Clark University Greenhouse Gas Emissions Update: 2018

Clark University’s gross total greenhouse gas emissions in 2018 were 13,970.67 metric tons of carbon dioxide equivalents, representing an increase over 2017 which was in turn an increase over 2016. Our net greenhouse gas emissions after offsets were 13,960.38

Background

In June 2007, President Bassett signed the American College and University Presidents Climate Commitment (ACUPCC), making Clark University a charter signatory to an exciting initiative aimed at mobilizing the resources of colleges and universities in efforts to reduce greenhouse gas emissions. Nearly a thousand institutions have pledged to date. The ACUPCC’s reporting and administrative platform was replaced by Second Nature in 2015. The core goal of the commitment is to achieve climate neutrality with net zero greenhouse gas emissions, also known as carbon neutrality. The Clark University Environmental Sustainability Task Force (CUES) accepted the task of developing a Climate Action Plan with mitigation strategies to lead the University toward its goal of climate neutrality. In December of 2009, Clark University released the Climate Action Plan (CAP), detailing strategies for the University to reduce its greenhouse gas emissions. The plan sets two goals: an interim goal of reducing emissions to 20% below 2005 baseline levels by 2015 (to 16,357.4 MTCO2e), and the ultimate goal of carbon neutrality by the year 2030. The CUES Task Force retained responsibility for recording and reporting on Clark’s emissions. In 2014, the CUES Task Force commissioned an update to assess viability of CAP strategies (i.e. changes in technology or University environment), and to recommend additional strategies with incremental goals; the update was not adopted and the CAP remains as published. The Task Force has not convened since 2014, pending the appointment of a Chair and Task Force members by President David Angel. An update to the Climate Action Plan is due to be submitted to Second Nature in the current reporting year; however Clark has elected not to update their CAP at this time.

The CAP interim goal set for 2015, 16,357.4 MTCO2e, was achieved in 2010, one year after the CAP was released. It has not been exceeded since. Achieving the significantly more ambitious goal of carbon neutrality by 2030, unless the CAP is updated to reflect a later date or barring the adoption of as-yet unknown technology, will require willingness on the part of all members of the Clark University community to recognize and invest in mitigation action as an institutional and personal priority, and to make the trade-offs required.

Methodology: Calculator

In order to effectively manage carbon footprint and emission reduction strategies, data for a Greenhouse Gas (GHG) Emissions Inventory has been collected annually since 2008. (GHG inventories for prior years use largely estimated data). Data is gathered from a range of campus entities, and their cooperation is essential to ensure reasonably accurate and complete calculations. 2018 represents Clark’s second year of using a new on-line third-party calculator from UNH’s Institute for Sustainability, SIMAP. Previously (2008-2016) we used the Campus Carbon Calculator, now defunct (for additional information regarding our choice of third-party calculators and software, please read prior Annual Updates on file). There is confidence from Second Nature that SIMAP is a valid replacement for the CCC.

Methodology: Inventory Inputs

In the Inventory, inputs are recorded for Scope 1 sources (on-site combustion, such as boilers and vehicle use); Scope 2 sources (off-site combustion, such as purchased electricity) and certain Scope 3 sources (other combustion such as commuting). The six greenhouse gases inventoried are those included in the Kyoto Protocol: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydro fluorocarbons (HFCs),
perfluorocarbons (PFC), and sulfur hexafluoride (SF$_6$). For ease of understanding and comparison, all gases are converted to a common measure: Carbon Dioxide Equivalents, CO$_2$e. The results of past inventories in CO$_2$e and Kyoto Protocol gasses have been reported to ACUPCC/Second Nature and shared with University administration via the annual Greenhouse Gas Emissions Update. The annual Updates are also available at Sustainable Clark, under Energy & Climate.

