5 AIR EMISSIONS SOURCE

CHAPTER CONTENTS

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5.1 AMBIENT AIR QUALITY

DQO START DATE January 1, 2003

IMPLEMENTATION DATE January 1, 2024

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SUMMARY OF PROPOSED CHANGES

There were a couple of minor grammatical changes for Ambient Air Quality for calendar year 2024.

DESCRIPTION AND TECHNICAL BASIS

Airborne emissions are routinely generated as a result of Brookhaven National Laboratory (BNL) operations and research activities. These emissions are released to the atmosphere through dedicated exhaust systems designed to protect workers and building occupants from inhalation exposure to irritants or potentially toxic compounds or via a building's general ventilation system when emissions from an operation do not present potential health impacts to workers. Airborne emissions may be released as particles, fumes, or gases.

The Environmental Protection Agency (EPA) has previously delegated authority to NYSDEC to issue permits in accordance with Part 201 of Title VI of the New York State Code of Rules and Regulations (NYCRR) for the construction or modification of any stationary source subject to the federal requirements of prevention of significant deterioration (PSD) and for many sources subject to New Source Performance Standards (NSPS) or National Emission Standards for Hazardous Air Pollutants (NESHAPS). These permits are issued only after NYSDEC is assured from information provided with permit applications that the operation or activity will be operated in compliance with all applicable regulatory requirements and emissions from new or modified sources and will not adversely impact the ambient air quality or place members of the public at undue risk of inhalation exposure from pollutants of varying levels of toxicity.

A condition of the Title V Facility Permit issued to BNL in January 2002 and renewed in January 2020 states:

> "No person shall cause or allow emissions of air contaminants to the outdoor atmosphere of such quantity, characteristic, or duration which are injurious to human, plant, or animal life or to property, or which unreasonably interfere with the comfortable enjoyment of life or property. Notwithstanding, the existence of specific air quality standards or emissions limits, this prohibition applies, but is not limited to, any particulate, fume, gas, mist, odor, smoke, vapor, pollen, toxic, or deleterious emission, either alone or in combination with others."

This condition and regulatory requirement (6 NYCRR 211.1) is a facility-wide condition that applies not only to operations and activities that release emissions to the atmosphere and are authorized under the Title V Facility permit issued by NYSDEC, but also to operations and activities that are exempt from New York State permitting requirements.

DRIVERS FOR MONITORING BEING CONDUCTED UNDER THIS PROGRAM

X Compliance

____ Support compliance

____ Surveillance

____ Restoration

The Clean Air Act (CAA) and CAA Amendments of 1990 establish a national permitting program for facilities that are considered to be major sources of criteria and/or hazardous air pollutants, specify emissions standards and monitoring requirements applicable to various industrial source categories that are significant contributors of criteria pollutants, establish emissions standards applicable to industrial categories which are significant contributors of 189 identified hazardous air pollutants, and seek to maintain and improve air quality throughout the nation. Many of the statutory requirements of the CAA and the 1990 Amendments aimed at maintaining or improving air quality were promulgated into regulations administered by NYSDEC under Parts 200–257 of the NYCRR.

In their evaluations of new applications for permits to operate emissions sources, NYSDEC uses a guidance document called the DAR-1, Guidelines for the Evaluation and Control of Ambient Air Contaminants Under 6NYCRR Part 212*,* to evaluate the potential impact to the public of pollutants released into the atmosphere from a process and to determine whether existing or proposed pollution control devices and administrative controls for the process are sufficient to protect the public from adverse impacts from the source's emissions.

Using these guidelines, emissions source-specific information (such as exhaust system stack height and diameter, stack exit velocity, and building height) and source-specific potential and actual emissions information are plugged into EPA's conservative dispersion screening model AERSCREEN. The model calculates average ambient annual and average short-term concentrations of a compound that would be expected at receptors downwind of the emissions source for the meteorological conditions built into the model.

These concentrations are then compared to Annual Guideline Concentrations (AGCs) and short-term guideline concentrations (SGCs) that have been established by the New York State Department of Health (NYSDOH) based on available toxicology data on the health risks to humans for that compound. To demonstrate compliance with the Title V Facility permit condition, the potential impacts for all proposed emissions sources at BNL that have the potential to release toxic compounds are evaluated using the DAR-1 model.

DATA QUALITY OBJECTIVE ANALYSIS

Step 1: State the Problem

Laboratory operations that release emissions have the potential to impact ambient air quality, the environment, and members of the public if the emissions are not properly controlled at the point where they are generated. Facility-wide procedures are in place requiring owners or operators of new emissions sources to assemble qualitative and quantitative information about potential emissions from the source, along with information about the exhaust system and emissions control devices. This information must be reviewed to determine whether adequate engineering and administrative controls are in place to ensure that the environment and members of the public are not adversely impacted by potential emissions from the source.

Step 2: Identify the Decision

The desired decisions for the review of BNL operations with potential emissions of toxic compounds are:

- Have all potential sources of toxic compound emissions been identified, and their potential impacts evaluated?
- Do the DAR-1-assessed impacts of a source's potential emissions show maximum potential concentrations of toxic compounds at downwind receptor locations to be less than corresponding AGCs?

Step 3: Identify Inputs to the Decision

Inputs necessary to support the decisions in Step 2 include:

- Completed Emissions Source Inventory or Emissions Source Modification forms with supporting information on compounds released (i.e., estimated quantities, safety data sheets, etc.)
- Exhaust system parameters including stack height, building height, exit velocity, and stack exit temperature
- Pollutant emissions rates
- EPA AP-42 emissions factors
- Meteorological data
- Pollution control device efficiencies
- AGC and SGC limits/emissions limits
- NYSDEC DAR-1, Guidelines for Evaluation and Control of Toxic Ambient Air Contaminants Under 6NYCRR Part 212
- Chemical Management System queries and reports on chemical use

Step 4: Define the Study Boundaries

To calculate worst-case impacts to compare with AGC and SGC limits, the DAR-1 model requires estimates of maximum hourly emissions rates (lbs./hr.) and maximum annual emissions rates (lbs./yr.) for all source pollutants. These estimates are based on information from completed Emissions Source Inventory forms or Emissions Source Modification Forms provided by BNL personnel. The estimates can be based on material balance calculations, published emissions factors, emissions test results, emissions tests from geometrically similar emissions sources, equipment manufacturer guarantees, and best engineering judgment. Due to atmospheric dispersion of the pollutants, the model may show that maximum impacts may occur beyond the Laboratory boundaries.

Step 5: Develop the Decision Rules

Decision 1

Have all potential sources of toxic compound emissions been identified, and potential impacts of emissions evaluated?

