



VIRGINIA TECH™

2020 VIRGINIA TECH

Climate Action Commitment Working Group Final Report

EXECUTIVE SUMMARY AND OVERVIEW

November 2020

7 TIME WINNER OF GOVERNOR'S ENVIRONMENTAL EXCELLENCE AWARD

#14 ON PRINCETON'S REVIEW TOP 50 GREEN COLLEGES OF 2019

24% REDUCTION IN GREENHOUSE GAS EMISSIONS SINCE 2006



EXECUTIVE SUMMARY

From January to June 2020, the Virginia Tech Climate Action Commitment Working Group executed its charge to evaluate the university's current position and future role in addressing climate change.

This summary report and the much longer full 2020 Virginia Tech Climate Action Commitment Working Group Report, Subcommittee Reports, and associated appendices provide a clear road map for not only how Virginia Tech can do its part to address climate change, but also become a leader in taking bold action to combat this worldwide crisis.

Throughout 2020, a global pandemic brought unprecedented hardship and suffering, particularly for the most vulnerable among us. In this public health crisis, citizens are learning an important lesson: when experts are near unanimous in ringing the alarm bells on looming crises, society must take decisive action.

This unique time is engendering a tremendous spirit of innovation and collaboration that is highly applicable to the Climate Action Commitment revision process.

In late 2019 – prompted by the demands of students and other community members involved in climate strikes and resolutions from the Faculty and Staff Senates, Student Government Association, and Graduate Student Assembly – President Tim Sands and Senior Vice President and Chief Business Officer Dwayne Pinkney established a Climate Action Commitment Working Group comprised of 26 faculty, students, staff, and community members. In announcing the creation of the Working Group, President Sands stated that “climate change presents one of the world's most pressing problems...and Virginia Tech has a duty to respond.”

The Working Group was charged to assess the university's progress in implementing the 2009/2013 Virginia Tech Climate Action Commitment, compare our experience to peer institutions, and develop a new commitment. Virginia Tech, like other universities, is facing both short-term fiscal challenges and long-term uncertainties in these challenging times. Nonetheless, the university remains committed to taking bold action to do its part to address the climate emergency.

Please read on to learn more about the 2020 Virginia Tech Climate Action Commitment. The full Working Group Report and other pertinent documents and information may be found at svpoa.vt.edu/index/VTACRevision. Chapter references that follow are applicable to the full report.

WORKING GROUP PROCESS

In order to engage a broad range of expertise and perspectives from across the university and wider community and conduct an ambitious work program, the Working Group established 12 subcommittees including a total of 130 faculty, students, community members, and staff to investigate and discuss specific issues relevant to the commitment. Most of the subcommittees met weekly from early February through the end of May. The subcommittees included:

- ▶ Agriculture, Forestry, and Land Use
- ▶ Budget and Finance
- ▶ Buildings Opportunities
- ▶ Climate Justice
- ▶ Community Engagement
- ▶ Energy Opportunities
- ▶ Greenhouse Gas (GHG) Inventory
- ▶ Peer Institutions Comparison
- ▶ Renewables Opportunities
- ▶ Structuring Sustainable Choices
- ▶ Transportation Opportunities
- ▶ Waste-Recycling-Composting and Procurement

The Working Group developed several mechanisms to expand community involvement in the process, including a website and email address for comment and two online surveys. Plans for face-to-face town hall meetings and conference sessions had to be reimaged when the university shut down after spring break. In place of the in-person events, the Working Group hosted 12 Zoom Convening sessions in April, attended by over 220 participants who provided excellent feedback. In anticipation of these Convening sessions, the Working Group and its subcommittees also developed ten creative videos that describe the Climate Action Commitment proposals. Learn more about campus community engagement in the process and access videos at svpoa.vt.edu/index/VTCACRevision.

The Working Group's efforts have focused on developing effective strategies the university can advance to achieve meaningful climate action. Throughout the multitude of Working Group, subcommittee, and community Zoom meetings, discussions have also reflected on the important opportunity for Virginia Tech to reinvent itself, not only in its commitment to climate action, but also in its responsiveness to the needs of the world around us, in the spirit of *Ut Prosim*.

The recommended Climate Action Commitment is bold, aggressive, and comprehensive. Its goals range from necessary upgrades to the campus physical plant to reduce GHG emissions, to integrating those improvements into the educational mission through a Climate Action Living Laboratory, to engaging everyone in creating a culture of sustainability—all to position Virginia Tech as a leader as the clean energy economy evolves in the Commonwealth and the world.

PROGRESS IMPLEMENTING 2009 VIRGINIA TECH CLIMATE ACTION COMMITMENT

Virginia Tech has made considerable progress in implementing its 2009/2013 Climate Action Commitment (2009 Virginia Tech Climate Action Commitment) over the past decade. The 2009 Virginia Tech Climate Action Commitment and Sustainability Plan was a cutting-edge effort for its time, but a decade later it fails to prescribe what climate scientists recognize as necessary actions and also falls short of many peer universities' recent initiatives.

In many respects, however, Virginia Tech has been forging ahead beyond the 2009/2013 Climate Action Commitment. Virginia Tech is a recognized leader in campus sustainability with a Sustainability Tracking and Rating System (STARS) Gold score 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 (#12 in 2019), the Governor's Environmental Excellence Award (7 times), Best Workplaces for Commuters (every year, gold in 2019-20), Bicycle Friendly Campus (every year, silver level in 2019), Tree Campus USA certification (every year), and many others.

The university has reduced greenhouse gas (GHG) emissions by 24 percent from 2006-19, despite 22 percent growth in campus building size and enrollment. This reduction is faster than the 2009 Climate Action Commitment targeted trajectory. It resulted from investments in energy efficiency in existing and new buildings, and most importantly, from replacing coal with natural gas in the steam plant, which was enabled by a new gas pipeline. Virginia Tech now has 36 LEED-certified buildings constructed or in process, amounting to 30 percent of campus space, and in 2015-20 the university invested \$14 million in energy efficiency improvements, resulting in energy and dollar savings with a 5-year payback.

