



The University of North Carolina at Chapel Hill

# 2021 Climate Action Plan

*DRAFT*



## The Road to Today

In 2007, The University of North Carolina at Chapel Hill (Carolina) became a charter signatory of the American College and University President's Climate Commitment. Carolina then worked to develop its climate action plan which was published in 2009. [The original plan](#) pledged to be carbon neutral by 2050 and established 15 near-term strategies to reach this goal.

Over the past decade, Carolina has implemented 75% of the near-term strategies in the 2009 climate action plan. These strategies, along with other actions, have resulted in a 24% decrease in greenhouse gas emissions despite a 27% increase in campus square footage and a 9% increase in the campus population.

In 2019, both the [Intergovernmental Panel on Climate Change](#) and the [U.S. Federal Government](#) issued reports emphasizing the need for immediate climate action and the potential consequences of no or limited actions. The responsibility of being a leader in Climate Action has never been greater for Carolina than it is now and this Climate Action Plan is the first step of our renewed commitment to sustainability, together.

It has become apparent that a static report released every 5-10 years is not the most effective way to plan for carbon neutrality. Because the technologies, ideas, and resources available to Carolina can change quickly, the climate action plan should be able to as well. For these reasons, Carolina has moved to a web-based version that can be updated as our progress and plans evolve.

## 2009 Climate Action Plan

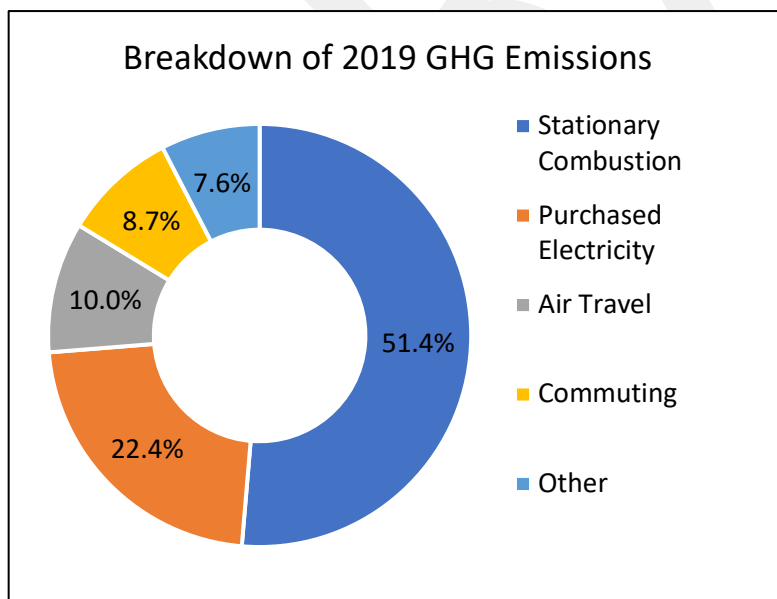
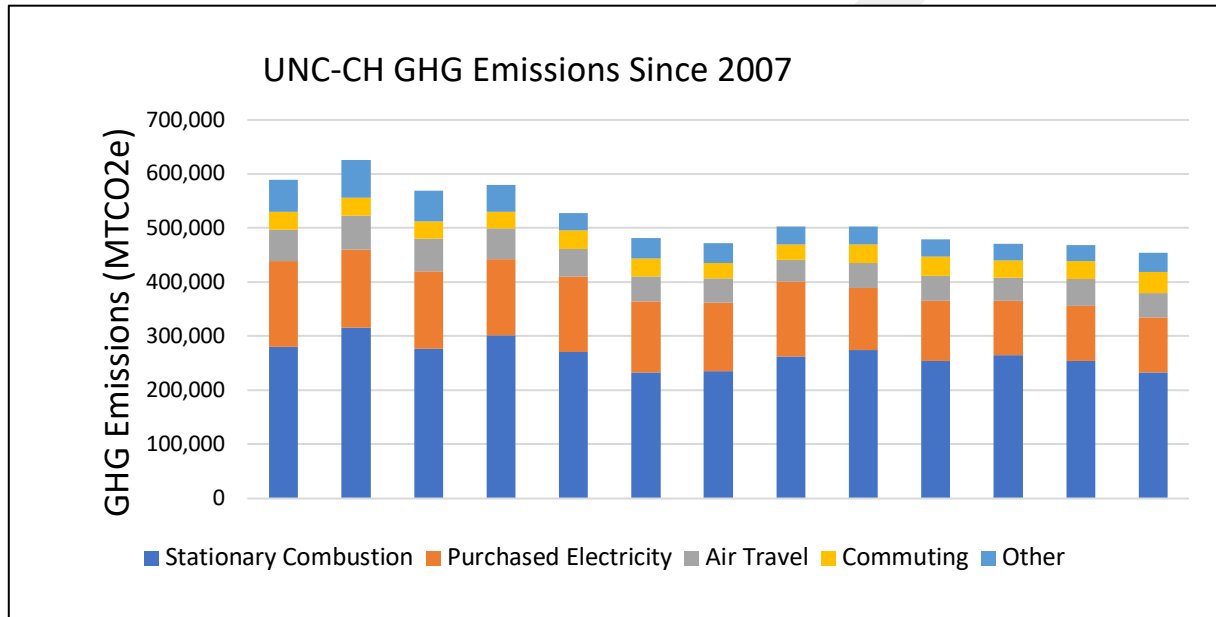
Carolina's [original climate action](#) plan contained 15 near-term strategies and several mid to long-term strategies. The status and results of each strategy can be seen in the figure below.

