The following is a pre-decisional draft revision to the CRCPD's April 2004 Part N,
"REGULATION AND LICENSING OF TECHNOLOGICALLY ENHANCED NATURALLY OCCURRING RADIOACTIVE MATERIAL (TENORM)"

Draft revisions to Part N, and the rationale that follows, are being circulated to further promote stakeholder feedback. Please note that any applicable revisions in response to comments received in June of 2025, have not yet been incorporated into this draft.

The CRCPD is not a rulemaking body. All Suggested State Regulations (SSRs) on the CRCPD website are templates States may elect to utilize in the construct of their regulations. The degree to which states draft regulations compatible with the SSRs can vary with federal requirements and individual enabling statutes. States wishing to promulgate regulations based off an SSR, would do so in accordance with their respective procedures for rulemaking and stakeholder comment.

For questions or comments regarding the draft revisions to Part N, please contact the current Part N Chair, Gary Forsee at Gary.Forsee@Illinois.gov.

To join CRCPD or participate on a Suggested State Regulation working group, email sbowen@crcpd.org and attach your completed membership application form.

Part N
REGULATION AND LICENSING OF TECHNOLOGICALLY ENHANCED NATURALLY OCCURRING RADIOACTIVE MATERIAL (TENORM)

Sec. N.1 - Purpose. This Part provides for the registration of persons producing or in possession of technologically enhanced naturally occurring radioactive material (TENORM). No person shall receive, possess, use, manufacture, distribute, transfer, own or acquire [NORM/TENORM] or devices or equipment containing [NORM/TENORM] except as authorized in this Part or in a specific license issued pursuant to Part C. These requirements provide for the protection of health, safety and the environment. The provisions of this Part are in addition to the definitions and applicable requirements of Parts A, C, D, J, M, O and T of these regulations.

Sec. N.2 - Scope.

a. This Part applies to industrial activities that may lead to exposures to [NORM/TENORM] of geological origin when concentrating or distributing radionuclides in the products, by-products, discharges, residues, or wastes. This Part also applies to industrial processes that increase the exposure of workers and/or members of the public, and/or lead to discharges of [NORM/TENORM] to the environment with subsequent human and non-human exposure.

b. Except as stated in N.2c., this Part does not apply to the remediation of areas contaminated by residual [NORM/TENORM] materials arising from past practices and remediated under previous standards. The requirements and guidance for the remediation of such areas are established by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA 42 USC §9601 et seq. as amended).

c. This Part applies to sites that have been identified as contaminated by [NORM/TENORM] residues and wastes from past activities (legacy sites), if individual members of the public will be exposed to greater than 1 millisievert (0.1 rem) TEDE annually, excluding indoor radon, from [NORM/TENORM] residues remaining on that site.

d. This Part does not apply to persons whose production, possession, transfer, disposal and reuse of [NORM/TENORM] is exclusively performed under a specific license issued in accordance with Part C of these regulations.

e. This Part does not apply to the manufacture and distribution of products containing [NORM/TENORM] in which the [NORM/TENORM]'s emitted radiation is considered beneficial to the products. These activities are subject to the provisions of Part C of these regulations.

f. This Part does not apply to source or byproduct material as defined in the Atomic Energy Act of 1954 (AEA 42 USC §2011 et seq.), and as revised in 1978 and 2005 by the Energy Policy Act (EPAct) which has been specifically or generally licensed by the U.S. Nuclear Regulatory Commission or an Agreement State under another Part of these regulations.

g. Storage incident to transportation and transportation of [NORM/TENORM] are governed by Parts D and T respectively of these regulations.

Sec. N.3 - Definitions. As used in this Part, the following definitions apply:

"Background radiation" means radiation from cosmic sources; naturally occurring radioactive materials, including radon (except as a decay product of source or special nuclear material) and global fallout as it exists in the environment from the testing of nuclear explosive devices. Background radiation does not include radiation from radioactive materials regulated by Part C of these regulations.

"Beneficial to the product" means that the radioactivity of the [NORM/TENORM] is necessary to the use of the product.

"Byproduct material" means (1) any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to radiation incident to the process of producing or utilizing special nuclear material; (2) the tailing or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content; (3) any discrete source of radium-226 that is produced, extracted, or converted after extraction, before, on, or after the date of enactment of the EPAct for use for a commercial, medical, or research activity; or any material that has been made radioactive by use of a particle accelerator and is produced, extracted, or converted after extraction, before, on, or after the date of enactment of the EPAct for use for a commercial, medical, or research activity; and (4) any discrete source of naturally occurring radioactive material, other than source material, that the Commission, in consultation with the Administrator of the Environmental Protection Agency (EPA), the Secretary of the Department of Energy (DOE), the Secretary of the Department of Homeland Security (DHS), and the head of any other appropriate Federal agency, determines would pose a threat similar to the threat posed by a discrete source of radium-226 to the public health and safety or the common defense and security; and is extracted or converted after extraction before, on, or after the date of enactment of the EPAct for use in a commercial, medical, or research activity.[1/]

"Bulk distribution" means material not sold as a consumer or retail product.

"Conditional release" means release by a registrant for a specified use other than release for unrestricted use.

"Consumer" means a member of the public exposed to [NORM/TENORM] from final end-use products available on a retail basis.

"Consumer or retail product" means any product, article, or component part thereof, produced, distributed or sold for use by a consumer in or around a permanent or temporary household or

[1/] *In accordance with the definition of Discrete source, once a discrete source meets the definition of Byproduct material, any contamination resulting from the use of such discrete sources of this byproduct material will also be considered byproduct material. This issue is discussed further in this document under ''Summary and Analysis of Public Comments on the Proposed Rule.''*

residence, or for the personal use, consumption, or enjoyment of a consumer, or for use in or around a school or playground.

"Critical group" means the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity for any applicable set of circumstances.

"Decommission" means to remove (as a facility) safely from service and reduce residual radioactivity to a level that permits release of the property for reuse and termination of the registration. The [Agency] may authorize release of the property and the resulting termination under unrestricted, limited-restricted or restricted release. Restricted release will generally include both engineering and institutional controls, where limited-restricted release requires only institutional controls (i.e., a deed notice/restriction).

"Decontamination" means the removal of radiological contaminants from, or their neutralization on, a person, object or area to within levels established by governing regulatory agencies (MARSSIM, Rev. 1 August 2000).

"Dose Assessment" means the process, and the result, of analyzing systematically and evaluating the dose associated with radiation sources and management practices, and associated protection and safety measures to an individual or group of individuals. For the purposes of this Part, this may include an assessment of the expected radiological impacts of facilities and activities on the environment for the purposes of protection of the public and protection of the environment against radiation risks.

"Exemption" means a generic authorization granted by the regulatory body which, once issued, releases the practice or source from the requirements that would otherwise apply and, in particular, the requirements relating to a residue management plan and a program to control worker exposures.

"Naturally occurring" means present in or produced by nature without human involvement or enhancement.

"Natural radioactivity" means radioactivity of naturally-occurring nuclides.

"Practice" or "Management Practice" means any human activity that introduces additional sources of exposure or additional exposure pathways, or that modifies the network of exposure pathways from existing sources, so as to increase the exposure or the likelihood of exposure of people or the number of people exposed.

"Product" means something produced, made, manufactured, refined, or beneficiated.

"Reasonably maximally exposed individual" means a representative of a population who is exposed to [NORM/TENORM] at the maximum [NORM/TENORM] concentration measured in environmental media found at a site along with reasonable maximum case exposure assumptions. The exposure is determined by using maximum values for one or more of the most sensitive parameters affecting exposure, based on cautious but reasonable assumptions, while leaving the others at their mean value.

"Residue" or "Residual" or "Residual radioactivity" means radioactivity in structures, materials, soils, groundwater, and other media at a site resulting from activities under the operator's control, but excludes background radiation. It also includes radioactive materials remaining at the site as a result of routine or accidental releases of radioactive material at the site and previous burials at the site, even if those burials were made in accordance with the provisions of previous standards.

"Risk" means the potential level of harm or loss due to exposure to radioactivity.

"Source material" means (1) uranium or thorium, or any combination thereof, in any physical or chemical form or (2) ores which contain by weight one-twentieth of one percent (0.05%) or more of: (i) uranium, (ii) thorium or (iii) any combination thereof. Source material does not include special nuclear material.

"Specific license" means a license, issued after application, to use, manufacture, produce, transfer, receive, acquire, own, or possess quantities of, or devices or equipment utilizing radioactive materials.

"Technologically Enhanced Naturally Occurring Radioactive Material (TENORM)" means naturally occurring radioactive material whose radionuclide concentrations or potential for human exposure are increased by or as a result of past or present human practices. TENORM does not include background radiation or the natural radioactivity of in-situ rocks or soils. TENORM does not include "source material" and "byproduct material" as both are defined in the Atomic Energy Act of 1954, as amended (AEA 42 USC §2011 et seq.) and relevant regulations implemented by the NRC.[*/]

"Transfer" means the physical relocation of [NORM/TENORM] within a business' operation or between registrants or specific licensees. This term does not include commercial distribution or a change in legal title to [NORM/TENORM] that does not involve physical movement of those materials.]

"Total effective dose equivalent (TEDE)" means the sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures)."

