

# UVA 2020 GREENHOUSE GAS INVENTORY

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APRIL 2021

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UVA SUSTAINABILITY



SUSTAINABILITY · UVA  
*From the Grounds Up*

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## CONTENTS

Executive Summary .....	1
Background .....	2
Methodology.....	2
Inventory boundary .....	3
Data collection .....	3
“Carbon Neutrality” and “Fossil Fuel Free” .....	3
Addressing growth.....	4
COVID-19.....	4
Emissions by scope.....	5
Electricity.....	6
Fuel (On-Grounds Stationary Sources).....	7
Transportation & Operations .....	9
Scope 3 Sources.....	10
Next Steps.....	11
Climate Action Together.....	11
Appendix A: Emissions and energy trends .....	11

# Executive Summary

In Calendar Year 2010, the baseline year for emissions analysis, UVA's Scope 1 and 2 greenhouse gas (GHG) emissions footprint was 291,123.5 Metric Tons of Carbon Dioxide Equivalent (MTCDE). In Calendar Year 2020, emissions decreased to 163,326.8 MTCDE, resulting in a **43.9 percent reduction in emissions compared to 2010**. This reduction is a significant step towards achieving UVA's goals to be carbon neutral by 2030 and fossil fuel free by 2050.

The reduction relative to 2010 can be attributed to UVA's ongoing efforts to increase renewable energy production and district energy plant improvements, in addition to UVA's extensive energy efficiency work in existing buildings. These reductions also reflect proactive building-level adjustments made due to a significant reduction in the number of people in buildings on Grounds during the COVID-19 pandemic. Some of these reductions are expected to increase as UVA returns to normal operations. Improvements to the electricity grid over time have also contributed. Figure 1 and Table 1 below report UVA's Scope 1 and 2 GHG emissions by source.

Figure 1: UVA's GHG Emissions by source (MTCDE), Calendar Years 2010-2020

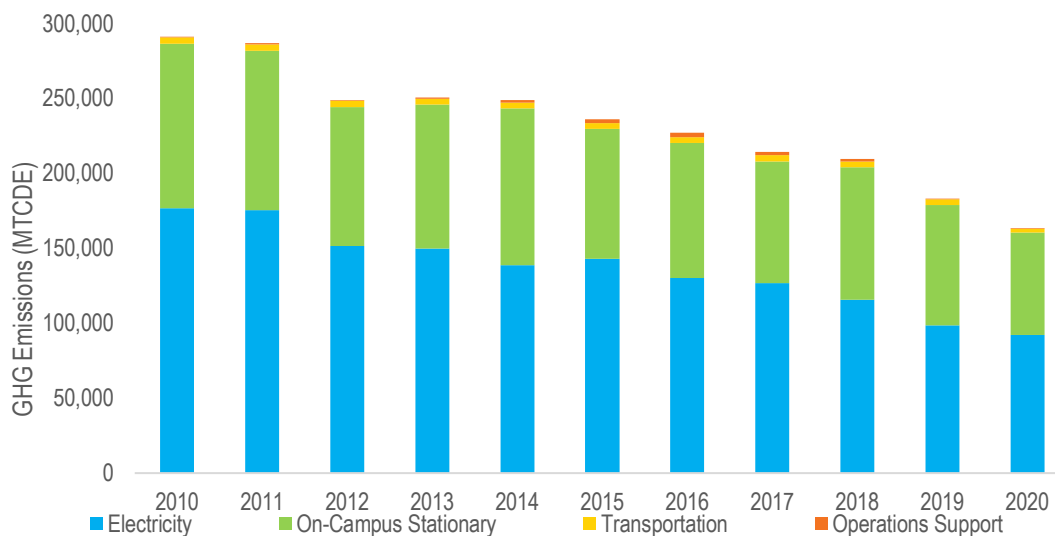


Table 1: UVA GHG Emissions by source (MTCDE), Calendar Years 2010-2020

GHG Source	2010	2015	2016	2017	2018	2019	2020
Electricity	176,643.8	143,030.3	130,273.8	126,882.4	115,710.0	98,557.7	92,148.5
Fuel	109,886.1	86,536.7	90,274.3	81,282.8	88,228.5	80,195.5	68,402.6
Transportation	4,335.3	3,927.7	3,832.8	3,967.4	4,081.4	3,887.7	2,511.5
Operations Support	258.2	2,863.6	2,766.9	2,219.1	1,689.5	357.5	264.2
<b>Total Net Emissions</b>	<b>291,123.5</b>	<b>236,358.2</b>	<b>227,147.7</b>	<b>214,351.7</b>	<b>209,709.3</b>	<b>182,998.3</b>	<b>163,326.8</b>

\*Totals may not sum due to independent rounding.