**Methodology: Scope 2 Purchased Electricity**

SIMAP defaults to the Emissions & Generation Resource Integrated Database (eGRID) to calculate emissions equivalents in our Scope 2 Purchased Electricity. The eGRID is a regionally-based averaged “source of data on the environmental characteristics of almost all electric power generated in the United States”, according to the EPA, and is considered a standardized approach to comparative measurement of emissions. Our assigned eGRID sub-region is NPCC (Northeast Power Coordinating Council) New England which publishes averaged regional resource mixes and emissions data; the most recent data in use by SIMAP are from eGRID 2014. The alternative in SIMAP is to select Custom Fuel Mix and input the state-specific resource mix data published by the utility provider in a Disclosure Label under requirement of the MA Department of Public Utilities. The most recent Disclosure Label from our purchased electricity supplier, National Grid, was published in 2018 and is specific to Massachusetts, although it is also noted that the information in the Disclosure Label comes from a range of suppliers in an integrated power grid, not from specific power-generating plants.

In 2017, the GHG Protocol, which is the international arbiter of “best practices” in carbon accounting across all sectors, issued an updated guidance document for Scope 2 emissions calculation. That document recognized that there are inherent strengths and weaknesses in both approaches (using supplier-specific versus regional eGRID factors), and recommended that organizations understand the results and implications of both types of calculations. The Protocol does not require a specific method. Given the specificity of the 2018 Disclosure Label 2018 combined with the fact that Massachusetts ranks high in renewable power generation compared to regional averages, and in the interest of providing the most accurate greenhouse gas emissions inventory for the University, Clark has elected to use the Custom Fuel Mix option in SIMAP with the fuel mix data supplied in the Disclosure Label. SIMAP still calculates the emissions factors for each category of fuel based on accepted standards.

**Updated Equivalencies; Impact on Data**

Due to the evolving nature of greenhouse gas emission factor science, third-party calculators such SIMAP update emissions factors annually with information from the EPA, IPCC, E-grid, DOE and other sources to determine the amount of metric tons of carbon dioxide equivalent (MTCO$_2$e) added to the atmosphere by campus operations across all inventoried inputs. Many standards are retroactive and almost all of Clark’s past data stored in SIMAP from 2005-2016 is affected by various updates. Even small changes in the factors will add up over time and retroactively. Therefore, previous Updates from 2009 – 2017 may show annual or category data points that differ from the current Update; included charts will reflect this. Clark’s interim goal was based on 2005 emissions and the standards at the time, as were the benchmarks and mitigation strategies in the CAP; our interim goal therefore remains unchanged at 16,357.4 MTCO$_2$e.
Benchmarking

It should be noted in all data comparisons that 2014 is considered a ‘benchmark-normal’ year. Weather patterns were typical and therefore the amount of heating and cooling produced on campus (Scope 1) can be termed ‘average’. 2014 is also a ‘benchmark-normal’ year in regards to campus operations; the co-generation engine operated throughout the year with normal inputs and there were no major renovation projects (Scope 2). As unforeseen or scheduled operational events occur to influence production capacity and as other factors (including changes in technology, population or footprint) influence Clark’s demand for energy it is important to recognize that improving Clark’s core energy efficiency and energy consumption practices will be measured against 2014 as a benchmark of ‘normal’ per capita and per square foot energy usage.

2018 Emissions Data: Overview

Total GHG emissions in 2018 were 13,970.67 MTCO\(_2\)e. This represents an increase of 2.71% from total 2017 GHG emissions of 13,601.71 MTCO\(_2\)e. Net GHG emissions in 2018 after offsets were 13,960.38 MTCO\(_2\)e, an increase of 2.71% over 13,591.42 MTCO\(_2\)e in 2017 (offsets are from on-campus composting, a relatively static number). Total and net GHG emissions in 2017 were in turn 1.22% greater than 2016 emissions. This report details some of the probable causes for the differences year-to-year.

Below is a chart showing the trend over time in Clark’s greenhouse gas emissions, measured in MTCO\(_2\)e.

