VIRGINIA TECH™

SUSTAINABILITY

2020-21 ANNUAL REPORT

CONTENT

LEED silver certified Creativity and Innovation District Living Learning Community building

EXECUTIVE SUMMARY

For 11 years, Virginia Tech made considerable progress towards implementing the 2009 Climate Action Commitment and Sustainability Plan. The 2009 Virginia Tech Climate Action Commitment was unanimously approved by the Virginia Tech Board of Visitors on June 1, 2009, and on May 9, 2013, the University Council approved Revision 1 which made adjustments based on four years of implementation.

While the 2009 Climate Action Commitment was ahead of its time, the Virginia Tech community came together and decided that Virginia Tech needed to continue to be ahead of the norm. After all, the first goal of the original commitment was to be a leader in campus sustainability. To be that leader, Virginia Tech created the 2020 Climate Action Commitment. This new commitment was approved by the Board of Visitors in March of 2021 and outlines stricter, more ambitious goals which will yield impressive and impactful results.

Today, Virginia Tech is recognized as a state and regional leader in sustainability with a Sustainability Tracking, Assessment, and Rating System (STARS) Gold rating that is highest among Virginia and ACC peer institutions. Virginia Tech has won numerous awards and recognitions since 2010, including Princeton Review's top 50 green colleges (#34 in 2020); Best Workplaces for Commuters (Gold); Bicycle Friendly University (Silver); Tree Campus Higher Education recertification (every year); Times Higher Education Impact Rating (top 25 globally); and many others.

The university has continued to reduce greenhouse gas emissions and released its first ever Greenhouse Gas Inventory and Assessment Report to share the data publicly. Additionally, Virginia Tech now has 34 LEED-registered buildings totaling over 2.8 million gross square feet. Twenty-one of those buildings are certified, five are pending certification, five 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.

Virginia Tech has done much to develop alternative transportation choices: installing bike racks and dual use trails; creating bike share, rideshare, and car share programs; increasing ridership on partner Blacksburg Transit; and implementing innovative plans to boost campus mobility. One of the most notable innovative plans to boost mobility is the Multi-Modal Transit Facility, which is currently under construction.

For Calendar Year 2020, Virginia Tech achieved an 85.2 percent waste diversion rate (waste diverted from the landfill) and a 38.1 percent recycling rate. In February, the Division of Campus Planning, Infrastructure, and Facilities produced the new Comprehensive Waste Management Plan which outlines pathways for achieving university waste management and recycling goals.

There is an enviable array of sustainability-related academic programs, majors, coursework, and research in green engineering, natural resources, energy systems, environmental policy, and many sustainability-related fields. In the STARS rating system, Virginia Tech earns 92 percent of possible points in academic categories. It also scores 86 percent of possible points in campus engagement. Virginia Tech has a rich campus life for students with a wide array of opportunities, including strong environmental student organizations. These student groups have pushed the university to move forward on climate action, and were a leading cause for the call to revise the Climate Action Commitment back in 2019.

The Division of Campus Planning, Infrastructure, and Facilities has embraced sustainability and climate action as part of its mission. The division has undergone organizational restructuring to better support the implementation of programs related to climate action, sustainability, and energy and multiple new positions have been created to better support the new Climate Action Commitment.

The Virginia Tech 2020-21 Sustainability Annual Report begins with a broad overview of the university's sustainability program, presents the 15 goals contained in the 2020 Virginia Tech Climate Action Commitment, and showcases sustainability highlights and progress for each point. This is the first year that the Sustainability Annual Report is being structured after the new 2020 Climate Action Commitment **bit.ly/VTCACExecReport20** and it serves as a checkpoint to show how much progress the university has made towards its new goals in just one year.

Power plant at Virginia Tech.

OVERVIEW

Introduction

Virginia Tech's Climate Action Commitment defines sustainability as the simultaneous pursuit of environmental quality, economic prosperity, and social justice and equity, 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.

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.

Energy and Sustainability Committee

The university established the Energy and Sustainability Committee on April 30, 2007. It is one of 16 committees within the university governance system. The Energy and Sustainability Committee's charge is "To review and provide advice to the University Administration on broad policy issues relating to the university's pursuit of environmental quality through action, education and engagement to address current needs without compromising the capacity and needs of future generations."

The Energy and Sustainability Committee reports to the Commission on University Support who reports to the University Council. The Energy and Sustainability Committee has 20 members and includes faculty, staff, and student representation. It is unique in that it is the only committee in the university governance system that has four student representatives (two undergraduate students and two graduate students). The other committees have a total of two student representatives. Please refer to **governance.vt.edu/assets/esc-roster.pdf** for more information.

Learn more about the university governance system at **governance.vt.edu/ccc.html**.

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, at their regularly scheduled meeting, 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. On May 6, 2013, the University Council approved the revision.

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 states, "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 Nov. 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 surrounding community. The group worked tirelessly through 2020, in spite of all the challenges posed by COVID-19, to produce the Virginia Tech 2020 Climate Action Commitment Working Group Final Report Executive Summary and Overview (appendix). This report was presented to Dr. Pinkney in July 2020. Following that presentation, the university governance review process kicked in at the start of the 2020 fall semester.

The Commission on University Support Resolution 2020-21A was successfully reviewed by the Energy and Sustainability Committee, the Commission on University Support, and the University Council during the semester. President Sands is the Chair of the University Council and both he and Dr. Pinkney participated in the University Council discussions, demonstrating the senior level involvement, excitement, and support for this effort.

Professor Emeritus John Randolph presented the revised Climate Action Commitment to the Board of Visitors on Nov. 15, 2020. Over the next 3 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 was requested by the Board of Visitors to help ensure the successful long-term implementation of the new Climate Action Commitment.

The financial review was presented to the Virginia Tech Board of Visitors on March 21 where the review, and the commitment as a whole, were approved. The 2020 Climate Action Commitment includes 15 goals for advancing the long-term university sustainability over the next 10 years. The Sustainability Annual Report will provide a yearly 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. Fortunately, Virginia Tech already has a running start in all of these areas. More than a decade of campus sustainability achievements contribute to a strong foundation for implementation. For instance, extensive groundwork has been laid in bolstering energy efficiency and reducing energy usage in university buildings. The Virginia Tech Office of Sustainability continues to expand hands-on sustainability experiential learning opportunities for students through its internship and Green RFP programs. Integration of sustainability into policymaking related to campus operations is also helping to foster a culture of environmental stewardship at Virginia Tech.

A Virginia Tech Climate Action Commitment Implementation Group has been formed and meeting regularly since the approval of the 2020 Climate Action Commitment.

Sustainability Plan

Virginia Tech has adopted the Association for the Advancement of Sustainability in Higher Education's (AASHE) (**aashe.org**) Sustainability Tracking, Assessment, and Rating System (STARS) (**stars.aashe.org**) protocol as the foundation of the Sustainability Plan. The STARS protocol consists of over 60 topical

areas (called credits) 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. Data and information submitted is measured against a national standard. Points are earned for each credit. Total points (score) yields an overall rating of Bronze, Silver, Gold, or Platinum.

Virginia Tech has received 5 STARS ratings (2011: Silver; 2013: Silver; 2014: Gold; 2017: Gold; and 2021: Gold). 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 good for three years and the Office of Sustainability will be looking to begin preparing for their 2024 submission in the near future.

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 Plan;
- 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 include 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 students groups to include the Student Government Association, Residence Hall Federation, Environmental Coalition, Environmental Student Organization, Food Justice at Virginia Tech, Galileo Living Learning Community, Hypatia Living Learning Community, Society of Renewable Resources, Stroubles Creek Restoration Initiative, Student Chapter of the American Water Resources Association, Students for Sustainable Practice, Sustainable Food Corps, Campus Kitchens at Virginia Tech, The Green Program - Study Abroad at Virginia Tech, Veg Club, United Feminist Movement, Citizens Climate Lobby, Outdoor Club, and Virginia Tech for Climate Justice.

Students show support for the 2020 Virginia Tech Climate Action Commitment outside of the March Board of Visitors meeting.

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, and Blacksburg Parks and Recreation.

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 AWARDS

Dining Services boasts a tradition of award-winning programming, venues, and service. Dining Services is committed to being the leader of college and university food service and a leader in sustainability and has received numerous awards for their efforts. Learn more at **dining.vt.edu/about/awards_honors**.

2020

BEST CAMPUS FOOD
for colleges in the US
thetravel.com

GOLD ADDY® AWARD
for Shiki Food Photography
aafroanoke.org

#2 BEST CAMPUS FOOD
Niche.com

GOLD LOYAL E. HORTON AWARD
"Shiki," Residential Dining - Special Event
NACUFS.org

GOLD ADDY® AWARD
for Shiki Special Event Menu
aafroanoke.org

#5 BEST CAMPUS FOOD
of 382 colleges: 2020 edition
princetonreview.com

SILVER LOYAL E. HORTON AWARD
"Curate," Catering - Special Event
NACUFS.org

SILVER ADDY® AWARD
for chili challenge video series
aafroanoke.org

2021

GOLD ADDY® AWARD
for Behind the Mask Social Media Campaign
aafroanoke.org

GOLD ADDY® AWARD
Best of Electronic for Chili Challenge Animation
aafroanoke.org

#1 TOP COLLEGES WITH BEST DINING OPTIONS
collegemagazine.com

GOLD ADDY® AWARD
for Curate Still Photography
aafroanoke.org

SILVER ADDY® AWARD
for Advertising Industry Self-Promotion
aafroanoke.org

#2 BEST CAMPUS FOOD
Niche.com

SILVER ADDY® AWARD
for Breadcrumbs Webisode
aafroanoke.org

SILVER ADDY® AWARD
for Blend Logo Design
aafroanoke.org

#6 2021 COLLEGE POWER PLAYERS
foodmanagement.com

#8 BEST CAMPUS FOOD
of 384 colleges: 2021 edition
princetonreview.com

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 2021 Best Workplaces for Commuters.

Virginia Tech was awarded a Silver ranking as a Bicycle Friendly University through the League of American Bicyclists for the period of 2019-23. This is an improvement from our previous Bronze rating. Virginia Tech has been recognized as a Bicycle Friendly University since 2013.

2021 TREE CAMPUS HIGHER EDUCATION REACCREDITATION

For the thirteenth 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 for 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.

Other Awards and Recognition

STARS GOLD RATING

72.78 POINTS

vtx.vt.edu/articles/2020/12/sustainability-greencolleges20

TOP 15% OF STARS REGISTERED INSTITUTIONS

GOLD STARS RATING

reports.aashe.org

Virginia Tech has received five Sustainability Tracking, Assessment, and Rating System (STARS) awards through the Association for the Advancement of Sustainability in Higher Education (AASHE). Most recently, in spring 2021 Virginia Tech earned a Gold STARS rating with a score of 72.78 points, our highest yet. With this rating, we continue to hold the highest active STARS rating in both the Atlantic Coast Conference and the Commonwealth of Virginia. As of July 2021, Virginia Tech is positioned in the top 15% of STARS registered institutions.

This is Virginia Tech's fifth STARS submission and third time earning a Gold rating. This submission took about a year and half to complete from start to finish and involved over 60 subject matter experts from across the campus community as well as at the local, state, and national level. At the heart of our submission are all of the efforts by Virginia Tech students. This article, found at **vtx.vt.edu/articles/2021/04/sustainability-stars**, covers some of the ways that students are featured in our report, including the Office of Sustainability student intern program and the Green RFP program. With the implementation of the 2020 Climate Action Commitment, we expect to consistently improve our score with each submission and continue being a leader in sustainability amongst our peers.

AASHE CONFERENCE

Nathan King, Virginia Tech's campus sustainability manager, and Josh Nease, Radford's sustainability manager, gave a presentation at AASHE's Global Conference

for Sustainability in Higher Education titled, “We need the leaders to make it happen” in October. The presentation focused on their continuing partnership through the annual winter SELU Leadership Workshop that brings both sustainability offices together. The workshop is intended to develop their interns’ leadership, communication, collaboration, and project management skills as they prepare to face future global challenges. Their presentation gave other sustainability students and professionals the information and resources necessary to implement a similar program at their universities.

THE PRINCETON REVIEW GUIDE TO GREEN COLLEGES, 2021 EDITION

For the eleventh consecutive year, Virginia Tech ranked among the most environmentally responsible universities in the US, Canada, and Europe, according to the Princeton Review. The Princeton Review Guide to Green Colleges: 2021 Edition, profiles institutions of higher education that demonstrate a commitment to sustainability across campus infrastructure, academics, career preparation, and more.

Virginia Tech earned a green rating of 97 out of 99 (same rating as last year), with the guide highlighting our Climate Action Commitment efforts, LEED certification of buildings, Dining Services efforts at Kentland Farm, and the intentional integration of sustainability concepts into nearly 750 courses and 33 majors. Even better, Virginia Tech was named to the Top 50 Green Colleges List, ranking at number 34.

2021 Princeton Review Guide to Green Colleges Edition:
princetonreview.com/college-rankings/green-guide

97 OUT OF 99 GREEN RATING
Princeton Review Guide to Green Colleges

#34 OF TOP GREEN COLLEGES
Princeton Review Top 50 Green Colleges
bit.ly/VT21GreenCollegeRank

MOST INNOVATIVE SCHOOLS

Virginia Tech rose in its Most Innovative Schools ranking from forty second in 2020 to thirty fifth in 2021. US News & World Report compiles its Most Innovative Schools ranking by asking college presidents, provosts, and admissions deans to nominate up to 15 colleges or universities that are making the most innovative improvements in terms of curriculum, faculty, student, campus life, technology, or facilities.

#35 MOST INNOVATIVE SCHOOLS IN THE U.S.
US News & World Report 2021 Ranking
bit.ly/VT21InnovativeSchool

TIMES HIGHER EDUCATION IMPACT RANKINGS

Virginia Tech was one of more than a thousand universities across the world to be recognized in the annual Times Higher Education (THE) Impact Rankings. The Impact Rankings assess institutions against the 17 goals for sustainable development by the United Nations. Approximately 1,117 universities spanning 94 countries participated in these rankings, comparing institutions across three categories: research, stewardship, and outreach.

In its first year as part of the Impact Rankings, Virginia Tech scored above the median in eight goals. They are: good health and well-being, quality education, gender equity, clean water and sanitation, decent work and economic growth, reduced inequalities, sustainable cities and communities, and responsible consumption and production.

#23 OF 503 INSTITUTIONS
Globally for responsible consumption and production

#56 OF 669 INSTITUTIONS
Globally for reduced inequalities.

Learn more about the Impact Ranking at
vtx.vt.edu/articles/2021/05/unirel-rankings.

AMY PRUDEN NAMED 2020 INTERNATIONAL ENVIRONMENTAL AWARD WINNER

Recipharm, a global contract development and manufacturing organization in the pharmaceutical industry, has named Amy Pruden, the W. Thomas Rice Professor in the Department of Civil and Environmental Engineering, as its 2020 International Environmental Award winner.

The award, which recognizes global innovators of environmental practice in the pharmacy and health care industries as well as academia, supports Recipharm's long-standing commitment to sustainable development. Recipients are identified as individuals who have made highly recognized and important contributions in the environmental field in the pursuit of sustainability.

Read more about Amy Pruden's accomplishments at **vtx.vt.edu/articles/2021/03/ce-Pruden.**

Other News Stories

Doctoral Student Shines a New Light on Materials for Sustainable Energy
bit.ly/VT21MiiNovy

Wave Drinker Team Wins a Spot in Waves to Water Prize
bit.ly/VT20WaveDrinker

Turning Trash into Treasure
bit.ly/VT21RareEarthsWaste

National Science Foundation Awards Grant for Studying Species Movement Due to Climate Change
bit.ly/VT21StudyingSpeciesMovement

Recent Graduates Help Sustainably Restore Olive Orchards in Afghanistan
bit.ly/VT21OliveTrees

Virginia Tech Team Tracks Invasive Weeds, Climate Change Impacts from Space
bit.ly/VT21InvasiveWeedsOutreach

2020-2021 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 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 CO_2 and N_2O, transmission/distribution losses), and
- Some Scope 3 emissions related to campus behavior (commuter driving, transit bus fuel, waste/recycling/compost, water/wastewater, aviation fuel, and commercial business travel).

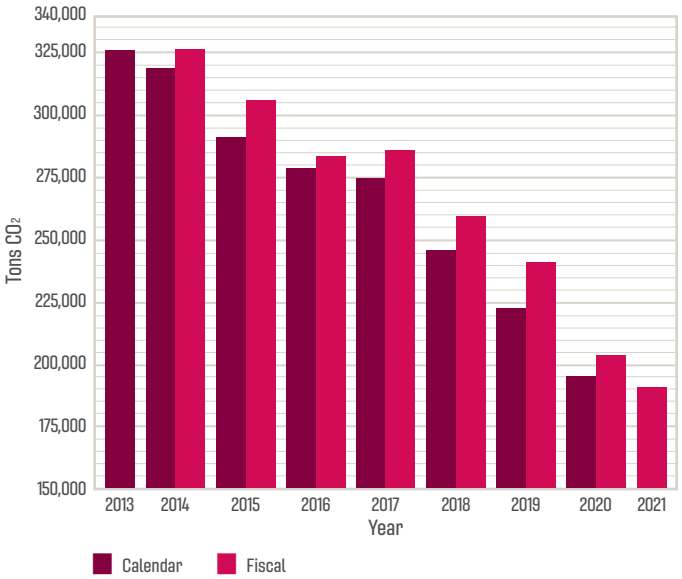
ANNUAL CO_2 EMISSIONS

The following figures show the decline in GHGs both from a calendar year and a fiscal year perspective. FY2021 shows a 6.06 percent decrease in total emissions compared to FY2020.

There were two main reasons for this decrease in total emissions:

1. The COVID-19 pandemic caused an abrupt shift to online learning during spring 2020. Most campus buildings were limited to certain personnel and students stopped coming to campus. This resulted in less electricity use, along with a reduced heating and cooling load during the spring and summer months. In addition to the reduction of other sources of emissions such as commuting and air travel, emissions fell sharply in FY2020 Q4 compared to previous years. For the 2020-21 academic year, many buildings remained closed or under limited operations, continuing this trend of decreased electricity use.

ANNUAL CO_2 EMISSIONS: VIRGINIA TECH



2. For the past two years, the campus steam plant has almost wholly converted to natural gas production. After continuing a pattern of declining coal and oil usage, there was a negligible amount of those commodities used in FY2021. The shift to natural gas provided more GHG savings compared to previous years due to cleaner emissions provided by its usage. The new natural gas-fired boiler installed last year is operational yet still in the commissioning process. The natural gas utility line size was increased to accommodate natural gas for current winter peak loadings. Backup fuel sources to replace coal are being investigated. An overhaul of the steam turbine will extend its life thus providing continuing and reliable co-generation (heat and power). Other projects include a new reverse osmosis (RO) water treatment system that eliminates the disposal of two treatment chemicals; and the installation of new, more efficient compressed air system dryers. To further reduce the plant's electrical energy usage, a lighting efficiency project is planned for FY2022.

The pie chart above shows the distribution of GHG emissions by source for the 2021 fiscal year. The largest sources of GHG emissions are purchased electricity (54.8 percent) followed by natural gas (31.6 percent) used in the co-generation steam plant.

GREENHOUSE GAS INVENTORY AND ASSESSMENT REPORT

Since 2007, Virginia Tech has been monitoring greenhouse gas (GHG) emissions from direct and indirect sources in order 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.

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. 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 in order 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 GHG emissions scope for this assessment includes:

- Scope 1 - Emissions from campus direct fuel use,
- Scope 2 - Emissions related to purchased electricity, and
- Some Scope 3 - Emissions related to campus behavior.

Reported Scope 3 emissions include commuter miles, transit bus fuel, waste/recycling/compost, water/wastewater, aviation fuel, commercial business travel miles, and more.

Solar panel array on top of Perry Street Garage.

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 constantly. 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% 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, which is now at 10 percent and by new state law must be 14 percent by 2025 and 30 percent by 2030.
- Renewable energy credits (RECs) or purchased MWh credits from utility or third parties.

