

UVA 2019 GREENHOUSE GAS INVENTORY

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UVA SUSTAINABILITY
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SUSTAINABILITY · UVA
From the Grounds Up

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Executive Summary

In Calendar Year 2009, the baseline year for emissions analysis, UVA's greenhouse gas (GHG) emissions footprint was 337,742.4 Metric Tons of Carbon Dioxide Equivalent (MTCDE). In Calendar Year 2019, emissions decreased to 245,302.6 MTCDE, resulting in a 27.4 percent reduction in emissions compared to 2009. **As of 2019, UVA has successfully reached its goal of reducing GHG emissions 25% below 2009 level by 2025.**

The reduction relative to 2009 is largely a result of an increase in renewable energy consumption, continued fuel switching on-Grounds, energy efficiency activities in existing buildings and plants, and improvements made to the electricity grid. It is important to note that UVA's GHG Inventory includes the Health System, which contributes approximately 40 percent of the total emissions produced by the University. Figure 1 and Table 1 below reports UVA's 2019 GHG emissions by source.

Figure 1: UVA GHG Emissions by source (MTCDE), 2009-2019

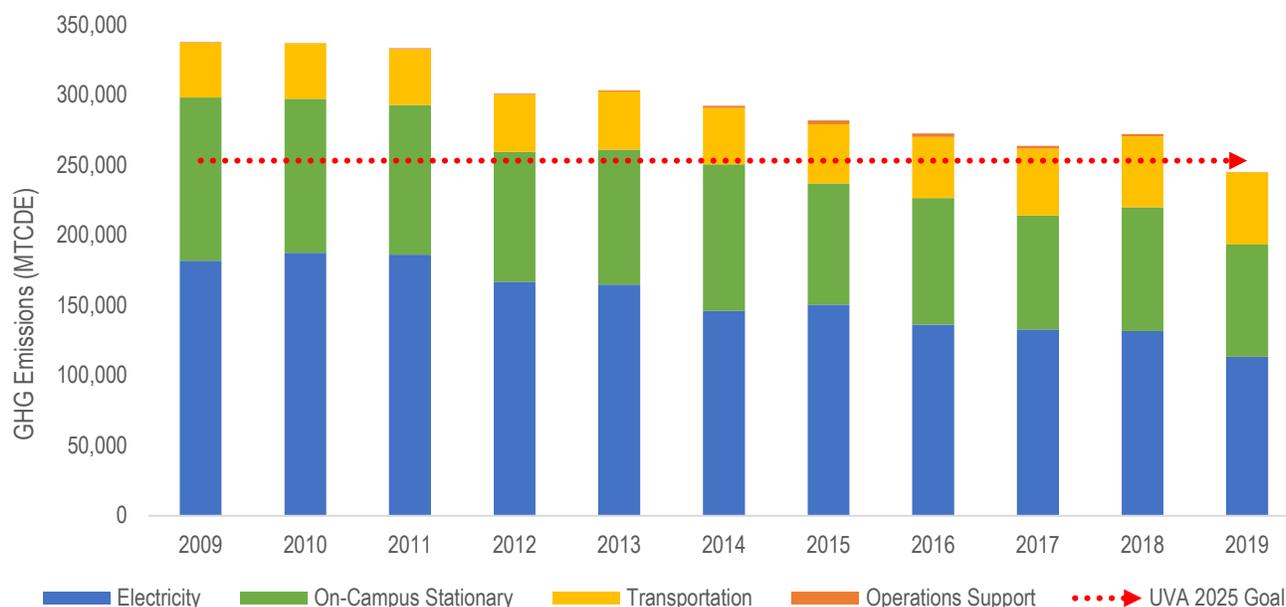


Table 1: UVA GHG Emissions by source (MTCDE), 2009-2019

GHG Source	2009	2010	2015	2016	2017	2018	2019
Electricity	182,023.6	187,561.8	150,510.6	136,398.0	132,847.3	131,891.0	113,361.1
Fuel	116,406.4	109,886.1	86,494.5	90,232.8	81,243.9	88,186.0	80,157.4
Transportation	38,946.0	39,472.4	42,236.2	43,478.1	47,625.4	50,545.5	51,573.2
Operations Support	366.4	230.3	2,742.1	2,625.7	2,066.1	1,530.5	211.0
Total Net Emissions	337,742.4	337,150.6	281,983.5	272,734.6	263,782.8	272,152.9	245,302.6

*Totals may not sum due to independent rounding.

