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Title: Evaluation of DOE Technical Standard 1027 and Supplemental Guidance NA-1 SD G 1027. Examining Radionuclide NESHAP Impacts and Off-Site Dose Consequences.

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Evaluation of DOE Technical Standard 1027 and Supplemental Guidance NA-1 SD G 1027. Examining Radionuclide NESHAP Impacts and Off-Site Dose Consequences.

I. Purpose

This document is intended to briefly describe changes to Department of Energy Technical Standard 1027 and the associated effects of these changes on radionuclide air emissions from operations at Los Alamos National Laboratory (LANL). Each general category of LANL radionuclide air emissions is evaluated, and the manner in which changes to Standard 1027 would affect the emissions and subsequent doses to members of the public is discussed. While the material discussed in this document applies specifically to LANL operations, the information may be generally applicable to other DOE sites in some cases.

II. Regulatory Background

DOE Standard 1027

Department of Energy Technical Standard 1027 categorizes DOE facilities by the off-site radiation dose consequence resulting from a design-basis accident, using this postulated event to determine if a facility is considered to be a radiological facility or a nuclear facility. The accident scenario used in this type of assessment is an uncontrolled release of the entire radioactive material inventory within the facility, using standard assumptions on air plume dispersion, uptake of radionuclides, distance to receptor, and other parameters that are consistent for all DOE facilities. Thus, the primary input on determining off-site dose in this assessment is the quantity of radioactive material within the facility. Controlling and tracking this inventory becomes the principal method of managing a facility's hazard categorization.

A radiological facility is considered to pose very little risk to the public, while nuclear facilities have increasing amounts of controls required in their processes due to the increasing hazards of their operations and increasing radioactive material inventories.[1] The dose threshold between a radiological facility and a Hazard Category 3 nuclear facility is a 10 rem dose to an individual located 30 meters from the facility. Prior to 2011, the amount of radioactive material inventory that would correspond to this 10 rem dose was 8.4 grams of plutonium-239 or equivalent material.[2] Facilities

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[1] Among nuclear facility designations, Hazard Category 3 is the lowest or least hazardous designation, with Hazard Category 2 and Hazard Category 1 each increasing the allowable radioactive material inventory threshold quantities and the level of controls required for operations.

[2] Plutonium "equivalency" is based on the amount of a given radioactive material that results in the same inhalation toxicity as an equivalent amount of Pu-239. For example, 45,900,000 grams of uranium-238 is equivalent to 38.6 grams of plutonium-239 under current DOE guidance.

track their radioactive material inventory relative to the threshold quantities of nuclides used in that facility, using a "sum of fractions" method.[3]

EPA Regulations

While Standard 1027 discusses radioactive material inventory quantities and accident scenarios, airborne emissions of radioactive material from normal facility operations are addressed by the Environmental Protection Agency (EPA) in the Radionuclide NESHAP.[4] This regulation, part of the Clean Air Act Amendments of 1990, limits air emissions from a DOE site to levels which would result in 10 millirem per year to the maximally exposed individual (MEI) member of the public. This 10 millirem per year limit is applied to LANL as a whole, while the DOE Standard 1027 is applied to individual buildings within LANL. Under the Radionuclide NESHAP, a source of emissions (e.g., stack) is continuously monitored if potential emissions exceed 1% of the emissions limit, or 0.1 millirem. These monitored sources are considered "major" sources, while sources whose potential emissions fall below this limit are called "minor" sources. Emissions from minor sources at LANL are evaluated by calculations and not continuous monitoring, and these calculations reflect potential emissions and potential doses, as no credit for filtration or other emissions controls are taken as part of the calculation.

Since 2000, LANL's off-site doses have averaged about 1.5 millirem; most years are well below 1.0 millirem. Of this annual total, the potential doses from all minor sources together total about 0.2 millirem on average. Dominant sources of emissions each year are typically emissions from the stacks at LANSCE, ambient air measurements of diffuse emissions from legacy contamination sites, and potential emissions from these minor sources.

