Air Quality 4

Brookhaven National Laboratory (BNL) monitors both radioactive and nonradioactive emissions at several facilities on site to ensure compliance with the requirements of the Clean Air Act (CAA). In addition, BNL conducts ambient air monitoring to verify local air quality and detect possible environmental impacts from Laboratory operations.

During 2020, BNL facilities released a total of 0.242 Curies of tritium. Because natural gas prices were comparatively lower than residual fuel oil prices throughout the year, BNL's Central Steam Facility used natural gas to meet 99 percent of the heating and cooling needs of the Laboratory's major facilities in 2020. As a result, emissions of particulates, oxides of nitrogen, sulfur dioxide, and volatile organic compounds were well below the respective regulatory permit criteria pollutant limits.

The COVID-19 pandemic had significant impacts on air travel greenhouse gas (GHG) emissions. From March 23 to September 30, when the Laboratory followed its limited operations plan consistent with New York State and Department of Energy guidelines, air travel emissions accounted for 2.5 percent of fiscal year 2020 totals. During this period, commuting GHG emissions were just 30 percent of the annual total, most likely due to 64 percent of employees working from home.

4.1 RADIOLOGICAL EMISSIONS

Federal air quality laws and U.S. Department of Energy (DOE) regulations that govern the release of airborne radioactive material include 40 CFR 61: Subpart H, National Emission Standards for Hazardous Air Pollutants (NESHAPs) part of the CAA, and DOE Order 458.1, Chg. 4, Radiation Protection of the Public and the Environment. Under NESHAPs Subpart H, facilities that have the potential to cause an annual radiation dose greater than 0.1 mrem (1 μSv) to a member of the public must continuously monitor emissions. Facilities capable of delivering radiation doses below that limit require periodic, confirmatory sampling.

BNL has two active facilities: the Brookhaven Linac Isotope Producer (BLIP), whose emissions are continuously monitored with an inline detection system, and the Target Processing Laboratory (TPL), which has a particulate filter sampling system to continuously collect samples for gross alpha and gross beta activity, and one inactive facility, the High Flux Beam Reactor (HFBR), where periodic emissions monitoring is conducted. Figure 4-1 provides the locations of these monitored facilities and Table 4-1 presents airborne release data from these facilities. Annual emissions from monitored facilities are discussed in the following sections of this chapter. The associated radiation dose estimates are presented in Table 8-5 in Chapter 8.

4.2 FACILITY MONITORING

Radioactive emissions are monitored at the HFBR, BLIP, and TPL. The sampling points in the exhaust stack for BLIP and the TPL exhaust duct are equipped with glass-fiber filters that capture samples of airborne particulate matter released from these facilities (see Figure 4-1). The filters are collected and analyzed weekly for gross alpha and beta activity. Particulate filter analytical results for gross alpha and beta activity in 2020 are reported in Table 4-2. The average gross alpha and beta airborne activity levels for samples collected from the BLIP exhaust stack were 0.0005 and 0.0055 pCi/m^3, respectively. Annual average gross alpha and beta airborne activity levels for samples collected from the TPL were 0.0007 and 0.0081 pCi/m^3, respectively.

4.2.1 High Flux Beam Reactor

In 1997, a groundwater plume was traced back to a leak in the HFBR spent fuel storage pool. Consequently, the HFBR was put in standby mode until November 1999, when the DOE declared that it

Figure 4-1. Air Emission Release Points Subject to Monitoring.

was to be permanently shut down. Residual tritium in water in the reactor vessel and piping systems continued to diffuse into the building's air through valve seals and other system penetrations, though emission rates were much lower than during the years of operation. In 2010, the HFBR was disconnected from the 100-meter stack, and a new HFBR exhaust system was installed in 2011. As part of the HFBR Long-Term Surveillance Program (BNL 2018), air samples are collected from outside the HFBR confinement structure using a permanently installed sample port. Samples are analyzed for tritium to evaluate facility emissions and to ensure that air quality within the building is acceptable to permit staff entry for inspections and routine maintenance. Samples are collected for three or four weeks per month using a standard desiccant sampling system for tritium analysis. Desiccant samples are analyzed by an off-site contract laboratory.