"Worker" means, for the purpose of this Part, any person who works, whether full time, part time or temporarily, for an employer and who has recognized rights and duties in relation to occupational radiation protection. As it pertains to this Part and the applicable limits on radiation exposure, a worker remains a member of the public and the afforded "occupational dose" is limited to 1.0 mSv (100 millirem) per year. The term occupational dose remains consistent with that utilized in 10 CFR Part 20.1003.

"Working level (WL)" means any combination of short-lived radon daughters in 1 liter of air that will result in the ultimate emission of 1.3×10^5 MeV of potential alpha particle energy. The short-

[*/] *All radionuclides are listed as hazardous substances pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA 42 USC §9601 et seq. as amended). Because the Superfund definition of hazardous substances extends to natural hazardous substances that have been removed from their place in nature and exposed to the accessible environment, materials containing naturally occurring radionuclides which have not been enriched in concentration are covered by CERCLA and related US Environmental Protection Agency (U.S. EPA) regulations.*

lived radon daughters of radon-222 are polonium-218, lead-214, bismuth-214, and polonium-214; and those of radon-220 are polonium-216, lead-212, bismuth-212, and polonium-212.

"Working level month (WLM)" means an exposure to 1 working level for 170 hours (2,000 working hours per year divided by 12 months per year is approximately equal to 170 hours per month).

Sec. N.4 - Radiation Exposure Limits for Individual Members of the Public.

a. Persons subject to this Part shall conduct operations so that the dose from all registrants under this Part are beneath the values below:

   i. Sites utilized for the disposal, storage or beneficial use of [NORM/TENORM] residues do not result in a total effective dose equivalent (TEDE) to the reasonably maximally exposed member of the public in excess of 0.25 mSv (25 millirem) in any year, exclusive of background and indoor radon;

   ii. The reasonably maximally exposed worker engaged with activities at or resulting from an operation subject to this Part, does not receive a total effective dose equivalent (TEDE) in excess of 0.1 mSv (0.1 rem) in any year from [NORM/TENORM], exclusive of background; and

   iii. Radon exposure to workers, engaged with activities at or resulting from an operation subject to this Part, does not exceed an average of 30 pCi/L or 0.3 WL, based on continuous workplace exposure for a 40 hr/week, 52 weeks/year and shall not exceed four WLM over a 12-month period. Persons subject to this part shall use an equilibrium ratio of 50 percent to convert radon exposure to WLM unless empirical data is available.

Sec. N.5 - Registration.

a. Except as otherwise specified in this Part, the following persons shall register with the [Agency].

b. Persons whose production, possession, disposal, re-use or distribution of [NORM/TENORM] has been determined by the [Agency] to result in radiation exposures to the public exceeding those in Section N.4; or

c. Persons who produce, possess, transfer or distribute [NORM/TENORM] residues with a concentration above background equal to or exceeding the values in Table 1 for solids or Table 2 for liquids.

Table 1. [NORM/TENORM] Registration Screening Levels (Solids)

Radionuclide / Chain	Concentration (pCi/g)
Po-210	27
Pb-210 *(Pb-210, Bi-210, Po-210)*	27
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* *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)*	27
K-40	13

Table 2. [NORM/TENORM] Registration Screening Levels (Liquids)

Radionuclide	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 mg/L
K-40	50 pCi/L

d. Nothing in this Section shall limit the ability of the [Agency] to initiate inspections or request further data to determine compliance with the public exposure limits in Section N.4.

e. In determining registration requirements for persons whose [NORM/TENORM] residues meet or exceed the values in Table 1 or 2, the following criteria shall be used:

i. The registration screening values are additive to (i.e., above) background concentrations of NORM.

ii. The values in Table 1 for solids are dry weight basis.

iii. If the registrant has determined the background concentration(s), the value(s) must be provided with the registration information.

iv. Background concentrations of NORM shall be determined by an appropriate method listed in U.S. EPA methods compendium SW-846 and may be subject to confirmation by the [Agency]. For the purposes of this Part, the sum of the analytically determined background concentration and the screening value in Table 1 shall not exceed 1 Bq/g (27 pCi/g).

v. Compliance calculations concerning multiple sources, multiple forms (solid and liquid) or multiple radionuclides shall utilize the "sum of fractions" methodology.

vi. For Table 1, the progeny assumed to be in equilibrium are listed. For Table 2, progeny are assumed to be in equilibrium.

vii. If the quantity of [NORM/TENORM] residues produced or possessed exceeds 12,000 kg annually, Table 1 may not be sufficient to determine compliance with the public dose limits in Section N.4 and the resulting registration requirement. Contact the [Agency] to determine compliance with Section N.4.

viii. The naturally occurring radionuclides and progeny identified in Tables 1 and 2 represent the most commonly encountered and likely significant in terms of dose contribution under Section N.4a. However, this Part does not limit or otherwise exempt the contribution of other naturally occurring radionuclides that may further contribute to "gross activity" (i.e., Sm-147, Rb-87, etc.).

f. The values in Table 1 and 2 shall not be used as waste acceptance criteria without a concurrent assessment of total residue volume and a comparison of potential dose impacts to the limits specified in Section N.4a.i.[2/]

g. Registration information shall be in a format prescribed by the [Agency] and furnished in accordance with subsection (f).

h. When registering with the [Agency], a person shall furnish the following, and any other information requested by the [Agency] to determine dose to the public resulting from the management of [NORM/TENORM] residues:

i. The name and mailing address of the registrant;

[2/] *The values in Table 1 and 2 are derived concentrations which may result in 0.25 mSv (25 mrem) per year of additional exposure to future residents of impacted sites when present in quantities of up to a few tons. Disposal or reuse of [NORM/TENORM] residues exceeding this volume should be assessed for compliance with Section N.4. The use of adequate engineered and institutional controls to maintain public doses in compliance with Section N.4 may facilitate higher waste acceptance criteria.*

ii. The name, title, phone number and email of the responsible individual designated as a representative of the registrant;

iii. If applicable, the value(s) the registrant has determined for NORM background concentrations;

iv. A description of the industrial, research, manufacturing or other process that results in a [NORM/TENORM] residue;

v. A description of the [NORM/TENORM] residue(s) in terms of solid, liquid, gas and any known chemical/radiological parameters (e.g., any analyses performed);

vi. Annual quantity of all [NORM/TENORM] residues generated;

vii. Current and historical methods used to store, dispose, re-purpose, distribute or otherwise disposition [NORM/TENORM] residues;

viii. State, local and federal permits or other regulatory controls currently applicable to the management of [NORM/TENORM] residues (e.g., land application permits, sampling requirements, effluent discharge limits, landfill disposal limits, etc.);

ix. Any other institutional or engineered controls that are utilized to mitigate exposures to workers or the public that should be considered (dust masks, water suppression, etc); and

x. A description of any current efforts to monitor worker exposure to radiation levels or radon.

i. Any person who is required by N.5a. to register with the [Agency] shall report a change in mailing address. This report shall be furnished to [Agency] within 30 days after the change.

j. A person from out of state is exempt from the registration requirement in N.5a. if the [NORM/TENORM] residues identified in this Section are not disposed of, transferred or deposited into the environment in areas subject to [Agency] jurisdiction.

k. Persons required to register in accordance with this Section shall update the information in subsection (f) annually.

Sec. N.6 - Residue Management Plan.

a. Persons whose production, possession, distribution, transfer, disposal or reuse of [NORM/TENORM] residues has been determined by the [Agency] to have the potential to result in public exposures exceeding N.4a., shall implement and maintain an [Agency] approved residue management plan.

b. Persons notified by the [Agency] under this Section as required to implement a residue management plan, shall submit within 60 days of notification, either:

i. A residue management plan meeting the criteria in section N.6d. for [Agency] evaluation and concurrence; or

ii. A dose assessment as described in Section N.8 for the purpose of demonstrating compliance with Section N.4 for [Agency] evaluation and concurrence; or

iii. A copy of the registrant's application to perform [NORM/TENORM] operations under a specific license issued pursuant to Part C.

c. In determining the registrants required to implement and maintain a residue management plan, the source terms in Table 3 may be utilized to demonstrate compliance with Section N.4a.i. The concentrations (dry weight basis) and maximum activity below represent the maximum source term a registrant could deposit to an impacted site and remain beneath the 25 mrem/year additive public exposure limit. These source terms assume there are no mitigating controls or practices in use. For mixtures of radionuclides, the sum of fraction methodology should be used.