Background

In 2011 the University of Virginia committed to reduce greenhouse gas (GHG) emissions 25 percent below 2009 levels by 2025. To track progress, UVA's GHG inventory is calculated annually by the Office for Sustainability and reviewed within Facilities Management. This report defines UVA's GHG accounting methodology, documents the current footprint, and analyzes the observed emission trends to target areas for further reductions.

Methodology

UVA's 2019 GHG emissions were calculated using the web-based Sustainability Indicator Management & Analysis Platform (SIMAP) developed by the University of New Hampshire. The methodologies in this tool are aligned with the recommendations of the American College and University Presidents' Climate Commitment (ACUPCC) guidance, which refers to The Climate Registry's General Reporting Protocol and the World Resource Institutes' Greenhouse Gas Protocol Corporate Accounting and Reporting Standard.

Electricity GHG emissions were calculated using the Market-Based regional electricity emissions factors from EPA's eGRID Database. EPA's eGRID Database is the preeminent source of air emission data for the electric power sector. Over time, eGRID's emissions factors (lbs. of emissions / MWh of electricity generated) have decreased due to new technologies improving the generation process or the increased use of renewables in the fuel mix. Additionally, as of 2018, UVA transitioned from eGRID's location-based emission factors to its market-based emission factors because it allows UVA to claim the specific emission rate associated with the RECs purchased from the Dominion owned and operated Hollyfield and Puller utility-scale solar projects.

SIMAP calculates GHG emissions from activities that produce carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and refrigerants. Emissions of CH₄, N₂O, and refrigerants are converted to metric tons of carbon dioxide equivalent (MTCDE) using Global Warming Potentials (GWPs) provided by the Intergovernmental Panel on Climate Change's Assessment Reports. This allows UVA to calculate a total carbon emissions Inventory for the University.

Inventory boundary

UVA's GHG inventory includes any emissions related to the functional operation of the University. This best aligns with an "Operational Control Approach" which includes emission sources UVA has the authority to affect through operating policies.

UVA's GHG emissions are generated from four distinct sources: Electricity, Fuel, Transportation, and Operations Support. Electricity includes purchased electricity as well as transmission and distribution (T&D) losses. Fuel includes coal, natural gas, distillate oil, and propane used on Grounds. Transportation includes direct emissions from fleet vehicles used as well as student,

faculty, and staff commuting. Operations Support includes fertilizer, refrigerants, solid waste, and wastewater emissions, which are all necessary for the functioning of the University.

The inventory includes all UVA-owned properties in the City of Charlottesville, Albemarle County, as well as some remote research buildings in the Commonwealth of Virginia, namely Mountain Lake Biological Station, and Anheuser-Busch Coastal Research Center. These buildings have either electricity provided through a UVA substation, a direct electricity feed and a bill paid by Facilities Management, or thermal energy provided from one of UVA's heating or chiller plants. Leased properties, UVA Foundation properties, the College at Wise, and UVA property in other geographic locations are not currently included in this GHG inventory boundary because they are either outside of UVA's operational control or utility billing is not available.

It is important to note several GHG sources are not included in UVA's GHG Inventory such as study abroad travel, holiday travel, and business travel. These emission sources have not been included because University-wide reporting methods do not currently exist in the appropriate capacity to generate consolidated and complete information. Likewise, GHG emissions from purchased paper is not included in this Inventory because a method of accurately accounting for paper purchasing on a University-wide basis is not available.