4.2.2 Brookhaven Linac Isotope Producer

Protons from the Linear Accelerator (LINAC) are sent via an underground beam tunnel to the BLIP, where they strike various metal targets to produce new radionuclides for medical diagnostics. The activated metal targets are transferred to the TPL in Building 801 for separation and shipment to various radiopharmaceutical research laboratories. During irradiation, the targets become hot and are cooled by a continuously recirculating water system. The

cooling water also becomes activated during the process, producing secondary radionuclides. The most significant of these radionuclides are oxygen-15 (O-15, half-life: 122 seconds) and carbon-11 (C-11, half-life: 20.4 minutes). During target irradiations, both isotopes are released as gaseous, airborne emissions through the facility's 33-foot stack. Emission levels of these radionuclides are dependent on the current and energy of the proton beam used to produce the radioisotopes. In 2020, the BLIP facility did not receive any proton beams due to year-long operational reviews and improvements. However, residual tritium produced from previous activation of the target cooling water continued to be released, totaling 0.0156 Curies. There were no emissions of O-15 or C-11 in 2020.

4.2.3 Target Processing Laboratory

As mentioned in Section 4.2.1, metal targets irradiated at the BLIP are transported to the TPL in Building 801, where isotopes are chemically extracted for radiopharmaceutical production. Airborne radionuclides released during the extraction process are drawn through multi-stage HEPA and charcoal filters and the filtered air is then vented to the atmosphere. The types of radionuclides that are produced depend on the isotopes chemically extracted from the irradiated metal targets, which may change from year to year. Annual radionuclide quantities released from this facility are very small, typically in the µCi to mCi range. Historical analytical results of TPL particulate filters show gross alpha/beta levels to be minimal. As a result, there are no reported radionuclide emissions from the TPL in Table 4-1. Should future gross beta analyses of TPL emissions show the potential for other radionuclide emissions, gamma analysis may be used to identify potentially emitted nuclides.

4.2.4 Additional Minor Sources

Several research departments at BNL use designated fume hoods for work that involves small quantities of radioactive materials in the µCi to mCi range. The work typically involves labeling chemical compounds and transferring material between containers. Due to the use of HEPA filters and activated charcoal filters, the nature of the work conducted, and the small quantities involved, these operations have a very low potential for atmospheric releases of significant quantities of radioactive materials. Compliance with NESHAPs Subpart H is demonstrated using an inventory system that allows an upper estimate of potential releases to be calculated.

Facilities that demonstrate compliance in this way include Buildings 463, 480, 490, 510, 734, 745, 815, and 820, where research is conducted in the fields of nuclear safety, biology, chemistry, high energy physics, photon science, advanced technology, environmental chemistry, and synthetic biology. See Table 8-5 in Chapter 8 for the calculated dose from these facility emissions.

Table 4-1. Airborne Radionuclide Releases from Monitored Facilities.

Facility	Nuclide	Half-Life	Ci Released
HFBR	Tritium	12.3 years	2.27E-01
BLIP	Tritium	12.3 years	1.56E-02
Total			**2.42E-01**

Notes:
1 Ci = 3.7E+10 Bq
BLIP = Brookhaven Linac Isotope Producer
HFBR = High Flux Beam Reactor (operations were terminated in November 1999)

4.2.5 Nonpoint Radiological Emission Sources

Nonpoint radiological emissions from a variety of diffuse sources may be evaluated for compliance with NESHAPs Subpart H. Diffuse sources evaluated often include planned research, planned waste management activities, and planned decontamination and decommissioning activities. Evaluations determine whether NESHAPs permitting and continuous monitoring requirements are applicable or periodic confirmatory sampling is needed to ensure compliance with Subpart H standards for radionuclide emissions. Chapter 8 discusses the NESHAPs evaluations of diffuse sources in 2020.

4.3 AMBIENT AIR MONITORING

As part of the Environmental Monitoring Program, air monitoring stations are in place around the perimeter of the BNL site (see Figure 4-2). There are four blockhouse stations equipped for collecting samples. At each blockhouse, vacuum pumps draw air through columns where particulate matter is captured on a glass-fiber filter. Particulate filters are collected weekly and analyzed for gross alpha and beta activity using a gas-flow proportional

counter. Also, water vapor for tritium analysis is collected on silica-gel adsorbent material for processing by liquid scintillation analysis. In 2020, silica-gel samples were collected every two weeks.

4.3.1 Gross Alpha and Beta Airborne Activity

Particulate filter analytical results for gross alpha and beta airborne activity are reported in Table 4-3. Ambient air samples are collected weekly from site perimeter monitoring stations P2, P4, P7, and P9. Validated samples are those not rejected due to equipment malfunction or other factors (e.g., sample air volumes were not acceptable).