Table 3. [NORM/TENORM] Maximum Source Terms

Radionuclide / Chain	Concentration Range (pCi/g)	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* *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

d. The residue management plan required under subsection N.6a. shall contain, at a minimum, the following:

i. Current information pertaining to registration and [NORM/TENORM] residues, identified in Section N.6f.;

ii. An analysis of the industrial process(es) used which can reasonably generate a [NORM/TENORM] residue and the anticipated radionuclides, concentrations, volumes, and disposal/reuse frequency.[3/]

iii. A description of all current and historical disposal, reuse, distribution, transfer or other management practices used for the disposition of [NORM/TENORM] residues;

iv. If applicable, site(s) impacted by [NORM/TENORM] residue management practices and the means the registrant will use to identify and track such locations (discharge locations, land application sites, landfills, storage locations, etc.).

v. If applicable, the method the registrant will utilize to identify sites that have been impacted by historical disposal or re-beneficiation of [NORM/TENORM] residues and can no longer support further disposal or reuse of [NORM/TENORM] residues without exceeding the public exposure limits in Section N.4a.i. (e.g., baseline background sampling). The registrant shall include the value of background NORM concentrations which indicate further disposal or reuse of [NORM/TENORM] residues is no longer afforded.

vi. Controls to be used to limit accumulation of [NORM/TENORM] in the environment to the levels which would give rise to doses in excess of Section N.4a.i. These may include engineered, administrative or other regulatory controls that apply to the management practices employed by the registrant.

vii. The means the registrant will use annually to assess the adequacy of controls specified in N.6d.vi. and determine compliance with the public dose limits in Section N.4a.i.

viii. A description of any [NORM/TENORM] residues (to include radionuclide concentration, quantity and physical form) that are distributed, transferred, sold or otherwise offered as a consumer product.

ix. Means used to assess compliance with Section N.4a.ii. and N.4a.iii., including any surveys or occupational controls relied upon for compliance.

x. A description of the registrant's [NORM/TENORM] residue, effluent and/or environmental sampling plan to characterize environmental impact and

[3/] *The U.S. Environmental Protection Agency (U.S. EPA) and the International Atomic Energy Agency (IAEA) publish industry-specific guidance which may assist registrants in gaining process knowledge and characterizing potential [NORM/TENORM] residues. Refer to the U.S. EPA TENORM Resources page and the IAEA Safety Reports and TECDOC Series for technical guidance.*

demonstrate compliance with the public exposure limits in Section N.4a.i. This sampling plan shall include, at a minimum, provisions for the following:

(1) Identification of the [NORM/TENORM] residues that will be deposited into the environment annually, to include estimated radionuclides, concentrations (average and maximum) and resulting residue quantities.

(2) Identification of co-contaminants if relevant to the control of the [NORM/TENORM] residue (either by other regulations or as a surrogate analyte).

(3) Information on the analytical methods to be used, the minimum detectable activity of each method and the person(s) performing the analyses.[4/]

(4) For each [NORM/TENORM] residue to be sampled, an explanation of the sampling plan (e.g., frequency, sample count, and composite/aliquot count per unit volume) to account for [NORM/TENORM] volumetric and temporal concentration variations; and

(5) If applicable, a description of the registrant's program for performing baseline sampling to quantify background NORM concentrations (including sample count per unit area, sampling depth, composite/aliquot count, and analytical method to be utilized).

xi. Identification of any TENORM analyses, surveys or other criteria which will be utilized to screen and support operational decision-making for the residue management plan.

xii. If applicable, the residue management plan shall include procedures for appropriate transfer and/or release of equipment and materials contaminated with [NORM/TENORM] in accordance with the criteria specified in Section N.9. Identify process vessels, piping, equipment or residues that will not be immediately dispositioned, but are likely to contain [NORM/TENORM] and will require assessment, treatment or remediation prior to decommissioning.

xiii. Identification of any sites historically or currently utilized for the disposal or reuse of [NORM/TENORM] residues that are expected to exceed the public dose limits in Section N.4a.i. without decommissioning or the imposition of engineering or institutional controls (i.e., a deed notice/restriction). If applicable, the registrant shall apply and receive [Agency] authorization for restricted or limited-restricted release in accordance with Section N.9. The residue management plan shall include the provisions utilized by the registrant to limit, to the extent possible, additional [NORM/TENORM] accumulation on these sites.

[4/] *Registrants may utilize the U.S. Environmental Protection Agency's compendium of hazardous waste test methods, SW-846 for appropriate analytical methods. While isotopic speciation is preferable for accurate dose assessment, if gross alpha / gross beta analyses are utilized, sufficient industrial process knowledge must be provided to identify the likely parent and progeny nuclides present.*

xiv. The timeline for implementation of the residue management plan.

xv. Records to be maintained to demonstrate compliance with the residue management plan. Record keeping shall consist of, at a minimum:

(1) Baseline NORM (background) concentrations of sites utilized for the disposal, storage or repurposing of [NORM/TENORM] residues. These records shall be retained for the duration of the registration period.

(2) Records detailing compliance with the training requirements in this Section. These records shall be maintained for a period of five years.

(3) Detailed analytical data, including lab methods used and associated uncertainties. Solids shall be reported on a dry weight basis. These records shall be retained for the duration of the registration period.

(4) Records pertaining to the disposal, re-use or transfer of [NORM/TENORM] residues. These records shall be retained for the duration of the registration period.

(5) Records pertaining to site remediation and/or site release under Section N.9. These records shall be retained for the duration of the registration period.

(6) If appropriate, records pertaining to the calibration in accordance with the manufacturer's instructions of radiation detection and measurement equipment. These records shall be maintained for a period of five years.

e. The [Agency] shall evaluate new and proposed revisions to approved residue management plans to determine if operations can be safely performed to maintain public exposures in compliance with Section N.4a.

i. The [Agency] may request such additional information as it considers necessary to conduct its review and the registrant shall provide the information requested.

ii. Upon a determination that a residue management plan meets the requirements of this Part, the [Agency] will approve the residue management plan authorizing the proposed activity in such form and containing such conditions and limitations as it deems appropriate or necessary.

f. Registrants shall provide annual training, which meets the criteria in Appendix B of this Part, to workers whose duties involve potential exposure to [NORM/TENORM] residues.

g. Persons required to implement and maintain a residue management plan in accordance with Section N.6 shall review the plan annually to verify the representations are accurate and reflective of the [NORM/TENORM] residues and management practices in use by the registrant. The registrant shall document the review and any revisions made and submit to the [Agency] annually.

Sec. N.7 - Control of Worker Exposures.

a. Persons whose production, possession, distribution, transfer, disposal or reuse of [NORM/TENORM] has been determined by the [Agency] to likely result in exposures to the registrant's workers exceeding N.4a.ii. or N.4a.iii., shall implement and maintain an [Agency] approved program for controlling worker radiation exposure.

b. Persons notified by the [Agency] under this Section as required to implement controls for worker exposure, shall submit within 60 days of notification, either:

   i. Activities taken to immediately ensure worker exposures are compliant with Section N.4a.ii. and N.4a.iii., and the controls the registrant will implement and maintain to ensure compliance with the exposure limits. Such controls shall include, at a minimum, the criteria in subsection N.7c.;

   ii. Activities taken to immediately ensure worker exposures are compliant with Section N.4a.ii and N.4a.iii., and a copy of the registrant's application to perform [NORM/TENORM] operations under a specific license issued pursuant to Part C; or

   iii. A dose assessment, as described in Section N.8c., for the purpose of demonstrating compliance with Section N.4a.ii. and N.4a.iii. for [Agency] evaluation and concurrence.

c. A program to control radiation exposures to workers, submitted to the [Agency] for evaluation and concurrence under N.7b., shall address the following criteria:

   i. Where [NORM/TENORM] residues include radium progeny, the registrant shall provide for radon measurements, performed at least quarterly in all routinely occupied areas where [NORM/TENORM] residues accumulate, to assess compliance with Section N.4a.iii. The registrant shall include appropriate mitigation measures to ensure workers are not exposed to radon levels exceeding the limits in Section N.4a.iii. The registrant shall address the means used to evaluate or otherwise ventilate process vessels or other areas that are not routinely occupied but periodically accessed by workers.

   ii. Radiation exposure rate surveys, performed at least annually in all routinely occupied areas where [NORM/TENORM] is stored, produced or possessed. The registrant shall address the means to evaluate exposure rates in process vessels or other areas that are not routinely occupied but periodically accessed by workers.

   iii. If applicable, engineered or administrative controls employed by the registrant to reduce inadvertent intake (ingestion/inhalation) of [NORM/TENORM] residues.

   iv. Where workers may become contaminated with [NORM/TENORM] residues, the means used to assess and decontaminate persons.

v. Provisions to post each radiation area, as defined in 10 CFR Part 20.1003, with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIATION AREA".

vi. The make, model and calibration frequency of equipment utilized to measure radon, external exposure rates, and contamination at the registrant's facilities.

vii. Registrants required to implement and maintain a program to control worker exposures shall provide annual training to workers which meets the criteria in Appendix B of this Part.

d. In determining the registrants required to implement and maintain controls for worker exposure under this Section, the production or possession of [NORM/TENORM] residues meeting or exceeding the concentrations in Table 4 shall require the registrant to submit a response to the [Agency] as instructed in N.7b.[5/]

Table 4. [NORM/TENORM] Concentrations Requiring Controls for Worker Exposure

Radionuclide / Chain	Concentration (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* *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

Sec. N.8 - Exemptions.