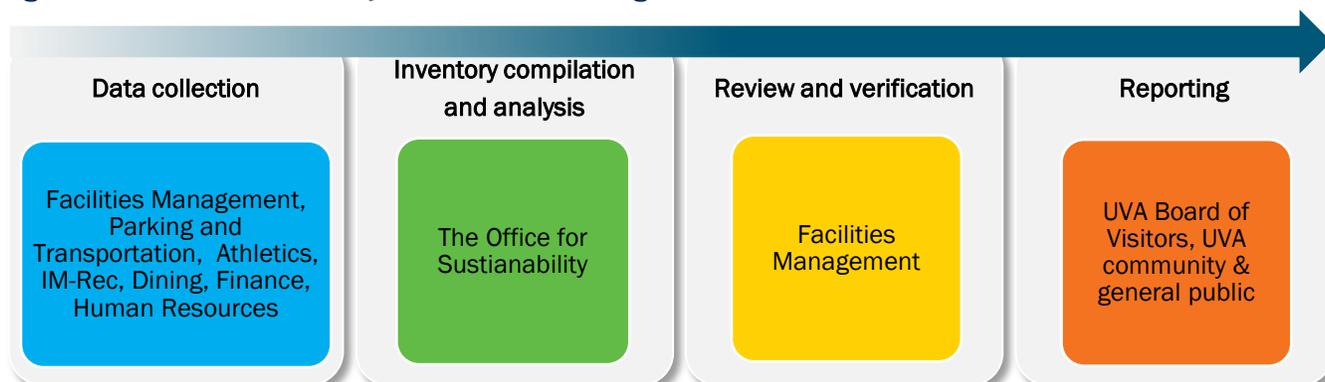
Data collection

Data input into SIMAP is derived from a variety of University personnel and sources. Fuel and electricity consumption are metered, and records are retained by Facilities Management. Direct transportation fuel consumption is maintained by Parking and Transportation. Records of refrigerant use are sourced from a variety of locations with Facilities Management and Dining being the primary contributors. Fertilizers are used and logged by Landscaping (Facilities Management), Athletics, and Intramural-Recreational Sports (IM-Rec).

Institutional arrangements

Figure 2 portrays UVA's institutional arrangements regarding the GHG Inventory process.

Figure 2: UVA GHG Inventory Institutional Arrangements



Addressing growth

The expansion to the University's offerings has resulted in growth in both population and building area. Since 2009, there has been a population increase of 6,084 students, faculty, and staff (a 20.2 percent increase). An approximately 2.2 million square feet (a 14.5 percent increase) of building space has been added to UVA's footprint and included within the boundaries defined for UVA's GHG inventory. The University's commitment to achieving this goal considering the continuing expansion is driving heavy investments in expanding sustainability efforts to enhance the University's operations and building portfolio.

Emissions by scope

When broken down by scope, UVA's largest contributor to overall net emissions are Scope 2 emissions, which accounts for the impacts of purchased electricity. Since 2009, Scope 2 has consistently accounted for approximately 50 percent of UVA's total net emissions inventory. In 2019, Scope 2 emissions accounted for 43.5 percent of total emissions. Scope 1 emissions contributed the second most (34.4 percent) while Scope 3 emissions contributed the remainder (22.1 percent). Figure 3 and Table 2 below reports UVA's 2019 GHG emissions by scope.

