
- **Half-life** - The time it takes half of a parent isotope to decay into its daughter.
- **Decay** - The process that occurs when an unstable isotope loses energy (emitting radiation) and becomes an isotope of a different element
- **Radon** - A colorless, odorless, radioactive gaseous element that is the product of natural uranium and thorium decay chains and is a leading contributor to lung cancer.
- **Radium** – A naturally occurring metallic element which is part of naturally occurring radioactive decay chains and includes isotopes of interest in public health.
- **NORM** – Naturally Occurring Radioactive Material – Typically refers to "unrefined" materials from the uranium and thorium decay chains, although in some scenarios is only applicable to materials in place
- **TENORM** – technically enhanced NORM- NORM that has been processed to make it either more radioactive or to increase the likelihood of human exposure
- **Exposure scenario / receptor** - A modeled situation in which a receptor (e.g., human, indoor air, plant/animal, groundwater) potentially is impacted by a substance of concern.
- **Pathway** – the method by which a receptor becomes exposed to a constituent of concern (e.g., inhalation of air or dust, ingestion of water, direct "shine")

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Senate Bill 246 Signed by Gov. May 2021

- Expand who may be held responsible for illegal radioactive waste disposal, to include not only a disposer, but anyone who arranges for or transports such waste for disposal.
- **Enable the Energy Facility Siting Council, with support from ODOE, to update and clarify the definition of radioactive waste subject to the disposal ban (OAR 345 Division 50).**
- Expand and clarify ODOE enforcement authority for radioactive waste disposal.
- Add authority to recoup costs to the agency when a violation occurs.

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Current Disposal Regulations

- ORS 469.525 (1977) prohibits radioactive waste disposal facilities in Oregon
- Because virtually everything contains some radioactivity, the Energy Facility Siting Council promulgated OAR 345-050 to define exempt wastes.
  - Exempt quantities
  - Exempt concentrations
  - “Pathway Exemption” for Naturally Occurring Radioactive Material (NORM)

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SECTION 2. ORS 469.525 is amended to read:

469.525. **(1)** Notwithstanding any other provision of this chapter, **no radioactive waste shall be disposed of within this state, no person may arrange for disposal of radioactive waste within this state, no person may transport radioactive waste for disposal in this state and** no waste disposal facility for any radioactive waste shall be established, operated or licensed within this state, except as follows:

(2) The Energy Facility Siting Council shall, in accordance with the applicable provisions of ORS chapter 183, adopt standards and rules as necessary to prevent the disposal of radioactive waste within this state.

(3) For purposes of this section, disposal does not include the temporary storage of:

(a) Radioactive waste used or generated pursuant to a license granted under ORS 453.635;

(b) Radioactive waste from a nuclear-fueled thermal power plant for which a site certificate has been issued pursuant to this chapter, on the site of that plant, until a permanent storage site is made available by the federal government; or

(c) Radioactive waste from a reactor for which a site certificate has been issued pursuant to this chapter that is operated by a college, university or graduate center for research purposes and is not connected to the Northwest Power Grid.

Unique Situation Resolved: Administrative rule cited in statute

(23)(a) "Radioactive waste" means all material which is discarded, unwanted or has no present lawful economic use, and contains mined or refined naturally occurring isotopes, accelerator produced isotopes and by-product material, source material or special nuclear material as those terms are defined in ORS 453.605. **The term does not include those radioactive materials identified in OAR 345-50-020, 345-50-025 and 345-50-035, adopted by the council on December 12, 1978, and revised periodically for the purpose of adding additional isotopes which are not referred to in OAR 345-50 as presenting no significant danger to the public health and safety**.

(b) Notwithstanding paragraph (a) of this subsection, "radioactive waste" does not include uranium mine overburden or uranium mill tailings, mill wastes or mill by-product materials as those terms are defined in Title 42, United States Code, section 2014, on June 25, 1979.

Restriction in statute allowed only very limited updates to the rules defining what is **not** radioactive waste.

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New Definition of "Radioactive Waste" in SB 246

(23)(a) "Radioactive waste" [*means*] **includes** all material which is discarded, unwanted or has no present lawful economic use, and contains mined or refined naturally occurring isotopes, accelerator produced isotopes and by-product material, source material or special nuclear material as those terms are defined in ORS 453.605. [*The term does not include those radioactive materials identified in OAR 345-50-020, 345-50-025 and 345-50-035, adopted by the council on December 12, 1978, and revised periodically for the purpose of adding additional isotopes which are not referred to in OAR 345-50 as presenting no significant danger to the public health and safety.*]

(b) [*Notwithstanding paragraph (a) of this subsection,*] "Radioactive waste" does not include:

(A) Materials identified by the council by rule as presenting no significant danger to the public health and safety.

