Status Update and Proposed Revisions

Domestic Suggested State Regulations for Regulation & Licensing of TENORM (SR-N)

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CRCPD SR-N

DOMESTIC REGULATION AND LICENSING OF NORM

Ongoing Objective

Address the need for a proper and uniform regulatory posture regarding the cleanup, use, and disposal of "tailings" and other process residues containing naturally-occurring radioactive material (NORM).

Presentation Topics

Overview of the domestic regulatory picture, basis for reviewing Part N, and the logic employed in drafting revisions.

Domestic Regulation of Uranium Production

- US EPA establishes standards for environmental protection; US NRC implements through licensing
- US NRC reviews, approves, and oversees decommissioning plans. Turns facilities over to the US DOE/State upon completion for long term oversight.
- Interagency agreements and memorandums of understanding established between co-regulating agencies to allocate responsibilities (US NRC and OSHA/MSHA)
- States may adopt identical or stricter regulations and implement the above

Challenging issues

- US uranium residues are regulated and substantial guidance exists to both federal and state regulators
- However, NORM residues from outside the uranium production cycle are not included in this regulatory framework
- NORM, if regulated at a federal level, is often media or activity based.
- Since federal standards are not applied to NORM in NRC licenses, responsibility falls to the states

Challenging issues

- States may or may not regulate NORM
- Those that do regulate NORM, do so only for select industries, or regulate only distinct portions – such as waste management
- Licensing requirements, disposal activities, and even definitions vary by state.
- Therefore, there is a patchwork implementation of the federal standards

States Regulation of TENORM

- The afore mentioned ‘regulation’ may or may not be in the form of a radioactive materials license.
- As a result, the scope of regulation may or may not encompass waste handling, worker protection, or TENORM from more than one industry.
- In fact, the very definition of TENORM remains in debate. *(NORM vs. TENORM)*
- Some states indicate they possess the ability to regulate TENORM under their existing licensing authority. However, not all exert that authority.

Challenging issues

- The Conference of Radiation Control Program Directors (CRCPD) develops national regulatory frameworks for adoption by the states
- CRCPD Part N has worked for 30+ years to develop a nationwide template for licensing NORM which would implement consistent environmental and worker safety standards
- Last version in 2004
- 2012 revisions began. Currently, working to harmonize with ICRP 103 and DS 459

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TENORM by State

TENORM-Specific Regulations

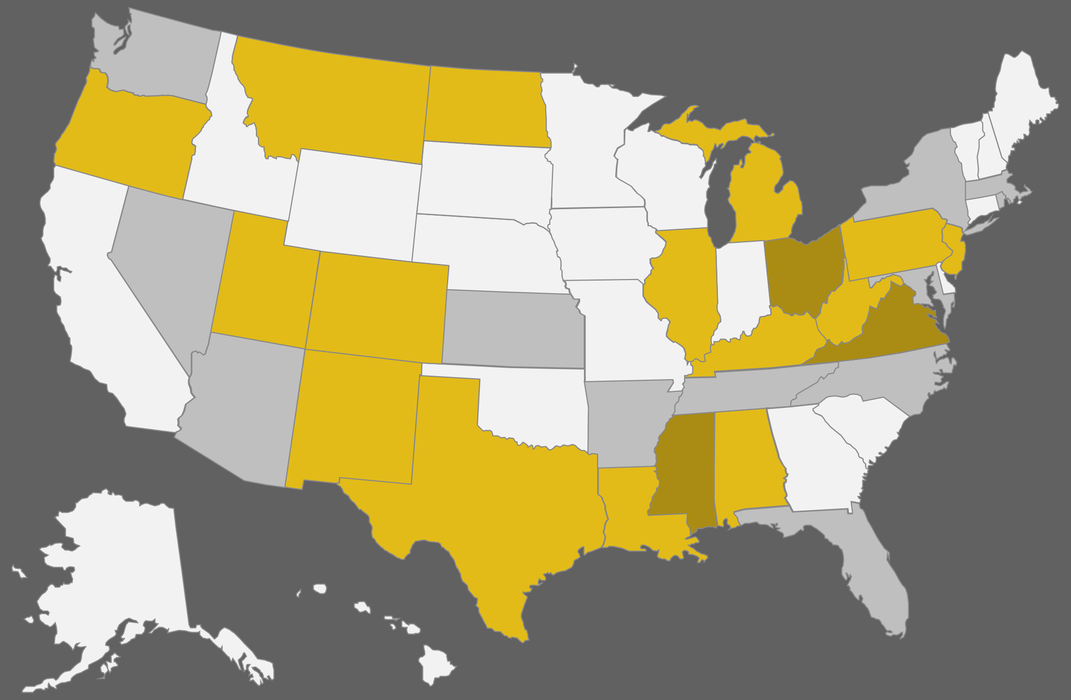
Current or developing rules, specific to TENORM. Often industry or waste-specific.