The annual average gross alpha and beta airborne activity levels for the four monitoring stations were 0.0010 and 0.0125 pCi/m^3, respectively. Annual gross beta activity trends recorded at Station P7 are plotted in Figure 4-3. The results for this location are typical for the site and show seasonal variation in activity within a range that is representative of natural background levels. The New York State Department of Health (NYSDOH) received duplicate filter samples that were collected at Station P7, using a sampler provided by NYSDOH. These samples were collected weekly and analyzed by the NYSDOH laboratory for gross beta activity. The analytical results were comparable to the Station P7 samples analyzed by General Engineering Lab, an analytical laboratory contracted by BNL. New York State's analytical results for gross beta activity at the Laboratory were between 0.0025 and 0.0183 pCi/m^3, with an average concentration of 0.0077 pCi/m^3. BNL results ranged from 0.0064 to 0.0197 pCi/m^3, with an average concentration of 0.0119 pCi/m^3.

As part of a statewide monitoring program, NYSDOH also collects air samples in Albany, New York, a control location with no potential to be influenced by nuclear facility emissions. In 2020, NYSDOH reported that airborne gross beta activity at that location varied between 0.0018 and 0.0259 pCi/m^3 and had an average concentration of 0.0121 pCi/m^3. All the BNL samples were less than the maximum concentration collected at the NYSDOH control location, demonstrating that on-site radiological air quality was consistent with that observed at locations in New York State not located near radiological facilities.

Table 4-2. Gross Activity in Facility Air Particulate Filters.

Monitored Facility		Gross Alpha (pCi/m^3)	Gross Beta (pCi/m^3)
BLIP	N	52	52
	Max.	0.0017 ± 0.0009	0.0129 ± 0.0015
	Avg.	0.0005 ± 0.0005	0.0055 ± 0.0011
	MDL	0.0009*	0.0010*
TPL - Bldg. 801	N	51	51
	Max.	0.0059 ± 0.0012	0.0356 ± 0.0021
	Avg.	0.0007 ± 0.0005	0.0081 ± 0.0010
	MDL	0.0006*	0.0008*

Notes:
See Figure 4-1 for monitored facility locations.
All values shown with a 95% confidence interval.
BLIP = Brookhaven Linac Isotope Producer
MDL = Minimum Detection Limit
N = Number of validated samples collected
TPL = Target Processing Laboratory
*Average MDL for all validated samples taken at this location

Table 4-3. Gross Activity Detected in Ambient Air Monitoring Particulate Filters.

Sample Station		Gross Alpha (pCi/m^3)	Gross Beta (pCi/m^3)
P2	N	51	51
	Max	0.0023 ± 0.0006	0.0268 ± 0.0031
	Avg.	0.0010 ± 0.0005	0.0131 ± 0.0012
	MDL	0.0006*	0.0007*
P4	N	50	50
	Max	0.0027 ± 0.0006	0.0198 ± 0.0013
	Avg.	0.0010 ± 0.0005	0.0133 ± 0.0012
	MDL	0.0005*	0.0007*
P7	N	50	50
	Max	0.0033 ± 0.0006	0.0197 ± 0.0016
	Avg.	0.0010 ± 0.0005	0.0119± 0.0011
	MDL	0.0005*	0.0007
P9	N	50	50
	Max	0.0020 ± 0.0007	0.0217 ± 0.0014
	Avg.	0.0011 ± 0.0005	0.0117 ± 0.0011
	MDL	0.0005*	0.0006*
Grand Average		**0.0010 ± 0.0005**	**0.0125 ± 0.0011**

Notes:
See Figure 4-2 for sample station locations.
All values shown with a 95% confidence interval.
MDL = minimum detection limit
N = Number of validated samples collected
*Average MDL for all validated samples taken at this location

