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One Step at a Time: Duquesne University's Ninth Greenhouse Gas Inventory

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One Step at a Time: Duquesne University's Ninth Greenhouse Gas Emissions Inventory

Duquesne University

Center for Environmental Research and Education

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May 2022



TABLE OF CONTENTS

Acknowledgements	3
List of Figures	4
List of Tables	4
1. EXECUTIVE SUMMARY	5
2. INTRODUCTION	6
3. METHODS	7
3.1 SCOPE 1 SOURCES	7
3.1.1 Stationary Fuel	7
3.1.2 Cogen Efficiencies and Outputs	7
3.1.3 Transport Fuel	8
3.1.4 Fertilizer	8
3.2 SCOPE 2 SOURCES	8
3.2.1 Utility Consumption	8
3.2.2 Renewable Energy	8
3.3 SCOPE 3 SOURCES	8
3.3.1 Commuting	8
3.3.2 Business Travel & Study Abroad	9
Faculty and Staff Travel	9
Athletic Travel	9
Study Abroad	10
3.3.3 Paper	10
3.3.4 Waste & Wastewater	10
3.4 SINKS	10

3.5 EMISSIONS CALCULATIONS	10
4. RESULTS	11
5. DISCUSSION	13
5.1 MAJOR EMISSIONS	13
5.1.1 Heating and Electricity	14
5.1.2 Travel	15
5.2 MINOR EMISSIONS	16
5.3 COMPARISON WITH OTHER UNIVERSITIES	16
5.4 METHOD CHALLENGES	17
5.5 COVID-19 AND ITS EFFECT IN EMISSIONS	18
5.6 EXISTING ENVIRONMENTAL ASSETS	18
5.6.1 Physical Facilities	18
5.6.2 Institutional Approaches	19
6. RECOMMENDATIONS	19
6.1 RENEWABLE ENERGY	19
6.2 IMPROVED EFFICIENCY	20
6.3 TRANSPORTATION	20
6.4 OFFSETS	20
7. CONCLUSION	21
Appendix A: Acronyms	22
Appendix C. University Statements Regarding COVID-19 (Coronavirus)	24
Appendix D: Previous GHG Inventories	28
Appendix E: References	29

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- William Spangler, *Associate Dean for Undergraduate Programs and Academic Affairs, Palumbo-Donahue School of Business*

List of Figures

Figure 1. Distribution of FY21 GHG emissions by scope

Figure 2. Distribution of FY21 GHG emissions by source

Figure 3: Purchased electricity and renewable energy credits (kWh) from FY18 to FY21

Figure 4. Transportation-related GHG emissions (MT eCO₂) from FY18 to FY21

List of Tables

Table 1. Total and per weighted campus user GHG (MT eCO₂) emissions from FY18 to FY21

Table 2. Major GHG emission sources and values (MT eCO₂) from FY18 to FY21

Table 3. Minor GHG emissions sources and values (MT eCO₂) from FY18 to FY21

Table 4. Recent GHG emissions of Duquesne University and other HECC universities

1. EXECUTIVE SUMMARY

The ninth greenhouse gas (GHG) emissions inventory was conducted for fiscal year 2021 (FY21), which began on July 1, 2020 and ended on June 30, 2021. Assembled by graduate assistants Gabriella Zuccolotto and Brianna Marks at the Center for Environmental Research and Education (CERE), these findings were compared with those derived from the previous inventories to assess trends in Duquesne University's GHG emissions. Furthermore, this inventory discusses options for reducing Duquesne's carbon footprint in future years.

Duquesne University's total GHG emissions were 41,562.40 MT eCO₂ for FY21. After calculating the full-time student equivalent and the full-time faculty/staff equivalents, SIMAP was able to generate the emissions per weighted campus user (WCU). This resulted in a carbon footprint of 5.07 MT eCO₂ per WCU in FY21. The largest contributor to Duquesne's GHG emissions was on-campus stationary combustion, which includes the natural gas cogeneration plant and auxiliary boilers. During FY21, the cogeneration plant accounted for 63.65% of Duquesne University's emissions. The second-largest contributor of GHG emissions during FY21 was student and employee commuting, which accounted for 19.72% of emissions, while purchased electricity (electricity not generated at the co-gen facility) accounted for 14.60% of emissions. However, emissions from purchased electricity do not count towards the reported total emissions, as they are offset entirely with renewable energy credits (RECs). Other emission sources, such as directly financed athletics and business travel, the university fleet, fertilizer, solid waste, wastewater and paper purchasing, contributed to total emissions, however these sources were comparatively insignificant.

Although Duquesne University began completing GHG inventories in 2006, assessing long-term trends in this data is difficult, as all fiscal years prior to 2018 utilized a different reporting methodology. However, the adoption of SIMAP as Duquesne's primary emissions calculation tool and implementation of a detailed protocol for data collection has allowed for standardization of GHG emission calculations. Therefore, this report, as well as future reports, will focus on changes in emissions from FY18 to present.

This inventory found that, compared to FY20, FY21 GHG emissions increased by 3.93%. FY20 experienced a 16.55% decrease in total emissions when compared to FY19, coinciding with students leaving campus and cancellation of all university travel in March 2020 in compliance with lockdown measures. As students gradually returned to campus through FY21, campus activity increased but was not yet operating at full capacity. The unique nature of the COVID-19 pandemic significantly impacted total reported emissions during FY20 and FY21, making it difficult to distinguish between GHG emissions variations from campus activity and emissions improvements purposefully made by the university. Despite these limitations to reporting, total emissions still appear to be decreasing when comparing pre-lockdown and post-lockdown emission values, with a 18.48% reduction observed between FY18 and FY21.