Figure 3: UVA GHG Emissions by scope (MTCDE), 2009-2019

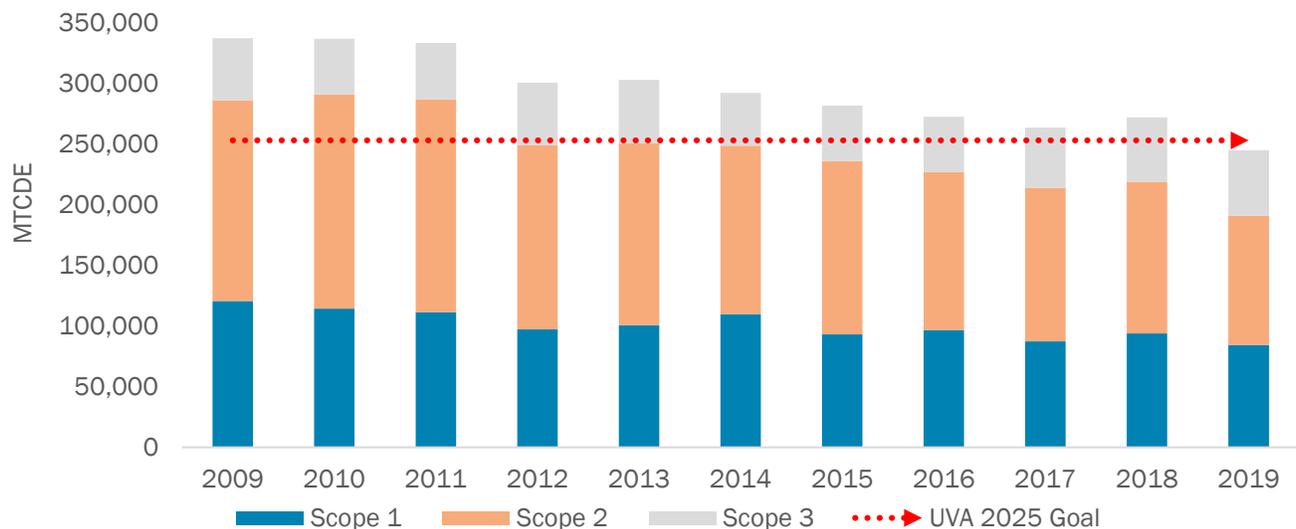


Table 2: UVA GHG Emissions by scope (MTCDE), 2009-2019

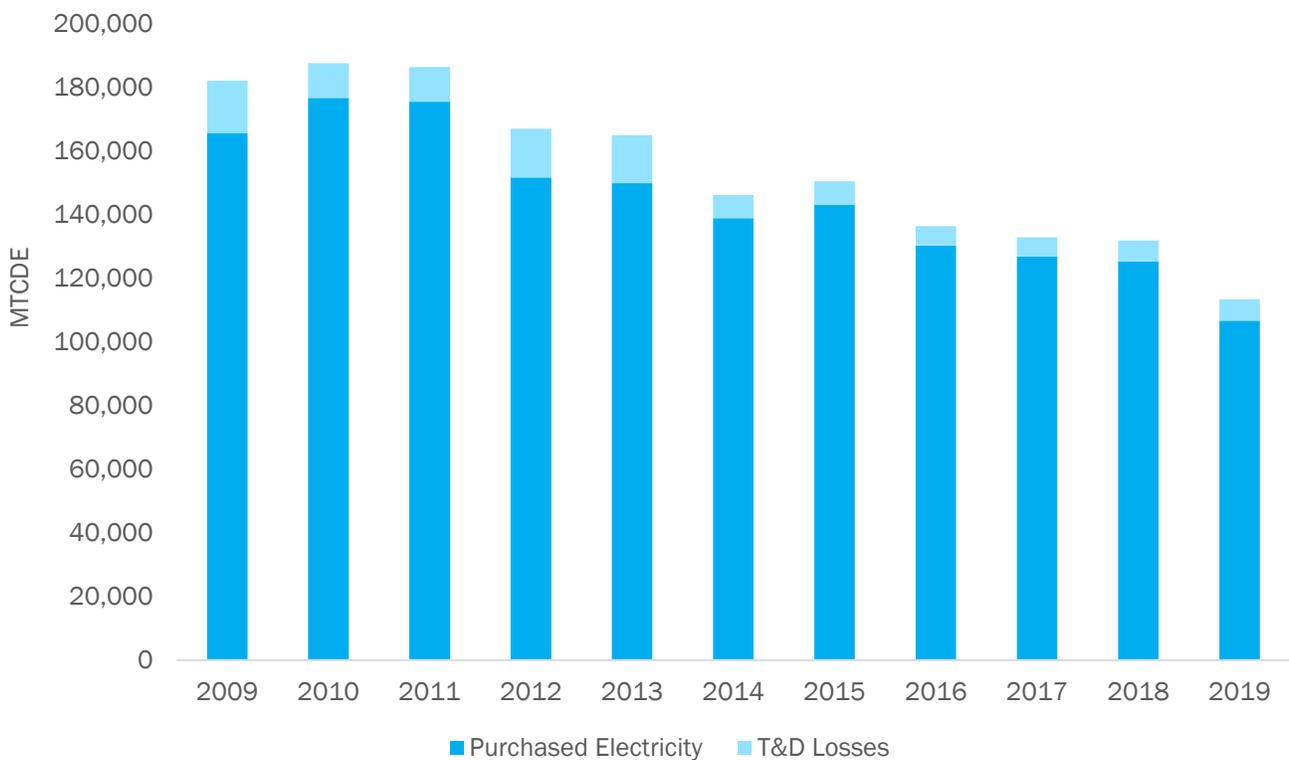
GHG Scope	2009	2010	2015	2016	2017	2018	2019
Scope 1	120,719.7	114,479.6	93,285.8	96,832.4	87,430.4	93,956.8	84,403.1
Scope 2	165,641.5	176,643.8	143,030.3	130,273.8	126,882.4	125,303.9	106,729.5
Scope 3	51,381.2	46,027.2	45,667.5	45,628.5	49,470.0	52,892.2	54,170.1
Total Net Emissions	337,742.4	337,150.6	281,983.5	272,734.6	263,782.8	272,152.9	245,302.6