SOLAR PROJECT DEVELOPMENT

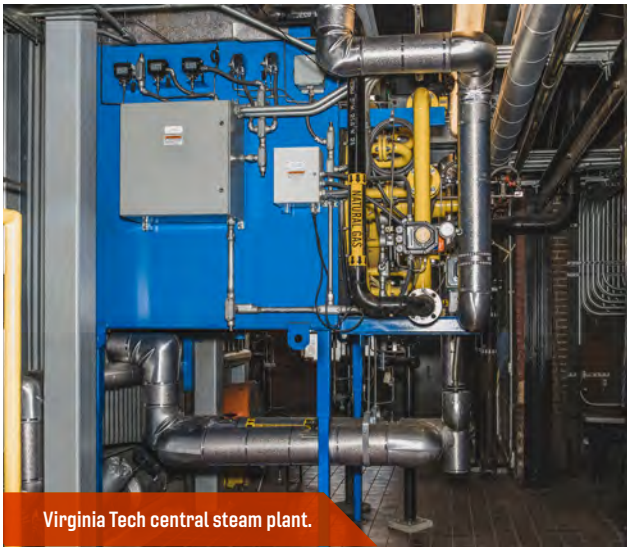
Virginia Tech is actively pursuing solar development agreements on campus. The Sterrett Facilities Complex is preparing an RFP for a 340 kW Virgina Tech owned rooftop system to be completed by 2022. There are also negotiations with prospective third-party solar developers for 2 MW on campus buildings/grounds under a power purchase agreement (PPA) in the near future.

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 full transition to renewable steam plant fuel after 2025, and continue to improve 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. That electricity production offsets the electricity purchased by the university for distribution across campus and within Blacksburg. Co-generation helps to increase thermal efficiency of the Central Steam Plant, reduces greenhouse gases and other harmful emissions, consumes no cooling water in the generation of electricity, and refocuses infrastructure investments on distributed generation and smart energy options. The university recently completed the installation of a nearly $7 million, 100,000 pound-per-hour gas fired boiler in place of the decommissioned coal boiler. This new boiler is in operation. Beyond the long-term financial benefits, the new gas boiler will result in a reduction of carbon dioxide emissions and increase the plant's overall capacity to meet future campus growth.



Virginia Tech central steam plant.

COMPRESSED AIR PLANT

The central campus compressed air plant, located within the central steam plant facility, includes a total of eight air compressors and three desiccant air dryers. It serves processes in the power plant, in addition to labs and shops across campus. Reduced airflow and pressure while delivering the same amount of air enables a more efficient system while meeting end user needs. Recent projects will improve plant efficiency in these ways, including the addition of a new variable speed compressor, compressed air piping improvements, the addition of a pressure flow controller (PFC), and the replacement of existing inefficient air dryers with newer, more efficient technology.

CAMPUS CHILLED WATER INFRASTRUCTURE

Virginia Tech also has two districts served by chilled water plants that leverage a complex system of water cooling that is then pumped to nearby buildings to help reduce room temperatures and cool research equipment. In general, a chilled water plant is 50 percent more efficient than cooling systems in individual buildings. Long-range plans call for building more centralized chilled water plants in various parts of campus. This will improve energy efficiency, reduce costs, and allow for additional growth. A project to upgrade existing chiller plant equipment is currently underway along with a project for a standalone chiller.

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 reduction in energy consumption on campus through the development and implementation of various Demand Side Management (DSM) policies, initiatives, and projects.

DSM promotes energy efficiency by means of 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 towards a net zero energy future.

VIRGINIA TECH GUIDELINES FOR ENERGY EFFICIENT DESIGN

The Division of Campus Planning, Infrastructure, and Facilities updated their Design and Construction Standards Manual (DCSM) in May 2020 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 more about Virginia Tech Guidelines for Energy Efficient Design at **bit.ly/VTEnergyEfficiencyDesignGuidelines.**

OPTIMIZING ENERGY USAGE WITH DATA

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 spreadsheets to monitor energy usage in real-time. New buildings are added to the energy management platform during each project phase and help to visualize real-time parameters of energy use. Building spreadsheets enable detailed analysis in performance of buildings, especially with regard to 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 energy data that can be analyzed. There are plans to upgrade metering, controls, and data management. Operations Data Warehouse software has been acquired.

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.

POWER PLANT FUEL CONSUMPTION

The figures below show power plant fuel consumption, usage, and GHG emissions between FY2014 and FY2021. The main point to note is that power plant fuel consumption has remained relatively steady with a 75 percent decrease in coal use as Virginia Tech has switched to cleaner burning natural gas. Power plant GHG emissions have been reduced over the past 8 years due to this change in fuel source.

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

Goal 4. Existing Building Energy Efficiency

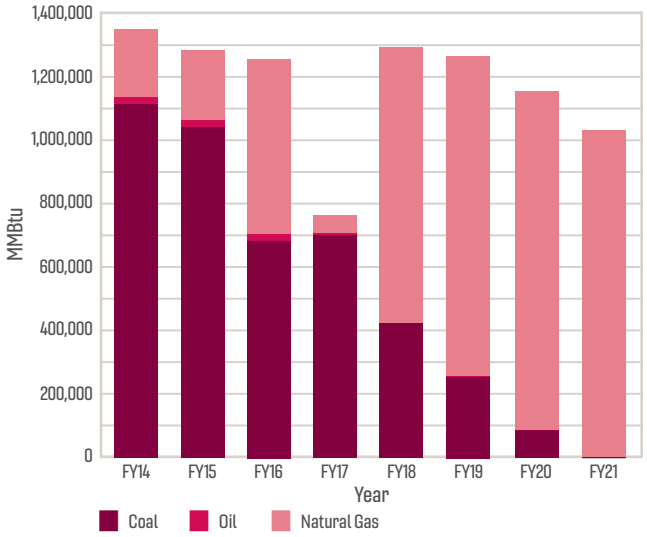
"Reduce existing building energy consumption to enable carbon neutrality by 2030."

TEN-YEAR ENERGY MANAGEMENT PLAN AND BUILDING AUTOMATION

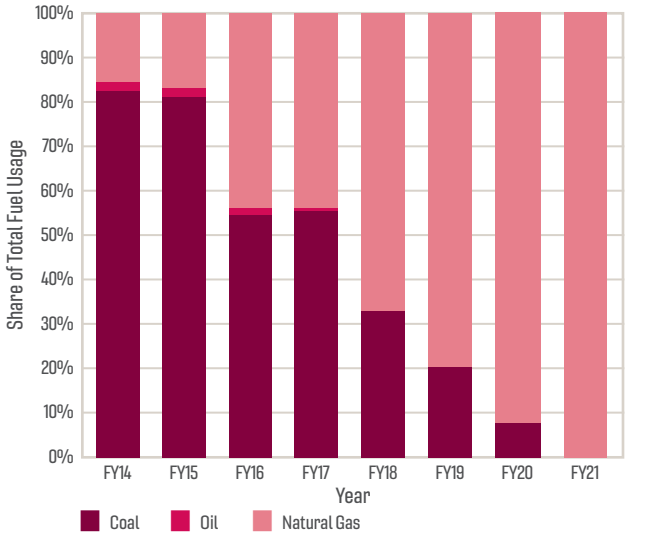
As part of a 10-year Energy Management Plan (EMP), contracting has begun for a campus-wide lighting audit to develop a strategy for LED lamps and controls. Additionally, the EMP has called for a retro-commissioning program for existing buildings. VTES is executing ongoing conversion of aging outdoor lighting systems to LED.

Virginia Tech also contracted CMTA Inc., for a Building Automation Assessment to assess Building Automation Systems (BAS) to enhance building and system operations and energy efficiency.

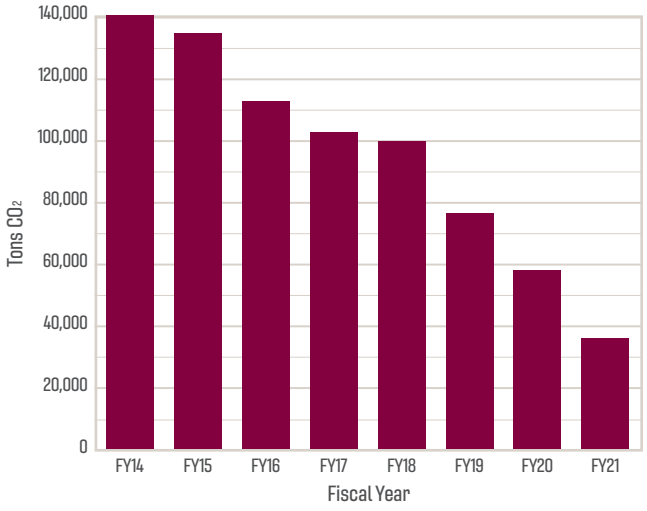
POWER PLANT FUEL CONSUMPTION



POWER PLANT FUEL USAGE BY FUEL TYPE



POWER PLANT GHG EMISSIONS



Virginia Tech is developing a LEED Operations and Maintenance (O&M) Recertification pilot project to inform development of campus-wide LEED O&M recertification for all LEED buildings in 2022.

Additionally, work is being done to develop financing strategies for energy management of auxiliary buildings, including Dining and Resident and Athletics. Meetings and discussion are underway with the Virginia Tech Foundation on revenue-neutral energy efficiency improvements on Virginia Tech Foundation-owned buildings used by the Virginia Tech departments.

RETRO-COMMISSIONING EFFORTS

Retro-commissioning (RCx) is a systematic process applied to existing buildings for identifying and implementing operations and maintenance improvements to ensure their continued performance over time. Beginning in 2018, the Office of Energy Management increased this effort significantly as part of the Five-Year Energy Action Plan (2015-20). Current FY21 RCx efforts have saved an estimated $20,000 per year at essentially zero investment. Internal resources and commitment to RCx were limited in FY2021 resulting in lower than estimated values; yet, those measures addressed were done predominantly with in-house labor resulting in low, simple payback. 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. Over 1000 individual RCx measures have been evaluated or proposed since the program began in 2018. Of those, 500 have been implemented with over 500 still to be addressed. Hundreds of other RCx measures are in study or development; or awaiting approval for implementation. 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.

THREE HISTORIC VIRGINIA TECH BUILDINGS AWARDED LEED CERTIFICATION

This spring, three of Virginia Tech's historic buildings surrounding the Drillfield - Davidson Hall, Sandy Hall, and the College of Liberal Arts and Human Sciences Building - were awarded Leadership in Energy and Environmental Design (LEED) certifications from the US Green Building Council.

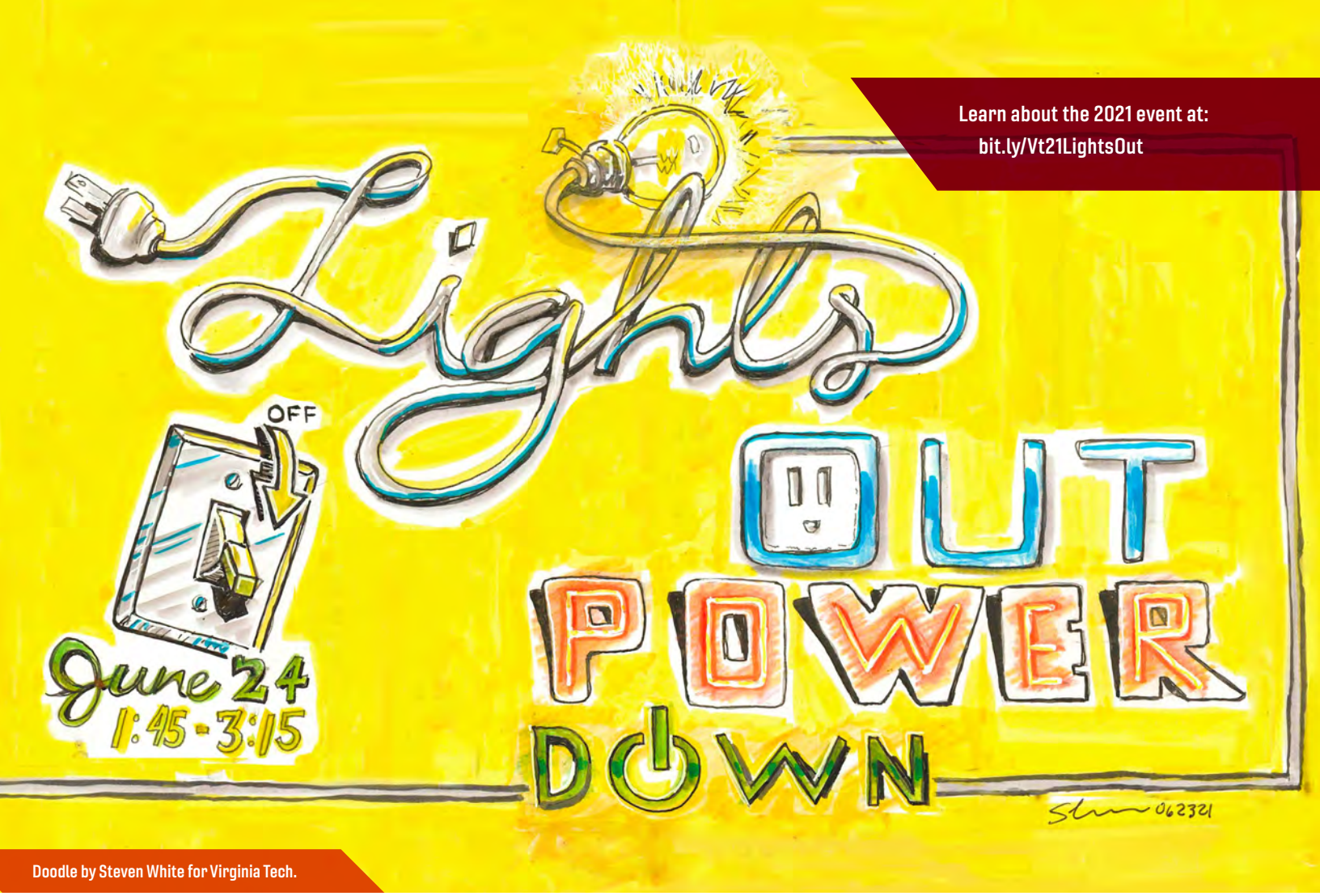
The three historic buildings underwent capital renovations to improve their functionality, address maintenance issues, and reduce space deficiencies. Environmentally friendly upgrades to the buildings included energy-efficient HVAC systems and windows as well as water-efficient plumbing. The building materials were also secured through sustainable procurement practices. Read more about the process at **vtx.vt.edu/articles/2021/05/historic-buildings-leed-certified.**

Davidson Hall earned a Silver certification. Both Sandy Hall and the College of Liberal Arts and Human Sciences Building received a Certified LEED rating. These three buildings join 18 other LEED certified buildings on Virginia Tech's Blacksburg campus. The full list of LEED buildings on campus can be found at **facilities.vt.edu/sustainability/sustainability-programs/leed-certification-and-green-building-initiatives**.


Sandy Hall


Davidson Hall


College of Liberal Arts and Human Sciences Building



Learn about the 2021 event at:
bit.ly/Vt21LightsOut

Doodle by Steven White for Virginia Tech.

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 twelfth year in a row, the Virginia Tech community exceeded its goal during the annual Lights Out/Power Down event held on June 24 on the Blacksburg campus. During the designated 90-minute time period (1:45-3:15 p.m.), the university reduced its campus electrical power demand to an average of 19,300 kilowatts from 22,300 kilowatts peak earlier in the day, a 3,000 kilowatt reduction. The demand goal for the 2021 event was 20,800 kilowatts for the hour.

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

New Construction, Major Renovations, and Existing Buildings

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 34 LEED-Registered buildings totaling over 2.8 million gross square feet (21 certified, five pending certification, five under construction, and three 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.

For a complete list of LEED-certified buildings separated by LEED Gold, Silver, and Certified along with gross square footage and completion status, see the table to the right. Please note that this table was updated June 2021. The full table is available in the Appendix.

BUILDING AUTOMATION SYSTEMS

The Building Automation Systems (BAS) Assessment performed by CMTA, Inc. (mentioned in Goal 4) will not only help improve the energy efficiency of existing buildings, it will also inform decisions surrounding new buildings. Intentionally designing and constructing new buildings with functioning automation systems will ensure energy and operations efficiency.

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.

LEED GOLD PROJECTS	Gross² Ft
▶ Ambler Johnston Hall	269,463
▶ Moss Arts Center	147,382
▶ Goodwin Hall	154,935
▶ Human and Agricultural Biosciences Building I (HABBI)	93,860
▶ O'Shaughnessy Hall Renovations	69,200
▶ Institute for Critical Technology and Applied Science Ph II (ICTAS II)	42,190
▶ Henderson Hall Renovation and Theatre 101 Addition	38,750
	815,780
LEED SILVER PROJECTS	
▶ Virginia Tech Carillon Biomedical Research Expansion	139,586
▶ Pearson Hall East	111,191
▶ Pearson Hall West	108,765
▶ Holden Hall Renovation	101,240
▶ Indoor Athletic Training Facility	91,600
▶ Lavery Hall	77,301
▶ Classroom Building	72,275
▶ Baseball Facilities Improvements	49,872
▶ Rector Field House	43,949
▶ Football Locker Room Addition	42,145
▶ Student Athletic Performance Center	25,800
▶ Davidson Hall (RRAB)	25,151
▶ Vet Med Instructional Addition	24,600
▶ Oak Lane Phase IV	20,508
▶ Chiller Plant Phase I (Southwest Chiller Plant)	16,655
▶ Undergrad Science Labs - Renovation (Derring Hall)*	13,127
✱ Creativity and Innovation District Living Learning Community	224,500
✱ Data and Decision Sciences Building	120,000
✱ Corps Leadership and Military Science Building	60,500
✱ Multi-Modal Transit Facility	13,606
● Hitt Hall and New Dining Facility	112,000
● Innovation Campus Academic Building	300,000
● Undergrad Science Labs - New Construction	102,000
	1,883,610
LEED-CERTIFIED PROJECTS	
▶ Davidson Hall	44,845
▶ Sandy Hall (RRAB)	19,889
▶ Visitors and Undergrad Admissions Center	18,155
▶ Liberal Arts Building (RRAB)	15,394
	98,283

Status: ▶ Complete ✱ Construction ● Design

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.

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

AGRICULTURE

Homefield Farm

Homefield Farm is a combination of 12 acres of land nestled inside Kentland Farm, a high tunnel at the Urban Horticulture Center (UHC), and rented greenhouse space on the Virginia Tech campus. Homefield represents an informal relationship between Dining Services and the College of Agriculture and Life Sciences.

Within the Homefield area at Kentland, we've had success reducing the amount of mowing from four acres to two acres and have a plan to reduce two more acres of mowing. The mowed areas are being converted into cover crops and vegetable production and will increase the total productive land by four acres, resulting in a significant reduction in fossil fuels and time spent maintaining agricultural land. The farm grows vegetables and herbs for Virginia Tech Dining Services and serves as a site of experiential student learning, interdisciplinary research, and community outreach.

In 2021, a class analyzed soil organic matter contents and moisture levels using drone imagery and traditional loss on ignition testing techniques to determine the accuracy of using drones to analyze soil organic matter. Read more at **vtx.vt.edu/articles/2021/07/cals-soil-moisture-project**. Research is also underway analyzing different cover crop mixes between plastic mulch beds for weed and insect suppression. As of June 23, 2021, Homefield has three out of four acres planted with vegetables and herbs used for dining services and a campus farm stand which sells the produce to students. One half acre of one acre total of research crops has been planted. Harvest totals as of June 23 for the 2021 season includes 1,617 pounds of collards, 142 pounds of lettuce mix, 346 pounds of cilantro, and 209 pounds of parsley with a total projected harvest of 50,000 pounds for the year.

Virginia Tech Dining Services and the College of Agriculture and Life Sciences welcomed Shawn Jadrnicek as the new manager for Homefield Farm in spring 2021. The position oversees the student-run, six-acre organic operation eight miles west of the Blacksburg campus.

Learn more about Shawn Jadrnicek and Homefield Farm at **bit.ly/VTShawnJadenicek**.

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:

1. **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.
2. **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.
3. **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.

Virginia Gov. Ralph Northam visits Catawba Sustianability Center on Dec. 10, 2020.

More information:

vtnews.vt.edu/articles/2020/12/outreach-catawba-medicinal-herbs
vtx.vt.edu/articles/2021/06/cals-ramps

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.

In December 2020, Governor Ralph Northam announced $40,000 in funding for a program at Virginia Tech's Catawba Sustainability Center to help forest farmers produce and market medicinal herbs. The money will be used to establish and maintain a propagation center for goldenseal, ramps, and black cohosh at the 377-acre farm property 20 miles east of Blacksburg. The Catawba Sustainability Center will provide technical support, training for growers, plant stock, workshops and demonstrations, processing facilities, and help with the marketing of forest-grown botanicals.

"This partnership provides an environment for learning and developing sustainability practices," said Roanoke County Director of Economic Development Jill Loope. The sustainable production of medicinal herbs can provide additional or supplemental income for many farmers and is an efficient way to use steep or marginal agricultural land and maturing woodlots.