III. Changes to Standard 1027

In November 2011, the Supplemental Guidance document NA-1 SD G 1027 was issued by the Department of Energy; this publication is referred to as SD 1027G. This document, which is intended to guide implementation of Standard 1027, recognizes advancements in the science and understanding of how radioactive materials move through the human body and behave in various organs in the body (e.g., the lung). The primary technical document illustrating these new scientific advancements is Publication 72 of the International Commission on Radiation Protection, referred to as

[3] For the Sum of Fractions, the inventory quantity of each nuclide is compared to its threshold quantity under SD 1027G, finding a ratio for each nuclide. The sum of all ratios of all radionuclides must be less than 1.0.

[4] 40 CFR 61, Subpart H, called the Radionuclide NESHAP or Rad-NESHAP, is the National Emission Standard for Hazardous Air Pollutants, as applied to emissions of Radionuclides from Department of Energy facilities. Compliance with the Rad-NESHAP at LANL is managed by the Environmental Protection Division.

ICRP 72 in this document.[5] ICRP 72 collects the results of prior ICRP publications and summarizes the results as dose conversion factors for members of the public exposed to radioactive materials. In addition to these dose conversion factors, the DOE's November 2011 Guidance also incorporates changes to the fraction of material that would be released to the air in the event of an accident as well as updated human intake parameters (e.g., the breathing rate of a typical person); these latter changes make these parameters consistent with other DOE accident analyses and reflect better understanding of the underlying science behind these analyses.

Using these updated ICRP 72 Dose Conversion Factors and the more accurate uptake and release parameters, changes have been made to the radionuclide threshold quantities for each level of facility (e.g., the amount of radioactive material that can be maintained in facility inventory). It should be noted that the hazard to a member of the public from these threshold quantities has NOT changed – it remains 10 rem in the case of a design-basis accident at a radiological facility – but with the updated analysis, the amount of radioactive material that would result in that outcome has changed. In some cases, the thresholds were lowered, and in some cases the thresholds increased. The most noticeable change is the inventory threshold limit for plutonium-239 for a radiological facility. The old threshold quantity of 8.4 grams has increased to 38.6 grams, a factor of 4.6 increase in the allowable radionuclide inventory of Pu-239 for a radiological facility.

Using improved scientific understanding of radionuclide behavior and human physiology, it has been determined that this higher level of Pu-239 can be maintained in the building inventory and the dose consequence from the accident scenario described above would remain at the same 10 rem level. Thus, there is no change in the dose consequence to a member of the public after such an accident, even though the amount of radioactive material inventory in a facility may have changed.

IV. Effects on LANL Operations & Air Emissions

General Concepts

By implementing SD 1027G at certain LANL radiological facilities, these facilities can gain operational flexibility and improve efficiency. For example, multiple radiological operations can be staged simultaneously and radioactive material handling can be reduced by operations personnel making fewer trips into & out of the facility. Radioactive waste can be staged prior to shipment, allowing decay of radionuclides and improved worker safety.

[5] ICRP Publication 72, "Age-dependent Doses to Members of the Public from Intake of Radionuclides."

With assumption of no change in controls and operations, one could assume the amount of potential airborne radioactive material is proportional to the material quantity processed or used in the facility. For example, if a radiological facility proposes to conduct experiments using Pu-239 at the higher limit (per SD 1027G), the calculated air emissions from this facility would increase by a factor of 4.6 compared to the facility operating under the old DOE-STD-1027 limit.

However, it should be recognized that adopting the new radioactive material inventory limits will not universally result in significant changes to air emissions for all LANL facilities, for several factors. First, the change in the inventory threshold quantities varies from radionuclide to radionuclide. While most actinides and transuranics did see an increase in threshold quantity limits, many lighter nuclides saw a decrease in the threshold value or no significant change in this limit. Also, actual air emissions from many LANL facilities depend on various factors that are not necessarily correlated to the radioactive material inventory of the facility. For example, emissions from the LANSCE stacks depend on the intensity and duration of the facility ion beam operations, not the radioactive material quantity of any experiment. And finally, emissions controls systems such as HEPA filtration[6] will dramatically reduce actual airborne emissions, reducing the level of measured emissions.