Strategy	Status
Thin client computers	Complete
<i>Description:</i> Utilize low-energy, longer lasting web-based computers for libraries and other applications	
<i>Result:</i> Over 100 thin-clients are currently in use. Replacements are expected to have similar or smaller electricity demands.	
Duplex Printing	Complete
<i>Description:</i> Make double-sided printing the default for campus printers	
<i>Result:</i> Duplex printing is standard. Due to this, and more paperless processes, paper use fell 32% between 2009 and 2019.	
Computer Standby	Complete
<i>Description:</i> Manage computer sleep and standby modes for campus computers	
<i>Result:</i> Established a standard policy that sets screens, hard drives, and standby times to save energy.	
Commercial Mail	Ongoing
<i>Description:</i> Reduce the amount of junk mail or undeliverable mail sent to campus	
<i>Result:</i> In 2016, Carolina adopted a <a href="#">Waste-Free Mail Policy</a> to reduce junk and undeliverable mail.	
Chiller Efficiency	Complete
<i>Description:</i> Three projects to replace or upgrade chillers to more efficient models	
<i>Result:</i> Many chiller efficiency projects have been completed. Emissions from chilled water operations fell 38% ('09 to '19)	
Heat-Recovery Chillers	Complete
<i>Description:</i> Capture heat from chiller condensing unit for HVAC use, rather than venting	
<i>Result:</i> Heat recovery chillers have been installed, assisting in the 38% decrease in chilled water emissions	
Behavioral initiatives	Ongoing
<i>Description:</i> Outreach and training to encourage occupants in energy savings	
<i>Result:</i> Carolina continuously engages the community through several different outreach programs	
Energy Conservation Measures (ECMs)	Ongoing
<i>Description:</i> Improve energy efficiency in existing buildings using Energy Conservation Measures	
<i>Result:</i> Due to the completion of many energy efficiency projects, Carolina's energy use intensity has fallen 36% since 2003	
Green Building	Ongoing
<i>Description:</i> Adhere to NC Senate Bill 668 energy efficiency requirements (30% below ASHRAE standards)	
<i>Result:</i> Ongoing improvements in building energy efficiency and retrofit projects have decreased EUIs across campus.	
Vehicle Fleet	Ongoing
<i>Description:</i> Increase fuel efficiency of campus fleet based on CAFÉ standards	

<i>Result:</i> Due to mileage reduction, use of efficient vehicles, and increased biofuel use, fleet emissions fell 9% ('09 to '19)	
Composting	Ongoing
<i>Description:</i> Extend composting to additional campus dining facilities and residence halls	
<i>Result:</i> By expanding to more food service sites, compost collection increased 62% from 2009 to 2019	
Landfill Gas	Ongoing
<i>Description:</i> Capture and combust landfill methane	
<i>Result:</i> System was installed in 2012. As of July 2020, the system had achieved ~310,000 MTCO <sub>2</sub> e in emission reductions.	
Business Travel	Unknown Results
<i>Description:</i> Improve teleconferencing facilities to decrease air travel	
<i>Result:</i> Teleconferencing facilities and technologies have improved, and air miles decreased 18% between 2009 and 2019.	
20% Coal Substitute	Incomplete
<i>Description:</i> Replace 20% of coal with torrefied wood	
<i>Result:</i> This strategy was adopted under certain assumptions about torrefied wood and wood pellet technologies that failed to materialize. Wood pellets were tested in 2010 and 2011. Carolina is currently researching other biofuels, electric boilers, and carbon capture technologies to lower emissions.	
Commuter Travel	Incomplete
<i>Description:</i> Avoid parking construction and increase public transportation (light rail)	
<i>Result:</i> This strategy hinged on the completion of the Durham-Orange Light Rail Transit project which has been indefinitely suspended. More commuters drove to campus in 2019 than in 2009, but emissions remained flat due to commuters living closer to campus and using more efficient vehicles. A Bus Rapid Transit project is currently under development.	