AEA Licensing of TENORM

TENORM, when regulated, is done so under AEA framework.

SR-N States

Adopted CRCPD SR-N framework.



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Disposal by State

5 pCi/g +/- BKG

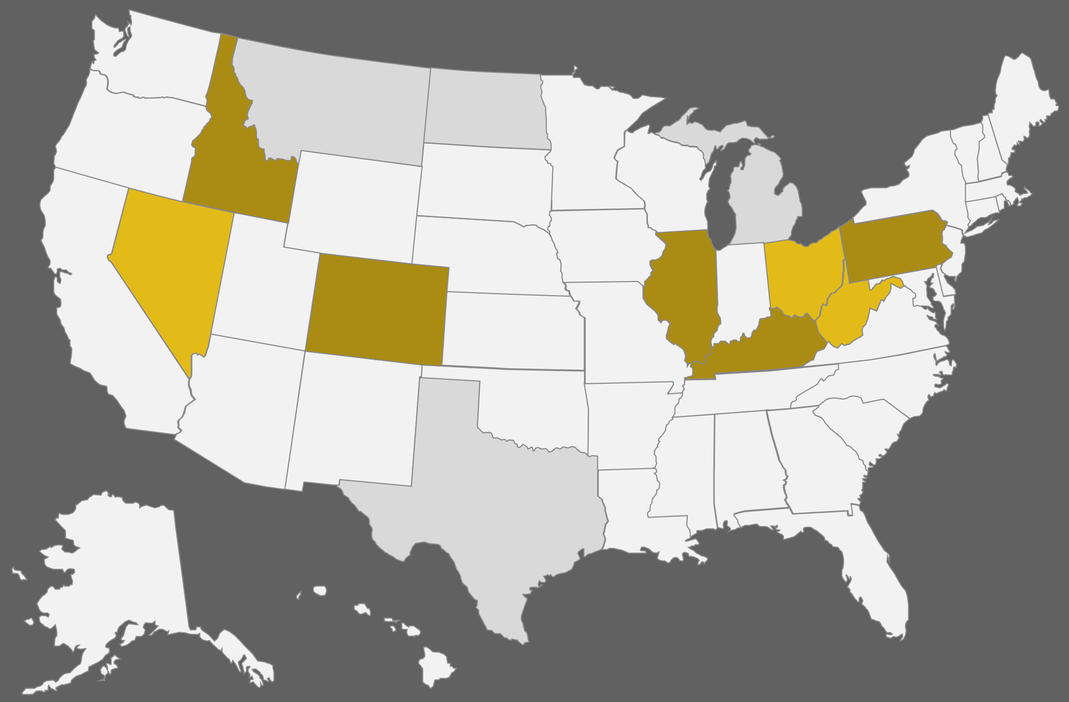
Ra-226, generally an exemption criteria.

30 – 50 pCi/g

Ra-226, w/some considerations to Th-232. Generally landfill.

Disposal > 100 pCi/g

Specialized facilities and/or select industries.



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Highlights of the current SR-N

Scope

Applies to all TENORM, except that which is defined as byproduct or source material by AEA of 1954.

Establishes rules for licensing of TENORM in a manner consistent with AEA framework.

- **5 pCi/g radium exemption**
- **Industry-specific exemptions**
- **100 mR/year TEDE exemption**
- **Land application < 10 pCi/g**
- **50 μR/hour scrap release**
- 5000 dpm/100cm^2, 1000 dpm/100cm^2
- **Licensing under AEA format**

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Key Issues Requiring Address