Partnership with Hardywood Park Craft Brewery

Virginia Tech's roots in agricultural research have sparked a new partnership with Hardywood Park Craft Brewery in Richmond, Va. This partnership has resulted in a licensed Virginia Tech beer - Fightin' Hokies Lager. The research was developed on Virginia Tech soil and sales will be fueling Virginia's local economy.

Not only are there economic benefits provided to the Commonwealth due to this partnership, but there are environmental benefits as well. Virginia Tech received interest from several top brewing firms in the country while looking for a partner to bring the product to the market. Hardywood's commitment to serving the commonwealth through implementing sustainable practices and sourcing ingredients locally made them an ideal partner for Virginia Tech. Hardywood's credo "Brew with Purpose" encompasses core values that include technical quality, environmental stewardship, sourcing local, and giving back to the community.

Hardywood was named Virginia Green Brewery of the Year in 2015 and was the first brewery in Virginia powered entirely by renewable energy, including solar, biomass, and wind through the Dominion Virginia Green Power Program. The Hardywood team works with local farms to reuse spent grain as compost and feed. Several of their beers are brewed in support of organizations dedicated to environmental awareness and protection.

Read more about this partnership at

vtx.vt.edu/articles/2020/12/research-virginia-tech-hardwood-partnership.

Arbor Day 2021 planting event at Virginia Tech.

TREE CAMPUS HIGHER EDUCATION
An Arbor Day Foundation Program

FORESTRY

Virginia Tech takes a holistic approach to campus urban forestry and 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 13th consecutive year in 2021.

Leading Virginia Tech's urban forestry efforts is Urban Forest Manager and University Arborist Jamie King, 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 purification, erosion control, and stormwater management, all while creating spaces on campus that improve human health and productivity" said King. Trees are among the most visible representations of Virginia Tech's commitment to environmental stewardship and tree preservation, reforestation, and education are prescribed throughout a number of 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. 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, tree planting events throughout the year, and urban forestry student internships.

A complete field inventory of trees on the 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 location, species, measurements,

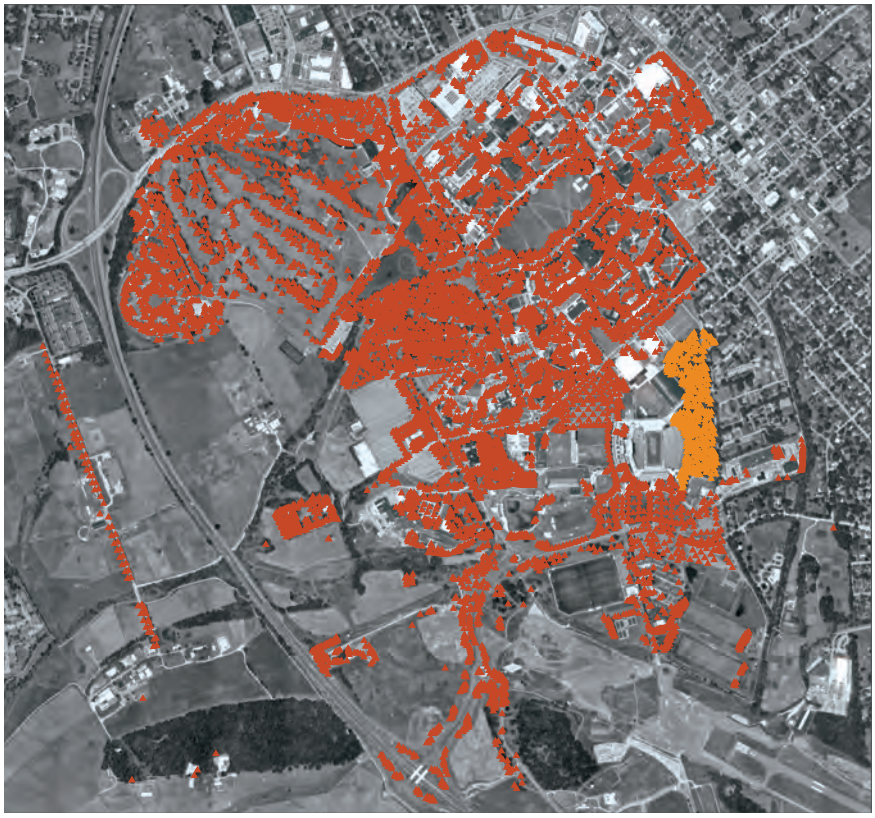
health, and condition details for trees all over campus. As of May 4, 2021, the Blacksburg Core Campus is home to approximately 9,849 living trees and a total of 11,931 records are logged in the Core Campus Tree Inventory.

The graphical representation on the Campus Tree Inventory is seen in the following figure. Dark orange dots indicate general campus trees and light orange dots indicate trees in the Old Growth Forest near Lane Stadium. Some urban trees and various larger forests are not included and will require inventory and assessment in the future. This resource helps guide tree preservation and maintenance as well as promoting education and awareness as the Campus Tree Inventory and Interactive Tree Map is available for public access at **facilities.vt.edu/buildings-space/facilities-treeinventory**.

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. This tool 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.

Virginia Tech's trees sequester and store enough carbon every year to offset approximately 3 percent of the carbon produced through total university operations (see Ecosystem Services graphic). As trees are removed through management operations, the wood may be utilized in construction and woodcraft, continuing the storage of carbon, sometimes for many generations. These trees also slow the runoff of stormwater on campus, resulting in less severe flooding events and cleaner streams. The leaves on campus trees filter particulates and pollution from the air; this cleaner air allows the community to experience fewer respiratory health problems.

CAMPUS TREE INVENTORY



ECOSYSTEM SERVICES

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 FT^3 = $17,184

Slower runoff = Healthier VT Streams

Air pollution removed every year:

2.7 TONS = $6,459

Cleaner air = Healthier VT community

URBAN FOREST STRUCTURAL REPLACEMENT VALUE

THE EXPENSE TO REPLACE VIRGINIA TECH'S TREES

$30,622,817

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 (see Replacement Value graphic). 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 percent. This means that nearly 15 percent of campus is under the shade of the tree canopy during the spring and summer months. In 2019, 20.9 percent of colleges and universities in the US reported having a campus tree cover goal (8.7 percent) or were currently developing one (12.2 percent). The UFMP proposes a Virginia Tech Tree Policy that establishes an UTC goal of 25 percent, 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.

Another assessment, conducted in 2019-20 by students in the Urban and Community Forestry course at CNRE, focused a sample-based photo interpretation method to determine UTC of specific campus districts. The students utilized i-Tree Canopy, a software developed by the United States Forest Service, that combines aerial photographs with ecosystem models to estimate 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 percent UTC campus wide, allowing comparison of UTC and ground cover data between districts across the campus. The results only differ slightly from the earlier study (14.7 percent 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 below.

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**

Districts with high UTC include Oak Lane (28.4 percent or 10.9 acres), Meadow (27.8 percent or 18.9 acres), and Drillfield (23.4 precent 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 percent or 8.3 acres), North Academic (10.1 percent or 7 acres), and Northeast and Upper Quad (8.2 percent 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.

Recently, University Arborist Jamie King conducted an assessment of the safety and health of the Old Growth Forest by Lane Stadium (**bit.ly/VTTreeInventoryGrowth**), commonly called Stadium Woods. The risk assessment was conducted as a means to continue the preservation of campus trees and help ensure the safety of the campus community. The proactive assessment focused 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 and natural resource management. The assessment was conducted in close alignment with the University Arboretum Committee.

Read more about the 2021 Arbor Day tree planting event and Virginia Tech's environmental preservation efforts at **vtx.vt.edu/articles/2021/06/campusplanning-treecampus21**

Branching Out, a new university arborist engagement video series, provides viewers with an inside look into urban forestry on campus, informative hands-on demonstrations, and other original content. In the spring 2021 Branching Out feature, King explores campus trees, discusses the Urban Forestry Program, demonstrates the do's and don'ts of urban tree mulching, and shows off one of the secret trees of Virginia Tech. King also spoke at a College of Natural Resources Lunch and Learn in May 2021 titled "This is Home: Exploring the Trees of Virginia Tech" to educate members of the community on the history of many of the famous trees of Virginia Tech while also answering questions about the future of these trees and many others on campus.

For Arbor Day 2021, Jamie King partnered with Students for Sustainable Practice to hold a tree planting at the Old Growth Forest. The group planted 15 white oak trees grown from old growth white oak acorns by Professor John Seiler in the College of Natural Resources and Environment. A video from the tree planting is available at **bit.ly/VTStadiumTreePlanting**.

LAND USE

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 IPM 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 clippings to be used as mulch for the lawns. Virginia Tech no longer vacuums areas of lawn that have clippings built up but rather use 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.)." More details can be found at **bit.ly/VTFacilitiesDCSM20**.

Goal 7. Zero-Waste Campus

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

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).

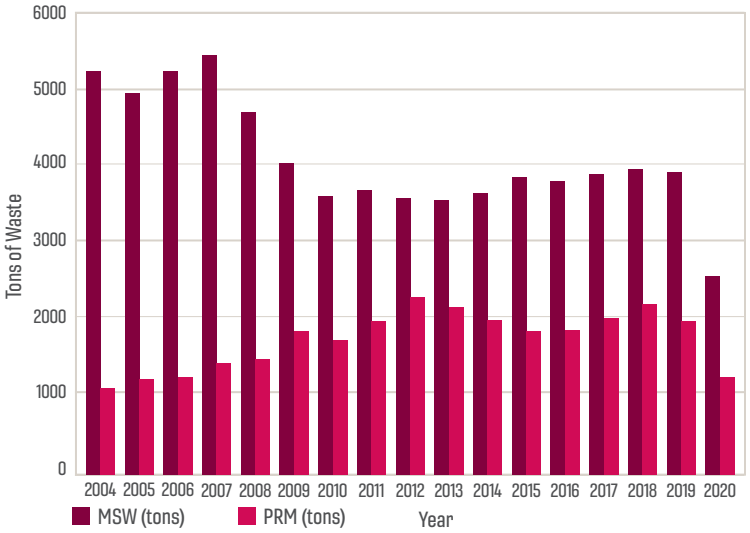
Virginia Tech transitioned to a single stream recycling system on July 1, 2015. Recyclable materials are transported from the university to MRSWA, weighed, and further transported to Recycling and Disposal Solutions (RDS) in Roanoke. RDS serves as the recycling hub for the region, receiving materials 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.

2020 RECYCLE RATE REPORT

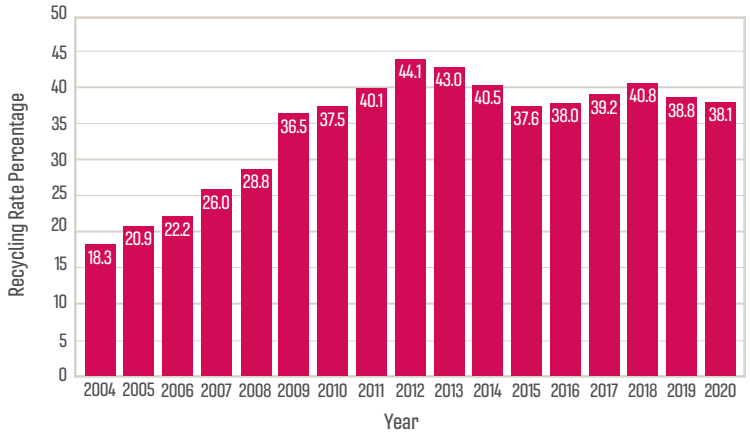
MRSWA prepares a consolidated recycling rate report for the region to include the four jurisdictional members and submits it to the Department of Environmental Quality (DEQ). Virginia Tech uses the DEQ format and formula to calculate its recycling rate and waste diversion rate. The waste diversion rate 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 2020 Recycle Rate Report can be found at **facilities.vt.edu/sustainability/recycling/recycling-totals**.

MUNICIPAL SOLID WASTE (MSW) VS. PRINCIPAL RECYCLED MATERIALS (PRM)



RECYCLING RATES



For calendar year 2020, Virginia Tech reported 1,291 tons of principal recyclable materials which included 138 tons of food waste, 141 tons fiber (paper and cardboard), and 365 tons of commingled material (single-stream recycling). Virginia Tech reported 2,604 tons of municipal solid waste (trash). The university's recycling rate was 38.1 percent and the waste diversion rate (waste kept out of the local landfill) was 85.2 percent.

EXECUTIVE ORDER 77

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:

1. 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
2. develop a long-term Plastic Pollution Reduction and Waste Diversion Plan.

Virginia Tech has established a cross-functional university working group to develop a coordinated response to Executive Order 77. The goal of the working group is to gather more details and guidance on the order, assess and consider the potential impacts to university operations, and develop an implementation plan. The group is collaborating closely with the Virginia Department of Environmental Quality, which is overseeing the order's statewide implementation, and with other Virginia colleges and universities impacted by the order.

While Virginia Tech's self-operating dining services ceased the purchase and use of polystyrene food service containers in 2014/2015, a few areas of the university still use polystyrene food service containers. The working group has made the decision to immediately cease the purchase and distribution of polystyrene food service containers. Extensions have been requested on the cessation for plastic cutlery and plastic straws/stirrers until Dec. 31, 2022 to allow completion of pilot programs testing new alternatives. The working group will also be implementing an overall 25 percent reduction program annually for paper bags, plastic food containers, and single use plastic water bottles as part of the university's overall implementation plan for EO 77. More information is available at **vtx.vt.edu/notices/svpcbo-eo77-update**.

Enacting sustainable procurement policies and procedures is a key tenet in the 2020 Virginia Tech Climate Action Commitment. See Goal 8 for more information on Sustainable Procurement.

COMPREHENSIVE WASTE MANAGEMENT PLAN

In commitment to implementing the most stringent recycling and waste management standards, the Division of Campus Planning, Infrastructure, and Facilities published a new Comprehensive Waste Management Plan that chronicles how Virginia Tech will manage its waste streams most efficiently, safely, and sustainably.

Virginia Tech handles roughly 6,000 tons of materials from various waste streams each year. Waste streams include municipal solid waste, construction and demolition waste, recyclable materials, compostable materials, reusable materials, electronic waste, universal waste, hazardous waste, and more.

The newest waste management plan highlights the current state of university waste management, goals of the waste management program, documented waste handling policies and procedures, and campus waste management contacts. The Comprehensive Waste Management Plan is available at **bit.ly/VT20CWMP**.

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, Y-Toss collection was held from May 7-12 during move out. Eight pods were set up across the residential side of campus, manned by volunteers, to collect donated goods. Around 7 tons of items were donated this year, consistent with pre-COVID donation numbers.

Since the first collection, 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 AND FOOD WASTE

During the 2020-21 academic year, Dining Services composted 118 tons of compostable material. Nearly 5,000 tons of organic waste have been sent from Virginia Tech dining facilities for composting since 2009. Virginia Tech is increasingly using products that promote a sustainable dining program and food systems.

Dining Services has begun to pilot dining unit waste audits to better understand pre-consumer food waste totals. The goal is to use the data to help chefs and their teams make informed decisions when preparing food and discarding food waste. Food waste audits will continue during the fall semester and methods will be explored on how our composting operations play a role in this operation as well.

One audit was conducted randomly during each month of the semester at Owens Hall. Dining Services worked with the Office of Sustainability Student Interns to benchmark food waste data from the FoodPro data system against the on-site food waste audit. This helped to measure and analyze cost per capita on a per month basis.

Green To-Go Containers

Dining Services offers a free reusable to go program which reduces waste to landfill and allows for a sustainable way to eat on the go. The program follows three simple steps of eat, return, repeat! Over 355,000 meals have been served in reusable to-go containers since 2014. This program has also kept 5,000 pounds of packaging out of the landfill since its inception.

Dining Services was committed to providing additional reusable to-go containers collection points to students during move-out. Y-Toss PODS also served as an additional return station for reusable to go containers. Six return locations were added and over 200 reusable containers were collected at the PODS.

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 to 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 239,000 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 during COVID. Since March 2020, 59,720 pounds of food have been donated with 34,041 pounds of that being donated during the 2020-21 academic year.

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

SUSTAINABLE PROCUREMENT POLICY

In accordance with the Virginia Tech Climate Action Commitment and Sustainability Plan, 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 full Virginia Tech Sustainable Procurement Policy is available at **bit.ly/VTSustainableProcurementPolicy**.

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 ensures that the university 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.

Policy 5505 states in Section 3.3 Operations and Maintenance, "The university shall purchase or lease Energy Star-rated appliances and equipment for all classification when designation is available, provided performance criteria are met." Section 3.5 Waste Reduction states, "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, "A new building entering the design phase of construction that is greater than 5,000 gross square feet in size, 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.

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 **facilities.vt.edu/planning-construction/design-and-construction-standards**.

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."

THE 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 Transit Facility project will deliver a central transportation hub and alternative transportation facilities in the vicinity of Perry Street, embedded within the North Academic District.

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 efficiency of the Blacksburg Transit (BT) system.

Proposed Multi-Modal Transit Facility.

Construction of the Multi-Modal Transit Facility began during this past academic year and will continue to progress over the next two years. The latest updates on the project will be available at **bit.ly/BTMultiModalTransitFacility**.

ELECTRIC BUSES JOIN BLACKSBURG TRANSIT FLEET

Blacksburg Transit launched its first ever group of electric buses on Earth Day (April 22, 2021), marking the first step in the town's long-term plans to convert to an all-electric fleet. The five electric buses replaced five conventional diesel-powered buses. BT Director Tom Fox states, "Our goal is that in three to four years, half of the entire fleet will be electric, and we will be 100 percent electric in about 10 years depending on funding. This is a large step towards reducing our carbon footprint while also reducing our dependence on fossil fuels." Read the full Roanoke Times article at **bit.ly/RoanokeTimesElectricBusTransit**.

During Summer 2021, Blacksburg Transit was awarded additional funding for 17 more electric buses. These buses will be manufactured and introduced to the fleet over the next year and a half.

BIKE SHARE

In June 2021, a new fleet of pedal-assist e-bikes replaced the orange Roam NRV bicycles previously found across the region. 75 teal e-bikes are now available through a partnership with Bolt Mobility, a micromobility company offering Hokies an environmentally friendly way to travel across the region, improve their health and wellness, and enjoy outdoor recreation. After pedaling for just a couple of rotations, a little motor kicks in and helps you get up to 20 miles per hour. Prior to the start of the fall 2021 semester, the size of the fleet will double to 150 e-bikes which will include seven new hubs on campus and some additional hubs in Blacksburg, Christiansburg, and in Montgomery County.

How it works

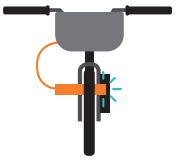
01

Create an account with your email and phone number

02

Use the app to scan the QR code on the e-bike to unlock

03



When lock pops, pull cable out and push it into the basket

04

Start peddling to engage electrical assist

05

Park at designated hubs and manually lock bike to rack using cable located in basket

06

End your ride in the app

Note: It can take a couple pedal rotations for the motor to kick in, giving you that extra boost of speed. That motor will assist you up to 20 miles per hour when travelling on roads and up to 15 miles per hour when travelling on the Huckleberry Trail.

More information about this transition can be found at **vtx.vt.edu/videos/k/2021/06/1_ax3leao7** and **bit.ly/VTE-Bikes**.

COMMUTE CHALLENGE

For the month of October, the Alternative Transportation Department launched the Virginia Tech Commute Challenge, a new initiative to get more of the campus community engaged in alternative transportation. The month-long event encouraged people to bike, walk, carpool, take transit, or telework instead of driving alone for trips and commutes. Every trip or telework day recorded in the RIDE Solutions platform earned participants points they could use to redeem rewards in the app. Nearly 50 people participated in the event. Cumulatively, they prevented 5.53 tons of greenhouse gas emissions!

Here are some other statistics from the challenge:

- Reduced trips: 763
- Reduced miles driven: 11,969
- Money saved: $6,885
- Gas saved: 559 gallons
- Calories burned: 21,680

Quick Stats	ROAM NRV July 2018 - May 2021	E-Bikes June 2021
Members	6,175	608
Number of trips taken	16,305	590
Distance travelled (miles)	46,820.9	2,483
Hours spent on bikes	10,820	418.2
Pounds of carbon reduced	41,287.52	2,190
Calories burned	1,872,836	N/A
Money saved vs. driving	$27,156	N/A

E-bikes on the Blacksburg campus.