There are several measures Duquesne must take to ensure that future reductions continue to decrease. These steps could include (1) increasing the purchasing and use of renewable energy, (2) improving the energy and water efficiencies of campus facilities, (3) providing alternative transportation options for commuters and/or incentivizing them to utilize sustainable transportation, and (4) increasing composting or considering additional sinks/offsets that will help neutralize Scope 1 and Scope 3 GHG emissions.

2. INTRODUCTION

As a partner of the nation's first EcoInnovation District, Duquesne University has committed to "creating an equitable and sustainable community."¹⁰ Some of the EcoInnovation District goals include increasing compost rates, reducing pesticide use, increasing sustainable forms of transportation, and most importantly, reducing carbon emissions from waste disposal, transportation, and energy.¹⁰ The university is also a member of the Pittsburgh 2030 District which, according to their website, is "an internationally recognized, locally driven strategic initiative of Green Building Alliance (GBA) that supports building owners and managers as they strive toward 50% reductions in energy use, water consumption, and transportation emissions by 2030, while improving indoor air quality."²⁰

In addition to Duquesne's commitment to Pittsburgh's EcoInnovation District and 2030 District, the University also promotes sustainability due to the Catholic Church's commitment to "the integrity of creation."^{5,10,20} This idea is expressed on the University's sustainability webpage:

At Duquesne, we work each day to find new ways to reduce our consumption of natural resources and to promote sustainable living. Achieving the goals of sustainability – whether through green operations, construction projects, research, academic coursework or community engagement initiatives – is one of the principal ways that we have been able to transform respect for the integrity of creation into action and honor our Catholic founding in the Spiritan tradition.⁵

Per Duquesne University's commitment to sustainability, the Center for Environmental Research and Education (CERE) conducted its first GHG emissions inventory in 2006. At the time, it served as the first completed GHG inventory by any university in Western Pennsylvania. This inventory provided campus officials, students, and community members with knowledge regarding the size and sources of Duquesne's GHG emissions. As a result of the inventory's success, Duquesne University decided to publish a GHG emissions inventory biennially to determine overall emission generation trends. To date, the University has published eight GHG inventory reports.

In 2019, it was determined that the GHG emissions inventory should be published annually rather than biennially. As such, plans were set in place to release a FY19 report in the spring of 2020. However, the COVID-19 pandemic hindered these plans, and as a result, FY19 and FY20 findings are both included in the eighth edition of Duquesne's GHG report. Going forward, reports will be released annually, beginning with this ninth edition.

While the purpose of the GHG emissions inventory is to provide the University with knowledge of their GHG emissions, the report also serves as a valuable tool for creating innovative solutions to reduce carbon emissions over time. Additionally, the report compares the most current inventory to previous inventories in an effort to track the University's progress towards its goal of achieving carbon neutrality.

3. METHODS

In 2017, the University of New Hampshire Sustainability Institute launched a new GHG emission inventory platform, the Sustainability Indicator Management & Analysis Platform (SIMAP). SIMAP uses state-of-the-art GHG emission knowledge and well-researched formulae to convert institutional data into emission figures.¹⁴ This program was first used to complete the FY 2018 report after replacing an older version of similar software known as Clean Air-Cool Planet.

SIMAP categorizes data into four broad functional fields:¹⁴

- Scope 1: Direct emissions from sources owned and/or controlled by the University.
 - Cogeneration facility, auxiliary boilers, combustion of fossil fuels in university-owned facilities or vehicles (campus fleet), and refrigerant use.
- Scope 2: Indirect emissions from sources neither owned nor operated by the University but whose products are directly linked to on-campus energy consumption.
 - Purchased electricity, steam, chilled water, and renewable energy including renewable energy credits.
- Scope 3: Other emissions that are directly financed but are neither owned nor operated by the University or are otherwise linked to campus activities.
 - Commuting, travel (by plane and bus), solid waste disposal, wastewater disposal, and paper usage.
- Sinks: Projects on or off-campus that reduce the institutional carbon and/or nitrogen footprint.
 - Compost, non-additional sequestration, and offsets (e.g. reforestation and biogas projects)

3.1 SCOPE 1 SOURCES

3.1.1 Stationary Fuel

On May 1, 2019, Duquesne University's Tri Generation facility (Energy Center) was sold to Clearway Energy, Inc.⁶ While this transaction means that Duquesne no longer owns the Energy Center, the facility is still controlled and operated by Duquesne employees. As a result, the Energy Center remains classified under Scope I as a stationary fuel source for FY21.

Stationary fuel data were provided by David Chismar via a monthly Energy Center report. This report details the University's usage of natural gas by building. The natural gas usage at the Energy Center, and its associated boilers, were recorded into SIMAP as cogeneration natural gas. The remaining natural gas usage was then recorded in SIMAP as a non-cogeneration form of natural gas. The University's natural gas was reported in million cubic feet (MCF) and converted to million British Thermal Units (MMBTU).

3.1.2 Cogen Efficiencies and Outputs

Information regarding Cogen efficiencies and outputs was obtained by Mark Johnson via the Clearway Energy ECP Uptown Campus LLC – Monthly Production Report. The total electric usage in kWh and the total electrical efficiency and steam efficiency were recorded. Additionally,

steam usage was recorded in Mlbs and converted to MMBtu. This information was then entered into SIMAP.

