
Rad NESHAP Training

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U.S. DEPARTMENT OF
ENERGY

Office of
Environmental Management

Training Overview

- Subpart H Overview
- Definitions
- EPA/DOE MOU
- Routine Emissions vs Off-Normal Emissions
- EPA Regional Role



Rad NESHAP Rule

- 40 CFR 61 Subpart H
 - NESHAP for emissions of Radionuclides Other Than Radon From Department of Energy Facilities
- General Rule approach
 - Standard (10 mrem/yr) based on all combined emissions from Site
 - Compliance is demonstrated in annual report
 - Monitoring/sampling applied to point sources
 - Alternatives allowed
 - Monitoring requirements based on a point source's Potential Effective Dose Equivalent (PEDE)
 - PEDE > 0.1 mrem/yr : Continuous monitoring
 - PEDE ≤ 0.1 mrem/yr : Periodic monitoring



1995 EPA/DOE MOU Summary

- Does not replace or supersede regulations
- Covers issues related to
 - Major and Minor Source Monitoring
 - DOE agrees to submit periodic monitoring protocol and diffuse source estimation methods to EPA Regional Offices
 - Ambient and critical receptor air concentration methods
 - Use of Subpart I guidance for Subpart H sources
- More detail in later slides



Some Terms

EDE (Effective Dose Equivalent) [§ 61.91]

A measure of the health risk due to the absorbed energy from radiation. Reported in terms of rem or mrem.

Curie (Ci)

Defined as 37,000,000,000 disintegrations per second. It takes a different quantity of each radionuclide to equal 1 curie.

Facility [§ 61.91]

All buildings, structures and operations on one contiguous site.



More Terms

Construction [§ 61.02]

Fabrication, erection, or installation of an affected facility.

Commence [§ 61.02]

That an owner or operator has undertaken a continuous program of construction or modification or has entered into a contractual obligation to undertake and complete, within a reasonable time, continuous program of construction or modification

Start of Construction

§ 61.05 prohibits commencing construction or modification without EPA approval. Definition of “Commence” includes procurement. So under Part 61 procurement of an item would mean construction began when the fabrication of that item began. Check with Region on their interpretation.



And More Terms

Point Source [§ 61.93(b)]

Stack or Vent

Diffuse Source [EPA Guide]

No active ventilation and not a point source

Fugitive Emissions [EPA Guide]

Releases not released through a confined air stream and may include both point and diffuse sources.

EPA Guide:

Methods For Estimating Fugitive Air Emissions of Radionuclides From Diffuse Sources at DOE Facilities, EPA 2004



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Potential Emissions

- Estimated Potential Emission Rate is based on discharge of the effluent stream that would result if all pollution control equipment did not exist, but facility operations were otherwise normal.
[§ 61.93(b)(4)(ii) or § 61.93(f)]
- PEDE determined by modeling potential emission source term to off-site public

PEDE: The potential effective dose equivalent of the most impacted member of the public from a source, which would occur if control equipment on that source were rendered ineffective for a year, assuming otherwise normal operations.



Appendix D - Estimate of Emissions Method

- Determine curies used at source
 - Sealed containers can be ignored
 - Basically throughput and/or inventory
- Apply physical state factor
 - 1 for gas (or heated above 100° C)
 - E-03 for liquid & particulate solids
 - E-06 for solids
- Apply control device factor
 - 0.01 for HEPA - particulate
 - 0.1 for charcoal - Iodine
 - etc.
- Result = Estimated Actual Emissions (Ci/yr)



Appendix D Example Calculation

Example 6-1: A fuel processing facility located 5 km from the site boundary has an inventory of 2000 Ci Pu-239 and 3000 Ci Cs-137. The material is all in a powder form and is not heated to a temperature above 100°C. The facility does have HEPA filtration for effluent controls. Using Appendix D methods, what is the facility's source term for both actual EDE and PEDE modeling?