[5/] *The values in Table 4 represent the concentration of [NORM/TENORM] (on a dry weight basis) at which a registrant shall address incidental inhalation and ingestion exposures to workers. Registrants must also assess external exposure rates to arrive at a TEDE measurement. Radon exposures must also be assessed for compliance with Section N.4(a)(iii). The values in Table 4 assume there are no mitigating controls or practices in use, particles are respirable and utilize the longest body retention factors. For mixtures of radionuclides, the sum of fraction methodology should be used.*

a. The [Agency] may, upon application or upon its own initiative, grant such exemptions or exceptions from the requirements of this Part as it determines are authorized by law and will not result in undue hazard to public health and safety or property.

b. Generic Exemption. The [Agency] may, upon application or upon its own initiative initiate a dose (performance) assessment to determine if a [NORM/TENORM] residue management practice, in general terms, should be subject to a residue management plan under Section N.6. If the dose assessment determines that the [NORM/TENORM] management practice is not likely to contribute to public doses in excess of 1.0 mSv/year (100 mrem/year) and that sites impacted by the [NORM/TENORM] management practice will not give rise to doses in excess of those in section N.4a.i.; the [Agency] may issue an exemption to the requirement for a residue management plan in N.6. Such dose assessment shall include, at a minimum:

   i. A description of the [NORM/TENORM] residue(s) involved, a description of the industrial practices generating such residues, the industrial, governmental and/or private sector(s) likely impacted by the dose assessment, likely stakeholders, and an assessment of the economic impacts of the regulatory decision.

   ii. For any institutional and/or engineered controls that are given credit towards mitigation of public dose; the license, permit, regulation or other prerequisite for operation that will verify their use.

   iii. The means used to verify the management practice being assessed has taken into account the variability in [NORM/TENORM] residue concentrations, operational practices, as well as seasonal and temporal variations.

   iv. An assessment of worker doses for compliance with Section N.4;

   v. A cumulative assessment of public exposure resulting from all registrants utilizing the subject [NORM/TENORM] management practice (e.g., landfill workers that facilitate placement of [NORM/TENORM] residues in a lift);

   vi. Assessment of potential public dose resulting from removal, disposal, cleaning, transfer or repurposing of equipment that may be contaminated with [NORM/TENORM] residues. Appendix A of this Part may be utilized for this purpose.

   vii. An assessment of the total source term a registrant could generate in a five-year period and the available means for disposal or re-beneficiation should a registrant abandon the [NORM/TENORM] residues.[6/]

   viii. Dose assessment modeling efforts shall assess the following minimum factors:

[6/] *[NORM/TENORM] residues that require disposal only as low level radioactive waste should generally not be considered as eligible for an exemption under this Section.*

(1) Maximum TEDE dose resulting from [NORM/TENORM] residues to the reasonably maximally exposed member of the public over a performance period of 1500 years.

(2) Reasonable future use scenarios, to include a resident farmer.

(3) Dose contribution from progeny ingrowth.

(4) If applicable, dose contribution from ground emanation of radon. Dose contribution from residential indoor radon need not be incorporated into the model.

(5) A wind erosion loss factor set to zero cm/year.

(6) The most conservative K_D factor for soils within the [Agency's] jurisdiction that are reflective of sites in which the [NORM/TENORM] management practice would reasonably be employed.

(7) The assumptions utilized for depth to groundwater and any mixing zone depth.

(8) Identification of the modeling software utilized. Identification of any model variables manipulated by from default values and an explanation as to the basis for doing so.

(9) Identification of the dose conversion factors utilized in the assessment.

(10) In addition to the [NORM/TENORM] radionuclide concentrations, and any variability therein; any relevant information on the chemical form and the impact to environmental mobility (e.g., oxidation state and the conditions under which residues will be stored or disposed).

c. Specific Exemptions. Persons required to register under Section N.5 may request exemption from the requirements for a residue management plan in Section N.6 or, if applicable, a program for controlling worker radiation exposures under Section N.7. Such a request shall include an analysis of the source terms, exposure pathways and resulting TEDE dose to both workers and members of the public. The registrant may utilize a computer-modeled dose (performance) assessment to determine if the exposure limits in Section N.4 can be met without additional limitations on [NORM/TENORM] residues, [NORM/TENORM] management practices or required engineered or administrative controls. If the [Agency] concurs with the result of the dose assessment and concludes that the dose limits specified in section N.4a. will not be exceeded; the [Agency] may issue an exemption. Such dose assessment shall include, at a minimum:

i. The applicable criteria specified in Section N.8b.

ii. The mechanism the registrant will use to identify any significant deviations in operations from the parameters used in the dose assessment.

iii. Laboratory analyses utilized to characterize [NORM/TENORM] residues including a description of the sampling plan and methodologies used to identify seasonal and volumetric variations.

iv. If applicable, the data used to substantiate values of mean AMAD particle size or body retention factors that depart from the values listed in Appendix B to 10 CFR Part 20.

v. If applying for an exemption from the requirements of a residue management plan, a description of the available [NORM/TENORM] residue disposal avenues. This must not be limited to disposal as low level radioactive waste.

a. Dose assessments performed in this Section that can demonstrate compliance with the public exposure limits in Section N.4a.i. only with a prescribed waste acceptance criterion, disposal concentration limit, volumetric or other limit on the concentration or quantity of a [NORM/TENORM] residue within a [NORM/TENORM] management practice; should be formalized into a residue management plan.

b. Approval of Exemptions.

i. Requests for exemptions under Section N.8b. or N.8c. shall be submitted to the [Agency] for review. Requests submitted to the [Agency] for evaluation and approval will be made available for public comment for a period of 45 days.

ii. Exemption requests will only be approved if the results of a dose assessment which meets the criteria specified in this section indicate public exposures are not expected to exceed the limits specified in Section N.4.

iii. Registrants shall be informed by written notice of regulatory decisions originating from the [Agency's] evaluation of a dose assessment. The results of the dose assessment review and the data utilized shall be provided in stakeholder comment period of 45 days.

iv. Exemptions granted as a result of dose assessments under this Section shall be valid for a period of five years from the time of [Agency] approval.

v. Nothing in this section shall limit the ability of [Agency] to take actions necessary to mitigate exposures to the public which exceed those specified in Section N.4 or to initiate appropriate licensing actions.

vi. Registrants granted relief from a residue management plan or the requirement for a program to control worker exposures shall notify the [Agency] within 30 days of identifying management practices, [NORM/TENORM] characteristics, or other conditions that would otherwise invalidate the regulatory decision that public exposures in Section N.4 were met.

c. The registrant shall maintain the commitments and representations made in the exemption request to maintain doses in compliance with Section N.4.

a. Changes in regulation, operations, controls or [NORM/TENORM] characteristics that differ from the representations in the dose assessment shall be communicated to the [Agency] within 30 days.

b. Data presented or available to the [Agency] which indicates the dose assessment may no longer be valid, may result in the exemption being re-evaluated by the [Agency] in accordance with the provisions of this Part.

c. The [Agency] may conduct such tests and inspections as necessary to determine compliance with the assertions in the dose assessment or associated request for exemption.

Sec. N.9 - Unrestricted, Restricted and Limited-Restricted Release.

a. Release of equipment for unrestricted use. A registrant may release equipment from the registrant's site for unrestricted use when that equipment is not contaminated with [NORM/TENORM] at levels greater than those in Appendix A of this Part. Upon application, specific approval of alternative levels may be granted by the [Agency].

b. Equipment not released for unrestricted use. Equipment contaminated with [NORM/TENORM] in excess of levels specified in Appendix A may be transferred pursuant to Section N.10.

a. Conditional release of metal for recycle. Metal potentially contaminated with [NORM/TENORM] may be conditionally released for recycle only under the following conditions:

   i. The metal does not exceed a maximum exposure level of 10 microroentgen per hour, including background radiation, at any accessible location of the surface prior to release from the site;

   ii. Sufficient process knowledge is available to preclude the presence of Pb-210 and/or Po-210 which may avoid detection by gamma exposure rate surveys alone; and

   iii. The internal surfaces of the metal are free from [NORM/TENORM] scales with concentrations exceeding those in Table 4 of this Part.

d. Release of a site for unrestricted use. [**/] The [Agency] shall release sites registered under this Part for unrestricted use upon request by the registrant who has demonstrated to the [Agency] that the following applicable criteria have been met:

[**/] *The Agency must consider, where applicable, the Clean Water Act, Safe Drinking Water Act, and other requirements of the U.S. EPA.*

i. The reasonably maximally exposed member of the public will not receive annually a public dose in excess of 0.25 millisievert (0.025 rem) TEDE from [NORM/TENORM] residues on site. The registrant may demonstrate compliance with this section through a dose assessment meeting the criteria in Section N.8b.viii.; or

ii. The concentrations (above background) and quantities of [NORM/TENORM] residues on site do not exceed the maximum source terms identified in Table 3 of this Part. Where [NORM/TENORM] residues consist of multiple radionuclides , the sum of fractions methodology shall be used. The sum of fractions is determined by dividing each average radionuclide concentration by the respective maximum concentration and then adding the ratios together. The sum of the fractions must be less than, or equal to, 1.0 to meet this criterion.

e. Unrestricted Release of Sites Utilized under a Residue Management Plan. Sites utilized for the disposal or beneficial reuse of [NORM/TENORM] residues under an approved residue management plan in Section N.6 may be released by the registrant without advance [Agency] authorization provided the dose limits in Section N.4(a)(i) have been met.

i. If the registrant failed to maintain compliance with the terms and commitments of the approved residue management plan, the registrant shall request that the [Agency] review and approve unrestricted release of any impacted site(s).

ii. If engineering or institutional controls are necessary in order to release the site and meet the public dose limits in Section N.4a.i., the registrant shall request restricted or limited-restricted release in accordance with Section N.9.f.