BNL's Standards-Based Management System (SBMS) *Non-Radioactive Airborne Emissions* Subject Area requires line personnel who are responsible for operations that generate nonradioactive emissions to complete and submit forms for new emissions sources or existing sources that are being modified to the Environmental Protection Division (EPD). These forms are reviewed to determine if new or modified sources are subject to New York State permit or other regulatory requirements. All new or modified emissions sources that emit toxic air contaminants are assessed using DAR-1, Guidelines for the Evaluation and Control of Toxic Ambient Air Contaminants Under 6NYCRR Part 212, to ensure that the sources are equipped with the appropriate emissions control equipment and will not have an adverse impact on potential on- or off-site receptors. The Environmental Protection Division Procedure for Completing a Process

Assessment Evaluation and Form (i.e., Procedure No. RC-SOP-402) also provides an opportunity for identifying potential sources of toxic emissions.

If there are potential sources of toxic compound emissions that have not been identified and evaluated for their potential impacts to the public and the environment, **then** periodic assessments of conformance to the *Non-Radioactive Airborne Emissions* Subject Area can be a means to identify additional sources for evaluation. Decisions should then be made as to whether the identified sources are subject to permitting requirements and if DAR-1 assessments of the potential impacts of the sources' emissions to members of the public and the environment need to be conducted.

Decision 2

Do the DAR-1 assessed impacts of a source's potential emissions show maximum potential concentrations of toxic compounds at downwind receptor locations to be less than corresponding AGCs?

If the calculated downwind receptor concentrations of the compounds emitted from a source are less than the respective AGCs and SGCs, **then** no additional control devices are suggested and the impacts from potential impacts of the source emissions are considered acceptable.

If administrative controls are implemented or pollution control devices are added to reduce emissions, **then** the potential impacts will be re-evaluated using the EPA AERSCREEN conservative computer model, based on reduced emissions rates.

If the AERSCREEN model shows calculated downwind receptor concentrations of one or more compounds to be above corresponding AGCs or SGCs, **then** the more sophisticated model EPA AERMOD should be used unless administrative controls, such as the substitution of an environmentally benign product or the addition of pollution control devices, have been implemented by the operator of the emissions source.

If the assessed impacts from an existing source's emissions are greater than one half the respective AGC or SGC for any highly toxic or moderately toxic compound based on the EPA AERSCREEN method and estimated emissions rates are in doubt, **then** EPD may request that representative stack samples be collected to verify emissions rates.

Step 6: Specify Acceptable Error Tolerances

To estimate worst-case toxic emissions rates from the source, instructions with the Emissions Source Inventory and the Emissions Source Modification forms direct users to provide information on the maximum number of hours per day and days per year the emissions source will be used. Similarly, the AERSCREEN dispersion screening model analyses building wake effects to calculate worst-case impacts under building downwash conditions. As a result, the screening method calculates conservative impacts under all conditions and will likely overestimate both the short-term and annual impacts.

The NYSDEC Division of Air Resources tries to base every ambient guideline concentration on its own chemical-specific evaluations. However, due to the number of chemicals manufactured and used in the State of New York, NYSDEC does not have sufficient funds to conduct an evaluation for each chemical. In the absence of self-conducted evaluations, NYSDEC uses other qualitative and quantitative information sources to derive AGCs and SGCs, based on the following hierarchy:

1) Toxicological assessments conducted by NYSDEC
2) Toxicological assessments conducted by NYSDOH
3) Information from the EPA-Integrated Risk Information System
4) Information from EPA Health Assessment Documents
5) Information from the National Toxicology Program
6) Data from the American Conference of Governmental Industrial Hygienists Threshold Limit Values (TLV) and National Institute for Occupational Safety and Health recommended exposure limits (REL) (whichever is more restrictive)

Interim AGCs can be calculated by applying uncertainty factors (as noted in the equations below) to the most restrictive recognized occupational exposure limits (time-weighted average [TWA] threshold limit value, TWA-TLV, or the TWA-recommended exposure limit, TWA-REL). Interim AGCs are not calculated for high toxicity contaminants such as known or potential human carcinogens.

HIGH & MODERATE TOXICITY CONTAMINANTS

$$\text{Interim AGC} = \frac{\text{Occupational Exposure Limit}}{420}$$

LOW TOXICITY CONTAMINANTS

$$\text{Interim AGC} = \frac{\text{Occupational Exposure Limit}}{42}$$

Step 7: Optimize the Design

With respect to existing laboratory hoods at BNL, a prior evaluation of the potential emissions from this large group of sources revealed an information gap. Estimates provided in Annual Emissions Statements for CY 1997, 1999, and 2001 suggested that the predicted impacts of chloroform emissions would have exceeded one-half the AGC in each of these years and the predicted impact of estimated carbon tetrachloride emissions in 2002 would have exceeded one-half its AGC. A follow-up evaluation of the potential impacts of lab hood emissions using the DAR-1 computer-based model showed predicted impacts of chloroform and carbon tetrachloride emissions for the years in question were less than one-half their respective AGCs.

Subsequent evaluations of lab hood emission impacts for CY 2004 through CY 2022, based on an examination of Chemical Management System hazardous air pollutant consumption records, showed that estimated impacts of carbon tetrachloride and all other hazardous air pollutant compounds in use, with the exception of chloroform, were less than one-half of their respective AGCs. A follow-up evaluation of the potential impacts of lab hood emissions using the DAR-1 computer-based model showed predicted impacts of chloroform for CY 2023 are less than one-half its AGC.

See Appendix B for the monitoring program for this Data Quality Objective.

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5.2 CENTRAL STEAM FACILITY EMISSIONS

DQO START DATE January 1, 2003

IMPLEMENTATION DATE January 1, 2024

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SUMMARY OF PROPOSED CHANGES

Proposed changes for Central Steam Facility Emissions for calendar year 2024 include:

1) Description and Technical Basis (paragraphs 7 and 8, respectively) were realigned to be in chronological order.
2) Description and Technical Basis (paragraph 8) was revised to accurately reflect 6 NYCRR 227-2 NOx emission standards and to accurately reflect where compliance was and was not demonstrated by 2018 stack tests.
3) Text in "Drivers for Monitoring Being Conducted Under This Program" was amended to reflect revisions to the 6 NYCRR 227-1 total suspended particulates emission limit.
4) Paragraph 4 was added in "Drivers for Monitoring Being Conducted Under This Program" subsection to describe Title V permit modifications affecting intermittent particulate emissions testing requirements for Boilers 1A, 5, and 6.