3.1.3 Transport Fuel

Both Public Safety and Facilities Management were contacted regarding the university fleet, and these departments provided gasoline and diesel usage. Public Safety reported operation of 6 vehicles with a fuel economy of 11 mpg in FY21. It was stated that each vehicle traveled approximately 12,000 miles throughout the year. Thus, the Public Safety vehicles traveled approximately 72,000 miles throughout FY21 while consuming roughly 6,545 gallons of gasoline.

While Public Safety provided the total vehicle miles, Facilities Management provided the total dollar amount spent on gasoline and diesel fuel. Since SIMAP requires data to be entered in the form of U.S. gallons, the monetary gasoline value provided by Facilities Management was divided by the average price of regular gasoline for the Pittsburgh area. This value was obtained by the Energy Information Administration (EIA) and was calculated to be \$2.48 for FY21.¹⁹ The same methodology was used to determine the total diesel miles, with the cost of diesel averaging \$2.78 for FY21.

3.1.4 Fertilizer

Fertilizer usage was received from Facilities Management in total bags purchased for FY21. According to Facilities Management, each bag weighed 50 lbs. The total amount of fertilizer used was converted into pounds and then entered into SIMAP.

3.2 SCOPE 2 SOURCES

3.2.1 Utility Consumption

Purchased electricity was obtained through David Chismar via Duquesne University's Monthly Summary of Commodities report. This information was given in kWh, which was consistent with SIMAP reporting units. Steam and hot water were not recorded in SIMAP under Utility Consumption, as the cogeneration facility produces these utilities, and thus, fall under Scope 1.

3.2.2 Renewable Energy

In 2020, Duquesne University renewed its Power Purchase Agreement with Direct Energy Business, LLC. The new contract, which supports 66,362 MWh of any national Green-e Energy certified REC, extends over 4 years resulting in a yearly offset of approximately 16,590.5 MWh. REC data is "Green-e" verified and entered as MWh in SIMAP.⁴

3.3 SCOPE 3 SOURCES

3.3.1 Commuting

Commuting information was obtained via the Duquesne University 2018 IMP Parking Memorandum.¹⁷ This report provided an average number of commute days per week for both

students (4.6) and faculty and staff (4.5). These values were multiplied by 2 to generate the number of one-way trips per week (9.2 and 9.0), which is the measure required by SIMAP. The number of one-way student trips was multiplied by the total number of commuter students (both full-time and part-time) to generate the total number of one-way student trips per week. This same process was repeated to determine the total number of faculty and employee one-way trips. All institutional data used was obtained by Angela Chirumbolo from the Office of Institutional Research and Planning.

When entering data into SIMAP, student, faculty, and staff commuting were all recorded separately. This allowed the difference in percentages of commuting methods (e.g., automobile, bike, bus, carpool, walking, etc.) between students and employees to be accounted for, which is also detailed in the Parking Memorandum.

3.3.2 Business Travel & Study Abroad

This category comprises four subgroups: (1) faculty, and staff travel, (2) athletic air travel, (3) athletic bus travel, and (4) study abroad travel. Subgroups 1-3 are referred to as “Other Directly Financed Travel” throughout this GHG inventory, while subgroup 4 is denoted “Air Travel.” This categorization is a direct result of the restraints imposed from the predetermined SIMAP categories. Additionally, SIMAP requires faculty and staff travel to be entered as either passenger miles or U.S. Dollars. Previous inventories reported data as passenger miles, which has been used again for FY21.

Faculty and Staff Travel

The amount of money spent for faculty and staff travel was obtained by Kenneth Mann from Procurement and Payment Services. This value was converted to passenger miles using the average Standard Industry Fare Level (SIFL) for FY21 (\$0.1682 per mile).^{11,12} The average miles flown were estimated to be between 501 and 1500 miles per trip.

Athletic Travel

Athletic travel was obtained from the Duquesne University Athletic webpage by analyzing all athletic schedules. When two or more events were scheduled 1-2 days apart, on the weekend, or during a University break, it was assumed that the team would not return to Duquesne in between. It was also assumed that any event located further than 8 hours away would require air transportation. Ground travel was calculated as round-trip miles via a diesel charter bus. All teams, excluding football, were assumed to have utilized one bus, while football is known to use two buses for game travel. The number of ground miles was obtained from *Google Maps*.

Along with faculty and staff travel, the amount of money spent on athletic air travel was also obtained from Kenneth Mann from Procurement and Payment Services. Similarly, the amount of money spent on athletic air travel was converted to passenger miles using the average SIFL of FY21.^{11,12}

Study Abroad

Study abroad data were obtained from the Study Abroad Office and the Palumbo-Donahue School of Business for all semester and summer trips that occurred during FY21. Due to the on-going COVID-19 pandemic, university travel abroad was restricted throughout FY21. Therefore, no study abroad data was reported for this inventory.

3.3.3 Paper

In previous GHG inventories, paper usage was provided by the Duquesne Print Shop and Receiving offices. Beginning in FY21, paper purchasing at Duquesne became the responsibility of individual departments. Each department now purchases paper from Office Depot through the university's Office Depot representative, Kelly Knetzer. Data for university department paper purchasing was provided by Kelly in the Green Usage Report. Weight of paper purchased was obtained from the Green Usage Report, and paper was assumed to contain 30% recycled content. However, the Duquesne Print Shop still purchased paper individually and provided the number of reams purchased during FY21. Weight of paper reams purchased by the Print Shop was assumed to be 2 lbs each with the same percentage of recycled content. Thus, to generate the total weight of paper used by the Print Shop, the total number of reams purchased by Duquesne University Print Shop was multiplied by 2 lbs. This number was then added to the total weight of 30% recycled content paper purchased through Office Depot to obtain the total weight of paper purchased by the university.