The manner in which changes in SD 1027G apply to different types of LANL operations are explained in the next section.

Anticipated Changes to Radionuclide Air Emissions from LANL Facilities

In general, the overall quantity of radionuclides released from LANL as a whole is not expected to change significantly with the inventory threshold quantity changes. Emissions of airborne radionuclides can be assigned into one of six different categories, summarized below. The impacts of adopting SD 1027G for each of these emissions categories are described in more detail on subsequent pages.

(1) LANSCE facility emissions of radioactive gases and activation products. These radioactive gases make up the largest fraction of LANL emissions since gas-phase radionuclides pass unfettered through HEPA filtration. Other vapor-phase and volatile activation products are also unaffected by filtration.
(2) Emissions from diffuse (non-point) sources. Diffuse sources have no filtration or control over emissions, and are subject to environmental factors such as wind resuspension.

[6] HEPA filtration = High Efficiency Particulate Air filtration. These filter systems remove over 99.95% of airborne particulate contaminants from stack air streams.

(3) Tritium facility emissions. Similar to radioactive gases above, these gas- and vapor-phase emissions cannot be removed from the stack air stream via typical HEPA filtration.
(4) TA-48 Hot Cell emissions. Vapor-phase nuclides and volatile compounds cannot be removed from air streams by HEPA filtration.
(5) Calculated potential emissions from non-monitored stacks (minor sources). LANL reports potential (uncontrolled/unfiltered) emissions from these "minor" sources which do not meet EPA thresholds for continuous emissions monitoring.
(6) "Other" major LANL source emissions. Measured particulate emissions from LANL radiological and nuclear facilities (PF-4, CMR, etc.).

<u>(1) LANSCE facility emissions</u>, as mentioned, are based primarily on the duration and intensity of ion beam operations at that facility. LANSCE is a high-energy particle accelerator. Radioactive gases and other activation products are generated by interactions of the ion beam and secondary particles with air, water vapor, and beam line components. The dominant radionuclide air emissions resulting from facility operations include short-lived radioactive gases, such as carbon-11 and oxygen-15.

More importantly, DOE Standard 1027 does not apply to accelerator facilities. Operational safety protocols for accelerator facilities are established by different DOE documents.[7] The change in inventory threshold quantities in SD 1027G will not affect air emissions or off-site doses from the LANSCE facility.

<u>(2) Diffuse or non-point emissions</u> are evaluated by radionuclide air concentration measurements at LANL's network of ambient air monitoring stations (Airnet), located at public receptor locations surrounding the Laboratory. The Airnet system was approved for this use by EPA Region 6 as part of the original Federal Facility Compliance Agreement for Rad-NESHAP compliance.[8]

The principle sources measured by Airnet are environmental remediation sites (e.g., MDA-B) and sites of legacy contamination (e.g., the Los Alamos Canyon hillsides). The radioactive material inventory for these types of sources does not increase, as these are static quantities resulting from historical contamination and deposition; threshold quantities play no role in air emissions for these sources. Emissions from legacy contamination sources depend on meteorological factors (wind speed, amount of

[7] DOE Order 420.2C, Safety of Accelerator Facilities, and DOE Guide 420.2-1, Accelerator Facility Safety Implementation Guide.
[8] U. S. Environmental Protection Agency Region 6; U. S. Department of Energy Los Alamos Area Office. Federal Facility Compliance Agreement Regarding CAA - - 40 C. F. R. Part 61, Subpart H at the Los Alamos National Laboratory. Signed 5/21/1996 (DOE LAAO) and 6/13/1996 (EPA R6).

rainfall, drought) and not anything related to LANL operations or threshold quantity changes.

Airborne radionuclide emissions from LANL firing sites and other operational diffuse sources are also measured by LANL Airnet stations. Decades of air measurements indicate that there is no real correlation between firing site operations and measured air concentrations at Airnet station locations at the LANL perimeter. This indicates that airborne radioactive materials generated at LANL firing sites do not travel off Laboratory property in any appreciable air concentration. Thus, the amount of radioactive material used in a given experiment will not affect Airnet measurements. Incorporation of SD 1027G threshold quantity limits for firing site activities or other diffuse sources will not affect Airnet operations or measured air concentrations.