- **Address *all* TENORM nuclides**

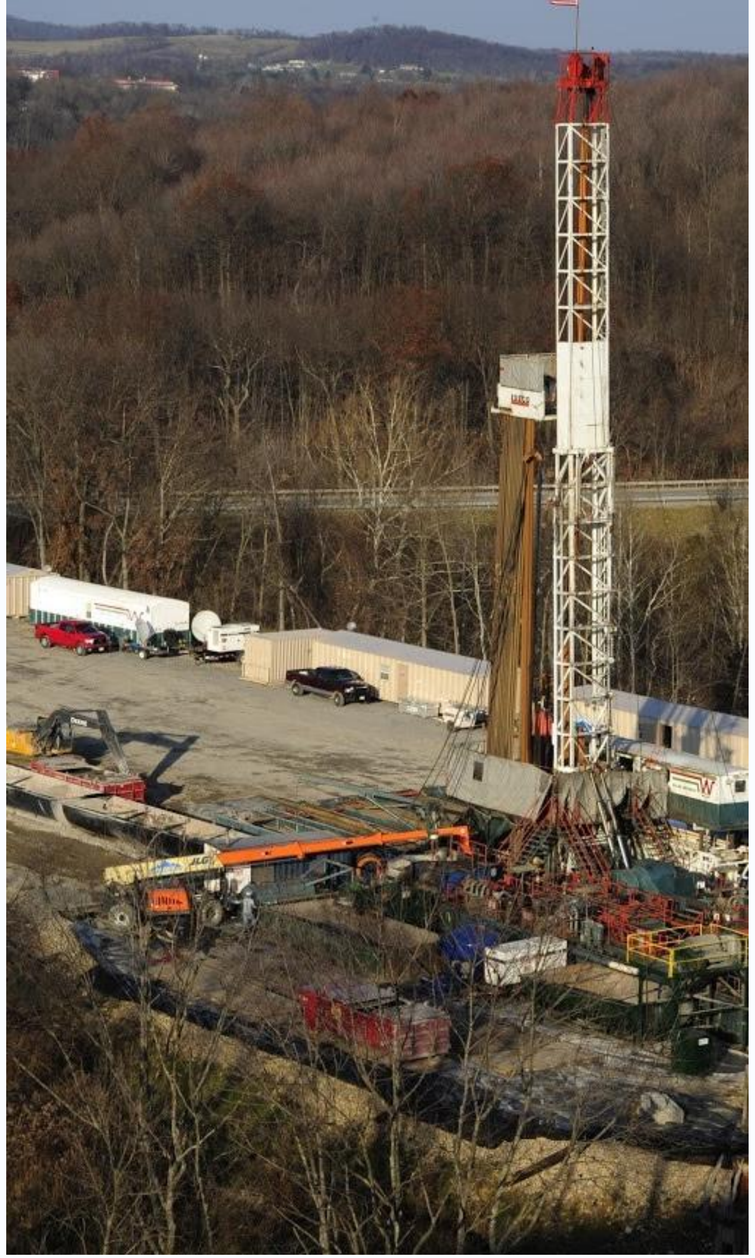
While radium is currently addressed, other TENORM nuclides require a similar exemption criteria.

- **Liquid effluents & radon**

Although available in licensing regulations, not consistently employed in TENORM regulations. Exposures or environmental concerns may exist at low concentrations

- **Varying disposal limits**

Although the exemption criteria have often been employed as a waste acceptance criteria, disposal limits have been trending upwards.



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Risk-Informed Regulatory Programs

- **What can go wrong?**

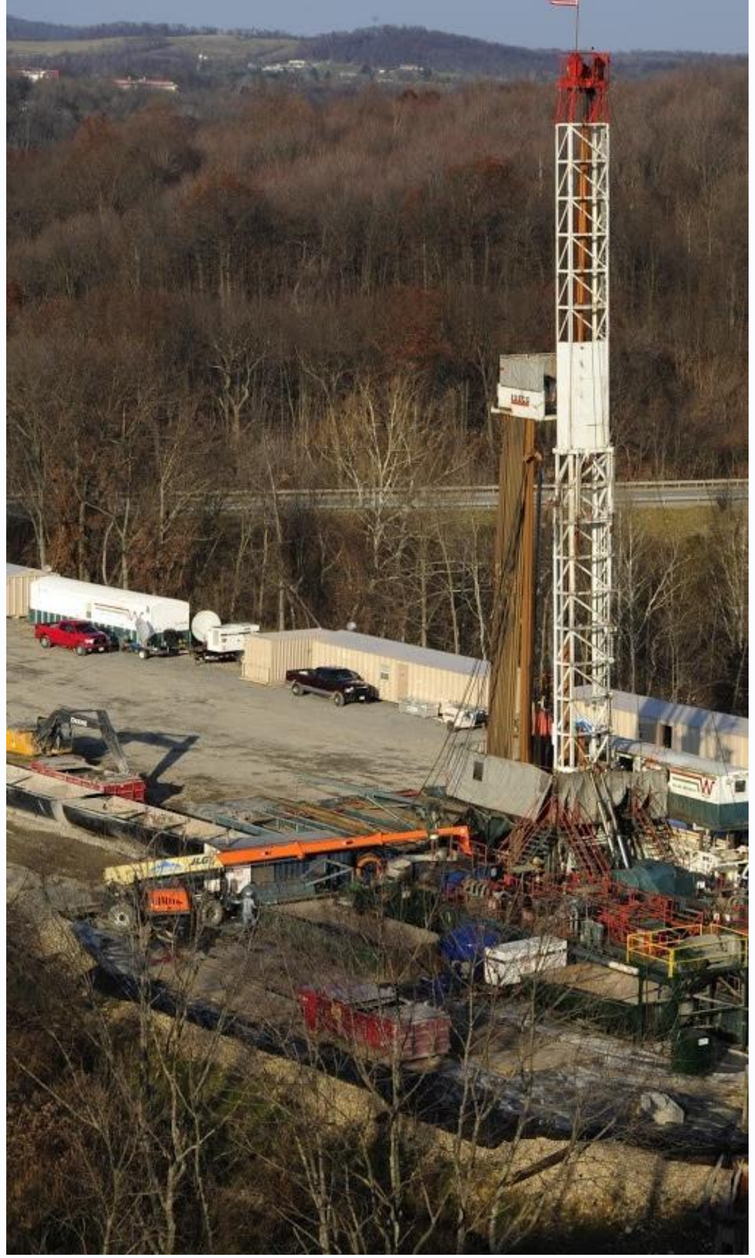
I.e, portable gauges getting smashed vs. industrial radiography accidents.