DESCRIPTION AND TECHNICAL BASIS

Airborne emissions are routinely generated as a result of Brookhaven National Laboratory (BNL) operations and research activities. These emissions are released to the atmosphere through a dedicated exhaust system designed to protect workers and building occupants from inhalation exposure to irritants or potentially toxic compounds or via a building's general ventilation system when emissions from an operation do not present potential health impacts to workers. Airborne emissions may be released as particles, fumes, or gases.

Emissions released to the atmosphere from many operations and activities at the Laboratory were authorized via individual permits issued by the New York State Department of Environmental Conservation (NYSDEC). These permits were issued only after NYSDEC was assured from information provided in permit applications submitted by BNL that the operation or activity would be operated in compliance with all applicable regulatory requirements and that emissions from new sources would not adversely impact the ambient air quality or place members of the public at undue risk of inhalation exposure from pollutants of varying levels of toxicity.

Various state and federal regulations governing non-radiological releases require facilities to conduct periodic or continuous emissions monitoring to demonstrate compliance with emissions limits. The Laboratory has several sources subject to state and/or federal regulatory requirements that do not require emissions monitoring. These emissions sources are included in the Title V Facility permit issued by NYSDEC to BNL on January 11, 2002, and subsequently renewed effective January 31, 2020. Conditions within the permit or the applicable requirements themselves require BNL to demonstrate compliance with federal and state requirements by means other than emissions monitoring. The Central Steam Facility (CSF) is the only BNL Title V permitted source that is required to monitor non-radiological emissions.

The CSF supplies steam for heating and cooling to BNL major facilities through an underground steam distribution system. The combustion units at the CSF are designated as Boiler Nos. 1A, 5, 6, and 7. Boiler 1A, which was installed in 1962, has a heat input of 56.7 MMBtu/hr. Boiler 5 was installed in 1965 and has a heat input of 225 MMBtu/hr. The newest units, Boilers No. 6 and 7, were installed in 1984 and 1996, respectively. Each of these boilers has a heat input of 147 MMBtu/hr.

Because of their design, heat inputs, and dates of installation, Boiler Nos. 6 and 7 are subject to Title 6 NYCRR Part 227-2 and the federal New Source Performance Standard, 40 CFR 60 Subpart Db. As such, these boilers are equipped with continuous emissions monitors for NO_X. Boiler No. 7 is also subject to the 40 CFR 60 Subpart Db emissions standard for total suspended particulates. Initial compliance with the total suspended particulate standard was demonstrated during a boiler performance test completed in December 1997. Flue gases released from the Boiler 7 stack are also continuously monitored for opacity. To measure combustion efficiency, both boilers are also monitored for carbon dioxide (CO_2). To enhance the Laboratory's ability to monitor particulate emissions from Boiler No. 6, a continuous opacity monitor was brought online in 2004. Continuous emissions monitoring results from the two boilers are reported on a quarterly basis to the Environmental Protection Agency (EPA) and NYSDEC.

Due to their age, Boilers 1A and 5 are only subject to Title 6 of NYCRR Part 227-2. Initial compliance with the 0.30 lbs./MMBtu NO_x emissions standard of Part 227-2 was demonstrated during stack tests conducted in January 1995 while the boiler burned No. 6 oil with a fuel nitrogen content of less than 0.3 percent and a fuel sulfur content of less than 0.3 percent. Continued compliance with the emissions standard is presumed if laboratory analysis of composite residual fuel samples confirms the fuel nitrogen content does not exceed 0.3 percent by weight.

On July 1, 2014, the new lower reasonably available control technology (RACT) limits for NOx in 6 NYCRR 227-2 became effective. As a result, NOx limits for CSF Boilers 5, 6, and 7 dropped from 0.30 lbs./MMBtu and 0.20 lbs. per/MMBtu when oil and natural gas are respectively combusted to 0.15 lbs./MMBtu for both fuels. Similarly, the NOx limit for the CSF's one mid-size boiler, Boiler 1A, dropped from 0.30 lbs./MMBtu to 0.20 lbs./MMBtu.

Per condition 40 of BNL's Title V Facility permit that was renewed effective January 31, 2020, stack tests must be conducted once during the five-year term of the permit. The tests are done to confirm that Boilers 1A and 5 are meeting their respective 6 NYCRR 227-2 NO_x emissions standards while Boiler 1A fires residual fuel and while Boiler 5 fires residual fuel and natural gas. Stack testing of Boilers 1A and 5, conducted respectively on December 7, 2018, and on December 4 and 5, 2018, demonstrated that Boiler 1A was compliant with the NOx standard of 0.20 lbs./MMBtu firing residual oil and that Boiler 5 was compliant with the 0.15 lbs./MMBtu NO_x emissions standard while burning natural gas but was above the 0.15 lbs./MMBtu NO_x emissions standard when Boiler 5 burned residual oil.

Recognizing that, based on past performance testing, none of the four boilers could meet the new RACT limits when residual oil was burned, BNL took advantage of flexibility provisions within 6 NYCRR 227-2 to craft a system averaging plan that was submitted to NYSDEC in January 2012 to comply with the new lower limits. Under the plan, BNL uses a NOx ledger to account for NOx credits accumulated during periods when natural gas is burned at levels below the NOx RACT limits to offset debits on the ledger that occur when any of the four boilers burn residual oil. Copies of the NOx ledger are included in quarterly Site-Wide Air Emissions/Monitoring System Performance Reports submitted to NYSDEC.

DRIVERS FOR MONITORING BEING CONDUCTED UNDER THIS PROGRAM

X Compliance
Support compliance
Surveillance
Restoration

The Clean Air Act (CAA) and CAA Amendments of 1990 establish a national permitting program for facilities that are significant contributors of the 189 identified hazardous air pollutants. The permitting program seeks to maintain and improve air quality throughout the nation by specifying emissions standards and the monitoring requirements that apply to various industrial sources. Many of the statutory requirements of the CAA and the 1990 Amendments for maintaining or improving air quality were promulgated into regulations administered by NYSDEC under Parts 200–257 of the New York State Code of Rules and Regulations.

Federal and state regulations 40 CFR 60 Subpart Db and 6 NYCRR 227-2 establish emissions standards for NO_x for all four CSF boilers and continuous emissions monitoring requirements for NO_x covering Boilers 6 and 7. Conditions of the Title V Facility permit require quarterly reports to demonstrate ongoing compliance with the emissions standards. Conditions of the renewal permit specific to Boilers 1A and 5 require that stack tests be conducted once during the five-year term of the permit to confirm that the NO_x emissions standard is being met while Boiler 1A burns residual fuel and Boiler 5 burns residual fuel and natural gas in separate tests.