<u>(3) Tritium facility operations</u>. As mentioned above, gas- and vapor-phase tritium cannot be removed from exhaust air streams by HEPA filtration. Air emissions of tritium depend on the type of work being performed (gas transfers, materials investigations, etc.) and not on specific inventory limits. Also, the inventory quantity limit for tritium did not change in SD 1027G. Thus, the change to the DOE guidance does not affect operations at LANL tritium facilities.

<u>(4) TA-48 Hot Cell operations</u>. The Hot Cells at TA-48 process chiefly gamma-emitting radionuclides for medical isotope production and related activities. Actual measured emissions consist primarily of volatile compounds that are not removed by HEPA filtration. The lighter nuclides processed in the Hot Cell areas did not experience the same factor of 4.6x increase as plutonium. The two nuclides which make up the greatest quantity of air emissions are germanium-68 and selenium-75; the inventory limit for Ge-68 actually decreased by almost a factor of 2 (from 0.15 grams to 0.088 grams), and Se-75 remained relatively unchanged, increasing by only 5% under the SD 1027G (from 0.022 grams to 0.023 grams). Limits for other commonly-emitted nuclides similarly increased only slightly or decreased.

While changes to SD 1027G do not significantly increase inventory limits for radionuclides common to the Hot Cell areas at TA-48 Building 1, changes in limits for other nuclides used in other wings of that building mean that more Hot Cell operations can take place. This means more targets can be processed, more medical radioisotope generators produced, etc. Therefore, actual measured emissions from the Hot Cell stacks may increase slightly after SD 1027G is incorporated into building operations. However, the overall emissions and off-site doses will not significantly change as a result of SD 1027G adoption, and will not approach allowable levels as defined in the EPA standard or those levels projected in the Site-Wide Environmental Impact Statement (SWEIS).[9]

<u>(5) Non-monitored sources</u>. LANL calculates emissions from "minor" sources which do not require monitoring under the Radionuclide NESHAP, and includes these sources in the annual emissions report as "potential" or uncontrolled emissions. LANL uses engineering calculations to determine these potential emissions, and does not take credit for HEPA filters or other emissions controls. These potential emissions are modeled to determine resulting radiological dose to the maximally exposed member of the public for each source. The doses from each individual source are totaled, and the sum reported as a single line-item in the annual Radionuclide Air Emissions Report sent to EPA Region 6 each June. Because we report potential emissions and resulting potential doses for these minor sources, the total from the non-monitored sources can make up a significant percentage of the Laboratory's reported dose to the Maximally Exposed Individual under the Radionuclide NESHAP. Since 2000, these minor sources collectively contribute about 0.2 millirem annually, which can be a large fraction of LANL's air pathway dose in some years. However, the EPA limit for air pathway dose is 10 millirem per year, so the minor source contribution from these potential emissions is relatively insignificant to the overall dose limit. At first glance, multiplying this 0.2 millirem contribution by a factor of 4.6 to reflect the changed Pu-239 inventory quantity would result in reported potential emissions of less than 1 millirem, still small compared to the EPA 10 millirem limit.

However, the true impact of SD 1027G changes on minor sources warrants more thorough evaluation. If facilities choose to maximize their usage of Pu-239 or equivalent under new proposed SD 1027G limits, the amount of material used in a facility may increase above current levels. If so, LANL staff would review the proposed change and there are two possible outcomes. First, the facility's anticipated usage may still be <u>below</u> the EPA dose threshold at which continuous monitoring is required. In this case, the source would still be considered a "minor" source, and potential emissions and potential off-site doses would be calculated and reported in the annual EPA report. The second possible outcome is that proposed operations in a minor source may increase to the degree that the potential emissions would exceed the EPA level above which continuous monitoring is required and the facility would install sampling systems on this stack. In this latter case, the source would now be considered a "major" source, and LANL would report *actual* measured emissions from the source in its EPA report instead of potential calculated emissions. The net result of this change would likely be a lower

[9] The Site-Wide Environmental Impact Statement (SWEIS), most recently updated in 2008, presents an upper bound on total stack emissions and resulting off-site dose from LANL operations.

reported dose impact from this source, because the actual measured emissions would reflect controls such as HEPA filtration, while the calculated minor source emissions do not take credit for such controls.