Appendix D Example Calculation

Solution

$$EDE_i = (Quantity)(PhysicalState)(Control\ Factor)$$

$$EDE_{Pu239} = (2000Ci)(0.001)(0.01) = 0.02 Ci$$

$$PEDE_{Pu239} = (Quantity)(PhysicalState)$$

$$PEDE_{Pu239} = (2000Ci)(0.001) = 2Ci$$



Potential Emissions

Other Methods Approved by at least one EPA Region

- Back Calculation from Actual Monitoring Data
- Process Based Calculations
- Analysis of HEPA filters
- Diffuse Source Methods in EPA Guidance

Note: All require prior approval from the regulator [§ 61.93(4)(i)]



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Application to Construct or Modify [§ 61.96]

- Approval to construct or modify [§ 61.07] only required if actual projected Effective Dose Equivalent caused by all emissions from the new construction or modification exceeds 0.1 mrem/yr.
- Notice of Startup [§ 61.09] also not required unless actual EDE exceeds 0.1 mrem/yr.
- Emissions must be estimated by Appendix D or another EPA Approved method
- Facility can not take this exemption unless in compliance with the Subpart as demonstrated in last Annual Report



61.92 Standard

- 10 mrem/yr
 - Dose to an offsite individual where there is be a residence, school, business or office. [*§ 61.94(a)*]
 - MEI (Maximally Exposed Individual)
 - MEOSI (Maximally Exposed Off Site Individual)
 - All emissions from all activities on the Site
 - Normal Point Source Emissions
 - Abnormal or Process Upset Point Source Emissions
 - Diffuse Source Emissions



61.93 - Emission Monitoring and Testing

- 61.93(a)
 - To determine compliance with Standard
 - Determine radionuclide emissions with EPA approved procedures
 - Calculate dose with EPA Approved Model
 - CAP-88
 - AIRDOS-PC
 - COMPLY (MEOSI within 3 kilometers of all sources)
- 61.93(b) or 61.93(c)
 - 61.93(b) for existing sources (point sources)
 - 61.93(c) for new sources (point sources)



New vs Existing Sources

- Existing Source
 - Constructed prior to September 9, 2002
 - No modifications since September 9, 2002 that meets the definition of modification in § 61.15
- New Source
 - As defined in Subpart A - Construction or modification after September 9, 2002
 - § 61.15(b) Upon modification, an existing source becomes a new source



Selection of Monitoring Scheme [§ 61.93(b)(4)(i) or 61.93(e)]

- Continuous vs Periodic Monitoring
 - PEDE > 0.1 mrem = Continuous monitoring
 - PEDE ≤ 0.1 mrem = Periodic measurements
- What to monitor or sample for
 - Flow rate
 - Any radionuclide contributing > 10% of the PEDE
 - Particulate
 - Iodine
 - Tritium
 - Noble Gas
 - Short-lived gases (O-15, C-11, etc.)
- Use a Graded Approach



Graded Approach

PIC Level	Required Monitoring and Sample Analysis	Example PEDE (mrem/yr)
1	Continuous sampling for a record of emissions and in-line, realtime monitoring with alarm capability; consideration of separate accident monitoring system	> 5
2	Continuous sampling for record of emissions, with retrospective, off-line periodic analysis	> 0.1 and ≤ 5



Graded Approach

PIC Level	Required Monitoring and Sample Analysis	Example PEDE (mrem/yr)
3	Periodic confirmatory sampling and off-line analysis	> 0.001 and ≤ 0.1
4	Annual administrative review of facility uses to confirm absence of radioactive materials in forms and quantities not conforming to prescribed specifications and limits	≤ 0.001



Effluent Flow Rate [§ 61.93(b)(1)] or [§ 61.93(c)(1)]

- Existing Sources per regulation [§ 61.93(b)(1)]
- New Sources per ANSI N13.1 - 1999
- Frequency
 - Variable flow : Continuous
 - Relatively constant : Periodic
- Some Allowed Methods
 - Continuous (40 CFR 52 Appendix E Certifications)
 - Hot wires
 - Self averaging pitot tubes
 - Annubars
 - Periodic
 - EPA Method 2
 - SF6 Tracer gas



Radionuclide Monitoring: PIC 1 or 2

- Continuous Sampling
 - Any radionuclide that contributes >10% to PEDE
 - Laboratory analysis for sample of record
- Pre- September 9, 2002 sources: ANSI N13.1-1969
 - Isokinetic Sampling (particles > 2.0 μm)
 - Cookbook approach
 - Can use ANSI N13.1 – 1999
- New Sources: ANSI N13.1-1999
 - Isokinetic is not preferred method
 - Performance based approach
- Appendix B, Method 114
- Alternatives allowed with prior regulator approval



Radionuclide Monitoring: PIC 3 or 4

- Periodic Confirmatory Measurements to confirm low emissions [§ 61.93(b)(4)(i) or [§ 61.93(e)]
- Regulation does not address how to do this
- DOE issued guidance September, 2006
 - “Recommendations for Developing a Protocol For Periodic Confirmatory Measurements of Minor Air Emissions Sources Subject to 40 CFR 61, Subpart H”
- 1995 EPA/DOE MOU requires the PCM be submitted to your EPA Region
 - Approval not required