3.3.4 Waste & Wastewater

Facilities Management provided the quantity of waste, in short ton, to a landfill during FY21. Wastewater generation was also obtained from Facilities Management and recorded in gallons in SIMAP. Emissions from wastewater generation result from treatment method(s) used at the designated treatment facility. The Allegheny County Sanitary Authority treats wastewater using anaerobic digestion.²

3.4 SINKS

In 2011, Duquesne University began partnering with AgRecycle - Pennsylvania's largest composting company.¹ As a result, food waste from Duquesne's dining halls is collected and composted via this third party. Composting of dining waste was obtained from Facilities Management and was recorded in SIMAP in short tons. Continuing with the precedent set by the GHG inventories from FY18-20, composting data are also reported for FY21.

3.5 EMISSIONS CALCULATIONS

SIMAP calculates GHG emissions values using the most recent version of emission factors. Updated emissions factors are released annually, with the most recent update (2021 version) released in February 2022.¹⁴ These updates help to improve the accuracy of reported emissions, however, they also make it difficult to assess changes in GHG emissions from year-to-year. All emissions values discussed in this report, including those from FY18, FY19 and FY20, were calculated using the 2021 version of emissions factors, as well as the fifth Assessment Report (AR5) of the United Nations Intergovernmental Panel on

Climate Change (IPCC) 100-year version for global warming potential, Bureau of Transportation Statistics (BTS) version of air travel cost conversion and a radiative forcing value of 2.7. It should be noted that, because the recommended calculation factors have been updated, the total emissions values discussed in this report for FY18, FY19 and FY20 will not match the total emissions values reported in the seventh and eighth GHG inventories.

Additionally, SIMAP calculates Scope 2 emissions based on both a location-based and a market-based approach.¹⁴ These approaches vary based on how they account for market-purchases, such as renewable energy credits (RECs). The location based-approach produces emissions values based on eGrid regions and does not account for RECs, while the market-based approach does account for RECs. Because Duquesne University purchases enough RECs to cover their annual purchased electricity, the total emissions values reported in this inventory for FY18 to FY21 (Table 1) were calculated using the Scope 2 market-based approach.

4. RESULTS

Duquesne University’s total GHG emissions for FY21 were 41,562.40 metric tons of carbon dioxide equivalent (MT eCO₂), equaling 5.07 MT eCO₂ per weighted campus user. In FY21, 63.87% of emissions (31,060.53 MT eCO₂) were attributed to Scope 1 sources, 14.60% of emissions (7,097.93 MT eCO₂) were attributed to Scope 2 sources, and 21.53% of emissions (10,469.14 MT eCO₂) were attributed to Scope 3 sources (Figure 1). To ensure that Scope 2 values were represented appropriately, consideration of RECs was disregarded when generating these figures.

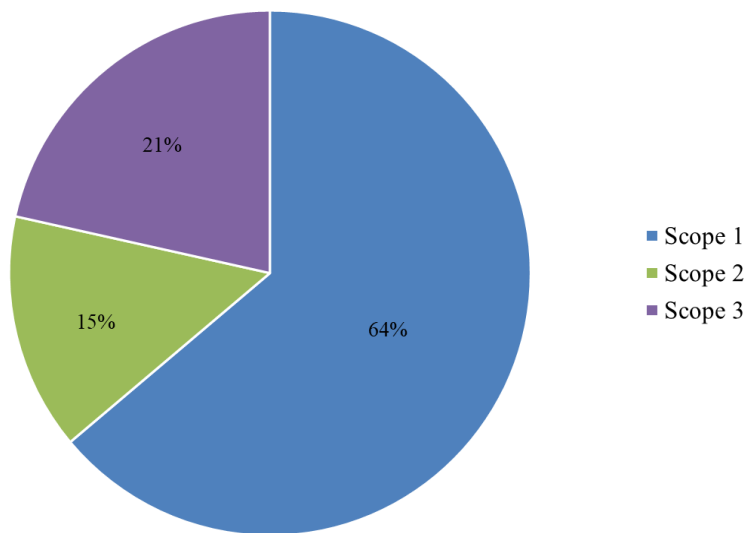


Figure 1. Distribution of FY21 GHG emissions by scope

When broken down individually, the source that produced the most emissions during FY21 was the Co-generation Facility on Duquesne’s campus. Emissions from this source made up 63.53% of the total emissions (30,951.58 MT eCO₂) for FY21. All sources considered to be “minor emissions sources” were grouped together in this chart and labeled as such. This group comprised 0.65% of total FY21 emissions (317.37 MT eCO₂). The lowest source of emissions was Directly Financed Air Travel, which made up 0.57% of total emissions (276.09 MT eCO₂) for this fiscal year (Figure 2).

