VT VIRGINIA TECH™

SUSTAINABILITY
2021-22 Annual Report

CONTENT

EXECUTIVE SUMMARY

With a full academic year since the Board of Visitors approved the 2020 Climate Action Commitment in March of 2021, Virginia Tech has shown outstanding progress toward meeting our ambitious climate action goals. We continue to be recognized for our impressive sustainability work in our Sustainability Tracking, Assessment, and Rating System (STARS) Gold rating, which remains the highest in Virginia and the Atlantic Coast Conference; our Tree Campus Higher Education status for the 14th year in a row; recognition for our alternative transit options with the 2022 Best Commuting Campuses designation; and a Silver National Association of College and University Food Services award for our sustainable dining programs. This past year also saw some new accolades such as our rising Times Higher Education Impact Ratings (98th in the world and 7th in the United States), Bee Campus USA membership, and two new Governor's Environmental Excellence Awards for our student internship program and campus-wide response to Executive Order 77. Virginia Tech has received 12 Governor's Environmental Excellence Awards to date.

The overarching goal of the Climate Action Commitment is for Virginia Tech's Blacksburg campus to become carbon neutral by 2030 which is no small task at an institution the size of Virginia Tech. Meeting this ambitious benchmark will require decreasing our carbon emissions and energy consumption while at the same time increasing our portfolio of renewable energy and sustainability-oriented educational programs. The major milestones to meet this ambitious climate action goal are segmented into 15 goals and the report is organized around the progress made in each category.

To accomplish both a reduction in our emissions and an increase in our university's academic and infrastructural profile, we've made several organizational changes and established the new Climate Action, Sustainability, and Energy department. We've brought on a full-time campus waste manager who will help us reach our goal of a zero-waste campus, working to raise our already laudable 31.5% recycling rate and 78% waste diversion rate. We've also added a dedicated energy analyst to the team who will help us make improvements in energy efficiency that will close the gap in terms of reaching our renewable energy goals.

On the reduction front, we've already begun to make substantial energy efficiency improvements to our buildings. Currently, more than 18% of campus buildings have LED lighting installed. During FY2022, Virginia Tech completed an audit of 71 buildings, approximately 35% of campus, to identify energy-saving opportunities. Current FY22 retro-commissioning efforts saved an estimated 673,800 kWh and 4185 MMBTUs, totaling $90,540 in energy expenses. There have also been meaningful gains towards building up our renewable energy portfolio. The contract for our largest renewable energy project to date has been finalized and the 2-megawatt rooftop solar project is advancing to the construction stage. Construction is expected to be near completion by the end of academic year 2022-23.

Also nearing completion is the Multi-Modal Transit Facility. With the completion of this facility, we expect to see significant reductions in transportation emissions from commuting members of campus as well as a general improvement in the quality of our local public transportation. This effort, alongside many other programs, will provide Virginia Tech community members with commuting options other than single-occupancy vehicles, helping to reduce our scope 3 emissions.

In addition to more public transit, you will also likely notice the hard work of our university arborist, who has been greatly expanding our campus tree canopy cover over the past few years. We plan on expanding from 14.7% tree cover to 25% tree cover by 2050, which will provide huge energy savings and foster a lush, green campus environment. While fostering an increase in canopy cover, Virginia Tech is also working to expand its pollinator habitat in line with our new Bee Campus USA certification.

These improvements in the infrastructure, operation, and facilities arms of the university are exciting, but we've also made substantial gains in terms of our academic programming. We have developed a core group of faculty for the Climate Action Living Laboratory (CALL) project, which will bridge the gaps between the academic and campus planning elements of the university. The CALL is one of the most exciting new initiatives from the 2020 Climate Action Commitment because it is one avenue that will engage students in campus sustainability work and creates a wealth of opportunities for faculty partnerships and grants. Alongside our ongoing work building a sustainability forum, supporting environmental student organizations, and running our award-winning student-internship program, the CALL initiative will further bridge the gap between academics and facilities.

As part of university-wide shared governance changes, we've also expanded and re-named the Energy and Sustainability Committee to the Climate Action, Energy, and Sustainability Committee as a way to capture the larger scope of climate action work we need to take on. This governance change will help facilitate implementation efforts for Climate Action Commitment goals through the creation of ten task forces which will serve as the primary mode of program, report, and policy development and execution relating to the CAC.

Perhaps our most visible work this year has been a series of roadshows where we've built awareness of our Climate Action Commitment progress and fostered vital partnerships across the university. We've conducted over 15 roadshows with audiences ranging from shared governance senates to Advancement, Athletics, and the President's Council. These meetings will form the foundation for our future progress and bring together the entirety of university operations around the goal of climate action.

We are excited to detail the extensive progress we've made in this report and look forward to a transformed university campus over the next eight years. The Virginia Tech 2021-22 Sustainability Annual Report begins with a broad overview of the university's sustainability programs, presents the 15 goals of the Climate Action Commitment, and showcases sustainability highlights and progress for each point. The Sustainability Annual Report serves as a benchmark to show how much progress the university has made toward its goals in just one year.

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OVERVIEW

Introduction

Virginia Tech's Climate Action Commitment defines sustainability as the simultaneous pursuit of environmental quality, economic prosperity, and social justice and equity. The goal of the Office of Sustainability and the university's Climate Action Commitment (CAC) is to achieve this pursuit through action, education, and engagement to address current needs without compromising the capacity and needs of future generations. Virginia Tech's sustainability vision is to be a leader in climate action in service to our community, the Commonwealth, and the world in line with our land grant and educational mission.

Virginia Tech's sustainability mission is to achieve carbon neutrality by 2030 through changes to the university's physical infrastructure, collective and individual behaviors, and educational mission; to engage everyone in creating a culture of sustainability, and to accomplish these objectives through just and equitable means. This will require significant infrastructural changes and significant strategic planning to ensure success.

Energy and Sustainability Committee

The university established the Energy and Sustainability Committee on April 30, 2007. It was one of the major committees within shared governance and was initially created as a response to the university's original Climate Action Commitment. At the time, it was unique in that it had the broadest membership of any committee, including four student representatives. As part of the 2020 Climate Action Commitment (CAC), the Energy and Sustainability Committee re-evaluated its role in the university and recognized the need to elevate its responsibilities in alignment with the heightened importance of climate action and the new Climate Action, Sustainability, and Energy (CASE) department.

As part of the larger shared governance changes that were approved by the Board of Visitors over the summer of 2020, the Energy and Sustainability Committee changed the committee name, charge, membership, and scope of responsibilities. The name was changed to the Climate Action, Sustainability, and Energy (CASE) Committee to reflect the corresponding department in charge of implementing the CAC. The charge was likewise altered to both comply with the new standard for committee charges set by the shared governance revisions and in recognition of the broader scope of climate action, that the university is committed to. The charge now reads, "To provide guidance to the university administration on implementation of the university's Climate Action Commitment and opportunities to enhance Virginia Tech's pursuit of environmental quality and social sustainability. The committee makes recommendations regarding the application of policies; infrastructural and operational changes; educational strategies

and modifications; and other steps intended to foster broad engagement with the university's environmental goals. The committee oversees subcommittees that each execute aspects of the committee's charge." In addition to broadening the charge, the committee also reevaluated and expanded its membership. Building on the success of having such a wide-ranging membership as the Energy and Sustainability Committee, the membership list was once again broadened and notably includes members from frontline communities as part of the university's commitment to climate justice, which is unique among all shared governance entities.

Several changes were made to the committee to fulfill this charge. During the 2021-22 academic year, the CASE Committee established ten task forces to target implementation strategies, policies, and planning efforts for the goals of the 2020 Climate Action Commitment. These task forces are strategically essential for making progress toward our goal of carbon neutrality by 2030. Additionally, they include members from all across the university including dozens of members from outside the core CASE committee membership, which will help to institute climate action as a broader priority and communicate CAC progress across the institution.

Virginia Tech Climate Action Commitment

During Earth Week in April 2008, former university President, Charles W. Steger, charged the Energy and Sustainability Committee to develop a climate commitment and accompanying sustainability plan that was unique to Virginia Tech, and to have the commitment placed in resolution format for review and action by the University Council in the 2009 spring semester. The Energy and Sustainability Committee developed the draft Virginia Tech Climate Action Commitment and Sustainability Plan and spearheaded the review process.

On April 22, 2009 (Earth Day), the University Council voted to recommend approval of the Virginia Tech Climate Action Commitment and accepted the accompanying Sustainability plan. On June 1, 2009, the Virginia Tech Board of Visitors unanimously approved the Virginia Tech Climate Action Commitment and it became Presidential Policy Memorandum 262. Containing 14 points, the commitment included sustainability goals, objectives, and aspirations. In academic year 2012-13, the Energy and Sustainability Committee revised the commitment and added a Sustainability Definition, Vision, and Mission. The University Council approved the revision on May 6, 2013.

On November 8, 2019, Virginia Tech President, Timothy D. Sands, released a statement found at vtx.vt.edu/articles/2019/11/president-climate-commitment in response to a climate strike held by students on campus. President Sands stated, "I encourage everyone in the Virginia Tech community to learn more about our Climate Action Commitment and the positive work we can accomplish when students, faculty and administrators unite under a common goal. Sustainability is part of the fabric of this university as we pursue environmental quality and stewardship, economic stability and affordability, diversity and inclusion, expansion of knowledge, and the education of future leaders.

The university's new strategic plan reflects these values. When we come together as a community to address common concerns, we can find a path to a bright and sustainable future." Within President Sands' statement was a charge to Dr. Dwayne Pinkney, senior vice president and chief business officer at Virginia Tech, to update the Virginia Tech Climate Action Commitment.

The Virginia Tech 2020 Climate Action Commitment Working Group was established on November 16, 2020, consisting of students, faculty, staff, and community members. It had 15 subcommittees comprised of over 150 stakeholders from across all sectors of the university and the surrounding community. The group worked to produce the Virginia Tech 2020 Climate Action Commitment which Professor Emeritus John Randolph presented to the Board of Visitors on November 15, 2020. Over the next three months, a dozen key operations and finance personnel at the university conducted a high-level review of the costs to implement the Virginia Tech 2020 Climate Action Commitment. This financial analysis and review were presented to the Virginia Tech Board of Visitors on March 21, 2021, where the review, and the commitment as a whole, were approved. The 2020 Climate Action Commitment includes 15 goals for advancing long-term university sustainability over the next ten years. The Sustainability Annual Report will provide an annual update on the university's progress on each of the goals.

The actualization of the 15 goals depends on comprehensive planning, unparalleled collaboration, and a shared pledge to advancing sustainability. In the first year and a half of implementation, we have seen the results of that hard work as captured by this report. Through broad university participation and collaboration we have made tremendous progress but still have more to do.

Sustainability Plan

Virginia Tech adopted the Association for the Advancement of Sustainability in Higher Education's (AASHE) Sustainability Tracking, Assessment, and Rating System (STARS) protocol as the foundation of the Sustainability Plan. The STARS protocol consists of over 60 topical areas that are placed in one of four categories: Academics, Engagement, Operations, and Planning and Administration. Additional credit is earned for unique initiatives implemented that are not covered in STARS (Innovation Credits). Data and information submitted are measured against a national standard. Points are earned for each credit. Total points yield an overall rating of Bronze, Silver, Gold, or Platinum.

Virginia Tech has received 5 STARS ratings: Silver in 2011, Silver in 2013, Gold in 2014, Gold in 2017, and Gold in 2021. For the 2021 Gold rating, Virginia Tech earned 72.78 points, the highest achieved score for any college or university in the Commonwealth of Virginia, and the highest achieved by peer institutions in the Atlantic Coast Conference. The STARS Gold rating is valid for three years and the Office of Sustainability is beginning to prepare for Virginia Tech's 2024 submission.

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Office of Sustainability

On June 1, 2009, following the approval of the original Virginia Tech Climate Action Commitment by the Virginia Tech Board of Visitors, the university established the Office of Sustainability. Recognized as the university clearing house for sustainability matters, the Office of Sustainability has the following duties and responsibilities:

+ Coordinate programs for campus sustainability;

+ Oversee implementation of the Virginia Tech Climate Action Commitment and Sustainability;

+ Monitor annual electricity and other energy use and GHG emissions;

+ Work with faculty and departments, to develop programs that utilize the campus as a sustainability laboratory; and

+ Coordinate communication regarding campus sustainability initiatives and programs to the university community and external audiences.

OFFICE OF SUSTAINABILITY PARTNERS
UNIVERSITY COLLEGES, DEPARTMENTS, AND UNITS

The Office of Sustainability collaborates with faculty and staff in virtually all of the colleges at Virginia Tech to including the College of Agriculture and Life Sciences, College of Architecture and Urban Studies, College of Business, College of Engineering, College of Liberal Arts and Human Sciences, College of Natural Resources and Environment, College of Science, and the Virginia-Maryland College of Veterinary Medicine.

STUDENT GROUPS

The Office of Sustainability works with many student groups including the Undergraduate Student Senate, Graduate Student Senate, Residence Hall Federation, Environmental Coalition, Food Justice at Virginia Tech, Galileo Living Learning Community, Hypatia Living Learning Community, Students for Sustainable Practice, Art for Environmental Justice, Student Chapter of the American Water Resources Association, Campus Kitchens at Virginia Tech, United Feminist Movement, Citizens Climate Lobby, Outdoor Club, and Virginia Tech for Climate Justice.

COMMUNITY GROUPS

The Office of Sustainability collaborates often with the Town of Blacksburg, the local citizens' group and nonprofit Sustainable Blacksburg, the Blacksburg Farmers Market, the YMCA, the Blacksburg Public Library, and Blacksburg Parks and Recreation.

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AWARDS AND RECOGNITION

Virginia Tech has consistently demonstrated its commitment to being a leader in campus sustainability and has received awards and recognition both at the state and national levels.

VIRGINIA TECH DINING SERVICES

Dining Services boasts a tradition of award-winning programs, venues, and service. The department is committed to being the leader of college and university food service and a leader in sustainability.

Silver Sustainability Education and Outreach Award
National Association of College and University Food Services Awards

Creating impact-driven experiential learning opportunities for our students is paramount. Three years ago, Dining Services piloted a program called, "The Sustainable Eats Bike Tour". The tour welcomes students to visit campus dining centers by bicycle, sampling locally sourced and plant-forward dishes while learning about campus sustainable dining measures at each stop. Ever since then, the program has become a department staple for student experiential learning. In April 2022, it was announced that Virginia Tech Dining Services' "Sustainable Eats Bike Tour" won the Silver in the outreach and education category of the inaugural National Association of College & University Food Services (NACUFS) Sustainability awards!

VIRGINIA TECH ALTERNATIVE TRANSPORTATION AWARDS

The Alternative Transportation Department seeks to meet all the travel needs of students, faculty, and staff in healthy and environmentally friendly ways.

Virginia Tech has been named one of the 2022 Best Universities for Commuters. Best Universities for Commuters demonstrate that options for commuting, such as transit, carpools, vanpools, and teleworking are economically and environmentally beneficial, yielding value to workers, employers, and our communities.

Virginia Tech was awarded a Silver ranking as a Bicycle Friendly University through the League of American Bicyclists from 2019 to 2023. This is an improvement from our previous Bronze rating. Virginia Tech has been recognized as a Bicycle Friendly University since 2013.

2022 TREE CAMPUS HIGHER EDUCATION REACCREDITATION

For the fourteenth consecutive year, Virginia Tech has been recognized for its best practices in campus community forestry through the Arbor Day Foundation's Tree Campus Higher Education program. Launched in 2008, Tree Campus Higher Education is a national program that honors colleges and universities for effective campus forest management and engaging students, faculty, and staff in conservation goals. Virginia

Tech achieved Tree Campus Higher Education recognition by meeting five national standards, which include maintaining a tree advisory committee, operating a campus tree-care plan, dedicating annual expenditures toward trees, organizing an Arbor Day observance, and executing student service-learning projects. More than 700 trees have been planted across campus since 2008. Trees are among the most visible representations of Virginia Tech's commitment to environmental stewardship.

BEE CAMPUS USA

For the first time in its history, Virginia Tech has earned the Bee Campus USA certification for its commitment to sustaining native insect pollinators. The initiative is sponsored by the Xerces Society for Invertebrate Conservation. Bee Campus USA certification requirements serve as a guideline for affiliated campuses to increase their commitment to preserving these native pollinators. This is achieved through a long-term plan to increase native plant habitat, provide pollinator nesting sites, reduce pesticide use on campus, and develop pollinator conservation education and outreach opportunities for the campus community. The Virginia Tech Bee Campus Standing Committee is composed of dedicated and enthusiastic students, faculty, and staff from many different disciplines across campus. This certification also works toward fulfilling aspects of the 2020 Virginia Tech Climate Action Commitment. The Commitment seeks to achieve carbon neutrality by changing the university's physical infrastructure, collective and individual behaviors, and educational mission. By becoming affiliated with Bee Campus USA, Virginia Tech will work closer to reaching Goals 6 and 10 of the Climate Action Commitment.

Read More About Sustainability Awards

vtx.vt.edu/articles/2022/05/sa-dining-nacufs-awards-2022

vtx.vt.edu/articles/2022/04/tree-bee-campus

vtx.vt.edu/articles/2022/06/cals-bee-campus-usa

vtx.vt.edu/articles/2022/06/environment-awards

vtx.vt.edu/articles/2022/05/unirel-IMPACT-rankings-2022

OTHER AWARDS AND RECOGNITION

Virginia Governor's Environmental Excellence Award

Virginia Tech received two 2022 Governor's Environmental Excellence Awards for its sustainability achievements at the Environment Virginia Symposium held in March 2022. Administered annually by the Department of Environmental Quality, in partnership with the Department of Conservation and Recreation,

Virginia Tech has received a total of

12 GOVERNOR'S ENVIRONMENTAL EXCELLENCE AWARDS.

the Governor's Environmental Excellence Awards recognize public, private, and nonprofit organizations for successful and innovative efforts to improve Virginia's environment.

The Office of Sustainability Student Internship Program received the 2022 Governor's Environmental Excellence Award Bronze Medal. The Office of Sustainability Student Internship Program provides students with invaluable opportunities to gain real-world insights and professional skills in sustainability and university operations. Approximately 20 interns participate in the academic year-long program every year.

Dining Services, in partnership and cross-campus collaboration with Procurement, Athletics, and many more departments, received a Silver Governor's Environmental Excellence Award for the development of its Plastic Pollution and Solid Waste Reduction Plan to address Executive Order 77 under Governor Northam, which banned all single-use plastics at state institutions. The award also recognized the university's future commitments to conducting an extensive waste and building audit on the Blacksburg campus, reducing single-use plastics, and an overall reduction of solid waste from landfills - supporting the university's Climate Action Commitment goal of becoming a zero waste campus by 2030.

Times Higher Education Impact Rankings

After making its debut in the Times Higher Education Impact Rankings a year ago, Virginia Tech found itself ranked in the top 100 overall out of more than 1,400 institutions across the world and in the top 10 in the United States in the 2022 Impact Rankings. The Times Higher Education Impact Rankings are the only global performance metrics that assess universities against the United Nations Sustainable Development Goals (SDG). The Times Higher Education rankings use calibrated indicators to compare universities across four areas: research, stewardship, outreach, and teaching.