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# Background

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. 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 GHG inventory is calculated annually by the Office for Sustainability, reviewed within Facilities Management, and then posted publicly on the UVA Sustainability website. UVA's 2020 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. In 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. The Market-Based emission factors were applied retroactively to all prior years.*

SIMAP calculates GHG emissions from activities that produce carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and refrigerants. Emissions of CH<sub>4</sub>, N<sub>2</sub>O, 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 process allows UVA to calculate a total carbon emissions Inventory for the University. In this report, "carbon emissions" and "carbon footprint" refer to the total GHG emissions converted to carbon dioxide emissions equivalent.

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## 2030 Goal boundary

UVA’s GHG goal boundary includes any emissions related to the functional operation of the University. This boundary best aligns with The Climate Registry’s Protocol and “Operational Control Approach,” which includes emission sources UVA has the authority to affect through operating policies and initiatives.

The physical inventory includes all UVA-owned properties in the City of Charlottesville and Albemarle County, which includes the core UVA Health System, 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, and/or thermal energy provided from one of UVA’s heating or chiller plants. Leased properties, UVA Foundation properties, the College at Wise, and UVA properties 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 data 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). Figure 2 portrays UVA’s institutional arrangements regarding the GHG Inventory process.

Figure 2: UVA GHG Inventory Institutional Arrangements



## “Carbon Neutrality” and “Fossil Fuel-Free”

In December 2019, the UVA Board of Visitors approved a resolution for the University to be carbon neutral by 2030. UVA defines this commitment to mean that by 2030, all Scope 1 and Scope 2



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carbon emissions related to the functional operation of the University (as described above), will be mitigated to zero. Specifically, Scope 1 includes fuel, fleet transportation, fertilizer, and refrigerants and Scope 2 includes purchased electricity. To meet this goal, UVA will prioritize strategies which aggressively reduce carbon emissions. By reducing our carbon footprint, we will establish the University as the leader among institutions of higher education in the areas of sustainability, energy, and environmental stewardship while also minimizing the expenditure necessary for renewable energy credits and carbon offsets in 2030 and beyond.

Additionally, the UVA Board of Visitors approved a second resolution for the University to be fossil fuel-free by 2050. Specifically, no fossil fuels will be used on Grounds to support UVA operations, including heating and cooling, electricity sources, and transportation. All energy will be supplied from renewable or non-fossil fuel-based energy sources.

## Addressing growth

Expansion of the University's offerings has resulted in growth in both population and building area. Since 2010, there has been a population increase of 6,802 students, faculty, and staff (a 20.1 percent increase). An approximately 3.1 million square feet (a 20.6 percent increase) of building space has been added to UVA's footprint and included within the boundaries defined for UVA's GHG inventory. **Despite growth, UVA has reduced its normalized, goal-subject emissions both per person and by square foot.** In 2010, UVA reported 8.6 MTCDE per person and 19.2 MTCDE per thousand square feet. In 2020, these numbers decreased to 4.0 MTCDE per person and 8.9 MTCDE per thousand square feet, respectively. The University's commitment to achieving its carbon neutrality and fossil fuel-free goals, considering its continuing expansion, ensures integration of sustainability in renovations and new construction to enhance the University's operations and building portfolio.

## COVID-19

The COVID-19 pandemic as well as UVA's response had significant impacts on the University's 2020 GHG emissions. By sending students home to participate in virtual learning and encouraging staff and faculty to telework, many dormitories, dining halls, classrooms, research buildings, recreation facilities, offices, and other buildings were unoccupied for an extended period. This decision significantly impacted the heating and cooling demands on those buildings as well as the energy consumption of the University as a whole. Additionally, the University vehicle fleet, including the Jet, were not operated as frequently, resulting in a noticeable decrease in gasoline, diesel, and jet fuel consumption from previous years. On the other hand, the UVA hospital observed an increase in energy use compared to previous years due to an increased patient load and upgrades in ventilation.

## 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 2010, Scope 2 has consistently accounted for approximately 50 percent of UVA's total net emissions inventory. In 2020, Scope 2 emissions accounted for 43.5 percent of total emissions. Scope 1 emissions, generated from sources such as stationary fuel combustion and vehicle use contributed 34.4 percent. Figure 3 and Table 2 below reports UVA's 2020 GHG emissions by scope. UVA's GHG Inventory also includes the core buildings of the Health System that are contiguous to Grounds, which contributes approximately 30 percent of the total emissions produced by the University.