PCM Protocol: DOE Guidance Summary

- Graded Approach
- Methods to be used
 - Sampling
 - Engineering Calculations
 - Radionuclide Inventory
- Frequency of Evaluation
- Quality Assurance as appropriate
- When to resubmit protocol to EPA



Diffuse Sources

- Two methods to estimate emissions
 - Calculations: EPA Guidance is best approach
 - Environmental Surveillance: Requires EPA approval
- EPA Guidance Manual
 - Calculation methods for various source types
 - Soils
 - Buildings
 - Ponds
 - Etc.
 - Requires a Quality Assurance Plan



Diffuse Source QA

- Conforms to EPA Method 114
- Inventory Quality Checks
- Procedures to ensure quality of inventory
- Environmental Surveillance confirms emission estimates
 - List throughout guidance as preferred method, but as standalone requires prior EPA approval
 - Can be used to confirm the calculation methods
 - DOE O 5400.5 also discusses using Environmental Surveillance to validate source monitoring



Test Methods [§ 61.93(b)(2)(iii) or [§ 61.93(c)(2)(iii)]

- Methods based on Method 114 Principles
- Typical Radionuclide Sampling and Analysis Procedures
 - Alpha Spectrometry
 - Tritium methods
 - etc.,
- Same requirements for all sources, both new and existing



Quality Assurance: Existing Source [§ 61.93(b)(2)(ii)]

- Section 4.0 of Method 114 : Quality Assurance
 - Document in Quality Assurance Project Plan (QAPP)
 - Required for PIC 1 and 2
 - PIC 3 and 4, QA per PCM which is given to EPA
 - Maintenance and inspection criteria (Table 2)
 - Nine Required Criteria are
 - 1) Organization
 - 2) Sample Collection & Analysis
 - 3) QA Plan Objectives
 - 4) Quality Control Program
 - 5) Sample Tracking
 - 6) Audits
 - 7) Corrective Action
 - 8) Reporting to Management
 - 9) Responding to Increased Emission Levels



Quality Assurance: New Source [§ 61.93(b)(2)(iv)]

- QA per ANSI N13.1
 - Section 7 of Standard
 - 18 required Elements
 - Specific Maintenance, calibration and field check criteria
 - Performance criteria requirements
- Suggest following QAPP format in Method 114



Maintenance, Calibration and Field Checks

- Same for both New and Existing Sources
- Table 2 of Method 114
- Table 5 in ANSI N13.1 – 1999
- 14 Requirements: Some are,
 - Inspect and test the sample transport system for leaks – Annually
 - Inspect rotameters for presence of foreign matter – Start of each sample period
 - Inspect pitot tubes for contamination deposits – Annually
 - Clean transport lines – visible deposits for HEPA-filtered applications or surface density of 1 g/cm² for other applications



Alternative Methods [§ 61.93(b)(2)(ii)]

- Must be impractical to follow EPA approved method
 - Per 1995 EPA/DOE MOU: Criteria for impractical are site specific and can include engineering, economic, health and safety considerations
- Four Criteria
 - Describe why method is not practical for specific effluent stream
 - Alternative procedure can not significantly underestimate emissions
 - Must be fully documented
 - Receive prior approval from EPA
- Can be used for flow, radionuclide collection methods, radionuclide analysis, calculation methods, etc.



Ambient Sampling [§ 61.93(b)(5) or [§ 61.93(g)]

- Allowed by regulation
- Method of choice for diffuse or non-point type sources
- Can not replace point source sampling but can be used to determine dose and demonstrate compliance
- Readily detect radionuclides that would cause an EDE of 10% of the Standard
- Compare to Table 2 of Appendix E. Use sum of fractions if needed.
- Must be approved by EPA prior to use.