Depending on how these LANL facilities incorporate the new inventory limits in SD 1027G, the likely outcome of increased radionuclide quantities in facilities will be a higher reported dose from minor sources and/or an increased number of major sources that are continuously monitored. But the overall emissions and off-site doses will not significantly change as a result of SD 1027G adoption, and will not approach allowable levels as defined in the EPA standard or those levels projected in the Site-Wide Environmental Impact Statement (SWEIS).

(6) Other LANL monitored sources. Existing major sources with particulate emissions will likely be the least affected by any change in facility radionuclide limits. Actual emissions, reflecting HEPA filtration or other controls, would still be quite low. Relative to gaseous or vapor-phase emissions and Airnet measurements, the off-site dose contribution from particulate facilities is insignificant – usually much less than 1E-06 millirem. As such, a worst-case increase in emissions by a factor of 4.6 would not be noticeable in LANL's reported annual dose.

One operational change resulting from increasing the radionuclide inventory in a facility may be in the type of sampling system installed in a given facility. If a facility has a sample system which currently meets design requirements of ANSI N13.1-1999[10], then no change would be required regardless of any change in radionuclide usage. However, if older sample systems that do not meet the ANSI N13.1-1999 requirements are installed, the situation would have to be addressed on a case-by-case basis to determine the relative off-site dose impact of any change, whether the increase in threshold quantities would technically be considered a "modification" or other factors. This evaluation will be performed according to LANL procedures. About half of the sources at LANL are currently equipped with systems which meet ANSI N13.1-1999 requirements; three stacks at TA-48, the new Radiological Laboratory at TA-55-400 (RLUOB), two stacks at LANSCE, and others. Older facilities have systems which were "grandfathered" at the time of the ANSI standard incorporation; these include the original Chemistry & Metallurgy Research (CMR) facility, the radioactive liquid waste facility, and the TA-55 plutonium facility (although TA-55 stacks are scheduled for upgrade in the near future).

[10] ANSI N13.1-1999, Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities. Incorporated by reference into 40 CFR 61 Subpart H. The ANSI standard was updated in 2011, with only editorial corrections and no technical changes. The 1999 version remains the operational guidance for sampling system design and operation for new sources at LANL.

The Environmental Protection Division at LANL has procedures in place that will address issues related to changing radioactive material throughput levels and resulting operational changes that may be required. Based on current operations, we do not anticipate any changes in air emissions or off-site doses from incorporating SD 1027G inventory limits at existing monitored particulate emissions sources.

V. Regulatory Compliance Impacts

EPA Notification and Dose Standard

Most LANL facilities were already in operation at the time of the promulgation of the Radionuclide NESHAP (1990). As such, there are no external regulatory permit limits on emissions or off-site doses from any specific facility, other than the general site-wide annual limit of 10 millirem to any member of the public from all operations at LANL. The Radionuclide NESHAP establishes a framework of operations, reviews, and controls but operations and emissions are not linked to specific buildings for most facilities.

The exceptions to this general principle are facilities for which Pre-Construction Approval has been sought and granted for a new or modified facility. In these cases, EPA Region 6 typically includes a requirement stating that if the emissions levels change from those put forth in the Pre-Construction application, then prior written approval is required. Currently, facilities for which this criterion applies include the Radiological Laboratory at TA-55-400 (RLUOB) and waste processing activities at TA-54 Dome 375. These facilities are to be evaluated on a case-by-case basis to determine appropriate path forward after incorporation of SD 1027G. If proposed changes to radiological operations exceed annual throughput levels established by the Pre-Construction approval for such facilities, communication with EPA Region 6 and appropriate authorization for expanded activities may be required.