BEST WORKPLACES FOR COMMUTERS FOR 2021

Virginia Tech was recognized as one of the Best Workplaces for Commuters for 2021 (**vtx.vt.edu/articles/2021/02/transpo-commuterworkplace**) for providing exceptional commuter benefits and progressive programs. Best Workplaces for Commuters (**bit.ly/VT21BestCommuter**) is an innovative membership program that provides qualified workplaces, universities, and sites with national recognition for their alternative commuting programs. Virginia Tech is one of the 41 universities to receive the honor in 2021. The full list can be viewed at **bestworkplaces.org/list/members-2021**.

The Virginia Tech Alternative Transportation Department proudly offers the campus community a range of commuter benefit options and programs:

- Free Access to the award-winning Blacksburg Transit bus system with a Virginia Tech ID.
- The Hokie Bike Hub - a free, self-service bike repair and maintenance facility for students, faculty, and staff.
- Ride matching and a Guaranteed Ride Home program through RIDE Solutions.
- Free bus service between the Blacksburg campus and the Virginia Tech Carilion School of Medicine and Research Institute on the Roanoke campus.
- Opportunities to log alternative transportation and telework to earn rewards and prizes in the Commute Challenge in October.

Additionally, during FY 2021, the Alternative Transportation department installed 30 new bicycle racks with a net capacity increase of 123 bicycles.

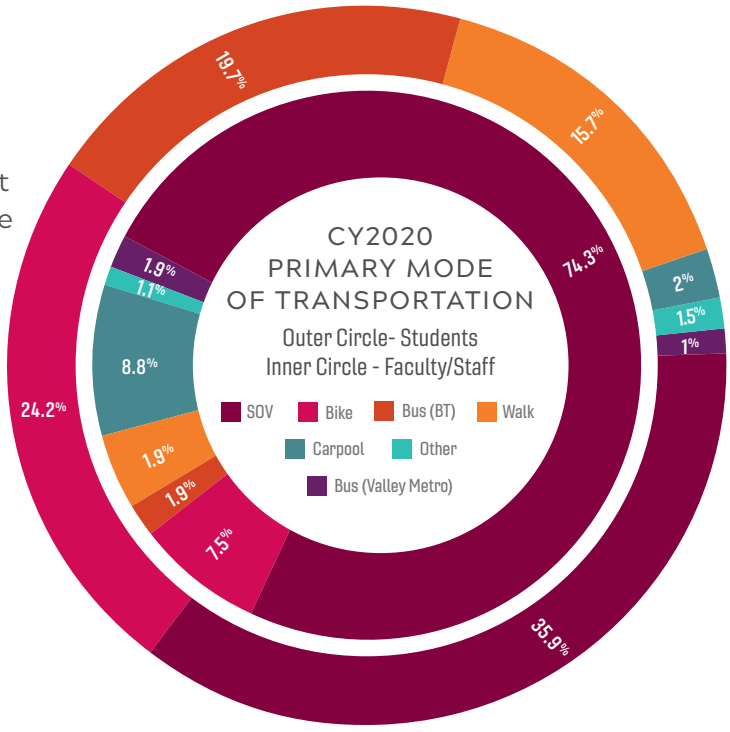
Thanks to these efforts and many others by the Alternative Transportation Department, Virginia Tech is also recognized by the League of American Bicyclists as a silver level Bicycle Friendly University.

2020 COMMUTER SURVEY

Virginia Tech's biennial Commuter Survey provides insights into Blacksburg campus affiliates' travel behaviors. The fourth version of this survey, administered by the Alternative Transportation Department, launched on January 2, 2020 and remained open until Dec. 18, 2020.

On March 13, 2020, shortly after the survey was launched, nearly all of campus closed down and transitioned to virtual instruction and remote working in response to COVID-19. The university remained in this state until early August 2020, just before the start of the fall semester. While the survey was still available for responses during this time, very few responses were collected. Transportation modes of all affiliates drastically changed or were eliminated altogether. Students were sent home, most faculty and staff began teleworking, and all affiliates stopped commuting as they normally would. Since the survey asked questions in present tense, responses received after March 13 were vastly different than they likely otherwise would have been. This altered both the survey response rate and data collected.

As a result, data from this survey show a different trend from previous surveys. There was a dramatic decrease in the number of responses when compared to previous



versions. The 2018 Commuter Survey had 1,452 participants, while the 2020 version only garnered 629 participants who provided valid responses.

At least 3,100 faculty and staff had a telework agreement in place for the 2020 fall semester. This compares to just 113 telework agreements in early 2020. Furthermore, data from Blacksburg Transit shows that their ridership is down roughly 83 percent when compared to the previous year.

Both on and off campus students showed similar tendencies with their chosen primary mode of transportation by relying on single-occupancy vehicles (SOVs) over all other modes of transportation (35.9 percent). Bicycling, riding BT, and walking round out the top four. Faculty and staff overwhelmingly chose SOVs as their primary mode of transportation (74.3 percent). They are nearly twice as likely to use an SOV as students.

2019 GREENHOUSE GAS INVENTORY AND ASSESSMENT REPORT

Director of the Virginia Tech Green Engineering program, Professor Sean McGinnis, prepared a Greenhouse Gas Inventory and Assessment Report to provide a quantitative analysis of campus emissions. Within this report, Scope 3 emissions from transportation were examined. Full information is available in the report, but the estimated miles travelled by commuters to campus are available below.

VIRGINIA TECH COMMUTER SURVEY ANALYSIS

Commuting Category	Number of Permits	Average Commuter Weeks/Year	One Way Trips per Week	Vehicle Miles per Trip	Survey Responses Used	Estimated Miles
Faculty/Staff/Wage Workers	6,897	39.5	12.0	11.9	481	38,903,218
Graduate Students	1,835	31.8	9.9	4.5	40	2,575,101
Undergraduate Commuters	5,072	23.1	17.0	2.1	374	
Undergraduate Residents	3,219	22.4	9.0	1.5	73	7,938,145
No Permit Undergraduate Commuters	6,378	32	8.5	1.6	486	
Weighted Undergraduates (for SIMAP)	14,669	26.8	11.6	1.74	933	7,921,613

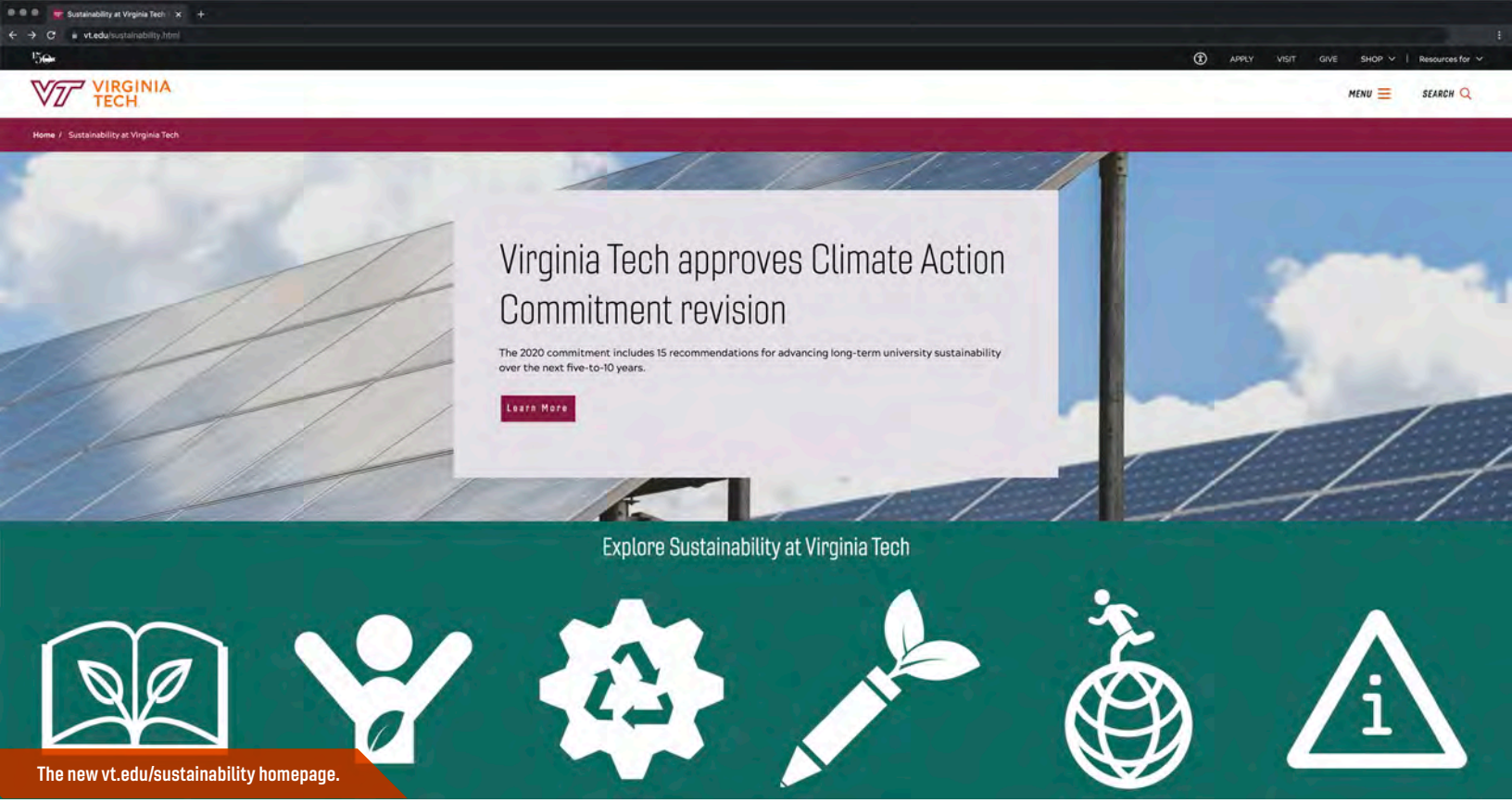
Goal 10. Climate Action Living Laboratory (CALL)

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

FACULTY SURVEY

A survey was distributed to determine faculty interest in participating and collaborating in the development of the Climate Action Living Laboratory (CALL). As a result of this survey, the Climate Action Commitment Implementation Team now has a working list of about 50 faculty members from eight colleges as potential collaborators. This is one of the first steps in making progress towards achieving the three objectives of the CALL, laid out in the Climate Action Commitment:

1. Alter norms and incentives to overcome traditional barriers and nurture cooperation between academic units (research and teaching) and operations units.
2. Engage the university's land grant extension and outreach programs to reflect the principles of the Climate Action Commitment and help implement them throughout the Commonwealth.
3. Integrate the physical infrastructure elements of the Climate Action Commitment into the fabric of the university's educational and research programs to expand funding opportunities for campus innovation from state and federal sources as well as foundations.



The new vt.edu/sustainability homepage.

SUSTAINABILITY WEBSITE

A new, updated Sustainability at Virginia Tech website, **vt.edu/sustainability**, is being developed to serve as the portal to all things Climate Action, Sustainability, and Energy. The new website is organized by STARS categories (Academics, Engagement, Operations, and Planning and Administration). The Academics category will present all sustainability and climate action-relevant majors, minors, courses, as well as relevant research and outreach/extension programs. The Engagement category will list all programs that students, employees, and community members can get involved in with relevant links for people to learn more about each option. The Operations category will link to data dashboard sites as they become available so the public can view progress being made towards Climate Action Commitment goals. The Administration category will be home to all sustainability reports, plans, and policies.

Other features of the website include an Events page, an About category where people can learn about the history of sustainability at Virgina Tech as well as the current Climate Action Commitment, and there will be resources for people to view such as recently released sustainability videos and news articles.

BUILDING ON EXISTING PROGRAMS

There are many existing programs that already support climate action and sustainability at Virginia Tech. Planning is underway to build upon these existing programs and expand these initiatives to not only better serve our Climate Action Commitment but also our students. Meetings, discussions, and follow-ups have occurred during the spring 2021 semester with Provost and Associate Provosts about the development of the Climate Action Living Lab and its potential to be incorporated into existing programs. There are also conversations underway about using the existing Pathways Minors, other minors, or a new minor to enhance and promote climate change and climate action related instruction. Additionally, the Climate Action Commitment supports research proposals in the Power and Energy Center and the Center for Energy and the Global Environment.

MGT 2354: LEADERSHIP FOR MANAGERS AND ENTREPRENEURS

One pre-existing example of using campus as a Climate Action Living Lab is the Virginia Tech Office of Sustainability's partnership with Dr. Kimberly Carlson, Associate Professor and Director of the Business Leadership Center in the Pamplin College of Business. The two groups have been working collaboratively throughout the 2020-21 academic year to provide meaningful, semester-long projects with a sustainability focus to students enrolled in MGT 2354: Leadership for Managers and Entrepreneurs.

This partnership serves as an example of how the Virginia Tech 2020 Climate Action Commitment can be implemented by integrating climate action projects into the curriculum.

The official course description for MGT 2354 is as follows: "Explore a broad range of concepts and theories important for a basic understanding of leadership skills for managers and entrepreneurs, including team leadership, motivation, conflict management, and community leadership. Practical assignments and case analyses are used to examine the ethical challenges leaders face in a global context."

Traditionally, this course would entail a semester-long collaboration with a local nonprofit in order to teach students teamwork and leadership skills while also allowing them to gain real world experience by working directly with clients to create a final product that meets the needs of all involved stakeholders. This course also has a designated service-learning component to it that commits all students to 15 hours of community service aligned with the course's learning objectives. Given the transition to a virtual format due to COVID-19, Dr. Carlson began thinking of ways to adapt the course to form a partnership internally within the university and reached out to the Office of Sustainability in August 2020. She worked with Campus Sustainability Manager, Nathan King, and Sustainability Coordinator, Emily Vollmer, to design a project that allowed students to develop their professional skills while promoting sustainability on campus.

During the fall 2020 semester, the course was focused on the promotion of the recently relaunched Green Office Certification (GOC) program. Groups of students were assigned to different departments on campus and were tasked with developing an enticing marketing pitch, delivering that pitch to their assigned department, and getting three offices from within that department to commit to participating in the Green Office Certification program. This assignment required students to gain a deep understanding of the Green Office Certification program in order to accurately advertise it and answer any questions that employees had about their potential participation. From this course and the hard work of Dr. Carlson's students, 12 different office units signed up to receive more information and updates on the GOC program with the intent of earning certification in the near future.

Due to the success of this partnership, the Office of Sustainability and Dr. Carlson continued working together. During the spring 2021 semester, the partnership focused on the creation of training materials for use in a digital badge program designed to educate faculty and staff on four major themes within sustainability: transportation, energy, waste management, and water. The students had to create a written training module on their assigned topic, either focusing on general education of why the topic is important and the impact it has on the environment, economy, and society; or focusing on the behavioral aspects of the topic, going into further details on actions that individuals can take to live more sustainability within each topic area. Throughout the semester, students worked with assigned subject matter experts to help develop accurate and thoughtful training materials that reflect the policies and programs of the university. The students' final products will be used as the basis of a Canvas course that will be developed over summer 2021 and launched the following fall.

THE LEARNING FACTORY

The Learning Factory, located in Durham Hall (rooms 197 and 297), serves as a hands-on engineering laboratory available to undergraduates, graduates, senior design teams, and various other research students. Looking ahead, the Learning Factory is being built around the ideology of serving as a testbed for Industry 4.0 in the ISE department.

Learning Factory solar array on the roof of Durham Hall.

Students in ISE Sr Design Team 46 developed and executed a project during the 2020-21 academic year to make the Learning Factory 100 percent renewable. The goal of their project was to implement a renewable energy generation system that will offset the power demands of the Learning Factory in its current state, as well as its future state once new equipment is added to the space. Achieving a net zero-electricity space is also a project goal in the hopes of being able to produce an equivalent, or higher, amount of electricity for use in the Learning Factory that would offset, and eventually replace, its reliance on fossil fuel electricity.

A solar array on the roof of Durham Hall was determined to be the most economic and efficient solution for powering the Learning Factory. The solar array system consists of 9 solar panels that are fixed to a south-facing rack on the roof of Durham Hall, directly above the Learning Factory. Because of the work by the student design team to fund these panels and move this project forward, the Learning Factory has a net-zero carbon footprint.

Goal 11. Climate Justice

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

The Virginia Tech Climate Action Commitment uses the following definition of climate justice from Harlan, et al. (2015) (**researchgate.net/publication/299916194_Climate_Justice_and_Inequality**) which contains four parts:

1. Sharing benefits and burdens of climate action equitably
2. Engaging marginalized groups as participants in the climate action process
3. Maximizing opportunities in climate action for marginalized groups to survive and thrive
4. Repairing historic harms against marginalized groups in developing climate action

As the commitment is implemented, Virginia Tech plans on continuing to bring in different stakeholders to shape the infrastructural changes necessary for implementation. Climate justice, when implemented well, is both the first and last considerations of any project. As the Energy and Sustainability Committee expands in the coming year, it will include a subcommittee specifically dedicated to forwarding climate justice. We want to pay special attention to those community members most affected by climate change and ensure their ability to shape our sustainability policies and have the material resources they need through cooperative extension programs. Moving forward, it is crucial to support our community and value their participation in shaping policy so that we can reach our goal of carbon neutrality by 2030 in an equitable and just manner.

The Virginia Governor's Executive Order 43 (**bit.ly/VAAccessibleEnergy**) and the 2020 Clean Economy Act (**bit.ly/CleanEconomyAct**) require clean energy and climate goals be achieved in a just manner that advances energy, social-equity, and environmental justice.

CENTER FOR FOOD SYSTEMS AND COMMUNITY TRANSFORMATION

In late 2019, the Center for Food Systems and Community Transformation at Virginia Tech (**foodsystems.centers.vt.edu**) was created. The Center aims to build capacity to address food system issues across the rural-urban community divide and to cultivate more resilient, socially just, and economically viable food and farming systems in Virginia and beyond. Kim Niewolny, associate professor in the Department Agricultural, Leadership, and Community Education and director of the center, which is in the College of Agriculture and Life Sciences, stated in a May 2021 article, found at **vtx.vt.edu/articles/2021/04/cals-food-systems**, that, "As a land-grant institution, we have a responsibility to dig deep to better understand how and why racial disparities occur so that we may be part of the solution to dismantle the attitudes, practices, and structures that hold racism in place as a step toward creating a more just and sustainable food system that works for everyone." The center is working hard to improve collaboration among a diverse group of stakeholders to address the complexity of food system issues with an emphasis on social equity and community sustainability.

Goal 12. Sustainable Choices and Behavior

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

THE GREEN OFFICE CERTIFICATION PROGRAM

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 wellbeing of our planet. Virginia Tech's Climate Action Commitment outlines goals surrounding energy efficiency, waste minimization, and greenhouse gas reductions. By participating, employees are able to directly help the university achieve its climate action goals while saving money and resources for their office.

This program was redeveloped and relaunched in fall 2020. Office 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 2020-21 academic year, the following offices completed their certification:

- Alternative Transportation Department - Gold
- Department of Religion and Culture - Gold
- Lab Support and Sterilization Services at the Center for One Health Research - Gold
- Lab Support and Sterilization Services at the Integrated Life Sciences Building - Gold
- Lab Support and Sterilization Services at Phase II - Gold
- Services for Students with Disabilities - Gold
- Translational Biology, Medicine, and Health (Roanoke Office) - Gold
- Student Affairs Project Management Department - Silver
- Women's Center at Virginia Tech - Silver

You can find out more about the Green Office Certification Program at **facilities.vt.edu/sustainability/sustainability-programs/green-office-program**.

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 gives 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.

Green Graduate Program at Virginia Tech.

By pledging, students are committing to foster 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 during Earth Week by the Office of Sustainability Graduate Assistant, Michael Bell, over 110 graduates participated in the program for the 2020-21 academic year. The Virginia Tech Green Graduates program has been running for six years straight now.

GAME DAY GREEN TAILGATE

The Game Day Green Team promotes tailgate recycling during home football games by passing out blue recycling bags to tailgaters in the six 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 this year due to COVID. However, the Office of Sustainability shared tips on social media on how individuals can green their gameday from home.

Office of Sustainability student interns hosting an engagement event.

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, Town of Blacksburg, and 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, Sustainability Week, America Recycles Day, and World Water Day.

The internship maintained normal operations despite COVID-19, meeting regularly over Zoom with each other, their university partners, and with our counterparts at Radford University.

Intern teams work alongside Site and Infrastructure employees.