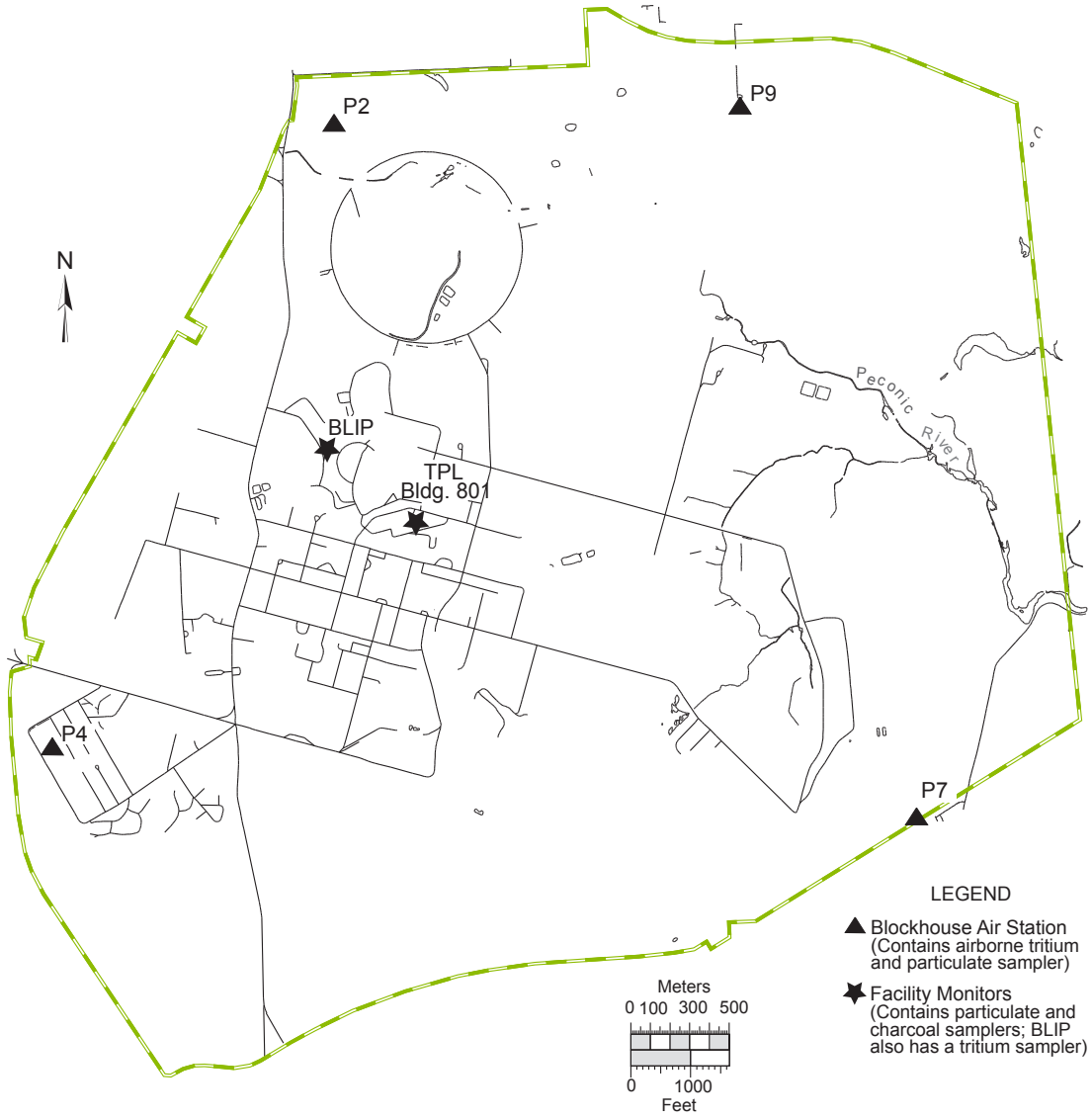


Figure 4-2. BNL On-Site Ambient Air Monitoring Stations.

4.3.2 Airborne Tritium

Airborne tritium in the form of tritiated water (HTO) is monitored throughout the BNL site. In 2020, samples were collected from Stations P2, P4, P7, and P9 to assess the potential impacts from the Laboratory's two tritium sources. Table 4-4 lists the number of validated samples collected at each location, the maximum value observed, and the annual average concentration. Validated samples are those not rejected due to equipment malfunction or other factors (e.g., a battery failure in the sampler, frozen or supersaturated silica gel, insufficient sample volumes, or the loss of sample during preparation at the contract analytical laboratory). Samples for airborne tritium were collected every two weeks from each sampling station during 2020. The average tritium concentrations at all the sampling locations were less than the typical minimum detection limits, ranging from 4.3 to 12.8 pCi/m^3.

4.4 NONRADIOLOGICAL AIRBORNE EMISSIONS

Various state and federal regulations governing non-radiological releases require facilities to

conduct periodic or continuous emission monitoring to demonstrate compliance with emission limits. The Central Steam Facility (CSF) is the only BNL facility that requires monitoring for non-radiological emissions. The Laboratory has several other emission sources subject to state and federal regulatory requirements that do not require emission monitoring (see Chapter 3 for details).

The CSF supplies steam for heating and cooling to major BNL facilities through an underground steam distribution and condensate grid. The location of the CSF is shown in Figure 4-1. The combustion units at the CSF are designated as Boilers 1A, 5, 6, and 7. Boiler 1A, which was installed in 1962, has a heat input of 16.4 MW (56.7 million British thermal units [MMBtu/per hour). Boiler 5, installed in 1965, has a heat input of 65.3 MW (225 MMBtu/hr). The newest units, Boilers 6 and 7, were installed in 1984 and 1996, and each has a heat input of 42.6 MW (147 MMBtu/hr). For perspective, National Grid's Northport, New York, power station has four utility-sized turbine/generator boilers, each with a maximum-rated heat input of 385 MW (1,315 MMBtu/hr).