Figure 3: UVA GHG Emissions by scope (MTCDE), 2010-2020

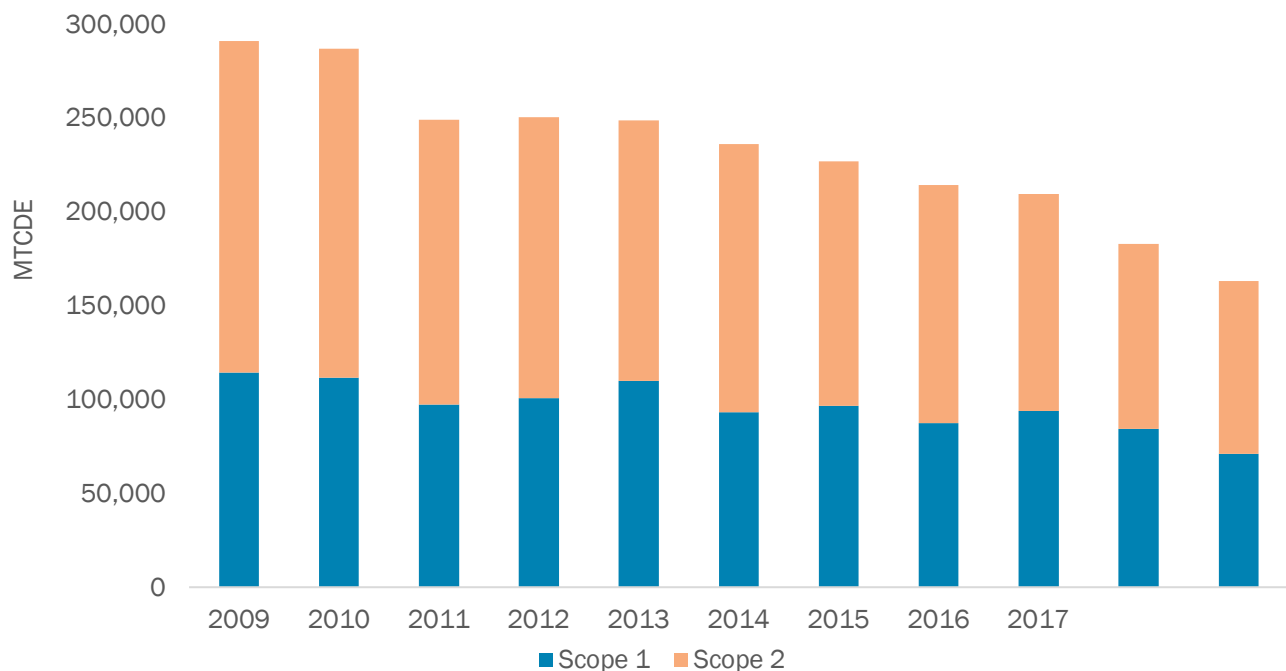


Table 2: UVA GHG Emissions by scope (MTCDE), 2010-2020

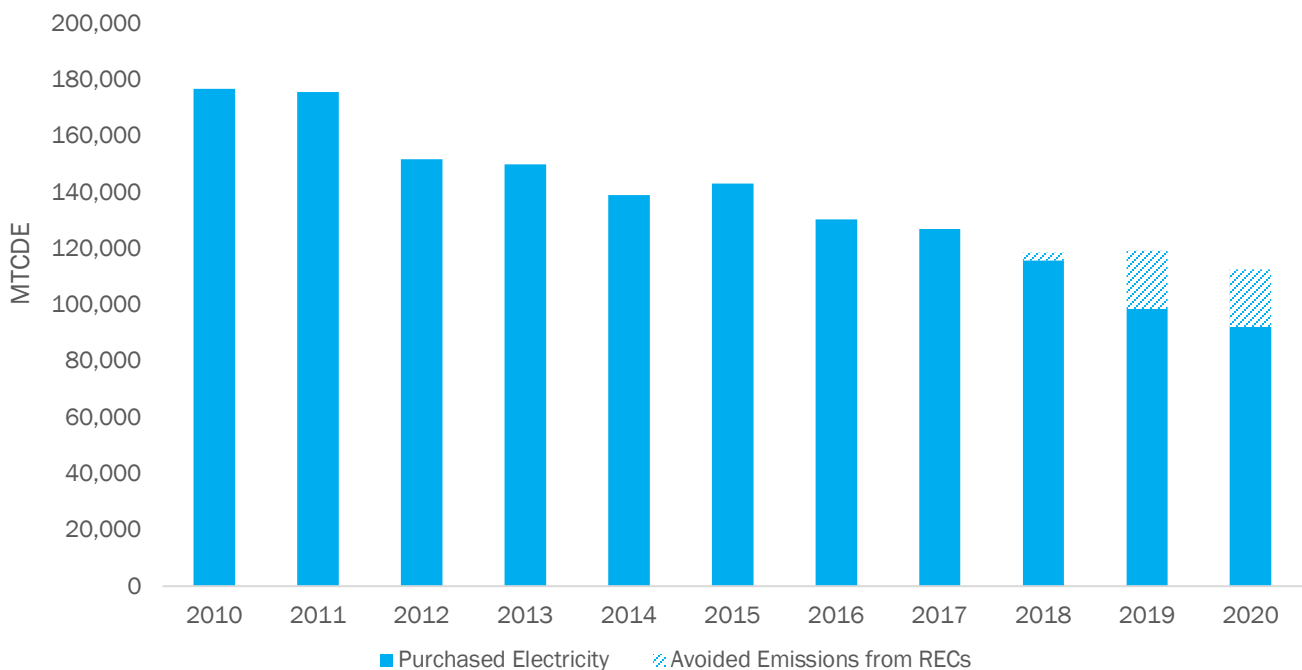
GHG Scope	2010	2015	2016	2017	2018	2019	2020
Scope 1	114,479.6	93,328.0	96,873.9	87,469.3	93,999.4	84,440.6	71,178.3
Scope 2	176,643.8	143,030.3	130,273.8	126,882.4	115,710.0	98,557.7	92,148.5
<b>Total Net Emissions</b>	<b>291,123.5</b>	<b>236,358.2</b>	<b>227,147.7</b>	<b>214,351.7</b>	<b>209,709.3</b>	<b>182,998.3</b>	<b>163,326.8</b>

\*Totals may not sum due to independent rounding.

# Electricity

Electricity consumption, used primarily for cooling and electrical services such as lighting and plug loads, continues to be the largest source of GHG emissions at UVA. In 2020, purchased electricity accounted for 92,148.5 MTCDE, or 56.4 percent of total UVA emissions. This quantity was a 6.5 percent decrease from 2019 and a 47.8 percent decrease from 2010. Additionally, through a power purchase agreement with Dominion Virginia Power, UVA is responsible for approximately 60,000 megawatt hours of solar generated renewable electricity annually. This electricity is generated from two utility-scale solar fields at Hollyfield and Puller. Together, these installations help UVA avoid approximately 20,000 MTCDE each year.

Figure 4: UVA Electricity GHG Emissions by Source (MTCDE), 2010-2020





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## *Reduction strategies*

UVA continues to implement initiatives to curb the use of electricity on Grounds. In 2020, following the transition to remote classes and work due to the COVID-19 pandemic, UVA shutdown or setback unoccupied spaces, significantly reducing unnecessary electricity consumption. The best practices identified during this process led to established protocols for unoccupied spaces that will now be implemented during winter breaks and spring breaks following the return of students to Grounds.

These activities, coupled with the Hollyfield and Puller solar fields, the continued building improvements spearheaded by the Delta Force program, and the Green Building Standards for new construction and significant renovations, among other initiatives, have helped UVA reduce its electricity consumption and associated emissions.

# Fuel (On-Grounds Stationary Sources)

Most 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 2020, these sources accounted for 68,402.6 MTCDE, or 41.9 percent of UVA's goal subject emissions. This total was a 14.7 percent decrease from 2019 and a 37.8 percent decrease 2010 levels.

Figure 5: UVA On-Grounds Stationary Combustion Emissions (MTCDE) Trends, 2010-2020