Another permit condition requires BNL to conduct a stack test of Boiler 7 once during the five-year term of the permit to confirm that the total suspended particulate emissions standard is being met while burning residual fuel. In June 2018, BNL's permit was revised with the addition of Condition 63 requiring the Laboratory to conduct stack tests of Boilers 1A, 5, and 6 once during the five-year term of the permit to confirm that total suspended particulate emissions do not exceed applicable emission limit of 0.2 lbs./MMBtu when burning residual fuel. Effective February 25, 2021, NYSDEC lowered the total suspended particulates emission limit of 6 NYCRR 227-1 for boilers with a maximum heat input capacities exceeding 50 MMBtu/hr to 0.1 lbs./MMBtu. In addition, DOE Order 436.1A (2023), *Departmental Sustainability*, requires that DOE sites comply with federal and state statutes and regulations.

In March 2023, the Laboratory received notice that minor Title V permit modifications submitted to NYSDEC in December 2022 had been approved. Included among the permit modifications was a request to remove the intermittent particulate emissions testing requirements of Condition 63. The Laboratory contended that Condition 63 should be removed based on NYSDEC's September 1, 2019 admission in the NYS Register that EPA AP-42 particulates emission factor for boilers burning residual oil with a sulfur content less than 0.50% wt. will be less than 0.1 lbs./MMBtu.

DATA QUALITY OBJECTIVE ANALYSIS

Step 1: State the Problem

CSF boilers subject to regulatory emissions and opacity standards rely on continuous emissions monitoring systems, intermittent emissions tests, periodic opacity observations, or sampling and analysis of materials used by the operation. Procedures have been established for operating and maintaining the boilers' continuous emissions monitoring systems (CEMS) and to make and log daily observations of stack opacity from Boilers 1A and 5. These procedures are designed to ensure:

- Compliance with regulatory permit monitoring and reporting requirements
- Collection and analysis of samples are performed according to EPA, state, and regulatory agency standards or guidelines.
- Compliance with NYSDEC Quality Assurance (QA) and Quality Control (QC) requirements for continuous emissions monitoring systems

Step 2: Identify the Decision

The desired decisions for the CSF boilers compliance and monitoring program can be cast as the following questions:

- Have we collected sufficient monitoring data during periods of boiler operation to meet minimum regulatory and permit data acquisition requirements?
- Are we in compliance with emissions and opacity standards and Title V Facility permit conditions?

Step 3: Identify Inputs to the Decision

Inputs necessary to support the decisions in Step 2 include:

- CEMS CO_2 and NO_x data for Boilers 6 and 7
- Opacity data for Boilers 6 and 7
- Analytical results of residual fuel analysis
- CSF Control Room log
- CEMS log
- Smoke Monitoring log sheets
- Daily CEMS calibration reports
- Contractor quarterly CEMS cylinder gas audit and opacity calibration error test results

Step 4: Define the Study Boundaries

The study boundaries incorporate the stacks for each of the four CSF boilers and continuous or periodic emissions monitoring equipment used to capture, analyze, and record representative samples for compliance monitoring purposes. NO_x data is recorded at 15-minute intervals and the data is reduced to one-hour block arithmetic averages. At least three data points are needed for a valid one-hour block average NO_x reading. Pursuant to 6 NYCRR Part 227-2.6, CEMS data for NO_x must demonstrate compliance with the NO_x emissions limits of the Title V permit on a 24-hour heat-weighted arithmetic average basis during the period from May 1 to September 30, and on a 30-day rolling average basis from October 1 to April 30.

The Boiler 6 and 7 opacity monitors record light transmittance across the stack diameters at ten-second intervals and automatically convert the data to percent opacity. Collected opacity data is reduced to six-minute averages that are compared to the opacity standards. Excess opacity is any six-minute average reading greater than 27 percent opacity or two or more six-minute average opacity readings in one hour greater than 20 percent opacity.

Periodic testing of Boilers 1A and 5 for conformance with the Title V Permit NO_x emissions limit must be conducted once during the five-year term of the permit (January 31, 2020, to January 30, 2025). Periodic tests of Boilers 1A, 5, 6, and 7 to confirm that flue gas emissions meet the Title V permit particulate emissions standard must also be conducted

once during the five-year term of the permit. The periodic test of Boiler 1A will consist of three one-hour test runs while the boiler is burning residual fuel oil with a nitrogen content not to exceed 0.30 percent by weight. Separate stack tests of Boiler 5 will be conducted while the boiler is burning natural gas and residual fuel with a nitrogen content not to exceed 0.30 percent by weight, and with each test consisting of three one-hour test runs. The particulate emissions tests of Boilers 1A, 5, 6, and 7 will consist of three one-hour test runs, while residual fuel oil is fired.

Step 5: Develop the Decision Rules

Decision 1

Have we collected sufficient monitoring data during periods of boiler operation to meet minimum regulatory and permit data acquisition requirements?

Calibration drift tests are conducted daily on the Boiler 6 and 7 NO_x and CO_2 CEMS. Whenever the measured drift exceeds twice the allowable drift test limits, the CEMS data logger flags this as a warning and the calibration is adjusted.

If the daily drift reading is greater than twice the drift limit five or more consecutive days or the drift reading is more than four times the drift limit, **then** the data logger flags the hourly NO_x as OC (Out of Control) periods.

All successive hourly periods are flagged as OC until corrective actions have been taken and the calibration drift measurements are less than the allowable limits (i.e., either less than two times or four times the allowable limit). OC periods are not counted as valid data. Periods of CEM maintenance, CEM calibration, and periods where erroneous data or system errors occur are all flagged by the CEMS data loggers and are counted as invalid data. Under conditions of the Title V Facility permit and requirements of 40 CFR Subpart Db and 6 NYCRR 227-2, sufficient monitoring data have been collected if there is valid CEMS data for 75 percent of the hours per day for 75 percent of the days of the month and 90 percent of the boiler operating hours in the quarter.

If at the end of the quarter it is determined that sufficient valid monitoring data has not been collected, **then** the data substitution method of 6 NYCRR 227-2.6(b) (3) (vii) will be used. Using this method, the 90th percentile value of all CEMS NO_x data collected over the last 180 boiler operating days will be substituted for the invalid or missing periods.

If NO_x monitoring data is not available during the quarter, **then** the data loggers flag the invalid data (e.g., OC – Out of Control, MD – CEM down for maintenance, ED – erroneous data/system error.).

OC periods and ED periods are the most likely source of insufficient data being captured during a quarter. Stationary engineers manning the CSF must record the apparent causes for invalid data and actions taken to restore proper CEMS operations. The CEMS Calibration Reports, the CSF Control Room log, and the CEMS log, are reviewed quarterly to ensure that the causes of the invalid periods are identified, and corrective and preventive actions are taken to prevent reoccurrences.