## Progress

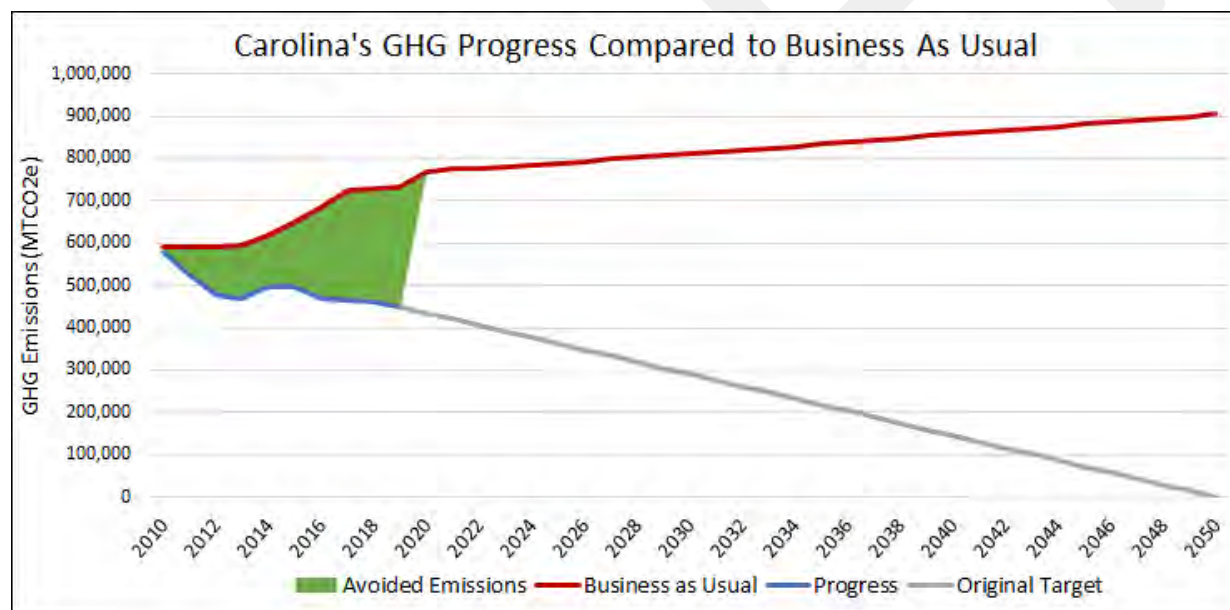
Since signing The Carbon Commitment in 2007, Carolina has completed an exhaustive annual GHG inventory and reduced its GHG emissions by 24% despite significant campus growth. This decrease was achieved with emission reductions in every category except for refrigerants and commuting. Carolina's emissions since 2007 and a detailed breakdown of Carolina's 2019 emissions can be seen below.



Since 2007, Carolina's largest GHG emission reductions have come from:

- **Energy Efficiency** - Despite a 27% increase in square footage and a 9% increase in population since '07:
  - Carolina's steam use per square foot has fallen by 37%
  - Carolina's electricity consumption per square foot has fallen by 20%
- **Stationary Combustion** - Carolina reduced its coal use at the cogeneration plant by 44% since 2007
- **Purchased Electricity** – Due to efficiency projects and a cleaner grid, emissions have fallen 36% since 2007

In the 2009 climate action plan, a business-as-usual scenario was modeled to predict future emissions with no action. With predicted increases in campus and population sizes, this scenario forecasted emissions rising to over 700,000 MTCO<sub>2</sub>e by 2018 and over 900,000 MTCO<sub>2</sub>e by 2050. However, due to the actions described above, Carolina's actual 2019 emissions were 39% lower than predicted, and over 1.5 million metric tons of CO<sub>2</sub>e emissions have been avoided since 2010.