## Reduction strategies

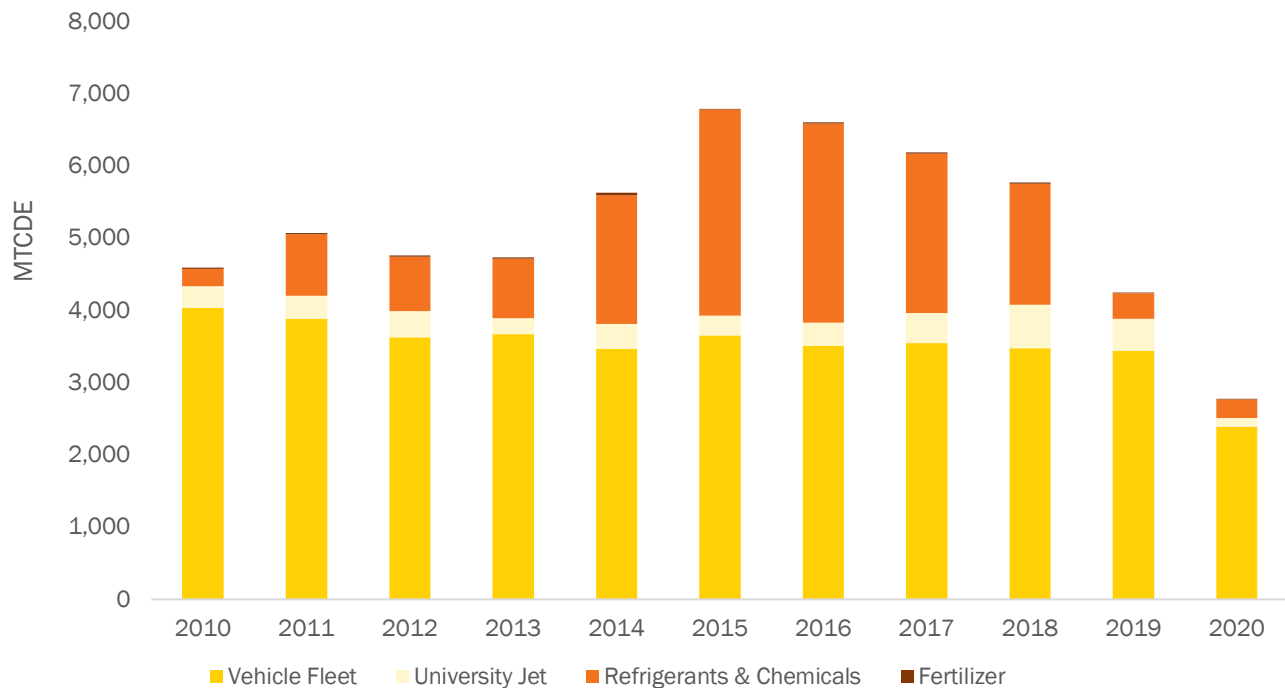
Since 2010, UVA has steadily and significantly reduced coal as a primary heating energy source with natural gas. Although coal use has decreased considerably since 2010, UVA's coal use fluctuates when Charlottesville experiences more extreme winter events, resulting in a shortage of the natural gas supply during this time. In response, the Main Heating Plant at times uses 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, burner replacements at Massie Road Plant, and the Delta Force program.

# Transportation & Operations

The UVA vehicle fleet includes the University-owned Transit System buses, cars, maintenance vehicles. These vehicles run on gasoline, diesel, and biodiesel fuel. UVA also owns and operates a jet which is included as well. UVA vehicles and the University jet were responsible for 2,389.9 and 121.7 MTCDE, respectively, in 2020. Together, these sources equal approximately 1.5 Percent of total goal-subject emissions. Additionally, UVA calculates the emissions generated from the release of refrigerants and other chemicals into the atmosphere as well as off-gassing from fertilizers within its inventory. In 2020, these sources represent 253.6 and 10.5 MTCDE, respectively, or less than 1 percent of overall emissions.

Figure 6: UVA Transportation and Operations Emissions (MTCDE) Trends, 2010-2020



## Reduction strategies

Since 2010, 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. UVA will continue to explore other options to reduce the impact commuting has on GHG emissions.

## Scope 3 Sources

In addition to the sources included in UVA's GHG reduction goal, the University keeps track of emissions for several indirect sources including student, faculty, and staff commuting, electricity transmission and distribution (T&D) losses, waste and wastewater. UVA will also continue to calculate additional emissions sources as data is received. Much of UVA's commuting emissions are captured in the City of Charlottesville and Albemarle County's greenhouse gas inventories because of the way that VDOT data is captured for their footprints. For UVA's inventory, commuting emissions are estimated from the approximate miles, frequency, and mode of transportation' students, faculty, and staff utilize to 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. The survey was postponed in 2020 due to the dramatic change in typical commuting practices in response to the COVID-19 pandemic. Purchased Electricity's T&D losses are calculated as a percentage of total electricity consumption based on regional estimates provided by the EPA. Waste activity data are collected and reported by Facilities Management. Lastly, Wastewater emissions are estimated based on monthly sewer charges to the University.