Virginia Tech has done much to develop alternative transportation choices, including dual use trails, bike share, ride share, and car share programs. The university has had record ridership on its partner Blacksburg Transit and innovative plans for campus mobility. Virginia Tech has a functional, although fragmented, waste management program with an 80 percent waste diversion rate (waste diverted from landfill) and 40 percent recycling rate, although shy of the 50 percent by 2020 goal of the 2013 Virginia Tech Climate Action Commitment. In April 2020, the Procurement Department unveiled a Sustainable Procurement Policy; and in May, the Facilities Department produced new Design and Construction Building Standards, both reflecting the ideals of the Virginia Tech Climate Action Commitment.



The university has an enviable array of sustainability-related academic programs, majors, coursework, and research, in green engineering, natural resources, agriculture, power and energy systems, environmental policy, and smart and sustainable cities. In the STARS rating system, Virginia Tech scores 89 percent of possible points in academic categories. It also scores 95 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. Indeed, these student groups have energized the university community to move forward on climate action, both in 2008 and in 2019.

The Division of Campus Planning, Infrastructure, and Facilities has embraced sustainability and climate action as part of its mission, and the Office of Sustainability is second to none, even with limited staff. The university has the highly unique and valuable Virginia Tech Electric Service (VTES), a university-owned electric energy utility system, which serves not only the campus, but also 6,000 Town of Blacksburg customers.

In other areas, however, the university is falling behind. Although the 2009/2013 Virginia Tech Climate Action Commitment was a leading effort for its time, from the perspective of 2020, it is limited in both scope and ambition. It did not include several sources of campus GHG, such as agriculture, business travel, and leased building space, the latter amounting to 13 percent of operational square footage. It did not mention renewable energy nor the human cost of climate change. Furthermore, its overall goal of an 80 percent reduction in GHG from 1990 levels by 2050, while a typical goal for its time, is not aggressive enough compared to the contemporary needs for climate action and the national movement of our peer institutions.

2020 VIRGINIA TECH CLIMATE ACTION COMMITMENT

The major product of the Working Group is a new Climate Action Commitment. It aims to be bold and visionary, but also comprehensive and pragmatic for a leading academic institution. Goals 1-9 target physical means to achieve carbon neutrality by 2030, Goals 10-14 address education, culture, social equity, and engaged implementation, and Goal 15 sets a longer-range goal of a fossil-fuel-free campus. The Working Group also developed a set of potential pathways to achieve each goal. The table to the right lists the goals, and they are presented with summary pathways. More detailed pathways are presented in chapter 2.

Vision of the 2020 Virginia Tech 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 2020 Virginia Tech Climate Action Commitment

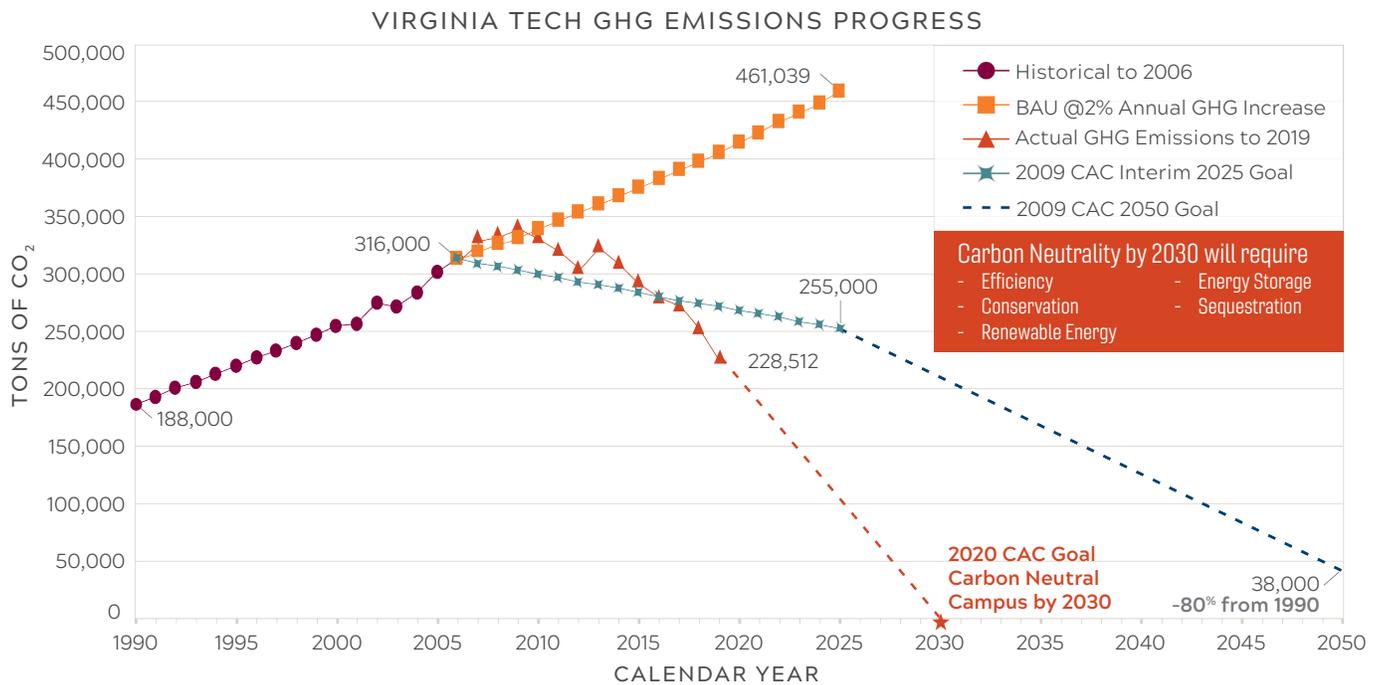
The mission of the 2020 Virginia Tech Climate Action Commitment is to achieve carbon neutrality by changing the university's physical infrastructure, collective and individual behaviors, and educational mission; to engage everyone in creating a culture of sustainability; and to achieve these objectives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

2020 VIRGINIA TECH CLIMATE ACTION COMMITMENT GOALS

1. Achieve a carbon neutral Virginia Tech campus by 2030.
2. Achieve 100 percent renewable electricity by 2030.
3. 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.
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 the 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 Climate Action Commitment into Virginia Tech's educational mission through the Climate Action Living Laboratory beginning in 2021.
11. Establish climate justice as a core value of the Virginia Tech Climate Action Commitment.
12. Diminish barriers to sustainable behaviors through institutional change, education and social marketing.
13. 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.
14. Develop innovative budgeting and financing mechanisms to generate funding and staffing to achieve Climate Action Commitment goals.
15. Develop Pathways after 2030 to eliminate fossil fuels and carbon offsets by 2050.