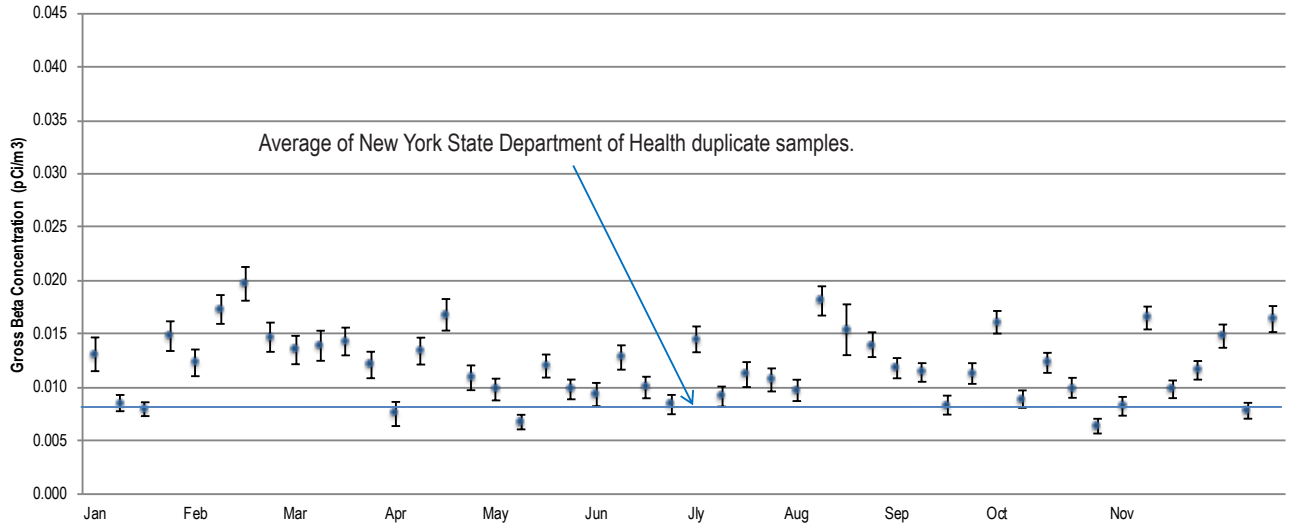
Because the CSF boilers have the potential to emit more than 100 tons per year of oxides of nitrogen (NOx), the CSF is considered a major facility, and all four of its boilers are subject to the Reasonably Available Control Technology (RACT) requirements of Title 6 of the New York Code, Rules, and Regulations (NYCRR) Subpart 227-2. Because of their design, heat inputs, and dates of installation, Boilers 6 and 7 are also subject to the Federal New Source Performance Standard (40 CFR 60, Subpart Db: Standards of Performance for Industrial-Commercial-Institutional Steam Boilers). Both boilers are equipped with continuous emission monitoring systems (CEMS) to show compliance with NOx standards of Subpart 227-2 and Subpart Db, and with continuous opacity monitors to demonstrate compliance with Subpart Db opacity monitoring requirements. To measure combustion efficiency, the boilers are also monitored for carbon monoxide (CO). Continuous emission monitoring results from the two boilers are reported quarterly to EPA and the New York State Department of Environmental Conservation (NYSDEC).

The Subpart 227-2 NOx RACT emission limit for the combustion of natural gas and the combustion of No. 6 oil burned in the CSF three large boilers is 0.15 lbs/MMBtu. The NOx RACT emission limit for the CSF's one mid-size boiler (Boiler 1A) is 0.20 lbs/MMBtu. From May 1 to September 15 of each year, the peak ozone period, owners and operators of boilers equipped with CEMS must demonstrate compliance with Subpart 227-2 NOx RACT limits by calculating the 24-hour average emission rate from CEMS readings and comparing the value to the emission limit. During the remainder of the year, the calculated 30-day rolling average emission rate is used to establish compliance. Owners and operators of boilers not equipped with CEMS must demonstrate compliance with NOx RACT limits via periodic emissions testing. Following the end of each calendar quarter, facilities with boilers equipped with CEMS must tabulate and summarize emissions, monitoring, and operating parameter measurements recorded during the preceding three months. Measured opacity levels cannot exceed 20 percent opacity, except for one six-minute period per hour of not more than 27 percent opacity.