![Greenhouse Gas Emissions 2010-2018](chart)

Total Greenhouse Gas Emissions in thousands of MTCO\(_2\)e

|------|------|------|------|------|------|------|------|------|------|

If and when all else is held constant, emissions will change in proportion to personal energy use. However, year-to-year differences in weather, sourcing and other conditions beyond University control will impact larger scale
campus generated emissions from energy production and campus fleet. External factors also beyond our control will effect emissions from purchased electricity and personal transportation. As climate instability increases it is ever more important to manage those University practices that do fall within our sphere of influence, and to consider resilience as a proactive strategic planning approach for those factors that fall without.

2018 Emissions: Percent by Scope & Sector

The largest source of Clark’s greenhouse gas emissions is Scope 1: fuel consumed by Clark’s transport fleet, power plant, boilers, generators and co-generation engine to produce both electricity and heat. This Scope is primarily two sectors: Co-generation and Boilers. It comprised 58% of all emissions in 2018; in 2017 the same Sectors were 69% of all emissions. Our Scope 2 emissions derive entirely from the operations of the electric utility (National Grid) from which Clark purchases electricity for needs not served by the co-generation plant. This Sector is termed Purchased Electricity and comprised 12.2% of all emissions in 2018 compared to 2.58% in 2017, 4.3% in 2016, and up to 30% in the years prior to Clark’s partnership with Solar Flair; more on this beneficial arrangement below. The second largest emissions source is Scope 3, also primarily two Sectors: fuel used in Employee Commute and University Sponsored Air Travel. This Sector comprised 29% in 2018 compared to 28.5% in 2017. Scope 3 has continued to increase over time in the absence of institutionally managed solutions for transportation. Lesser emissions sources in Scopes 1 and 3 include refrigerants, utility-based transmission and distribution losses, waste to energy (incineration), and campus fleet; all less than 1% of total emissions.

Below are charts of emissions by MTCO₂e with all Sectors combined, by Sector percentage of total, and of significant individual Sectors from 2014-2018. It is useful to recognize overall trends within each Sector, bearing in mind that the scales differ (see Y axis).
The chart below indicates percent-of-total emissions for the major contributing sectors.

![Pie Chart](image)

The series of charts below, while at varying scales (see Y axis), indicate the specific annual volumes and therefore overall trend of individual contributing Sectors from 2014 – 2018. All measures are in MTCO2e; Scope and Sector totals by year are found in the stacked bar chart above.

![Bar Chart](image)
Explanations Scope 1 Emissions: On-Site Fuel Combustion from Co-Generation and Boilers; Fleet

Clark’s co-generation engine, the three large boilers in the power plant, and multiple other boilers and generators across campus are all included in Scope 1 calculations. Fuel used in campus fleet is as well.

- The cogeneration engine was offline for nearly six months (early April until late September) in 2018. A failed switchgear resulted in further infrastructure failures, extensive repairs and most importantly, detailed testing of all systems before the engine could be safely restarted. This is in contrast to 2016 and 2017 in which the co-generation engine operated for the balance of the year excluding routine maintenance shutdown. In prior years the co-gen has been out of operation for varying periods; the next longest gap was over three months in 2015. As Scope 1 is the single largest source of emissions on campus, an absent co-gen, which maximizes fuel efficiency, causes a significant impact on Clark’s greenhouse gas emissions.

- Emissions derived from natural gas combustion in boiler operations were higher in 2018 than in any previous year for which Clark has been tracking emissions. (Natural gas has been the sole
fuel source for the power plant boilers since 2016. Prior to 2016 the boilers also consumed ‘dirtier’ #6 fuel oil, which added to overall source emissions. The explanation for the spike is weather related but also illustrates an impact of the co-gen being offline. The boilers in the power plant supplement distributed steam and hot water byproducts of co-generation to support ambient heating through the fall, winter and spring. While 2018 recorded above-average summer heat, we also experienced a record-cold and extended spring; twice as much fuel was consumed in boiler operations during April than is usual. Because the co-gen acts as the system’s primary heating source but was not operational either during part of April or when heating season began in September, more fuel was consumed in the boilers as the sole heating source.