- **What is the probability of this happening?**

Portable gauges smashed weekly. Radiography accidents every so often.

- **What are the consequences?**

Examine in the context of other regulated materials. Generally licensed devices, movement of CAT 3 sources to security requirements…



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International Efforts at Risk-Informed Decision Making

- **GSR Part 3**

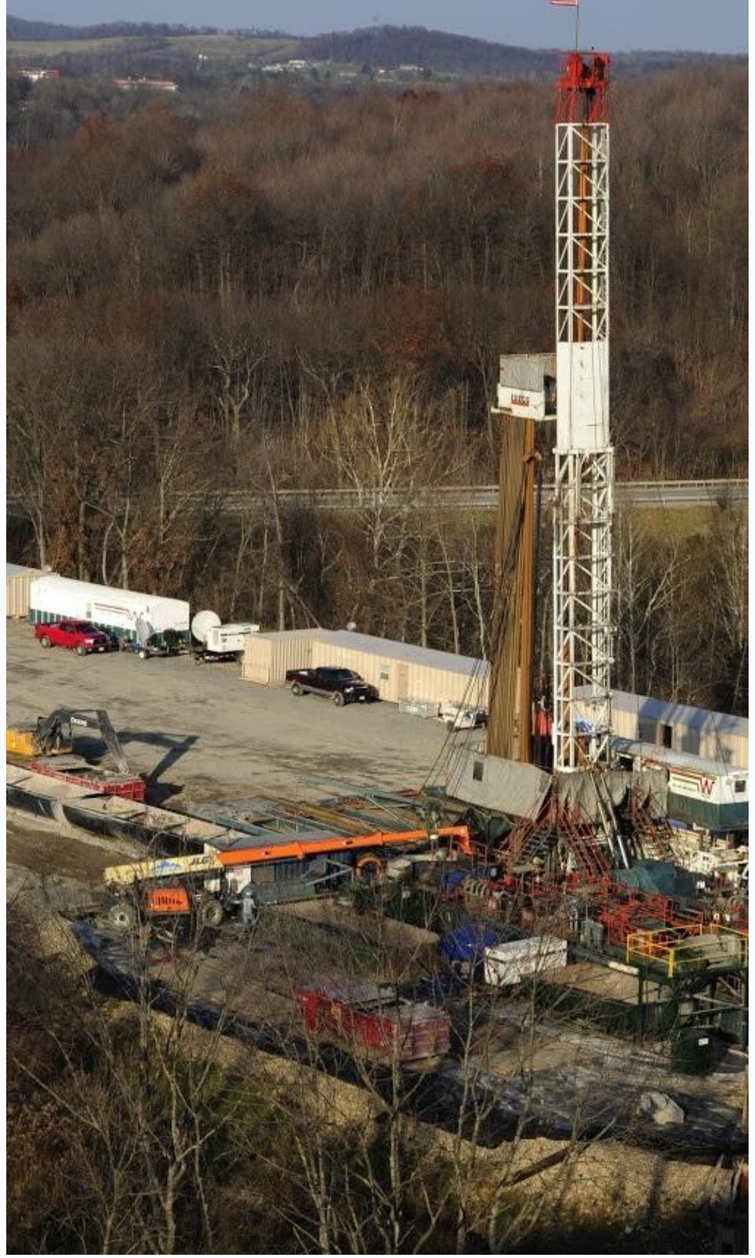
Among other concepts, planned vs. existing vs. emergency scenarios.