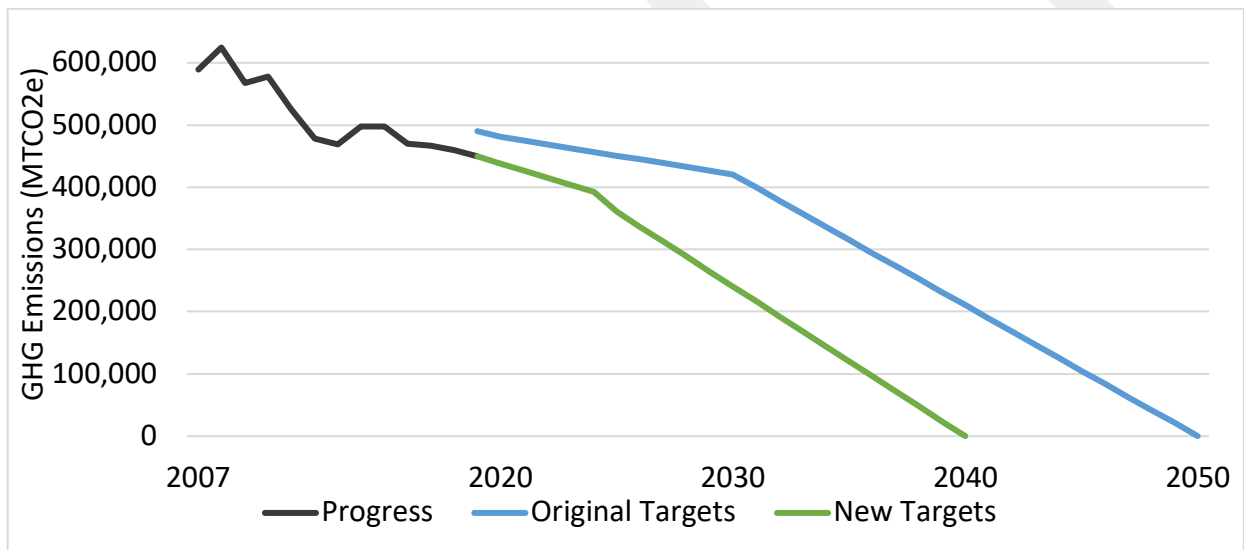


## Goals

Because of the urgent and immediate need for climate action, Carolina has set new more ambitious greenhouse gas goals. These goals include:

1. Carolina aspires to comply with Governor Roy Cooper's Executive Order 80 which calls for a 40% statewide reduction of greenhouse gas emissions by 2025.
2. Carolina will strive to achieve net-zero greenhouse gas emissions by 2040 instead of 2050.

These are aggressive targets that will require the input and support of the campus community to be reached. Carolina is committed to transparency in our progress, successes, and limitations. By challenging circumstances that may preclude projects or change priorities, Carolina will maintain openness as progress towards these goals continues.



## The Path to 2040

To meet the goals listed above, Carolina will have to take many actions over the next 20 years. Some of these actions have been identified, and many more are yet to be realized. The sections below detail Carolina's project selection criteria and the strategies that are being considered for the next ~5 years.