This year, Virginia Tech received an overall impact ranking of No. 98 out of 1,406 universities spanning 106 countries. The university garnered high marks in seven categories, with a top ranking of No. 19 out of 604 universities globally in the category of responsible consumption and production. This category measures universities' research on responsible consumption and their approach to the sustainable use of resources.

Virginia Tech also earned a high ranking in the category of zero hunger (No. 36 out of 553), a category that considers a university's research on hunger, their teaching of food sustainability, a commitment to tackling food waste, and a commitment to addressing

hunger on campus and locally. The school's Center for Food Systems and Community Transformation helped with the high ranking in this category.

Other top marks for Virginia Tech came in the categories of sustainable cities (No. 56 out of 783), climate action (No. 59 out of 674), clean water (No. 66 out of 634), reduced inequalities (No. 67 out of 796), and life on land (No. 87 out of 521).

2021-22 SUSTAINABILITY PROGRESS

Goal 1. Carbon Neutrality

"Achieve a carbon neutral Virginia Tech campus by 2030."

Carbon neutral is defined as net-zero emissions of CO_2, CH_4, and N_2O by Virginia Tech operations on the Blacksburg campus based on the geographic and greenhouse gas (GHG) scope of the 2020 Climate Action Commitment. The initial scope of the 2020 Climate Action Commitment includes all Virginia Tech-owned lands and buildings on the main campus, buildings leased by university departments in Blacksburg, and agricultural/forestry operations and lands in the Blacksburg region. The GHG scope includes:

+ Scope 1 emissions from campus direct fuel use,

+ Scope 2 emissions related to purchased electricity (generation CO2 and N2O transmission/distribution losses), and

+ Scope 3 emissions related to campus behavior (commuter driving, transit bus fuel, waste/recycling/compost, water/wastewater, aviation fuel, and commercial business travel).

ANNUAL CO_2 EMISSIONS

The following figure shows the change in GHGs both from a calendar year and a fiscal year perspective. CY2021 shows a 10 percent increase in total emissions from CY2020. However, when compared to 2019, before the abrupt shift to online learning and campus closures for COVID-19, there was a 1.5 percent decrease in total emissions.

Aviation emissions have been adjusted from previous years to include an emissions factor of 2.7 due to radiative forcing at high atmospheric elevations. All CO2 emissions data have been adjusted from FY2014-2022.

Annual CO_2 emissions were calculated using a third party verified tool. SIMAP, a carbon

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Figure 1. Annual CO2 Emissions
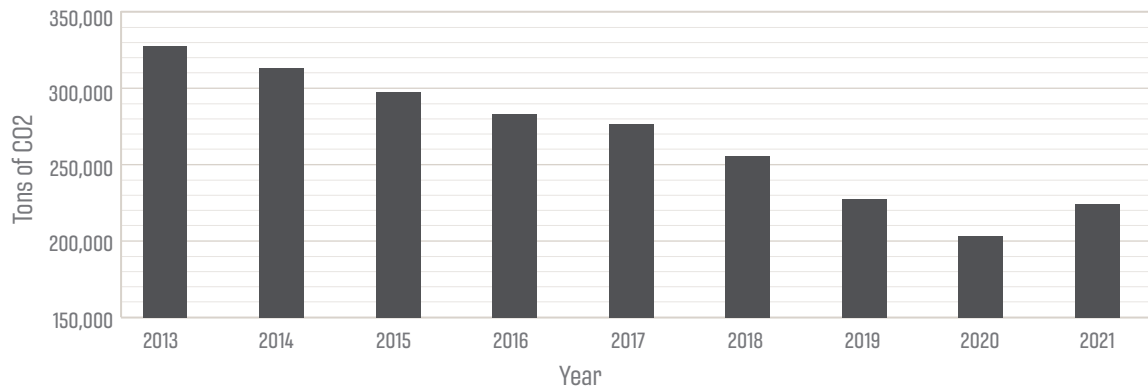
and nitrogen-accounting platform that tracks and analyzes campus-wide sustainability. This benchmarking methodology is streamlined with our annual Greenhouse Gas Assessment and Inventory Report where Calendar Year 2019 serves as the baseline year for emissions benchmarking.

There were a couple of reasons for this recent increase in total emissions and the decrease in total emissions when compared to CY2019:

+ In Spring 2020, the COVID-10 pandemic caused an abrupt shift to online learning. Most campus buildings were limited to certain personnel and students. In Fall 2021 (CY2022), students returned to campus at full capacity. This resulted in increased electricity use, heating and cooling load, and increased activity in classrooms and research laboratories. Commuting, aviation travel, and municipal solid waste emissions increased as campus activity resumed. Increased ventilation rates to accommodate new safety standards and prevent the spread of airborne illness also increased heating loads and electricity consumption on campus.

+ In Calendar Year 2022, Virginia Tech's Blacksburg Campus footprint increased by 297,921 square feet with the new construction of the Creativity and Innovation District Living-Learning Community (CID-LLC) and the renovation of Holden Hall. While the overall campus CO_2 emissions increased, when normalized for the additional campus area, the CO_2 increase from the campus energy consumption is nominal. While our CO_2 emissions increased slightly, the additional square footage suggests the campus building stock is becoming more efficient.

+ This past year, the campus steam plant converted almost entirely to natural gas consumption, burning a minimal amount of fuel oil as a backup source. Coal has not been used at the campus steam plant since February 2020. The reduction in total emissions compared to CY2019 can be largely attributed to the shift to natural gas, which provides cleaner emissions. The campus steam plant has also completed several energy efficiency upgrades, discussed later in this report.

+ Virginia Tech has not purchased Renewable Energy Credits (RECs) in Calendar Year 2021. In 2020, Virginia Tech purchased RECs to offset 10 percent of campus electricity consumption.

Figure 2 shows the distribution of GHG emissions by source for the 2021 fiscal year. The largest source of GHG emissions is purchased electricity (60.4 percent) followed by natural gas (26.6 percent) used in the co-generation steam plant. Agriculture fuels, faculty/staff airline travel, animal, fertilizer and upstream lifecycle methane leakage are among the GHG emissions excluded in this figure.

Figure 2. GHG Emissions Breakout FY2022
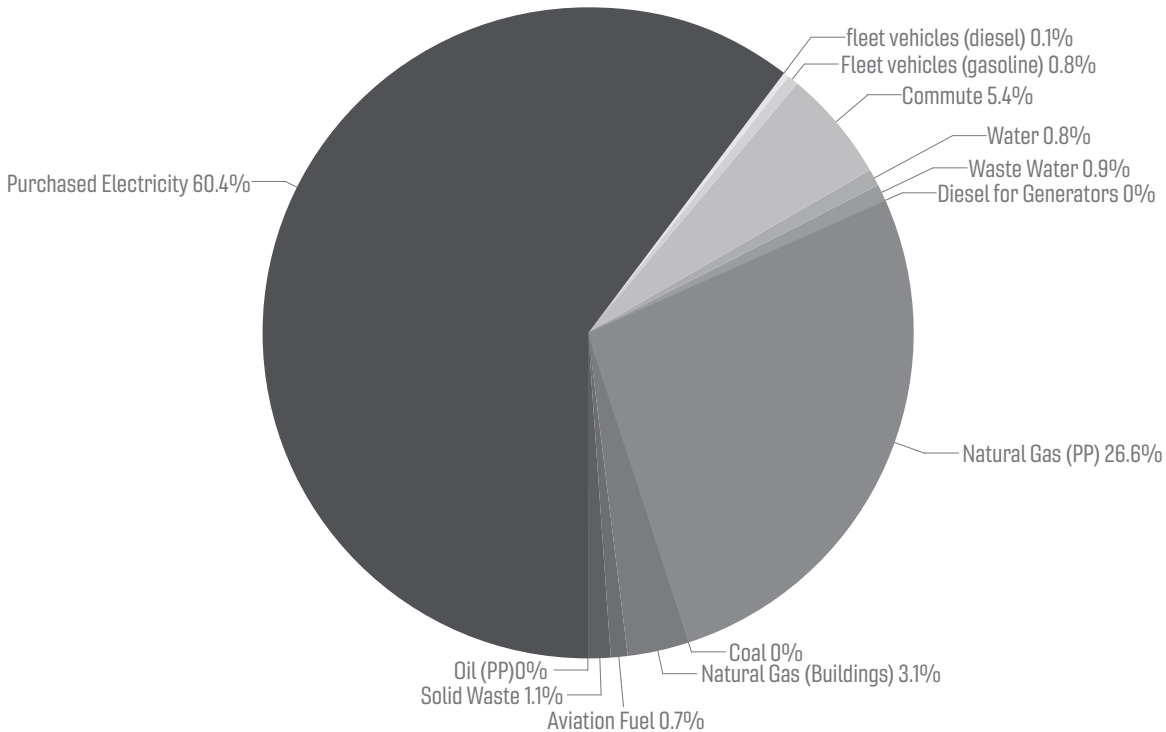
GREENHOUSE GAS INVENTORY AND ASSESSMENT REPORT

Since 2007, Virginia Tech has been monitoring GHG emissions from direct and indirect sources to assess its carbon footprint. In general terms, it is the amount of carbon dioxide (and other gases) that are produced or emitted during normal campus operations. It is often associated with the burning of fossil fuels for energy or transportation, but GHG emissions can result from many other sources. The Greenhouse Gas Inventory and Assessment Report is a quantitative analysis, critical for driving planning, policies, and operations that will continue to result in emissions reductions across the university. As state, national, and worldwide leaders seek to limit or reduce GHG emissions by 2030, Virginia Tech is well positioned to do its part. As we transition the GHG emissions accounting to encompass the 2020 CAC broadened demands, we spent most of the last year creating a new protocol so that we can have strong and consistent data to work with over the next decade.

The Greenhouse Gas Inventory and Assessment Report also serves as a great resource for students, faculty, and staff to learn more about their associated impacts on the environment. As part of the 2020 CAC, the carbon we account for with the Greenhouse

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Gas Inventory and Assessment Report has been broadened to include Scopes 1 and 2 emissions (direct and indirect energy usage) fully as well as a significant portion of Scope 3 emissions. Scope 3 emissions correspond to activities that many of us can influence through our choices, such as commuting, purchasing, and waste management. The university will need dedicated action and support from the entire campus community to meet our goal of carbon neutrality by 2030. The GHG Assessment uses SIMAP, the Sustainability Indicator Management and Analysis Platform, developed by the University of New Hampshire.

The latest Greenhouse Gas Inventory and Assessment Report (bit.ly/VTGHG1920) was published in 2021 using 2019 data and an update is currently underway using 2021 data. The CASE committee has a dedicated subcommittee to assist in the process of developing the Greenhouse Gas Inventory and Assessment Report as well as continued support from the Green Engineering program, which has historically contributed to the project through an experiential learning program for students.

CASE TASK FORCES

The Climate Action, Sustainability, and Energy Committee established a series of task forces during academic year 2021-22 to address Climate Action Commitment goals and related implementation strategies. Many of those task forces relate to the CAC's overarching goal of carbon neutrality:

CARBON NEUTRAL COMMUTING AND CARBON NEUTRAL FLEET TASK FORCES

This task force is currently working to develop a timeline and strategy for upgrading Virginia Tech's fleet to include electric vehicles, installing EV charging infrastructure on campus, and developing mechanisms to advance non-single-occupancy vehicle modes.

GREENHOUSE GAS (GHG) INVENTORY TASK FORCE

This task force's goal is to develop a 2021 greenhouse gas inventory strategy which includes data acquisition, methodology, timeline, and scope. The task force hopes to submit the final inventory by the end of August 2022. They're interested in exploring the possibility of including upstream emissions from food and expansion of reporting to satellite campuses not included in the footprint of the Blacksburg campus.

CARBON OFFSET AND MANAGEMENT TASK FORCE

This task force is working to develop strategies for VT's acquisition of carbon offsets including local and regional options to achieve net-zero GHG emissions by 2030. Critical considerations for the task force include defining acceptable carbon offset characteristics; identifying and prioritizing carbon offset options based on capacity, feasibility, quality, and cost; finding collaborators for internal carbon offset development; and working closely with the GHG Inventory Task Force to estimate the magnitude of carbon offsets required in future years.

Goal 2. 100 Percent Renewable Electricity

"Achieve 100 percent renewable electricity by 2030."

Renewable electricity comes from energy sources that are derived from natural processes that are replenished continuously. This includes electricity and heat generated from solar, wind, biomass, hydropower, and geothermal. A carbon-free electricity supply will support Goal 1 of the Climate Action Commitment. Virginia Tech can achieve 100 percent renewable electricity through a combination of:

+ Solar energy projects on campus building rooftops and Virginia Tech lands up to 2.35 MW by 2022 and 15 MW by 2030. These can be Virginia Tech-owned or third-party-owned with a Virginia Tech power purchase agreement.

+ Power purchase agreements (PPA) with utility or third-party-owned projects with Southwest Virginia, up to 100 MW by 2030.

+ Other PPAs or virtual PPAs.

+ Appalachian Power will be increasing its renewable portfolio by 294 MW of solar and 204 MW of wind power over the next three years as part of the Virginia Clean Economy Act (VCEA). By 2040, Appalachian Power plans to add 3,300 MW of solar, 2,600 MW of energy storage, and nearly 3,000 MW of onshore wind to its portfolio.

+ Renewable energy credits (RECs) or purchased MWh credits from utility or third parties.

SOLAR PROJECT DEVELOPMENT

A new solar energy power purchase agreement will help boost Virginia Tech's CAC implementation efforts toward 100% renewable electricity by 2030. The project involves 2.1 megawatts of solar arrays on several Blacksburg campus buildings. When complete, the arrays will produce 2,800 megawatt-hours of electricity per year and reduce campus carbon dioxide emissions by 44,000 tons over 20 years.

The new solar installations will accompany the existing and much smaller solar arrays located on the roofs of the Perry Street Garage, Whittemore Hall, and Durham Hall. Installation of the new arrays is underway and full installation is anticipated to be completed in about a year.

Virginia Tech is partnering with Sun Tribe to execute the power purchase agreement after a competitive bidding process. Sun Tribe is based in Charlottesville, Virginia, and was co-founded by three Virginia Tech alumni. Sun Tribe will develop and initially own and maintain the arrays and sell the power to Virginia Tech Electric Services through a power purchase agreement for six years. After that, Virginia Tech plans to purchase and maintain the systems for the remainder of its 30-year lifespan. Implementation is assisted by a small grant from the Virginia Department of Energy.

Read about campus solar implementation: vtx.vt.edu/articles/2022/03/campusplanning-solaragreement

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Goal 3. Energy System Efficiency and Total Steam Plant Conversion to Natural Gas

"Complete the total conversion of steam plant fuel to natural gas by 2025, plan for the full transition to renewable steam plant fuel after 2025, and continue to improve the efficiency of campus energy systems."

CENTRAL STEAM PLANT

The Central Steam Plant is a co-generation asset that produces centralized steam and simultaneously uses some of the steam as a by-product to generate up to 6.25 MW of electricity. The steam-turbine -powered generator was recently refurbished and returned to operation in Spring 2022. From March 2022 to June 2022, 6,903,518 kWh of electricity was produced at the plant. That electricity production offsets the electricity purchased by the university for distribution across campus and within Blacksburg. Co-generation increases the thermal efficiency of the Central Steam Plant reduces greenhouse gases and other harmful emissions and refocuses the infrastructure investments on distributed generation and smart energy options.

Figures 4 and 5 show power plant fuel consumption, usage, and GHG emissions between FY2014 and FY2022. Power plant GHG emissions have been reduced significantly since the change in fuel source to natural gas nine years ago. Fuel consumption at the power plant increased slightly from FY2021, which can be attributed to the campus reopening after COVID-19 closures and the recent campus area increase.

Much of the emissions savings at the power plant in FY2022 compared to the pre-COVID baseline FY2019 can be attributed to several upgrades and efficiency initiatives. In Fall 2021, a new natural gas-fired boiler was installed along with a reverse osmosis (RO) system, which removes scale-forming salts from the boiler feedwater. This RO system replaced the less efficient demineralizers in the plant and also reduced the handling of corrosive and very dangerous materials in the plant. Additionally, the air dryer in the plant was recently replaced with a more efficient unit equipped with an energy management mode that allows for a longer drying cycle, longer runtimes, and fewer regenerations. To further reduce the plant's emissions, there are plans to have the cogeneration system rewound in the Spring of 2023 along with the replacement of the generator cooling water piping. This will allow for a higher volumetric flow rate through the system, providing better heat transfer.

Virginia Tech has continued to achieve steady progress in reducing GHGs at the power plant despite continued growth. Much of that reduction is attributed to the increased use of natural gas as the university's primary fuel source and the introduction of Boiler Pollution Reduction initiatives. Studies of potential steam plant fuel options, including the potential use of biomass pyrolysis/gas/biochar are underway.

Figure 4. Power Plant Fuel Consumption

Figure 5. Power Plant Greenhouse Gas Emissions
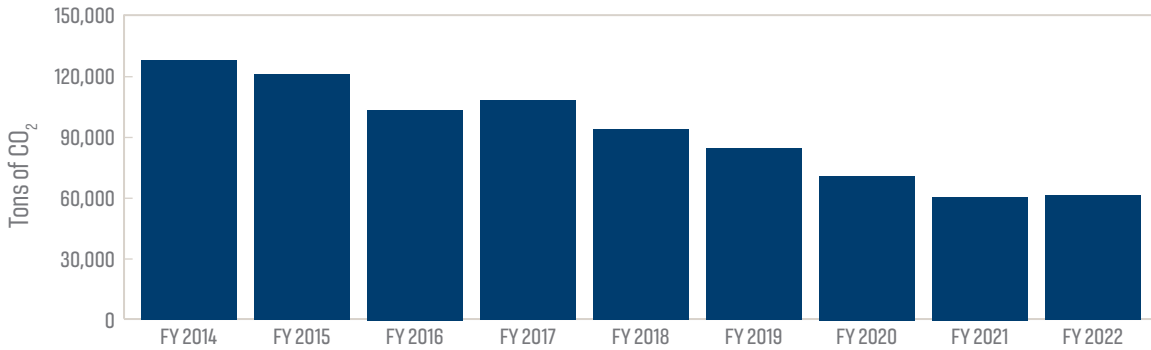
CAMPUS CHILLED WATER INFRASTRUCTURE

Virginia Tech completed its chilled water infrastructure capital construction project, a multiyear project beginning in July 2019. Previously, two on-campus plants, the North and Southwest Plants, distributed chilled water through an underground piping network to cool buildings across the Blacksburg campus. In addition to the installation of three state-of-the-art 3,000-ton chillers, roughly four miles of new underground piping were installed across campus. This extensive network of piping enabled the connection of the North and Southwest Chiller Plants and stand-alone chiller systems into one continuous chilled water loop. Since the Chiller Plant Phase II project began in 2019, electricity consumption for chilled-water generation in Fiscal Year 2022 fell by 54% when compared to the pre-construction five-year average annual consumption for a cumulative reduction of 19.6 million kWh. This equates to an energy cost avoidance of approximately $1.8 million and an environmental impact avoidance of 8,479 MTCO2e or 21 million miles driven by an average US passenger vehicle!