2020 Virginia Tech Climate Action Commitment: SUMMARY OF GOALS AND PATHWAYS

1. Carbon Neutral Virginia Tech Campus by 2030.



Carbon neutral equals net-zero emissions of CO₂, CH₄, and NO₂ from Virginia Tech operations at Blacksburg campus based on the geographic and GHG scope of the 2020 Climate Action Commitment.

POTENTIAL PATHWAYS:

- ▶ 100 percent renewable electricity by 2030 can reduce emissions by 50 percent below 2019 levels.
- ▶ Total conversion from coal to natural gas in steam plant by 2025 can reduce GHG by 10 percent below 2019.
- ▶ Reduction of energy use in existing and new buildings can result in further emissions reductions of 10 percent, despite campus growth.
- ▶ Reduction of GHG from waste/recycling, transportation, and agriculture, forestry, and land use described below can reduce emissions by 10 percent.
- ▶ In 2030, remaining emissions can be negated by carbon offsets.

2. 100 Percent Renewable Electricity by 2030.

POTENTIAL PATHWAYS:

- ▶ 2020: achieve 30 percent renewable electricity via purchase of 20 percent renewable energy certificates (RECs) from APCO + APCO 10 percent renewable portfolio.
- ▶ 2020-2030: Achieve 100 percent renewable electricity by 2030 via combination of Virginia Tech rooftops/lands solar (15 MW), 3rd party owned PPA, and APCO owned SWVA PPA solar capacity (130 MW+15 MW=145 MW) to serve campus (95 MW) and town customers (50 MW) for 60 percent of needs plus 30 percent APCO renewable portfolio and 10 percent RECs to cover steam plant cogeneration.
- ▶ Integrate solar development into the Climate Action Living Laboratory (CALL) of academic instruction and research, including dual-use solar-farm production agrivoltaics; a 10-MW storage testbed/showcase project for smart micro-grid reliability and resilience research through Virginia Tech Electric Service and the Virginia Tech Power and Energy Center; and other instruction/research initiatives.
- ▶ As with all components of this Climate Action Commitment, full lifecycle analysis of renewables procurement should include the environmental and social justice costs and benefits of procured systems.
- ▶ The siting of renewable energy systems should employ best practices in public engagement to identify the most appropriate locations.



3. 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.

POTENTIAL PATHWAYS:

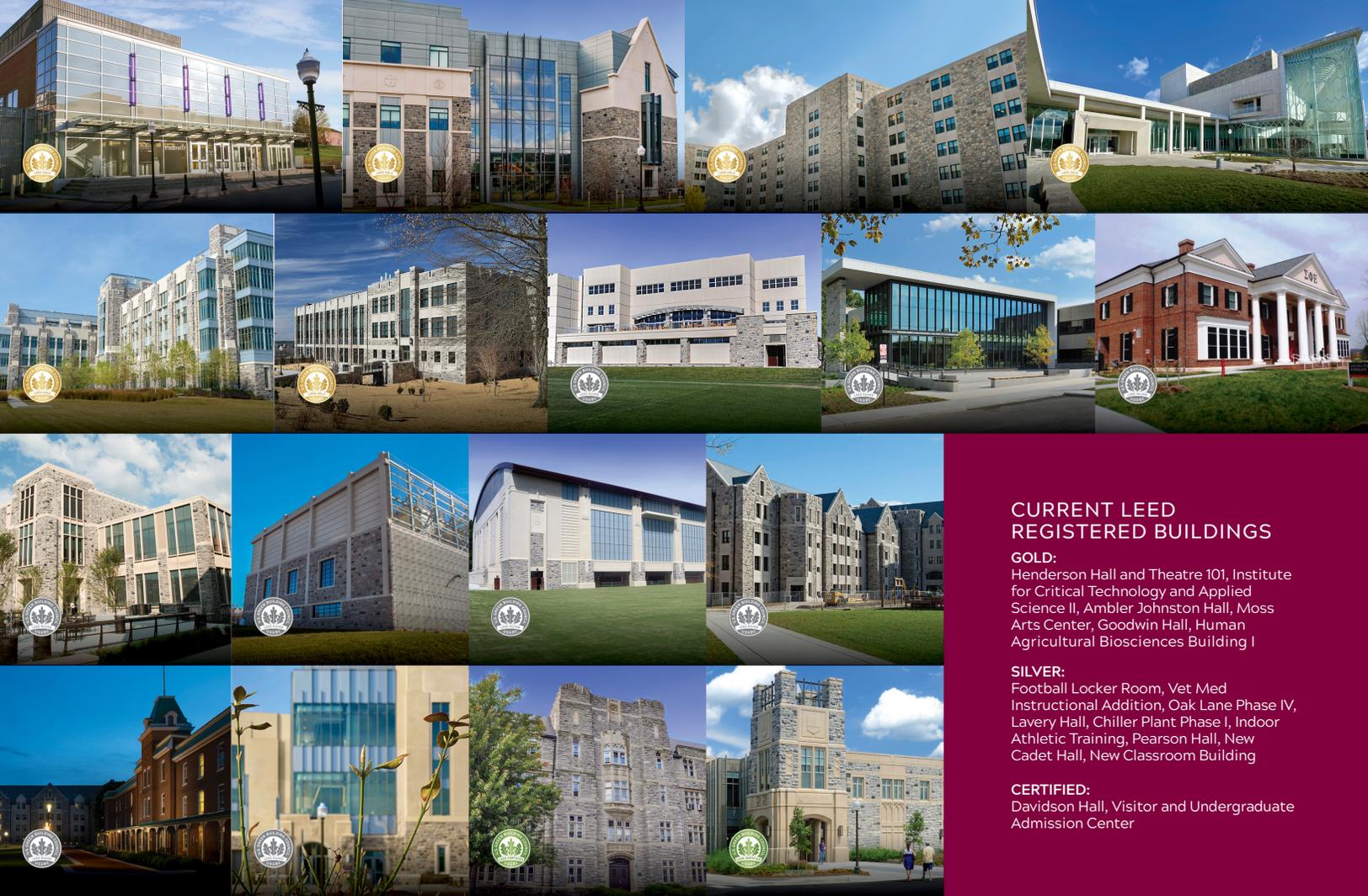
- ▶ Addition of gas boiler #12 provides natural gas thermal capacity for all steam plant demand.
- ▶ VT's new natural gas service contract signed in summer 2020 and effective until 2025, provides favorable price and reliability terms and prospects for renewable gas.
- ▶ For reliability and resilience, a plan is needed for backup fuel (such as liquefied natural gas (LNG), biochar, or other fuel) when natural gas is unavailable, and boiler redundancy (so-called "n+1") in case of a boiler outage at a critical time.
- ▶ Improve chiller efficiency: By 2023 the Chiller Plant Phase II capital project will reduce central chiller energy usage by 20% from 2020; future campus growth needs for chilled water will be met from central plants where possible.
- ▶ Ten-year 2021-30 Energy Management Plan will improve efficiency of stand-alone chilled water plants
- ▶ Establish an online Climate Action Living Laboratory (CALL) Energy Dashboard for faculty, staff, and students to access and analyze campus facilities energy use data for instruction and research.
- ▶ After 2025, plan for transition to renewable energy in heating systems, considering renewable gas, geothermal and ground source heat pump systems, and other non-fossil-fuel options for heating existing and new districts of campus.
- ▶ Beginning with the CAC 2025 revision, develop a plan for full transition to renewable energy for campus heating systems. To promote zero emissions energy options in the plan, refine GHG inventory estimates of methane leakage from VT natural gas sources and include those estimates of methane leakage in the carbon neutral goal for 2035.