Decision 2

Are we in compliance with emissions and opacity standards and Title V Facility permit conditions?

If monitoring data, sample results, and opacity observations demonstrate compliance with emissions limits, opacity standards, and permit conditions, **then** compliance status is communicated to regulators through quarterly Air Emissions and Monitoring System Performance Reports and the Semi-Annual Monitoring Report.

If opacity observations show an exceedance of an emission or opacity standard and the cause is found to be due to quarterly calibration error testing of the opacity monitor or to boiler start-ups or shutdowns, **then** no further notifications beyond those made in quarterly Air Emissions and Monitoring System Performance Reports are required. If NO_x monitoring data shows an exceedance of an emission standard, the cause of the exceedance and the corrective actions taken to bring emissions under the standard are described in the quarterly report. Exceedances of emissions limits or opacity standards are described both quantitatively in Section 1 of the reports and qualitatively (determined causes of exceedances and the corrective or preventative action taken) in Section 5 of the reports.

If, however, emissions in excess of emissions standards or deviations from permit conditions are found to be due to unavoidable malfunctions of equipment during its operation or maintenance, **then** notification to regulatory agencies shall be made as soon as possible, but no later than 48 hours after the occurrence and an evaluation of the equipment malfunction will be conducted under the Standards Based Management System (SBMS) *Event/Issues Management* Subject Area.

Step 6: Specify Acceptable Error Tolerances

CEMS for NO_x have been used on Boilers 6 and 7 to demonstrate compliance with applicable NO_x emissions standards since these boilers became operational in November 1990 and May 1996, respectively. Initial performance tests of the CEMS for each boiler were conducted using EPA-approved methods to verify their accuracy and ensure that NO_x emissions standards were being met. For Boiler 7, initial testing included an emissions test to confirm that total suspended particulates were below the 40 CFR Subpart Db limit. To ensure that flue gas opacity limits are not exceeded, a continuous opacity monitor is required on Boiler 7. This monitor also serves as a surrogate monitoring device to ensure ongoing compliance with the total suspended particulates emissions limit. A separate continuous opacity monitor is voluntarily used on Boiler 6.

Because the CEMS are used to continuously demonstrate compliance with NO_x emissions standards and opacity limits, quality assurance is essential to ensure that the CEMS are functioning properly. To satisfy the quality assurance requirements of 40 CFR 60 Appendices B and F that are applicable to CEMS, a quality assurance plan for the CEMS for Boilers 7 was prepared and submitted to NYSDEC in 1994 along with an operating permit application. The quality assurance plan was subsequently amended in the summer of 1999 when a new dedicated CEMS was installed for Boiler 6.

Before the installation of the new system, emissions from Boiler No. 6 were monitored by a time-share system that electronically switched between stacks to continuously monitor flue gas concentrations of CO_2 and NO_x in Boilers 6 and 7. After installation of an opacity monitor for Boiler 6 was completed, a separate quality assurance plan for Boiler 6 CO_2, NO_x, and opacity CEMS was submitted to NYSDEC in June 2004. CEMS quality assurance plans for both boilers were revised in 2016, following the replacement of NOx analyzers for both boilers in July 2015, and again following the replacement of the continuous opacity monitors for both boilers in May 2018. The revised plans discuss quality assurance practices that are followed to satisfy the requirements set forth in 40 CFR 60 Appendix B and F.

The CEMS for NO_x and opacity undergo quality assurance checks on a daily and quarterly

basis. Daily calibrations to measure the relative accuracy of the CEMS are called calibration drift (CD) tests. The ESC Data Acquisition System initiates the CD tests each day at 7:00 a.m. and 8:00 a.m., respectively, for the Boiler 6 and 7 CEMS. For the CO_2 and NO_x monitors, samples from calibration gas cylinders are extracted and analyzed by the CEMS. The CD is the difference between the measured CEMS concentration of the cylinder gas sample and the certified concentration of the gas. For the transmissometer (opacity monitor), a calibrated filter screen is automatically placed in the transmissometer path. A spectrophotometer in the transmissometer measures the amount of light trapped by the filter screen and converts the value to an equivalent opacity. The CD is the difference between the measured opacity of the filter screen and the calibration value certified by the filter screen manufacturer. The allowable calibration drift test limits for each type of monitor are noted in the table below.

Table 5.3.1. Daily Drift Limits

CEM Pollutant	Allowable Limit	Maintenance Limit	Out of Control Limit
Opacity	± 1%	± 2 %	± 4 %
NOx	± 12.5 ppm	± 25 ppm	± 50 ppm
CO2	± 0.5 %	± 1 %	± 2 %

Whenever the measured drift exceeds the maintenance limits for NO_x and CO_2, the CEMS data logger flags this as a warning and the CSF personnel manually adjust the calibrations. If the daily drift reading is greater than the maintenance limit five or more consecutive days or the drift reading is more than the OC limit, the data logger flags the hourly NO_x as OC periods. All successive hourly periods are flagged as OC until corrective actions have been taken and the calibration drift measurements are less than the allowable limits.

For NO_x and CO_2 monitors, quarterly cylinder gas audits must be performed during three calendar quarters, and a relative accuracy test audit (RATA) of the CEMS must be done during one calendar quarter of the year. The cylinder gas audits are usually completed during the first, second, and third quarters of the year, while the RATA is normally completed during the fourth quarter. Quarterly calibration error tests must be performed each quarter for the opacity monitors.

Step 7: Optimize the Design

The current monitoring fulfills regulatory and Title V permit requirements for Boilers 1A, 5, 6, and 7. As previously noted, conditions within BNL's Title V permit require the Laboratory to conduct stack tests of Boilers 1A, 5, 6, and 7 once during the five-year term of the permit. Stack tests of Boilers 1A and 5 performed the week of December 3, 2018, and stack tests of Boilers 6 and 7 performed on January 23, 2019, confirmed that the total suspended particulate emissions standard were met while burning residual fuel. Test results for Boiler 1A confirmed that it met the NOx emission standard of 6 NYCRR 227-2.4(c)(1)(ii). Meanwhile, test results for Boiler 5 confirmed that it complied with the NOx emission standard when natural gas was combusted and exceeded the NOx emission standard of 0.15 lbs./MMBtu when residual fuel was burned.