*It is important to note there are Scope 3 GHG emission sources that 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 currently available.*

Table 3: UVA Scope 3 Emissions (MTCDE) Trends, 2010-2020

GHG Source	2010	2015	2016	2017	2018	2019	2020
Staff Commuting	27,556.4	31,119.0	32,240.0	35,103.7	37,734.5	38,953.7	38,510.0
Faculty Commuting	5,173.4	4,669.2	4,732.2	5,721.6	5,772.7	5,875.0	5,870.4
T&D Losses	10,918.0	7,480.4	6,124.3	5,964.8	6,082.8	6,123.9	5,781.4
Student Commuting	2,478.6	2,602.4	2,647.6	2,728.8	2,940.5	2,821.3	2,825.6
Solid Waste	(236.7)	1,149.9	1,283.0	1,239.0	1,309.5	1,251.6	1,062.2
Wastewater	252.5	174.0	161.8	136.1	147.0	147.2	116.8
<b>Total Net Emissions</b>	<b>46,142.1</b>	<b>47,194.8</b>	<b>47,188.8</b>	<b>50,894.1</b>	<b>53,986.9</b>	<b>55,172.6</b>	<b>54,166.4</b>

\*Totals may not sum due to independent rounding.

# Next Steps

## Climate Action Together

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. This collaboration, called Climate Action Together, provides a unique opportunity for UVA to leverage its relationship to the community and grow its regional climate action networks and partnerships. 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.

## Appendix A: Emissions and energy trends

Table 4: UVA Electricity Emissions (MTCDE) Trends, 2010-2020

GHG Source	2010	2015	2016	2017	2018	2019	2020
Electricity	176,643.8	143,030.3	130,273.8	126,882.4	118,513.4	119,315.1	112,642.1
Avoided Emissions from Solar					(2,803.4)	(20,757.4)	(20,493.6)
<b>Total Net Emissions</b>	<b>176,643.8</b>	<b>143,030.3</b>	<b>130,273.8</b>	<b>126,882.4</b>	<b>115,710.0</b>	<b>98,557.7</b>	<b>92,148.5</b>

\*Totals may not sum due to independent rounding.

Table 5: UVA On-Grounds Stationary Combustion Emissions (MTCDE) Trends, 2010-2020

GHG Source	2010	2015	2016	2017	2018	2019	2020
Coal	79,735.9	29,257.2	25,788.9	27,320.2	29,614.0	25,811.1	13,833.5
Natural Gas	26,036.5	54,342.7	63,344.8	53,286.0	56,710.0	52,844.8	53,765.6
Distillate Oil	3,968.6	2,751.9	1,020.7	554.5	1,696.9	1,378.7	737.9
Propane	145.1	184.9	119.8	122.1	207.6	160.9	65.6
<b>Total Net Emissions</b>	<b>109,886.1</b>	<b>86,536.7</b>	<b>90,274.3</b>	<b>81,282.8</b>	<b>88,228.5</b>	<b>80,195.5</b>	<b>68,402.6</b>

\*Totals may not sum due to independent rounding.

Table 6: UVA Transportation Emissions (MTCDE) Trends, 2010-2020

GHG Source	2010	2015	2016	2017	2018	2019	2020
Diesel	2,378.5	2,064.9	1,983.8	2,068.1	1,966.1	1,996.1	1,233.2
Gasoline	1,652.71	1,589.51	1,530.30	1,479.59	1,512.10	1,447.77	1,156.63
Jet Fuel	304.1	273.3	318.7	419.7	603.1	443.8	121.7
<b>Total Net Emissions</b>	<b>4,335.3</b>	<b>3,927.7</b>	<b>3,832.8</b>	<b>3,967.4</b>	<b>4,081.4</b>	<b>3,887.7</b>	<b>2,511.5</b>

\*Totals may not sum due to independent rounding.

Table 7: UVA Operations Support Emissions (MTCDE) Trends, 2010-2020

GHG Source	2010	2015	2016	2017	2018	2019	2020
Refrigerants & Chemicals	240.5	2,848.0	2,755.7	2,203.7	1,674.3	346.5	253.6
Fertilizer	17.7	15.7	11.2	15.4	15.3	11.0	10.5
<b>Total Net Emissions</b>	<b>258.2</b>	<b>2,863.6</b>	<b>2,766.9</b>	<b>2,219.1</b>	<b>1,689.5</b>	<b>357.5</b>	<b>264.2</b>

\*Totals may not sum due to independent rounding.