When No. 6 oil was burned, past emissions testing and CEMS results have shown that CSF boilers 5, 6, and 7 cannot meet the new lower NOx RACT standards; therefore, BNL uses an approved system averaging plan to demonstrate compliance in quarterly reports submitted to NYSDEC. This plan utilizes a NOx ledger, where NOx rate credits accumulated during quarterly periods when natural gas is burned at levels below the NOx RACT limits offset ledger debits that occur when Boilers 5, 6, and 7 burn oil. The ledger must show that the actual NOx weighted average emission rate of operating boilers is less than the Subpart 227-2 permissible NOx weighted average rate for the quarter.

The actual weighted average emission rates for operating boilers in the first, second, third, and fourth quarters, respectively, were 0.085, 0.088, 0.087, and 0.108 lbs/MMBtu, while the corresponding permissible weighted average emissions rate for all four quarters was 0.150 lbs/MMBtu.

In 2020, there were 20 recorded excess opacity measurements. Recorded readings on July 27 and December 1 and four recorded readings on December 15 were due to the start-up and shutdown



Note: All values are presented with a 95 percent confidence interval.

Figure 4-3. Airborne Gross Beta Concentration Trend Recorded at Station P7.

of Boiler 6. A single Boiler 6 excess opacity reading on October 13 was from an unknown cause. Ten additional excess opacity readings on December 15 were the result of heavy snowfall that obstructed the transmission of light in the Boiler 6 continuous opacity monitor. While there are no regulatory requirements to continuously monitor opacity for Boilers 1A and 5, surveillance monitoring of visible stack emissions is a condition of BNL's Title V operating permit. Daily observations of stack gases recorded by CSF personnel throughout the year showed no visible emissions on days when the boilers were operated.

To satisfy quality assurance requirements for the continuous emissions monitoring system of the Laboratory's Title V operating permit, a relative accuracy test audit (RATA) of the Boilers 6 and 7 continuous emissions monitoring systems for NOx and CO_2 was conducted in December 2020. The results of the RATA demonstrated that the Boiler 6 and 7 NOx and CO_2 continuous emissions monitoring systems met RATA acceptance criteria, which are defined in 40 CFR 60, Appendix B, Specifications 2 and 3.

In 2020, residual fuel prices exceeded those of natural gas for most of the year. As a result, natural gas was used to supply 99 percent of the heating and cooling needs of BNL's major facilities. By comparison, in 2016, residual fuel satisfied 21 percent of the major facility heating and cooling needs. Consequently, 2020 emissions of particulates, NOx, and sulfur dioxide (SO_2) were 1.5, 4.7, and 17.8 tons less than the respective totals for 2016, when No. 6 oil was used to supply a much higher percent of site heating and cooling needs. Table 4-5 shows fuel use and emissions since 2011.

4.5 GREENHOUSE GAS EMISSIONS

Since the implementation guidance for Executive Order (EO) 13834, Efficient Federal Operations, that was released in April 2019 did not require agencies to amend greenhouse gas (GHG) reduction targets, the Laboratory has continued to strive to achieve the numerical targets set forth in EO 13693.

One of the overarching goals of EO 13693 was for federal agencies to establish agency-wide GHG reduction targets for their combined Scope 1 and 2 GHG emissions and for their Scope 3 GHG emissions (see Appendix A for definitions). DOE set the following GHG emission reduction goals for fiscal year (FY) 2025: reduce Scope 1 and 2 GHG emissions by 50 percent relative to its FY 2008 baseline and reduce Scope 3 GHG emissions by 25 percent relative to its FY 2008 baseline. BNL includes these same goals in its annual Site Sustainability Plan (SSP), which it submits to DOE in December of each year (BNL 2020). BNL's SSP identifies several actions that have or will be taken to help the

Table 4-4. Ambient Airborne Tritium Measurements in 2020.

Sample Station	Wind Sector	Validated Samples	Maximum (pCi/m³)	Average (pCi/m³)
P2	NNW	26	6.0 ± 4.8	0.3 ± 4.1
P4	WSW	26	7.0 ± 5.7	-0.4 ± 5.5
P7	ESE	26	7.4 ± 5.2	-0.1 ± 5.3
P9	NE	26	8.3 ± 6.5	0.5 ± 5.2
Grand Average				**0.1 ± 5.0**

Notes:
See Figure 4-2 for station locations.
Wind sector is the downwind direction of the sample station from the High Flux Beam Reactor (HFBR) stack.
All values reported with a 95% confidence interval.
Typical minimum detection limit for tritium is between 4.3 and 12.8 pCi/m³.

Laboratory progress towards meeting the Scope 1 and 2 GHG emissions reduction goal.