*Totals may not sum due to independent rounding.

Electricity

Electricity consumption continues to be the largest source of greenhouse gas emissions at the University. In 2019, purchased electricity and its associated transportation and distribution (T&D) losses accounted for 113,361.1 MTCDE, or 46.2 percent of total UVA emissions. This was a 4.6 percent decrease from 2018 and a 14.3 percent decrease from 2009 levels. UVA purchases the majority of its electricity from Dominion Virginia Power. The electricity is used primarily for cooling and electrical services such as lighting and plug loads. T&D losses are calculated as a percentage of total electricity consumption.

Figure 4: UVA Electricity GHG Emissions by Source (MTCDE), 2009-2019



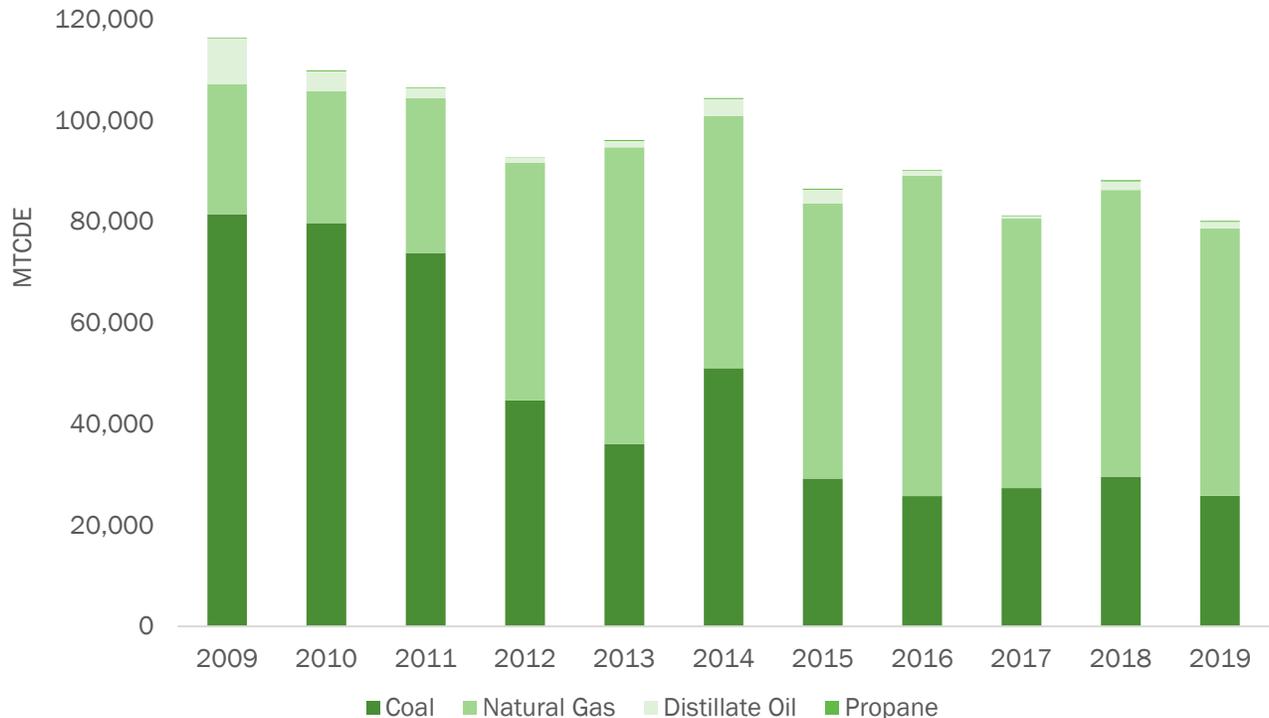
Reduction strategies

UVA continues to implement initiatives to curb the use of electricity on Grounds. In 2019 UVA saw continued success in implementing LED lighting technology in exterior lighting, building retrofits through Delta Force projects, and in new construction and renovation projects. Additionally, both of UVA's utility scale solar fields, Hollyfield and Puller, were completely operational for the entirety of 2019, contributing to a significant increase of green power. These activities, coupled with Green Building Standards, have helped UVA reduce the consumption and emissions from new facilities added by the University since 2009.

Fuel (On-Grounds Stationary Sources)

The majority of UVA’s scope 1 emissions stem from on-Grounds stationary fuels used for heating. These sources include coal, natural gas, distillate oil, and propane gas. In 2019, these sources accounted for 80,157.4 MTCDE, or 32.7 percent of UVA’s total net emissions. This was a 9.1 percent decrease from 2018 and a 31.1 percent decrease from 2009 levels.

Figure 5: UVA On-Grounds Stationary Combustion Emissions (MTCDE) Trends, 2009-2019