- **DS 459**

Utilizing the graded approach for NORM residue management

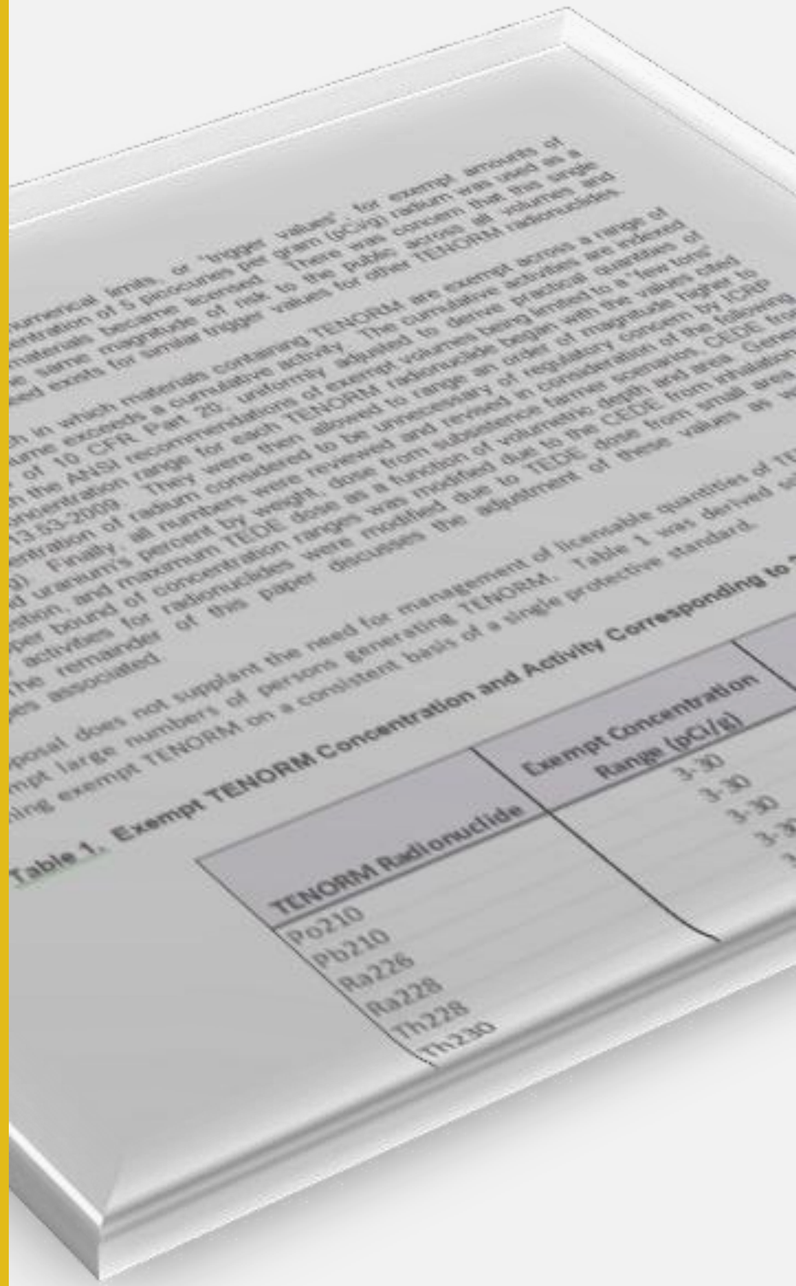
- **Draft TECDOC**

Incorporating the graded approach into a draft regulatory NORM framework



Draft proposals

The views and opinions shared in this presentation do not represent the opinions of the Conference of Radiation Control Program Director members, the CRCPD Executive Board, nor do they represent a consensus amongst the SR-N working group at this early stage of development.



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Draft Revisions

- **Incorporate IAEA GSR Part 3 “Planned” and “Existing” scenario concepts**

SR-N would apply to all ‘planned’ activities and only those ‘existing’ scenarios where the public exposure limits may exceed 100 mR/year.

- **Screening > Dose assessment > SR-N regulated**

A lower screening criteria is used to select practices subject to regulation based on the recommendations from ANSI. Generic dose assessments are utilized for **practice**-specific exemptions should a state so choose.

- **Planned industries**
- **Concentrations of TENORM exceed initial screening limits**
- **Exposures exceeding 25 mrem/year?**
- **Dose assessments may exempt certain disposal methods (i.e. landfilling) or entire industries (i.e., phosphate fertilizers).**

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Screening Criteria for "Planned Situations"

- **Adapts the ANSI N13.53-2009 administrative release values as 'screening criteria'**
- **State or industry can elect to perform a dose assessment**
  - Site-specific modeling encouraged.
  - The regulating entity may perform generic, *practice-wide* modeling to exempt as appropriate (landfilling, land application).