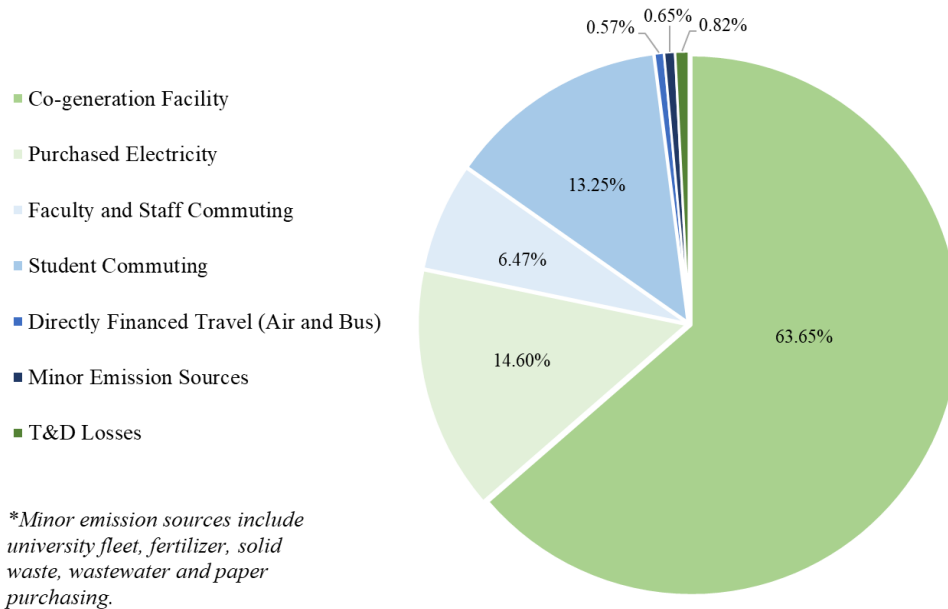


Figure 2. Distribution of FY21 GHG emissions by source

Stationary combustion from Duquesne’s cogeneration facility has consistently been the university’s largest source of GHG emissions over time. In FY21, Duquesne University consumed 539,034 MCF of natural gas, and the cogeneration facility produced 29,593,643.00 kWh of electricity and 241,775 Mlbs of steam. This production of electricity and heat from the cogeneration facility accounted for 63.65% of GHG emissions for FY21 (Figure 2). In FY21, an additional 15,522,321 kWh of electricity was purchased to supplement the electricity produced by the cogeneration facility. However, this additional electricity was counterbalanced by the purchasing of 16,590,500 kWh worth of RECs (Figure 3), resulting in net-0 Scope 2 emissions.

Emissions related to travel represent a significant portion of Duquesne University’s total emissions each year. Duquesne has a variety of transportation related emissions including commuting, study abroad air travel, and other directly financed travel (faculty/staff business travel and athletic travel). These sources contributed 9,863.48 MT eCO₂ in FY21, which accounted for 23.99% of Duquesne’s GHG emissions. Commuting was responsible for the majority of transportation emissions in FY21 at 97.20%.

Minor emissions sources of university GHG emissions include university fleet vehicle usage, fertilizer usage, wastewater production, office paper usage, and solid waste production. These sources are considered minor emissions as the totals of these categories constitute less than 1.00% of the total university GHG emissions each fiscal year. In FY21, minor emissions sources made up 0.653% of total campus emissions (317.37 MT eCO₂). The largest contributor out of this group was university fleet vehicle usage, which resulted in 108.47 MT eCO₂ for FY21. Fertilizer contributed the least emission with only 0.48 MT 3CO₂ throughout the fiscal year.

5. DISCUSSION

Using the 2021 version of emissions calculation factors, emissions for FY18, FY19, FY20 and FY21 were 50,986.49 MT eCO₂, 47,918.57MT eCO₂, 39,989.18 MT eCO₂ and 41,562.40 MT eCO₂, respectively (Table 1). FY19 observed a 6.02% decrease when compared to FY18, and FY20 observed a 16.55% decrease when compared to FY19. The dramatic decrease in emissions from FY19 to FY20 coincides with lockdown measures associated with the COVID-19 pandemic, which resulted in limited campus activity. As lockdown measures were reduced and students returned to campus for the 2020-2021 academic year, emission levels rose, with an observed increase of 3.93% from FY20 to FY21. Despite this increase, overall emission levels appear to be trending downward with an observed decrease of 18.48% between FY18 and FY21. However, Duquesne campus activities have not completely returned to pre-COVID levels, as study abroad and athletics travel were limited throughout FY21. This could still be contributing to the sustained lower emissions of FY21 compared to FY18.

Table 1. Total and per weighted campus user GHG (MT eCO₂) emissions from FY18 to FY21

Fiscal Year	Total Emissions (MT eCO ₂)	Emissions Per Weighted Campus User (MT eCO ₂)
2018	50,986.49	5.59
2019	47,918.57	5.31
2020	39,989.18	4.40
2021	41,562.40	5.07

5.1 MAJOR EMISSIONS

Major emissions sources of university GHG emissions include the heating and electricity related sources such as stationary combustion at the cogeneration facility and purchased electricity in addition to travel related sources, such as commuting, study abroad travel and other directly financed travel. These sources consistently make up the majority of Duquesne Universities total GHG emissions each fiscal year. In FY21, major emissions sources comprised 98.20% of total campus emissions. A 4.29% increase in major emissions was seen from FY20 to FY21, with 39,135.35 MT eCO₂ in FY20 (Table 2). A decrease in major emissions is observed from FY18 to FY21, with totals dropping 18.33% from 49,973.17 MTeCO₂ in FY18 to 40,815.06 MT eCO₂ in FY21. This supports an overall decreasing trend in emissions over time.