Sources at which radiological operations are not addressed by a radionuclide NESHAP Pre-Construction Approval will not require EPA notification in the event of an increase in radioactive material inventory within the facility. As long as radionuclide processes remain the same, increasing the material quantity does not constitute a modification to the source and therefore no advance notification is required. The issue of increasing the production rate of a source is specifically exempted from being a modification in 40CFR61.15(d)(2). If new or significant processes take place or if new construction is needed, then a new Pre-Construction Approval request will be generated. Otherwise, routine communication (e.g., via the annual radionuclide air emissions report) will suffice to notify EPA after-the-fact of these changes.

Major/Minor Source Categorization

The manner in which LANL treats minor sources is described above. Calculated potential emissions are modeled to determine off-site dose consequence, and the sum total of these potential emissions across all minor sources is reported as a single line-item in the annual Radionuclide Air Emissions report each June. Without consideration for any emissions controls, this minor source contribution has ranged from 0.08 millirem to 0.30 millirem over the past several years (2000-2012), averaging about 0.2 millirem per year total from all minor sources. In the same time frame, emissions and off-site doses from major stacks (monitored sources) have decreased, primarily due to increased controls at the LANSCE facility and reduced scope of tritium operations. LANSCE still remains LANL's most significant point source, and emissions are not affected by changes to DOE Standard 1027. The relative contribution from minor sources, while remaining relatively steady at the fractional millirem level, now makes up a larger portion of LANL's off-site dose.

Major sources are continuously sampled or monitored to measure actual emissions, and the effects of control systems (e.g., HEPA filters) can clearly be seen. The average dose from a major monitored particulate-only stack is less than 0.0001 millirem per year; the annual total of such stacks is about 0.002 millirem per year. Thus, the actual reported doses from major sources are less than the potential emissions reported from minor sources; this over-reporting of minor sources is a limitation that LANL accepted as part of the FFCA for Rad-NESHAP. Relative to the EPA's 10 millirem per year limit, this collective minor source contribution makes up a small fraction of LANL's allowable emissions. This would still be true even if the minor source contribution increased by a factor of 4.6 (0.2 x 4.6 = 0.92 millirem, much less than the 10 millirem limit and small compared with recent doses, even with this assumption that Pu-239 is the sole contributing radionuclide).

As described above, increasing the quantity of radioactive material at LANL minor sources may result in higher emissions from this minor source contribution, since the reported doses scale linearly with the amount of radioactive material used in a facility in a given year. However, if usage increases to the point where continuous monitoring is required at a given source, then that source would switch over to the major / monitored source category. In this case, the reported dose from that source would likely drop as actual measured emissions are reported instead of conservatively calculated potential emissions. Appendix A of this document summarizes the anticipated possible outcomes of changing radionuclide inventory limits at existing LANL sources.

Plume Dispersion and Dose Modeling

The plume dispersion and dose assessment software mandated by the EPA for determining Radionuclide NESHAP compliance is CAP88. Version 3 of CAP88 was updated with ICRP 72 dose conversion data in 2006. Similar results were noted as when SD 1027G was issued; the dose impacts of some nuclides decreased while others increased. Dose impact from actinides decreased in general, with plutonium decreasing by about a factor of two. This factor of two change does not directly match the factor of 4.6 noted in the inventory threshold calculations, but the variability of other modeling parameters in CAP88 (e.g., meteorological factors, stack height, stack exhaust velocity, and distance to receptor) make it impossible to directly compare inventory limits and CAP88 dose conversion factors. The net trends do agree; a higher inventory limit for a facility corresponds to a lower CAP88 dose conversion factor.

The time lag between the incorporation of ICRP 72 by EPA (in 2006) and by DOE (in 2011) has resulted in some complications as well. Facility operations with inventories established by the original Standard 1027 saw a drop in potential off-site doses when calculated by CAP88 version 3 after its 2006 promulgation, and there has been five years for parties to become accustomed to this level of potential dose. Now with inventory changing under SD 1027G, a short-term review appears to show an increase in potential doses. However, when comparing calculated potential doses from 2005 and prior with levels predicted for 2013 and beyond, the two doses are relatively similar. Potential doses calculated "pre-ICRP 72" with old Standard 1027 limits and old CAP88 dose assessment are generally similar to new "post-ICRP72" calculations using new limits from SD 1027G and CAP88 version 3 dose assessment.