Reduction strategies

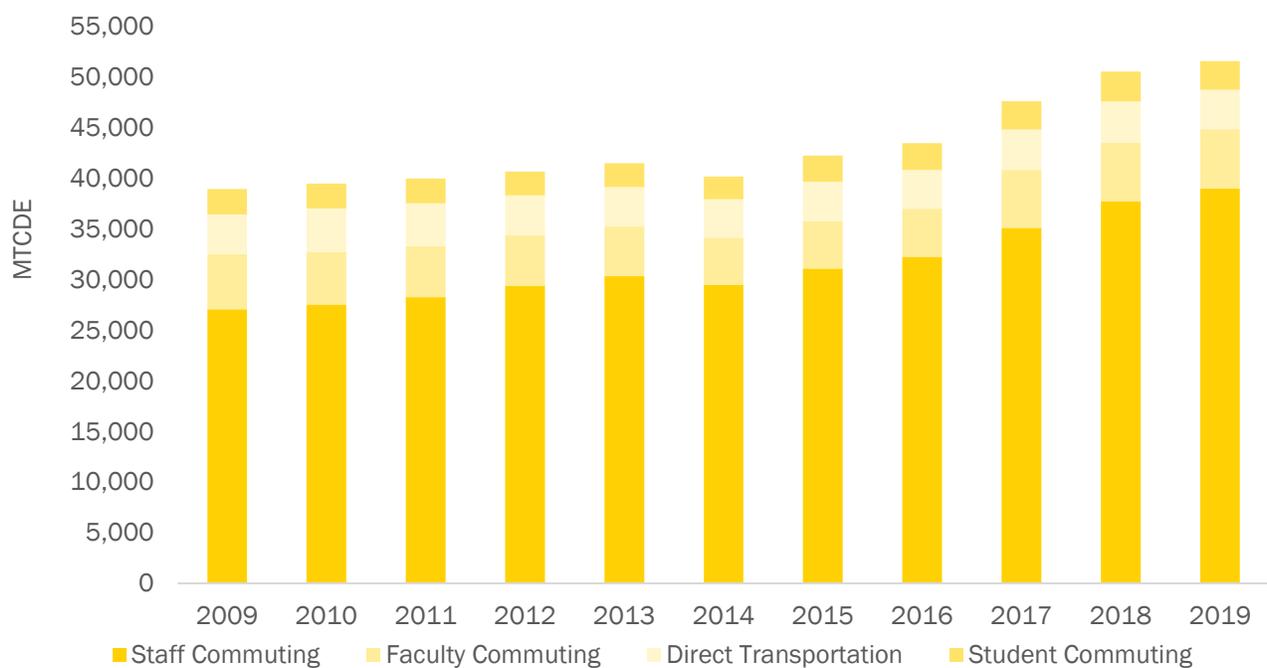
Since 2009, UVA has replaced coal as the University’s primary heating energy source with natural gas. Although it has decreased considerably since 2009, UVA’s coal use fluctuates when Charlottesville experiences more extreme winter events, resulting in a shortage of the natural gas supply during this time. In response, the Main Heating Plant combusts coal to meet peak demand.

While fuel switching has significantly reduced emissions from on-Grounds stationary combustion, additional actions also contributed to this success including the replacement of boilers at the North Grounds Mechanical Plant with low temperature hot water generators and heat recovery chillers, the burner replacements at Massie Road Plant, and the continued building improvements spearheaded by the Delta Force program.

Transportation

Transportation emissions include the impacts of the University’s vehicle fleet, categorized as direct transportation, as well as the impact of UVA’s faculty, staff, and student commuting practices. The UVA vehicle fleet portion of emissions includes the University-owned Transit System buses, cars, maintenance vehicles, and the University jet. These emissions are estimated from the approximate miles’ students, faculty, and staff travel to and from the University each day. This information is collected through a University-wide survey that is conducted every three years, the last being 2017. Transportation emissions accounted for 51,573.2 MTCDE, or 21.0 percent of total 2019 UVA emissions. This was a 2.0 percent increase from 2018 and a 32.4 percent increase from 2009 levels.

Figure 6: UVA Transportation Emissions (MTCDE) Trends, 2009-2019



Reduction strategies

Since 2009, UVA has established campaigns and incentives to promote more sustainable commuting practices while continuing to offer the University Transit Service and a partnership with Charlottesville Area Transit (CAT). These programs help faculty, staff, and students get to destinations both on and off-Grounds. The Cavpool program, is the most common sustainable, non-single occupant vehicle, commuting program at UVA for faculty and staff while other programs, such as UVA’s bicycle sharing program, are more recent additions to commuting options. UVA will continue to explore other options to reduce the impact commuting has on GHG emissions.

Operations support

Operations support includes the emissions generated from the release of refrigerants and other chemicals into the atmosphere, off-gassing from fertilizers, and emissions associated with treating wastewater. This category also includes the mitigation of methane production by landfilling solid waste to facilities that capture the methane and use for power generation, equaling a negative emissions value. Operations support is the smallest contributor to overall emissions at UVA, accounting for 0.6 percent of total 2019 emissions.

Next Steps

In 2016, UVA launched its first Sustainability Plan and outlined both long-term goals and short-term actions through 2020. This plan included UVA's GHG goal to reduce emissions 25% below 2009 levels by 2025. In December 2019, the UVA Board of Visitors approved a resolution for **the University to be carbon neutral by 2030 and fossil fuel free by 2050**. These goals align with UVA's 2030 Great and Good Plan and build upon the successes of the Board of Visitors' 2011 and 2013 sustainability resolutions, the first UVA 2016-2020 Sustainability Plan, and the work of thousands of engaged individuals over the past several years.