f. Restricted and Limited-Restricted Release. The [Agency] may authorize release of sites from the registration requirements of this Part under limited-restricted or restricted release. Restricted release is utilized where both engineering and institutional controls are required to meet the release criteria specified in Section N.9b.i. Limited-restricted release is utilized where only institutional controls (i.e., a deed notice/restriction) is required to meet the release criteria specified in Section N.9b.i. For either restricted or limited-restricted release, the registrant shall apply to the [Agency] and receive advance authorization prior to release of the site. The registrant shall specify the engineered or administrative controls necessary and demonstrate the ability to meet the annual public dose limit of 0.25 millisievert (0.025 rem) TEDE with a dose assessment meeting the criteria in Section N.8b.viii. Where applicable, the transfer of control or ownership of land shall include [an annotation of the deed records] /[notice to owners of surface and mineral rights][***/] to indicate the necessity of the engineered or administrative controls.

g. Registrants shall notify the [Agency] in writing prior to commencing activities to reclaim

[***/] *CERCLA may require remediation or decommissioning activities to a public dose standard that is more restrictive than those identified in this Part.*

a site which cannot be released for unrestricted use under this Section. Decontamination activities require a specific license under Part C if the dose to workers will exceed the limits specified in Section N.4a.ii. and iii.

h. Sites contaminated by [NORM/TENORM] residues from past activities (legacy sites), shall not be released by a registrant for unrestricted use if individual members of the public will be exposed to greater than 1 millisievert (0.1 rem) TEDE annually, excluding indoor radon, from [NORM/TENORM] residues remaining on that site.

i. Such sites shall be managed under a residue management plan until the [Agency] approves the use of administrative and engineered controls in combination with any required decommissioning activities to meet the criteria for unrestricted, restricted or limited restricted release as described in this Part.

ii. Decommissioning actions taken to confine [NORM/TENORM] on site or to remediate sites shall be based on a 0.25mSv (0.025 rem) (25 mrem) per year dose limit for a time period up to and including 1500 years or longer as determined by the appropriate regulatory authority in each individual case.

iii. Where a registrant or responsible party cannot be identified by the [Agency] as subject to this Part for the appropriate remediation or management of such sites; the site shall be referred to the U.S. EPA or appropriate State authority for consideration under CERCLA. The [Agency] shall notify appropriate stakeholders and take such actions necessary to protect public safety.[7/]

i. Other transfers of [NORM/TENORM]. Other transfers of [NORM/TENORM] shall be in accordance with Section N.10 or Part C (as applicable) of these regulations.

Sec. N.10 – Transfer of material, equipment or real property.

a. The transfer of [NORM/TENORM] subject to this Part from one registrant to another registrant or appropriately authorized specific licensee is authorized if:

i. The equipment and facilities contaminated with [NORM/TENORM] are to be used by the recipient for a similar purpose, provided that no member of the public shall receive a dose in excess of that allowed under N.4a.; or

ii. The transfer of control or ownership of land which has been used for the disposal or reuse of [NORM/TENORM] residues and is contaminated with a quantity of [NORM/TENORM] that will give rise to exposures above those in Section N.4a.i. includes [an annotation of the deed records][8/] [notice to owners of surface and mineral rights][****/] to indicate the presence of [NORM/TENORM].

[7/] *CERCLA may require remediation or decommissioning activities to a public dose standard that is more restrictive than those identified in this Part.*

[8/] *The notice to local government is to ensure notification of the appropriate government agency that regulates land use. The intent is to ensure that no use of the land or construction occurs that would cause exposure to the TENORM above the limit for a member of the public without the knowledge of the individuals being exposed.*

[****/] *This option is provided for those states in which notations to recorded deeds are prohibited*

b. For transfers not made in accordance with N.10a., prior written approval by the [Agency] is required. [To obtain Agency approval, the transferor shall submit information that demonstrates compliance with N.9. Records of such compliance shall be maintained for the duration of the registration.[***/]]

c. For transfers made under N.10a, the registrant who makes the transfer shall assess the amount and extent of [NORM/TENORM] residues present, inform the registrant or licensee receiving the [NORM/TENORM] of these assessments prior to such transfer, and maintain records required by these regulations that include:

   i. The date, recipient name and location;

   ii. A description and quantity of the material; and

   iii. A description of the procedures and mechanisms used to ensure that material will not be released in another manner, such as an unrestricted release.

d. A registrant intending to transfer material or real property for unrestricted use shall document compliance with the requirements of N.9. Records of such compliance shall be maintained for the duration of the registration.

e. Distribution of [NORM/TENORM] products between registrants. The distribution of [NORM/TENORM] products subject to this Part from one registrant to another registrant is authorized provided the product is accompanied by labels or manifests which identify the type and amount of [NORM/TENORM].[9/]

Sec. N.11 – Mitigation of [NORM/TENORM] Contamination.

a. Registrants shall, to the extent practical, conduct operations to minimize the introduction of [NORM/TENORM] residues into the site, including the subsurface, in accordance with the residue management plan, program for control of worker exposures and the site release criteria in Section N.9 of this Part.

b. Registrants that fail to comply with an [Agency] approved residue management plan, the representations made to the [Agency] in a dose assessment, the commitments made in an [Agency] approved program to control worker exposures or other applicable provisions of this Part; and whose use, possession or storage of [NORM/TENORM] residues cause uncontrolled contamination of any area shall, upon order of the [Agency], remove or provide for the removal of such contaminants at his own expense through the use of an authorized transferee and shall decontaminate the site to meet the release criteria in specified in Section N.9.

c. Decommissioning actions taken to confine [NORM/TENORM] on site or to remediate sites shall be based on a 0.25mSv (0.025 rem) (25 mrem) per year dose limit for a time

[***/] *This option is provided for those states in which notations to recorded deeds are prohibited.*

[9/] *This may be accomplished by providing notification to the recipient through literature such as Material Safety Data Sheets, manifests, or labeling accompanying the product.*

period up to and including 1500 years or longer as determined by the appropriate regulatory authority in each individual case.

d. Spills and Inadvertent Releases.

i. Registrants shall develop emergency procedures which provide for the response and adequate mitigation of spills or releases of [NORM/TENORM] which will result in public exposures exceeding the limit specified in Section N.4a.i. or worker exposures exceeding the limit specified in Section N.4a.ii.

(1) Procedures shall provide for the assessment of environmental impacts resulting from any such release and the decontamination of the impacted site(s) to satisfy, at a minimum, the release criteria specified in Section N.9.

(2) Procedures shall include, where applicable, an assessment of worker exposure as a result of contamination or exposure incidents.

i. Emergency procedures shall include provisions to notify the [Agency] within 30 days of any contamination incident which would preclude unrestricted release as described in Section N.9 of the impacted site(s).

ii. Emergency procedures shall include provisions to notify the [Agency] within 15 days of any contamination incident which would indicates a worker received an exposure in excess of the limits specified in Section N.4a.ii. or N.4a.iii.

iii. If, after the mitigation activities have been conducted, the registrant is unable to meet public dose limits specified in N.4a.i., the registrant may seek restricted or limited-restricted release for the impacted site(s) as described in Section N.9.

iv. Alternate criteria for release of impacted site(s) may be requested from the [Agency] in accordance with the procedures in Section N.13.

v. Complex contamination events may require substantial coordination with other regulatory bodies and stakeholders. Emergency procedures shall address any immediate actions required to identify and control exposures to the public in excess of 1 mSv (100 millirem) per year which result from [NORM/TENORM] subject to this Part.

vi. The [Agency] may assess the adequacy of mitigation measures undertaken by the registrant in accordance with Section N.5b.

vii. Mitigation measures taken under this part do not alleviate the registrant from responsibilities under any other State, Federal or local requirements.

Sec. N.12 - Notifications and Postings.

a. Registrants shall notify the [Agency] within 60 days of significant changes in [NORM/TENORM] residuals, residue management strategies, or exposure scenarios that change the commitments made in an [Agency] approved dose assessment, residue management plan or program to control worker exposures.

b. Registrants shall notify the [Agency] within 30 days of spills, releases, contamination events or other incidents involving the loss of control of a quantity of [NORM/TENORM] exceeding the values in Table 3 (activity and consignment).

c. Each registrant shall, no less than 30 days before vacating or relinquishing possession or control of registered sites which have been utilized for the possession, storage or use of [NORM/TENORM] under this Part, notify the Agency in writing of intent to vacate.

d. Each registrant shall post, or make readily available to workers, current copies of the following documents:

   i. The regulations in this Part;

   ii. Any [Agency]-approved residue management plan, dose assessment or program for the control of worker exposures;

   iii. The emergency procedures applicable to registered activities as described in Section N.11;

   iv. Any notice of violation involving radiological working conditions, proposed imposition of civil penalty, or order issued by the [Agency], and any response from the registrant.

Sec. N.13 - Decommissioning Cost Estimates and Financial Assurance.

a. Registrants whose [NORM/TENORM] residues require management, transfer and/or disposal exclusively as low-level radioactive waste shall submit a reclamation plan and a cost estimate for approval by the [Agency] and secure a financial assurance arrangement as described in *[reference financial assurance regulations]* for the amount specified in the [Agency]-approved cost estimate.

b. Registrants whose contaminated equipment may be subject to management, transfer and/or disposal as low level radioactive waste, but [NORM/TENORM] residues can be effectively managed under an [Agency]-approved residue management plan, are not required to submit a decommissioning cost estimate or secure a financial assurance arrangement.