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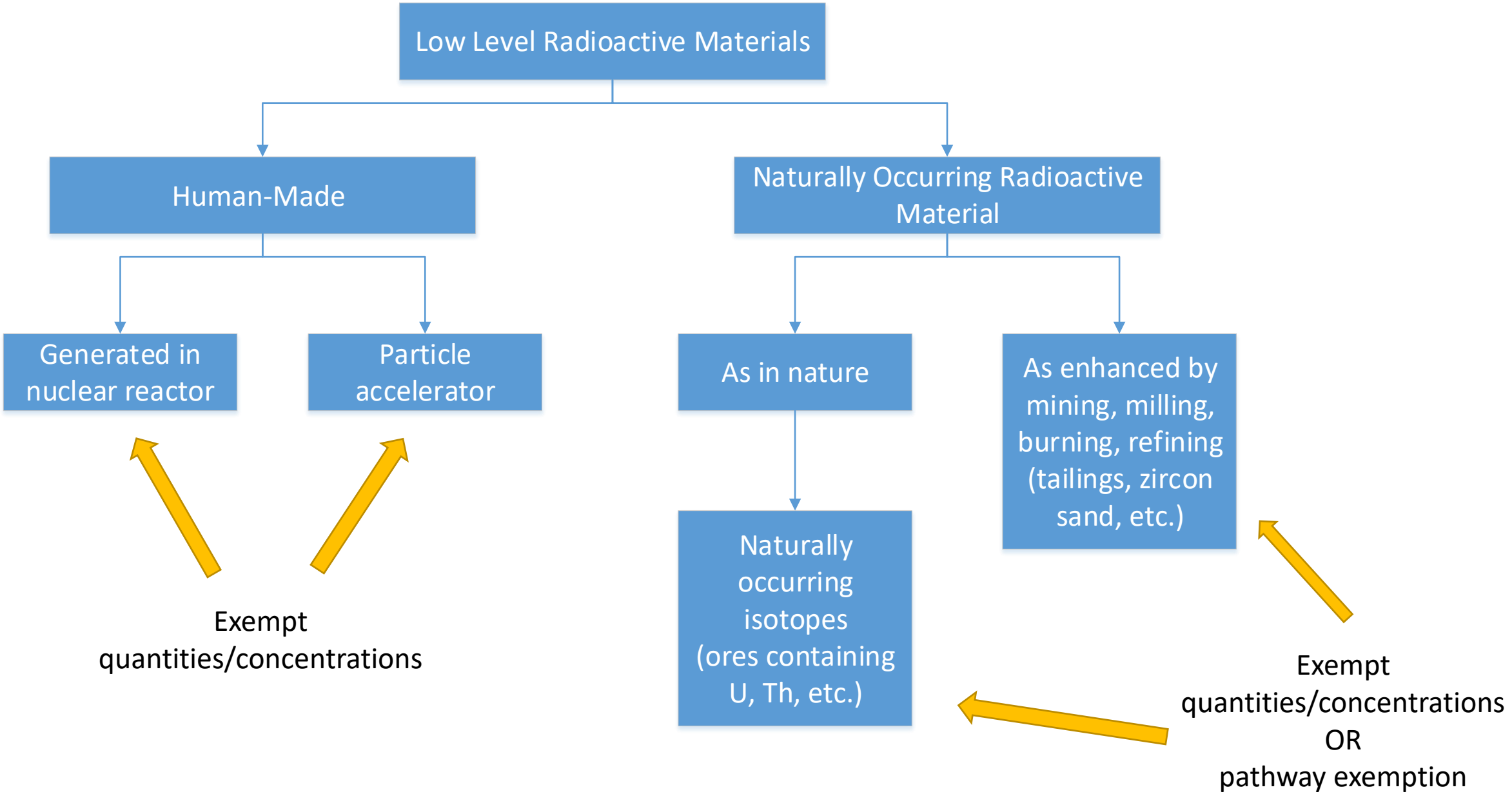