VI. Conclusions

Overall, the changes in radionuclide inventory threshold quantities allowable for radiological facilities will not dramatically affect LANL operations, the level of radionuclide air emissions from operations, or the off-site dose from these emissions. As shown in this document, annual off-site doses are primarily driven by factors which are not tied to radionuclide inventory thresholds or are not affected by the changes in SD 1027G. When compared to air emissions projections in the SWEIS and annual off-site dose limits in the Radionuclide NESHAP, changes resulting from radionuclide threshold quantities are insignificant.

Individual facilities at LANL may face slight operational changes. If radionuclide processing in non-monitored (minor) sources increase beyond a certain point, installation of continuous emissions monitoring may be required. In this case, the number of monitored (major) sources at LANL will increase. Also, certain sources for which EPA Region 6 had granted Pre-Construction Approval may need to receive EPA approval again prior to increasing radionuclide threshold quantities if new predicted emissions exceed those levels projected for these specific facilities. Other older stack sampling systems may need to be upgraded to newer designs if radionuclide usage levels increase. But these operational issues can be readily addressed, using procedures that are already in place at LANL. From a regulatory compliance perspective, Lab-wide radionuclide air emissions levels and subsequent off-site doses will not change in any significant manner as a result of incorporating this Guidance.

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January 28, 2014

Appendix A: Possible Paths Forward for Updating Radioactive Material Inventory Threshold Quantities at LANL Facilities

Changes to radioactive material quantities typically will result in one of the following outcomes.

1. Minor Sources (non-monitored stacks)
   - Compliance dose assessment based on calculated emissions
   - Emissions calculations do not take credit for control systems (e.g., HEPA filtration).
   - Calculations based on throughput, so off-site dose should scale directly with radioactive material quantity used.
   - Doses from all minor sources totaled and reported together as a single line-item in EPA report.

      a. Inventory and radioactive material usage increases but not to the point where continuous monitoring of stack emissions is required. Source remains a minor source, tracked by LANL's Radioactive Materials Usage Survey (RMUS). Emissions calculations, dose assessment, and inclusion in annual report continue as listed above.

      b. Inventory and radioactive material usage increase to the point where EPA thresholds are met and continuous stack monitoring is required. In this case, the minor source will become a major (monitored) source. Emissions calculations, dose assessment, and reporting as a major source as described below.

      For both cases 1.a and 1.b above: formal notification to EPA of the change is addressed as part of the annual Radionuclide Air Emissions report for that year. Informal courtesy notification (e.g., email) recommended.

2. Major Sources (monitored stacks)
   - Compliance dose assessment based on actual measured emissions
   - Emissions measurements reflect effects of control systems (e.g., HEPA filtration).
   - Actual measured emissions may not scale directly with radioactive material inventory quantity.
   - Dose from each major source is included as an individual line-item in the annual EPA report.

      a. Sources which are covered by a Pre-Construction Approval notice from EPA Region 6. If potential emissions increase & exceed the amounts approved in the Pre-Construction application, a follow-up notification must be sent to EPA Region 6 describing the situation. Approval from EPA Region 6 must be received prior to implementing change.

      b. Sources which are not covered by any Pre-Construction Approval notice. No EPA advance notification is required, unless new activities take place at the facility. Notification to EPA of the change is addressed as part of the annual Radionuclide Air Emissions report for that year. Radionuclide inventory changes are not considered a modification; exempted in 40CFR61.15(d)(2).

      c. Monitored sources at which new activities or significant construction is taking place as part of the radioactive material inventory change. In these cases, if the changes result in an off-site dose increase of at least 0.1 millirem, the source is considered a new/modified source and a Pre-Construction Approval application must be submitted to EPA Region 6 and approval granted prior to construction. If changes result in less than 0.1 millirem, only after-the-fact notification as described in 2.b above is needed.

      d. Monitored sources using sampling systems that do not meet ANSI N13.1-1999 design criteria. These systems were "grandfathered" in 2003, when ANSI N13.1 was adopted into Subpart H. These sources are evaluated case-by-case to determine applicability of proposed changes and the need for sampling system upgrades.