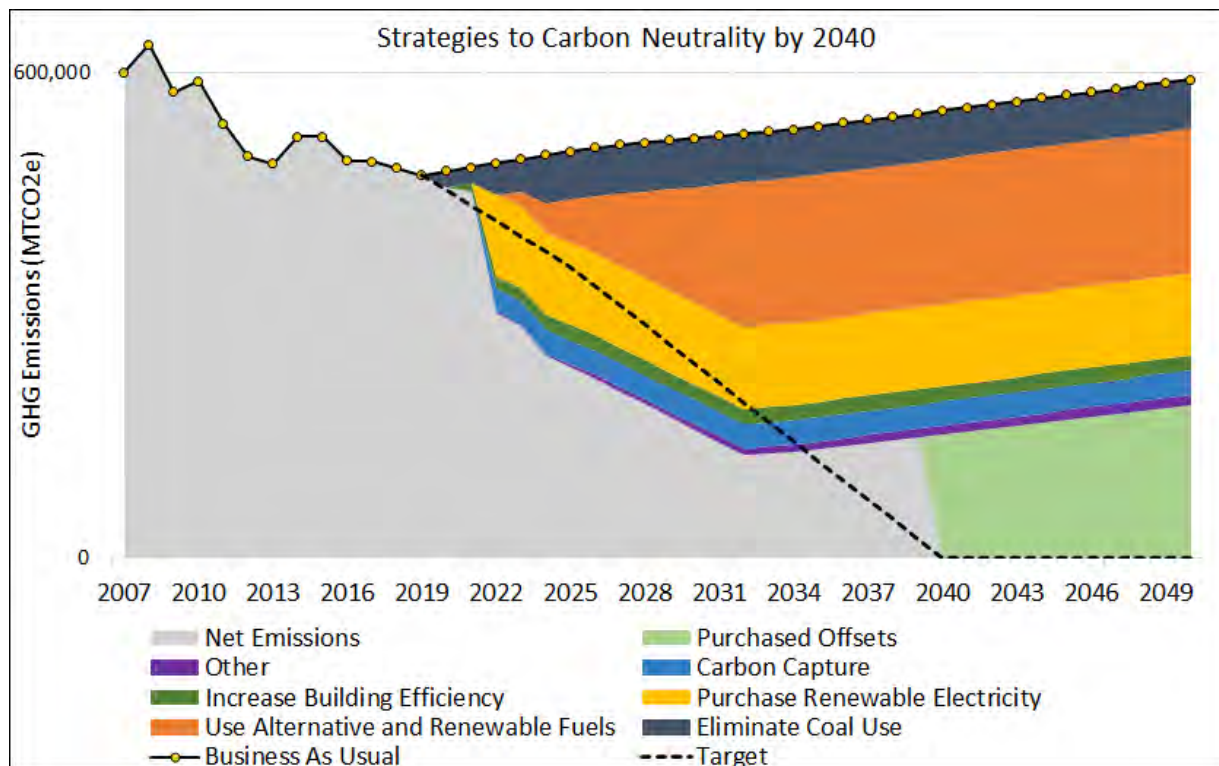
### Project Prioritization

To utilize Carolina's resources as efficiently as possible, all potential strategies and initiatives are evaluated based on the following criteria. These criteria are not weighted and considerations of current budgets, needs, and priorities will factor into final decisions.

<b>Lowens Greenhouse Gas Emissions</b>
While projects of all sizes will be considered, Carolina will prioritize projects that have the potential for large greenhouse gas reductions. As these projects are completed or ruled out, smaller projects will be elevated.
<b>Co-Benefits</b>
Projects with environmental, social, and equity benefits will be prioritized
<b>Technically Feasible</b>
Regardless of the impact and benefits, projects must be technically feasible to be considered. While Carolina strives to be innovative in its approach, technologies must be at least semi-proven
<b>Financially Feasible</b>
Carolina seeks to meet carbon neutrality in the most cost-effective way. The net present value of each project is compared to the emission reduction potential to get a NPV/MTCO <sub>2e</sub> figure. This figure is used to compare the financial viability of each project. Projects with positive net present values will be prioritized. The capital cost (relative to the emission reduction) will also be considered
<b>Practically Feasible</b>
A project's practical feasibility is determined by factors such as climate, geography, infrastructure, etc.
<b>Excitement</b>
It is important to get the campus community excited about efforts to reduce greenhouse gas emissions. Projects that are highly visible and draw attention to the effort are more attractive
<b>Living Learning Lab Impact</b>
Due to Carolina's mission as an institution of higher learning, projects that allow students, faculty, and staff to explore, research, and learn are prioritized



## Strategies



Carolina has identified 25 strategies to reduce greenhouse gas emissions. These strategies have the potential to reduce emissions by 79% compared to the 2007 baseline. The high-level strategies can be seen in the diagram below and all strategies are explained in full detail in the following sections.

### Energy

Due to the size of campus, the amount of intensive research being conducted, and the steam needs of labs and UNC Hospitals, Carolina uses a lot of energy every year. Some of this energy comes from onsite sources such as the cogeneration facility, and some is purchased from Duke Energy. While both Carolina and Duke Energy are working to lower the greenhouse gas emissions associated with energy production, much of the energy used still comes from fossil fuels and releases greenhouse gases. Each year, the energy used in buildings on campus directly and indirectly contributes to roughly 70-75% of Carolina's greenhouse gas emissions.

Reducing emissions from campus energy use can be done in two general ways: reducing energy use and using cleaner energy. Below, the strategies for both using less energy and utilizing renewable and clean energy sources are laid out.

### Energy Efficiency

The first step to lowering energy related emissions is to reduce energy use on campus. By reducing energy use in buildings, Carolina not only lowers the associated greenhouse gas emissions, but also creates financial savings and may improve occupant comfort.