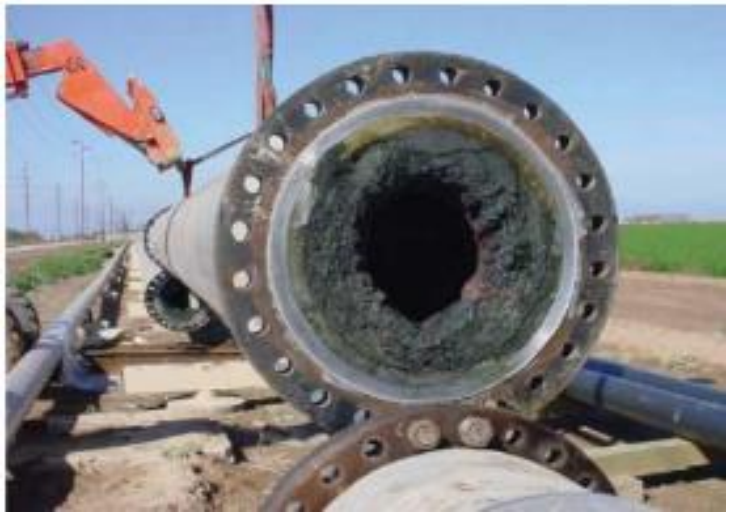
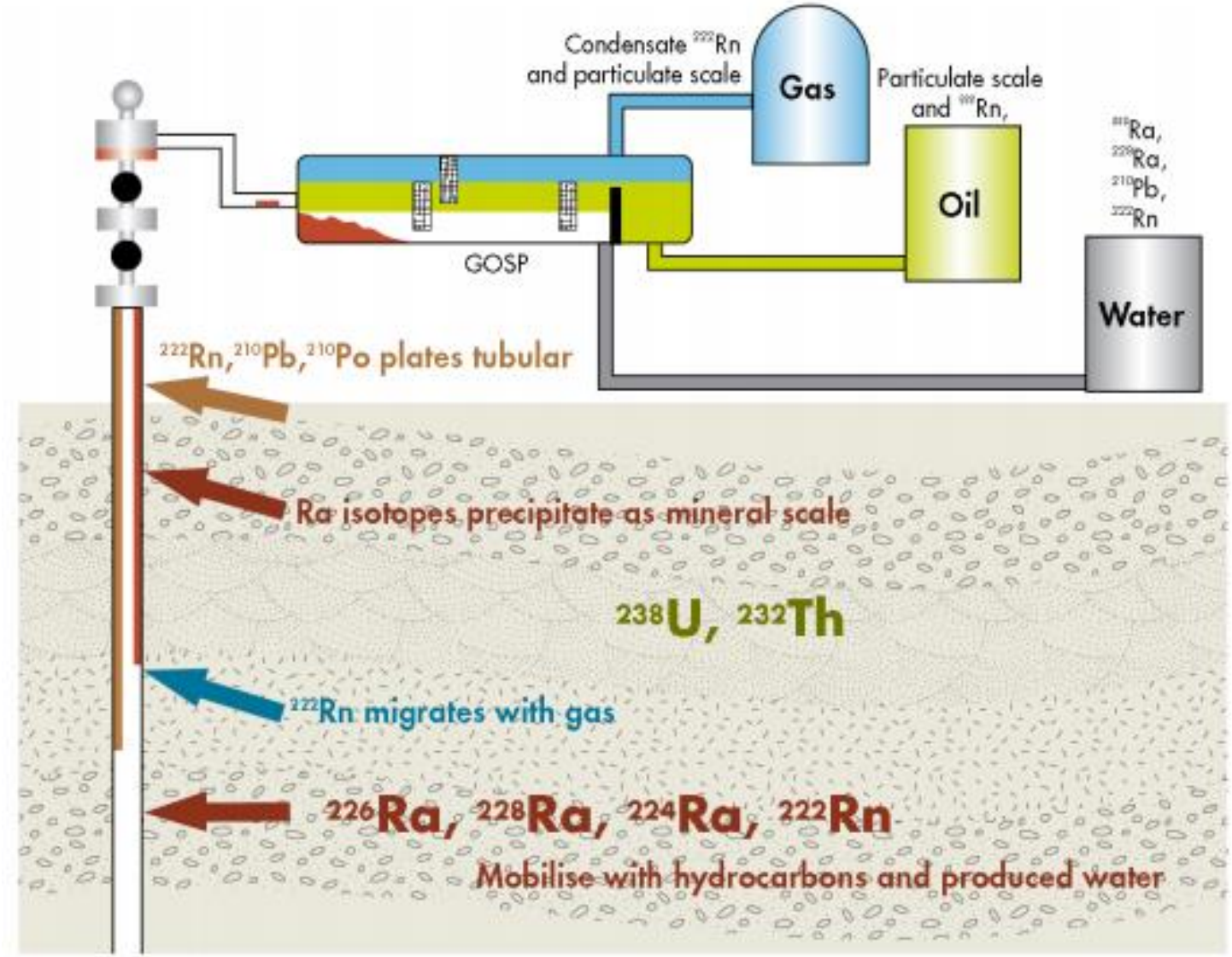