During periods of operation, the opacity limitations of 6 NYCRR Part 227-1.3 are applicable to CSF Boilers 1A, 5, 6, and 7. This regulatory requirement restricts opacity from a boiler to not more than 20 percent (i.e., a six-minute average) except for one six-minute period per hour of not more than 27 percent opacity. Boiler 7 demonstrates compliance with this requirement via the continuous opacity monitor that was installed pursuant to the opacity monitoring requirements of 40 CFR 60 Subpart Db. To demonstrate that Boilers 1A, 5, and 6 comply with the opacity limitations of 6 NYCRR Part 227-1.3 during periods of operation, BNL made a commitment to use the flue gas oxygen monitors on each boiler as a surrogate indicator of opacity levels in its initial Title V permit application. Since the flue gas monitor data acquisition systems were programmed to record measured concentrations at two-minute, five-minute, ten-minute, hourly, or daily intervals, significant data acquisition system reprogramming would have been needed to report flue gas

oxygen concentrations as six-minute averages, the reporting interval that NYSDEC had preferred.

BNL staff discussed the matter with NYSDEC during an annual inspection of Title V permitted processes conducted on March 11, 2002. During these discussions, NYSDEC suggested an option that would allow BNL to certify compliance with the opacity limitations by making and recording daily observations of stack opacity using a method other than EPA Reference Method 9. The Laboratory subsequently developed and began using a new opacity monitoring procedure (BNL Energy & Utilities Procedure No. EU-CSF-018), whereby CSF operators objectively observe and record opacity daily using a 0–10 scale with a reading of 2 being "Economy Haze," a universally recognized term used by boiler operators that suggests an unacceptable level of opacity.

Because the individual opacity observations under this procedure are but snapshots of visible particulate emissions from each boiler and represent a small fraction of the boiler operating day, periods where excess particulate emissions might exceed 20 percent opacity are likely to go unnoticed. Recognizing the deficiencies in the procedure and the fact that violation of the opacity limits could result in the assessment of civil penalties up to $32,500 per violation per day, BNL requested and received funds to purchase and install continuous opacity monitors for each of the boilers. Installation of the Boiler 6 opacity monitor was completed in 2004. Calibration drift tests of the unit were successful and data acquisition system integration was finalized. Upon completion of performance testing conducted in accordance with the NYSDEC approved test protocol, the opacity monitor was brought online on October 1, 2004. BNL subsequently reconsidered its plans to purchase and install continuous opacity monitors for Boilers 1A and 5 and opted instead to continue to use the opacity observation procedure to demonstrate compliance with 6 NYCRR Part 227-1.4 opacity limits.

See Appendix B for the monitoring program for this DQO.

5.3 AIR MONITORING AT THE BROOKHAVEN LINAC ISOTOPE PRODUCER

DQO START DATE January 1, 2003

IMPLEMENTATION DATE January 1, 2024

POINT OF CONTACT Tim Welty (631) 344-4212

SUMMARY OF PROPOSED CHANGES

The Data Quality Objective was updated to capture two changes that will be made in calendar year (CY) 2024 at the Brookhaven National Laboratory (BNL) Linear Accelerator (LINAC) Isotope Producer (BLIP) facility. First, since the change from glass fiber-type particulate filter to a membrane-type filter was delayed in 2023, that change will be made in 2024. Second, mass flowmeters will be installed in the two sensing legs of the emissions monitoring system. Finally, an uninterruptible power supply will be placed in service for the continuous emissions monitoring system.

DESCRIPTION AND TECHNICAL BASIS

The BNL LINAC accelerates protons into the booster of the Alternating Gradient Synchrotron (AGS). The BLIP facility uses a beam of excess protons from the LINAC to irradiate targets for the production of short-lived radioisotopes used for medical diagnostic procedures and scientific research. The energy of the proton beam from the LINAC degrades through up to eight different BLIP targets placed in series. During the highest energy runs, the first target in the series is irradiated with protons up to 200 MeV and the last target is irradiated with protons up to 20 MeV. The proton beam current can reach 173 microAmperes, but the average range has been 80-166 microAmperes. During the irradiation process, the targets are cooled continuously by recirculating water in an 18-inch-diameter shaft, which is enclosed in a 30-foot underground tank. After irradiation, the targets are moved to the Radionuclide Research and Production Laboratory (RRPL), Building 801, for processing.

The principle gaseous radionuclides produced during target irradiation are oxygen-15 (half-life: 122.2 seconds) and carbon-11 (half-life: 20.38 minutes), due to the activation of cooling water and air. The BLIP facility exhaust effluent is monitored on a weekly basis for Gross Alpha, Gross Beta, and tritium emissions with particulate filters and silica gel cartridges at the location identified as 064-60. The sample collection and analyses are performed in accordance with Environmental Monitoring Standard Operating Procedure (EM-SOP-506), *Air Sampling at Radiological Emissions Facilities*, and 40 CFR 61 Appendix B, Method 114, prescribed by the US Environmental Protection Agency (EPA). Due to current BLIP operations, the estimated annual dose to the maximally exposed individual exceeds 0.1 mrem, the level at which EPA requires continuous emissions monitoring.

The latest authorization to construct and modify the BLIP facility stack was approved by EPA in August 2009, and the stack and sampling systems were last upgraded and modified to the ANSI N13.1-1999 standard before the start of the 2010 run season.

DRIVERS FOR MONITORING BEING CONDUCTED UNDER THIS CHANGE

__X__ Compliance
__X__ Support compliance
__X__ Surveillance
__ Restoration

DATA QUALITY OBJECTIVE ANALYSIS

Step 1: State the Problem

For the BLIP facility to be in compliance with the NESHAPs regulations, radiological air emissions are measured on a continuous basis and characterized properly. The technical problem is the sampling of the exhaust effluent for the activation radionuclides created from the proton beam, which include tritium, Beryllium-7, Carbon-11, Nitrogen-13, Oxygen-15, and Sodium-22. The potential hazards associated with BLIP are tritium in water vapor form and Carbon-11, Nitrogen-13, and Oxygen- 15 in gaseous form, as well as hazards from rare events such as target can failures. Sampling for tritium is conducted with silica gel, and sampling for particulates of alpha- and beta-emitting nuclides is conducted using two-inch-diameter particulate filters. The most significant gaseous effluents include Oxygen-15, with a 122.2-second half-life, and Carbon-11 (in CO_2), with a 20.38-minute half-life. These gaseous effluents decay via positron emissions and electron capture and contribute the most to the immersion dose in contaminated air, and therefore should be characterized to comply with regulations.

The radioactive gaseous emissions in the effluent cannot be captured by conventional methods, but their radioactivity is directly measured using a low-resolution gamma spectrometer with an in-line sampling system connected to the hot cell exhaust system. In addition, Carbon-11, Nitrogen-13, and Oxygen-15 spectra must be stripped to evaluate the potential for dose contribution from any of these radionuclides to be greater than ten percent of the total dose.