Compliance & Reporting [§ 61.94]

- Compliance with Standard determined by calculating highest EDE to any member of the public at an offsite location
- DOE Effluent Information system Issue
 - Regulation requires that DOE submit what is sent to the DOE Effluent Information System
 - Problem is DOE Effluent Information System has been cancelled
 - Suggest preparing the report as would be sent and filing on site.
- Annual report prepared per § 61.94(b) and submitted but June 30
 - EPA Headquarters
 - EPA Regional Office
 - DOE Headquarters (Not in regulation)



Compliance & Reporting [§ 61.94] continued

- Annual Report signed and dated by Corporate Officer or Public Official in charge of facility
 - Certification statement form regulation must used for the report.
 - "I certify under penalty of law that I have personally examined and am familiar with the information submitted herein and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment. See, 18 U.S.C. 1001."
- Monthly reports required if facility not in compliance with Standard



Recordkeeping [§ 61.95]

- Maintain records for five years at site
- Types of Records
 - Input parameters and measurements upon which they are based
 - Calculations
 - Analytical methods results
 - Procedures
- Don't forget Chain-of-Custody records



Subpart A

- Application for Approval to Construct - § 61.07
 - Note: Can be waived for Actual Emissions < 0.1 mrem/yr per 40 CFR 61.96
- 30 - 60 days prior notification of startup for new facility - § 61.09
- DOE Exempt to § 61.10 per § 61.97
- Compliance with Standard - § 61.12
 - Per Subpart H monitoring requirements
- Emission Tests - § 61.13
 - Subpart H does not require source tests.
 - Additional requirement may be in Approval to Construct



Subpart A, continued

- Monitoring Requirements - § 61.14
 - General duty clause for monitoring
 - Administrator may require test at any time
 - Record retention requirements
- Modifications - § 61.15
 - defines what is a modification
 - Increase in emissions due to proposed activity
 - used in conjunction with 40 CFR 61.96
 - Modified source becomes a new source
- § 61.15(d) Exemptions
 - Maintenance, repair or replacement
 - Increase in production rate without capital expenditure
 - Increase in hours of operation
 - Relocation or change in ownership of a stationary source



1995 EPA/DOE MOU

- Does not replace or supersede regulations
- Monitoring
 - 1a) Facilities not in compliance with monitoring provisions will get with EPA regional office and establish plan to get in compliance
 - 1b) Periodic confirmatory measurements
 - Program development is responsibility of facility
 - Program will be designed to confirm low emissions
 - Representative measurements or Engineering calculations are OK
 - Facility must provide protocol to EPA regional office



1995 EPA/DOE MOU, continued

- Monitoring, continued
 - 1c) Alternative monitoring methods require prior EPA approval
 - Criteria in § 61.93(b)(3) must be met
 - Criteria for impractical are site specific and can include engineering, economic, health and safety considerations
 - 1d) Air Concentrations at Critical Receptor can be used with prior EPA approval
 - § 61.93(b)(5) criteria must be met.
 - Good for facilities where emissions are primarily from minor sources or diffuse sources
 - Air sampler must be in location to give accurate representation of dose to the receptor



1995 EPA/DOE MOU, continued

- Approval to Construct or Modify
 - 2a) Facilities meeting requirements of § 61.96 are exempt from filing an application for approval to construct or modify
 - Source term must be from Appendix D or other EPA approved method
 - Facilities not subject to continuous monitoring provisions can take exemption once PCM protocol is implemented
- High Level Waste and Transuranic Disposal and Monitoring Retrievable Storage
 - 3a) Although 40 CFR 61 does not apply the DOE policy is to implement requirements of Subpart I for High-Level Waste Repository and Subpart H for WIPP
 - 3b) Operations at the Monitored Retrievable Storage facility are subject to Subpart I.



1995 EPA/DOE MOU, continued

- Subpart Q Compliance
 - Where flux measurements demonstrate compliance no further measurements are required
 - Where flux measurements demonstrate out of compliance EPA and DOE will determine appropriate actions
 - DOE will monitor storage and disposal sites per DOE Order 5400.5 and guide DOE/EH-0173H
- Miscellaneous Sources
 - 5a) Diffuse Sources
 - Emissions must be included to demonstrated compliance with Standard
 - Emission estimation methods will be provided to EPA regional office
 - Emissions data will documented in Annual Report
 - 5b) DOE will collect and report radon-220 emissions data at select sites (Subpart Q or T)



1995 EPA/DOE MOU, continued

- Reporting Requirements
 - 6a) DOE may use Appendix D and E of 40 CFR 61
 - 6b) Annual report will include a list of all stacks, vents or other points where radioactive materials are released to the atmosphere
 - Similar minor release points may be grouped



Summary

- Communicate with and get along with your EPA Region
- Use EPA approved methods.
- There are no de minimis levels under this regulation
- Do NESHAP evaluations for all new and modified sources
- Keep records for your site sources up to date
- Try to attend annual DOE Rad NESHAP meetings