Low Level Radioactive Materials
Human-Made
Naturally Occurring Radioactive Material
Generated in nuclear reactor
Particle accelerator
As in nature
As enhanced by mining, milling, burning, refining (tailings, zircon sand, etc.)
Naturally occurring isotopes (ores containing U, Th, etc.)
Exempt quantities/concentrations
Exempt quantities/concentrations OR pathway exemption

Naturally Occurring Radioactive Material

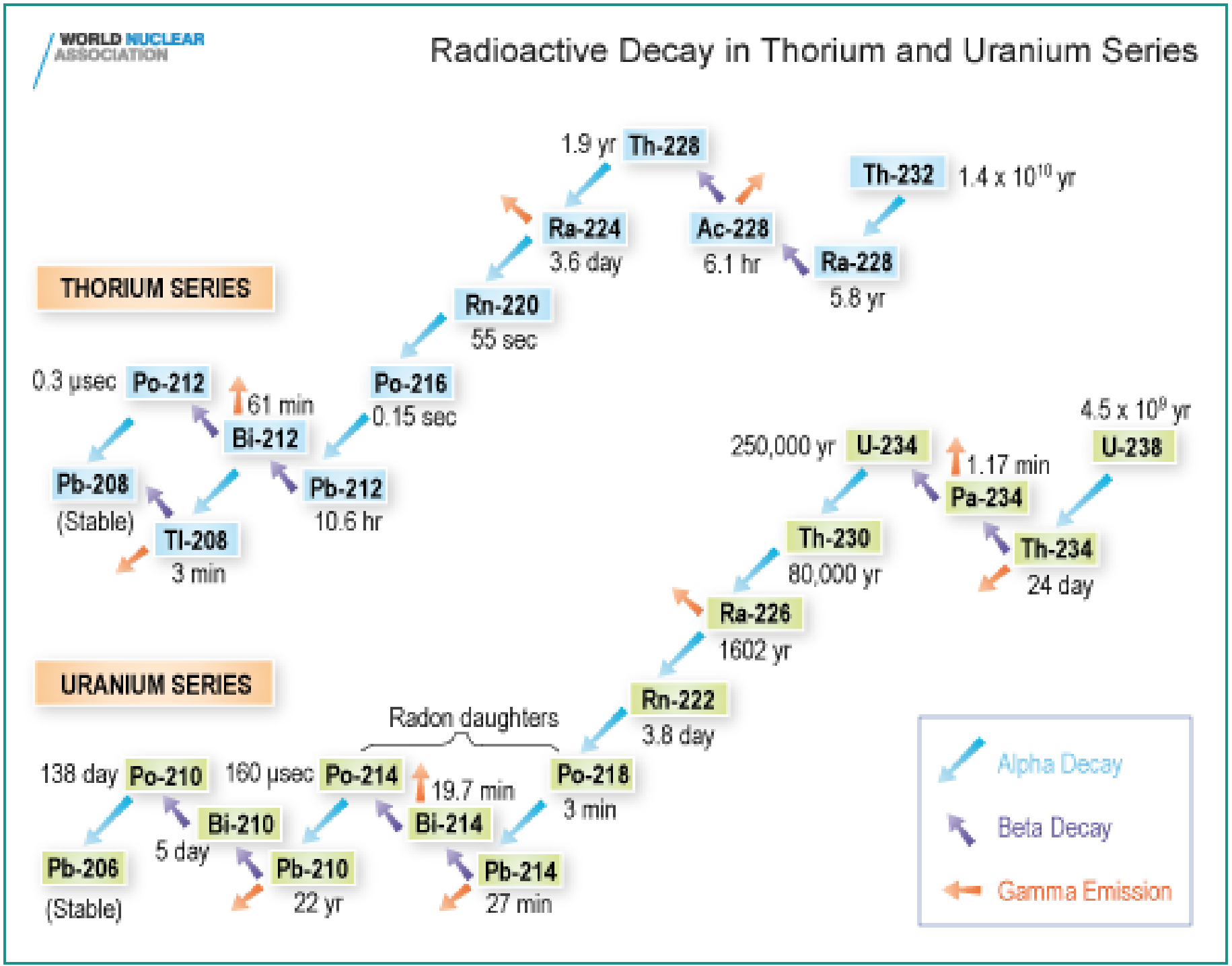


WHAT IS TENORM?



Origins of TENORM and Where It May Accumulate

Source: International Assoc. of Oil & Gas Producers, Report No. 412 (2008)


WORLD NUCLEAR ASSOCIATION
Radioactive Decay in Thorium and Uranium Series
THORIUM SERIES
Th-232
1.4 x 10^10 yr
Ra-228
5.8 yr
Ac-228
6.1 hr
Th-228
1.9 yr
Ra-224
3.6 day
Rn-220
55 sec
Po-216
0.15 sec
Pb-212
10.6 hr
Bi-212
61 min
Po-212
0.3 µsec
Pb-208
(Stable)
Tl-208
3 min
URANIUM SERIES
U-238
4.5 x 10^9 yr
U-234
250,000 yr
Th-234
24 day
Pa-234
1.17 min
Th-230
80,000 yr
Ra-226
1602 yr
Rn-222
3.8 day
Po-218
3 min
Pb-214
27 min
Bi-214
19.7 min
Po-214
160 µsec
Pb-210
22 yr
Bi-210
5 day
Po-210
138 day
Pb-206
(Stable)
Radon daughters
Alpha Decay
Beta Decay
Gamma Emission

Common industries that produce TENORM

- Oil and gas exploration (produced water, tank bottoms, filters)
- Geothermal power production (water filtration)
- Metal processing (zircon sands)
- Glass and metals casting (refractory casting molds + bricks)
- Wastewater treatment (pipe scales, sludges)
- Hazardous waste cleanups (sites with buried NORM/TENORM)
- Pulp & paper mills (region dependent from pipe scales and sludge)
- Uranium mining and mill tailings*
- Coal combustion residuals*
- Some building materials (gypsum, bricks, granite counters, cement)
- Sandblast media

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High Country News

States lack rules for radioactive drilling waste disposal

New report calls for stronger regulation to protect human health and water quality.

Jodi Peterson | Nov. 23, 2015 |

U.S. News & World Report

Regulators Prep for North Dakota Nuclear Waste Disposal

By Associated Press, Wire Service Content Aug. 17, 2020, at 1:01 a.m.