Climate Action Together

As UVA sustainability staff are engaged in this climate action planning processes, the city and county are participating in a parallel exercise. This provides a unique opportunity for UVA to leverage its relationship to the community and grow its regional climate action networks and partnerships. In February 2019 the City of Charlottesville, Albemarle County, and the University of Virginia, building upon a history of commitments on sustainability and climate, embarked on a collaborative community outreach effort as each entity began to update its GHG reduction targets and began developing new climate action plans. To enable broad community engagement and participation in informing these commitments, the three organizations are coordinating their outreach efforts across their sustainability offices. Residents, businesses, and area stakeholders are being encouraged to get involved and participate in this collaboration.

The new website www.ClimateActionTogether.org shares specific participation opportunities, previous regional climate action efforts, and more information about each organization's efforts.

Appendix A: Emissions and energy trends

Table 3: UVA Electricity Emissions (MTCDE) Trends, 2009-2019

GHG Source	2009	2010	2015	2016	2017	2018	2019
Electricity	165,641.5	176,643.8	143,030.3	130,273.8	126,882.4	125,303.9	106,729.5
T&D Losses	16,382.1	10,918.0	7,480.4	6,124.3	5,964.8	6,587.1	6,631.7
Total Net Emissions	182,023.6	187,561.8	150,510.6	136,398.0	132,847.3	131,891.0	113,361.1

*Totals may not sum due to independent rounding.

Table 4: UVA On-Grounds Stationary Combustion Emissions (MTCDE) Trends, 2009-2019

GHG Source	2009	2010	2015	2016	2017	2018	2019
Coal	81,489.9	79,735.9	29,235.0	25,769.4	27,299.6	29,591.6	25,791.6
Natural Gas	25,631.6	26,036.5	54,324.4	63,323.5	53,268.1	56,691.0	52,827.1
Distillate Oil	9,149.4	3,968.6	2,750.2	1,020.1	554.1	1,695.8	1,377.9
Propane	135.4	145.1	184.9	119.8	122.1	207.6	160.9
Total Net Emissions	116,406.4	109,886.1	86,494.5	90,232.8	81,243.9	88,186.0	80,157.4

*Totals may not sum due to independent rounding.

Table 5: UVA Transportation Emissions (MTCDE) Trends, 2009-2019

GHG Source	2009	2010	2015	2016	2017	2018	2019
Staff Commuting	27,083.8	27,536.8	31,082.1	32,257.3	35,124.5	37,748.7	38,983.5
Faculty Commuting	5,465.9	5,169.7	4,665.0	4,734.3	5,724.9	5,774.8	5,879.4
Direct Transportation	3,899.7	4,335.3	3,927.7	3,832.8	3,967.4	4,081.3	3,888.2
Student Commuting	2,496.6	2,430.7	2,561.5	2,653.7	2,808.6	2,940.7	2,822.0
Total Net Emissions	38,946.0	39,472.4	42,236.2	43,478.1	47,625.4	50,545.5	51,573.2

*Totals may not sum due to independent rounding.

Table 6: UVA Operations Support Emissions (MTCDE) Trends, 2009-2019

GHG Source	2009	2010	2015	2016	2017	2018	2019
Refrigerants & Chemicals	391.4	240.5	2,848.0	2,755.7	2,203.7	1,674.3	346.5
Wastewater	203.7	208.8	143.9	133.8	112.6	121.6	121.7
Fertilizer & Animals	22.2	17.7	15.7	11.2	15.4	15.3	11.0
Solid Waste	(250.9)	(236.7)	(265.4)	(274.9)	(265.5)	(280.6)	(268.2)
Total Net Emissions	366.4	230.3	2,742.1	2,625.7	2,066.1	1,530.5	211.0

*Totals may not sum due to independent rounding.