The projects that our intern teams worked on during the 2020-21 academic year include:

- Drafting a proposal for a Green Room Certification Program in collaboration with Dining Services, Housing, and Residence Life Sustainability Manager Blake Bensman for Housing and Residence Life. The program would serve as a pathway for students to learn more about sustainable living, including reducing energy usage, returning green reusable containers to the dining centers, utilizing alternative transportation, and recycling;
- Using the FoodPro database to catalog items as locally sourced, recyclable, and/or compostable within Dining Services' inventory database in collaboration with Dining Services and Blake Bensman;
- Performing research and analysis in support of waste reduction efforts within Dining Services. Student Interns focused on data analysis of each dining center's end-of-day pre-consumer food waste log recording; and
- Creating a training/educational video on macroinvertebrate stream sampling along with supplementary educational materials in partnership with Katelyn Muldoon from Site and Infrastructure Development. Their video is available at **youtube.com/watch?v=rzVNKlFjo7E**.

The student interns also helped host 2021 Earth Week events including a food drive, educational trail walk, tabling at dining halls, and social media activities.

More information on the student internship program and the work that the interns completed throughout the academic year is available at **vtx.vt.edu/articles/2021/06/sustainability-interns-2021**.

Two students involved in the Student Internship Program were highlighted in the VTx for their exceptional efforts both in our program and across campus in their courses, student organizations, and extracurricular activities. Taylor Bush, a two-time intern and 2021 graduate, is featured in this article, found at **liberalarts.vt.edu/news/articles/2021/05/taylor-bush**, which goes into further detail about her research and work to support waste reduction efforts in the dining halls on campus. Natalie Koppier, another 2021 graduate, is featured in this VTx article at **vtx.vt.edu/articles/2021/06/cals-aaec-koppier-sustainability** for her efforts in the student internship program and for being a member of the Climate Action Commitment Working Group.

SUSTAINABILITY WEEK/SUSTAINABILITY THROUGH THE SEASONS

Sustainability Week 2020 served as the kickoff for a new, year-long program called Sustainability Through The Seasons which will be replacing Sustainability Week in the future. There was a mix of virtual and in-person events, including a trail work service day at Poverty Creek with the Trails Coalition, a cycling commuter clinic, and Virginia Tech Dining bike tour, the Blacksburg Farmers Market, a virtual panel on changes to local recycling, the Blacksburg Bike Parade, and much more.

Sustainability Through the Seasons (STTS) has been developed to promote sustainability and events throughout the whole year, rather than just during one week. As a part of STTS, a series of virtual meetings were held called New Year/New Ideas where members of the community were able to share ideas for events and programs and the leadership team behind STTS made plans to make those events happen.

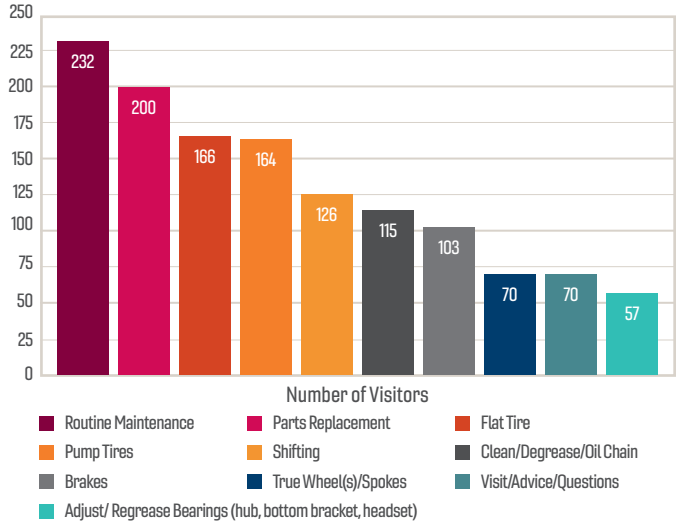
Another part of STTS is Sustainable Blacksburg's 21 Actions for 2021. Each week for 21 weeks, Sustainable Blacksburg shared an article and resources on different actions anyone can take to live more sustainably every day. Some examples include choosing reusables, donating or giving away items you no longer need, reducing food waste, sustainable gift giving, and more. You can find all of the actions on the Sustainable Blacksburg website **sustainableblacksburgva.org**.

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.

The graph to the right shows the number of visitors to the Hokie Bike Hub for each given primary reason. As you can see, people come to the bike hub for all sorts of reasons including routine maintenance, fixing flat tires, general advice and questions, parts replacement, and more.

HOKIE BIKE HUB VISIT REASONS IN 2020



SUSTAINABLE EATS BIKE TOUR

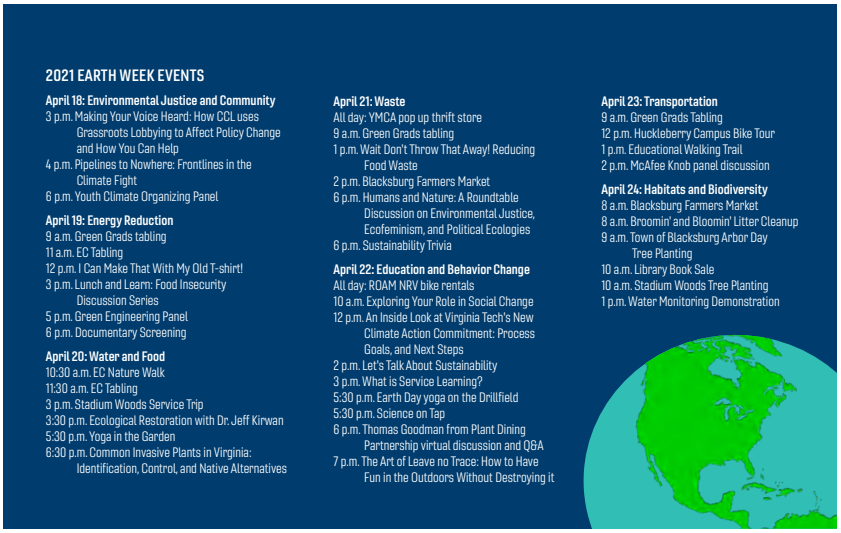
On Sept. 22, 2020, a dozen students and staff rode across campus for the second annual Sustainable Eats Bike Tour. The event was powered by ROAM, a campus bikeshare program, and Virginia Tech Alternative Transportation. The tour stopped at dining centers to taste dishes made with local and campus-raised ingredients. The bike tour concluded at a farm stand stocked with produce from Homefield Farm.

2020 Sustainable Eats bike tour.

Menu items included:

- Sweet potato sofritas taco with pico, cilantro lime crema, and super slaw
- Bruschetta with rosemary bread toast points
- Red Rooster Coffee and farms featured items
- Homestead Creamery ice cream and milkshakes
- Homefield Farm soup with bread and sliced produce from Farm Stand

EARTH WEEK



2021 EARTH WEEK EVENTS

April 18: Environmental Justice and Community
3 p.m. Making Your Voice Heard: How CCL uses Grassroots Lobbying to Affect Policy Change and How You Can Help
4 p.m. Pipelines to Nowhere: Frontlines in the Climate Fight
6 p.m. Youth Climate Organizing Panel

April 19: Energy Reduction
9 a.m. Green Grads tabling
11 a.m. EC Tabling
12 p.m. I Can Make That With My Old T-shirt!
3 p.m. Lunch and Learn: Food Insecurity Discussion Series
5 p.m. Green Engineering Panel
6 p.m. Documentary Screening

April 20: Water and Food
10:30 a.m. EC Nature Walk
11:30 a.m. EC Tabling
3 p.m. Stadium Woods Service Trip
3:30 p.m. Ecological Restoration with Dr. Jeff Kirwan
5:30 p.m. Yoga in the Garden
6:30 p.m. Common Invasive Plants in Virginia: Identification, Control, and Native Alternatives

April 21: Waste
All day: YMCA pop up thrift store
9 a.m. Green Grads tabling
1 p.m. Wait Don't Throw That Away! Reducing Food Waste
2 p.m. Blacksburg Farmers Market
6 p.m. Humans and Nature: A Roundtable Discussion on Environmental Justice, Ecofeminism, and Political Ecologies
6 p.m. Sustainability Trivia

April 22: Education and Behavior Change
All day: ROAM NRV bike rentals
10 a.m. Exploring Your Role in Social Change
12 p.m. An Inside Look at Virginia Tech's New Climate Action Commitment: Process Goals, and Next Steps
2 p.m. Let's Talk About Sustainability
3 p.m. What is Service Learning?
5:30 p.m. Earth Day yoga on the Drillfield
5:30 p.m. Science on Tap
6 p.m. Thomas Goodman from Plant Dining Partnership virtual discussion and Q&A
7 p.m. The Art of Leave no Trace: How to Have Fun in the Outdoors Without Destroying it

April 23: Transportation
9 a.m. Green Grads Tabling
12 p.m. Huckleberry Campus Bike Tour
1 p.m. Educational Walking Trail
2 p.m. McAfee Knob panel discussion

April 24: Habitats and Biodiversity
8 a.m. Blacksburg Farmers Market
8 a.m. Broomin' and Bloomin' Litter Cleanup
9 a.m. Town of Blacksburg Arbor Day Tree Planting
10 a.m. Library Book Sale
10 a.m. Stadium Woods Tree Planting
1 p.m. Water Monitoring Demonstration

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 twenty other student, university, and community groups. Earth Week 2021 was held Sunday, April 18 through Saturday, April 24. Each day of Earth Week is themed around an important sustainability topic, like 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 had a mix of virtual and in-person events in order to safely accommodate appropriate COVID-19 protocols while also providing a valuable and engaging experience for participants. Our 30 different partners held 43 total events throughout the week. Of those events, 21 were in person and 22 were virtual. Some noteworthy events included an Arbor Day celebration and

Yoga event during Earth Week 2021.

tree planting at Stadium Woods; Green Grads tabling; a green engineering panel discussion; yoga in Hahn Horticulture Garden; a YMCA pop up thrift shop on the Drillfield; a roundtable discussion on environmental justice, ecofeminism, and political ecologies; tabling at the Blacksburg Farmers Market; bike rides and walking events along the Huckleberry Trail; a water monitoring demonstration; and much more. The full calendar of events can be found at **facilities.vt.edu/sustainability/sustainability-programs/earth-week**.

Dining Services packed Earth Week 2021 with amazing opportunities for students to showcase their Dining Services related sustainability Projects.

- Plant-forward education: Plant-forward menus were featured throughout the week at various dining facilities. In addition, a tabling event was held to help students learn more about plant-forward.
- Hydroponic wall and water conservation: Dining Services partnered with students from the School of Plant and Environmental Sciences to focus on hydroponics research and the creation of a green wall.
- Waste reduction: The Office of Sustainability Waste Interns showcased their waste reduction project focused on food waste diversion and helpful tips for students to reduce their waste on campus.
- Local and sustainable foods: The Food Interns from the Office of Sustainability presented their sustainable supply chain research of Deet's Place and provided solutions to increase sustainable purchasing.
- Choose to reuse: This year, Dining Services teamed up with the Virginia Tech Living Learning Community "Studio 72". Together, they highlighted the impact of Dining Services' reusable containers through a one-of-a-kind art piece.

During Earth Week, the Office of Sustainability held a week-long food drive for The Giving Tree Food Pantry in Christiansburg. Throughout the week, collection points were made available for people to donate food. At these collection points, members and interns of our office not only collected food, but educated students, faculty, staff, and community members on topics of food insecurity and

Campus Kitchen food drive.

sustainability. In total, we were able to donate 362 total items weighing in at 339 pounds. Our office partnered with the Campus Kitchen program to get all of the donated goods delivered alongside their regularly scheduled delivery of redirected unserved food.

Tyler Harris, a student in the Multimedia Journalism program at Virginia Tech, created this video on the food drive **youtube.com/watch?v=hWIGo90S4Tw**.

VT ENGAGE

On top of running the Campus Kitchens program (see Goal 7), VT Engage also hosted several local service projects during spring 2021 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.

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 (**vtx.vt.edu/articles/2021/07/campusplanning-lightsout21**), allows the university to test its ability to meet that demand should those conditions occur.

For the twelfth year in a row, the Virginia Tech community exceeded its goal during the annual Lights Out/Power Down event held on June 24 on the Blacksburg campus. During the designated 90-minute time period (1:45-3:15 p.m.), the university reduced its campus electrical power demand to an average of 19,300 kilowatts from 22,300 kilowatts peak earlier in the day, a 3,000 kilowatt reduction. The demand goal for the 2021 event was 20,800 kilowatts for the hour.

This program challenges employees to alter their habits in the workplace to reduce their energy consumption. Requiring simple behavior changes during Lights Out/Power Down, such as turning off the lights or unplugging appliances that are not in use, brings awareness to the big effects small actions can have. By having this event on an annual basis, employees are consistently reminded of the impact their actions in the workplace have on campus energy use.

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."

COMMITMENT IMPLEMENTATION WORKING GROUP

The Climate Action Commitment Implementation Working Group is the primary force in developing plans of action and guidelines for the implementation of the 2020 Climate Action Commitment. The commitment Implementation Working Groups consists of employees from across the Division of Campus Planning, Infrastructure, and Facilities (CPIF) and a few key faculty members. The group meets on a weekly basis to document progress and set achievable goals to continuously make progress towards achieving the goals laid out in the commitment.

Goal 13 aims to engage the entire university in climate action and sustainability. Programs cited above in Goal 12 provide such opportunities, but the Climate Action Commitment Implementation Working Group has identified two particularly successful programs in the Office of Sustainability that can be built upon to further achieve commitment implementation and engagement: the Student Sustainability Internship Program and the Student Green RFP Program.

CAMPUS PLANNING, INFRASTRUCTURE, AND FACILITIES ORGANIZATIONAL CHANGES

During the summer of 2021, positive organizational changes are taking place within the Division of Campus Planning, Infrastructure, and Facilities (CPIF) which will help elevate commitment implementation in the university, especially for the physical changes required to achieve GHG emission reduction. The commitment aims for a broader, university-wide commitment including academic instruction, research, and outreach; campus culture and behavior; and climate justice. Therefore, CPIF's efforts must be complemented by positive leadership related to academics, campus life, and student affairs. The current short-term Senior Fellow for Climate Action is intended to fill this role, and plans are being developed to provide for more permanent leadership.

NEW OFFICE OF SUSTAINABILITY WEBSITE

Development is well underway for a new sustainability website (**vt.edu/sustainability**) that will serve as the portal to all things sustainability and climate action, organized by STARS categories (academics, operations, engagement, administration). The academics category will present all sustainability/climate action-related majors, minors, courses, as well as relevant research and outreach/extension programs. The operations category will link to data dashboard sites as they become available. The engagement category will link to relevant programs and opportunities for the campus community to participate in climate action.

"AN INSIDE LOOK AT VIRGINIA TECH'S NEW CLIMATE ACTION COMMITMENT" EARTH DAY WEBINAR

On April 22, 2021 (Earth Day), the Office of Sustainability hosted Professor Emeritus John Randolph for a webinar titled "An Inside Look at Virginia Tech's New Climate Action Commitment." The new commitment had just been approved a month prior and this event served as an introduction of the commitment to the Virginia Tech community.

Denny Cochrane, the Director of the Office of Sustainability, provided an historical overview of Virginia Tech's sustainability efforts and our previous Climate Action Commitment. Then, Dr. John Randolph went through the 15 goals of the new Climate Action Commitment and laid out some potential pathways for achieving those goals. There was a Q&A from the audience as well, allowing students, faculty, staff, and members of the Town of Blacksburg to ask any questions they had.

The webinar was recorded and is available at **youtube.com/watch?v=7z0019022rk&t=1s**.

SUSTAINABILITY TRACKING, ASSESSMENT, AND RATING SYSTEM (STARS)

Virginia Tech was awarded a Gold STARS rating on March 18, 2021 with a score of 72.78. This is an improvement from our previous score, despite even stricter standards in the reporting system than previous years. With this rating, we continue to hold the highest active STARS rating in both the Atlantic Coast Conference and the Commonwealth of Virginia.

Maintaining a STARS Gold rating or above through 2030 is an important aspect of Goal 13 as it allows us to continuously evaluate our sustainability goals and progress. We can use our score as a way to measure our improvement in areas of academics, engagement, planning and administration, and operations and develop strategies to improve upon them.

This is our fifth STARS submission and our third time earning Gold. This submission took about a year and half to complete from start to finish and involved over 60 subject matter experts from across the campus community as well as at the local, state, and national level. At the heart of our submission are all of the efforts by Virginia Tech students. The VTx article found at **vtx.vt.edu/articles/2021/04/sustainability-stars** covers some of the ways that students are featured in our report, including the Office of Sustainability student intern program and the Green RFP program.

2020-21 STARS STANDINGS

Atlantic Coast Conference

Institution	Score	Rating
Virginia Tech	72.78	Gold
North Carolina	69.57	Gold
Miami	66.97	Gold
Virginia	66.30	Gold
Louisville	66.24	Gold
Florida State	65.91	Gold
Wake Forest	65.53	Gold
Notre Dame	63.29	Silver
Boston College	54.99	Silver
Clemson	53.85	Silver
Syracuse	53.65	Silver
Pitt	49.76	Silver
NC State	—	—
Georgia Tech	—	—
Duke	—	—

Commonwealth of Virgina

Institution	Score	Rating
Virginia Tech	72.78	Gold
University of Virginia	66.30	Gold
James Madison University	65.92	Gold
University of Richmond	65.64	Gold
George Mason University	65.155	Gold
Virginia Commonwealth University	60.83	Silver
Washington and Lee University	55.10	Silver
Radford University	50.18	Silver
Bridgewater College	—	—
Christopher Newport University	—	—
College of William & Mary	—	—
Eastern Mennonite University	—	—
Ferrum College	—	—
Hollins University	—	—
Longwood University	—	—
Lynchburg College	—	—
Mary Baldwin University	—	—
Old Dominion University	—	—
Randolph College	—	—
Roanoke College	—	—
Shenandoah University	—	—
Sweet Briar College	—	—

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 clearly support the Climate Action Commitment in order to receive funding consideration. Since its initiation in academic year 2010-11, the Green RFP program has provided funds in excess of $1.5 million for 110 student sustainability proposals.

The Office of Sustainability received 57 proposals during the 2019-2020 academic year. Of those proposals, 19 were selected to be reviewed by the Office of Budget and Financial Planning. However, due to COVID-19, the review and funding of these proposals was put on hold.

Despite the pandemic, the Office of Sustainability still opened up submissions for Green RFPs during the 2020-21 academic year. We received a total of 65 proposals, 18 of which moved through the Energy and Sustainability Committee to be presented to the Office of Budget and Financial Planning alongside the 2019-20 RFPs.

On June 1, 2021, 14 proposals were funded from the 2019-20 batch of proposals for a total of $217,750 and 13 proposals from the 2020-21 batch were funded for a total of $155,048. These 27 approved proposals with funding at nearly $373,000 are currently being implemented. Some examples of funded projects include replacing water fountains with water bottle refill stations, LED lighting upgrades in multiple buildings and in lamp posts along sidewalks, an HVAC upgrade to the Moss Arts Center, creation of a monarch butterfly habitat in Hahn Horticulture Garden, installation of three electric vehicle charging stations in the Squires parking lot, and much more. The full list of approved proposals is available at **facilities.vt.edu/sustainability/sustainability-programs/green-rfp-program**.

CLIMATE ACTION COMMITMENT BUDGET REQUEST

The Climate Action Commitment Implementation Group worked to create a budget request for the 2021-22 fiscal year to support the advancement of the commitment. The group is currently awaiting final results of that request. This budget request included funding for additional staffing to help carry out implementation of the Climate Action Commitment.

GREEN REVOLVING INVESTMENT TRACKING SYSTEM (GRITS)

Virginia Tech is now a member of the GRITS online platform. GRITS allows users to track the energy, financial, waste, water, and carbon savings data from sustainability projects. GRITS also features a library of more than 2,500 projects completed by other GRITS users across the United States.

GRITS is currently being used by the Office of Energy Management and discussions are underway to determine the best projects to track in GRITS so that benefits can be better quantified, tracked, and shared with the public. Understanding the financial and environmental impacts of projects that happen on campus and being able to back those up with data is the first step in developing support for innovative financing options for future projects.

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. 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 more substantial discussion on the pathway toward this goal.

CONCLUSION

Virginia Tech continues to demonstrate its commitment to being a leader in campus sustainability. The greatest showcase of this commitment is the passing of the new 2020 Climate Action Commitment by the Virginia Tech Board of Visitors in March 2021. The new commitment, which framed this report, presents a clear commitment to institutional change and progress. The 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. This commitment to progress is seen in the major strides the university has made in just a short time since the Commitment's approval.