RADWASTE

FEBRUARY 23, 2018

Colorado Bill Would Require Rules for TENORM Disposal

BY CHRIS SCHNEIDMILLER

courier journal

Kentucky to look at new fracking rules

LEXOLOGY

Pennsylvania and Ohio regulatory efforts regarding NORM/TENORM in oil and gas production wastes

King & Spalding LLP

BILLINGS GAZETTE

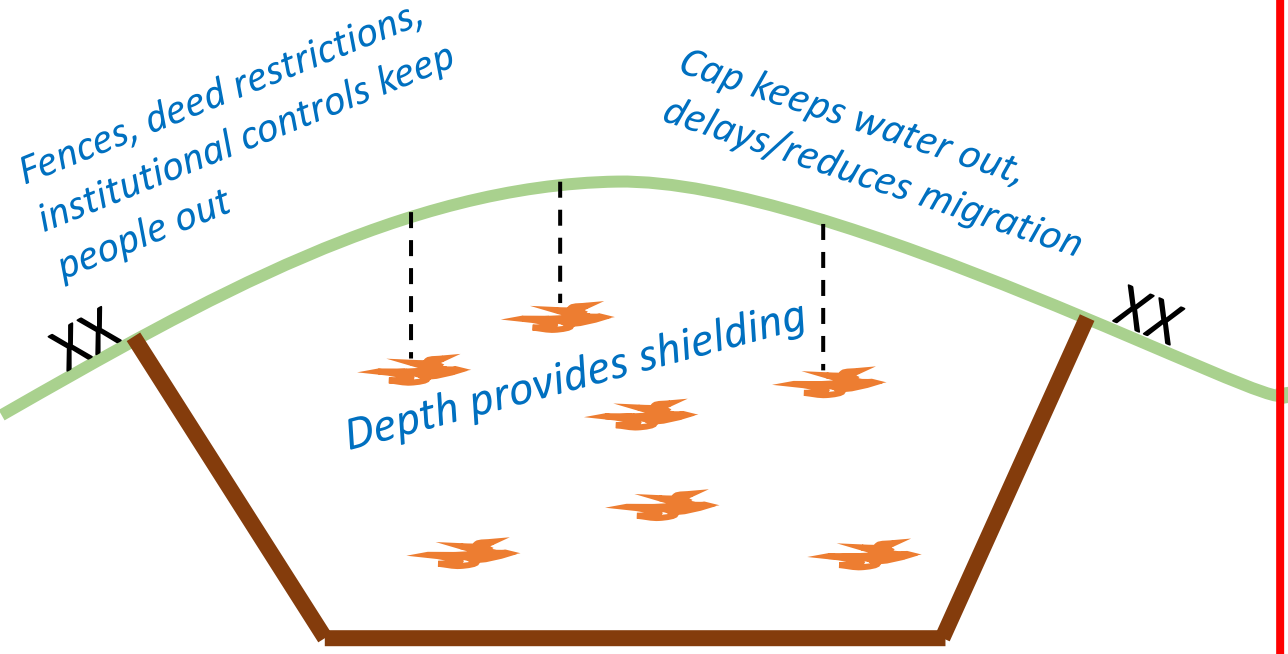
Montana's first rules limiting radioactive waste from oilfields set to take effect

Phoebe Tollefson May 28, 2020

Oregon's rules are fundamentally different

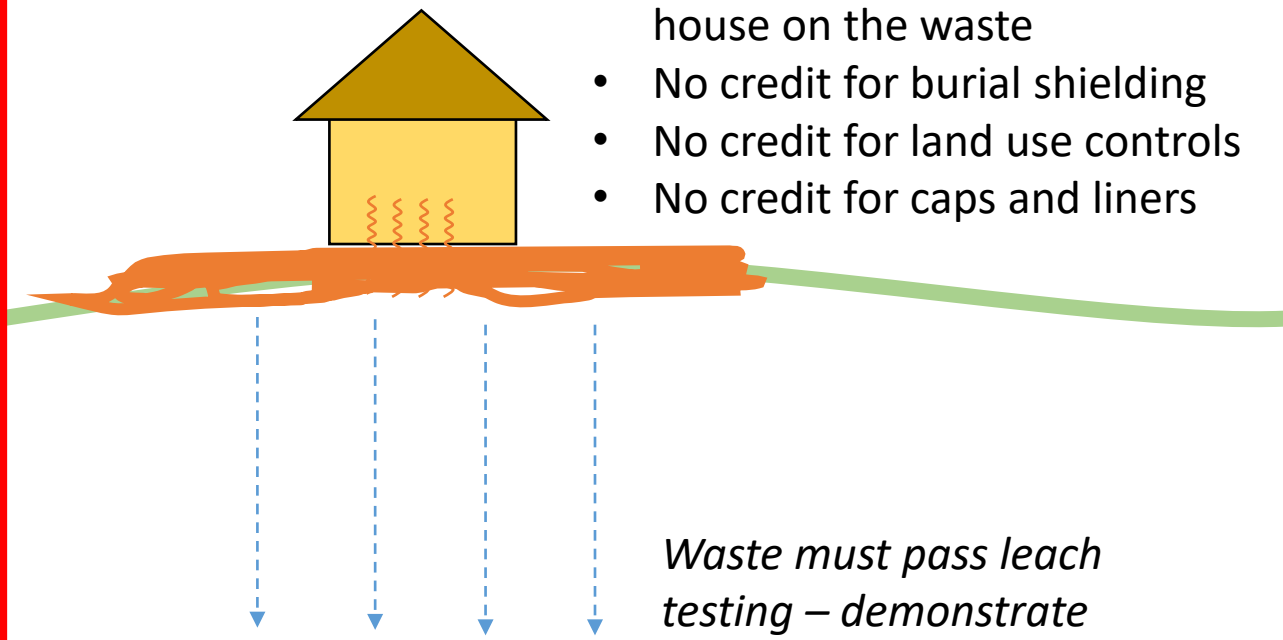
Some other states allow disposal in permitted facilities with safety features