4. Reduce Building Energy Consumption to Enable Carbon Neutrality by 2030.

- ▶ By the end of 2022, reduce electricity consumption (kWh) by 10 percent and electricity intensity (kWh/gsf) by 20 percent below 2006 levels.
- ▶ By 2030, employ energy management retrofits to reduce total energy consumption in all buildings by 10 percent and energy use intensity (Btu+kWh/gsf) by 20 percent below 2020 levels.

POTENTIAL PATHWAYS:

- ▶ Implement an aggressive 2021-30 ten-year energy management plan updated annually to reduce total energy consumption in all buildings including auxiliaries by 10 percent.
- ▶ For leased buildings owned by the Virginia Tech Foundation, work with the Foundation to develop financial arrangements to improve efficiency and reduce emissions.
- ▶ By 2021, develop a campus-wide Climate Action Living Laboratory Green Lab program based on a pilot test-bed Green Lab to reduce energy, emissions, and materials in our most energy-intensive facilities.
- ▶ Reduce building energy and GHG emissions by smart operations, such as demand response, digital controls, thermostat settings, occupant behavior, and innovative space scheduling, especially in summer.
- ▶ Achieving these goals will require sufficient staffing in energy management.



CURRENT LEED REGISTERED BUILDINGS

GOLD:

Henderson Hall and Theatre 101, Institute for Critical Technology and Applied Science II, Ambler Johnston Hall, Moss Arts Center, Goodwin Hall, Human Agricultural Biosciences Building I

SILVER:

Football Locker Room, Vet Med Instructional Addition, Oak Lane Phase IV, Lavery Hall, Chiller Plant Phase I, Indoor Athletic Training, Pearson Hall, New Cadet Hall, New Classroom Building

CERTIFIED:

Davidson Hall, Visitor and Undergraduate Admission Center

5. Operations of New Buildings Initiated by 2030 will be Carbon Neutral.

- ▶ New building efficiency will conform to latest adopted LEED-Silver standards and ASHRAE 90.1 energy performance standards + 10 percent.
- ▶ By 2022, reduce total energy use intensity (EUI) in newly initiated buildings by 20 percent compared to 2020 existing buildings.
- ▶ By 2026, build a signature zero-net-energy (ZNE) building on campus as a showcase and learning model for the Climate Action Living Laboratory.
- ▶ By 2028, newly initiated buildings' efficiency improvements will reduce total energy use intensity (EUI) in new buildings by 40 percent compared to 2020 existing buildings.

POTENTIAL PATHWAYS:

- ▶ In 2021, identify candidate new buildings for a showcase zero-net-energy (ZNE) building and begin fundraising to attract donors to help fund the project to be completed by 2026.
- ▶ Electricity currently contributes 50 percent of total GHG emissions. One hundred percent renewable electricity by 2030 will reduce building CO₂ emissions by more than 50 percent.
- ▶ By 2030, all newly initiated building design will have carbon neutral operations through 100 percent renewable electricity, improved energy efficiency, and carbon offsets.
- ▶ Post-occupancy evaluation (POE) should become standard practice to fine tune building operations and engage occupants to better serve users and reduce emissions.
- ▶ New buildings offer opportunities for campus Climate Action Living Laboratory research and instruction by faculty and students through field testing and use of emerging technologies, monitoring energy use, air quality, and occupant perceptions, and other projects.
- ▶ Achieving these goals will require sufficient engineering and design staffing.



6. Agricultural, Forestry, and Land Use Operations Go Carbon Neutral by 2030.

POTENTIAL PATHWAYS:

- Develop the University Compost Facility at Kentland to provide benefits to campus organic waste management, help reduce animal waste GHG emissions, support soil health, and reduce need for new land for future land application of animal wastes.
- Adopt Campus Tree Policy to increase canopy cover from 16-to-25 percent and manage Virginia Tech trees, forests and woodlands to increase carbon sequestration and provide additional environmental benefits.
- Reduce agricultural and forestry net GHG emissions through more efficient operations, reduced animal enteric fermentation emissions, improved energy and fuel efficiency, possibly an anaerobic digester to produce usable methane, and other means.
- Use Virginia Tech agricultural lands to develop solar farms toward renewables goal, including co-use solar and farmland agrivoltaics for Climate Action Living Laboratory instruction and research.
- In 2030, offset any remaining net GHG emissions from agricultural/forestry operations with solar production from Virginia Tech agricultural land and/or by purchasing carbon offsets.