Virginia Tech's efforts towards practicing sustainability are being recognized on a national and global level. During the 2020-21 academic year, Virginia Tech received its highest-ever Gold STARS rating, improving upon its score despite stricter standards. The latest STARS rating keeps Virginia Tech at the top of not only all universities in the Commonwealth of Virginia, but also in the Atlantic Coast Conference. The Times Higher Education Impact Rating, guided by the United Nations Sustainable Development Goals, puts Virginia Tech in the top 25 globally for Responsible Consumption and Production (12). Additionally, the Impact Ranking places Virginia Tech in the top 200 globally for Clean Water and Sanitation (SDG 6) and Sustainable Cities and Communities (SDG 11). The university has also maintained its Tree Campus Higher Education accreditation for the thirteenth straight year.

Major strides have been made in the realm of energy use and efficiency on campus. This year's campus-wide lighting audit and Building Automation System Assessment gives Virginia Tech the background information needed to develop an ambitious and achievable Ten-Year Energy Action Plan in the near future. These efforts, combined with the current discussions on increasing the presence of solar on campus, will put Virginia Tech in a good position to achieve carbon neutrality by 2030.

Virginia Tech's campus proudly displays 34 LEED-Registered buildings totaling over 2.8 million gross square feet. Twenty-one of those buildings are certified, five are pending certification, five 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.

Waste management and recycling at Virginia Tech is continuing to hold strong. The release of the new Comprehensive Waste Management Plan will ensure that waste is managed properly across campus. The current recycling rate is 38.1% and the diversion rate is 85.2 percent, putting us well on our way to a zero-waste campus by 2030.

Sustainability at Virginia Tech is a partnership between its colleges, departments, units, students, employees, and the Blacksburg community. It represents a town-gown model for the Commonwealth of Virginia and the U.S. At the end of the day, all Hokies are sustainability champions with the goal of making Blacksburg a Special 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**.

Acknowledgments

2020-21 Sustainability Annual Report Prepared by the Office of Sustainability:

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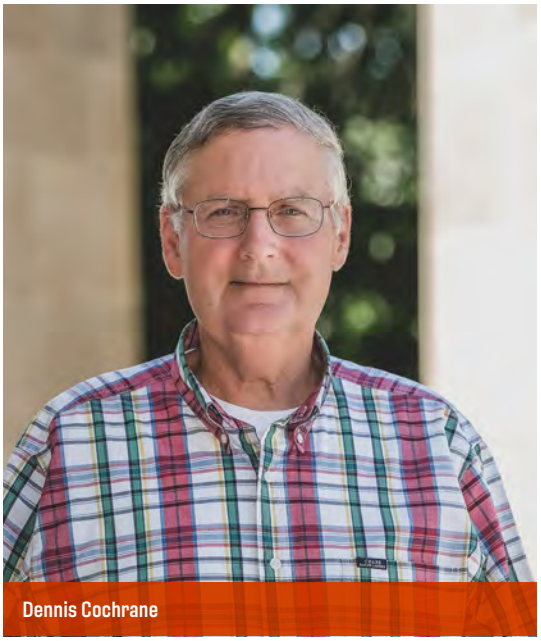
The Virginia Tech and Blacksburg Community

DENNY COCHRANE


Dennis Cochrane

The Director of Sustainability, Denny Cochrane, retired from Virginia Tech on July 1, 2021. For the past 55 years, Denny has been a proud Hokie - as an undergraduate in the Corps of Cadets, a cadet leader in the U.S. Army, a campus administrator, and as a sustainability champion.

In September 2007, Cochrane was tasked with starting and leading a new unit to Virginia Tech: the Office of Sustainability. One month later, the new office led Virginia Tech's first sustainability collaboration with the Town of Blacksburg and local citizens group, Sustainable Blacksburg, that launched Sustainability Week. This annual event was recognized at the state level as a model for a town-gown sustainability partnership and received a Governor's Environmental Excellence Award. Denny was also instrumental in the creation of Virginia Tech's first Climate Action Commitment in 2009.

Over the past 14 years under Cochrane's leadership, the Office of Sustainability has advanced environmental stewardship at Virginia Tech in countless ways. Delivering sustainability engagement opportunities for students, including the award-winning internship program, and the Green RFP program, which has provided university funding for the implementation of 110 student-generated campus sustainability projects over the past decade, are just a couple of highlights.

The university's continued recognition as a national leader in sustainability can be attributed in large part to the office's and Cochrane's efforts. Virginia Tech's Sustainability Tracking, Assessment, and Rating System (STARS) Gold rating, Tree Campus Higher Education certification (13 consecutive years), and Princeton Review top 50 Green Colleges reflect Virginia Tech's dedication to the environment.

Virginia Tech would not be the leader in sustainability that it is today without the hard work and dedication from Denny Cochrane.

From the Office of Sustainability and the Virginia Tech community, we wish Denny Cochrane well in his retirement and thank him for his many years of service to this university, community, and nation. His impact on all of us has been profound and will not be forgotten.

Read about Cochrane and his accomplishments **vtx.vt.edu/articles/2021/06/Denny-Cochrane-Retirement**.

APPENDIX

2020 Climate Action Commitment
Greenhouse Gas Inventory and Assessment Report
LEED Summary Table
Design and Construction Standards Manual
Calendar Year 2020 Recycle Rate Report
Comprehensive Waste Management Plan
Sustainable Procurement Policy
2020-21 Student Green RFP Memorandum

RESOLUTION TO APPROVE THE VIRGINIA TECH 2020 CLIMATE ACTION COMMITMENT

WHEREAS, Virginia Tech recognizes that sustainability is an integral part of the fabric of the university as it pursues enhanced economic stability and affordability, diversity and inclusion, environmental stewardship, expansion of knowledge, and education of future leaders; and

WHEREAS, Virginia Tech has long been recognized as a leader in campus sustainability, with the highest scores for the Association for the Advancement of Sustainability in Higher Education (AASHE) Sustainability Tracking, Assessment, and Rating System (STARS) for institutions in the Commonwealth of Virginia and the Atlantic Coast Conference, numerous Governor's Environmental Excellence Awards, prominent standing in Princeton Review's top 50 Green Colleges, and many other accolades; and

WHEREAS, the 2009 Virginia Tech Climate Action Commitment and Sustainability Plan, as revised in 2013, was a cutting-edge effort for its time, but now fails to prescribe what climate scientists recognize as necessary actions and also falls short of many peer universities' recent initiatives; and

WHEREAS, the campus community has pushed for more aggressive climate action as represented by demands of student environmental organizations and resolutions by the Faculty Senate and Staff Senate, the Student Government Association, and the Graduate Student Assembly; and

WHEREAS, Virginia Tech President Timothy D. Sands stated in November 2019 that "climate change presents one of the world's most pressing problems…and Virginia Tech has a duty to respond," and called for a new working group to evaluate the university's progress in climate action and to update its climate action commitment; and

WHEREAS, a 26-member Virginia Tech Climate Action Commitment Working Group met weekly for six months from January through June 2020; led 12 subcommittees involving 125 faculty, staff, student, and community participants; and engaged hundreds of university community members in online surveys and virtual convening sessions, to produce a comprehensive evaluation of progress and develop a new Virginia Tech 2020 Climate Action Commitment; and

WHEREAS, the Virginia Tech 2020 Climate Action Commitment contains an aggressive yet pragmatic set of 15 goals - and pathways to achieve those goals - that involve necessary upgrades to the campus physical infrastructure and operations to reduce greenhouse gas emissions (GHG), integrate these improvements into the university's educational and research mission, engage everyone to enhance the campus culture of sustainability, and consider these actions' financial, environmental, reputational, and social equity impacts and benefits; and

WHEREAS, the Virginia Tech 2020 Climate Action Commitment sets the stage for Virginia Tech to shine as an exemplar and leader in higher education climate action by not only aiming to become a carbon neutral and zero-waste campus by 2030, but also utilizing the university's unique Virginia Tech Electric Service to partner and develop a way to 100 percent renewable electricity by 2030; using considerable land resources to manage agricultural impacts, sequester carbon, and develop renewable energy; accounting for behavior-related GHG emissions from waste and transport; integrating climate action into education; and specifically addressing community engagement, sustainable behaviors, and social equity;

WHEREAS, in developing innovative budgeting and financing mechanisms to achieve the Virginia Tech 2020 Climate Action Commitment goals, the university shall recognize that all financial needs compete for resources, consider the impact on tuition and fee constraints as well as university debt capacity, and incorporate funding requests into established annual operating and/or capital budgeting processes as appropriate.

NOW, THEREFORE, BE IT RESOLVED, that the Virginia Tech Board of Visitors approve the Virginia Tech 2020 Climate Action Commitment, including the following vision and mission statements, and 15 goals:

Vision of the Virginia Tech 2020 Climate Action Commitment:

In the spirit of Ut Prosim, Virginia Tech will be a leader in climate action in service to our community, the Commonwealth, and the world.

Mission of the Virginia Tech 2020 Climate Action Commitment:

The mission of the Virginia Tech 2020 Climate Action Commitment is to achieve carbon neutrality by changing our physical infrastructure, collective and individual behaviors, and educational mission; to engage everyone in creating a culture of sustainability; and to achieve these objectives through just and equitable means.

The Virginia Tech 2020 Climate Action Commitment Goals

1. Carbon neutral Virginia Tech campus by 2030

2. 100 percent renewable electricity by 2030

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

4. Reduce building energy consumption to enable carbon neutrality by 2030

5. Operations of new buildings initiated by 2030 will be carbon neutral

6. Agricultural, forestry, and land use operations will be carbon neutral by 2030

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

8. Establish sustainable procurement policy and procedures by 2022

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

10. Integrate the Virginia Tech 2020 Climate Action Commitment into the university's educational mission through a new Climate Action Living Laboratory beginning in 2021

11. Establish climate justice as a core value of the Virginia Tech 2020 Climate Action Commitment

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

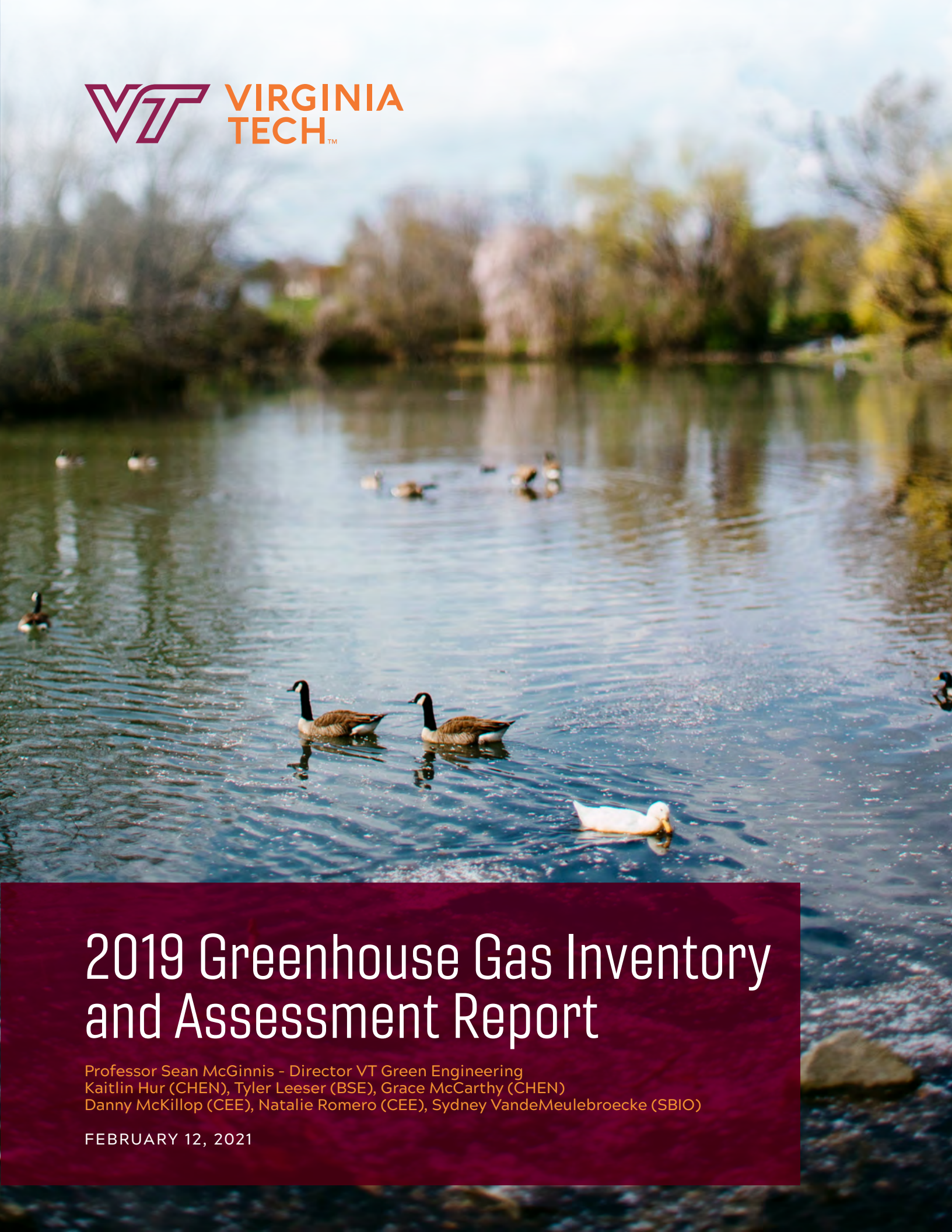
13. Implement the Virginia Tech 2020 Climate Action Commitment at a high level of university administration and governance; by integrating goals for facilities, education, and campus culture; and with stakeholder engagement in the ongoing evaluation of goals and progress

14. Develop innovative budgeting and financing mechanisms to generate funding and staffing to achieve the Virginia Tech 2020 Climate Action Commitment goals

15. Develop pathways after 2030 to eliminate fossil fuels and carbon offsets by 2050

Recommendation:

That the Virginia Tech 2020 Climate Action Commitment be approved.



VIRGINIA TECH™

2019 Greenhouse Gas Inventory and Assessment Report

Professor Sean McGinnis - Director VT Green Engineering
Kaitlin Hur (CHEN), Tyler Leeser (BSE), Grace McCarthy (CHEN)
Danny McKillop (CEE), Natalie Romero (CEE), Sydney VandeMeulebroecke (SBIO)

FEBRUARY 12, 2021

Introduction

Virginia Tech has completed a Greenhouse Gas (GHG) Inventory and Assessment Report since 2007 as part of its Climate Action Commitment. GHGs are chemicals that absorb heat in the upper atmosphere and lead to global warming. The dominant GHG is carbon dioxide (CO_2) which is emitted from the combustion of fossil fuels. Other important GHG emissions include methane (CH_4) and nitrous oxide (N_2O). These chemicals are compiled in a GHG Assessment, often called a carbon footprint, which is a critical component of the commitment because it provides a quantitative analysis of campus emissions and goals. It also provides a means to quantify the various sources of emissions so that detailed plans can be developed for future emissions reductions. Without an accurate GHG Assessment, campus GHG plans and goals may not reduce emissions effectively and there can be a lack of accountability. Claims of carbon neutrality, in which all included GHG emissions are reduced to zero or offset, require a GHG assessment to confirm compliance.

The current Climate Action Commitment, approved in 2013, states in point 13 that:

> *"Virginia Tech will monitor energy use and GHG emissions as well as changing internal and external conditions, prepare an annual 'report card' showing progress towards targets, and periodically re-evaluate targets, making adjustments to targets as appropriate based on changing internal and external conditions and evolving technologies."*

The 2019 GHG assessment also supports the spring 2020 Climate Action Committee (CAC) recommendation of a carbon-neutral Virginia Tech campus by 2030. In this context, carbon neutral is defined as net-zero emissions of CO_2, CH_4, and N_2O by Virginia Tech operations at the Blacksburg campus based on geographic and GHG scope of 2020 commitment. The commitment resolution was approved by the University Council in November 2020 and will be voted on by the Board of Visitors in spring 2021.

This GHG assessment uses SIMAP, the *Sustainability Indicator Management and Analysis Platform* (SIMAP) developed by the University of New Hampshire. This is the most common GHG analysis platform used by universities around the US. Previous GHG assessments at Virginia Tech used an internal excel spreadsheet compiled and analyzed by the Facilities department. Moving to a formal GHG platform will standardize this process and allow for more accurate and consistent analyses from year-to-year.

Results and Discussion

Scope	Source	CO_2 (kg)	CO_2 (mt CO_{2e})	CH_4 (kg)	CH_4 (mt CO_{2e})	N_2O (kg)	N_2O (mt CO_{2e})	GHG (mt CO_{2e})	GHG (%)
2	Purchased Electricity	123,257,006	123,257	11,898	333	2,172	576	124,166	44.2
1	VT Power Plant Steam	52,475,485	52,475	5,372	150	283	75	52,701	18.8
1	VT Power Plant Electricity	17,321,708	17,322	1,773	50	93	25	17,396	6.2
3	Upstream Methane Leakage	0	0	620	17,366	0	0	17,366	6.2
3	Faculty Commuting	13,873,467	13,873	749	21	486	129	14,023	5.0
3	Electricity T&D Losses	13,705,818	13,706	1,323	37	242	64	13,807	4.9
1	Fertilizer & Animals	0	0	384,544	10,767	6,104	1,618	12,385	4.4
3	Business Air Travel	9,155,116	9,155	15	0	107	28	9,184	3.3
1	Building Natural Gas	8,207,390	8,207	817	23	16	4	8,235	2.9
1	Fleet and Aviation Fuels	4,595,961	4,596	120	3	98	26	4,625	1.6
3	BT Bus System	3,025,873	3,026	9	0	9	2	3,029	1.1
3	Undergraduate Student Commuting	2,829,711	2,830	153	4	99	26	2,860	1.0
3	Graduate Student Commuting	927,065	927	50	1	33	9	937	0.3
3	Wastewater	0	0	0	0	752	199	199	0.1
3	Solid Waste	0	0	-4,724	-132	0	0	-132	0.0
			249,375		28,625		2,781	280,781	100%
88.8% CO_2 + 10.2% CH_4 + 1.0% N_2O = 100% Virginia Tech GHG Emissions									

Table 12. SIMAP GHG Emissions Results

All GHG emissions results were calculated by SIMAP based on the inventory data and emissions factors detailed in the previous sections. The resulting emissions are shown in Table 12, 13, and Figure 3.

The total estimated GHG emissions for this assessment are 280,781 metric tons carbon dioxide equivalent (mt CO2e). The scope 2 utility electricity is the largest emission category at 44 percent. The direct university emissions in scope 1 account for 34 percent. The indirect emissions of scope 3 are 22 percent of the total carbon footprint. 70 percent of these scope 3 emissions are due to the expanded scope elements of electricity T&D losses, upstream methane leakage, business air travel, and the BT bus system.

Breaking this down by GHG chemical, 89 percent of these emissions are due to CO_2, 10 percent due to CH_4, and 1 percent due to N_2O. From a source perspective, 70% of the emissions results from

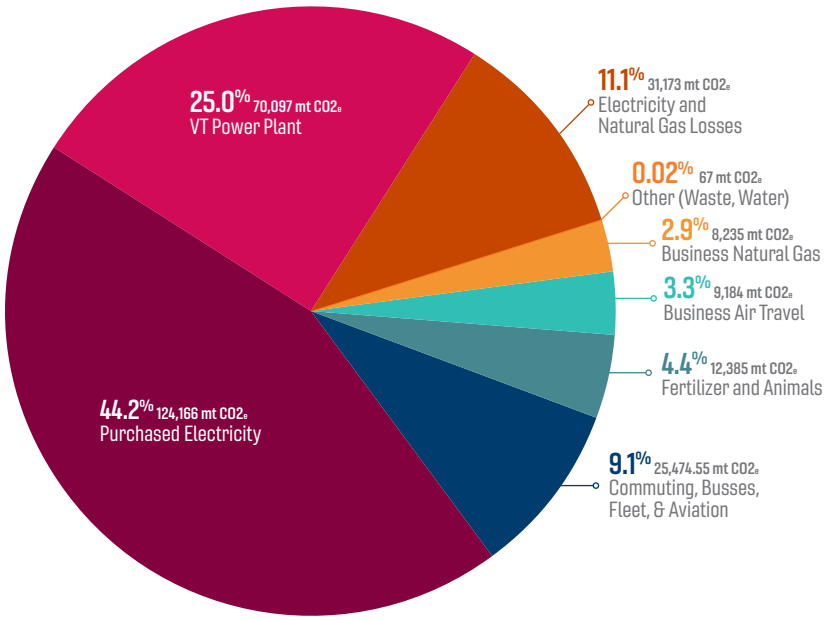


Figure 3. SIMAP GHG results by category

Scope	GHG (mt CO2e)	GHG (%)
1	95,342	34.0
2	124,166	44.2
3	61,273	21.8
	280,781	**100%**

Table 13.