(supported by predictive environmental model)



ORS 469.525: Radioactive waste disposal facilities prohibited

("Radioactive waste" is defined by its risk properties)



- Assume a person builds a house on the waste
- No credit for burial shielding
- No credit for land use controls
- No credit for caps and liners

Waste must pass leach testing – demonstrate inherently low migration

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How is exempt NORM defined now?

"Exempt" means the NORM does not qualify as "radioactive waste" in Oregon and may be disposed anywhere (i.e., landfill not assumed).

1. Quantity/Concentration thresholds for Uranium, Thorium, and Radium are low and generally consistent with many other states.

2. Pathway Exemption (if thresholds are exceeded):

   a) **External gamma** dose of 500 millirem/year based on direct measurement + model

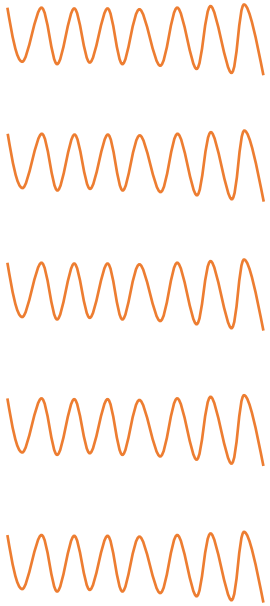
   b) Testing of actual waste required to ensure it will not **leach to water and air** above specified concentrations in Table 3 of the rule (based on 25 millirem/year).

   c) **Radon-specific value** must be met (based on 3 pCi/L or 0.033 WL) as supported by measurements and a model assuming a house built on the waste.

Test 1: Gamma Pathway

- 500 millirem per year dose to a future individual.
- Assume no dilution.
- Does not consider effects of land use restriction or cover material.
- Allows consideration of “annual solid waste stream leaving a site for landfill disposal”.
- Interpretive rule based on a numerical model of a house.

Gamma Pathway Interpretive Rule:
18 micro-R / hr
At 1-foot away
corresponds to
500 mrem/yr
based on a prior
numerical model



Test 2: Water Pathway

- Leachate concentrations from waste not to exceed 5% of Table 3 in rule (**25 mrem/yr**).
- Table 3 based on federal standards for members of the public in 10 CFR 20 Appendix B.
- Based on actual measurement leached from at least 4 representative samples.
- Allows consideration of “annual average concentrations”.
- Accounts for multiple isotopes.
- Does not consider migration potential in the environment.

<u>Water Pathway Interpretive Rule:</u>
Averaged SPLP lab test of leachates from 4 representative samples not to exceed 5% of Table 3 concentrations.