- Natural gas purchased for individual boilers, those that serve buildings not connected to the power plant, was also higher in 2018 than in 2017 by 4%.

**Explanations Scope 2 Emissions: Purchased Electricity; Renewable Energy**

Clark’s cogeneration plant is designed to produce electricity for central campus, including all of the buildings that are connected to the co-gen and power plant. We purchase supplemental electricity from National Grid electric utility for several reasons: to supply buildings that are not connected to the co-gen, to supply a demand gap from connected buildings beyond co-gen production capacity, and when the co-gen is not operational.

- Electricity purchased in 2018 to supply buildings not connected to the co-gen was 9.84% greater than the volume purchased in 2017. The comparable 2017 versus 2016 number is +2.5%.
- Electricity purchased to meet the demand gap of all connected buildings may not be a valid measure for the 2018 reporting year; with the co-gen offline for such an extended period it is not possible to isolate the annual demand gap from actual demand. In 2017 the demand gap was 16.4% of total; in our ‘benchmark’ year of 2014 it was 13.7% of total.
- Electricity purchased to meet demand outside co-generation capacity was 45.65% of total demand in 2018; directly correlating to the co-gen’s six months closure. Furthermore, the co-gen was not operating during the summer months in which we experience the highest demand for electricity due to air conditioning, and it was a notably hot and humid summer including record nighttime highs. Our central chiller systems are normally supported through the co-generation engine as well, but needed purchased electricity to function.

**Scope 2 Emissions, Other Impacts**

**Solar Flair:**

- 2018 marked the fourth full year of our partnership with Solar Flair providing Clark solar energy “credits” through what is known as an Alternative PPA. We calculate an equivalent kWh from the partnership’s financial incentives from solar production. (For a full explanation of Clark’s arrangement with Solar Flair and National Grid, please see the Emissions Update 2014). Because Solar Flair’s farms are operating at full build-out production capacity and we are receiving the full benefit, any additional decreases in Scope 2 emissions will require that Clark commit to comprehensive energy efficiency, targeted management of consumption practices, or additional renewable energy sources.
- In 2018, the solar production kWh equivalent accounted for 31.7% of Clark’s total purchased electricity, compared to 59.3% in 2017 and 48% in prior years. Because our calculation for percent
Shaich Family Alumni and Student Engagement Center (SFASEC) Solar Array:

- SFASEC is all-electric (heating and cooling as well as lighting, equipment and appliances) and is not connected to the co-gen. The rooftop solar array was designed to supply 50% of the building’s electricity demand. In the twelve months of 2018, the solar array produced 157,252 kWh, or 50% of ASEC’s total annual electricity demand. (During the spring and summer months there was excess production, not consumed by the building; this excess was exported to the utility grid). Solar energy produced by the ASEC array directly offsets the building’s electricity, so our total Scope 2 purchased electricity is reduced by the amount of kWh produced; however there is demand in excess of on-site solar production for which we purchase electricity. Emissions from SFASEC’s net purchased electricity are included in the 2018 total.

Renewable Energy Certificates (SREC’s):

- ASEC’s solar array generates not only power for the building’s needs, but also solar carve-out renewable energy certificates (SREC’s) under the Massachusetts Department of Energy Resources (DOER) Green Communities program. Each certificate represents the environmental attributes of one megawatt-hour (MWh) of energy generation and is made available for sale via the New England Power Pool energy credit market. Clark has a third party vendor managing the sale of our SREC’s. Due to the workings of the market and verification procedures, there is up to a six-month delay in receiving the credits for the sale of SREC’s. In 2018 we claimed four fiscal quarters of applicable credits from June 2017 – June 2018 for a total of 139 MWh, equivalent to $36,896.