Carolina's [Energy Management](#) team is constantly working to increase the energy efficiency of both its existing buildings and new builds. Thanks to these efforts, Carolina's energy use intensity has fallen 36% since FY2003. Carolina is currently working toward Governor Roy Cooper's Executive Order 80 which calls for a 40% reduction in energy use intensity by 2025.

Strategy	Total Emission Reduction Potential (%)	NPV of Emission Reduction (\$/MTCO <sub>2</sub> e)
Continue Energy Conservation Measures Program	4%	\$41
<i>Description:</i> <a href="#">Energy Management</a> will continue to identify, fund, and execute energy efficiency projects such as steam reductions, LED retrofits, and airflow reductions to reduce campus energy use.		
<i>Status:</i> As of FY2020, Carolina had reduced energy use per square foot by 36%. More information on past progress and future energy efficiency projects can be found <a href="#">here</a> .		
Continue Building Optimization Program	TBD	TBD
<i>Description:</i> This program ensures that campus buildings are working correctly. By ensuring proper functioning, energy is saved, and occupants are more comfortable.		
<i>Status:</i> Results of the program can be seen <a href="#">here</a> .		
Update Design Guidelines	TBD	TBD
<i>Description:</i> Carolina is in the process of revising its building design guidelines to reflect the most current targets, strategies, and technologies. By setting aspirational design guidelines, emissions of future buildings can be reduced.		
<i>Status:</i> In Progress		

### Stationary Combustion

Not only does Carolina have a high demand for steam, the supply must be extremely reliable to keep the hospital running and maintain sensitive research. The repercussions of campus energy outages can be immense, including loss of life or lifesaving research. To meet the campus steam demand, and maintain extremely high levels of reliability and resilience, Carolina needs to have multiple fuel options and be able to store fuel on site. Unfortunately, this means that Carolina currently uses fossil fuels to create steam.

Carolina is working to move the cogeneration facility away from coal as quickly as is technically and financially feasible. Currently, this is being done by increasing natural gas use. While transitioning to natural gas is significantly lowering campus emissions, Carolina is still researching better long-term solutions. Until an alternative fuel source is found which minimizes emissions while generating the necessary steam output, Carolina is using the following strategies to reduce emissions in the short term while planning for a long-term sustainable solution.

Strategy	Total Emission Reduction Potential (%)	Cost of Emission Reduction (\$/MTCO <sub>2</sub> e)
Eliminate Coal Use	~15%	TBD
<i>Description:</i> Carolina is committed to eliminating the use of coal as quickly as is technically and financially feasible. Currently that includes increasing natural gas use at the cogeneration facility to reduce coal use.		
<i>Status:</i> In 2019, Carolina used 43% less coal than in 2007. <a href="#">A burner restoration project</a> , completed in late 2019, is allowing Carolina to significantly increase natural gas use.		
Explore Next Generation Fuels	~34%	TBD
<i>Description:</i> Because natural gas is a temporary fuel solution, alternative fuels will be researched and tested until Carolina finds an alternative that is clean, renewable, reliable, and affordable.		
<i>Status:</i> Carolina is constantly researching and monitoring alternative fuels. Technologies currently being researched include electric boilers paired with renewable electricity generation, biodiesel, and biogas.		
Explore Carbon Capture	TBD	TBD
<i>Description:</i> Regardless of the fuel used, combustion results in carbon dioxide emissions. Carbon capture and storage technologies can be used to mitigate these emissions, regardless of the source.		
<i>Status:</i> Carolina is currently researching technologies that provide carbon capture and storage.		

### **Purchased Electricity**

Carolina's cogeneration facility produces roughly 15-20% of the electricity used annually by the University. The remaining electricity is purchased from Duke Energy which typically accounts for 20-25% of Carolina's annual GHG emissions. Other than energy efficiency, which was mentioned above, there are four ways Carolina can continue to reduce purchased electricity emissions: onsite renewable generation, renewable energy purchases, Renewable Energy Certificate (REC) purchasing, and virtual power purchase agreements. Each mechanism, and its associated benefits and drawbacks is explained below.