TENORM Radionuclide / Chain	Exempt Concentration (pCi/g)
Po-210	3
Pb-210 *(Pb-210, Bi-210, Po-210)*	3
Ra-226 *(Ra-226 Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210)*	3
Ra-228 *(Ra-228, Ac-228)*	3
Th-228 *(Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64))*	3
Th-230 *(Th-230, Ra-226 Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210)*	3
Th-232	3
Th-*Equilibrium* *(Th-232 in equilibrium with Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64))*	1.6
U-*Equilibrium*[2] *U-238 chain (0.489); U-234 (0.489); Th-230 (0.489), U-235 chain (0.022): (Ac-227, Ra-223, Rn-219, Po-215, Pb-211, Bi-211, and Tl-207 all at (0.022))*	3
U-238 *(U-238, Th-234, Pa-234m)*	30
K-40	13

Concentrations shown reflect parent nuclide, or in equilibrium with progeny

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Screening Criteria for "Planned Situations"

- **Proposes effluent screening criteria**
  - Screening criteria for potential regulatory oversight.
  - Based on a drinking water pathway exposure limit of 4 mrem/year (USEPA TSD, 2002)
  - Site-specific modeling to demonstrate compliance with 0.25 mSv/a encouraged

TENORM Radionuclide / Chain	Exempt Concentration
Po-210	15 pCi/L
Pb-210	1 pCi/L
Ra-226	5 pCi/L
Ra-228	5 pCi/L
Th-228	15 pCi/L
Th-230	15 pCi/L
Th-232	15 pCi/L
U-238	30 μg/L
K-40	50 pCi/L

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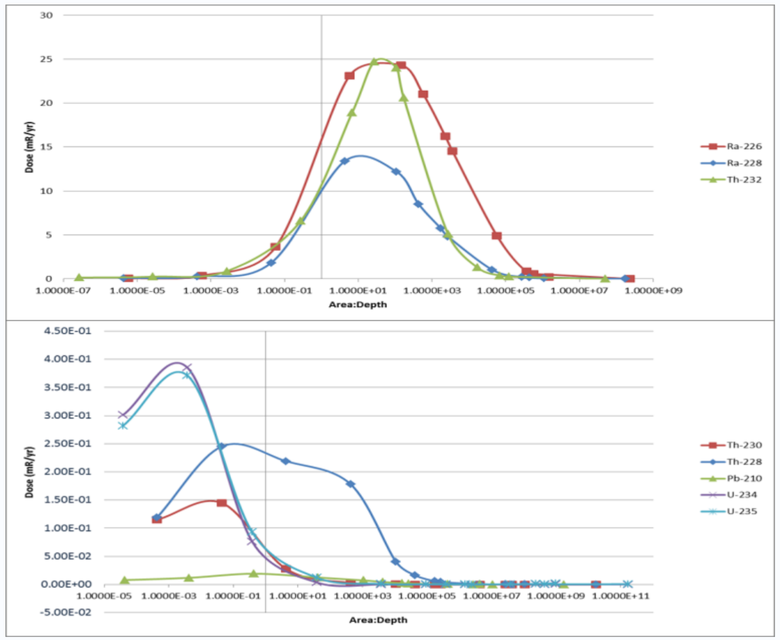
Exemption Proposals

- **“Trigger Numbers”**

Derived concentration and quantity that would likely not exceed 25 mrem/year if released into the environment *(all pathways, radon on)*



TENORM Radionuclide / Chain	Exempt Concentration Range (pCi/g)	Exempt Activity (microcuries)
Po-210	3-30	10
Pb-210 *(Pb-210, Bi-210, Po-210)*	3-57	10
Ra-226 *(Ra-226 Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210)*	3-46	7.5
Ra-228 *(Ra-228, Ac-228)*	3-35	10
Th-228 *(Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64))*	3-66	10
Th-230 *(Th-230, Ra-226 Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210)*	3-36	10
Th-232	3-6.6	10
Th-*Equilibrium* *(Th-232 in equilibrium with Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64))*	1.6 - 6	5
U-*Equilibrium*[2] *U-238 chain (0.489)*; *U-234 (0.489)*; *Th-230 (0.489)*, *U-235 chain (0.022)*: *(Ac-227, Ra-223, Rn-219, Po-215, Pb-211, Bi-211, and Tl-207 all at (0.022))*	3-22	10
U-238 *(U-238, Th-234, Pa-234m)*	30-165	100
K-40	13 - 800	45

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Licensing Framework Proposals

- **[General license / Registration]**
  - Flexible terminology to accommodate various State paradigms.
  - If planned, exceed screening criteria and not otherwise exempt: implement a TENORM residue management plan, conduct minimum worker training, radon monitoring, and annual surveys.
  - **Workers in this category are still considered members of the public.**

- **Specific license triggered > 100 mR/year**
  - Proposes removing the sections of SR-N addressing specific licensure and simply referencing Part C.
  - TENORM specific licenses would be no different that any other specific license.