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DEMAND SIDE MANAGEMENT

The Office of Energy Management with the Department of Campus Planning, Infrastructure, and Facilities guides the operations of the university to achieve tangible reductions in energy consumption on campus through the development and implementation of various Demand Side Management (DSM) policies, initiatives, and projects.

DSM promotes energy efficiency through upgrading, retrofitting, and commissioning mechanical, lighting, building automation, and electrical systems in university buildings. While DSM is primarily concerned with reducing on-site energy consumption and related costs, it also supports the university's commitment to sustainability. The benefits gained from the program include carbon footprint reduction, improvement of indoor air quality, and conservation of resources. The DSM program will help the university to be less vulnerable to sudden changes in the energy market and helps set the way toward a net zero energy future.

VIRGINIA TECH GUIDELINES FOR ENERGY EFFICIENT DESIGN

The Division of Campus Planning, Infrastructure, and Facilities updated its Design and Construction Standards Manual (DCSM) in 2022 to ensure that the design and construction of buildings at Virginia Tech comply with the Virginia Energy Conservation code as well as ASHRAE 90.1. The purpose of the Virginia Tech Guidelines for Energy Efficient Design is to formulate additional requirements that go beyond the applicable Energy Code and are specific to the university. The DCSM presents recommended design elements in ten sections, each representing a vital interrelated component of an energy-efficient design and includes running a building energy simulation, efficient building shell design, windows and daylight harvesting, efficient use of lighting and power, heating and cooling, ventilation, local service water heating, building automation, renewable energy systems, and energy metering.

Learn about the Virginia Tech Guidelines for Energy Efficient Design at:
bit.ly/VTEnergyEfficiencyDesignGuidelines

DATA-DRIVEN ENERGY OPTIMIZATION

Using data to guide decisions and achieve energy efficiency at scale is at the core of the Energy Action Plan. The Office of Energy Management utilizes a combination of a central energy management platform and building-level energy data spreadsheets to monitor energy usage in real-time. New buildings are added to the energy management platform during construction and help to visualize real-time parameters of energy use. Building spreadsheets enable detailed analysis of the performance of buildings, especially concerning efficiency project savings achieved.

Through newly-installed smart meter and sub-meter infrastructure, energy data is stored in various campus systems that enable the Office of Energy Management and other users to identify potential projects and track energy usage per building.

Practitioners can then identify energy consumption patterns to optimize lighting, ventilation, heating, and air based on demand. Data visualization can also help detect irregular spikes in energy usage.

The Office of Energy Management is currently working with other departments to develop a Master Metering Plan to provide enhanced metering capabilities on campus. This will ultimately enable more detailed and accurate cost accounting and budgeting for campus building users, along with providing even more data that can be analyzed. Upgrades to metering, controls, and data management are underway. Several buildings have migrated to a modernized platform that enables advanced automation and energy savings initiatives. Additionally, all metering data is migrating to the newly developed Operational Data Warehouse (ODW) system. This will improve real-time access to utility performance data through extensive dashboards and advanced analysis tools.

VIRGINIA TECH ELECTRIC SERVICE

Few universities serve the electrical needs of their surrounding communities - and none to the extent of Virginia Tech and the Virginia Tech Electric Service. VTES has been in the business of providing primary electrical distribution service to the campus and other customers for more than 100 years. VTES is the electric utility provider for the Blacksburg campus and about 7,000 residential and commercial customers in the Town of Blacksburg. VTES continues to retrofit campus street lighting to LED technology.

Goal 4. Existing Building Energy Efficiency

"Reduce existing building energy consumption to enable carbon neutrality by 2030."

ENERGY ACTION PLAN (EAP) 6

More efficient buildings reduce GHG emissions as they reduce fossil fuel emissions created by electricity, steam, and chilled water generation. Building-level energy savings initiatives are underway with many additional projects planned. The Office of Energy Management has proposed the sixth phase of the Energy Action Plan (EAP). to continue efforts for the implementation of the Virginia Tech 2020 Climate Action Commitment. EAP 6 proposed projects include the conversion of 18 buildings to a new Building Automation System (BAS) platform, an LED lighting overhaul of 21 buildings (E&G and Auxiliaries), various retro-commissioning projects, additional energy metering installations, chilled water system optimization, and chilled water piping projects.

BUILDING AUTOMATION SYSTEM UPGRADES

The BAS system is a critical tool for energy management operations. A recent BAS assessment identified and proposed efficiency opportunities through modernization and investments in the BAS system. These upgrades are anticipated in FY2023 and FY2024.

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LED LIGHTING UPGRADES

EAP 6 proposes a large group of LED lighting upgrades. Conversion to LED lighting will increase light quality and quantity while reducing energy use and cost, greenhouse gas emissions, maintenance costs, and materials waste.

Currently, more than 18% of the campus (24 buildings) has LED lighting being installed. In FY2022, Virginia Tech completed a lighting audit of 71 buildings, approximately 35% of campus, to identify energy saving opportunities. The potential savings exceed 6.7 million kWh or roughly $629,800 in energy- savings annually. These upgrades would also divert nearly 11,700 lamps from landfills. Lighting retrofits are underway for 10 of these recently audited buildings, with plans to complete the remaining upgrades over the next two years. There are several additional lighting projects in progress including McBryde Hall, the Media Building, the Urban Horticulture Garden, and Kentland Dairy Farms. These projects are funded by various sources including the Green RFP Program.

The Office of Energy Management plans to audit and retrofit roughly 3,500,000 square feet of campus to LEDs soon.

RETRO-COMMISSIONING EFFORTS

The EAP 6 budget also includes a robust retro-commissioning (RCx) program. RCx is a systematic process applied to existing buildings for identifying and implementing operations and maintenance improvements within the heating, ventilation, and air conditioning systems to ensure their continued high performance over time. Beginning in 2018, the Office of Energy Management increased this effort significantly as part of the Five-Year Energy Action Plan (2015-2020). Current FY22 RCx efforts saved an estimated 673,800 kWh and 4185 MMBTUs, totaling $90,540 in energy expenses. The average RCx project saves $4,765 in energy-related expenses with minimal upfront investments as projects are completed predominantly with in-house labor. These types of savings, when combined with other larger payback projects (i.e. solar) will help maintain overall energy fund simple paybacks within target values. RCx will continue to be a major contributor to reducing energy consumption on campus and will be instrumental in Virginia Tech meeting its energy efficiency goals in the updated Climate Action Commitment.

LABORATORY VENTILATION OPTIMIZATION PROJECT - STEGER HALL NORTH AND SOUTH

This fall, Virginia Tech will install a laboratory ventilation optimization system and program for Steger Hall North and South. Laboratory ventilation optimization has been identified as low-hanging fruit and a widespread need with multimillion-dollar project potential. Steger Hall was identified as a great candidate for this air quality monitoring and optimization system installation, measuring and reporting air quality and safety in real-time while reducing unnecessary energy usage. The project will cost $400,000 and have annual energy cost savings of $73,000 (a 5.5-year simple payback period).

LIGHTS OUT!/POWER DOWN!

Since 2010, Virginia Tech has participated in the Interruptible Load Reliability energy reduction program. The program is part of Virginia Tech's agreement with PJM Interconnection, Virginia's regional electric transmission grid operator, and is managed by the Virginia Department of Mines, Minerals, and Energy and administered by CPower.

As a large consumer of electricity in the region, Virginia Tech's participation helps mitigate the loss of power in the broader community during times of peak energy usage, such as hot, humid summer afternoons and early evenings. This program, nicknamed Lights Out/Power Down, allows the university to test its ability to meet that demand should those conditions occur.

For the thirteenth year in a row, the Virginia Tech community exceeded its goal during the annual Lights Out/Power Down event held on the Blacksburg campus. The university reduced its campus electrical power demand to an average of 17,400 kilowatts, exceeding the demand goal for this year's test event of 17,500 kilowatts. The peak energy use that day - before the event - was marked at 26,500 kilowatts. The university community reduced its total energy consumption by over 9,000 kilowatts.

During this year's Lights Out! Power Down! Event, the Division of Campus Planning, Infrastructure, and Facilities partnered with Hokie Wellness and Rec Sports to provide free outdoor wellness activities to encourage using the time to unplug both literally and metaphorically. Events included a group walk, yoga, and mindfulness meditation.

LEED OPERATIONS AND MAINTENANCE RECERTIFICATION PROGRAM

Virginia Tech launched its LEED Operations and Maintenance (O&M) Recertification pilot project, beginning with Moss Arts Center, LEED-certified by the U.S. Green Building Council (USGBC) in 2014. The LEED O&M program requires a year of actual building performance data collection and verifies ongoing high-performance and sustainable operations. The Office of Sustainability interns supported the Office of Energy Management in the energy, water, waste stream, and occupant health and satisfaction data collection process. The framework has been developed with plans to replicate the process with Goodwin Hall and New Classroom Building, followed by the remaining eligible LEED-certified buildings on campus.

USGBC VIRGINIA LEED HIGHER EDUCATION SHOWCASE

Virginia Tech contributed knowledge of LEED building strategies to the US Green Building Council (USGBC) Virginia LEED Higher Education Showcase on September 15. The campus sustainability manager, campus energy manager, associate director of capital construction, and planning & operations director for residence life gave a presentation to the group on the recently renovated LEED Gold O'Shaughnessy Hall. They detailed their successes, challenges, and lessons learned in waste reduction and building energy efficiency during the renovation process so that other campuses could learn from their experience.

Goal 5. New Building Energy Efficiency

"New buildings initiated by 2030 will operate carbon neutral."

Designing for high energy efficiency in new buildings is necessary to achieve and maintain carbon neutrality and sustainable operations.

LEED STANDARDS

The US Green Building Council provides a green building certification program known as LEED, or Leadership in Energy and Environmental Design. This program scores buildings on their level of energy efficiency based on a point system. Currently, Virginia Tech has 35 LEED-Registered buildings totaling over 3.2 million gross square feet (23 certified, 1 pending certification, 8 under construction, and 3 in design). The university has specified that all new buildings entering the design phase of construction that are greater than 5,000 gross square feet in area, or the renovation of such buildings where the cost of renovation exceeds 50 percent of the value of the building, shall conform to LEED Silver standards or better.

DESIGN AND CONSTRUCTION STANDARDS

The university's Design and Construction Standards Manual (DCSM) outlines the philosophy, standards, recommendations, and requirements for the design and construction of campus buildings.

As a component of the DCSM, Guidelines for Energy Efficient Design address the energy efficiency and on-campus renewable energy utilization requirements. These standards apply to all new construction, additions, and renovation projects on campus.

	Status	LEED Projects	GSF
Gold	●	Ambler Johnston Hall	269,463
	●	Goodwin Hall	154,935
	●	Henderson Hall Renovation and Theatre 101 Addition	38,750
	●	Human & Agricultural Biosciences Building I	93,860
	●	ICTAS- Phase II	42,190
	●	Moss Arts Center	147,382
	●	O'Shaughnessy Hall Renovations	69,200
Silver	●	Chiller Plant Phase I (Southwest Chiller Plant)	16,655
	●	Classroom Building	72,275
	●*	CID LLC	224,500
	■	Corps Leadership & Military Science Building	60,500
	■	Data & Decision Sciences	120,000
	●	Davidson Hall (RRAB)	25,151
	●	Football Locker Room Addition	42,145
	▶*	Global Business & Analytics Complex Residence Halls	60,500
	■	Hitt Hall & New Dining Facility	112,000
	■	Holden Hall Renovation	101,240
	●	Indoor Athletic Training Facility	91,600
	■	Innovation Campus Academic Building	300,000
	●	Lavery Hall	77,301
	■	Multi-Modal Transit Facility	13,606
	■	New Upper Quad Residence Hall -	58,000
	●	Oak Lane Phase IV	20,508
	●	Pearson Hall East	111,191
	●	Pearson Hall West	108,765
	▶*	Slusher Hall Replacement/Planning	187,848
	●	Student Athlete Performance Center	25,800
	▶*	Student Wellness Improvements	263,000
	■	Undergraduate Science Laboratories - *New Construction*	102,366
	●	VT Carilion Biomedical Research Expansion	139,586
	●	Vet Med Instructional Addition	24,600
Certified	●	Visitors & Undergraduate Admissions Center	18,155
	●	Davidson Hall	44,845
	●	Sandy Hall (RRAB)	19,889
	●	Liberal Arts Building	15,394
		Total GSF	3,165,200

● Complete ■ Construction ▶ On Hold * Certification Pending

A complete list of LEED-certified buildings separated by LEED Gold, Silver, and Certified along with gross square footage and completion status, see the associated table.

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ENERGY STAR ®

Energy Star ® provides labels for appliances and other products that are superior in energy efficiency. Virginia Tech's goal is to set a minimum standard for all energy-consuming equipment to be Energy Star ® rated or better, assuming that the performance criteria are met.

DESIGNING A SUSTAINABLE STUDENT LIFE VILLAGE

Much of Campus Planning, Infrastructure, and Facilities and the campus community engaged in an 8-month master planning process to conceptualize a student life village that would potentially be built in the Oak Lane community and golf course area. The project was led by Senior VP and CBO, Dwayne Pinkney, and involved Sasaki as the architectural firm. This master plan was notable from the standpoint that it would be one of the largest design projects on campus featuring sustainable facilities and landscape as a core design principle. Several technical advisory groups were formed to broadly discuss sustainability in various areas like transportation, energy systems, construction, landscape, and student life. The village could potentially expand beds on campus by as many as 5,000 and provide a comprehensive range of services from dining to recreation. It presented a remarkable opportunity to incorporate holistic sustainability concepts in every aspect of planning. The final plan was presented to campus by the Sasaki team in March 2022.

Goal 6. Agricultural, Forestry, and Land Use Operations will be Carbon Neutral by 2030.

AGRICULTURE

HOMEFIELD FARM

Homefield Farm is a partnership between Dining Services, the School of Plant and Environmental Sciences, and the College of Agriculture and Life Sciences. This six-acre farm grows fruits, vegetables, and herbs for Virginia Tech Dining Services, and serves as a site of experiential student learning, interdisciplinary research, and community outreach. Since Fall 2016, Dining Services has held a Homefield Pop-up Farm Stand on campus. Students can purchase fresh, local campus-grown veggies from Virginia Tech's very own Homefield Farm.

Over 200,000 pounds of produce have been produced at Homefield Farm to date. More than 25 different herbs and vegetables were grown in 2021. 43,082 pounds of produce were harvested and delivered to campus dining centers, including 250 units sold at the campus Farm Stand.

MANAGEMENT OF CROP LANDS

Virginia Tech's crop and farm lands cover approximately 1,800 acres. All 1,800 acres are maintained in accordance with a four-tiered Integrated Pest Management (IPM) Plan as follows:

+ **Action Thresholds**: Each of our crops (corn, alfalfa, barley, grass hay, pasture) is grown over numerous fields through the College of Agriculture and Life Sciences farm system. Each field is treated separately in the IPM plan so we never treat an entire crop as one unit when making applications; instead, it's handled one field at a time. A manager is regularly scouting fields to determine what, if any, course of action is required. Applications are only made if the manager thinks crop losses will outweigh application expenses.

+ **Monitor and Identify Pests:** Managers regularly monitor crop needs, identifying pests and pest damage. Managers only take actions when warranted, not as a standard practice.

+ **Prevention:** The goal is to use the lowest pesticide rates possible to control pests. Concentrated pesticides are purchased in bulk containers to reduce plastic container waste.

CATAWBA SUSTAINABILITY CENTER

Virginia Tech's Catawba Sustainability Center (vtrc.vt.edu/catawba) is a 377-acre farm property situated in the beautiful Catawba Valley of Virginia. The Center serves as a living laboratory to advance environmental stewardship and community engagement to provide a learning environment for research, teaching, and demonstration of sustainable practices in agriculture, forestry, and land management.

As a member of Virginia Tech's Outreach and International Affairs, the work at the Catawba Sustainability Center exemplifies the notion that learning is interdisciplinary and occurs in both the classroom and on the farm.

The Catawba Sustainability Center offers a space for faculty, students of all ages, community members, and visitors just passing through to learn about sustainable agriculture production, agroforestry, water quality monitoring, wetland restoration, and much more.

FORESTRY

Virginia Tech takes a holistic approach to campus urban forestry and the management of university lands. This approach, rooted in planning, collaboration, education, and community engagement, helped the university earn Tree Campus Higher Education recognition for the 14th consecutive year in 2022.

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Leading Virginia Tech's urban forestry efforts is Jamie King, the Urban Forest Manager and University Arborist who joined the Division of Campus Planning, Infrastructure, and Facilities in 2019. "Trees play an integral part in maintaining a sustainable campus. They help support air quality, water quality, energy conservation, stormwater management, carbon capture and storage, wildlife habitat, and community wellbeing, all while creating spaces on campus that serve as a living-learning lab," said King. Trees are among the most visible representations of Virginia Tech's commitment to environmental stewardship. Tree preservation, reforestation, and education are prescribed throughout several key university frameworks, including the Campus Master Plan, the 2020 Virginia Tech Climate Action Commitment, and the Virginia Tech Blacksburg Campus Urban Forest Master Plan (UFMP), which is currently in development and under community review.

Since 2008, more than a thousand canopy and ornamental trees have been planted on the Blacksburg campus and many thousands more have been planted in riparian areas on Virginia Tech lands. Over the 2022 planting season, more than 175 landscape trees were planted across the core campus as part of tree replacement programming and capital projects. Many of these trees were planted with support from partners in the Office of Sustainability, the College of Natural Resources and Environment (CNRE), and the Virginia Department of Forestry offering students immersive learning experiences and public service opportunities, all centered around urban forest management and environmental stewardship on campus. These programs include hands-on academic sessions at campus trees and forests, tree planting events throughout the year, and urban forestry student internships.

A complete field inventory of trees on Virginia Tech's Blacksburg campus was completed in 2018 and the report can be obtained on the Virginia Tech website. A collaboration among the Division of Campus Planning, Infrastructure, and Facilities and CNRE, the inventory includes tree identity, precise location, measurements, health, and condition details for trees all over campus. As of June 24, 2022, the Blacksburg Core Campus is home to approximately 10,117 living trees and a total of 12,446 records are logged in the Core Campus Tree Inventory.

The graphical representation of the Campus Tree Inventory is seen in Figure 6. Dark green dots represent campus urban trees and light green dots indicate trees in the Old-Growth Forest near Lane Stadium. Some urban trees and various larger forests are not included and require future inventory and assessment. This resource helps guide tree preservation and maintenance as well as promotes education and awareness as the Campus Tree Inventory and Interactive Tree Map are available online for public access.

The total value of the structural and environmental benefits provided by the trees on the Blacksburg campus was included in the 2018 inventory and analysis. The data collected as part of this project was analyzed with software developed by the United States Forest Service called i-Tree Eco, a tool that models the structure of an urban forest and how trees influence the world around them. The software then analyzes the results and quantifies the environmental benefits provided by the inventoried trees to the community.

Figure 6. Aerial Photograph with Campus Tree Overlay

Carbon stored in campus trees:

4,573 TONS = $566,214

When we utilize urban wood resources from campus, we store this carbon for much longer.