In November 2011, the Long Island Solar Farm (LISF), a large array of more than 164,000 solar photovoltaic panels constructed on the BNL site, began producing solar power. The LISF was estimated to deliver an annual average of 44 million kilowatt-hours (kWh) per year of solar energy into the local utility grid over a 20-year period. To date, it has exceeded the estimate every year; in 2020, the LISF provided 48 million kilowatt-hours of solar energy to Long Island. This equates to 25,988 metric tons CO_2 equivalents (MT CO_2e) GHG offset or reduction.

Even though the power from the LISF is purchased by the local utility, the Laboratory receives GHG reduction credits by purchasing an equivalent amount of Renewable Energy Credits (RECs) each year. In March 2011, BNL began receiving 15 megawatts per hour of hydropower from the New York Power Authority. In 2020, BNL consumed 116,430 megawatts of hydropower, providing a net combined GHG reduction of 39,117 MT CO_2e from the LISF and hydropower. Furthermore, in 2016 BNL completed an expansion of the Northeast Solar Energy Research Center (NSERC). The NSERC is a solar photovoltaic facility that now has a total peak capacity of 907 kW. In 2020, it provided 977,967 kWh and offset 529 MT CO_2e.

DOE awarded BNL's first Utility Energy Service Contract (UESC) in October 2013. This project provided for the implementation of energy savings measures to reduce Scope 1 and 2 GHG levels by approximately 7,000 MT CO_2e. The USEC project implementation was completed in May 2015 and included the following energy conservation measures:

- Installation of a 1,250-ton high-efficiency chiller to increase the efficiency of supplied chilled water;
- Upgraded lighting systems in 18 buildings; and

Table 4-5. Central Steam Facility Fuel Use and Emissions (2011–2020).

	Annual Fuel Use and Fuel Heating Values						Emissions			
Year	No. 6 Oil (10^3 gals)	Heating Value (MMBtu)	No. 2 Oil (10^3 gals)	Heating Value (MMBtu)	Natural Gas (10^6 ft³)	Heating Value (MMBtu)	TSP (tons)	NO_x (tons)	SO_2 (tons)	VOCs (tons)
2011	31.49	4,726	0.01	2	657.06	668,564	2.6	30.4	0.9	1.8
2012	43.44	6,519	0.00	0	613.44	630,616	2.5	29.1	1.2	1.7
2013	117.21	17,590	0.00	0	631.95	649,645	2.9	30.7	2.9	1.8
2014	34.03	5,107	0.00	0	673.80	690,584	2.6	30.9	1.0	1.9
2015	9.66	1,449	0.00	0	619.98	638,209	2.4	30.3	0.4	1.7
2016	804.38	120,712	0.00	0	441.98	453,348	3.7	33.6	19.0	1.7
2017	65.07	9,765	0.00	0	564.96	579,559	2.3	28.2	1.7	1.6
2018	36.04	5,409	0.04	6	642.33	662,242	2.5	31.5	1.0	1.8
2019	15.56	2,335	0.13	17.94	588.49	649,343	2.3	28.5	0.5	1.6
2020	44.20	6,455	0	0	553.70	610,905	2.2	28.9	1.2	1.5
Permit Limit (in tons)							**113.3**	**159.0**	**445.0**	**39.7**

Notes:
NO_x = oxides of nitrogen
SO_2 = sulfur dioxide
TSP = total suspended particulates
VOCs = volatile organic compounds