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- **Planned industries**

- **Concentrations of TENORM exceed initial screening limits**

- **Generate / dispose of volumes exceeding he exempt source term *OR* Dose assessment indicates > 25 mrem per year**

- **Subject to requirements in SR-N.**

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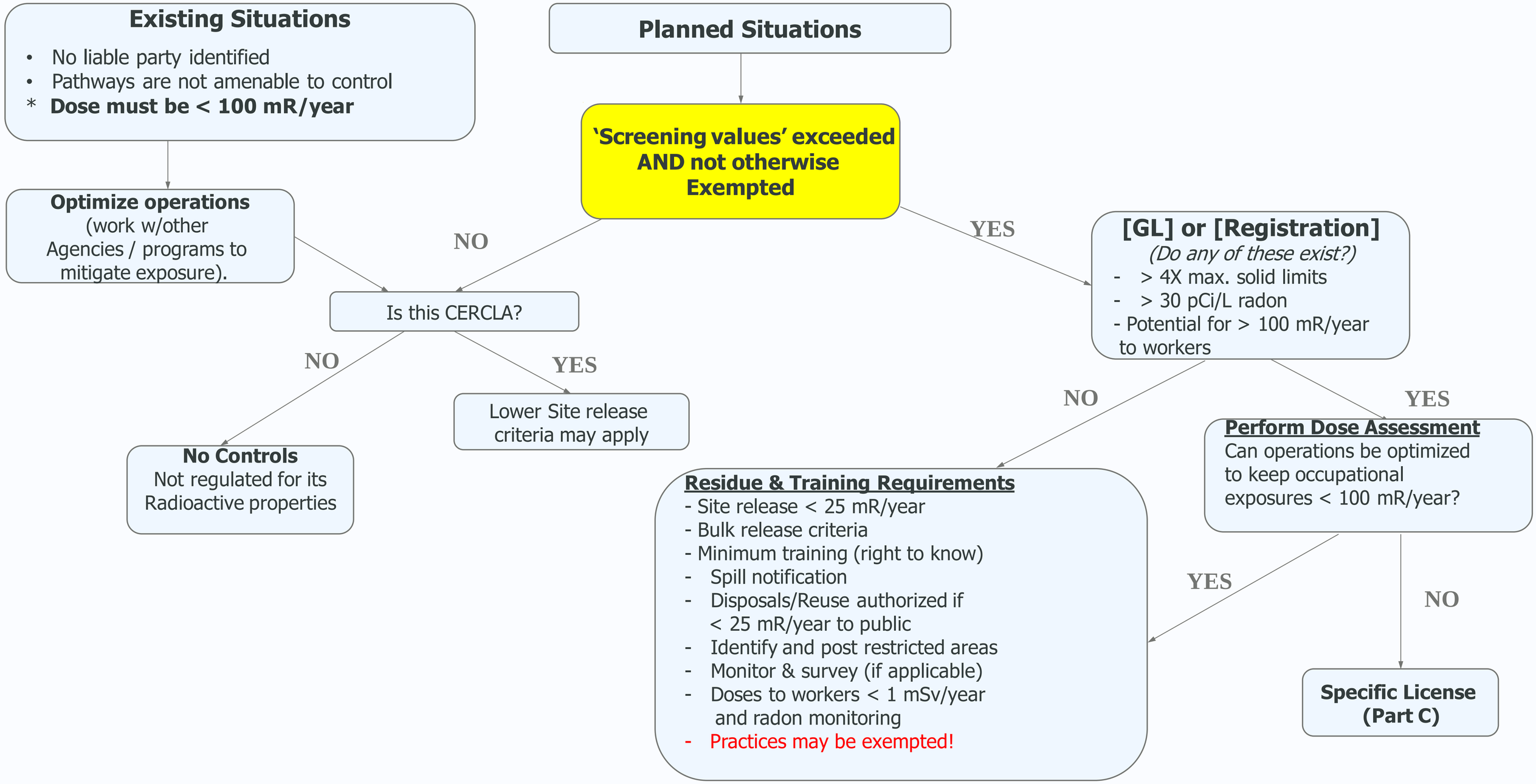
Licensing Framework Proposals

- **Regulated industries do not want to model.**
  - "Trigger numbers" on the right are simply 4X the max concentrations that result in an ingestion or inhalation CDE of 25 mrem.
  - Represent the maximum concentrations before moving to specific license.

- **Specific License**
  - May still optimize operations to stay out of specific license.
  - May perform a site-specific dose assessment to stay out of a specific license.