- While our net purchase of electricity and therefore Scope 2 emissions are obviously reduced by the amount of solar energy produced and used on-site and the University receives direct financial benefit from the market activity, the creation and sale of SREC’s adds to our Scope 2 emissions consistent with the EPA’s Renewable Energy Certificate methodology. When an SREC is purchased on the market, it offsets emissions produced by the buyer. When an SREC is sold, however, the producer takes on those equivalent emissions through the mechanism of the SREC. We have already received the double benefit of “free” solar power and payment; we cannot “double dip” by using a sold SREC as an offset.

Excess Production:

- Under normal conditions, the cogeneration engine runs consistently at optimum load and produces more electricity than campus can use during low-demand hours. Until late 2017, this kWh excess production was returned to the electric utility grid without any offsetting credit, and Clark incurred the full burden of production-based emissions without actually using all of the electricity produced. The University now participates in net metering, in which Clark receives payment for the excess electricity transferred to the utility’s supply grid. However, even under this agreement we must still include emissions from the production of unused electricity in our
reporting. The 2018 amount of excess production is 307,071 kWh, or about 50% of average, and equivalent to 4.9% of total electricity production, or 85 MTCO$_2$e.

Explanations: Scope 3 Emissions, Commute and Travel

Scope 3 increased 4.7% in 2018 versus 2017, following a smaller increase of 0.4% 2017 over 2016. Daily (vehicle) commute emissions decreased while the air travel emissions increased. To calculate emissions from daily commuting we use full-time and part-time employee data provided by the institution and assume weekly mileage based on survey data rather than actual recorded mileages. In our second year using the SIMAP calculator, we have recognized that it’s required split of Faculty versus Staff commute data approximates to part-time versus full-time employee data and have made this adjustment to fit the model. Neither study abroad nor student commute are included in Clark’s version of the greenhouse gas emissions inventory. As noted previously, until and unless there are University-supported solutions to the single-driver commute, such as offset incentives, carpooling and shuttle programs, or telecommuting, this emissions source will continue to be a barrier to Scope 3 greenhouse gas emissions.

To calculate air travel emissions, we use industry-accepted average cost-per-mile standards and actual University travel expenses. Air travel produces a large amount of emissions due to the magnified effects of fuel combustion at high altitudes, so even a small change in directly-financed air travel has a significant effect on Scope 3 emissions. Institutional solutions include incentivized carbon offsets, changing behavior to travel less frequently or more efficiently, and electronic options such as remote conferencing. Certainly air travel for necessary conferences, recruiting and other institutional functions is vital to the continued success of Clark University. As is the case with faculty and staff commute, this data will not change significantly until viable alternatives are enacted.

Energy Consumption on Campus

The Climate Action Plan’s goals and mitigation strategies, including energy management strategies, are expressed in MTCO$_2$e. In the emissions inventory, we measure total consumption of fossil fuels, however this data includes over-production that is not consumed on campus. There is of course a direct relationship between fossil fuel combustion and MTCO$_2$e. There is also a direct relationship between personal energy consumption - campus electrical energy and thermal (heating) energy demand - and emissions that bears a closer look. This can be termed energy usage. It is helpful to look at campus electrical and thermal energy usage over time to identify patterns and results. Technology-dependent strategies to reduce energy consumption (for example lighting efficiency, mechanical system upgrades) will reduce MTCO$_2$e although they may be offset by other non-technological increases such as a larger population or physical space footprint. Non-technological mitigation strategies (for example personal energy conservation practices, maximizing use of space) are harder to quantify than technology strategies but significant in managing Clark’s energy consumption patterns as they will have a long term and aggregate effect. Current plans to reduce energy (thermal) consumption include replacing an aged and leaking steam distribution line between the co-gen and Jefferson /Atwood Halls; this is expected to greatly increase efficiency. In summer 2018 the lighting in Jonas Clark was replaced with LED’s. Smaller scale, incremental projects are always on-going, although there are no comprehensive reduction plans at this time.