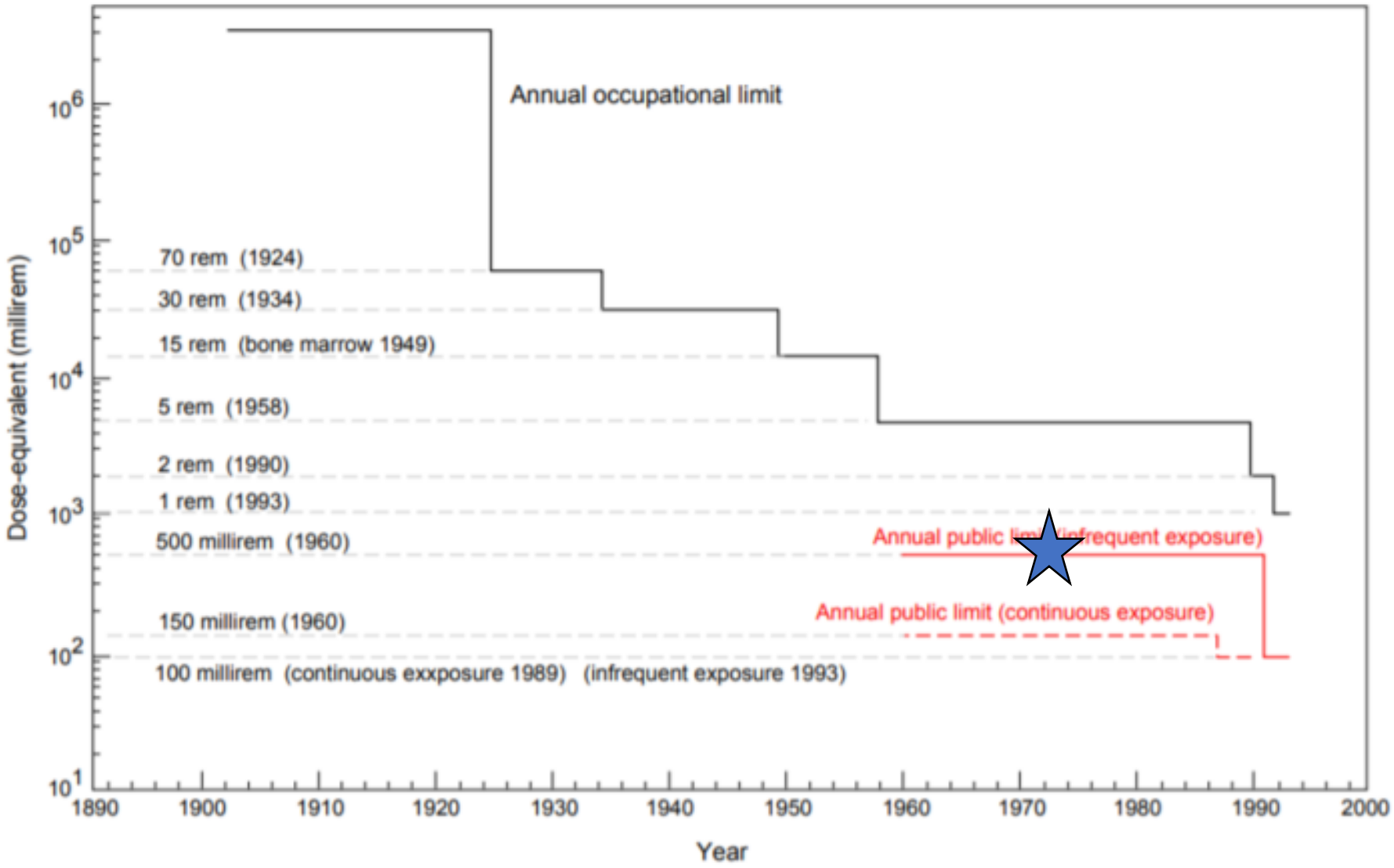
Test 3: Air Pathway

- Radon concentration in a standard house must not exceed **3 picoCuries per Liter of air** or 0.03 Working Levels.
- EPA radon “action level” is 4 pCi/L.
- Must be based on experimentally measured radon emanation rate of the waste in question.
- Does not allow consideration of radon mitigation in construction.
- Compliance based on a numerical model developed in the 1980s.
- Recent technical memo allows alternate methods of computation.

Figure A-1. Radon monitor and chamber setup.

Air Pathway Interpretive Rule:
Radon emanation measurement plus computer model to demonstrate 3 pCi/L or less in a standard home.

Safe dose basis has changed



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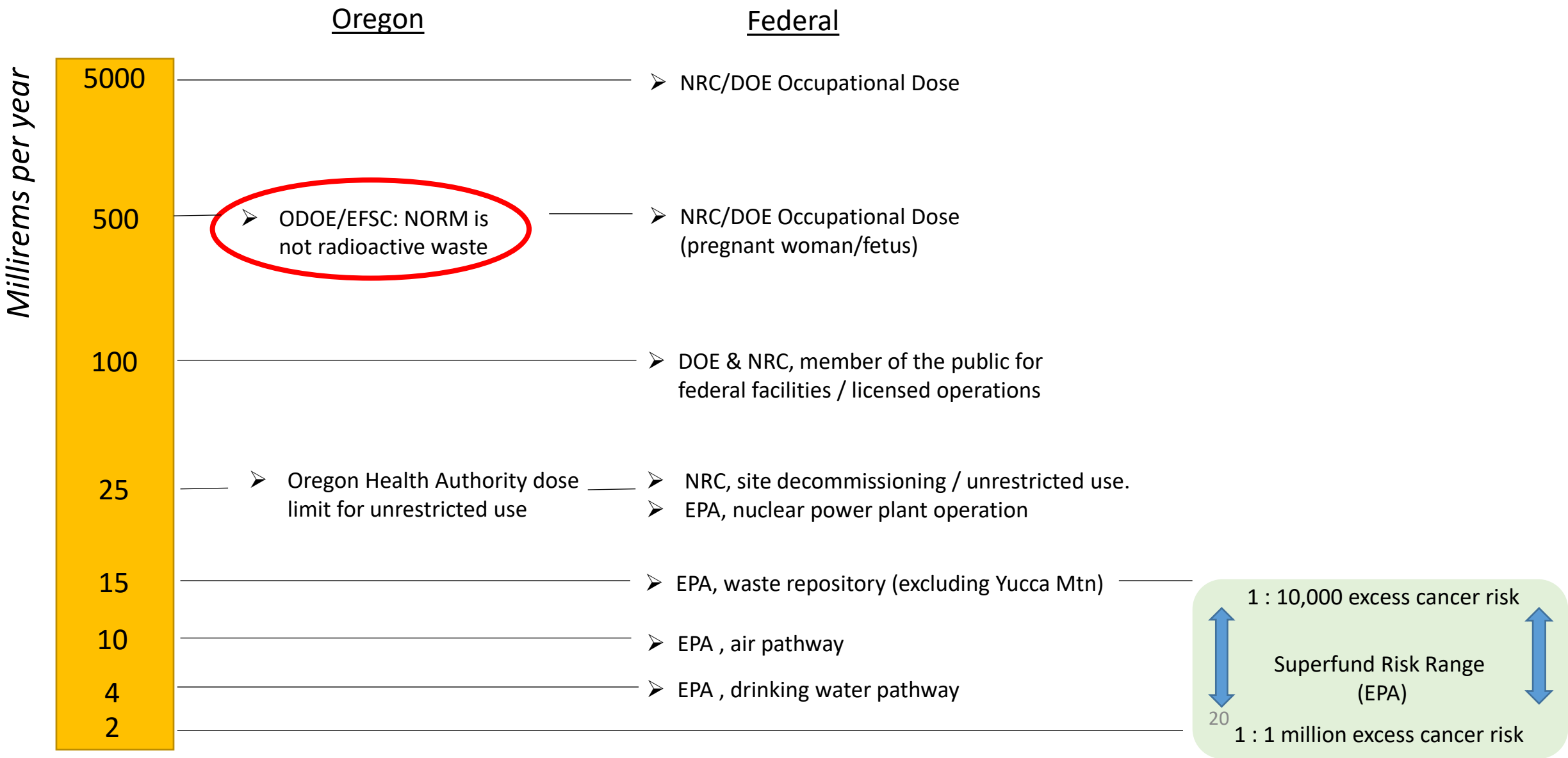
Source: "A Brief History of Radiation Protection Standards". Los Alamos Science Number 23, 1995