Strategy	Total Emission Reduction Potential (%)	Cost of Emission Reduction (\$/MTCO <sub>2</sub> e)
Increase On-Campus Renewable Energy	1%	Up to \$21
<i>Description:</i> Carolina will continue to install rooftop solar PV on campus through additions to new and existing buildings. The pace of these installations will depend on funding and planned renovations and new builds. A 2019 study by Energy Services identified 38 campus rooftops that fit preliminary site requirements for solar PV. If solar systems were installed on all identified locations, roughly 5MW of capacity could be added. This would cover roughly 2% of Carolina's annual electricity use.		
<i>Status:</i> Carolina currently has solar PV on three buildings, totaling 43.8 kW. Several additional rooftop installations are in the planning process, and a 376kW ground-mounted solar project is scheduled for completion at a satellite campus in 2021.		
Procure Renewable Energy	21%	TBD
<i>Description:</i> In North Carolina, third party sales of electricity are prohibited, meaning Carolina must purchase all electricity from Duke Energy. Duke Energy currently has three programs for renewable energy purchasing. Unfortunately, none of these programs work well for Carolina in their current forms. Carolina is currently analyzing potential ways to make these programs work or create new programs that would allow Carolina to procure renewable energy.		



<i>Status:</i> Ongoing		
Purchase Renewable Energy Certificates	21%	-\$2.41
<i>Description:</i> If Carolina were unable to procure renewable energy through Duke Energy, renewable energy certificates could be purchased. Renewable energy certificates will only be used if Carolina cannot purchase renewable electricity.		
<i>Status:</i> Renewable energy certificates have been researched but not purchased to date.		

## Transportation

### Commuting

Commuting is one of the few emission categories that has increased since 2007. This increase is largely driven by two factors: more employees and students are driving alone to campus and employees are living further from campus. Reducing commuting emissions relies heavily on influencing individuals to make sustainable commuting decisions.

Strategy	Total Emission Reduction Potential (%)	Cost of Emission Reduction (\$/MTCO <sub>2</sub> e)
Encourage and aid Chapel Hill Transit (CHT) in transition to Electric Buses	<1%	TBD
<i>Description:</i> In 2019, Carolina's student-run Renewable Energy Special Projects Committee (RESPEC) helped partially fund three electric buses with CHT. Carolina will continue to work with CHT to encourage/aid the adoption of electric buses.		
<i>Status:</i> More information and timeframe can be found <a href="#">here</a> .		
Increase use of the Commuter Alternative Program (CAP)	<1%	TBD
<i>Description:</i> The <a href="#">Commuter Alternative Program</a> offers numerous public transit benefits to members who use alternative transportation, including free bus passes, a discounted ZipCar membership, and more.		
<i>Status:</i> <a href="#">Transportation and Parking</a> is constantly working to increase participation in the program.		
Study Parking Pass Structure	N/A	N/A
<i>Description:</i> Redesigning the parking pass structure to favor low-emission vehicles and flexible day schedules could reduce commuting emissions.		
<i>Status:</i> Study yet to be completed.		
Expand Electric Vehicle Charging	<1%	TBD
<i>Description:</i> Charging infrastructure can be a limiting factor in electric vehicle adoption. Carolina will continue to add electric vehicle charging stations as funding allows to encourage electric vehicle adoption.		
<i>Status:</i> Carolina currently has six electric vehicle charging stations on campus.		

### Air Travel

Air travel, both domestic and international, is a large part of being a global research university. Carolina's faculty, staff, and students fly over 100 million miles every year for research, conferences, and studies. While this travel is often essential in making Carolina a leader in research, it was responsible for 10% of Carolina's 2019 GHG emissions.

Strategy	Total Emission Reduction Potential (%)	Cost of Emission Reduction (\$/MTCO <sub>2</sub> e)
Explore Green Air Travel Program	TBD	TBD
<i>Description:</i> Carolina will work to research and develop green air travel programs that use education and travel alternatives to reduce air travel emissions without compromising Carolina's ability to be a global institution.		
<i>Status:</i> Not-started.		
Explore voluntary or mandatory air travel carbon offsets	Up to 10%	TBD
<i>Description:</i> Carolina is currently researching many travel-specific carbon offset programs to determine whether these would be feasible and effective.		
<i>Status:</i> In progress		

### Fleet

Carolina's fleet consists of around 900 vehicles and was responsible for roughly half a percent of Carolina's total emissions in 2019. Since 2007, fleet emissions have been reduced 17% primarily due to decreased fuel consumption and increased use of alternative fuels B20 and E85. To further reduce emissions, the following strategies are being pursued.