Electricity

Actual total campus electrical load (Scope 1 electricity produced in the co-gen less that exported plus Scope 2 purchased electricity) of 12,547 MWh presented a 7% increase over 2017, which was a 3% increase over 2016; 2016 was in turn a 3% increase over 2015. There does not seem to be a discernable
pattern nor a single causal explanation. Including our Alternative PPA solar credits, the total campus electrical load in 2018 equates to 3,524 MTCO\textsubscript{2}e. The campus load has remained relatively stable over time even with a variety of factors including increased population, additional personal and academic electronic use, and hotter summers requiring more air conditioning. This is a testament to our energy management and upgrades.

**Heat**
Clark’s 2018 thermal energy use for heating was equal to 6,251.8 MTCO\textsubscript{2}e, slightly lower than 2017 at 6,498.5 MTCO\textsubscript{2}e; again without the full co-gen operations providing steam in April and September. This measure has remained relatively constant when factoring in changes in conditioned space (i.e. changes to square footage that we heat) since 2012; until and unless there is comprehensive University support for lower ambient temperatures and reduced set points (i.e. 65° instead of 68°) and an investment in our control technology (i.e. program controlled thermostats, zone analysis and updating), it is likely to vary along with seasonal temperature variations, community demand, and University practices in areas such as space use and closure.

**Therms**
As there is a direct relationship between energy consumption and MTCO\textsubscript{2}e created, it is helpful to examine the University’s electrical and thermal energy consumption in terms of a standard unit of energy measurement: therms. This is expressed in million British thermal units, or MMBtu’s, and is in common use across industry when evaluating energy output or consumption regardless of source. An energy consumption profile differs from an emissions profile; it evens out the impact of different Kyoto Protocol gasses to a common measure. The conversion from kWh to MMBtu uses EPA standards. The charts below show Sectors 1 and 2 addressed in this report with their measures of electricity kWh and natural gas therms expressed in MMBtu’s. Additional charts show Clark’s electrical and thermal energy consumption per capita and per square foot over a set of years. Per capita includes full-time employee and student equivalents as determined by the Office of Institutional Research; per square foot does not include non-conditioned space such as garages, but takes into account increases in our footprint over time.

**Energy Consumption Year over Year in Therms**

It is helpful to look at energy consumption across a period of years. The first chart below shows therms of fuel consumed in thermal energy consumption campus-wide (co-generation engine + power plant boilers + independent boilers) and track it across five years. This is all in Scope 1. We do the same with therms of fuel consumed to supply campus-wide (co-generation engine + utility purchased) electricity demand. This is data from Scope 1 and Scope 2. While thermal energy consumption is largely a factor of weather variations, it is also affected by steam distribution efficiency, building envelope conditions, and individual behavior. Until this year’s co-gen shutdown, Clark was on a strong downward trend overall due to efficiency and building upgrades. The overall trend in electrical energy consumption is also slightly down, due to continual lighting and power efficiency improvements. These trends are significant in that both our population and space footprint have increased in the same period of time, indicating that we are doing well at managing consumption.
The chart below shows campus-wide thermal (heat) and electrical energy consumption, expressed in MMBtu.

Clark's Energy Usage by Type
2014-2018

The chart below shows per capita thermal (heat) and electrical energy consumption, expressed in MMBtu.

Clark's Energy Usage by Type per Capita
2014-2018
The chart below shows thermal (heat) and electrical energy consumption per square foot of all space for which Clark has operational control, in MMBtu. The square footage used in the calculation includes unconditioned (not heated or cooled such as garages) and dormant (areas currently not in full use) spaces but does not include owned but not occupied (such as rental property) spaces in order to maintain comparative validity, consistency across years, and include population data.