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

POTENTIAL PATHWAYS:

- Hire a zero-waste consultant to conduct a waste audit study and plan to evaluate organization, procedures, and staffing to enhance campus waste management.
- Based on consultant recommendations, consider hiring a campus waste manager.
- Engage personnel involved in campus waste management on a Waste/Recycling Council to help streamline operations and reduce redundancies.
- Develop University Compost Facility at Kentland to process campus organic waste from dining halls and athletics, veterinary and agriculture animal waste, yard trimmings, wood waste, non-recyclable soiled paper, and other compostables.
- Engage faculty, students, and staff in greater use of recycling/compost behavior using social marketing and media, incentives, and innovative approaches to advance Circular Economy and Pollution Prevention (P2) principles as part of the Climate Action Living Laboratory.
- Evaluate and improve as needed the management of specialty wastes, such as e-waste, laboratory waste, construction debris, and wastes from major sporting and other events.

8. Establish the Sustainability Procurement Policy and Procedures by 2022.

POTENTIAL PATHWAY:

- On a pilot basis, adopt, implement, and evaluate the 2020 Sustainable Procurement Policy.
- In 2022, the Energy & Sustainability Committee will assess the pilot project and work with the Procurement Department to formulate the Sustainability Procurement Policy v.2.



9. Reduce Single-Occupancy Vehicle (SOV) Commuting to Campus by 20 percent by 2025 and Reduce Transportation Related GHG Emissions by 40 percent by 2030.

POTENTIAL PATHWAYS:

- ▶ Promote walking/biking/transit as the preferred means of commuting to campus: Use parking policies, alternative transportation programs, campus mobility planning in collaboration with Town of Blacksburg, and encourage Blacksburg Transit (BT) programs to improve the safety and convenience of and promote walking, biking, and transit.
- ▶ Promote sustainable mobility choices through marketing, including social media, parking permit literature, gaming, university promotion literature and website, and student orientation.
- ▶ Promote non-commuting work and learning opportunities such as telecommuting, innovative online instruction, Internet conferencing, and other means.
- ▶ Improve infrastructure and traffic management to improve mobility choices and safety by reducing speed limits, improved bike and pedestrian path lighting, limiting/restricting vehicles in core campus, implementing current transportation plans, and coordinating with Town of Blacksburg plans.
- ▶ Improve vehicle efficiency and promote low-carbon emissions vehicles through Motor Pool purchases and development of electric vehicle charging stations on campus.
- ▶ Promote social equity in mobility and parking policies by developing effective and efficient commuting options for lower wage employees who cannot afford to live in Blacksburg, sliding-scale parking fees based on salary/wage, and collaboration with the Town of Blacksburg to provide affordable workforce housing proximate to campus.
- ▶ Reduce and negate business travel GHG emissions with carbon offsets.
- ▶ Establish an alternative mobility subcommittee of the Transportation and Parking Committee to recommend strategies to increase the non-SOV mode share on campus.

10. Integrate the Climate Action Commitment into Virginia Tech's Educational Mission through the Climate Action Living Laboratory (CALL) Beginning in 2021.

POTENTIAL PATHWAYS:

- ▶ Recognize the excellent opportunities for student learning, faculty and student technical research, and staff development. Benefits include learning from and innovating creative solutions in-house for Virginia Tech's climate initiatives and better engaging the entire university both in Blacksburg and other Virginia Tech locations in our quest for sustainable and just climate action.
- ▶ Establish the Climate Action Living Laboratory (CALL) in the new University Office for Climate Action and Sustainability (OCAS) to enhance offerings and build bridges between facilities and academic departments, facilitating and supporting opportunities.

- ▶ Alter norms and incentives to overcome traditional barriers and nurture cooperation between academic units (research and teaching) and operations units such as Division of Campus Planning, Infrastructure, and Facilities and auxiliary units including Dining Services, Housing and Residence Life, and Athletics. Greater collaboration between university units will help implement the Climate Action Commitment and integrate physical plant climate action with academics and campus life.
- ▶ Integrate Climate Action Living Laboratory (CALL) initiatives in other goals/pathways for renewables (2), energy materials, devices and systems (3), buildings (4, 5), agriculture (6), waste (7), transportation (9), climate justice (11), sustainable behaviors (12), and community engagement (13).
- ▶ 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.
- ▶ 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.

11. Establish Climate Justice as a Core Value of the Climate Action Commitment.

POTENTIAL PATHWAYS:

- ▶ Encourage an accelerated transition to carbon-neutral status as a climate-justice imperative.
- ▶ Ensure that the social impacts of Virginia Tech’s climate mitigation choices (e.g. energy, land use, and waste) are identified and addressed to the greatest extent possible.
- ▶ Establish a Climate Justice Subcommittee of the revised Climate Action, Sustainability, and Energy (CASE) Committee by 2021 with representation from students, faculty, and community members from frontline groups.
- ▶ Ensure that Virginia Tech climate action implementation plans recognize and assist vulnerable or frontline groups adversely affected by those plans, including low-wage Virginia Tech employees, tuition-paying students, VTES town ratepayers, historically marginalized people of color and Indigenous communities, coalfield communities, and others.
- ▶ Establish education, research, and outreach programs to assist vulnerable and historically marginalized groups mitigate and adapt to climate change and thrive in the new energy economy. These efforts should specifically target Virginia Tribes, African Americans in the New River Valley, coalfield communities in southwest Virginia, and coastal Virginia communities threatened by climate-related hazards.

12. Diminish Barriers to Sustainable Behaviors through Institutional Change, Education, and Social Marketing.

POTENTIAL PATHWAYS:

- ▶ Implement infrastructural changes—from waste management to transportation to building operation—to make sustainable choices easier.
 - › Identify structural, social and institutional barriers to sustainable behaviors.
 - › Develop educational programs to foster pro-environmental behavior change.
- ▶ Design and implement choice architecture or “nudges” to promote sustainable behavior, while allowing for individual choice, using social media, gaming, and other means.
- ▶ Develop a shared toolkit of best practices in social marketing, rooted in behavioral sciences, for campus groups initiating sustainability initiatives.
- ▶ Nurture cross-campus partnerships to coordinate climate action and enhance sustainability initiatives.



13. Implement the Virginia Tech Climate Action Commitment.

... at a high level of university administration and governance;

... by integrating Climate Action goals for facilities, education, and campus culture; and

... with ongoing stakeholder engagement for evaluation of goals and progress.