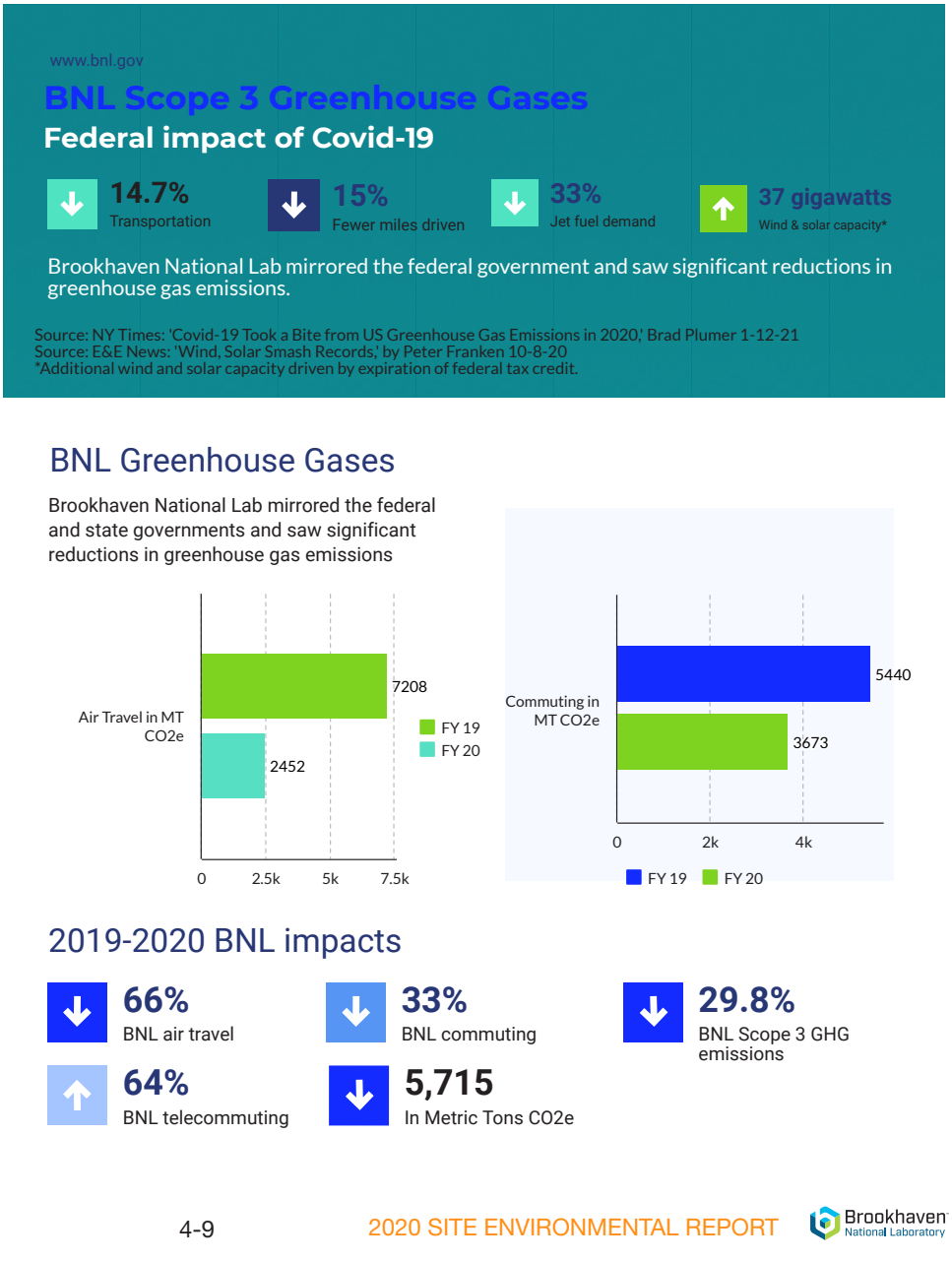
- Enhanced building control upgrades and additions to provide for heating, ventilation, and air conditioning temperature setbacks in nine buildings.

The UESC project has been a success, with annual energy savings within three percent of the original estimates for each of the six years since completion. In FY 2018, an investment grade audit (IGA) was initiated for potential Phase II UESC projects. In 2019, the IGA was completed and the process to issue a contract was begun. Planned energy savings projects under consideration include additional lighting and building control upgrades, free cooling, and some HVAC improvements for the Chemistry Building. Due to some concerns by Brookhaven Science Associates and DOE, the UESC II effort was temporarily paused. However, it is expected to resume soon. BNL continues to periodically evaluate the potential to install a combined heat and power plant, as well as renewable energy projects, and will recommend going forward if a business case is developed to make installation a viable alternative.

To meet the 2025 Scope 3 GHG emissions reduction goal, Scope 3 emissions must be lowered by 5,034 MT CO_2e from the FY 2008 baseline of 20,136 MT CO_2e. Overall, Scope 3 GHG emissions decreased by 5,715 MT CO_2e, down 29.8 percent from FY 2019, and 33 percent less than the FY 2008 baseline value of 20,136 MT CO_2e. The decrease from FY 2019 is mostly due to a 4,756 MT CO_2e drop in GHG emissions from business air travel, and a 1,767 MT CO_2e decrease in commuting GHG emissions.

The COVID-19 pandemic had significant impacts on national transportation, as well as Laboratory air travel and commuting GHG emissions, as noted in Figure 4-4. From March 23 to September 30, when the Laboratory followed its limited operations plan consistent with New York State and DOE guidelines, air travel GHG emissions accounted for just 2.5 percent of FY 2020 total air travel emissions. During this period, commuting GHG emissions were just 30 percent of the annual total, since 64 percent of employees were working at home.

Figure 4-4. BNL Scope 3 Greenhouse Gases: Federal Impact of Covid-19



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