Sec. N.14 - Termination.

a. A registrant meeting the criteria for release of utilized sites and equipment as described in Section N.9 and ceasing all operations with [NORM/TENORM] subject to this Part; may petition the [Agency] for termination of the registration.

b. A registrant that has applied for and received an approved specific license under Part C to conduct activities with [NORM/TENORM] exclusively under the license; may petition the [Agency] for termination of the registration.

c. Records pertaining to the release of sites and decommissioning activities shall be made available to the [Agency] upon request for termination of the registration.

[Sec. N.51 - Effective Date. The provisions and requirements of this Part shall take effect on [effective date of the regulations] and shall apply to all facilities or sites owned or controlled by a person on that date. [Products introduced into commerce and disposals approved prior to that date are not subject to the provisions of this Part.]******/

******/ *This provision may not be necessary if covered by generally applicable laws or rules of the State*

Part N

APPENDIX A

SURFACE CONTAMINATION[1] LEVELS FOR [NORM/TENORM] ON EQUIPMENT TO BE RELEASED FOR UNRESTRICTED USE

A review of available literature for updated release values included Reg Guide 8.21, 8.30, ANSI N13.12-1999 and NUREG 1757. Reg Guide 8.30 references the values utilized in Reg Guide 1.86. The updated values in Reg Guide 8.21 are "*considered to be compatible in level of safety*" with those from Reg Guide 1.86 but may exceed the detection capabilities of commonly utilized field instrumentation. The same can be said for ANSI N13.12-1999, in that the required detection capability will likely exceed that of instruments in the field – rendering screening or operational decisions very difficult.

An analysis of the removeable contamination values utilized in Reg Guide 1.86 indicates they are protective (yielding an estimated 25 mrem to the reasonably maximally exposed individual) of the most restrictive inhalation [NORM/TENORM] hazards: Th-232 and thorium in equilibrium with progeny. This assumes the activity being detected is representative of that inhaled each workday, at a mass loading rate of 2.00 E-4 grams per cubic meter for one year. The values could reasonably be up to three-five times higher for other [NORM/TENORM] nuclides. This roughly aligns with the values for average, fixed contamination which could become airborne during removal or processing.

Due to these values still being supported by Reg Guide 8.21 and 8.30; their application towards field use and the analysis above; the values are not proposed for further change in this revision of Part N.

Removable contamination is determined by smearing with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the smear. Be certain to convert "disintegrations per minute" to "counts per minute" using the instrument's calibration certificate and knowledge of the radionuclides being surveyed.

	AVERAGE[2, 3, 6]	MAXIMUM[2, 4, 6]	REMOVABLE[2, 3, 5, 6]
Alpha	5,000 dpm/100 cm^2	15,000 dpm /100 cm^2	1,000 dpm /100 cm^2
Beta-gamma	5,000 dpm/100 cm^2	15,000 dpm /100 cm^2	1,000 dpm /100 cm^2

The values above are not inclusive of natural background.

[1] Where surface contamination by both alpha and beta-gamma emitting nuclides exists, the limits established for alpha and beta-gamma emitting nuclides should apply independently.

[2] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[3] Measurements of average contamination level should not be averaged over more than one square meter. For objects of less surface area, the average should be derived for each object.

[4] The maximum contamination level applies to an area of not more than 100 cm^2.

[5] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of surface area A (where A is less than 100 sq. cm) is determined, the entire surface should be wiped and the contamination level multiplied by 100/A to convert to a "per 100 sq cm" basis.

[6] The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr (2 μGy/hr) at 1 cm and 1.0 mR/hr (10 μGy/hr) at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber. Note on Skin Contamination: Skin contamination should always be kept ALARA. Exposed areas of the body of persons working with unsealed radioactive materials should always be monitored and should be washed when any contamination is detected. It is important, however, that contaminated skin should not be so treated or scrubbed that the chance of intake of radioactivity into the body is increased.

Part N

APPENDIX B

[NORM/TENORM] Awareness Training

a) For registrants required to have a residue management plan under Part N.6, [NORM/TENORM] awareness training (1-2 hours at a minimum) shall be included as part of the facility's health and safety training program.

b) [NORM/TENORM] Awareness Training shall contain, at a minimum, policies and procedures for each facility, including the management policy to maintain all personnel exposure as low as reasonably achievable. Additionally, workers shall be:

1) Kept informed of the storage, transfer or use of sources of radiation and the location of any restricted areas;

2) Instructed, at appropriate levels of detail, in the health protection problems associated with exposure to radiation or radioactive material, in the risks of radiation exposure to the embryo and fetus, in precautions or procedures to minimize exposure and in the purposes and functions of protective devices employed;

3) Instructed in, and instructed to observe to the extent within the worker's control, any engineered or administrative controls utilized by the registrant for the protection of personnel from exposures to radiation or radioactive material;

4) Instructed to report promptly to the registrant any condition that may constitute, lead to or cause a violation of this Part, the requirements of Part D or unnecessary exposure (i.e., exposure that results when prescribed safety measures are not followed) to radiation or radioactive material;

5) Advised as to the mechanisms in place to ensure workers exposure limits are maintained within the limits established in Section N.6.

6) Instructed in the operation and safe use of any radiation monitoring equipment.

c) These instructions shall be of sufficient detail to avoid radiological health protection problems and shall be given directly to each worker either in writing or in an orientation course; with the workers signing a statement that they have received the information listed in section N6b. and understand it. Refresher training that covers all of the required topics shall be provided annually.

NOTE: The extent of training should be commensurate with potential radiological health protection hazards present in the workplace. Where routine work conditions are not expected to result in radiation exposures in excess of the limits specified in Section N.4a. to [NORM/TENORM], the [NORM/TENORM] Awareness Training may be significantly shorter in scope (i.e., only addressing the facility's radiation control and monitoring measures, why they are in place and awareness of [NORM/TENORM]

containing areas). Additionally, components of this section's training may be applicable to specific licensees under Part C or useful in the construct of communication tools, at an appropriate level of detail, for workers, managers and stakeholders.

d) In addition to the [NORM/TENORM] Awareness Training described above, registrants required under Part N.7 to have a program to control worker radiation exposures shall provide training to employees and contractors which includes the following:

1) Fundamentals of Radiation Safety:

A) Introduction to NORM and TENORM;

B) Characteristics of alpha, beta and gamma radiation;

C) Units of radiation dose and quantity of radioactivity associated with [NORM/TENORM];

D) Hazards of exposure to the different kinds of radiation;

E) Levels of radiation from [NORM/TENORM] sources of radiation;

F) Methods of controlling radiation dose through time, distance and shielding, ventilation, decontamination and source reduction to reduce doses as low as practicable; and

G) Methods of avoiding intake or contamination through the use of personal protective equipment, proper working procedures and decontamination.

2) Radiation Detection Instruments including:

A) Use, operation and limitations of radiation survey instruments for alpha, beta and gamma radiation;

B) Survey techniques including ambient and frisking methods;

C) Surveying and sampling for [NORM/TENORM]; and

D) Monitoring equipment and action levels for radon.

3) Proper Use of Personnel Protective Equipment (PPE) including:

A) Different types of PPE;

B) Donning of PPE;

C) Removal of PPE;

D) Decontamination techniques; and

E) Use of respiratory protection equipment and radon mitigation as needed.

4) Identification of areas requiring posting and labeling including identification of known and potential [NORM/TENORM] containing areas. This includes pumps and piping where mineral scales accumulate; lagoons, tanks where residues accumulate; filters, pumping stations and storage tanks where scales and sludges

accumulate; facilities where filter backwash, brines or other contaminated water accumulates; facilities that are enclosed (radon); and residue processing or handling areas. Workers will also be instructed to observe the work operations and to report to the site supervisor any build-up of potentially radioactive material on surfaces and in other areas.

5) Containerization, storage and disposal of [NORM/TENORM] wastes.

6) Requirements of pertinent federal and State regulations.

7) Topics and discussions of assigned activities during normal and abnormal situations involving exposure to [NORM/TENORM] which can reasonably be expected to occur during work activities.

e) Training shall be provided initially before assigning duties and following changes in duties or potential radiation hazards. The registrant shall provide [NORM/TENORM] refresher training for employees annually and when there is a significant change in processing conditions (new equipment, new feedstock material, etc.), radiation protection policies, procedures or regulations.

f) Recommended Training for Instructors. Instructors of [NORM/TENORM] courses, other than a Radiation Safety Officer (RSO) for a specific licensee under Part C, should have adequate and commensurate experience in field operations associated with [NORM/TENORM] activities at the type of facility in which they will be instructing. The field experience work needs to include sufficient time in radiation protection and use of radiation detection equipment.

2024

RATIONALE FOR REVISIONS

Part N

REGULATION AND LICENSING OF TECHNOLOGICALLY ENHANCED NATURALLY OCCURRING RADIOACTIVE MATERIAL (TENORM)

Executive Summary

The revised SSR-N is a departure from the traditional SSR format in order to overcome identified barriers to adoption and to accommodate the various regulatory approaches many states have already taken. In short, SSR-N establishes the methodology to consistently evaluate TENORM residues or associated industrial processes and determine the appropriate level of regulatory oversight. In partnership with domestic and international regulatory bodies, the aim is to supplement SSR-N with additional technical guidance documents which provide the industry and residue-specific considerations that must be evaluated to model environmental impact, evaluate the appropriateness of any authorized exemptions or exceptions, and assess the effectiveness of engineered or institutional controls.