![Clark's Energy Usage by Type per Sq. Ft. 2014-2018](chart.png)

**Conclusion**

Clark’s total greenhouse gas emissions for 2018 are larger than the previous year, with a 2.71% increase that can partially be explained by the year’s limited cogeneration operation: it represents the most efficient way to burn fossil fuel. 2018 is the second consecutive year of increased rather than decreased greenhouse gas emissions. We are approaching our 2013 emission level of 14.08 MMTCO$_2$e. This is of particular note because Clark has put considerable technological investment toward reduction since 2013: adding renewable energy resources via ASEC and Solar Flair; replacing an inefficient cogeneration engine and leaking distribution lines; completing energy efficiency upgrades with LED lighting, controls, motors and more; adding technology to ‘smart rooms’ to manage downtime energy use, and numerous other upgrades. Conversely, we have also expanded our physical footprint and employee population since 2013 and have successfully managed to maintain and even control emissions with the addition of people and buildings and building extensions as we have managed our energy consumption. MTCO$_2$e per square foot in 2018 are 0.00823; in 2013 emissions were also 0.00823 per square foot.

2015 was a landmark year in our Climate Action Plan, the year of our interim goal to reduce emissions 20% below baseline. This interim goal was actually achieved in 2010 and has not been exceeded since. The University has no other interim goals between now and our commitment to net zero emissions by 2030. Where are we in relation to our next - and ultimate - goal?
As of 2018, Clark has reduced total emissions by 32% over the 2005 baseline. Much of that reduction has occurred from scheduled Climate Action Plan mitigation strategies and large-scale investments implemented in 2009-2013. To put this seemingly impressive statistic into the larger context; if we continue the same rate of emissions reduction per year (annual reduction of 2.46%) and hold all else constant in a business-as-usual (BAU) strategy with no increase in emissions and no changes in energy portfolio, by 2030 we will have reduced emissions by another 29% over baseline but still be less than two-thirds to our stated climate commitment and carbon neutrality goal.

There is much uncertainty in looking 12 years ahead. Taking advantage of future developments in technology may provide exponential reductions. Our long-established practice of efficiency upgrades and retrofits as appropriate and affordable will continue to have incremental impact. A number of strategic initiatives explored in the CAP and in other avenues but not yet enacted may prove significant if implemented, while voluntary behavior change can aggregate and show results over time. Perhaps re-visiting the CAP with updated mitigation strategies will be successful, or investing in new and creative solutions for energy production. The purchase of carbon offsets is considered a last resort within the Climate Action Plan.

Scope 3 has emerged as the most difficult and least addressed challenge. Scope 1 or 2 can be and currently are directly impacted by investments in operations-based technology and efficiency solutions. Scope 3 on the other hand requires soft-resource investment in policy and institutional support for broad behavioral change. For example, University commitment to well-monitored programs and institutional incentives for alternatives such as telecommuting, shuttle service, supported car and van pools, managed parking, or personal carbon offsets combined with a mandate toward whole-campus engagement could reduce Scope 3 emissions. Clark is not alone in struggling with Scope 3 realities, and there are no easy answers.

Although we have reached and have retained our interim goal, it is clear that business-as-usual for the next 12 years will not achieve the goal of the Climate Action Plan without a completely different, as yet undetermined approach, or without relying on the carbon offset market mechanism. Continued expansion of the University, combined with continuing unstable weather patterns due to climate change, make achieving our 2030 goal of carbon neutrality extremely challenging without addressing significant behavioral, habitual and technological inputs as a community, and without investing in them financially, operationally and personally. Clark’s Climate Action Plan provides a roadmap to effectively achieve our Climate Commitment goals, however; there is still much to be accomplished that will require the commitment and ingenuity of the entire Clark community if we are to meet our goals of climate neutrality - net zero emissions - by 2030. As the Clark University Environmental Task Force has noted in several reports, the low-hanging fruit has been captured via CAP mitigation strategies and while operations-based investments in technology will continue, to truly impact our emissions a whole-campus approach that includes every employee with high levels of administrative support and direction to ask for significant behavior change, as well as changing long-held habitual and institutionally-condoned practices, will be necessary before 2030.