Carbon sequestered every year:

59.75 TONS = $7,751

Campus trees and other VT forests offset university carbon emissions by ~3%

Stormwater mitigated every year:

257,072 FT³ = $17,184

Slower runoff = Healthier VT Streams

Air pollution removed every year:

2.7 TONS = $6,459

Cleaner air = Healthier VT community

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Virginia Tech's trees sequester and store enough carbon every year to offset approximately 3% of the carbon produced through total university operations (Randolph 2020, Figure 11). As trees are removed through management operations, the wood may be utilized for student academic projects, construction and woodcraft, wildlife habitat, or mulching materials, continuing the storage of carbon, sometimes for many generations. These trees also slow the runoff of stormwater on campus, reducing severe flooding events and improving water quality. The leaves on campus trees filter particulates and pollution from the air; this air quality improvement allows the community to experience fewer respiratory health challenges.

If Virginia Tech were to replace every tree recorded in the Blacksburg Campus Tree Inventory with the largest commonly available planting stock, the expense would amount to almost $31 million. This analysis does not account for the generations required for trees to mature and provide the benefits the Virginia Tech community enjoys today. These assets require continued investment in maintenance and protection to maximize tree benefits, including carbon capture and storage, for generations to come.

Currently, the urban tree canopy (UTC), the percentage of surface area covered with tree leaves during the growing season, at Virginia Tech is 14.7% (Hwang and Wiseman 2020). In 2019, 20.9% of colleges and universities in the US reported having a campus tree cover goal (8.7%) or were currently developing one (12.2%) (Schmitt-Harsh 2019). The UFMP proposes a Virginia Tech Tree Policy that establishes a UTC goal of 25%, an increase of tree leaf area equivalent to 108 acres, by 2050. This goal supports carbon capture and storage on campus and will contribute significantly towards campus carbon neutrality while providing all of the other environmental and social benefits described in detail above.

Another assessment, conducted in 2019-2020 by students in the Urban and Community Forestry course at CNRE utilized a sample-based photo interpretation method to determine the UTC of specific campus districts (Byers and Wiseman 2020). The students utilized an application called i-Tree Canopy, a software developed by the United States Forest Service, that combines aerial photographs with ecosystem models to determine estimates of land cover types and the ecosystem services provided by UTC cover at specific locations. This land cover data is created through a process called sample-based photo interpretation where analysts classify land cover types through statistical point sampling, allowing fast and inexpensive UTC reports. The i-Tree results report 16.9% UTC

THE EXPENSE TO REPLACE VIRGINIA TECH'S TREES

$30,622,817

NORTHEAST AND UPPER QUAD DISTRICT

NORTH ACADEMIC DISTRICT

CREATIVITY AND INNOVATION DISTRICT

21ST CENTURY LIVING LEARNING DISTRICT

DRILLFIELD

MEADOW

STUDENT LIFE DISTRICT

OAK LANE

AG BELT

LIFE SCIENCES AND TECHNOLOGY DISTRICT

ATHLETICS AND RECREATION DISTRICT

District	Acres	UTC %	Impervious %	Plantable %
Ag Belt	209	16	1.7	64.7
Athletics and Recreation	196.4	4.5	37.8	13.5
Creativity and Innovation	37.4	16.5	32.9	10.6
Drillfield	23.1	23.4	12.5	12.5
Life Sciences and Technology	125.3	18.4	48.2	13.5
Meadow	67.9	27.8	8.7	29.6
North Academic	70.2	10.1	42	14.3
Student Life	64.8	17.3	30	12.7
Northeast and Upper Quad	29.9	8.2	36.5	9.4
Oak Lane	38.7	28.4	33	12.5
21st Century Living Learning	43.3	19.4	2	59.2
All Campus	1,051	19.6	24.4	26.6

Figure 9. Campus District Overlay and 2020 i-Tree Canopy Study Data Table

campus-wide, allowing comparison of UTC and ground cover data between districts across the campus. The results only differ slightly from the earlier Hwang and Wiseman 2020 study (14.7% campus-wide) due to differences in imagery dates and analysis methods. The final report illustrates the UTC relative to other ground covers in each zone on campus and the results of the primary campus districts are illustrated in Figure 3. Districts with high UTC include Oak Lane (28.4% or 10.9 acres), Meadow (27.8% or 18.9 acres), and Drillfield (23.4% or 5.4 acres). The Drillfield district tree canopy is relatively high when considering the canopy is restricted to the edges of the Drillfield district. These districts show great contrast when compared to districts with low UTC like Athletics and Recreation (4.5% or 8.3 acres), North Academic (10.1% or 7 acres), and Northeast and Upper Quad (8.2% or 2.4 acres). This assessment informs tree planting and preservation priorities across the campus so tree benefits, including carbon capture and storage, are maximized as more complete tree planting and preservation plans are developed to maximize plantable space tree protection in districts with challenging constraints.

Each year the University Arborist office conducts tree assessments focused on safety and preservation within the Old-Growth Forest by Lane Stadium and across the campus. These risk assessments are scheduled and executed as a means to continue the preservation of campus trees and help ensure the safety of the campus community. The proactive assessments focus on trees adjacent to pathways and campus thoroughfares. Ongoing inspections, tree risk assessments, and maintenance activities are critical tools in advancing Virginia Tech's tree preservation commitment, natural resource management goals, and the Climate Action Commitment. These assessments and operations are conducted in close alignment with the University Arboretum Committee and the Virginia Tech community.

In partnership with Dr. John Seiler, professor in CNRE, and the University Arborist's office was awarded a Virginia Department of Forestry Urban and Community Forestry Assistance Grant to plan and execute a complete inventory of trees in the Old-Growth Forest by Lane Stadium. Throughout the summer of 2022, a crew of student interns is conducting this census of trees 4" in diameter and greater which includes performing measurements and assessments of each tree for data to input into i-Tree for ecological analysis. The resulting report will detail the ecological services provided by the forest to the VT community and allow the development of a detailed conservation and management plan for the Old-Growth Forest in the coming years.

Other inventories and urban forest assessment projects are ongoing including a campus Legacy Tree analysis conducted by urban forestry intern Grace Steger. During her internship in 2021 and 2022 Grace has identified potential legacy trees across Virginia Tech's Blacksburg campus, assessed each tree for criteria to meet the Legacy Tree status, appraised qualifying trees to report each tree's asset value, and prescribed tree protection zones for reference during campus development. This sub-inventory is a huge asset for the University as campus development, facility replacement and renovation, and infrastructure projects are planned and executed allowing the University to better preserve and protect its most precious tree assets.

Branching Out, an ongoing university arborist outreach video and community engagement program provides viewers and participants with an inside look into urban forestry on campus, informative hands-on demonstrations, and other educational opportunities and content. Throughout each academic year, University Arborist Jamie King explores campus trees, discusses the Urban Forestry Management Program, hosts hands-on learning opportunities and lectures for courses across the university, and leads campus urban forest tours for various community groups. Notable examples in 2022 include an alumni tree tour hosted by CNRE and an urban forest tour for the Virginia Master Gardener College hosted by the Virginia Cooperative Extension where participants learned the history of many of the famous trees of Virginia Tech while also receiving personal perspectives and context concerning the future of campus trees and other natural resources on campus. Beyond the outreach focused on the Virginia Tech community, the University Arborist office engages with groups regionally to help connect people to the urban forest and in May 2022 hosted sessions for Radford, VA high school students who learned about the arboriculture and urban forestry professions and how they may find great rewards from public service and environmental stewardship.

For Arbor Day 2022, the University Arborist office partnered with CNRE and the Earth Week Committee to host a legacy tree planting ceremony at the Duckpond. Participants learned the story of the legacy black willow that once stood on the bank of the Duckpond and how Dr. John Seiler propagated a clone of the tree before the tree was removed due to decay and decline. The clone was planted as a demonstration and community participants had their choice of urban forest tours including a Legacy Tree Tour at VT's Golf Course led by Grace Steger, a tour of the Old-Growth Forest led by Jackson Helling, and a campus tree tour led by Jamie King.

Land Use

BEE CAMPUS USA

For the first time in its history, Virginia Tech has earned the Bee Campus USA certification for its commitment to sustaining native insect pollinators. The initiative is sponsored by the Xerces Society for Invertebrate Conservation. Bee Campus USA certification requirements serve as a guideline for affiliated campuses to increase their commitment to preserving these native pollinators. This is achieved through a long-term plan to increase native plant habitat, provide pollinator nesting sites, reduce pesticide use on campus, and develop pollinator conservation education and outreach opportunities for the campus community. The Virginia Tech Bee Campus Standing Committee is composed of 17 dedicated and enthusiastic students, faculty, and staff from many different disciplines across campus. This certification also works toward fulfilling aspects of the 2020 Virginia Tech Climate Action Commitment. By becoming affiliated with Bee Campus USA, Virginia Tech will work closer to reaching Goals 6 and 10 of the Climate Action Commitment.

This past year, the Bee Campus Standing Committee partnered with students in Hillcrest Hall to perform a lavender planting during Earth Week. The committee

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also held an educational walk and talk on pollinators and their habitats at the Hahn Horticulture Garden. For Pollinator Week in June, the committee partnered with the local chapter of the Master Naturalists to host an invasive species removal event in Stadium Woods.

MANAGEMENT OF LAWNS AND GROUNDS

Virginia Tech's lawns and grounds cover approximately 300 acres. Although lawns and grounds do not adhere to a prescribed Integrated Pest Management plan, they are maintained with herbicides for broadleaf weeds and invasive plant material.

All lawn mowers utilize mulching blades for normal mowing operations. This allows the grass clipping to be used as mulch for the lawns. Virginia Tech no longer vacuums areas of the lawn that have clippings built up but rather uses high-velocity blowers to distribute the clippings evenly across the lawn. Additionally, in the fall, the mulching mowers are used to chop leaves to avoid the need to collect leaves and transport them off of the main campus. All tree limbs less than four inches in diameter are also chipped and used on campus to mulch areas under large canopy trees and stormwater management facilities.

DESIGN AND CONSTRUCTION STANDARDS MANUAL

The Virginia Tech Design and Construction Standards Manual states that "native plants will be used to the maximum extent possible." See Section 4.6.6.1.7. The DCSM also considers energy-efficient landscape design strategies and states, "A landscape of predominantly long-lived shade trees with accents of flowering and evergreen trees is preferred. To simplify maintenance, shrubs should be planted in masses, avoiding complicated multi-species arrangements while serving a specific function (screening, traffic control, unmowable slope cover, etc.)." Designing landscapes with maintenance in mind limits the creation of spaces that require intensive care with lawn and other maintenance equipment and, as a result, limits emissions. More details can be found at **bit.ly/VTFacilitiesDCSM20**.

STROUBLES CREEK RESTORATION

Stroubles Creek is an approximately 12-mile-long stream that runs through the town of Blacksburg, the Virginia Tech campus, and Montgomery County, Virginia until it empties into the New River. Virginia Tech, in partnership with the Stroubles Creek Restoration Initiative and students from many organizations across campus, has been working to repair the riparian area along the segment of the stream leaving campus since 2014. Restoration efforts are funded through student proposals submitted via the Green RFP program.

In Fall 2021, materials were purchased to cover maintenance work on the 3,000 bare root seedling trees with shelters that have been planted over the years. This maintenance work was completed during a huge work week with Stroubles Creek Coalition, VTCC, Orion Living Learning Lab, Lambda Iota Mu, and InMotion. Also during the fall semester,

900 4 ft tree tubes were extended at Docs Branch to 6 ft to prevent observed deer browsing. Lastly, 1000 rotting untreated shelter stakes at Docs Branch were replaced with PVC.

In Spring 2022, class partnerships resulted in the planting of 373 trees with shelters as well as wildlife assessments on beaver, otter, mink, and wood ducks as part of senior capstone projects for a Conservation Biology course. 2,300 trees with shelters were planted at Docs Branch by a contractor, Conservation Services. This was the largest bare root tree planting in Virginia Tech history.

Also in Spring 2022, the Environmental Coalition at Virginia Tech partnered with Sustainable Blacksburg and the Stroubles Creek Coalition to host the Big Plant. The Big Plant 2022 took place on February 26 with over 500 volunteers able to plant 9,150 trees along the creek.

39,116 NATIVE TREES
planted along Stroubles Creek since 2014.

Goal 7. Zero-Waste Campus

"Virginia Tech to become a Zero-Waste Campus by 2030."

Figure 10. Current campus recycling graphic

Virginia Tech, the Town of Blacksburg, the Town of Christiansburg, and Montgomery County are the four jurisdictional members of the Montgomery Regional Solid Waste Authority (MRSWA). Located in Christiansburg, MRSWA operates a transfer facility that receives the majority of the university's principal recyclable materials (PRMs) and all municipal solid waste (MSW).

Virginia Tech transitioned to a single-stream recycling system on July 1, 2015. Recyclable materials are transported from the university to MRSWA, weighed, and further transported to Recycling and Disposal Solutions (RDS) in Roanoke. RDS serves as the recycling hub for the region, receiving materials from both the New River and Roanoke Valleys. Solid waste materials are transported from the university to MRSWA, weighed, and further transported to the local landfill operated by the New River Resource Authority (NRRA) in Pulaski County in Dublin, Virginia.

2021 RECYCLE RATE REPORT

MRSWA prepares a consolidated recycling rate report for the region to include the four jurisdictional members and submits it to the Department of Environmental Quality (DEQ). Virginia Tech uses the DEQ format and formula to calculate its recycling rate and waste diversion rate. The waste diversion rate includes all additional materials diverted from the local landfill. Reporting is done on a calendar year basis. The Office of Sustainability has monitored recycling rates for over 15 years. In compliance with Virginia's Department of Environmental Quality, Virginia Tech completes an annual calendar year recycling rate report. These reports provide details on what specific materials make up the recyclable materials collected on campus, what types of materials were diverted from the landfill for reuse purposes, and the details of specific materials collected on campus. The 2021 Recycle Rate Report can be found at facilities.vt.edu/sustainability/recycling/recycling-totals.

For the calendar year 2021, Virginia Tech reported 1,290 tons of principal recyclable materials which included 260 tons of food waste, 141 tons of fiber (paper and cardboard), and 386 tons of commingled material (single-stream recycling). Virginia Tech reported 3,588 tons of municipal solid waste (trash). The university's recycling rate was 31.5 percent and the waste diversion rate (waste kept out of the local landfill) was 78 percent.

ZERO WASTE CONSULTANT RFP

Campus Planning, Infrastructure, and Facilities staff members formed a multi-department search committee to hire a zero waste consultant after the latest Climate Action Commitment budget request was approved. The goal of hiring a consultant was to analyze Virginia Tech's waste management infrastructure, staffing, policies, procedures, and waste stream along with updating the university's 2018 composting plan. The consultant will then use this information to create recommendations for how the campus can reach zero waste in the next 7 years. The committee received 5 proposals from a nationwide search and eventually chose to partner with Reduction in Motion and O2/Veteran Compost to do the work. A thorough analysis of campus operations, policies, and procedures began during the summer of 2022.

Y-TOSS

Coordinated by the YMCA at Virginia Tech, Y-Toss is one of the largest sustainability events on Virginia Tech's campus. Each year, the program collects gently used items, such as furniture and clothing, from the residence halls during student move-out. Those items are then made available to students during a fall move-in sale at Cassell Coliseum at greatly reduced prices. All of the profits from this sale support the YMCA Student Programs.

This year, during Y-Toss collection was held from May 6-11 during move-out. Eight PODS were set up across the residential side of campus, manned by volunteers, to collect donated goods. This was the strongest Y-Toss on record; 10.8 tons of materials were collected and all 8 PODS were filled up!

Since the program's inception in 2015, with the help of partners, sponsors, and volunteers, Y-Toss has diverted over 100 tons of gently used household items from the waste stream. At the same time, the program has engaged over 1,300 community volunteers and generated over $60,000 to support student-led programs.

COMPOSTING PROGRAM AND WASTE REDUCTION

Dining Services has been composting food waste since 2009 and, to date, the composting program has diverted over 6,000,000 pounds of waste from the landfill. In 2021, 253 tons of composted food waste were collectively sourced from the 47 dining units and Southgate Center. The university consolidated the waste at a central storage facility on campus and delivered the waste to a regional composting facility, Royal Oak Farm, a family-operated facility located in Evington, Virginia.

Dining Services is also making composting in the dining halls more efficient by removing 90 percent of water from compost and Turner Place in Lavery Hall through the use of their waste reduction technology.

In addition, Virginia Tech Dining Services recycles its cooking oil in partnership with Valley Proteins, Inc. During 2021, Dining Services recycled 69,345 pounds of cooking oil.

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REUSABLE CONTAINERS

Dining Services offers a free reusable to-go program that reduces waste in the landfill and allows for a sustainable way to eat on the go. The program follows three simple steps of eat, return, repeat! Over 450,000 meals have been served in reusable to-go containers since 2014. This program has also kept 5,500 pounds of packaging out of the landfill since its inception. During the Fall and Spring semesters, Dining Services held pop-up "Choose to Reuse" tabling events in the dining halls which allowed for open discussions with students about the marketing of the green-to-go program, educated students about the benefits of participating in the reusable to-go program, and reminded them to return their containers to the dining halls when they were done with them.

Dining Services also offers students a compostable container option for to-go meals. All styrofoam containers were discontinued from use during the Winter of 2018. This included getting rid of styrofoam at franchise locations, such as Chick-fil-A and Dunkin'.

LOCAL AND CAMPUS SOURCED FOOD

Virginia Tech is increasingly using products that promote a sustainable dining program and food systems. Local products are considered to be products sourced from within 250 miles of Blacksburg or from within the Commonwealth. Produce, beef, lamb, pork, eggs, milk, herbs, fruits, and vegetables are all campus-sourced products.

CAMPUS KITCHEN

The Campus Kitchen (CKVT) is a partnership between VT Engage and Virginia Tech Dining Services. Campus Kitchen works to increase food access and reduce food waste by redirecting unserved food from on-campus dining centers to hunger relief agencies in the New River Valley. Since launching in the fall of 2015, Campus Kitchen has:

+ Diverted 263,000 pounds (and counting) of quality, unserved food from campus to community.

+ In the community, CKVT has worked with six hunger relief agencies and other nonprofits: Radford-Fairlawn Daily Bread, the Giving Tree Food Pantry, Plenty! Farm and Food Bank, New River Valley Agency on Aging, Warm Hearth Village, and the YMCA after-school program.

+ On campus, CKVT has partnered with nine dining centers: D2, Deet's Place, West End Market, Owens Food Court, Hokie Grill, Au Bon Pain, Southgate, Burger '37, and Turner Place.

Campus Kitchen continued redirecting unserved food even as struggles associated with COVID continued throughout the academic year. Since March 2020, 93,761 pounds of food have been donated with 24,000 pounds of that being donated during the 2021-22 academic year.

CONTINUED EO-77 EFFORTS

Virginia Governor Ralph Northam signed Executive Order 77: Virginia Leading by Example to Reduce Plastic Pollution and Solid Waste (bit.ly/VAExecutiveOrder77) into effect in March 2021. Executive Order 77 requires state agencies, including Virginia Tech, to:

+ cease buying, selling, and distributing plastic bags, single-use plastic and polystyrene food service containers, plastic straws and cutlery, and single-use plastic water bottles;

+ and develop a long-term Plastic Pollution Reduction and Waste Diversion Plan.