To be able to accurately quantify emissions during the entire year or for the period of an unusual event, the effluent flow rate must be measured and recorded on a periodic basis, and the accuracy of the flow rate measurement system must be verified on a periodic basis. The emissions monitoring system must also remain in continuous operation at all times since the exhaust system at BLIP operates continuously.

Step 2: Identify the Decision

The decisions for the BLIP monitoring program can be formulated as the following questions:

- Does the potential radiological dose to members of the public exceed one percent of the federal dose limit of 10 mrem per year?
- Is BNL in compliance with ambient air quality regulatory requirements?
- Have risk and dose to the members of the public exceeded any threshold values?
- Are facility emissions control and monitoring systems effective and robust?
- Are all actual and potential released radionuclides detected and identified?
- Which radionuclides, if any, contribute to dose in excess of the “10 percent of the dose” limit?

Step 3: Identify Inputs to the Decision

Conduct sampling and analysis in accordance with 40 CFR 61, Appendix B, Method 114. The following items need to be characterized before any dose estimates can be made. The inputs necessary for the decision include:

- Beam current, beam energy, water gaps between objects in the beam, and planned operations at BLIP
- Stack effluent flow rates—measured, characterized, and confirmed
- Short-lived gases emission rate—sampled, analyzed, and quantified
- Meteorological data
- Stack height, stack diameter, precipitation, and other variables
- Modeling of dose to maximally exposed off-site individual (MEOSI) using the current version of CAP-88 PC
- 40 CFR 61, Subpart H NESHAPs regulations
- Regulatory requirements (DOE Order 458.1)
- Analytical methods and detection limits (as described in this document)
- Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities: ANSI N13.1 - 2011
- Tritium – EPA Method 906
- Gross Alpha/Gross Beta – EPA method 900.0
- Results of alpha and gamma spectroscopy of the particulate filter
- Review of analytical results by project managers in accordance with Environmental Protection Division (EPD) data review procedures to ensure data are of acceptable quality

Step 4: Define the Study Boundaries

The purpose of the study is to characterize the radioactivity of BLIP stack emissions based on prescribed NESHAPs regulations and ANSI N13.1-2011 standards by collecting representative samples from an acceptable sampling point in the BLIP stack. The bounding conditions for sampling the effluents include:

- Expected temperature range at potential sampling points in the stack
- Air effluent flow rates, composition, and particle size representative of stack flow
- Proper air effluent mixing and stable extraction point

Step 5: Develop the Decision Rules

If any radionuclide is identified that is not naturally occurring in the environment, **then** evaluate the raw data to confirm the presence of the radionuclide and compare the concentration with the derived concentration guide to assure regulatory compliance. Calculate the effective dose and base the decision on the following:

- **If** the effective dose to the MEOSI is less than one percent of the NESHAPs standard of 10 mrem, **then** no action is required.
- **If** the dose is greater than one percent of the NESHAPs standard of 10 mrem and the facility is not continuously monitored, **then** the facility is non-compliant, and an evaluation will be conducted in accordance with the BNL *Event/Issues Management* Subject Area.
- **If** trending of emissions data from continuously monitored facilities at BNL, compared to historic operational releases, indicates potential dose below 15 percent of the NESHAPs standard of 10 mrem, **then** no action is required.
- **If** trending of emissions data from continuously monitored facilities at BNL, compared to historic operational releases, indicates potential dose to the MEOSI may be greater than 15 percent of the NESHAPs standard of 10 mrem, **then** use actual sample analysis data to continually track the estimate of expected resultant dose using the current version of the CAP88-PC modeling program **and** inform management of the program producing the subject emissions as well as the management of EPD to determine if mitigation measures need to be taken.
- **If** the effective dose to the MEOSI approaches 50 percent of the NESHAPs standard dose of 10 mrem**, then** a request for authorization from the Brookhaven Site Office to exceed the administrative control limit (ACL) of five mrem will be required.
- If the effective dose to a MEOSI exceeds 50 percent of the NESHAPs standard of 10 mrem, then the facility is approaching non-compliance, and without emissions mitigation will be approaching

violation of EPA regulations. This may result in a request for authorization from EPA to apply mitigation measures to the BLIP facility to avoid exceeding the standard.

Step 6: Specify Acceptable Error Tolerances

The acceptable error tolerances for record sampling and control monitoring are listed below.

Factor or Consideration	Record Sampling	Control Monitoring
Frequency of Sampling	Continuous	Continuous
Frequency of Measurement	Weekly	Real-time
Overall Accuracy	± 30%	± 40%
Overall Precision	± 30%	± 40%
Sampling Accuracy	± 20%	± 20%
Sampling Precision	± 20%	± 20%
Measurement Accuracy	± 20%	± 35%
Measurement Precision	± 20%	± 35%
System Availability	> 95%	> 95%

Step 7: Optimize the Design

The air-monitoring program shall be optimized based on the surveillance data collected, audits, air surveillance assessments, the anticipated source term, and level of system robustness every calendar year. After collection of air emissions data for a year and proper characterization of the short-lived gases Carbon-11 and Oxygen-15, BNL will undertake a design review of the emissions system. The design basis shall assess the cost–benefit impact and consider the necessity of measures to decrease the amount of radioactive emissions.

For CY 2024, one change shall be made to the monitoring system to optimize the program design for robustness and quality assurance. To more accurately measure and control the sampling system flow rates, mass flow meters will be added to the line sampling for short-lived gases and tritium as well as for the line sampling for gross alpha- and gross beta-emitting particulates.

See Appendix B for the monitoring program for this DQO.

5.4 AIR MONITORING AT THE RADIONUCLIDE RESEARCH AND PRODUCTION LABORATORY (RRPL) (BLDG. 801)

DQO START DATE January 1, 2003

IMPLEMENTATION DATE January 1, 2024

POINT OF CONTACT Tim Welty (631) 344-4212

SUMMARY OF PROPOSED CHANGES

For calendar year (CY) 2024, no changes are anticipated in the continuous emissions monitoring system at the RRPL.

DESCRIPTION AND TECHNICAL BASIS

The RRPL in Building 801 includes five semi-hot cells, three chemical processing hot cells, and three high-level hot cells for the handling and processing of radioactive materials. Three new hot cells were commissioned in CY 2023 to process targets for production of Actinium-225 (Ac-225). Metal targets irradiated at the Brookhaven LINAC Isotope Producer (BLIP) facility, and in the near future at the Cyclotron facility, are transported to the RRPL and radiopharmaceuticals are chemically extracted for medical use. Airborne radioactive emissions are generated as a result of procedures involving the processing of irradiated targets for the recovery of radioisotopes.