The revised SSR-N provides screening criteria, above which a state would annually assess industries in possession of TENORM residues, and if necessary, require an environmental monitoring plan and worker awareness-level training program. Due to the various jurisdictional authorities TENORM may fall under in the states (environmental, public health, radiation safety, natural resources, etc.); this level of regulatory oversight may need to be incorporated into an existing environmental monitoring program, conducted under a permit or a general license. Notably, SSR-N does not identify any exempted industries, exempted residue management practices or specify concentration limits on disposal. Rather, SSR-N provides the process through which a state may issue a general exemption to an entire industry or practice (like land application or landfilling wastes) – or a specific exemption to a single entity (i.e., an industrial decommissioning company) based on a consistent dose. Largely at the request of stakeholders, numerical 'screening' values are still provided to demarcate the levels of regulatory oversight.

Should industry wish not to use screening values to determine the amount of regulatory oversight necessary (which would not account for any engineered or administrative controls), a dose assessment must be performed. Stakeholders, then, must have detailed knowledge of the specific industry processes, waste forms, methods of disposition and volumes. While the supplemental guidance documents will detail the specific factors requiring consideration, the model inputs will vary by state and may not always result in the same concentration limits or permissible means of handling residuals. Attempting to capture these variations, along with permissible concentrations or waste handling practices led to some of the largest barriers in SSR-N adoption. Therefore, rather than setting prescriptive limits; SSR-N aims to prescribe the methodology and consistent dose criteria by which a state may elect to determine the necessary amount of regulatory oversight.

Finally, at a higher threshold, SSR-N then specifies the criteria at which an industry should be evaluated for the need for a specific license. A specific license should also be evaluated if the environmental monitoring program discussed above is absent, ineffective, or the entity is unable to meet public dose constraints. If warranted, the specific license is issued under SSR Part C.

Technical Basis for SSR-N Revisions

Identifying barriers and technical areas needing address

The SSR-N working group was reconvened in 2012 to review and identify needed revisions to the regulations for the licensing of technologically enhanced naturally occurring radioactive material (TENORM). The initial focus was on identifying barriers to state adoption, review existing exemption levels for radium-226, establish appropriate exemption levels for other naturally occurring radionuclides and evaluate the potential for TENORM exposures from emerging industries. The committee identified at least (38) policy and technical issues for address as well as (53) relevant publications on TENORM from consensus standard bodies requiring review. These include the American National Standard (ANSI/HPS) N13.53-2009, International Commission on Radiological Protection (ICRP) and International Atomic Energy Agency (IAEA) publications, National Counsel on Radiation Protection and Measurement (NCRP) commentaries and reports, as well as numerous studies on TENORM disposal and residue (waste or commodity) management. Among the more formidable hurdles, was identifying how to harmonize TENORM regulations among states that ranged from the absence of TENORM regulations, to those regulating only portions such as waste management, to those requiring radioactive materials licenses. Even the definition and the resulting scope varied from state to state (i.e., NORM vs. TENORM).

A contributing factor to this inconsistent regulatory approach lies in the fact the authority to regulate TENORM (in part or in whole), if undertaken by a state, often lies within an environmental, public health, waste management, or other agency that may lack radioactive material licensing authority. Thus, only portions of the TENORM lifecycle may be regulated, and that oversight may not necessarily occur under a radioactive materials license. Moreover, stakeholders expressed concern that TENORM regulation was often residue-specific, industry-specific or radionuclide-specific. As a result, a consistent and comprehensive regulatory framework was lacking to address all segments of existing and emerging TENORM industry. Initial efforts to expand exemptions and encompass other industries proved untenable and likely to result in a revised rule that would not keep pace with technology.

Further complicating this approach, several states advised a prescriptive rule that would address specific industries or practices may further prevent adoption. Not all states can or want to regulate all the various TENORM industries – either due to jurisdictional boundaries, political or socioeconomic factors – or simply the dose consequence to the public doesn't warrant a regulatory presence.

Stakeholder input and common ground

However, two foundations of the national materials program found consensus among stakeholders when applied to the regulation of TENORM. First, the radiation exposures to individual members of the public from TENORM operations should be no higher than those from licensed operations (1 mSv per year, 10 CFR 20.1301(a)(1)). Second, residual radioactivity in the environment resulting from TENORM operations should not be permitted to exceed the maximum radiological criteria for unrestricted use from licensed operations (0.25 mSv TEDE per year above background, 10 CFR 20.1402). Consensus aside, determining compliance on the basis of dose creates a modeling mandate that many stakeholders (regulators and industry alike) could not accommodate.

Ultimately, consensus was elusive on use of the term "NORM" or "TENORM". While the international community utilizes the term "NORM", "TENORM" was crafted domestically to demarcate regulated residues and industries from those consistent with natural background. The definition of "TENORM" is utilized by the U.S. EPA, while many states have already promulgated regulations for "NORM". Still others are prohibited by their enabling statutes from regulating "NORM" and opt for the term "TENORM". SSR-N attempts to address this issue by making the definition of "TENORM" less relevant to the scope of the rule (i.e., identifying regulated industries and residues). As discussed in the next section, the scope is instead set by a consistent dose constraint. Therefore, SSR-N uses brackets around the term "NORM/TENORM" – allowing states to select the necessary term.

<u>Exemption, Clearance or Screening Criteria?</u>

The use of concentration-based exemption criteria (e.g., 5 pCi/g of Ra-226) serves many purposes. First, notwithstanding any exemption, they effectively establish the scope of SSR-N. They also navigate around a dose modeling mandate by providing a field-measurable value around which industry can fashion a sampling and compliance program. That said, the 5 pCi/g radium-226 exemption limit was targeted for review as it was a forty-six year old performance-based limit adapted from the Uranium Mill Tailings Radiation Control Act. Over the years, it was also utilized as waste acceptance criteria, at times diverting low-concentration TENORM residues into low-level radioactive waste storage facilities. Recent U.S. Department of Energy and State modeling assessments had demonstrated TENORM-contaminated wastes could safely be deposited in RCRA landfills without adverse dose consequence to the public. Conversely, consensus standard documents such as ANSI/HPS N13.53-2009 recommended administrative release levels be lowered to 3 pCi/g for radium and thorium decay chains, with higher limits for uranium and potassium. Notably, ANSI recommended a corresponding volumetric limit of a "few metric tons". From a practical standpoint, in addition to the concentration, an assessment of the TENORM residue *volume* is essential to determining dose consequence. A few gallons of 30 pCi/g radium-226 tank sediment may not present significant radiation exposure concerns. Tens of metric tons of bulk water treatment sludge at 3 pCi/g over background can increase natural background, potentially impact groundwater, or contribute to increases in indoor radon. Building upon the efforts in ANSI/HPS N13.53-2009 and borrowing from 49 CFR 173.436; the concept of using both concentration and quantity to evaluate the appropriateness of regulatory oversight was pursued.

Regulators and industry concurred that a regulatory framework that is implementable must contain *"a number"* that is readily interpretable in the field and does not require complex modeling efforts to determine compliance with state regulations. Historically, this number has been in the form of an activity concentration, beneath which the bulk residue is largely 'exempt'. For reasons developed later in this rationale, SSR-N deviated from this approach and has now developed the radionuclide-specific numbers in Table 1 and 2 as "*screening levels*". In their development, multiple domestic and international values were evaluated, with the bounding values being from ANSI N13.53-2009 (0.111 Bq/g for radium/thorium) and 1 Bq/g (10 Bq/g for K-40) from the IAEA's General Safety Requirements Part 3. The lower value having been developed in recognition of dose impacts from environmental deposition of large volume, low-activity TENORM residues and the upper value being pragmatically derived as the upper bound of worldwide distribution of naturally occurring radionuclides. Both values were assessed against the underlying premise of SSR-N's regulatory framework: that sites utilized for the disposal or beneficial reuse of TENORM residues should not contribute more than 0.25 mSv of annual TEDE dose above background to the maximally exposed member of the public. (Additionally, as mentioned above, workers engaged in TENORM activities should not be exposed to more than 1 mSv annually.)

Therefore, SSR-N modeled the unrestricted deposition of TENORM into the environment, absent any controls on exposures pathways, to calculate the maximum permissible concentration and quantity for each radionuclide. Dose assessments were run for all common NORM nuclides with progeny in equilibrium. The resulting model outputs were plotted as a function of area covered by the source term where the 'y' axis value represents the maximum projected TEDE dose. Goal-seeking variations of the individual concentrations and quantities were performed to maximize the source term while staying beneath 0.25 mSv per year TEDE. The resulting data and additional discussion on the derivation of these 'screening values' is available in Appendix A. Generally speaking, when the upper bound of the maximum permissible concentration limits (1 Bq/g) were used, the volume (more specifically, the total activity) required to stay within a 0.25 mSv/year dose constraint became restrictively small (kilogram quantities). Additionally, the maximum permissible concentration limits for some radionuclides were reduced to limit committed dose from inhalation and ingestion, and to remain beneath 0.05% by weight for uranium. Dose assessments indicate the IAEA's 1 Bq/g exemption criteria works well with a 1 mSv/year dose constraint. However, the 0.25 mSv/year dose constraint warrants assessment of residues at much lower activity concentrations – consistent with those identified in ANSI. That said, the lower range of these concentrations are difficult to distinguish (if not consistent) with domestic background and may not be identifiable with field instrumentation. Recognizing it wouldn't be necessary to assess very small volumes of bulk residues at the low concentrations, Table 1 initially listed a cumulative activity limit as well. Bulk residues beneath both the activity concentration and cumulative activity could be administratively released. However, implementation of this approach became cumbersome. It also failed to address the environmental accumulation of multiple "administratively-released or exempted" volumes – either from multiple disposals or multiple generators. Thus, cumulative activities were removed from Table 1 and Table 2, and an annual assessment of generated residues was incorporated. The

source term concept was retained in Table 3, identifying the amount of TENORM residues an entity could conceivably use/possess on site without the need for a residue management program.