The EO-77 task force, composed of 26 staff members, was busy over the winter developing their implementation guidelines for the campus. The team identified 4 pathways for successful deployment of their plastic reduction goals through governance, education, operations changes, and monitoring. The strong efforts of the task force were recognized and rewarded at the state level through a Governor's Environmental Excellence Award that the task force received in late March at the Environment Virginia Symposium. Later in the spring EO-77 was rescinded by Governor Youngkin and replaced with EO-17. However, many of the original EO-77 task force members are continuing to use the data collected during the process to inform greater campus zero waste efforts.

To learn more about how Virginia Tech is progressing in reducing single-use plastic and solid waste, view this article: vtx.vt.edu/articles/2021/09/sustainability-eo77

Goal 8. Establish the Sustainable Procurement Policy and Procedures by 2022

Sustainable Procurement Policy

In accordance with the Virginia Tech Climate Action Commitment, the Virginia Tech Procurement Department recognizes its responsibility to support the university in its efforts to minimize negative impacts on health and the environment while supporting a vibrant campus community and local economy. The Procurement Department recognizes that products and services have inherent social, health, environmental, and economic impacts and that the Department should make procurement decisions that embody the university's commitment to sustainability whenever possible.

The Virginia Tech Sustainable Procurement Policy is available at bit.ly/VTSustainableProcurement

University Policy 5505: Campus Energy, Water, and Waste Reduction

The University Policy 5505 (policies.vt.edu/5505.pdf) is an integral part of Virginia Tech's procurement process. This policy ensures that Virginia Tech follows the 3 R's of waste reduction (reduce, reuse, and recycle) by minimizing waste on the front end as opposed to just recycling on the back end.

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Policy 5505 states in Section 3.3.5 Operations and Maintenance that the university shall "purchase or lease Energy Star® rated appliances and equipment for all classification when the designation is available, provided performance criteria are met." Section 3.5.8 Waste Reduction states that the university shall "purchase only recycled paper except where equipment limitations or the nature of the document preclude the use of recycled paper." Section 3.2 Building and Construction states that any "new building entering the design phase of construction that is greater than 5,000 gross square feet, or the renovation of such a building where the cost of renovation exceeds 50 percent of the value of the building, shall meet the Virginia Department of General Services, Division of Engineering and Buildings, Virginia Energy Conservation and Environmental Standards for energy performance and water conservation. All such buildings shall conform to US Green Building Council LEED Silver standards."

Policy 5505 was originally written in 2006 and revised in 2016. Due to progression with Virginia Tech's sustainability standards and the revision of the Virginia Tech Climate Action Commitment in March 2021, the Climate Action, Sustainability, and Energy Committee created a task force during the 2021-22 academic year to revise Policy 5505 again to be more in line with the Climate Action Commitment. Revisions are still underway and expected to be completed during the academic year 2022-23.

DESIGN AND CONSTRUCTION STANDARDS MANUAL

Virginia Tech's Design and Construction Standards Manual (DCSM) outlines the philosophy, standards, recommendations, and requirements for the design and construction of campus buildings. The DCSM requires that Life Cycle Cost and Energy Analyses are done throughout a project and the results of such analyses should inform purchasing decisions for materials used within projects. The goal of this is to have more sustainably-minded design practices throughout the building process. The Design and Construction Standards can be found at bit.ly/VTDCSM.

The 2022 Building Design and Construction Manual was under development and revisions throughout the winter and spring. This resulted in the significant addition of EV charging station design guidelines for the campus. These guidelines can be found in section 4.9.9 of the manual and cover topics involving location, equipment, electrical, and sign placement.

Goal 9. Transportation GHG Emission Reduction

"Reduce single-occupancy vehicle commuting to campus by 20 percent by 2025 and reduce transportation-related GHG emissions by 40 percent by 2030."

BLACKSBURG TRANSIT MULTI-MODAL TRANSIT FACILITY

The product of decades of planning led by the Town of Blacksburg in close coordination with Virginia Tech, the Blacksburg Transit Multi-Modal Facility project will deliver a central transportation hub and alternative transportation facilities in the vicinity of Perry Street, embedded within the North Academic District.

907 charging sessions=

8.388<small>KG</small>

GHG emissions avoided !

17%

Increased visitation to hokie bike hub

Centralization of bus stops and routes throughout the region at the Blacksburg Transit Multi-Modal Transit Facility will help improve safety and convenience for riders and pedestrians, as well as the efficiency of the Blacksburg Transit (BT) system.

Construction of the Multi-Modal Transit Facility began during AY20-21 and has continued to progress over the past academic year. Construction is estimated to be completed in its entirety in Spring 2023. The latest updates on the project are available at: bit.ly/VTMMTfacility

BIKE PARKING IMPROVEMENTS

The Department of Alternative Transportation installed 27 bike racks with a net capacity increase of 226 bicycles. This includes the new covered bike rack design, which was installed along Washington Street between the Food Science and Technology Laboratory and the Hahn Horticulture Garden. A retrofit was also performed at an existing covered bike rack at Cochrane Hall.

ELECTRIC VEHICLE CHARGING STATIONS

The first publicly-available EV charging stations were installed on campus in November 2021. There are three level 2 charging stations in the Squires Lot with a total capacity of six vehicles. One of the spaces is an accessible parking space. These charging stations have recorded 907 charging sessions from 187 unique drivers. The use of these charging stations has resulted in 8,388 kg of GHG emissions being avoided!

DUCK POND AND OAK LANE TRAILS REPAVED

The Duck Pond Trail was widened two feet when it was repaved. More significantly, a new trail was constructed on the north side of the Duck Pond from West Campus Drive to Oak Lane. There was not any pedestrian infrastructure along this stretch before the trail was constructed. This makes walking a much more viable option for students moving between the Oak Lane Community and the North Academic District of campus.

HOKIE BIKE HUB

The Hokie Bike Hub is a free bike repair and maintenance workshop for Virginia Tech affiliates. Cyclists have access to tools and one-on-one help for self-service bike repair. They can also attend bike maintenance workshops and Smart Cycling classes. The Hokie

Bike Hub has become the home of bicycling on campus and serves as a social space for cyclists to interact and learn from one another. Having a space like this available for free on campus helps encourage and support the use of bicycles as a mode of alternative transportation.

There were 2,646 visits to the Hokie Bike Hub last fiscal year. This is a 17% increase over FY19-20. The top five reasons for visiting the Hokie Bike Hub last year included: pumping tires, routine maintenance, flat tires, shifting, and cleaning/degreasing/oil chain.

Sustainable Transportation Fair

Alternative Transportation hosted a breakfast event to communicate transportation options available to all faculty, staff, and students at the start of the Fall semester. The Fair highlighted current programs and explored future opportunities for transportation. Representatives from Blacksburg Transit, the Office of Sustainability, Hokie Wellness, Virginia Tech Police Department, Recreational Sports, RIDE Solutions, Roam NRV bike share, and Spin were on hand to talk to visitors about the services they offer and answer any questions. People had an opportunity to learn how Alternative Transportation is promoting sustainable transportation modes to decrease Virginia Tech's greenhouse gas emissions and improve campus life by reducing single-occupancy-vehicle reliance on campus.

Carbon-Neutral Commuting and Carbon Neutral Fleet Task Force

During the 2021-22 academic year, the Energy and Sustainability Committee established 10 task forces to target implementation strategies, policies, and planning efforts for the goals of the 2020 Climate Action Commitment. These task forces will be the primary mode of making progress in the years to come as we get closer to our target of carbon neutrality by 2030. The Carbon-Neutral Commuting and Carbon-Neutral Fleet Task Force have established a work plan for the next fiscal year. Items of consideration include:

+ Launching the Heads Up Hokies online educational and safety course;

+ Introducing five more electric buses into the Blacksburg Transit fleet;

+ Determining a standardized way of measuring progress towards shifting commutes to non-SOV modes;

+ Requiring the use of a total cost of ownership calculator before procuring any vehicles to encourage electric and hybrid vehicle purchases;

+ Opening the Multi-Modal Transit Facility;

+ Installing more electric vehicle charging stations on campus; and

+ Including better information on transportation options in the employee onboarding process.

Goal 10. Climate Action Living Laboratory (CALL)

"Integrate the Climate Action Commitment into Virginia Tech's educational mission through the Climate Action Living Laboratory beginning in 2021."

Faculty Retreats

The Climate Action Commitment was developed in partnership with over 150 members of the Virginia Tech community, bringing together the academic and operational sides of the institution. The Climate Action Living Laboratory (CALL) goal provisions that we continue to facilitate these vital partnerships. Professor Emeritus and Interim CASE Director, John Randolph, spearheaded the CALL activities by bringing together over 100 faculty experts in a series of retreats, meetings, and outreach events throughout the past academic year. The largest retreat was held on September 17, 2021, and smaller retreats were hosted throughout the fall, spring, and summer semesters. By consistently bringing these academic professionals together with Campus Planning, Infrastructure, and Facilities (CPIF) employees, we were able to build a strong network of people passionate about sustainability at Virginia Tech.

From the pool of retreat attendees, a smaller core CALL faculty group was formed that serves as the foundation for the academic engagement on CAC implementation.

This core group of faculty alongside CPIF employees began a MIRO board, which was used as a project management platform to strategize for CAC implementation. This board mapped out each of the goals and pathways as well as identified key stakeholders to contact. This platform was useful as a way to organize the different faculty research projects, identify overlapping research interests for larger partnerships, identify faculty-CPIF partnerships that further the mission of both, improve workflow, present ongoing work, and provide a brainstorming hub for new projects.

Experiential Learning Partnerships

One interesting outcome of this CALL work was the facilitation of experiential learning partnerships between facilities and the academic sides of the university. Some of these were continuing partnerships from former years, such as our relationship with Dr. Kimberly Carlson in the Pamplin College of Business who worked with the Office of Sustainability on class projects centered around teamwork, or Dr. Sean McGinnis's work on the greenhouse gas inventory using data provided by CPIF. Read more about sustainability experiential learning opportunities at vtx.vt.edu/articles/2021/10/sustainability-CALL.

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Goal 11. Climate Justice

"Establish climate justice as a core value of the Virginia Tech Climate Action Commitment."

Virginia Tech's commitment to implementing climate justice at all levels of decision-making sets the 2020 Climate Action Commitment apart from other universities. We've begun that work with gusto this year and have made significant progress, although we have more work to do in this arena, especially to support and include members of frontline communities.

CLIMATE JUSTICE TASK FORCE

During the 2021-22 academic year, the Climate Action, Sustainability, and Energy Committee established 10 task forces to target implementation strategies, policies, and planning efforts for the goals of the 2020 Climate Action Commitment. These task forces will be the primary mode of making progress in the years to come as we get closer to our target of carbon neutrality by 2030. The Climate Justice Task Force has begun working towards embedding climate justice goals throughout Climate Action, Sustainability, and Energy Committee and beyond.

The initial meetings of the Climate Justice Task Force took place in the Spring of 2022 and brought several faculty and students onboard who were involved with the 2020 Climate Action Commitment working group. After deciding on their work plan, which included preliminary research into university budgetary decisions and assessing current standings of broad CAC implementation efforts, the task force expanded its membership to include 20 more members from all around the university including students, faculty, and staff. The task force felt as though broadening its membership was an important first step towards bringing in a wealth of perspectives as well as building up the capacity to send climate justice task force members into other task forces for input and feedback on their efforts.

Climate Action, Sustainability, and Energy Committee MEMBERSHIP CHANGES

The Climate Action, Sustainability, and Energy Committee, formerly the Energy and Sustainability Committee, altered its membership during the 2021-22 academic year to broaden representation from within the university as well as allocate specific seats for members of frontline communities. These membership changes are unique as most shared governance membership is decided based on university activity, so including considerations for justice-oriented membership is unprecedented. However, this expanded membership is necessary to fulfill the accountability and community-oriented components of climate justice. See the table on the next page for a comparison of membership.

In addition to these formal membership changes, there has been broadened inclusion through the ten subcommittees that carry out the work of the committee. These members are led by official CASE committee members but are composed of students,

Energy and Sustainability Committee Membership

≥18 REPRESENTATIVES

+ Vice President for Campus Planning, Infrastructure, & Facilities
+ Vice President for Finance (or designee)
+ Assistant Vice President for Utilities
+ Assistant Vice President Planning & University Architecture
+ Sustainability Manager, Dining Services, Housing, & Residence Life
+ Director of Climate Action, Sustainability, and Energy
+ Two department representatives selected by the Vice President for Campus Planning, Infrastructure, & Facilities

+ One Environmental Health & Safety Services representative selected by the Vice President for Enterprise Administrative and Business Services
+ Four Faculty Senate representatives
+ Two Staff Senate representatives
+ One college dean selected by the Council of College Deans
+ Two Graduate and Professional Student Senate representatives

Climate Action, Sustainability, and Energy Membership

≥27 REPRESENTATIVES

+ Vice President for Campus Planning, Infrastructure, & Facilities
+ Vice President for Finance or designee
+ Assistant Vice President for Infrastructure & Sustainability
+ Director of Climate Action, Sustainability, & Energy
+ Sustainability Manager, Dining Services, Housing, & Residence Life
+ Assistant Vice President for Planning & University Architect
+ Four department representatives selected by the Vice President for Campus Planning, Infrastructure, & Facilities
+ Senior Director of Transportation Services
+ One Environmental Health & Safety Services representative selected by the Vice President for Enterprise Administrative and Business Services

+ Four Faculty Senate representatives
+ Two A/P Faculty Senate
+ One Counsil of College Dean representative
+ Two Graduate and Professional Student Senate representatives
+ One Provost's Office representative
+ One Student Affairs representative
+ One Student Engagement & Campus Life representative
+ Two environmental focused student organization representatives
+ One employee and one student front-line community group representatives

faculty, and staff from across the university who are not members of the CASE committee, allowing for more inclusive participation.

Additional Efforts...

The CASE Committee is only avenue through which climate justice is being established as a core value of the university. Faculty members are also contributing, working towards developing a climate justice minor to embed climate justice into Virginia Tech's educational mission. Additionally, several Earth Week events centered on climate justice.

Students have shown continued engagement, whether through partnerships with the Office of Sustainability to forward climate justice educational materials/policies or independently of the Office by holding rallies for climate justice. Throughout the year, the students have demonstrated how important climate justice is to them through words and actions.

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Goal 12. Sustainable Choices and Behavior

"Diminish barriers to sustainable behaviors through institutional change, education and social marketing."

GREEN OFFICE CERTIFICATION

The Green Office Certification Program gives faculty, staff, and students the tools they need to become greener Hokies working in more sustainable office areas. The goal of the program is to help employees reduce their footprint and improve the overall well-being of our planet. Virginia Tech's Climate Action Commitment outlines goals surrounding energy efficiency, waste minimization, and greenhouse gas reductions. By participating, employees can directly help the university achieve its climate action goals while saving money and resources for their office.

This program was redeveloped and relaunched in the Fall of 2020. Offices can participate by identifying a Green Representative who completes a training session through the Office of Sustainability. In this training, they gain the skills and knowledge needed to create a greener workplace. Once the Green Representative completes training, they will unlock the Green Office Certification checksheet, where they will work with their colleagues to complete tasks and become more sustainable. Offices are scored in the following categories: Recycling and Events, Energy, Purchasing, Waste Reduction, Transportation, and Innovation. Offices will then be awarded either Bronze, Silver, Gold, or Platinum Green Office Certification.

During the 2021-22 academic year, the following offices completed their certification:

+ Procurement - Bronze

+ Office of Sustainability - Platinum

+ Department of Management - Gold

+ Office of the University Bursar - Bronze

GREEN LAB CERTIFICATION

The Green Lab Certification Program is a self-assessment tool that empowers, encourages, and recognizes labs that are engaging in sustainable practices. The program provides faculty, staff, and students with the tools needed to go green in their labs. There are over 1,200 labs across Virginia Tech's Blacksburg campus, so there are lots of opportunities to improve energy efficiency and conservation and waste and recycling efforts in labs.

The Green Lab Certification Program was originally developed by Ellen Garcia, who received her master's in biology from Virginia Tech in 2020. Her work on this program has led to the final iteration of the Green Labs Tool, which assesses the laboratory's sustainability efforts spanning 11 different topic areas.

The program was officially launched in January 2022: vtx.vt.edu/articles/2022/01/sustainability-greenlab

GREEN GRADUATES

The Green Graduates of Virginia Tech program asks graduating students to take a personal sustainability pledge to think about the environmental impact of their jobs, travel, and other adventures after leaving Virginia Tech. The pledge allows students an opportunity to reflect on the values and lessons they gained during their time on campus and to think about which of those lessons and values they will take with them as they depart.

By pledging, students are committing to fostering sustainable behaviors both in their own lives and in the lives of their friends, family, and coworkers. To honor the students who wish to take such a pledge, the Office of Sustainability awards all pledge signers with a free green cord to wear at graduation. All undergraduate and graduate students are eligible to participate. Thanks to tabling efforts in December and during Earth Week in April by Office of Sustainability Graduate Assistant, Michael Bell, over 215 graduates participated in the program for the 2021-22 academic year. That's almost double our participation from last year! The Virginia Tech Green Graduates program has been running for seven years straight now.

GAME DAY GREEN TEAM

The Game Day Green Team promotes tailgate recycling during home football games by passing out blue recycling bags to tailgaters in the highest impact parking lots surrounding Lane Stadium, including the Coliseum, Stadium, Maintenance, Track and Field, Chicken Hill, and Litton-Reaves Parking Lots. The Green Team educates tailgaters on what can and can't be recycled, and how to green their game day experience.
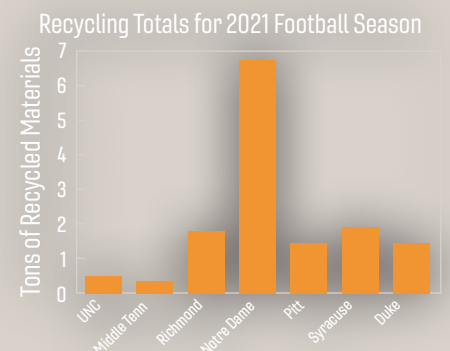
The Game Day Green Team is led and organized by students who manage supplies, recruit volunteers, work with the Division of Campus Planning, Infrastructure, and Facilities on waste collection, and execute the program on each home game day. The program was on hold for the Fall 2020 season due to COVID. The program came back better than ever for Fall 2021 with record-breaking recycling numbers. Tailgaters and fans inside Lane Stadium recycled 14.35 tons for the whole season, more than double of any previous season. We had around 30 volunteers for the season who helped educate VT football fans and make this possible.

OFFICE OF SUSTAINABILITY STUDENT INTERNSHIP PROGRAM

The mission of the Student Internship Program is to provide students with valuable opportunities to create lasting, sustainable change at Virginia Tech while developing their professional skills and expanding their knowledge of the inner workings of the university. The program encourages ownership, creativity, and collaboration to solve some of the toughest sustainability problems the world is facing today. The program blends real-world projects with practical, skills-based professional development workshops to prepare students for an ever-changing career in the sustainability field.

The projects the students complete, paired with professional development classes and other training, allow students to sharpen and expand their environmental and professional skill sets. Intern teams work on a variety of tasks, including:

+ **Partner Projects:** Teams will partner with various departments such as Energy Management, Stormwater Management, Sustainable Dining, and Housing and Residence Life to complete technical projects.