POTENTIAL PATHWAYS:

- ▶ **Governance:** By fall 2021, restructure the university Energy and Sustainability Committee (E&SC), renaming it the Climate Action, Sustainability, Energy (CASE) Committee, and revising its charge, membership, and reporting, to oversee the implementation and review of the Climate Action Commitment goals and progress involving student, faculty, and staff stakeholders.
- ▶ **Implementation/operations:** Appoint a new university Chief Climate Action and Sustainability Officer (CCASO) to direct a reconstituted University Office of Climate Action and Sustainability (OCAS) to oversee Climate Action Commitment implementation and other campus sustainability initiatives. The CCASO would jointly report to the Senior Vice President and Chief Business Officer and to the Executive Vice President and Provost. The CCASO would chair the CASE Committee. The Facilities Division would, in parallel, appoint a director of strategic success to oversee a range of strategic Facilities issues including climate action and sustainability.
- ▶ **Learning:** Establish the Climate Action Living Laboratory (CALL) in the new OCAS to enhance offerings and build bridges between facilities and academic departments, facilitating and supporting opportunities (Goal 10).
- ▶ **Duties of Operations and Governance units:**
 - › Collect data relevant to the Climate Action Commitment including GHG inventory and prepare an Annual Report of Climate Action Commitment progress each fall semester for the previous fiscal year.
 - › Establish mechanisms to engage and educate the Virginia Tech community on the Climate Action Commitment and climate action.
 - › Establish ad hoc committees to develop instructional, research and outreach programming for the Climate Action Living Laboratory (CALL).
 - › Evaluate Climate Action Commitment goals according to best practices in light of new information and standards and direct update of the Climate Action Commitment on a five-year cycle.
 - › Broaden the geographic scope of the Climate Action Commitment to all Virginia Tech properties in future iterations to include the entire university.
 - › Advocate for allocation and prioritization of resources to support the Climate Action Commitment.
- ▶ **Annual review:** Conduct an in-depth annual review of the Climate Action Commitment goals and implementation, progress that involves student, staff, faculty, and community stakeholders. The results of this review will be shared publicly in an accessible and easy-to-read format.

14. Develop Innovative Budgeting and Financing Mechanisms to Generate Funding and Staffing to Achieve Climate Action Commitment Goals.

POTENTIAL PATHWAYS:

- ▶ Strategically invest university E&G and auxiliary funds to implement the 10-year Energy Management Plan at a level of \$5 million/year in energy efficiency projects with a cumulative 8-year financial payback or 12 percent return on investment.
- ▶ Major investment is needed to implement the pathways for renewable electricity both on Virginia Tech buildings/lands and in the Southwest Virginia region, including the following options:
 - › Virginia Tech-owned and developed projects on Virginia Tech buildings/land and
 - › Utility or third party owned and developed projects on Virginia Tech buildings/land and in SWVA with Virginia Tech power purchase agreement (PPA).

The first option requires major Virginia Tech capital investment but provides greater long-term return and control, while the second requires no Virginia Tech capital but provides less long-term financial return. A combination of the two options may be used to meet the Climate Action Commitment renewables goal.

- ▶ As a unique power utility, VTES has opportunities for investment in renewable energy serving both campus and its town customers.
- ▶ The Virginia Tech Foundation helps the university achieve its goals and may be a valuable partner in implementing the Climate Action Commitment:



- › As owner of most of the leased academic space off campus, the Foundation has already agreed to provide funding for an energy efficiency retrofit pilot project in Corporate Research Center buildings on a revenue neutral basis.
- › Campus solar development provides another opportunity for Foundation investment with appropriate return on that investment.
- ▶ Additional sources of funds to implement the Climate Action Commitment include, federal and state grants, research funding in connection with the Living Laboratory, advancement donations, philanthropic organizations and foundations, and low interest revenue bonds by VTES and auxiliaries.
- ▶ In addition to project funding, implementation of the Climate Action Commitment will require upgrading the staff to rise to the needs of the commitment, especially in energy management, energy and utility systems, building analysis and design, waste management, university compost facility operation, and campus sustainability.

15. Develop Pathways After 2030 to Eliminate Fossil Fuels and Offsets by 2050.

POTENTIAL PATHWAYS:

- ▶ A long-term Utilities Master Plan should fully incorporate the goals of this Climate Action Commitment
- ▶ It is difficult to anticipate how technology, the economy, and public policy will evolve in the next 10-30 years, necessitating revisions along the way:
 - › 2025: 5-year Climate Action Commitment revision review explore options for 2030-2040 timeframe.
 - › 2030: 5-year Climate Action Commitment revision review explore options for 2040-2050 timeframe.
- ▶ Beginning with the CAC 2025 revision, develop a plan for full transition to renewable energy for campus heating systems. To promote zero emissions energy options in the plan, refine GHG inventory estimates of methane leakage from VT natural gas sources and include those estimates of methane leakage in the carbon neutral goal for 2035.
- ▶ Eliminating offsets and fossil fuels would require significant changes in Virginia Tech's physical plant. The university is dependent on natural gas in the steam plant and eliminating natural gas will require replacement by a non-carbon fuel (e.g. biogas, hydrogen, biochar) or a new heating system based not on steam but on hot water perhaps generated by renewable electricity and geothermal ground-source heat pump systems. Some universities are moving in that direction, and Virginia Tech will have much to learn from them about the prospects.

IMPLEMENTATION MILESTONES

The 15 goals and pathways include many target dates for actions or achievement as part of their implementation. They are summarized in the table below, with date, relevant goal number and action milestone.