TENORM Radionuclide / Chain	Maximum Concentration Range (pCi/g)
Po-210	120
Pb-210 *(Pb-210, Bi-210, Po-210)*	228
Ra-226 *(Ra-226 Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210)*	184
Ra-228 *(Ra-228, Ac-228)*	140
Th-228 *(Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64))*	264
Th-230 *(Th-230, Ra-226 Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210)*	144
Th-232	26.4
Th-*Equilibrium* *(Th-232 in equilibrium with Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64))*	24
U-*Equilibrium*[2] *U-238 chain (0.489)*; *U-234 (0.489)*; *Th-230 (0.489)*, *U-235 chain (0.022)*: *(Ac-227, Ra-223, Rn-219, Po-215, Pb-211, Bi-211, and Tl-207 all at (0.022))*	88
U-238 *(U-238, Th-234, Pa-234m)*	165
K-40	3200

Proposed SR-N Regulatory Framework

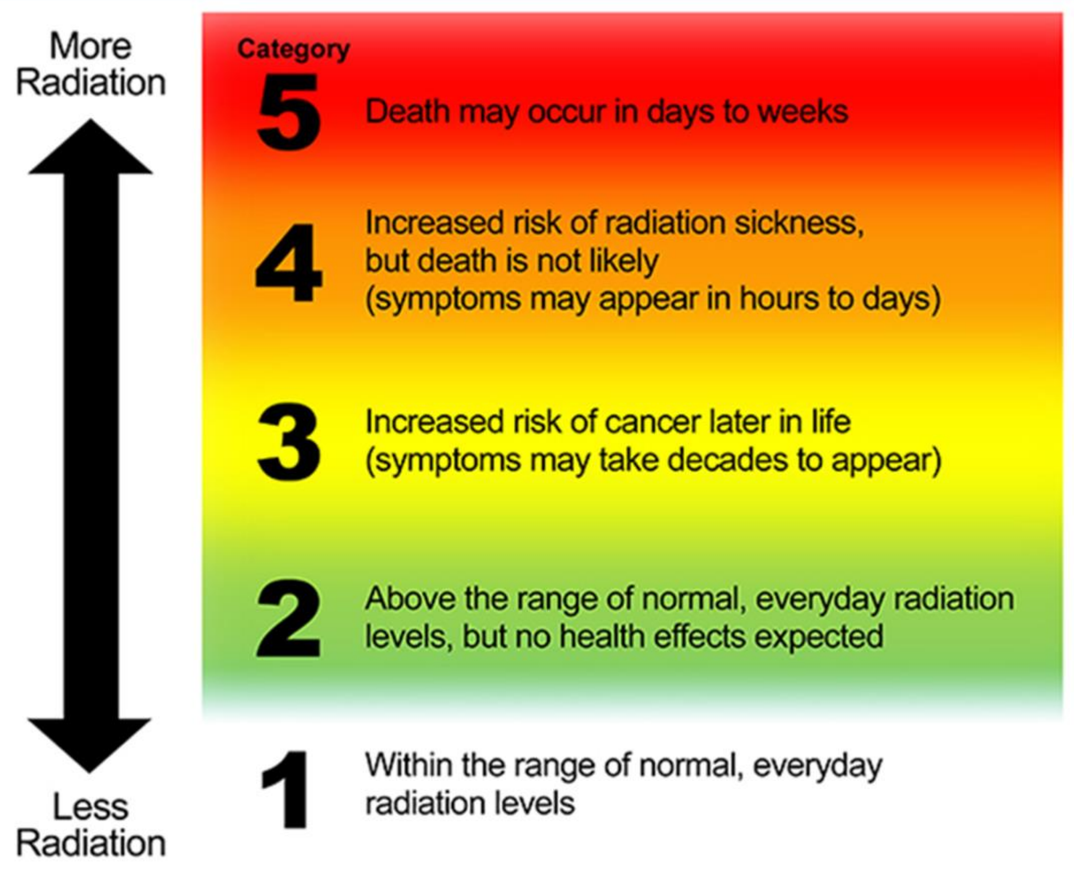


Summary

- “High exposure risks” generally are not a concern with NORM compared to other radioactive materials use,
- High probability of *some* exposure, but generally mitigated through a residue management plan,
- The associated risk, no matter the magnitude, is often poorly understood by industry and the public

Summary

- At the lowest NORM levels, implement residue management plans to mitigate high probability but low risk scenarios
- Identify low probability, but *higher* risk occupational exposure scenarios (Pb-210), and increase regulatory oversight to a commensurate level
- Utilize existing guidance, combined with worker training to provide context of the risk involved



https://www.cdc.gov/nceh/radiation/

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Next Steps

- **E-45, NCRP, Stakeholder review/input**

Gathering member input and concurrence

Vetting of numerical “trigger numbers”

Compare liquid effluent values to IAEA/ICRP ingestion dose coefficients

Continue to negotiate radon action levels

Guidance on dose assessments *(pending IAEA TECDOC)*

- **Opportunity for comment / participation**

Openings for members

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