Past Calendar Year GHG Assessments

297,488 MT CO_2 in 2013

284,489 MT CO_2 in 2014

269,874 MT CO_2 in 2015

257,244 MT CO_2 in 2016

250,867 MT CO_2 in 2017

232,260 MT CO_2 2018

operations and building energy from the utilities and the Virginia Tech power plant. The emissions associated with losses due to electricity and natural gas distribution are 11% and not under the control of the university, though these values scale down linearly as energy use is reduced. Transportation fuels account for 13% of emissions, with half of these attributed to faculty/staff/student commuting, and can be reduced most easily and cost effectively through reduced use of vehicles, but also through more efficient vehicles. The expected transition in the future to more electric vehicles will mainly move these emissions from the fuels to the electricity category, but emissions are expected to continue to drop due to higher electric vehicle efficiencies and more renewable energy in the electrical grid.

For context, previous Virginia Tech GHG assessment results are shown to the left, but the 2019 results shouldn't be directly compared given the significant changes in the method and expanded scope of this assessment. The main changes are adding leased building space, the BT Bus system, RECs, business air travel, electricity T&D losses, and methane leakage to the assessment scope. CH_4 and N_2O GHG emissions were also not considered in past assessments. Despite these scope additions, the total GHG emissions are only approximately 20 percent higher than estimated in 2018, mainly due to the hydropower RECs which reduced the overall electricity emissions.

Conclusions

The 2019 GHG Emissions Assessment was completed during fall semester 2020 using the expanded scope and methods recommended by the GHG Subcommittee of the spring 2020 Climate Action Committee. All recommended scope elements are included in this assessment except for Dining/Food Emissions and carbon sequestration by Virgina Tech agricultural/forestry lands and the campus tree canopy. This report is a critical piece of the Climate Action Plan since it provides detailed data for future decisions and plans to reduce carbon emissions associated with Virgina Tech.

This was the first year using Sustainability Indicator Management and Analysis Platform (SIMAP) software instead of the Facilities Master Spreadsheet. The Master Spreadsheet is still one of the main ways that Facilities compiles utility electricity and natural gas and Central Steam plants fuels and data.

Data review and analysis was done by an Independent Study course advised by Dr. Sean McGinnis, Director of the Green Engineering Program, with help from Virginia Tech staff, faculty, and students. As noted, in some areas like fleet fuels and business travel, data collection would be easier and more accurate with updated operational procedures.

A future project is also recommended to determine the best way to handle and analyze the large amount of dining/food data which is available from Dining Services to include estimates of upstream food emissions.

VIRGINIA TECH

VIRGINIA TECH
LEED PROGRAM SUMMARY

Status	Number of Buildings	Gross Sq. Ft. (GSF)
Projects Completed: LEED Certification Attained	21	1,504,254
Projects Completed: LEED Certification Pending	4	259,207
Projects Under Construction: LEED Registered	5	519,846
Projects Under Design: LEED Registered	3	514,366
Projects Under Design: LEED Registration Pending	1	58,000
Total	**34**	**2,855,673**

Goodwin Hall - LEED Gold - Academic Building
154,935 GSF

Ambler Johnston Hall - LEED Gold - Residence Hall
269,463 GSF

Moss Art Center - LEED Gold - Center for the Arts
147,382 GSF

Human & Agricultural Biosciences Building I
LEED Gold - Research Building
93,860 GSF

VIRGINIA TECH LEED BUILDINGS STATUS - 2021.06.29

Projects Completed - LEED Certification Attained

Project	Project #	Budget	GSF	Construction Start	Occupancy Date	LEED Certification	Date of Certification
Henderson Hall Renovation & Theater 101 Addition	208-16758-001	15,838,792	38,750	02/18/2008	8/14/2009	Gold	02/01/2010
Football Locker Room Addition	208-L00016-000	14,004,621	42,145	07/08/2009	06/21/2011	Silver	10/01/2011
Institute for Critical Technology & Applied Science - Phase II	208-17291-000	34,587,710	42,190	04/08/2009	04/06/2011	Gold	11/01/2011
Visitors & Undergraduate Admissions Center	208-L00012-000	10,338,192	18,155	03/23/2010	08/29/2011	Certified	08/01/2012
Lavery Hall	208-17859-000	44,302,610	77,301	07/29/2010	09/05/2012	Silver	04/01/2013
Vet Med Instructional Addition	208-199791-000	12,343,316	24,600	07/26/2011	11/05/2012	Silver	06/01/2013
Ambler Johnston Hall	208-17557-000	66,968,679	269,463	05/26/2009	06/25/2012	Gold	11/01/2013
Chiller Plant Phase I (Southwest Chiller Plant)	208-17657-000	20,097,729	16,655	03/22/2012	06/14/2013	Silver	11/01/2013
Moss Arts Center	208-16758-002	$100,087,000	147,382	08/10/2010	08/21/2013	Gold	05/01/2014
Human & Agricultural Biosciences Building I	229-17861-000	53,759,344	93,860	12/22/2011	03/10/2014	Gold	04/17/2015
Indoor Athletic Training Facility	208-17296-000	21,300,000	91,600	04/23/2014	06/25/2015	Silver	10/05/2015
Goodwin Hall	208-17658-000	95,218,249	154,935	09/13/2011	05/29/2014	Gold	10/28/2015
Davidson Hall	208-17662-000	32,003,099	44,845	02/17/2012	06/08/2014	Certified	03/11/2016
Pearson Hall East	208-L00031-000	45,500,000	111,191	10/14/2013	11/11/2015	Silver	12/16/2016
Oak Lane Phase IV	208-L00021-002	5,132,300	20,508	08/29/2011	01/04/2013	Silver	10/04/2017
Pearson Hall West	208-L00031-000	45,000,000	108,765	07/27/2015	04/28/2017	Silver	06/11/2018
Classroom Building	208-17995-000	40,851,740	72,275	01/26/2015	08/17/2016	Silver	08/12/2020
O'Shaughnessy Hall Renovations	208-L00044+000	21,593,211	69,200	05/17/2017	08/01/2018	Gold	01/28/2021
Sandy Hall (RRAB)	208-18065-000	30,563,000	19,889	01/04/2017	05/01/2019	Certified	02/11/2021
Liberal Arts Building (RRAB)	208-18065-000	30,563,000	15,394	01/04/2017	05/01/2019	Certified	02/11/2021
Davidson Hall (RRAB)	208-18065-000	30,563,000	25,151	01/04/2017	05/01/2019	Silver	02/11/2021
Total GSF	—	—	**1,504,254**	—	—	—	—

VIRGINIA TECH LEED BUILDINGS STATUS - 2021.06.29

Projects Completed - LEED Certification Pending

Project	Project #	Budget	GSF	Construction Start	Occupancy Date	LEED Certification
Rector Field House	208-L00037-001	18,595,000	43,949	12/01/2016	02/03/2018	Silver
Baseball Facilities Improvements	208-L00037-002	18,496,000	49,872	02/01/2017	02/03/2018	Silver
VT Carilion Biomedical Research Expansion	208-18269-000	85,574,000	139,586	02/05/2018	04/20/2020	Silver
Student Athlete Performance Center	208-L00056-000	16,681,500	25,800	08/08/2019	01/31/2021	Silver
Total GSF	—	—	**259,207**	—	—	—

Projects Under Construction - LEED Registered

Project	Project #	Budget	GSF	Construction Start	Occupancy Date	LEED Certification
Creativity & Innovation District Living Learning Community	208-L00060-000	105,500,000	224,500	03/04/2019	06/15/2021	Silver
Holden Hall Renovation	208-18267-000	73,500,000	101,240	08/15/2019	10/29/2021	Silver
Multi-Modal Transit Facility	CP-2029	38,000,000	13,606	05/18/20220	05/23/2022	Silver
Data & Decisions Sciences	208-18427-000	79,000,000	120,000	07/31/2020	07/28/2022	Silver
Corps Leadership & Military Science Building	208-L00043-000	40,000,000	60,500	08/02/2021	07/03/2023	Silver
Total GSF	—	—	**519,846**	—	—	—

VIRGINIA TECH LEED BUILDINGS STATUS - 2021.06.29

Projects Under Design - LEED Registered

Project	Project #	Budget	GSF	Construction Start	Occupancy Date	LEED Certification
Undergraduate Science Laboratories - New Construction	208-18332-000	85,705,631	102,366	TBD	TBD	Silver
Hitt Hall & New Dining Facility	208-L 00049-000	68,000,000	112,000	07/01/2020	07/01/2022	Silver
Innovation Campus Academic Building	208-18412-000	275,000,000	300,000	08/01/2021	02/01/2024	Silver
Total GSF	—	—	**514,366**	—	—	—

Projects Under Design - LEED Registration Pending

Project	Project #	Budget	GSF	Construction Start	Occupancy Date	LEED Certification
New Upper Quad Residence Hall - Femoyer Replacement	208-L00064-000	40,000,000	58,000	06/14/2021	06/23/2023	Silver (Pending)
Total GSF	—	—	**58,000**	—	—	—

Projects Under Design - LEED Registration Pending: PROJECTS ON HOLD

Project	Project #	Budget	GSF	Construction Start	Occupancy Date	LEED Certification
Global Business & Analytics Complex Residence Halls	208-L00063-000	84,000,000	60,500	N/A	N/A	Silver (Pending)
Slusher Hall Replacement/.Planning	208-L00058-000	3,500,000	187,848	N/A	N/A	Silver (Pending)
Student Wellness Improvements	208-18357-000	58,000,000	263,000	N/A	N/A	Silver (Pending)
Total GSF	—	—	**511,348**	—	—	—

1.2.5 Sustainability

Per the latest revision of the Presidential Policy Memorandum No. 262, the Virginia Tech Climate Action Commitment (VT CAC), Virginia Tech will be a leader in campus sustainability and programs to achieve sustainability goals will be represented in the University's Strategic Plan. Innovations in construction and building design have raised the benchmark for certification standards for buildings since 2013. The VT Facilities Department will strive to incorporate a maximum amount of sustainability improvements to honor the VT CAC to the limits of affordability for each design project.

The University is committed to the principles of energy conservation. All designs shall strive to maximize energy efficiency, and comply with the energy conservation requirements contained in these standards and Campus Energy, Water, and Waste Reduction Policy – No. 5505.

1.2.5.1 Sustainable Design

In order to incorporate sustainable design solutions in new construction and renovation projects, Virginia Tech has joined the U.S. Green Building Council (USGBC) and fully supports the principles of the LEED (Leadership in Energy and Environmental Design) Building Rating System. The pursuit of high performance green buildings that are energy efficient and environmentally sensitive will help to lower operating and energy costs, improve employee productivity, promote improved learning, and enhance the health, and well-being of the students, faculty and staff at Virginia Tech. All projects shall address sustainability as it relates to site issues, water, energy efficiency, materials and resources, and indoor air quality in accordance with the VT CAC.

In the early stages of design, the A/E shall strive to meet or exceed the minimum number of points needed for LEED certification under the rating system appropriate for the project in accordance with the VT CAC. The A/E shall determine the most cost effective means of achieving these points, and shall take full credit for points achieved through compliance with other University standards that address sustainability issues, such as building commissioning. The A/E shall submit for the University's review and approval a LEED Project Checklist, identifying the specific measures proposed to be incorporated into the project to achieve the target number of points. The A/E should consider the ParkSmart certification for projects involving parking garages.

Commonwealth of Virginia Locality Recycling Rate Report For Calendar Year 2020

Reporting Solid Waste Planning Unit: Virginia Tech

Contact Person: Dennis C. Cochrane
Title: Director, Office of Sustainability, Campus Planning, Infrastructure & Facilities
Address: Virginia Tech, Sterrett Center, 230 Sterrett Drive, Blacksburg, VA 24061
Office Phone Number: (540) 231-5184 **Email Address:** denniscc@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 collects 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 our famous "Hokie Stone," the Limestone-Dolomite stone for the exterior of most campus buildings. Calendar Year 2020 was dominated by the COVID-19 pandemic which had a significant impact with recycling and trash collection operations at all levels. In mid-march 2020 the university pivoted to mostly online classes, and this continued through the 2020 Fall Semester. The result was a significant decrease in on campus student and employee population for most of the year, which led to a significant decrease in our recycling and trash tonnage. For example, our food waste collection was reduced from 566 tons in 2019 to 138 tons in 2020 (a 75% reduction).

Virginia Tech achieved a 38.1% Recycling Rate and a 85.2% Waste Diversion Rate (percentage of waste kept out of the local landfill) for Calendar Year 2020 (page 2).

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.

Dennis C. Cochrane	Director, Office of Sustainability	March 26, 2021
Authorized Signature	Title	Date

Locality Recycling Rate Report — For Calendar Year 2020

PART A: Recycling Rate Calculations – 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 %

1,291	/	1,291	+	2,604	X 100 =	33.1	%
TONS		TONS		TONS		Basic Recycle Rate	

Step 2: CREDITS calculation

a. Total Recycling Residue	0	tons
b. Total Solid Waste Reused	30	tons
c. Total Non-MSW Recycled	13,627	tons
CREDITS	13,657	tons

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

1,291	+	13,657	/	1,291	+	13,657	+	2,604	X100 =	85.2	%
TONS		TONS		TONS		TONS		TONS		Waste Diversion Rate	

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

☐ **Adjusted Recycling Rate #1 + 2% SRP Credit = Adjusted Recycling Rate #2***

85.2	%	+ 2% =	87.2	%

Step 5: Final Recycling Rate* for Solid Waste Planning Unit = 38.1 **%**

Final Recycle Rate

***Total credits resulting from Steps 3 and 4 may not exceed 5 percentage points above the Base Recycle Rate (step 1) achieved by the Solid Waste Planning Unit.**

Locality Recycling Rate Report — For Calendar Year 2020

Part B: DATA

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	172
Plastic	3
Glass	0
Commingled (also known as Single Stream)	365
Yard Waste (composted or mulched)	250
Waste Wood (chipped or mulched)	15
White Goods	6
Tires	6
Used Oil	9
Used Oil Filters	1
Batteries	6
Electronics	4
Fluorescent Bulbs & Ballasts	15
Food Waste Organic - Composting	138
Waste Cooking Oil	25
TOTAL PRMS	**1,291** **(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.
   e.
   f.
   g.
   h.
   i.

Part II: Credits by Category (see Credits Worksheet, Page 5)

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	27
_____	_____	_____
_____	_____	_____
_____	_____	_____
	TOTAL SOLID WASTE REUSED	**30**

(Enter Total on Page 2, Step 2 b)

C. Non-Municipal Solid Waste (MSW) Recycled

MATERIAL DESCRIPTION	RECYCLING METHOD	TONS OF MATERIAL
"Hokie Stone" Gravel	Overburden (Cuttings) from VT Quarry Ops	11,804
Asphalt Milling	Asphalt Milled from VDOT Campus Roadwork	850
Masonry, Concrete	Construction Projects (CID-LLC, Holden Hall)	932
Masonry, Concrete	Construction Project (Student Athletic Perf Ctr).	36
Roofing Membrane	EPDM from various Roofing Renovation Projects	5
	TOTAL NON-MSW RECYCLED	**13,627**

(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, and should not 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.**

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	
Commercial	
Institutional	2,604
Other (DO NOT INCLUDE INDUSTRIAL WASTES)	
TOTAL MSW DISPOSED	**2,604**

(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	27
		TOTAL TONS	**30**

(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)	850
_X_	Construction	Holden Hall	180
_X_	Construction	CID-Living Learning Ctr (Res Hall)	752
_X_	Construction	Student Athlete Performance Ctr	36
_X_	Quarry Ops	Hokie Stone "Overburden"	11,804
_X_	Roofing	EPDM - various Roof Renovations	5
___	Other		
		TOTAL TONS	**13,627**

(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.

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.		

Comprehensive Waste Management Plan

Virginia Tech is committed to being a leader in campus sustainability.

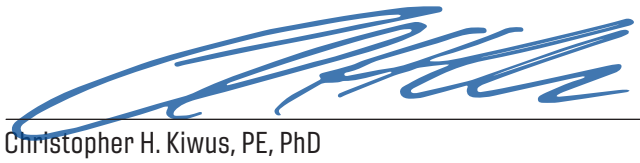
Approved initially in 2009 by the Virginia Tech Board of Visitors, and revised in 2013, the Virginia Tech Climate Action Commitment serves as the university's guiding framework around sustainability and energy efficiency in campus operations, facilities, curriculum, and research. As part of that commitment, goal eight states, "Virginia Tech will minimize waste and achieve a 50 percent recycle rate by 2020." In 2019, President Sands called for renewal and revision of the commitment to ensure the most stringent climate and sustainability standards are implemented as Virginia Tech continues to grow and seeks to be a leader in environmental stewardship. Proposed revisions were presented to the Virginia Tech Board of Visitors in November 2020. A comprehensive financial review of the proposed revisions is currently underway. The seventh goal of the proposed renewal positions Virginia Tech to become a zero-waste campus by 2030. Zero-waste is defined by the waste management industry as keeping 90% of our solid waste out of the landfill.

Further, university policy 5505, Campus Energy, Water, and Waste Reduction provides that the Division of Campus Planning, Infrastructure, and Facilities has overall responsibility for recycling and trash collection on campus and is charged with developing and implementing a comprehensive waste management plan.

The comprehensive waste management plan will serve to both fulfill the aforementioned policy requirement and serve as a driving factor in helping campus operations align toward prescribed aspirations.

The Office of Sustainability spearheaded the creation of this plan and numerous campus stakeholders participated. Virginia Tech is one of four jurisdictional members of the Montgomery Regional Solid Waste Authority (MRSWA), and their Executive Director, Alan Cummins, participated in the review process. This team approach produced an outstanding document that captures current procedures and provides recommendations to enhance future operations.

The comprehensive waste management plan for Virginia Tech dated January 1, 2021 is hereby approved:



01/07/2021

Christopher H. Kiwus, PE, PhD — Date

Vice President for Campus Planning, Infrastructure, and Facilities

Executive Summary

The Comprehensive Waste Management Plan for Virginia Tech (CWMP-VT) was developed by the Division of Campus Planning, Infrastructure and Facilities (DCPIF) in order to ensure Virginia Tech maintains compliance with all regulations and that the university pursues methods and procedures to improve stewardship to the community. Input was received from relevant parties and stakeholders to develop a campus-wide waste disposal guide. This plan describes current waste management operations and responsibilities for the management of campus waste. The plan will be reviewed annually and revised when appropriate.

While the CWMP-VT provides an overall view of campus waste management processes, the ultimate goal is decreasing all waste streams for both financial and environmental benefits. It furthermore notes broad recommendations for improving all campus waste management procedures that will have the least environmental impact. Campus waste streams include: Municipal Solid Waste (MSW); Construction and Demolition Waste (C&D); Recyclable Materials; Compostable Materials; Reusable Materials; Electronic Waste; Universal Waste and Hazardous Waste.

1.0 Purpose

Waste management practices affect all areas of campus. The purpose of this plan is to catalog the current state of waste management on campus and the responsible parties who carry out the day-to-day tasks to achieve the removal of such wastes. This plan shall serve as a guide for all waste generating units on the Blacksburg Campus outlining current procedures for various types of waste disposal. The CWMP-VT will be reviewed annually and updated as appropriate.

2.0 Policies

Virginia Tech Climate Action Commitment (Presidential Policy Memorandum No. 262, Rev 1.)

On June 1, 2009, the Virginia Tech Board of Visitors approved "The Virginia Tech Climate Action Commitment" and it became Presidential Policy Memorandum No. 262. This Virginia Tech Climate Action C established goals and objectives guide the university in a variety of sustainability endeavors to include recycling and waste minimization. The Climate Action Commitment was revised on May 6, 2013 to reflect numerous sustainability accomplishments and lessons learned. See Presidential Policy Memorandum 262, Revision 1: it.vpas.vt.edu/docs/sust/op18/PPM262rev1.pdf, and Appendix 7.6. Point #8 states "Virginia Tech shall minimize waste and achieve a recycle rate of 50% by 2020." While the university has made progress in increasing our recycling rate, much work is needed to achieve the 50% goal. The university has made progress with increasing the recycling rate from 18% in 2004, to 44% in 2012. Several factors have impacted our waste and recycling numbers which has led to our percentage leveling off to a 40% average recycling rate.