DATE	ACTION MILESTONE	GOAL
2020	BOV approves 2020 Virginia Tech Climate Action Commitment	
	30 percent renewable electricity	2
2021	E&SC renamed Climate Action, Sustainability & Energy (CASE) Committee	13
	Operation plan for Climate Action Living Laboratory (CALL)	11
	Candidate identified for zero-net-energy new building to be built by 2026	5
	First year of 10-year 2021-30 Energy Management Plan	3,4
	Fishburn Forest student-led assessment	2
2022	2.3 MW solar PV on Virginia Tech rooftop and land	2
	VTES Solarize Program for Town customers, 250 kW net metered	2
	Electricity use 10% below 2006 (Governor's E.O. 43)	4
	Newly initiated buildings EUI 20% below 2020 existing average	5
	Sustainable Procurement Policy v.2. implemented	8
2023	Virginia Tech Foundation energy efficiency plan for leased buildings (CRC)	14
	VTES Community Solar project for Town customers 0.5-1 MW	2
2024	Chiller Phase II Upgrade complete	3
2025	Complete conversion of steam plant fuel to natural gas	3
	Begin planning transition to renewable steam plant fuel	3
	Five-year Climate Action Commitment update: Explore options for 2030-2040	15
	Recycling rate 55%; waste diversion rate 85%; reduce trash to landfill/capita by 25%	7
	Reduce single-occupancy-vehicle commuting by 20%	9
	10 MW solar PV on Virginia Tech lands	2
	Explore geothermal heat pump hot water heating options for new districts	3
2026	Signature Zero-Net-Energy (ZNE) building on campus	5
2027	10 MW battery storage for Virginia Tech Smart Grid research by VT PEC-VTES partnership	2
	35 MW solar PPA with APCO/third party in SWVA including coalfields	2
2028	Newly initiated buildings EUI 40% below 2020 existing average	5
2029	100 MW solar PPA with APCO/third party in SWVA including coalfields	2
2030	Five-year Climate Action Commitment update: Explore options for 2040-50	15
	Carbon neutral campus operations	1
	100% renewable electricity	2
	Total building energy use down 10%; EUI down 20% below 2020	4
	Newly initiated buildings carbon neutral operations	5
	Carbon neutral agriculture/forestry operations	6
	Zero-waste campus	7
	Transportation emissions reduced 40% from 2020	9
2050	Fossil fuel-free campus	15

COSTS AND BENEFITS OF 2020 VIRGINIA TECH CLIMATE ACTION COMMITMENT GOALS AND PATHWAYS

The Working Group assessed the impacts of the 2020 Virginia Tech Climate Action Commitment goals and pathways including GHG emissions, fiscal costs and benefits, and implications for Virginia Tech's educational mission, operations, policies and governance, and culture. These implications are far-reaching and are presented in Chapter 3.

Major benefits are reduction of GHG and enhanced university reputation, culture, and educational programs linked to campus climate action and sustainability.

To implement the Climate Action Commitment goals, there will be costs and benefits for the university:

- Some initiatives (e.g., upgrades to the steam plant) are part of the cost of doing business, and the added costs to incorporate climate action goals may be small.
- Others, such as energy efficiency retrofits, have a positive return on investment.
- Others, including solar electric projects, will require major investment; however, creative power purchase agreements can reduce capital cost and achieve cost-effective results.
- Finally, some projects (e.g., the proposed University Compost Facility at Kentland) require capital and operating expenditures but provide substantial operational and educational benefits.

Effective Climate Action Commitment implementation will require changes in operations and governance. Goal 13 recommends establishing a University Office for Climate Action and Sustainability (OCAS) directed by a Chief Climate Action and Sustainability Officer that reports jointly to the Senior Vice President and Chief Business Officer and the Executive Vice President and Provost.

The university's financial uncertainties resulting from the Covid-19 pandemic require flexibility in implementing the Climate Action Commitment. As presented on the next page, much can be done with limited investment.



IMMEDIATE NEAR-TERM INITIATIVES (2020-22)

Although the 2020 Virginia Tech Climate Action Commitment focuses on 2030 as the target date for its goals, the pathway to those goals begins the day the Climate Action Commitment is officially adopted by the university, if not before. The Working Group has identified a number of initiatives and projects that can and should be acted on in the short term from now until 2022 with full understanding of the current budget constraints of the university. The “shovel ready” initiatives aim to get a jump start on necessary action and to demonstrate the university’s commitment. They are listed below sorted by (a) low-cost/no-cost/revenue-neutral initiatives, (b) ongoing and budgeted projects, and (c) new priorities in need of funding and/or approval. These initiatives are described in Chapter 9.

a. Low/no cost/revenue neutral project/policy/planning initiatives

- ▶ Establish framework for Climate Action Living Laboratory (CALL) through the Office of the Provost and Executive Vice President, college deans, and the Division of Campus Planning, Infrastructure, and Facilities.
- ▶ Restructure the Energy and Sustainability Committee to oversee 2020 Virginia Tech Climate Action Commitment, renaming it the Climate Action, Sustainability, and Energy (CASE) Committee.
- ▶ Establish an alternative mobility subcommittee of the Transportation and Parking Committee.
- ▶ Develop plan for steam plant resilience/redundancy needs to complete conversion to natural gas by 2025.
- ▶ Develop a Utility Master Plan.
- ▶ Develop a Campus Energy Dashboard.
- ▶ Initiate Student Project for Fishburn Wind Energy Assessment.
- ▶ Promote partnership between Virginia Tech Electric Service and the Virginia Tech Power and Energy Center as part of Climate Action Living Laboratory.
- ▶ Initiate partnership with APCO on renewable electricity development.
- ▶ Initiate community relations with VTES Town of Blacksburg customers.
- ▶ Identify candidates for a zero-net-energy building on campus and develop fundraising plan.
- ▶ Engage Virginia Tech Foundation in energy efficiency retrofit plan for leased buildings.
- ▶ Adopt a Campus Tree Policy.
- ▶ Seek external funding for agrivoltaics test array at Catawba Sustainability Center.
- ▶ Implement and evaluate Sustainable Procurement Policy.

b. Ongoing budgeted projects

- ▶ Implement ongoing steam plant and chiller upgrade projects.
- ▶ Evaluate new natural gas contract on implications for Climate Action Commitment goals and pathways.
- ▶ 2020 RECs for 30 percent renewable electricity, continue through 2022 as needed.
- ▶ Implement Design and Construction Standards in light of Climate Action Commitment Goals.
- ▶ Fill the Virginia Tech energy manager position and supplement staff as needed.
- ▶ Implement budgeted projects in the Parking and Transportation Plan.

c. New priority projects in need of funding/approval

- ▶ Establish the University Office of Climate Action & Sustainability (OCAS) and appoint a university Chief Climate Action and Sustainability Officer (CCASO).
- ▶ Develop University Compost Facility at Kentland.
- ▶ Initiate 10-year energy management plan, 2021-30, and develop first year projects.
- ▶ Develop solar projects on campus: 2.3 MW by 2022: Sterrett and other rooftop projects.
- ▶ Implement zero-waste management consultant study.
- ▶ Implement a Green Lab Program.
- ▶ Dedicate consistent, annual funds to maintain existing trails, sidewalks, bicycle infrastructure.
- ▶ Implement transportation infrastructure plans (e.g., MMTF).