+ **Education and Outreach:** Teams will plan and execute outreach events in partnership with community organizations such as the YMCA, the Town of Blacksburg, and the Blacksburg Farmers Market. Past events include Thrift Swaps, Pop-up Farmers Market, and seed plantings.

+ **University-Wide Campaigns:** Teams will assist in executing large-scale campaigns including Earth Week, America Recycles Day, and World Water Day.

The projects that our intern teams worked on during the 2021-22 academic year include:

+ **Waste Team:** Piloted a soft plastic recycling program on campus in partnership with Dining Services, Housing, and Residence Life. The program placed specialized recycling bins in Squires Student Center, CID, Ambler Johnston, and Cheatham Hall which the students worked to advertise and manage throughout the spring semester. They were able to collect over 3,900 individual pieces of soft plastics.

  - More information on the program:
    vtx.vt.edu/articles/2022/04/sustainability-softplasticrecycling

+ **Food Team:** Worked with The Market at Virginia Tech to produce videos that were used to build up their marketing portfolio. The Market at Virginia Tech works to reduce food insecurity for VT students by providing healthy, nutritious ingredients weekly to students in need.

+ **Water Team:** Educated students of local elementary and middle schools on the benefits and impacts of rain barrels. The students attended workshops and taught lessons to students on stormwater and gave them materials to help build their understanding. They also donated rain barrels to a few local schools to be used in their gardens for educational purposes.

+ **Energy Team:** Made progress towards getting the Moss Arts Center re-certified under LEED Operations and Maintenance certification. This was a pilot for the LEED O+M program to see if it's a recertification program that VT would like to implement for other buildings across campus. Our students worked with the Office of Energy Management to host a LEED tour of Moss Arts Center as well as a waste audit during Earth Week.

STUDENT SUSTAINABILITY FORUM

The Student Sustainability Forum is held once a month during the fall semester and more frequently in the spring. In the fall, the forum provides student groups with the opportunity to discuss ways they can better collaborate to achieve common goals. The forum is facilitated by staff members of the Office of Sustainability who open each

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100 hours of events

31 partners

24 outdoor events

13 indoor events

2 virtual events

39 events

session with an update on sustainability projects and Climate Action Commitment implementation at Virginia Tech. The OS staff also brings in guests from other Virginia Tech offices and from the Town of Blacksburg to talk about initiatives in their relative areas. In the spring, the forum is opened up to Virginia Tech employees as well as community members to facilitate the planning of Earth Week activities.

Students who are not currently part of a student group, but who are interested in sustainability are welcome to attend to learn about the projects and goals of each group. This allows the forum to serve as a recruiting tool for the organizations involved in sustainability on campus.

EARTH WEEK

Virginia Tech's annual Earth Week events are led by The Environmental Coalition at Virginia Tech and the Office of Sustainability with support from over thirty other student, university, and community groups. Earth Week 2022 was held Sunday, April 17 through Saturday, April 23.

Each day of Earth Week is themed around an important sustainability topic, like consumerism, environmental justice and community, energy reduction, water and food, waste, education and behavior change, transportation, and habitats and biodiversity. The particular events held during Earth Week change year to year, but the basic mission to celebrate and take action for a sustainable campus is carried from year to year.

This year, Earth Week was back to a primarily in-person celebration. Our 31 partners held 39 total events throughout the week. There were 24 outdoor events, 13 indoor events, and 2 virtual events for a total of over 100 hours of events to choose from. Some noteworthy events included an Arbor Day celebration and tree planting of a historic willow at the Duck Pond; Green Grads tabling; bike to campus day and pop-up

Read the full article about Dining Services' third annual Sustainable Eats Bike Tour: vtx.vt.edu/articles/2021/10/sa-dining-sustainable-eats-bike.

bike repair tents; a waste audit and LEED tour at the Moss Arts Center; an educational walk on pollinators and Virginia Tech's recent Bee Campus certification; tabling at the Blacksburg Farmers Market; and much more. The full calendar of events from the week can be found at facilities.vt.edu/sustainability/sustainability-programs/earth-week.

SUSTAINABLE EATS BIKE TOUR

Dining Services and Housing and Residence Life celebrated sustainable dining as both a journey and a destination with its recent Sustainable Eats Bike Tour.

The tour welcomed students to visit campus dining centers by bicycle, sampling locally sourced and plant-forward dishes while learning about campus sustainable dining measures at each stop. In th third year of the tour, this was the first time participants used pedal-assisted electric bikes, provided by the program partners Roam New River Valley (Roam NRV) bikeshare and Bolt Mobility.

Read the full article about Dining Services' third annual Sustainable Eats Bike Tour at vtx.vt.edu/articles/2021/10/sa-dining-sustainable-eats-bike

VT ENGAGE

On top of running the Campus Kitchens program (see Goal 7), VT Engage also hosted several local service projects during spring 2022 with the Master Naturalists to help with the removal of invasive plants from Stadium Woods. VT Engage also hosted multiple offerings of a virtual workshop titled "Wait, Don't Throw that Away!" These workshops were open to anyone interested in attending and provided tips on how to reduce waste in unique ways. Additionally, VT Engage participated heavily in Earth Week by providing even more workshops and service opportunities with an environmental focus.

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Goal 13. Climate Action Commitment Implementation and Engagement

"Implement the Virginia Tech Climate Action Commitment at a high level of university administration and governance; by integrating goals for facilities, education, and campus culture; and with stakeholder engagement for evaluation of goals and progress."

CLIMATE ACTION COMMITMENT ROADSHOWS

To educate the campus community about the 2020 Climate Action Commitment, members of the Climate Action, Sustainability, and Energy (CASE) unit went on a unique and engaging "roadshow" across all levels of the university to gain additional support from key stakeholders who play a role in its implementation and success.

In these roadshow presentations, we not only educated them on what the goals of the Climate Action Commitment are but also made connections between the CAC and their areas of work. We acknowledged the work that they've already done to promote sustainability and cooperatively developed opportunities for partnership and growth. These roadshows were also a great opportunity to get feedback on the work we've been doing thus far and ways for our office to improve.

Throughout the process, we were able to create a network of sustainability champions from nearly every department (both academic and non-academic) across campus. We now have contacts that can support us in future program development and who we can support as well.

The roadshow series began in the Fall of 2021 with presentations being given at the aforementioned Faculty Retreat and to the Senior Vice President and Chief Business Officer and team. In the Spring, presentations were given to Student Affairs, the VP for Equity and Accessibility, Enterprise Administrative and Business Services, the Undergraduate Student Senate, the Faculty Senate, the Graduate and Professional Student Senate, and University Council. During Summer 2022, presentations were given to Facilities Operations, Campus Planning and Capital Financing, the A/P Faculty Senate, the VP for Advancement, and residents of Carilion buildings Riverside 2 and 4.

There are even more groups we would like to present to over the next few months, including but not limited to Staff Senate; Vice President for Inclusion and Diversity and Strategic Affairs; College of Agriculture and Life Sciences; Vice President of Campus Planning, Infrastructure, and Facilities; Athletics; Virginia Tech Foundation and Real Estate Management; President's Council; IT; Human Resources; Finance; Policy and Governance; and multiple Student Organizations.

The roadshow series was submitted as a case study on the AASHE Resource Hub: hub.aashe.org/browse/casestudy/26303/Climate-Action-Commitment-Roadshow-Series

"CLIMATE ACTION COMMITMENT ONE YEAR LATER" EARTH WEEK WEBINAR

On April 20, 2022, the Office of Sustainability hosted a webinar detailing the progress that has been made on the Climate Action Commitment since its approval in March of 2021. This served as a follow-up to Earth Week 2021 when the Office of Sustainability hosted a similar webinar titled "An Inside Look at the Climate Action Commitment" which provided attendees with more of an overview of what the CAC meant for Virginia Tech. The office intends to use this series as a means of updating members of the Virginia Tech community on the progress being made towards achieving the goals of the CAC on an annual basis.

Guests from across campus presented updates being made in their area of work. The full list of webinar panel members includes:

- John Randolph
  Interim CASE Director

- Nathan King
  Campus Sustainability Manager

- Emily Vollmer
  Sustainability Coordinator

- Steve Durfee
  Campus Energy Manager

- Nick Quint
  Alternative Transportation Manager

- Teresa Sweeney
  Waste Management Program Manager

- Todd Schenk
  Associate Professor (SPIA) and STEP Director

- John Shewchuk -
  VT for Climate Justice Student Leader

The webinar was recorded and is available at youtu.be/Hm_HEVhO4Tw

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Strategic Plan Dashboard Inclusion

Virginia Tech's Strategic Dashboard describes metrics and milestones that will be used to track progress towards achieving the goals of the Strategic Plan. The Strategic Dashboard provides the most recent available information on outcomes in each of the identified milestones. In Fall 2021, milestones were added to the Strategic Dashboard relating to sustainability, illustrating the university's commitment to sustainability and the connection that the topic has to Virginia Tech's Strategic Plan.

The sustainability goals being tracked on the Strategic Planning Dashboard include:

+ Develop 2 MW of solar on campus by 2023 – udc.vt.edu/spm/data/excellence/solar_energy

+ Achieve a recycling rate of 55% by 2025 – udc.vt.edu/spm/data/excellence/recycling_rate

+ Achieve an annual net reduction of campus greenhouse gas (GHG) emissions of 3% through 2030 – udc.vt.edu/spm/data/excellence/greenhouse_gas_emissions

Hokie Wellness and Benefits Fair

On Wednesday, May 18, 2022, the Office of Sustainability tabled at the Hokie Wellness and Benefits Fair to educate faculty and staff on the goals of the Climate Action Commitment. After teaching members of the VT community about the goals of the CAC, they were invited to vote for which goal they thought was the most important or interesting to them. Through this activity, we were able to engage with 87 faculty and 163 staff for a total of 250 employees. Goals 2, 7, and 12 were the top three goals chosen by employees with 50% of surveyed employees recognizing them as vital. Specifically, goal 2 was identified as the most important to faculty while the majority of staff surveyed felt that goal 7 was the most important.

E&SC Transition to CASE Committee

A key part of implementing the Climate Action Committee is to engage all parts of the university by elevating CAC materials in Virginia Tech's shared governance structure. The natural place to do this was through the Energy and Sustainability Committee, which was formed after the initial 2009 Climate Action Commitment was approved. We elevated and reconfigured the committee this year as part of the larger shared governance overhaul. Most visibly, it has been renamed the Climate Action, Sustainability, and Energy Committee or CASE committee to mirror the new CASE department and director position.

The CASE committee was also elevated to reflect the university's increasing commitment to climate action. While it previously fell under the Commission on University Support, it now stands alone and reports directly to the University Council Cabinet. In combination with the broad membership documented earlier, this creates a direct line to shared governance and university leaders to convey new sustainability initiatives and communicate CAC progress directly. The charge was updated to reflect this elevated

position and more emphasis was placed on climate action and its urgency at this moment.

As part of the restructuring process, the committee's membership was also changed to reflect the broader university commitment to climate action taken on by the 2020 CAC. More student and community representation was added and a number of task forces were created to aid in the implementation of climate action. These task forces include E&SC Name Change, Charge, and Changes to Membership; Greenhouse Gas Inventory; Climate Justice; Policy 5505 Update; Climate Action Living Laboratory, Education, and Student Involvement; Sustainable Campus Culture, Engagement, and Sustainable Choices; Town-Gown Sustainability; Sustainable Procurement; Carbon Neutral Commuting; Carbon Offset and; Sustainability Awards and they report to the CASE committee.

Having so many task forces is highly unusual in shared governance but it mirrors the breadth of the CAC. Over the academic year 2021-22, all of the task forces developed their strategic work plans for the coming years and identified some ways they can work to implement the CAC goals and pathways.

Goal 14. Innovative Financing

"Develop innovative budgeting and financing mechanisms to generate funding and staffing to achieve Climate Action Commitment goals."

Green RFP Program

Student engagement is an important factor in advancing sustainability at Virginia Tech. The Green Request for Proposal (RFP) Program gives students the opportunity each year to submit a proposal for a sustainable idea that they would like to see implemented on the university's Blacksburg campus. Proposed ideas must support the Climate Action Commitment to receive funding consideration. Since its initiation in the academic year 2010-11, the Green RFP program has provided funds in excess of $1.75 million for 123 student sustainability proposals.

The Office of Sustainability received 63 proposals during the 2021-22 academic year. Of those proposals, 15 were selected to be reviewed by the Office of Budget and Financial Planning. On May 10, 2022, 13 proposals were funded from the 2020-21 batch of proposals for a total of $267,670. Some examples of funded projects include occupancy sensors in Shanks Hall, a Stadium Woods restoration project, and multiple pollinator-friendly habitat installations across campus. The full list of approved proposals is available at facilities.vt.edu/sustainability/sustainability-programs/green-rfp-program

A couple of Green RFPs that were implemented this year from last year's batch of approvals include electric vehicle charging stations in Squires and new covered bike racks across campus.

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CPIF Sustainability Foundation Fund

The Office of Sustainability worked to establish a fund for sustainability projects through the Virginia Tech Foundation during Spring 2022. This fund allows donors to support student engagement opportunities, fund research, and have a direct impact on Climate Action Commitment implementation.

Giving Day

Giving Day was held February 23-24 and served as a special opportunity for all Hokies to unite and give back to favorite departments, programs, student organizations, and teams. Due to the establishment of the CPIF Sustainability Fund, the Office of Sustainability was able to participate for the first time this year. Thanks to support from more than 20 individuals, nearly $2,000 was raised for the CPIF Sustainability fund. These funds will go towards projects on campus that support our Climate Action Commitment implementation.

Honors College Crowdfunding Partnership

As part of Virginia Tech's sesquicentennial celebrations, colleges and academic units have been selecting different university programs to sponsor for month-long crowdfunding initiatives. This raises the profile of the selected programs and connects the program with excited alumni to raise funds for its success. The Honors College contacted the Office of Sustainability to partner with us on spotlighting our recent Bee Campus USA certification. This certification was made possible through faculty, staff, and student partnerships over the past academic year, and one student, Susan Sale, served a large role on the Bee Campus VT Standing Committee. Susan, who also served as an Office of Sustainability student intern and as Hillcrest Hall's Sustainability Officer, worked to establish a pollinator habitat outside of Hillcrest Hall to help VT get its certification. Collaboratively, the Honors College and the Office of Sustainability put together a crowdfunding campaign for July 2022 to support the creation and expansion of pollinator habitats, assist in funding bee-related research, and develop educational signage across campus.

Link to crowdfunding page: crowdfund.vt.edu/project/32348

Climate Action Commitment Financial Requests

At the March 2021 Board of Visitors meeting, a comprehensive financial review of the proposed revisions to the Climate Action Commitment was presented and ultimately unanimously approved. In continuation of the financial plan from the Climate Action Committee, in support of reducing Virginia Tech's environmental footprint, budget allocations have been approved for the 2022-23 fiscal year to support hiring a Campus Waste Manager and to support building retro-commissioning efforts.

Also for FY23:

+ $650k one-time resource was provided for the utility master plan which will work hand-in-hand with the CAC work.

+ $750k one-time resource was provided for fume hood repairs and replacements which will help reduce building energy consumption and improve air handling.

+ A $1.4 million one-time resource was provided for stormwater management.

+ Opportunities funded during FY22 relating to the CAC include:

  — $370k base and $250k one-time to support the university's investment in the Climate Action Commitment through investments in sustainability and energy staffing, the liquified natural gas backup study, and waste management consultative services.

Solar Power Purchase Agreement

A new solar energy power purchase agreement will help boost Virginia Tech's CAC implementation efforts toward 100% renewable electricity by 2030. The project involves 2.1 megawatts of solar arrays on several Blacksburg campus buildings. When complete, the arrays will produce 2,800 megawatt-hours of electricity per year and reduce campus carbon dioxide emissions by 44,000 tons over 20 years.

The new solar installations will accompany the existing and much smaller solar arrays located on the roofs of the Perry Street Garage, Whittemore Hall, and Durham Hall. Installation of the new arrays is underway and full installation is anticipated to be completed in about a year.

Virginia Tech is partnering with Sun Tribe to execute the power purchase agreement after a competitive bidding process. Sun Tribe is based in Charlottesville, Virginia and was co-founded by three Virginia Tech alumni. Sun Tribe will develop and initially own and maintain the arrays and sell the power to Virginia Tech Electric Service through a power purchase agreement for six years. After that, Virginia Tech plans to purchase and maintain the systems for the remainder of its 30-year lifespan. Implementation is assisted by a small grant from the Virginia Department of Energy.

Campus solar implementation information: vtx.vt.edu/articles/2022/03/campusplanning-solaragreement

Energy Savings Performance Contracting (ESPC)

Virginia Tech campus stakeholders are considering utilizing the Energy Savings Performance Contracting (ESPC) model, which would provide additional funding and resources for energy efficiency and infrastructure upgrades.

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Additionally, work is being done to develop financing strategies for energy management of auxiliary buildings, including the Division of Student Affairs and the Athletics Department. Meetings and discussions are underway with the VT Foundation on revenue-neutral energy efficiency improvements on Foundation-owned buildings used by VT departments.

Goal 15. Toward 2050 Fossil Fuel Free

"Develop Pathways after 2030 to eliminate fossil fuels and carbon offsets by 2050."

Virginia Tech is laying the groundwork for being fossil fuel free by 2050. A Utilities Master Plan is being developed which will be used to steer the design and development of infrastructure in a way that will be conducive to reaching carbon neutrality. The Utility Master Plan effort is kicking off in the summer of 2022 and is expected to take approximately 18 months to complete. One avenue that will be explored in the creation of the UMP is the total electrification of campus. Additionally, our plans to transition to renewable energy sources by 2030 will be instrumental in moving towards this long-term goal, as will technological innovations and reductions in our coal and natural gas usage at the steam plant. When the commitment is revisited in 2025, there will be a more substantial discussion on the pathway toward this goal.

CONCLUSION

Virginia Tech established a strong commitment to tackling the challenge of climate change with the adoption of the 2020 Climate Action Commitment in March 2021 and the last year has seen substantial progress towards meeting the goals laid out in this commitment. The overarching goal of carbon neutrality by 2030 is not being taken lightly and the entire university community is on board to make the necessary improvements and changes happen—from the Provost's office to Strategic Affairs and Campus Planning, we have seen a clear shift in the institutional priorities and attitudes around sustainability.

Virginia Tech's efforts toward practicing sustainability are being recognized on a national and global level. Virginia Tech has maintained its standing as having the highest STARS rating in the Commonwealth of Virginia and the Atlantic Coast Conference. Additionally, our Times Higher Education Impact Rankings, guided by the United Nations Sustainable Development Goals, have placed us in the top 100 universities globally and the top ten in the US. This success was only possible because of the ambitiousness of the Climate Action Commitment and we expect that the substantial progress towards our goals in the years to come will only improve our ranking nationally and globally. The university has also maintained its Tree Campus Higher Education accreditation for the fourteenth straight year while taking on Bee Campus USA certification for the first time.

Funding obtained this year through innovative means has paved the way for even more exceptional progress to be made next year. The $6 million Energy Action Plan 6 will provide funding for retro-commissioning of buildings and major energy efficiency improvements. The solar power purchase agreement for 2 MW of rooftop solar has been signed, and those panels will be seen going up across campus within the next nine months. The CPIF Sustainability Foundation Fund also allows for more projects and programs to be pursued. These funding avenues, combined with the programs they support, will put Virginia Tech in a good position to make progress toward achieving carbon neutrality by 2030.