Screening levels were also needed for liquid TENORM residues. The US EPA 'Radionuclides Notice of Data Availability Technical Support Document, March 2000', allows the derivation of nuclide-specific liquid values, corresponding to 4 millirem per year. Utilizing these values as the lower bound for screening appeared appropriate, an approach which is echoed in ANSI N13.53-2009. While the US EPA's technical support document cites higher maximum contaminant limit values for alpha-emitters, it ultimately settled on a cumulative 15 pCi/L screening level for alphas. After consideration of developing separate dose-based values, screening values for liquid effluents were adopted from other applicable federal regulations (USEPA drinking water and water quality standards) so as not to create conflicting standards.

In addition to establishing 'screening levels' to determine when some degree of regulatory assessment is appropriate; SSR-N Table 4 establishes the upper bound of TENORM activity limits which if present should be assessed for the need for a radioactive materials license. These correspond to activity concentrations which, absent any other engineered or institutional controls, present the potential for workers to receive a committed dose in excess of 1 mSv per year,. (NOTE: Since reference man intake is limiting, volumes are less relevant in this table).

Several consensus standard bodies have completed or are in the process of providing guidance on the conduct of TENORM dose assessments. Developments in this area are anticipated to lead to petitions to deviate from the assumptions made in Attachment A and the resulting screening levels. SSR-N continues to allow for industry (and regulators) to use site-specific or other empirical data to deviate from the table data. Indeed, the screening levels are only provided to initiate notification between industry and regulators and prompt an evaluation of how residues and potential exposures are managed. It is important to note that these screening levels are not waste acceptance criteria. As described in the next section, the screening values provide a consistent dose-based criteria which may be used in the support of regulatory decision making – in the absence of more refined dose assessments.

<u>CRCPD and IAEA Collaborative Agreement</u>

Beginning in 2016, the CRCPD established a practical arrangement with the IAEA which included a focus on the control of worker and public radiation exposures from NORM (TENORM). Several SSR-N committee members and contributors were able to benefit from this collaboration and bring the shared insights into SSR-N revisions. Additionally, SSR-N members participated in regional meetings, technical consultancies, working groups for SR-34, "*Radiation Protection and the Waste Management of Radioactive Waste in the Oil and Gas Industry*", SSG-60, "*Management of Residues Containing Naturally Occurring Radioactive Material from Uranium Production and Other Activities*" and others which further harmonized the regulatory approaches developed abroad with those under development within the CRCPD. Interestingly, many of the technical and policy hurdles faced domestically were actively being worked upon by other member states. It's worth noting IAEA TECDOC Report number 2071, "*Holistic*

Approach to Management of Naturally Occurring Radioactive Material (NORM)", which eloquently summarized the issue at hand,

> *"It is also to be [recognized] that the Radiation Protection framework was originally developed to activities (energy generation and research), medical exposures and practices involving sealed sources. Applying this framework to situations involving exposure to natural sources has proven to be quite challenging."*

While publications and input from the international community continued to shape and provide insight on SSR-N until the final drafts; not all provisions could be readily incorporated. As previously mentioned, the 1 Bq/g exemption levels utilized by the IAEA simply fail to meet domestic site release criteria when bulk TENORM residues are involved. SSR-N concurred that protection of the public from indoor radon should be addressed outside of SSR-N; but fell short of adopting the use of IAEA's reference bands and resulting permissible exposures. SSR-N does attempt to harmonize with the international community by adopting the concepts of planned, existing and emergency scenarios. Emergency scenarios are largely dismissed as being relevant to TENORM exposures and SSR-N's scope was narrowed to 'planned' scenarios. Sites that were previously remediated under an older standard (5 pCi/g of radium) or NORM found to exceed the exemption values would not be subject to SSR-N unless public exposure exceeded 1 mSv per year. This essentially 'grandfathers' legacy sites and avoids regulation of NORM anomalies unless the public exposure warrants intervention.

Regulatory Framework

In order to facilitate adoption and promote consistency, SSR-N was revised to be less prescriptive in terms of the concentrations and practices afforded – and more focused on allowing regulators to assess the impacts of such activities. SSR-N does not attempt to name every industry, waste form or practice. To the contrary, mention of any industry or practice (e.g., landfilling, land application, deep well injection, long term storage, etc.) was removed. Instead, SSR-N seeks to establish a single, consistent dose-based methodology for states to review these industries and practices and determine the appropriate amount of regulatory oversight.

If the generation and management of TENORM residues will result in doses to the public in excess of 0.25 mSv/year [25 mrem/year] TEDE, an environmental management program may be required (referred to herein as a residue management plan). Table 1 and 2 provide screening levels to assist regulators and industry identify TENORM residues that may give rise to such exposures. *Note that very large quantities of low-activity bulk TENORM may also require assessment based on the exposure scenarios present.* Since the regulatory authority for residue management may not necessarily reside with the radiation protection authority in all states; this need not take the form of a specific or general license. In fact, effective environmental monitoring and controls that would mitigate the potential for exposure may already be in place under other regulatory programs (NPDES, NESHAPS, deep well injection or landfill permits, etc.) Therefore, the notification and registration requirement may be met under other, existing environmental management programs. If a review of the residues generated or the management practices utilized indicates public exposures above 0.25 mSv/year are unlikely; regulatory

oversight is limited to notification and registration. In order to capture changes in TENORM residues, industrial processes or management practices; the data provided to the regulator is updated annually. Regulators should annually assess any aggregate environmental accumulation TENORM residues, as well as any contribution from other TENORM registrants. Note that the 0.25 mSv/year TEDE dose constraint, as well as the values in Table 1 and 2, are above background.

If the projected dose to a worker could exceed 1 mSv/year [100 mrem/year] TEDE or average workplace exposures to radon exceed 30 pCi/L, then occupational controls are required under Section N.7. Table 4 provides screening levels to assist regulators and industry identify TENORM residues that may give rise to such exposures. It is possible that TENORM workplace exposures can be mitigated through the use of administrative or engineered controls. These may already be in effect as a result of other regulatory programs. The registrant may elect to detail these protective measures as described in Section N.7.c or submit a dose assessment to validate worker exposures are beneath 1 mSv/year. If the dose constraint cannot be met, the operation should transition to a specific license under Part C. At all levels of regulatory oversight aside from simply notification/registration, a worker training program is required to inform workers of the hazards present in the workplace and the purpose behind any occupational and engineered controls. A template training program is provided in Appendix B of SSR-N.

Exemptions

Section N.8 details the method regulators may elect to use should they seek to categorically exclude certain TENORM industries or TENORM residue practices from the need for a residue management plan or worker protection plan. Relevant dose assessment criteria and sample data required for the assessment are listed. Exemptions are subject to public comment, the public dose constraints in Section N.4, and re-evaluation every five years.

Topics for Consideration in Future Revisions

A goal of the SSR-N committee was to review available literature and update the surface contamination limits for unrestricted release of TENORM-contaminated equipment. As discussed in Appendix A of SSR-N, the values published in ANSI N13.53-2009 remain protective and applicable. However, stakeholders expressed concern in meeting these detection limits with commonly deployed field instrumentation. An analysis of the contamination values in Reg Guide 1.86 (now superseded by Reg Guides 8.21 and 8.30), indicates they are unlikely to result in exposures to the public in excess of 0.25 mSv/ year. As technology and field detection capabilities improve, the surface contamination criteria listed in ANSI N13.53-2009 Table 2.1 should be revisited for use in future revisions. A further consideration should be the detection of alpha and beta emitters on inaccessible surfaces.

Future SSR-N revisions should also evaluate Section N.13. Stakeholders expressed concern that application of financial assurance requirements and decommissioning cost estimates to all TENORM registrants would have widespread cost implications for industry and regulators alike. SSR-N is currently structured so that TENORM industries unable to meet the 0.25 mSv per year site release criteria or the 1.0 mSv workplace exposure limits would operate under a specific

license (presumably subject to a state's existing financial assurance requirements). TENORM industries beneath this threshold have presumably demonstrated residues and workplace exposures can be managed through readily available disposal practices and administrative controls. Where disposal as low-level radioactive waste is required, Section N.13 requires a decommissioning cost estimate and referral to the State's financial assurance regulations. The presence of industries generating very large quantities of bulk TENORM residues or a high concentration of TENORM industries may result in liabilities that are not adequately covered by Section N.13 or readily recoverable under a state's enforcement process.