Table 2. Major GHG emission sources and values (MT eCO₂) from FY18 to FY21

Emission Source Category	FY18 Emissions (MT eCO ₂)	FY19 Emissions (MT eCO ₂)	FY20 Emissions (MT eCO ₂)	FY21 Emissions (MT eCO ₂)
<i>Cogeneration Facility</i>	37,384.87	33,015.44	25,985.18	30,951.58
<i>*Purchased Electricity</i>	9,705.82	8,016.01	7,277.47	7,097.93
<i>Commuting</i>	7,392.42	9,956.00	9,986.65	9,587.39
<i>Study Abroad Travel</i>	2,777.80	1,916.55	991.19	0.00
<i>Other Directly Financed Travel</i>	2,418.08	2,153.78	2,172.33	276.09

**Values for purchased electricity in Table 2 are completely offset by REC purchasing and are not included in the calculation of total emissions.*

5.1.1 Heating and Electricity

A 21.29% decrease in stationary combustion emissions occurred from FY19 to FY20, likely due to COVID-19 lockdown measures in March of 2020. As students returned to campus throughout the 2021 fiscal year, emissions from the cogeneration plant rose, increasing 19.11% from FY20 to FY21. Emissions from purchased electricity fluctuate yearly, with a 2.47% decrease observed from FY20 to FY21 (Figure 3). REC purchasing decreased by 4,581.9 MWh in FY20 after a new four-year contract with Direct Energy Business, LLC was signed. This level was maintained in FY21. It is worth noting that over the past four fiscal years, emissions from purchased electricity were entirely offset by REC purchases, resulting in net-0 Scope 2 emissions.

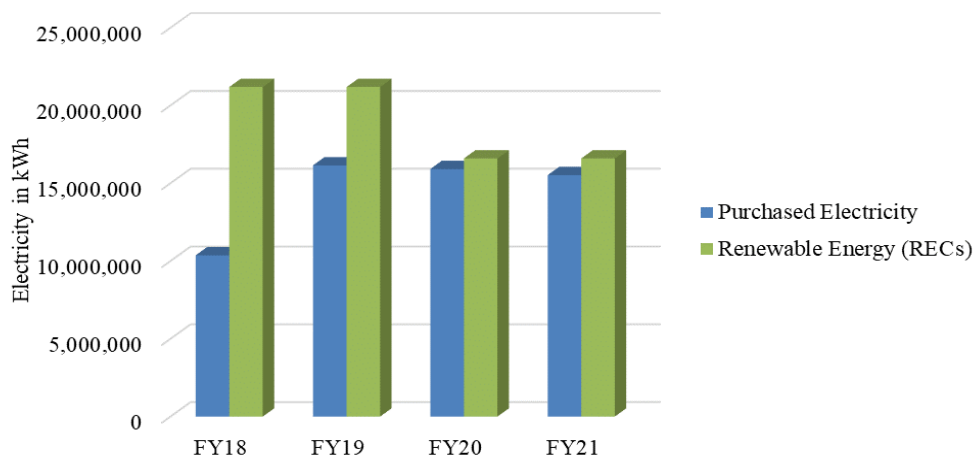


Figure 3: Purchased electricity and renewable energy credits (kWh) from FY18 to FY21

5.1.2 Travel

Commuting emissions decreased 3.99% from FY20 to FY21. Variations in commuting emissions fluctuate depending on enrollment, and SIMAP’s methodology was unable to remove the months during FY20, where commuting ceased due to lockdown. This can be seen in the 0.31% increase in commuting that occurred from FY19 to FY20, despite the fact that no commuting took place during lockdown. SIMAP was also unable to account for hybrid-learning during FY21, which reduced the number of commuter trips students and employees were making to campus. Due to this limitation, it is likely that emissions from commuting are being over-reported in FY20 and FY21. Additionally, emission calculations are based on the average number of one-way commuter trips, which were reported in the 2018 parking memorandum.¹⁷ The creation of the 2018 parking memorandum significantly improved previous methodology for calculating commuting emissions. However, a new memorandum has not been produced since, and therefore, these averages may no longer accurately represent commuting behavior in FY21.

In the FY18 and FY19 inventories, study abroad air travel was a major source of GHG emissions for Duquesne University. However, reduced emissions were reported from study abroad air travel in FY20 - specifically cancellation of the “May-mester” program - and no emissions reported in this category in FY21 due to restrictions from the COVID-19 pandemic (Figure 4). Emissions from other directly financed travel, which includes air and bus travel for business and athletics, were also significantly impacted by COVID-19 travel restrictions, with a 87.29% decrease observed from FY20 to FY21.