Strategy	Total Emission Reduction Potential (%)	Cost of Emission Reduction (\$/MTCO <sub>2</sub> e)
Optimize Vehicle Choice	<1%	TBD
<i>Description:</i> Many vehicles on campus have a primary use that is different than their intended purpose. For example, trucks are often purchased when more efficient passenger vehicles, or even electric vehicles, could suffice. Fleet Services works with departments to select vehicles that are the correct size and type in an effort to lower fuel use and emissions.		
<i>Status:</i> Ongoing.		
Increase Use of Biofuels	<1%	\$175
<i>Description:</i> Carolina's fleet has been increasingly using ethanol and biodiesel in its fleet when feasible. These fuels will continue to be used and expanded.		
<i>Status:</i> Ongoing		
Expand Use of Vehicle Telematics	<1%	\$53
<i>Description:</i> Carolina uses telematics in many of its vehicles to reduce miles driven and fuel use. Carolina is expanding this program to more departments.		
<i>Status:</i> The current telematics program has helped to reduce annual fuel use by roughly 28,000 gallons.		

## Education and Research

As an institution of higher learning, simply reducing greenhouse gas emissions is not good enough. Carolina has a responsibility to educate and engage its community members to ensure that climate action occurs both on and off campus. With almost 30,000 students, and over 12,000 employees, this is a huge task, and equally large opportunity. Meeting Carolina's sustainability goals will be much easier and impactful with full campus engagement.

Strategy	Total Emission Reduction Potential (%)	Cost of Emission Reduction (\$/MTCO <sub>2</sub> e)
Increase student involvement in sustainability	N/A	N/A
<i>Description:</i> Through programs such as “peer-to-peer sustainability”, sustainability challenges, and engagement and outreach, Carolina will increase its efforts to involve students in the initiatives to become a more sustainable campus.		
<i>Status:</i> Ongoing		
Increase Staff and Faculty Involvement in sustainability	N/A	N/A
<i>Description:</i> Through programs such as a “Green Office Program”, Green Labs, expanded sustainability course offerings, and “high-impact learning programs”, Carolina will increase its involvement of staff and faculty in efforts to become more sustainable.		
<i>Status:</i> Ongoing		

## Other

Strategy	Total Emission Reduction Potential (%)	Cost of Emission Reduction (\$/MTCO <sub>2</sub> e)
Replace SF <sub>6</sub> Switches with Solid-State Dielectric Switches	<1%	TBD
<i>Description:</i> Sulfur Hexafluoride (SF <sub>6</sub> ) is an extremely powerful greenhouse gas that is used in electric switch gear. Carolina is working to reduce leakage from its SF <sub>6</sub> switches and is planning to replace aging switches with solid state dielectric switches, that do not produce fugitive emissions, as budgets allow.		
<i>Status:</i> Ongoing		
Replace Refrigerants with Climate-Friendly Alternatives	<1%	TBD
<i>Description:</i> Carolina is working to reduce refrigerant leaks and attempts to use refrigerants with low environmental impacts.		
<i>Status:</i> Between 2007 and 2019, Carolina reduced refrigerant use by roughly 50%.		



## Sustainable, Together

The challenge of reducing Greenhouse Gas emissions to reach carbon neutrality and meet our Climate goals requires collaboration across all levels of Carolina. With ambitious plans for climate action also comes the need for funding. While most of the strategies and ideas outlined in this Climate Action Plan rely on decisions made at the institutional level, the individual behaviors that all members of the UNC Community will be the key to realizing our ambitions.

Opportunities to connect and collaborate on individual behavior change will continue to develop now and into the future, and Sustainable Carolina is committed to facilitating them through an open process. For ideas on the actions you can take to reduce emissions and create a more sustainable campus and an opportunity to leave your own idea for emissions reduction, please visit the “What Can I Do?” web page and leave a note through the feedback form.

By learning about the quantified emissions impacts that everyday choices have, communicating greenhouse messaging to peers, and staying aware of new tools that shrink greenhouse gas footprints, the Carolina community is moving forwards towards our new ambitious climate goals together.

## Acknowledgements

Developing this climate action plan required a campus-wide collaboration. Thank you for all of the help in developing this. The following groups provided data or insights that helped form this plan: [Carolina Dining Services](#), [Energy Management](#), [Energy Services & Sustainability](#), [Fleet Services](#), [Office of Waste Reduction and Recycling](#), [Study Abroad](#), [The Town of Chapel Hill](#), [Transportation and Parking](#), and Travel Services.