COMMUNITY ENGAGEMENT

Engaging the university community in the Climate Action Commitment update was part of the Working Group's charge and a critical component of our effort. The process overall—with its robust network of subcommittees—may be considered a true 'collaborative' enterprise, with over 130 students, staff, faculty, and community members involved. In terms of wider outreach, the Engagement Subcommittee originally planned on holding a major half-day town hall event on campus. Unfortunately, COVID-19 made that impossible.

The group responded by deploying a range of 'physically distanced' engagement activities:

- ▶ Dedicated website portal introducing the Climate Action Commitment process and sharing committee materials.
- ▶ Dedicated email address for the initiative.
- ▶ A series of 10 videos sharing progress of the Working Group and the subcommittees.
- ▶ A survey distributed widely throughout the community with 242 respondents.
- ▶ A series of 12 hour-long Zoom "convenings," attended by at least 226 participants.

Each of these streams of engagement is detailed in Chapter 5, and insights and information collected through them is summarized. Key findings from these various engagement efforts include:

- ▶ The vast majority of participants/respondents believe that climate change is a serious threat, and thus support aggressive action on the part of the university. In fact, many feel that Virginia Tech is not doing enough.
- ▶ The importance of setting ambitious goals and sticking to them was emphasized.
- ▶ Emphasis was placed on systemic or "upstream" solutions rather than placing the onus on behavior change of individuals, given that many of the barriers to action are infrastructural and institutional (e.g., poor cycling infrastructure).



- ▶ The above notwithstanding, many did see individual actions as important and needing of attention. Creative ideas emerged around how to, for example, ‘gamify’ desired actions.
- ▶ Key champions are important for propelling further action, including potentially a higher-level champion within university administration. This may be achieved through a stronger OCAS (see recommendation #13).
- ▶ There is strong support for taking a more holistic view of understanding our greenhouse gas emissions, accounting for emissions associated with community behaviors like commuting.
- ▶ There is broad support for key actions proposed through the Climate Action Commitment update process, including:
 - › A shift to carbon neutrality and 100 percent renewable energy, including integrating renewable energy infrastructure into campus design.
 - › Alternative transportation and reductions in private automobile usage, including a ban on freshmen car parking permits.
 - › Improved waste management, including a new compost facility, and reductions at the source through purchasing decisions that minimize waste and promote sustainability
 - › The creation of a ‘living laboratory’ to foster partnerships between campus operations, local partners, and the academic (teaching and research) enterprise.
 - › A green lab system, and similar programs to promote sustainable behaviors within work and student life spaces.
 - › Optimize building design, including with energy, water, and waste monitoring.
 - › The need to account for climate justice in any and all actions taken.
 - › Stronger partnerships with other institutions, including the Town of Blacksburg.
 - › There is a strong desire to see engagement continue as the university shifts to implementation.

COMPARISON WITH PEER UNIVERSITIES

One of the Working Group's deliverables is a comparison of Virginia Tech progress in climate action to peer universities, and this is presented in Chapter 8. There are three good reasons for doing this:

1. To offer an evaluative reference point (i.e., to see how we are doing),
2. To adopt effective plans and avoid ineffective ones (i.e., to borrow good ideas), and
3. To demonstrate that what the university is proposing is feasible and in line with similar universities (i.e., to show it is not far-fetched to have a bold and aggressive climate action plan).

Knowing that our perspective is comprehensive and that other universities have different strengths in different areas, the Working Group decided to have our thematic subcommittees select the peer and exemplary universities to assess in their specific areas.

Those areas include:

- Buildings
- Carbon neutrality and GHG inventory
- Waste-Recycling-Composting
- Renewable Energy
- Budget and Finance
- Agriculture, Forestry, Land Use
- Energy Systems
- Climate Justice
- Community Engagement
- Transportation

In most areas the Working Group selected 3-8 universities that they consider to be peers or to be exemplary in that area. Some are from Virginia, some are Land Grants, some are from the Atlantic Coast Conference, some are far away, but all offer good examples and benchmark our progress to-date and our aspirations for the 2020 Climate Action Commitment.

All in all, our peer reviews told us that, while our 2009 Climate Action Commitment was right for its time and has led to improved energy efficiency and reductions in GHG emissions, it now lags behind the actions of many of our peers. This deficiency is most notable in the quest for carbon neutrality, for renewable energy, for zero-waste, for zero-net-energy buildings, for alternative transportation, and for community engagement to advance climate action and sustainable behavior.

Many of our related programs do standup well in comparison to others, but if Virginia Tech is to regain its leadership role in climate action and sustainability, it needs to move to a new Climate Action Commitment that is right for this time. Of course, that is what it has set out to do, and the Working Group believes that it has found the right balance of aggressive, yet pragmatic, climate action. The group's goals are to achieve carbon neutrality by 2030, 100 percent renewable electricity by 2030, investment in energy efficiency in existing and new buildings, carbon neutral agriculture, a zero-waste campus, sustainable procurement practices, sustainable mobility, climate justice as a core value, community engagement, and the establishment of a Climate Action Living Laboratory that will integrate these goals into the fabric of the university.

Relative to the peer and exemplary universities reviewed in this analysis, this 2020 Virginia Tech Climate Action Commitment sets the stage for Virginia Tech to shine as an exemplar and leader in university climate action. Beyond our climate neutrality and zero-waste campus goals, six areas of the 2020 Climate Action Commitment stand Virginia Tech above the rest:

1. The detail and specificity of the pathways developed to achieve the Climate Action Commitment goals
2. Our own unique utility VTES leading our way to 100 percent renewable electricity, while most other universities are totally dependent on private utilities and companies.
3. Using our considerable land resources not only to manage our agricultural climate impacts, but also to sequester carbon and develop renewable energy.
4. Incorporating in our carbon neutral goal scope 3 GHG emissions relating to behavior (e.g., commuting, waste/recycling, water/wastewater, business travel), while most others include just scope 1 and 2.
5. Integrating our physical climate action into the university's educational mission through the Climate Action Living Laboratory (CALL).
6. Specifically addressing community engagement, sustainable behaviors, and social equity and justice as core elements of our climate action.





LEARN MORE

View the full Virginia Tech 2020 Climate Action Commitment Working Group Report and associated appendices at svpoa.vt.edu/index/VTCACRevision.

Questions may be addressed to climateaction@vt.edu.



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