Virginia Tech's campus proudly displays 35 LEED-Registered buildings totaling over 3.2 million gross square feet. Twenty-three of those buildings are certified, one is pending certification, eight are under construction, and three are in design. The university has specified that all new buildings entering the design phase of construction that are greater than 5,000 gross square feet, or the renovation of such buildings, shall conform to LEED Silver standards or better. The LEED criteria have been embedded into considerations for new and existing building design through our Design and Construction Standards Manual as well as revisions to the sustainable procurement guidelines that specify more environmentally friendly building materials and equipment. This is just one way in which we see sustainability thinking embedded at the level of policy become second nature for the university.

One of the most notable successes of this academic year was the series of CAC roadshow presentations, which updated and fostered partnerships with departments and offices across the entire campus on what the CAC means for them. By breaking down disciplinary and institutional barriers between units and fostering relationships with people at all levels across the university, we now have a wide network of people who can be called on to share their own expertise and help us reach our goals. It's only by creating these partnerships between Facilities, administration, and the academic units of the university that we can fulfill the educational and land-grant components of the CAC in line with Virginia Tech's core mission.

Sustainability at Virginia Tech extends beyond campus life and, as we've seen through our series of roadshows, is a partnership between colleges, departments, units, students, employees, and the Blacksburg community. The broad provisions in the CAC represent a town-gown model for the Commonwealth of Virginia that we've worked hard to develop by continuing to have a strong relationship with the local community. At the end of the day, all Hokies are climate action champions with the goal to make Blacksburg a sustainable place.

The Office of Sustainability has been producing Sustainability Annual Reports since 2010. For access to all prior reports, visit facilities.vt.edu/sustainability/sustainability-reports/virginia-tech-sustainability-annual-reports.

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Acknowledgments

2021-22 Sustainability Annual Report Prepared by the Office of Sustainability

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With Special Thanks To:

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+ The Virginia Tech and Blacksburg Community

APPENDIX

2020 Climate Action Commitment

Calendar Year 2021 Recycle Rate Report

Sustainable Procurement Policy

2021-22 Student Green RFP Memorandum

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Commonwealth of Virginia Locality Recycling Rate Report For Calendar Year 2021

Reporting Solid Waste Planning Unit: Virginia Tech

Person Completing This Form: Teresa Sweeney   **Title:** Program Consultant and Engagement Specialist, Campus Planning, Infrastructure & Facilities

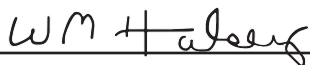**Address:** Virginia Tech, Sterrett Center, 180 Sterrett Drive, Blacksburg, VA 24061

Office Phone Number: (540) 998-5707   **Email Address:** msrecycle247@vt.edu.

Summary: Virginia Tech, the Town of Blacksburg, the Town of Christiansburg, and Montgomery County represent the four jurisdictional members of the Montgomery Regional Solid Waste Authority (MRSWA). Located in Christiansburg, MRSWA operates a transfer facility that receives the majority of our principal recyclable materials (PRMs), and all of our municipal solid waste (MSW). Our region uses a "single stream recycling system" with Recycling & Disposal Solutions (RDS) in nearby Salem, Virginia serving as the "hub." Food waste is collected at all, on-campus, dining facilities and stored, transported and processed into composting material by Royal Oak Farm (ROF) at their facility in Evington, Virginia. The New River Resource Authority (NRRA) located in Dublin, Virginia operates the local landfill. Virginia Tech owns and operates a Quarry that produces "Hokie Stone," the Limestone-Dolomite stone for the exterior of most campus buildings. Like 2020, Calendar Year 2021 was dominated by the COVID-19 pandemic which continued to impact recycling and trash collection operations at all levels. The significant increase in our trash tonnage was caused by more disposable takeout containers ending up in the trash. We noticed a significant increase in food deliveries which means less waste stays at the dining facilities. With the increased MSW, recycling tonnages remained about the same. Our food waste collection increased from 138 tons to 260 tons which is still well below the 566 tons from 2019. During 2021, we implemented the Governor's E0-77 mandates to our waste reduction efforts which eliminates single use plastics on campus. The impacts of these efforts won't be reflected in the FY21 numbers. We will be contracting for a waste consultant to do a complete audit of our operations this year and anticipate this will help us improve our overall waste and recycling efforts.

Virginia Tech achieved a 31.5% Recycling Rate and a 78% Waste Diversion Rate (percentage of waste kept out of the local landfill) for Calendar Year 2021.

Data in this report was collected from our recycling and solid waste facilities and other campus stakeholders. I certify that I have personally examined, and am familiar with, the information submitted in this form, and that based on my inquiry of the individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete.

_____WM Halsey_____   **AVP- Facility Operations**   **22 Mar 2022**
Authorized Signature   **Title**   **Date**

PART A: Recycling Rate Calculation - Using the formulae provided below and the information reported on Pages *3, 4 and 5* to calculate your recycling rates.

Step 1: [(PRMs) / (PRMs + MSW Disposed)] X 100 = Base Recycling Rate %

1,290 TONS	/	1,290 TONS	+	3,588 TONS	X 100=	26.5%

Step 2: CREDITS calculation

    a. Total Recycling Residue   0   tons
    b. Total Solid Waste Reused   17   tons
    c. Total Non-MSW Recycled   10,155   tons
               CREDITS   10,172   tons

Step 3: [(PRMs + CREDITS) / (PRMs + CREDITS + MSW Disposed)] X 100 = Adjusted Recycling Rate #1*

1,290 TONS	+	10,172 TONS	/	1,290 TONS	+	10,172 TONS	+	3,588 TONS	X 100=	76%

Step 4:   [   ]   **Source Reduction Credit does not apply; or**

        [X]   **Adjusted Recycling Rate #1 + 2% SRP Credit = Adjusted Recycling Rate #2***

76%	+ 2% =	78%

Step 5: Final Recycling Rate* for Solid Waste Planning Unit = | 31.5% |

* Total credits resulting from Steps 3 and 4 may not exceed 5 percentage points above the Base Recycling Rate achieved by the Solid Waste Planning Unit.

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Part I: Principal Recyclable Materials (PRMs): Report only PRM material generated within the reporting SWPU and recycled, NOT imported PRMs for recycling.

PRM Type	Recycled Amount (Tons)
Paper	141
Metal	42
Plastic	0
Glass	0
Commingled (also known as Single Stream)	386
Yard waste (composted or mulched)	150
Waste wood (chipped or mulched)	250
White Goods	6
Tires	4
Used Oil	2
Used Oil Filters	1
Batteries	1
Electronics	3
Fluorescent Bulbs & Ballasts	9
Food Waste Organic – Composting	260
Waste Cooking Oil	35
Total PRMs	**1,290(PRMs)**

(Enter Total on Page 2, Step 1)

Listing of sources for PRM data

1. Solid waste facilities from Virginia Tech which MSW disposed/recycled data was collected:

    a. Office of Sustainability – Campus Planning, Infrastructure & Facilities (CPIF) Division

    b. Facilities Operations (Buildings & Grounds) – CPIF Division

    c. Capital Construction & Renovation – CPIF Division

    d. Dining Services – Division of Student Affairs

    e. Housing & Residence Live – Division of Student Affairs

    f. Environmental Health & Safety Department

    g. Fleet Services – Parking & Transportation Department

    h. Athletic Department

    i. Human Resources Department

2. Other facilities/operations (not included in #1 above) from which MSW disposed/recycled data was collected:

    a. Montgomery Regional Solid Waste Authority (MRSWA) – Christiansburg, VA

    b. YMCA at Virginia Tech – Blacksburg, VA

    c. Campus Kitchens Food Donation Program – VT Engage – Blacksburg, VA

    d. _____

PART II: Credits by Category (see Credits Worksheet)

A. Recycling Residue – "Recycling residue" means the (i) nonmetallic substances, including but not limited to plastic, rubber, and insulation, which remain after a shredder has separated for purposes of recycling the ferrous and nonferrous metal from a motor vehicle, appliance, or other discarded metallic item and (ii) organic waste remaining after removal of metals, glass, plastics and paper which are to be recycled as part of a resource recovery process for municipal solid waste resulting in the production of a refuse derived fuel. (§ 10.1-1400 of the *Code of Virginia*) (use only SWPU generation)

Material Description	Facility/Operation		Tons of Material
_____	from	_____	
_____	from	_____	
_____	from	_____	
	TOTAL RECYCLING RESIDUE		0

(Enter Total on Page 2, Step 2 a)

B. Solid Waste Re-Used

Material Description	Reuse Method	Tons of Material
Furniture/Appliances	YToss Program (Collected – Student Move-Out)	3
Food Donation Prgm	Partnership w/Dining Services & VT Engage grp	14
	TOTAL RECYCLING RESIDUE	17

(Enter Total on Page 2, Step 2 b)

C. Non-Municiple Solid Waste (MSW) Recycled

Material Description	Recycling Method	Tons of Material
"Hokie Stone" Gravel	"Overburden" (Cuttings from VT Quarry Ops	8,795
Asphalt	Milled Asphalt from VDOT Campus Roadwork	475
Masonry, Concrete, etc.	Construction Projects (Data & Decision Sci)	885
	TOTAL NON-MSW RECYCLED	10,155

(Enter Total on Page 2, Step 2 c)

D. A credit of two (2) percentage points may be added to the Adjusted Recycling Rate #1 if the Solid Waste Planning Unit has implemented a Source Reduction Program (SRP). Examples of SRPs include Grass-cycling, Home Composting, Clothing Reuse, Office Paper Reduction (duplexing), Multi-Use Pallets, or Paper Towel Reduction. The SRP must be included in the Solid Waste Management Plan on file with the Department:

SRP description: Campus Kitchens Program is a partnership with VT Engage & Dining Svcs (Division of Student Affairs) to donate excess food to local community.

SRP description: YMCA at Virginia Tech's YToss Program collects reusable items from our students in residence halls during Spring Move Out for sale in the Fall 2021.

SRP description: The Procurement Department's Sustainable Procurement Policy introduced in Spring 2020 and focuses on waste reduction at the front of the waste stream.

(Certify on Page 2, Step 4)

Exclusions: For the purposes of this report, the following materials are not considered solid wastes, be included in any of the data categories utilized in calculating the recycling rate.
1. Biosolids –industrial sludge, animal manures; or, sewage sludge (unless composted)
2. Automobiles – unless part of the Inoperable Vehicle Program (DMV)
3. Leachate
4. Soils – contaminated soils, soil material from road maintenance
5. Household hazardous waste
6. Hazardous waste
7. Medical waste
8. Rocks or stone
9. Woody waste derived from land clearing for development, VDOT or easement tree trimming/clearing.

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Part III: Total Municipal Solid Waste (MSW) Disposed ** - Report only MSW generated within the reporting jurisdiction(s), NOT imported wastes or industrial wastes.

MSW Type	Total Amount of MSW Disposed (tons)
Household	0
Commercial	0
Institutional	3,588
Other (Do not include industrial wastes)	0
Total MSW Disposed	**3,588**

(Enter Total on Page 2, Step 1 and Step 3)

Note: MSW DISPOSED for the purpose of this report means delivered to a permitted sanitary landfill, delivered to a waste-to-energy facility, or managed at a transfer station for transport to a landfill or waste-to-energy facility.

Credits Worksheet

I.   Reuse of any Solid Waste

√	Material description	Tons
PRM		
PRM		
PRM		
Industrial		
Construction		
Demolition		
Debris		
Other		
X YToss Program	Reusable Residence Hall Items	3
X Campus Kitchen	Food Donation w/ Dining Svcs	14
	Total Tons	**17**

(enter data on Page 4, Solid Waste Re-Used)

II. Recycling of any Non-Municipal Solid Waste

√	Material description	Tons
X Roadwork	Asphalt Milling (VDOT)	475
X Construction	Construction Projects (D&DS)	885
X Quarry Ops	Hokie Stone "Overburden"	8,795
	Total Tons	**10,155**

(enter data on Page 4, Non-MSW Recycled)

III. Inoperable Vehicles Removed and Demolished – include number of vehicles that the localities received reimbursement from DMV under §46.2-1207 of the Code of Virginia.

# of vehicles removed/reimbursement received	0
Average tonnage per vehicle	X 1 Ton each
Total Tons	**0**

(enter data on Page 3, PRMs, as Inoperative Motor Vehicle Program)

NOTE: Check "Exclusions" on Page 5 to avoid listing of those materials on this worksheet and/or in the data fields of this report.

Part C: Recycling Rate Report Instructions

Amended Regulations for the Development of Solid Waste Management Plans (9 VAC 20-130-10 et seq.) require that Solid Waste Planning Units (SWPUs) in the Commonwealth develop complete, revised solid waste management plans. Section 9 VAC 20-130-120 B & C of the Regulations requires that a minimum recycling rate of the total municipal solid waste generated annually in each solid waste planning unit be maintained. It also requires that the plan describe how this rate shall be met or exceeded and requires that the calculation methodology be included in the plan. Section 9 VAC 20-130-165 D establishes that every solid waste management planning unit with populations over 100,000 shall submit to the department by April 30 of each year, the data and calculations required in 9 VAC 20-130-120 B & C for the preceding calendar year. SWPUs with populations of 100,000 or less are only required to report every 4 years (CY years 2016 and forward).

NOTE: ONLY RECYCLING RATE REPORTS FROM AN APPROVED SOLID WASTE PLANNING UNIT (SWPU) WILL BE ACCEPTED FOR PROCESSING. JURISDICTIONS WITHIN A SWPU MUST SUBMIT THEIR RECYCLING DATA TO THE SWPU FOR INCORPORATION INTO THE ANNUAL REPORT.

It is requested that all amounts included on the form be listed in **tons (2,000 pounds)**. If actual weights are not known, volumes can be converted to weight estimates. To assist you with these estimates, a standardized volume to- weight conversion table is attached.

Contact Information Section: Please provide information on the Reporting SWPU and information on the individual completing this form. Under Member Governments, please list the local governments identified in the applicable solid waste management plan.

Calculated Recycling Rate Section: Using the formulae provided, calculate your recycling rates for the reporting period from information identified in the Recycling Rate Calculations Section.

Signature Block Section: Please provide an authorized signature prior to submitting the completed form. Authorized signatories include Executive Officer, Administrator, or other legally designated representative of the SWPU reporting entity.

Recycling Rate Calculations Section: Please provide the requested information:

Part I: Principal Recyclable Material (PRM) - Report the amount in tons of each PRM collected for recycling in the named jurisdiction(s) during the reporting period. PRMs include paper, metal, plastic, container glass, commingled, yard waste, waste wood, textiles, tires, used oil, used oil filters, used antifreeze, batteries, electronics, and other materials approved by the Director taken from the Municipal Solid Waste (MSW) generation. A one ton credit may also be entered for each inoperable motor vehicle for which a locality receives reimbursement from the Virginia Department of Motor Vehicles under §46.2-1207 of the Code of Virginia. The total weight in **TONS** of all PRMs collected for recycling is represented as **PRMs** in the Recycling Rate Calculation. **New for CY 2015: Provide source information for the PRMs reported on the report (permitted and unpermitted facilities).**

Part II: Credits - Report the amount in **TONS** of each material for which recycling credit is authorized in §10.1- 1411.C of the Code of Virginia: (i) one ton for each ton of recycling residue generated in Virginia and deposited in a landfill permitted under §10.1-1408.1 of the Code of Virginia; (ii) one ton for each ton of any solid waste material that is reused; and, (iii) one ton for each ton of any non-municipal solid waste that is recycled. The total weight in **TONS** of all material for which credits are authorized is represented as **CREDITS** in the Recycling Rate Calculation. A credit of two percentage points of the minimum recycling rate mandated for the Solid Waste Planning Unit (SWPU) may be taken for a source reduction program that is implemented and identified in its Solid Waste Management Plan. Total credits may not exceed five percentage points above the Base Recycling Rate achieved by the SWPU.

Part III: Total Municipal Solid Waste (MSW) Disposed: Report the total amount in **TONS** of MSW that was disposed of by the Solid Waste Planning Unit (SWPU) during the reporting period for each of the source categories (Household, Commercial, Institutional, and Other). For the purpose of this report, "disposed," means delivery to a permitted sanitary landfill or waste incinerator for disposal, and excludes industrial wastes. Industrial waste and by-products should not be included in the MSW or Recycling calculation. The total weight in tons of MSW disposed is represented as **MSW Disposed** in the Recycling Rate Calculation.

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Locality Recycling Rate Report Volume to Weight Conversion Table

Material	Volume	Weight in Pounds
Metal		
Aluminum Cans, Whole	Once cubic yard	50-74
Aluminum Cans, Flattened	One cubic yard	250
Aluminum Cans	One full grocery bag	1.5
Ferrous Cans, Whole	One cubic yard	150
Ferrous Cans, Flattened	One cubic yard	850
Automobile Bodies	One vehicle	2,000
Paper		
Newsprint, Loose	One cubic yard	360-800
Newsprint, Compacted	One cubic yard	720-1,000
Newsprint	12" stack	35
Corrugated Cardboard, Loose	One cubic yard	75-100
Corrugated Cardboard, Baled	One cubic yard	1,000-2,000
Plastic		
PETE, Whole, Loose	One cubic yard	30-40
PETE, Whole, Loose	Gaylord	40-53
PETE, Whole, Baled	30"x62"	500
Film, Baled	30"x42"x48"	1,100
Film, Baled	Semi-Load	44,000
Film, Loose	Standard grocery bag	15
HDPE (Dairy Only), Whole, Loose	One cubic yard	24
HDPE (Dairy Only), Baled	32" x 60"	400-500
HDPE (Mixed), Baled	32" x 60"	900
Mixed PET & Dairy, Whole, Loose	One cubic yard	32
Mixed PET, Dairy & Other Rigid (Whole, Loose)	One cubic yard	38
Mixed Rigid, No Film	One cubic yard	49
Glass		
Glass, Whole Bottles	One cubic yard	600-1,000
Glass, Semi-Crushed	One cubic yard	1,000-1,800
Glass, Crushed (Mechanically)	One cubic yard	800-2,700
Glass, Whole Bottles	One full grocery bag	16
Glass, Uncrushed to Manually Broken	55 gallon drum	125-500
Arboreal		
Leaves, Uncompacted	One cubic yard	200-250
Leaves, Compacted	One cubic yard	300-450
Leaves, Vacuumed	One cubic yard	350
Wood Chips	One cubic yard	500
Grass Clippings	One cubic yard	400-1,500
Other		
Battery (Heavy Equipment)	One	60
Battery (Auto)	One	35.9
Used Motor Oil	One gallon	7.4
Used Oil Filters (Uncrushed)	55 gallon drum	66 Lbs./Used Oil+ 110 Lbs./Ferrous Metal
Used oil Filters (Crushed)	55 gallon drum	16.5 Lbs./Used Oil + 368 Lbs./Ferrous Metal
Tire - Passenger Car	One	20
Tire - Truck, Light	One	35
Tire - Semi	One	105
Antifreeze	One gallon	8.42
Food Waste, Solid & Liquid Fats	55 gallon drum	412
Electronics: CRT/CPU/Laptop/TV	Each (avg wt from NCER)	38/26/8/49 respectively
This Table For General Guidance Only.		