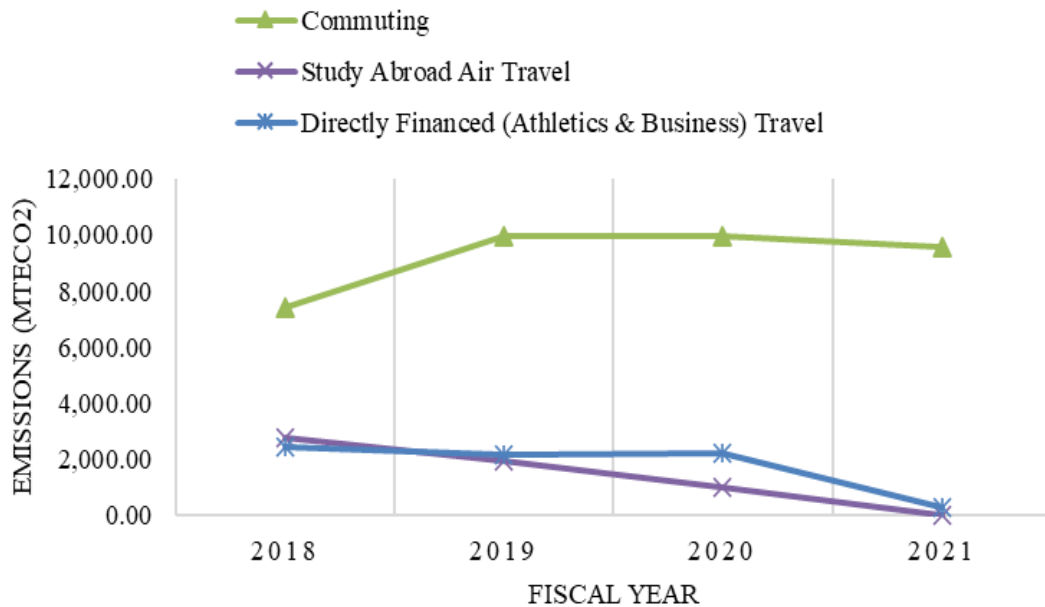


Figure 4. Transportation-related GHG emissions (MT eCO₂) from FY18 to FY21

5.2 MINOR EMISSIONS

Minor emissions for FY21 show a decrease of 23.14% compared to FY20, with totals of 412.94 MT eCO₂ in FY20 and 317.37 MT eCO₂ in FY21. A larger reduction in minor emissions of 38.37% was seen from FY18 (514.96 MT eCO₂) to FY21. University fleet vehicle usage produced the most emissions in FY21 at 108.47 MT eCO₂ (Table 3). This is not consistent with previous years which showed solid waste or wastewater as the highest minor emission sources. Minor emissions in FY21 comprised the smallest percentage of total emissions compared to the other three years. This fiscal year also had the smallest total of minor emissions compared to other years. This is evident in the emissions calculated for each source, as all except for office paper usage are less than previous years.

Table 3. Minor GHG emissions sources and values (MT eCO₂) from FY18 to FY21

Emissions Source Category	FY18	FY19	FY20	FY21
Mobile Combustion - Fleet Vehicle Usage	130.04	120.25	127.98	108.47
Fugitive Emissions - Fertilizer	1.00	0.84	0.84	0.48
Wastewater	174.24	158.88	121.58	98.21
Office Paper - Usage	18.71	15.28	11.77	12.99
Solid Waste	190.97	150.59	150.77	97.22
Total	514.96	445.84	412.94	317.37
Percentage of Total Emissions	0.848%	0.797%	0.874%	0.653%

5.3 COMPARISON WITH OTHER UNIVERSITIES

In an effort to gauge Duquesne University's GHG emissions, Duquesne was compared to other universities affiliated with the Pittsburgh Higher Education Climate Consortium (HECC). HECC is a partnership between 10 Pittsburgh institutions of higher education that "actively collaborate to reduce greenhouse gas emissions", according to their website. The most recent GHG inventories from three HECC-affiliated universities, Carnegie Mellon University, Penn State Center Pittsburgh and University of Pittsburgh, were compared to Duquesne University.

Duquesne University ranks third in lowest GHG emissions per full-time equivalent (FTE) user behind Carnegie Mellon University and Penn State Center Pittsburgh, which is composed of multiple Penn State branch campuses. However, Penn State Center Pittsburgh has significantly less FTE users (3,051) compared to Duquesne (9,636). It should also be noted that although Duquesne is not the smallest university on the list in terms of FTE users, it is geographically the smallest campus on the list, with an area of only 48 acres.

Table 4. Recent GHG emissions of Duquesne University and other HECC universities

Institution	Reporting Year	Campus Area (Acres)	Total FTE Users	Total GHG Emissions (MT eCO ₂)	GHG Emissions per FTE (MT eCO ₂)
Carnegie Mellon University	FY2021	157	17,386	38,785	2.23
Duquesne University	FY2021	48	9,636	41,562	4.31
Penn State Center Pittsburgh	FY2020	307	3,051	11,076	3.63
University of Pittsburgh	FY2020	145	39,777	186,068	4.67

5.4 METHOD CHALLENGES

One of the most considerable challenges of compiling this report involves the methodology and assumptions that are required when considering travel-related emissions. For example, in 2018 Duquesne University produced a parking memorandum that outlines employee and student commuting behavior, including the average number of commuter days per week.¹⁷ This method does not take into account the distance that employees and students travel to the university. Additionally, a recent inventory has not been completed, and therefore, these values may not accurately represent FY21 commuting activity. Significant changes in commuting behavior that occurred mid-way through FY20 and FY21 associated with hybrid learning during the COVID-19 pandemic were unable to be accounted for in SIMAP’s methodology.

Another limitation to calculating Duquesne’s travel-related emissions is a lack of flight information for study abroad programs. Through Duquesne’s Center for Global Engagement, we are provided with the destinations of study abroad programs and the number of students that attend each program. We are not, however, given any information regarding flight layovers. As a result, we must assume that all flights are direct, thereby underreporting the actual number of air miles flown.

There is also much room for error when documenting athletic travel in addition to uncertainty regarding general air travel and study abroad reporting methods. At the current time, there is no direct contact with the Athletics Department when reporting ground/air miles. Rather, information is obtained from online schedules, and assumptions are made to determine whether a trip involved ground or air travel. Fortunately, we were provided with the total amount spent on athletic air travel through the Procurement and Payment Services in FY21, and therefore, our confidence in reported athletic air miles has increased. However, without direct contact with the Athletics Department, there is much uncertainty in the reported bus miles. Thus, it is suggested that contact with the Athletic Department is made to improve bus travel mileage accuracy on future reports.