Varying state and federal standards



Other States Responding

State	Disposal Limit (picocuries per gram)	Radionuclide	Type of Limit
California	1800	total picocuries/gram	landfill permit
Colorado	2000	total picocuries/gram	landfill permit
Idaho	1500	Ra-226 and Ra-228	landfill permit
Illinois	200	Ra-226	state rule for drinking water treatment sludge
Louisiana	30	Ra-226	state rule
Michigan	50	Ra-226 and Ra-228	state rule
Minnesota	30	Ra-226	state rule for drinking water treatment sludge
Mississippi	30	Ra-226 and Ra-228	state rule
Montana	30	Ra-226 and Ra-228	state policy
New Mexico	30	Ra-226 or Ra-228	state rule - landspreading
Texas	30	Ra-226 or Ra-228	state rule - landspreading
Utah	10000	Ra-226 and Ra-228	landfill permit
Washington	10000	Ra-226 and Ra-228	landfill permit
Wyoming	50	Ra-226 and Ra-228	state policy

Most recently in 2015, North Dakota established a rule allowing disposal of up to 50 pCi/g of Ra-226 + Ra-228, supported by an Argonne National Lab study that equated this concentration with a 100 mrem/yr limit when disposed in a special waste or industrial landfill and buried >10 ft bgs.

Note: many states commonly have a limit of 5 pCi/g Ra-226.

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https://deq.nd.gov/TENORM/OtherStates/TABLE%20of%20State%20TENORM%20disposal%20limits-v.FINAL.pdf

Rulemaking questions to consider

- Is the Pathway Exemption framework still necessary and protective?
- Are there pathways missing? (e.g., plant uptake, livestock)
- Is the 7-day deadline for disposing waste appropriate?
- Is the 500 millirem gamma dose rule appropriate?
- Should any protection be assumed when disposed normally in an existing landfill?
- Is the evaluated period of waste generation appropriate?
- Is accumulation of NORM in landfills adequately accounted for?
- How to account for waste disposed under a previously-approved pathway exemption?

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Rulemaking questions to consider

- Should there be any new exemptions for certain waste forms/types?
- Are out-of-equilibrium wastes appropriately analyzed in the current rule?
- Are there circumstances when waste blending may be allowed?
- Are doses to landfill workers adequately controlled by the standards?
- What kind of verification/recertification should be required for pathway exemptions?
- Should there be specific tracking or reporting requirements for in-state exempted NORM disposal or out of state radioactive waste disposal from Oregon generators?
- Are any additional standards or rules necessary to prevent disposal of radioactive waste in Oregon?

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Discussion Question 1: What is the intent of ORS 469.525? What kinds of materials is it intended to prevent from being disposed of in Oregon? What kinds of materials should be allowed?

Discussion Question 2: Do you think differently about disposal in a landfill versus disposal in other contexts such as land spreading?

Discussion Questions 3: Are there specific issues or topics you want the RAC to discuss as part of this process? Would you like to present your organization's perspective on a specific issue at a future RAC meeting?

Questions?

www.oregon.gov/energy | jeff.burright@oregon.gov

Alpha radiation emitting from natural U-238