MEMORANDUM

TO:	Student Organizations
FROM:	Mary-Ann O. Ibeziakor
DATE:	September 21, 2021
SUBJECT:	Academic Year 2021-22 Request for Proposal for Climate Action, Sustainability, and Energy Initiatives by Student Organizations Program (Green RFP Program)

Student engagement is an important factor in advancing climate action, sustainability, and energy initiatives at Virginia Tech. The university has created the Request for Proposal for Climate Action, Sustainability, and Energy Initiatives from Student Organizations Program (called the "Green RFP Program") to solicit proposals from recognized student organizations that supports the goals of the Virginia Tech 2020 Climate Action Commitment. Since its initiation in academic year 2010-11, the Green RFP Program has provided funds in excess of $1.5 million for 110 approved student sustainability proposals.

The purpose of this memorandum is to present the proposal submission process, timeline, format, contacts, and the review criteria. Recognized student organizations should identify sustainability initiatives that are directly targeted to specific projects and therefore limited in size and scope. The university is especially interested in projects focused on energy reduction and conservation that produce achievable savings. Requests for one-time support are generally preferred over those requiring ongoing support.

The process and key dates for proposal submission and are shown in Attachment 1. The process begins with this memorandum and continues through the current academic year. Approved proposals will be formally announced during Spring Semester 2022.

Student organizations will submit a proposal(s) using the form titled "Green RFP Submission Form" shown in Attachment 2. All four parts of the form must be completed in detail. Part III, "Supporting Information" should be completed prior to addressing Part II, "Project Cost Information." As shown in Part IV, all proposals must have an appropriate university official's participation and concurrence prior to submission. The participation of the appropriate university official is essential, particularly if a proposal involves the purchase and installation of new equipment, a modification to an existing facility or grounds, or a new program.

The completed form must be signed and electronically submitted to Nathan King in the Office of Climate Action, Sustainability, and Energy at naking@vt.edu by 4 p.m. on November 19, 2021. If students have questions, need assistance in completing the form, or need assistance with identifying the appropriate university official for their proposal, please contact Mr. King via email or office telephone at 540-231-7358. If technical assistance is needed in preparing a proposal, please see our subject matter contact list in Attachment 3. For a list of previously approved Green RFPs, please visit the Office of Climate Action, Sustainability, and Energy website:

facilities.vt.edu/sustainability/sustainability-programs/green-rfp-program.

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The Office of Climate Action, Sustainability, and Energy will present select proposals to the university's Energy and Sustainability Committee for review and prioritization. This committee is a part of our university governance system and is comprised of faculty, staff, graduate students, and undergraduate students. The committee will consider and evaluate proposals based on the following criteria:

- Does the proposal help to achieve the goals of the Virginia Tech 2020 Climate Action Commitment?
  See: vt.edu/sustainability/background

- Does the proposal generate savings that exceed the cost of implementation?

- Does the proposal pertain to energy reduction/conservation that produces cost savings?

- Does the funding request address a one-time or an ongoing need?

- Does the proposal leverage other sources of funding or volunteer effort?

Select proposals meeting these criteria will be prioritized and submitted by the Energy and Sustainability Committee to the Office of Budget and Financial Planning (OBFP) for further consideration. OBFP will assemble a budget committee to review proposals and determine potential funding strategies for those recommended for approval. The Vice President for Finance will announce the list of approved proposals and funding sources. The Division of Campus Planning, Infrastructure, and Facilities will oversee implementation.

Thank you for your interest in the university's environmental stewardship efforts. I encourage your participation in this very popular student program.

c: Wendy M. Halsey

James S. Hillman

Timothy L. Hodge

Travis W. Hundley

Frances B. Keene

Nathan T. King

Christopher H. Kiwus

Jamie D. Lau

Kenneth E. Miller

Angela S. Page

Frank X. Shushok Jr.

Jonathan C. Teglas

STUDENT ORGANIZATIONS SUSTAINABILITY INITIATIVE
PROPOSAL PROCESS AND TIMELINE

Date	Activity
Sep 20, 2021	Assistant Vice President for Infrastructure and Chief Sustainability Officer announces the AY 2021-22 Green RFP Program and the Office of Climate Action, Sustainability, and Energy (CASE) notifies student organizations.
Nov 19, 2021	Proposal submission deadline to CASE.
Dec 1, 2021	CASE coordinates a proposal review for feasibility and completeness.
Jan 31, 2022	Energy and Sustainability Committee receives select proposals and appoints Subcommittee to review and recommend a priority order.
Feb 28, 2022	Subcommittee presents proposed priority recommendations to the Energy and Sustainability Committee for approval.
Mar 4, 2022 (estimated)	Energy and Sustainability Committee presents proposals to the Office of Budget and Financial Planning for review and funding consideration.
Mar 2022 (estimated)	Office of Budget and Financial Planning, in coordination with other university offices, determines potential funding options for proposals and seeks the appropriate approvals.
Apr 2022 (estimated)	Vice President for Finance announces the approved proposals and funding sources.
May 2022 (estimated)	The Office of Budget and Financial Planning transfers funds to the appropriate Green RFP funding codes for proposal implementation.
May 2022 (estimated)	CASE initiates Green RFP implementation.

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GREEN RFP SUBMISSION FORM

Part I- General Information:

Name of Student Organization	
Contact/Responsible Person	
Contact Office Held/Title	
Contact Email Address	
Contact Telephone Number	

Part II- Project Cost Information

Estimated Cost of this Proposal		See III.C. below
Estimated Savings -		See III.D. below
Net Cost of this Proposal =		

Part III- Supporting Information

A. Please describe your climate action, sustainability, and/or energy initiative and attach supporting documentation.

B. How does this initiative help to achieve the goals of the Virginia Tech 2020 Climate Action Commitment Resolution and Sustainability Plan?

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C. What is the cost of your proposal? Please describe in adequate detail the basis for your cost estimate.

D. Will your proposal produce cost savings for the university? If so, how much? Please describe in adequate detail the basis for your savings estimate.

D. Is this funding request for a one-time need or an ongoing need (please mark one)?

           One-Time   Ongoing

F. Is funding available for this request from another source? If yes, describe the funding (source, amount, etc.).

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GREEN RFP SUBMISSION FORM

Part IV- Requestors/Reviewers

_____   _____
Prepared By (Name of Contact for Student Organization)   Date

_____   _____
Reviewed By (Name of Appropriate U niversity Official)   Date

_____   _____
Reviewed By (Name of Office of Climate Action, Sustainability, and Energy Representative)   Date

GREEN RFP SUBMISSION

CONTACT LIST

In the preparation of your Green RFP form, student organizations are encouraged to seek input and guidance from the following list of university employees. These individuals are familiar with the form and the process. They can address the feasibility of your proposal, provide a technical review, and evaluate the cost & potential savings.

Engineering & Operations, Energy Management	Steve Durfee	Campus Energy Manager	sdurfee@vt.edu
Facilities: Housing & Residence Life	Todd Pignataro	Associate Director of Facilities	ptodd@vt.edu
Facilities: Buildings & Grounds (Small Renovations)	Jim McDaniel	Project Coordinator	jmdani@vt.edu
Exterior Lighting	Matt Hagy	Associate Director for Event Services	mhagy1@vt.edu
Student Engagement & Campus Life	Spencer Stidd	Associate Director of Utilities	sstidd@vt.edu
Dining Services & Housing (Student Affairs)	Blake Bensman	Sustainability Manager	bensman@vt.edu
Alternative Transportation (Bus, Bike, & Walk/EVs)	Nick Quint	Transportation Network Manager	nquint@vt.edu
Landscape Architecture	Jack Rosenberger	Campus Landscape Architect	jrosenb@vt.edu
Hahn Horticulture Garden	Scott Douglas	Director/Instructor	dsd1@vt.edu
Recycling & Waste Management	Teresa Sweeney	Program Consultant	msrecycle247@vt.edu
Other Sustainability Topics	Nathan King	Campus Sustainability Manager	naking@vt.edu

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Virginia Tech Sustainable Procurement Policy

1. Background

In accordance with the Virginia Tech Climate Action Commitment and Sustainability Plan, the Virginia Tech Procurement Department [the Department] recognizes its responsibility to support the university in its efforts to minimize negative impacts on health and the environment while supporting a vibrant campus community and local economy. The Department recognizes that the types of products and services procured have inherent social, health, environmental and economic impacts, and that the Department should make procurement decisions that embody the university's commitment to sustainability whenever possible.

2. Purpose

This Sustainable Procurement Policy will complement and strengthen our commitment to sustainability and intends to:

- Identify those sustainability factors that shall be incorporated into procurement decisions;

- Provide implementation guidance;

- Empower employees to be innovative and demonstrate leadership by incorporating sustainability factors into procurement decisions;

- Complement university wide and department-specific sustainability goals and related policies; and communicate the Department's commitment to sustainable procurement.

- Encourage vendors to promote products and services that they offer which are most suited to the university's sustainability principles;

- Reduce the spectrum of environmental impacts from the university's use of products, including greenhouse gas emissions, landfill waste, health and safety risks, and resource consumption;

- Communicate the Department's commitment to sustainable procurement, by modeling the best product and services choices to the campus community, and other institutions of higher education;

- Reduce the environmental impacts of materials acquired for use in the operation, maintenance and upgrades of buildings, new building construction; and,

- Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills or incineration facilities.

3. Policy

3.1 General Policy Statement

Procurement Department employees and those with delegated procurement authority will procure materials, products or services in a manner that integrates fiscal responsibility and environmental stewardship whenever possible within the guidelines of the Purchasing Manual for Institutes of Higher Education. Each university department shall comply with this policy and actively encourage procurement decisions that reflect the policy objectives. The Procurement Department shall actively promote and encourage product and service acquisitions compliant to the policies and guidelines adopted herein.

3.2 Sustainability Factors

Procurement Department employees shall incorporate whenever possible the following factors when writing specifications for, or procuring materials, products, or services.

Environmental factors which may be considered include, but are not limited to, the life cycle assessment of:

- Pollutant releases
- Toxicity
- Waste generation
- Water efficiency
- Greenhouse gas emissions
- Energy efficiency

- Packaging and shipping impacts
- Depletion of natural resources

- Recyclability
- Use of recycled content

Fiscal factors to be considered may include, but are not limited to:

- Product efficiency which minimizes need
- Product performance, quality, and durability
- Upfront cost
- Life-cycle cost
- Leveraging of buying power through the utilization of cooperative, group purchasing and consortium contracts
- Impact on staff time and labor, including operational and maintenance requirements

While not all factors will be incorporated into every purchase, it is the intent of this policy that Procurement Department employees will make a good faith effort to incorporate and balance these factors to the maximum extent possible.

4. Use of Best Practices

Procurement Department employees will utilize best practices in sustainable procurement as they evolve whenever possible. As it applies to this policy, best practices in sustainable procurement are those that utilize leading edge sustainability factors, standards, and procedures in an efficient and effective way that is successful and replicable. The Procurement Department will promote and encourage strategies to reduce consumption due to the societal and community costs, such as landfill waste handling, toxin exposures, resource depletion, and greenhouse gas emissions.

The following guidelines and best practices are provided and required to the extent practical:

General
- Always look for environmental labeling, including recycling symbols and qualifying assertions such as ENERGY STAR, WaterSense, EPEAT, and/or Green Seal certified.
- When purchasing materials, supplies or equipment, purchases must meet sustainability requirements as may be specified in the solicitation documentation.
- Waste stream management within the buildings and among the grounds must be compliant with specified requirements, specifically for consumable goods and facilities alterations and additions.

4.1 Applicable Codes and Laws

It is the intent of this policy to complement existing codes and laws. Nothing in this policy shall be construed to conflict or be inconsistent with applicable federal, state, or local procurement codes or laws.

5. Environmental Standards and Product and Certifications

5.1 Standards: The standard for all acquisitions shall be compliant at least to:

- The U.S. Environmental Protection Agency (EPA) standards whenever published for a product or services; and
- The Virginia Department of Environmental Quality (DEQ)

5.2 Third-Party Certifications: The Procurement Department shall apply the most stringent third-party label standard available for a product or service being acquired. The Department shall use independent, third-party social and/or environmental (eco) product or service label certifications when writing specifications for procuring materials, products, or services, whenever a responsible label standard is available. Qualifying labels shall be:

- Developed and awarded by an impartial third-party (examples include: Green Seal, ENERGY STAR, EPEAT, Environmental Choice and Forest Stewardship Foundation);
- Developed in a public, transparent, and broad stakeholder process; and
- Represent specific and meaningful leadership criteria for that product or service category.

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In addition, whenever possible, label standards used in product or service specifications should represent standards that consider multiple attributes and life-cycle considerations, with claims verified by an independent third party.

5.3 Specifications and Contracts

The Director of Procurement shall be responsible for:

- Ensuring that specifications written by the Department comply with this policy and incorporate sustainable procurement best practices.

- Ensuring procurement manuals and other internal procedures reference this policy and incorporate best practices for specifying products and services that meet the intent of this policy; and,

- Developing and integrating sustainable procurement boilerplate language into solicitation document templates.

6. Implementation and Responsibilities

6.1 Acquisition Responsibilities

Leadership of those areas with delegated procurement authority shall:

- Serve on specification or best practice teams, to collaborate with other university staff and the Procurement Department in standards, strategies and specifications;

- Ensure internal policies and procedures that reference this policy and incorporate the use of sustainable products and services that meet the intent of this policy; and,

- Encourage pilot testing for environmentally preferable/sustainable products.

The Procurement Department shall:

- Promote and ensure that bid and contract strategies incorporate the most favorable standards and best practices in sustainable procurement;

- Stay current and informed on advances in sustainable procurement specifications and strategies; and,

- Consult with experts as needed when reviewing or designing specifications, to ensure progressive and emerging specifications for the product or service being solicited.

7. Education

Leadership of those areas with delegated procurement authority shall be responsible for:

- Building awareness of this policy through information dissemination and incorporation into routine employee trainings;

- Encouraging employee attendance at internal and external trainings related to sustainability; and

- Encouraging the use of environmentally preferable/sustainable products and services through information dissemination, development of internal procedures, pilot testing, and leading by example.

The Purchasing Department shall be responsible for:

- Developing employee sustainable procurement resources such as, but not limited to, standards, specifications, tools, and best practices;

- Developing buyer-specific training on sustainable procurement best practices that meet the intent of this policy;

- Developing buyer competency in communicating to other university departments about this policy and opportunities for incorporating sustainable procurement best practices into solicitations and contracts;

- Developing communication among higher education procurement professionals about sustainable procurement best practices; and

- Taking the lead in communicating to existing and potential vendors about this policy and related requirements.

8. Policy Review

The Director of Procurement shall be responsible for periodically bringing together internal stakeholders to review this policy for updates or to otherwise determine whether this policy is in alignment with other university sustainability efforts and policies. The policy review shall be completed at least every five years but may be done on a more frequent basis as needed.

9. Explanation of Sustainable Terms

Following are routine terms related to sustainability as they apply to this policy.

Alternative/Hybrid Fuel Vehicle - vehicles that are powered by fuels that reduce air pollution, reduce fossil fuel consumption, solid waste and/or hazardous waste that result from their manufacture, use, service, and maintenance. The term is used to refer to various types of vehicles, including compressed natural gas, biodiesel, ethanol, electric and hybrid electric, propane, liquefied natural gas, and hydrogen fuel cell.

Biodegradable - capable of readily decomposing under natural conditions.

Durable Goods - goods which do not quickly wear out, or more specifically, it yields services or utility over time rather than being completely used up when used once.

Energy Efficiency - refers to products that meet or exceed the U.S. Department of Energy (DOE) federal energy management program's energy efficiency recommendations r that meet the energy efficiency criteria of the U.S Environmental Protection Agency (EPA) ENERGY STAR program.

ENERGY STAR - A voluntary partnership among DOE, EPA, product manufacturers, local utilities and retailers. Partners help promote efficient products by labeling with the ENERGY STAR logo and educating consumers about the benefits of energy efficiency.

Environmentally Preferable - products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or service that serve the same purpose. The product or service comparison may consider raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance or disposal.

EPEAT- the Electronic Product Environmental Assessment Tool: epeat.net

Integrated Pest Management- the coordinated use of pest information, environmental information, and available pest control methods to prevent unacceptable levels of pest damage by the most economical means and with the least possible hazard to people, property, and the environment.

Ongoing Consumables - Goods that may be depleted or worn out by use and must therefore be regularly replenished.

Post-Consumer Material - refers to a material or finished product that has served its intended use and has been discarded for disposal or recovery, having completed its life as a consumer item. "Post-consumer material" is part of the broader category of "recovered material."

Practicable - means sufficient in performance and reasonably available at a competitive cost.

Reconditioned/Remanufactured - the process of restoring used durable products to meet original performance standards. Remanufacturing has many other names, including: rebuilding, retreading, reconditioning, and refurbishing.

Recycled Content - materials that have been recovered from the solid waste stream, either during the manufacturing process (pre-consumer), or after consumer use (post-consumer).

Recycling- placing used materials into channels that reuse them.

Waste Stream - The total flow of solid waste from homes, businesses, institutions, and manufacturing plants that is recycled, burned, or disposed of in landfills.

Xeriscaping/Sustainable Landscaping - an ecologically sound landscaping approach that is water conscious.

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10. Additional Resources

This section provides university staff, vendors, and potential vendors resources for identifying suppliers of sustainable products as well as best practices which may be useful in the successful application of this sustainable procurement policy. The following lists of organizations and sites may be consulted when purchasing products and services.

The Association for the Advancement of Sustainability in Higher Education: aashe.org
AASHE empowers higher education faculty, administrators, staff and students to be effective change agents and drivers of sustainability innovation.

ENERGY STAR: energystar.gov
Develops energy efficiency guidelines and helps promote the utilization of efficient products through the ENERGY STAR logo.

EPA Green Resources: epa.gov/greenerproducts
Allows users to search for EPA programs related to greener products based on the type of user and their specific product interests.

EPEAT: epeat.net
The Electronic Product Environmental Assessment Tool consists of a set of voluntary environmental criteria for identifying energy efficient and environmentally preferable computers and other electronic components.

Green Seal: greenseal.org
Establishes environmental standards and awards its "green seal of approval" to products meeting its standards. Green Seal has created environmental standards for more than 30 product categories and regularly publishes its Choose Green Reports, which evaluate the environmental impacts of products.

My Green Lab: mygreenlab.org
Formed to unify and lead scientists, vendors, designers, energy providers, and others in a common drive toward a world in which all research reflects the highest standards of social and environmental responsibility.

New American Dream: newdream.org
Provides extensive information on purchasing energy efficiency and environmentally preferable products via its Responsible Purchasing Network.

US EPA WaterSense: epa.gov/watersense
Provides labeling, certification, information regarding water efficient products, contractors, and programs.

Virginia Department of Environmental Quality: deq.virginia.gov
The Department of Environmental Quality protects and enhances Virginia's environment, and promotes the health and well-being of the citizens of the Commonwealth.

Virginia Tech Office of Sustainability: facilities.vt.edu/sustainability
The Office of Sustainability acts as a central hub to connect the many sustainability champions and efforts taking place all across campus.