Each hot cell is provided with individual exhaust air filters, as well as a backup filter preceding discharge to a common duct leading to the Building 801 Main Exhaust stacks. Exhaust potentially containing airborne radionuclides released during the extraction process is drawn through an acid scrubber before going through multi-stage HEPA and High Efficiency Gas Adsorption (HEGA) filters and then to the Building 801 stacks. The RRPL emissions are monitored by sampling them with particulate filters, which are then tested for gross alpha/beta activity. The particulate filters also undergo alpha and gamma spectroscopy for alpha- and gamma-emitting particulates, and gaseous emissions are sampled for gaseous gamma emitters as well, with the advent of Thorium-232 targets. Radionuclides released to the atmosphere from RRPL operations have not been significant contributors to the site perimeter dose from the airborne pathway (less than one percent). This is not expected to change, but the potential exists for an increase in such emissions as processing production ramps up.

Department of Energy (DOE) facilities with airborne emissions that have the potential to deliver a radiation dose to a member of the public of greater than 0.1 mrem/yr. must be continuously monitored in accordance with National Emission Standards for Hazardous Air Pollutants (NESHAPs) requirements (40 CFR 61, Subpart H). The facilities with such emissions that fall below NESHAP levels require only periodic, confirmatory monitoring. The sample collection and analyses will continue to be done in accordance with Environmental Monitoring Standard Operating Procedure (EM-SOP-506), *Air Sampling at Radiological Emissions Facilities*, and 40 CFR 61 Appendix B, Method 114, prescribed by the U.S. Environmental Protection Agency (EPA).

In 2009, a decision was reached to decommission and demolish the 98-meter High-Flux Beam Reactor (HFBR) stack, which released the Building 801 emissions. Therefore, three new stacks were built on the roof of Building 801, with the modifications completed in August 2010. Historically, the emissions from Building 801 have been very low; therefore, authorization from the EPA was not required for the stack

modification. Nonetheless, the three new stacks were constructed and modified to comply with ANSI N13.1-1999 for radioactive emissions sampling. Each stack has a 12,400-cfm exhaust fan and, at any given time, two fans are operational with a capacity of ~23,390 cfm.

The existing multi-stage HEPA and HEGA filters for the exhaust system were kept intact. An additional multi-stage HEPA and HEGA filter train for the new hot cells, named All-inclusive Processing Hot Cells (AP Hot Cells), was added. Although the emissions from Building 801 are very small, the facility is continuously monitored as described above. In addition, the exhaust emissions from Ac-225 processing will require continuous spectroscopic monitoring as well.

DRIVERS FOR MONITORING BEING CONDUCTED UNDER THIS CHANGE

__X__ Compliance
__X__ Support compliance
__X__ Surveillance
____ Restoration

DATA QUALITY OBJECTIVE ANALYSIS

Step 1: State the Problem

- Laboratory operations that have the potential to impact the environment through discharge of radioactive emissions must be monitored in accordance with NESHAPs.
- The source term of operations includes new alpha-emitting and gamma-emitting nuclides.
- Exhaust potentially containing radioactive airborne emissions from the facility must be measured and recorded for annual reporting.
- Exhaust emissions must comply with DOE Order 458.1.
- Unplanned releases of radioactive airborne materials or gases must be detected and quantified.

Step 2: Identify the Decision

- Is BNL in compliance with ambient air quality regulatory requirements?
- Do dose and risk to members of the public exceed any threshold values?
- Are facility emissions control systems effective and robust?
- Which radionuclides, if any, contribute to offsite dose in excess of the "10 percent of the dose" limit?

Step 3: Identify Inputs to the Decision

Complete sampling and analysis in accordance with 40 CFR 61, Appendix B, and Method 114. The following items shall be characterized before any dose estimates can be made. The inputs necessary for the decision include:

- Stack effluent flow rates
- Quantified emission rates
- Meteorological data, including wind data
- Agricultural data
- Radionuclide emissions data
- Stack height, stack diameter, and other variables
- Model the dose to the maximally exposed off-site individual (MEOSI), using the current version of CAP88-PC, according to 40 CFR 61, Subpart H NESHAPs regulations
- Regulatory requirements (DOE Order 458.1 [2020], *Radiation Protection of the Public and the Environment*; DOE Order 436.1A [2023], *Departmental Sustainability*)
- Analytical methods and detection limits

- Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities: ANSI N13.1 (2011)
- Gross Alpha/Gross Beta Particulate Filter Analysis – EPA Method 900.0
- Gamma composite sampling and analysis – DOE HASL300
- Charcoal cartridge sampling and analysis for noble gases – DOE HASL300
- Real-time gamma detection counting and count channel analysis
- Review of analytical results by project managers in accordance with Environmental Protection Division (EPD) data review procedures to ensure data are of acceptable quality

Step 4: Define the Study Boundaries

Based on prescribed NESHAPs regulations and the ANSI N13.1-2011 standards, representative effluent and analysis samples are collected from an acceptable sampling point in the Building 801 main exhaust duct. The following parameters shall form the basis for the design of the system for sampling the effluents:

- Expected temperature range at potential sampling points in the stack
- Air effluent flow rates, composition, and particle size
- Proper air effluent mixing and stable-flow extraction point

Step 5: Develop the Decision Rules

If any gross alpha-, gross beta-, or gamma-emitting activity above the normal range is identified that is not naturally found in the environment, **then** use alpha and gamma spectroscopy results to identify the isotopes generating the activity. Make a comparison with the derived concentration guide to assure regulatory compliance. Calculate effective dose and base the decision on the following statement:

If the calculated dose from this facility, compared to historic operational releases, indicates a resultant dose to the MEOSI, then continually track the estimate of expected resultant dose using the current version of the CAP88-PC modeling program and inform the management of the program producing the subject emissions as well as the management of EPD to determine if mitigation measures need to be taken.

Step 6: Specify Acceptable Error Tolerances

The acceptable error tolerances for record sampling and control monitoring are listed below.

Factor or Consideration	Record Sampling	Control Monitoring
Frequency of Sampling	Continuous	Continuous
Frequency of Measurement	Weekly	Real-time
Overall Accuracy	± 30%	± 40%
Overall Precision	± 30%	± 40%
Sampling Accuracy	± 20%	± 20%
Sampling Precision	± 20%	± 20%
Measurement Accuracy	± 20%	± 35%
Measurement Precision	± 20%	± 35%
System Availability	> 95%	> 95%

The baseline condition (i.e., the null hypothesis [H_o]) was established for the emissions rate.

Step 7: Optimize the Design

The emissions monitoring program shall be optimized based on the surveillance data collected,

audits, and air surveillance assessments every calendar year.

In CY 2024, the design of the CEMS is anticipated to remain stable and without significant changes.

See Appendix B for the monitoring program for this DQO.

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