University Policy 5505, Campus Energy, Water and Waste Reduction

The purpose of this policy is to guide operations of the university to achieve the highest standards in energy and water usage and waste reduction with the consideration of the impact of environmental quality and economic performance. The university has established procedures to consider waste reduction in the design and operation of university facilities in the most economically and environmentally sensitive manner possible. The university shall strive to reduce the consumption of paper products and disposable supplies, and increase our recycling rate consistent with the commitment. This policy states the Facilities Department (now called the Division of Campus Planning, Infrastructure, and Facilities) has overall responsibility for recycling and trash collection and charged it to develop and implement a comprehensive waste management plan. See policies.vt.edu/5505.pdf.

3.0 Waste Management Overview

In general, the Division of Campus Planning, Infrastructure and Facilities and its Virginia Tech Waste and Recycling unit have the overall responsibility for trash and recycling operations at Virginia Tech. Day-to-day operations are managed by the Director of Building and Grounds and the Grounds Manager while funding is provided through a university waste management central fund. Funded separately to provide food waste composting, Dining Services contracts with Royal Oak Farm (ROF), located in Evington, Virginia. Specialized waste disposal, such as electronic and universal waste, is provided by appropriate university units as described in this document.

All MSW and the majority of recyclable materials from Virginia Tech, the Town of Blacksburg, the Town of Christiansburg, and Montgomery County are taken to the Montgomery Regional Solid Waste Authority (MRSWA) per an agreement signed by the four jurisdictions that serve as members of the Authority. Located in Christiansburg, Virginia, MRSWA operates a transfer station and a materials processing facility for segregated corrugated cardboard. Municipal Solid Waste (trash) is transported from campus, to MRSWA, where it is weighed, and further transported to the local landfill operated by the New River Resource Authority (NRRA) in Pulaski County, near Dublin, Va.

Recyclable materials are transported from the campus, to MRSWA, weighed, and with the exception of corrugated

cardboard, further transported to Recycling and Disposal Solutions (RDS), located in Roanoke, Va. MRSWA processes and sells the corrugated cardboard to various paper mills. RDS serves as the recycling "hub" for our region, receiving recyclable materials from both the New River and Roanoke Valleys. RDS separates the single stream recycling material for sale to vendors.

Food waste is collected from our eleven, on-campus, dining facilities, transported to the Prices Fork Closed Landfill, and placed in a 10-ton "sledge" container. When the container is full, Royal Oak Farm (ROF) transports the waste to their composting facility located in Evington, Va., near Lynchburg. This approximates to once every ten days during the academic fall and spring semesters.

The Commonwealth of Virginia Department of Environmental Quality requires each region of the state to prepare and submit an annual recycling rate report. The report is for the previous calendar year (January 1 to December 31). MRSWA prepares a collective report for its four jurisdictional members and other activities within the region. Virginia Tech uses the DEQ format to calculate our base recycling rate, our waste diversion rate, and our final recycling rate.

Waste management activities across campus differ depending on stream (trash, recycling, composting, reusable materials electronic, universal and hazardous) and building type, therefore various units are responsible for the management of campus waste. The Buildings and Grounds unit has the primary responsibility for trash and recycling as coordinated by the DCPIF, along with campus wide campus waste management planning and policy development.

The management of every material stream on campus has an associated cost. The disposal of trash has been and will continue to be the most expensive method of waste disposal. Diverting waste to other streams such as recycling and reuse will decrease waste management costs for the university. The least expensive method for waste disposal is, however, avoiding the creation of waste whenever and wherever possible. Virginia Tech has implemented several methods to reduce the creation of waste to include reusable mug discounts, refillable water bottle stations, reusable to-go containers and waste reduction measures for student move in and move out.

The collection process for MSW and recycling materials begins with the occupants of each building. Building occupants are responsible for taking their recyclable materials from their offices, rooms, or work stations to a central collection location. The Housekeeping staff for the administrative and academic buildings is typically responsible for transferring these materials from the central collection location in the building, to a designated pick-up location outside the building. The Director of Buildings and Grounds for the Division of Campus Planning, Infrastructure, and Facilities, has the overall responsibility for trash and recyclable materials collection outside the buildings, and for delivery to the MRSWA facilities, or to another location if deemed applicable.

The auxiliary units (dining, housing and residential life) for the Division of Student Affairs and all other auxiliary units will continue implementing and maintaining internal procedures for moving trash and recycling to a central location outside the buildings. The Building and Grounds unit utilizes a combination of waste and recycling crews and contracted services to manage MSW and recyclable materials. Specialized wastes are referred to the office of Environmental Health & Safety. In-house crews provide daily collection of single-stream recycling and trash from several hundred small outside collection receptacles. Contracted services employees provide daily and weekly trash collection of our large trash containers including the trash compactors at designated dining facilities locations. Recycling containers are located in the Overflow Parking Lot located near the Duck Pond for volunteer recycling of corrugated cardboard and single-stream recycling.

Additional contracted support is utilized for special events such as student move-in, home football games and student move-out. Experience shows student move-in generates nearly 30 tons of corrugated cardboard. The university adds temporary receptacles to ensure this waste stream is captured and processed appropriately. Virginia Tech normally hosts six or seven home football games which results in increases with both recycling materials and trash. During student move-out provisions are made for the collection of usable discards through the very popular "Y-Toss" program. The YMCA at Virginia Tech and Virginia Tech Buildings and Grounds staff co-sponsor "Y-Toss" and includes participation from students, staff, faculty and local volunteers. Reusable items are collected, inspected and stored by the YMCA Thrift Store during the summer, and offered for sale prior to the start of the fall semester. The "YToss" program provides students with leadership opportunities for planning and execution, and it is the recipient of a Governor's Environmental Excellence Award.

4.0 Campus Waste Streams -Operations and Responsibilities

As previously mentioned the Virginia Tech Division of Division of Campus Planning, Infrastructure, and Facilities has the overall responsibility for trash and recycling operations. This is accomplished through the Buildings and Grounds unit handling the day to day operations. Funding is provided through the university waste management central fund. Three major financial costs are associated with the disposal of Virginia Tech's MSW: rental fees for outdoor receptacles, fees charged for the removal of each ton of waste produced on campus (hauling fees), and

fees charged for disposing of material at the transfer station (tipping fees). Food waste composting is funded separately through a contract established by Dining Services with Royal Oak Farm located in Evington, Virginia. Specialized waste, such as electronic waste, is provided by appropriate university units and disposal fees are paid through a central fund managed by the Office of Environmental Health & Safety. The same fund is used to pay for proper disposal of chemical, radiological, and biological wastes.

Below is a listing of waste collected, the responsible party for collection and removal, and contact information. Should you have questions about topics not included in the information below, please contact Nathan King in the Sustainability Office at 540-231-5184 or by email, naking@vt.edu.

4.1 | Trash (Windell Jones - 540-231-9916, jonesjw@vt.edu)

- Republic Services (Outdoor large bins, Athletic Facilities).
- Meridian Waste (Some outdoor large bins).
- Virginia Tech Waste Management & Recycling (Big Belly Solar Trash Compactors, Parking Lot Cans, and Special Pick-ups).
- University Facilities Housekeeping and Residential Services Housing Unit each play a distinctive roll in waste removal from campus buildings.
- Montgomery Regional Solid Waste Authority (MRSWA) in Christiansburg, VA, receives our trash in their transfer station and then sends trash to the New River Resource Authority (NRRA) Landfill in Dublin, VA.

4.2 | Recycling (Windell Jones - 540-231-9916, jonesjw@vt.edu)

- Meridian Waste (Outdoor large bins, Athletic Facilities, Tailgate Recycling).
- VT Waste Management & Recycling (Yard and Wood Waste, Big Belly Recycling Containers and Special One-Time Pick-ups).
- University Facilities Housekeeping and Residential Services Housing Unit each play a distinctive roll in recycling operations for campus buildings.
- Montgomery Regional Solid Waste Authority (MRSWA) in Christiansburg, VA, receives the majority of our Principal Recyclable Materials (PRMs) and transports our single stream recycling material to Recycling & Disposal Solutions (RDS) located in Roanoke, VA. RDS further processes single stream material and sells it to various markets. MRSWA processes our cardboard and sells it to Virginia paper mills.

4.3 | Food Waste Composting (Blake Bensman - 540-231-3064, bensman@vt.edu)

- Meridian Waste collects food waste from all campus dining facilities for transport to the Prices Fork Closed Landfill and placement in 10-ton Sledge Containers. Food waste from the Athletic Department or The Inn at Virginia Tech and Skelton Conference Center is currently not composted.
- Royal Oak Farm (ROF) owns the Sledge Containers. When full, ROF swaps out the full container for an empty one and transports the full container about 77 miles to their composting facility at Evington, Virginia (near Lynchburg) and are the only DEQ permitted composting facility in Southwest Virginia.

4.4 | Electronic Waste (Kenny Osborne - 540-231-2509, kosborne@vt.edu)

- Environmental Health and Safety collects and recycles electronic waste (e-waste) and consists of computer monitors, computers, computer cables, and other electronic devices.

4.5 | Universal Waste (Kenny Osborne - 540-231-2509, kosborne@vt.edu)

- Environmental Health and Safety (EHS) collects and recycles universal wastes which includes batteries, fluorescent tubes and lamp ballasts.

4.6 | Hazardous Waste (Kenny Osborne - 540-231-2509, kosborne@vt.edu)

- Environmental Health and Safety collects and manages the disposal of all hazardous waste from the university. Approximately 70 percent of this comes from laboratory operations and 30 percent from facilities operations.

4.7 | Lab Waste (Kenny Osborne - 540-231-2509, kosborne@vt.edu)

- Environmental Health and Safety (EHS) collects and manages the disposal of all hazardous and non-hazardous laboratory waste from the university.

4.8 | Waste Cooking Oil - (Blake Bensman - 540-231-3064, bensman@vt.edu)

- Valley Protein collects waste cooking oil in barrels from Dining Services and at The Inn at Virginia Tech and Skelton Conference Center.

4.9 | Motor Vehicles (John Falck - 540-231-4955, jwfalck@vt.edu)

- Fleet Services (used tires, waste oil and oil filters, used batteries)
- Environmental Health and Safety (waste oil and oil filters, used batteries)

4.10 | Yard Waste & Wood Waste (Bo Frazier - 540-231-6450, frazierj@vt.edu)

- The Division of Campus Planning, Infrastructure and Facilities Department transports, stores and grinds yard waste (brush and trees) in a designated area at the Prices Fork Landfill.

4.11 | Hokie Stone (Anthony Watson - 540-231-6852, anwatson@vt.edu)

- Virginia Tech owns and operates a 40-acre limestone Quarry in Blacksburg, and uses the stone for the exterior façade of the majority of our on-campus buildings. It is our signature building material called "Hokie Stone."
- Hokie Stone is cut at the Quarry. Stone scrap that cannot be used (called overburden) is ground into gravel for fill material at various project sites.
- On average, the Quarry produces between 1,000 to 2,000 tons of overburden per month, and it is included in our waste diversion rate calculations.
- All About Hokie Stone: vt.edu/about/traditions/hokie-stone
- Video: facilities.vt.edu/department-services/quarry

4.12 | Trash and Recycling for New Construction and Major Renovation Projects (Denny Cochrane - 540-231-5184, dennisc@vt.edu)

- General Contractor responsible for selecting trash and recycling vendors, the placement of collection containers, the disposal of waste and for recording data for our LEED (Leadership in Energy and Environmental Design)

4.13 | Trash and Recycling for Minor Renovation Projects (Denny Cochrane - 540-231-5184, dennisc@vt.edu)

- Contractor is responsible for providing trash and recycling services

4.14 | Virginia Tech Owned Facilities (Windell Jones - 540-231-9916, jonesjw@vt.edu) and Leased Properties in Blacksburg:

- Virginia Tech is responsible for providing trash and recycling services for our owned facilities.
- For properties Virginia Tech leases in Blacksburg, trash and recycling services are in accordance with the lease agreement.
- For properties at the Corporate Research Center leased by Virginia Tech, trash and recycling services are in accordance with the lease agreements.

4.15 | Reoccurring Special Events (Nathan King - 540-231-7358, naking@vt.edu)

- Virginia Tech Waste Management & Recycling Coordinates Services
  - Gobblerfest,
  - Relay for Life,
  - April 16 3.2 Mile Run for 32.
- Dining Services' Hokie Hi Picnic

4.16 | Surplus Property (Ronald Barrett II - 540-231-2177, ronald@vt.edu)

- The Surplus Property Department, located at 1425 South Main Street in Blacksburg, Va., is responsible for receiving and disposing of surplus Virginia Tech property.
- The majority of the items received are repurposed either by re-utilizing them with other university activities, or selling them at their in-person auctions or through govdeal.com. Some scrap pieces are recycled and the remainder go to the landfill.
- Policy 3955: Management of Surplus Property - policies.vt.edu/3955.pdf

4.17 | Y-toss Program (Enrique Rebolledo - outreach@vtymca.org)

- 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 Virginia Tech and all of the profits support the YMCA Student Programs.
- See housing.vt.edu/experience/sustainability/Y-toss

4.18 | Education and Outreach (Sarah Myers - 540-525-6167, midnight@vt.edu)

- The Outreach and Engagement Unit of the Division of Campus Planning, Infrastructure, and Facilities works on outreach and education which includes compiling information and using Virginia Tech sources to reach students and the public regarding any updates within the respective units of Division of Campus Planning, Infrastructure, and Facilities.
- The outreach team additionally provides information, tours and presentations to our partners and others within the campus and off-campus community.

4.19 | Regulatory Communication and Reporting by MRSWA (Alan Cummins - 540-998-5704, acummins@mrswa.com and Sherry Frederick - 540-381-2820 ext. 305, sfrederick@mrswa.com)

- MRSWA provides the region with the assurance of a fully integrated solid waste management plan, which includes closed landfill management, a transfer station, and recycling. mrswa.com. The MRSWA Solid Waste Management Plan includes sections detailing the process of collecting and moving trash, principle recyclable material, and compostable material from campus to MRSWA or other designated facilities. The plan also details waste reduction activities, the recycling of construction and demolition waste, and the disposal of special materials.
- Material types are tracked for regional waste and recycling tonnages that are reported to the Department of Environmental Quality.

5.0 Long Term Goal

During Academic Year 2019-2020 the university took a fresh look at the current Climate Action Commitment. Among a list of 15 goals is the long-term goal for the development of a comprehensive strategy to become a Zero Waste Campus thereby, further reducing waste streams in all campus units. The industry definition of Zero-Waste is keeping 90% or more of our generated waste out of the landfill.

6.0 Conclusion and Recommendations

Continuous improvement in managing waste on our Virginia Tech campus is a priority for the Division of Campus Planning, Infrastructure, and Facilities. Great strides have been made to remove waste and recycling from campus in an efficient, economic and an environmentally conscience manner. As Virginia Tech experiences growth within the campus community, the university will continue to explore opportunities to provide resources and maintain exceptional service to our students, faculty and staff.

Tech aspires to be the best steward of our campus and make available the best methods for disposal of all waste materials without compromising the environment. An evaluation will be completed to determine waste and recycling initiatives for the coming year, along with action items and responsible personnel to perform the tasks needed to achieve approved goals and objectives. Future CWMP-VT revisions will support the Virginia Tech Climate Action Commitment and serve as the necessary documentation for the Sustainability Tracking, Assessment and Rating System (STARS) Rating, the Department of Environmental Quality Annual Recycling Rate Report, and the MRSWA Solid Waste Management Plan.

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.

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.

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 - The Electronic Product Environmental Assessment Tool: **epeat.net**
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.

VIRGINIA TECH

Vice President for Campus Planning, Infrastructure, and Facilities
230 Sterrett Dr., Suite 112 (0127)
Blacksburg, Virginia 24061
Phone: 540-231-6291 Fax: 540-231-4745

MEMORANDUM

TO: Student Organizations

FROM: Christopher H. Kiwus, Associate Vice President and Chief Facilities Officer

DATE: September 21, 2020

SUBJECT: Academic Year 2020-21 Request for Proposal for Sustainability Initiatives by Student Organizations Program (Green RFP Program)

Student engagement is an important factor in advancing sustainability at Virginia Tech. The university has created the Request for Proposal for Sustainability 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 Climate Action Commitment and Sustainability Plan. Since its initiation in academic year 2010-11, the Green RFP Program has provided funds in excess of $1.2 million for 83 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 2021.

Student organizations will submit a proposal(s) using the form titled "Sustainability Initiatives by Student Organizations Funding Proposal" shown in Attachment 2. All four parts of the form must be completed in detail. Part Ill, "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 Dennis C. Cochrane in the Office of Sustainability at **denniscc@vt.edu** by 4 p.m. on November 20, 2020. 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. Cochrane via email or office telephone 540-231-5184. 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 Sustainability website:

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

The Office of Sustainability 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 Climate Action Commitment and Sustainability Plan? See: Presidential Policy Memorandum No. 262 Revision 1 "Update to the Virginia Tech Climate Action Commitment" dated May 8, 2013.**facilities.vt.edu/content/dam/facilities vt edu/sustainability/climate-action-commitment.pdf**
- 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 Office of Sustainability will oversee implementation.

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

c: Dennis C. Cochrane
James S. Hillman
Timothy L. Hodge
Travis W. Hundley
Kenneth E. Miller
Angela S. Page
Frank X. Shushok Jr.
Jonathan C. Teglas

Attachment # 2

STUDENT ORGANIZATIONS SUSTAINABILITY INITIATIVE PROPOSAL 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 sustainability initiative and attach supporting documentation.

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

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.

E. Is this funding request for a One-Time need or an Ongoing need (please check one)?

☐ One-time ☐ Ongoing

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

Attachment # 2

STUDENT ORGANIZATION SUSTAINABILITY INITIATIVE PROPOSAL FORM
(Continued)

Part IV- Requestors/Reviewers	
Prepared By (Name of Contact for Student Organization)	Date
Reviewed By (Name of Appropriate University Official)	Date
Reviewed By (Name of Office of Sustainability Representative)	Date

STUDENT ORGANIZATIONS SUSTAINABILITY INITIATIVE PROPOSAL PROCESS AND TIMELINE

Date	Activity
Sep 21, 2020	Associate Vice President and Chief Facilities Officer announces the 2019-20 Green RFP Program and the Office of Sustainability (OS) notifies student organizations.
Nov 20, 2020	Proposal submission deadline to OS.
Dec 1, 2020	OS coordinates a proposal review for feasibility and completeness.
Jan 25, 2021	Energy and Sustainability Committee receives select proposals, and appoints Subcommittee to review and recommend a priority order.
Feb 22, 2021	Subcommittee presents proposed priority recommendations to the Energy and Sustainability Committee for approval.
Mar 5, 2021 (estimated)	Energy and Sustainability Committee presents proposals to the Office of Budget and Financial Planning for review and funding consideration.
Mar 2021 (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 2021 (estimated)	Vice President for Finance and Chief Financial Officer announces the approved proposals and funding sources.
May 2021 (estimated)	The Office of Budget and Financial Planning transfers funds to the appropriate Green RFP funding codes for proposal implementation.
May 2021 (estimated)	OS initiates Green RFP implementation.

STUDENT ORGANIZATION SUSTAINABILITY INITIATIVE FUNDING PROPOSAL 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.

Area of Expertise	Name	Title	Email
Engineering & Operations, Energy Management	Kim Briele	Director Engineering & Assessment	**sbriele@vt.edu**
Facilities: Housing & Residence Life	Todd Pignataro	Associate Director of Facilities	**ptodd@vt.edu**
Facilities: Buildings & Grounds (Small Renovations)	Jim McDaniel	Project Coordinator	**jmcdani@vt.edu**
Exterior Lighting	Rob Glenn	Director VT Electric Service	**robglenn@vt.edu**
Student Engagement & Campus Life	Spencer Stidd	Associate Director for Events Services	**sstidd@vt.edu**
Dining Services & Housing (student Affairs)	Blake Bensman	Sustainability Manager	**bensman@vt.edu**
Alternative Transportation (Bus, Bike, & Walk/Electric Vehicles)	Nick Quint	Transportation Network Manager	**nquint@vt.edu**
Landscape Architecture	Melissa Philen	Site Planner	**mnphilen@vt.edu**
Hahn Horticulture Garden	Scott Douglas	Director/Instructor	**dsd1@vt.edu**
Recycling and Waste Management	Denny Cochrane	Director Office of Sustainability	**denniss@vt.edu**
Other Sustainability Topics	Nathan King	Sustainability Manager Office of Sustainability	**naking@vt.edu**