5.5 COVID-19 AND ITS EFFECT IN EMISSIONS

The novel coronavirus (COVID-19) began as a small, isolated cluster of pneumonia cases in the city of Wuhan, China. The virus quickly spread around the world leading to over one million global cases only four months after its identification.¹³ Due to the possible severity of COVID-19 and its initial rapid spread, lockdowns were ordered in various locations worldwide. On March 11, 2020, Duquesne University began the process of transitioning students to online learning, and by March 15th, all students residing on campus were asked to return home. As a result, nearly all campus activities were ceased immediately (See Appendix C for official announcement). Classes continued to be held remotely during the summer semester.

Campus activity increased slightly but still remained limited throughout FY21 (see Appendix C for more information regarding the Fall 2020 semester). Changes can most notably be observed in cogeneration, study abroad, and athletic/business travel emissions. Emissions from the cogeneration facility increased from 25,985.18 MT eCO₂ in FY20 to 30,951.58 MT eCO₂ in FY21. Study abroad travel was significantly lowered in FY20. However, there was no study abroad activity throughout FY21, resulting in significantly reduced Scope 3 emissions. In addition, athletic/business travel saw a 87.3% reduction from FY20 to FY21. Thus, it is difficult to determine if decreases in campus emissions for certain sources are due to changes in campus infrastructure or limited university travel and campus activity throughout the COVID-19 pandemic.

5.6 EXISTING ENVIRONMENTAL ASSETS

5.6.1 Physical Facilities

Duquesne University has a cogeneration facility that is responsible for keeping GHG emissions low. This facility uses natural gas to produce electricity for nearly all of the campus. Additionally, the facility's heat recovery system captures the steam produced by burning natural gas, which heats the University in return. This facility also contributes to an on-campus ice-making process, which provides cooling to University buildings. In addition to housing a cogeneration facility, the Duquesne University Facilities Management Department has continuously improved building efficiency throughout campus. For example, renovations to the heating, ventilation, and air conditioning (HVAC) of 17 buildings provide one means of lessening the University's energy needs. The university has implemented a direct digital control (DDC) system that utilizes a variable air system to minimize energy usage using off-peak times. Another ongoing project includes improvements and upgrades to the University's lighting systems. While students were away from campus during COVID-19, facilities management at Duquesne University replaced over 15,000 fluorescent light bulbs on campus with LEDs. Duquesne University has also installed LED bulbs in all of the campus street lights and ballasts. The continued conversion to LED lighting will reduce electrical needs and the amount of purchased electricity required by the University. According to the 2021 Institutional Master Plan,⁷ "The University is committed to applying sustainable practices to major new building and renovation projects where financially feasible. Going forward, this will include consideration of the Passive House criteria for building design." By ensuring that future construction and renovation projects are green, the University will be able to reduce their GHG emissions.

5.6.2 Institutional Approaches

Duquesne has a multitude of initiatives that support GHG emission reductions. First, the University is a member of the Association for the Advancement of Sustainability in Higher Education (AASHE), an organization described as a national coalition of universities and colleges dedicated to environmental responsibility.¹⁶ As a member of AASHE, the University completes an annual STARS (Sustainability Tracking, Assessment, and Rating System) report. This report, which ranks Duquesne's sustainability efforts with those of other universities, provides a unique tool for Duquesne to assess sustainability strengths and weaknesses. The University has implemented several sustainable initiatives since completing the first STARS report in 2019. As a result, Duquesne's sustainability ranking has improved from a Bronze ranking in 2019 to a Silver ranking in 2020 and 2021.

In addition to Duquesne's membership in AASHE, several departments on campus promote sustainability. The Center for Environmental Research and Education (CERE), a department within the Bayer School of Natural and Environmental Research and Education, focuses its education and research on critical environmental problems. Additionally, the Palumbo-Donahue School of Business MBA in Sustainable Business Practices trains future business leaders to integrate responsible climate approaches into sound economic management. This program is ranked 4th in the world for its commitment to environmental and social issues by Corporate Knights.³ Duquesne's computer store works to recycle and repurpose old electronics through their buy-back program,⁸ and the University partners with Waste Management Inc. landfill in Monroeville, Pennsylvania to dispose of waste and recover methane produced during decomposition to generate electricity. In addition, a variety of on-campus organizations, including *Net Impact*, *Evergreen*, and the *Ecology Club*, help to promote and implement sustainable practices and environmental stewardship. Duquesne also partners with organizations such as Uptown Partners of Pittsburgh, Pittsburgh 2030 District Challenge, and 3 Rivers Quest to maintain green practices in conjunction with other organizations in the area.^{9,18,20} Finally, Duquesne manages an on-campus garden through faculty and student volunteers. Since its creation in the Spring of 2021, the garden has increased in size and popularity. The vegetables grown in the garden are donated to Food Rescue 412, a local food bank in Pittsburgh.

6. RECOMMENDATIONS

6.1 RENEWABLE ENERGY

Duquesne University has implemented renewable energy in a variety of ways across campus. During the construction of Des Places Living Learning Center, solar panels were installed on the rooftop to provide supplemental electrical generation to the building. The University also purchases RECs to promote renewable energy generation throughout the U.S., while offsetting the decreasing amount of purchased electricity required for campus operation. In addition to these uses of renewable energy on campus, there are more options that should be implemented to promote renewable energy at Duquesne. Some of these ideas include (1) purchasing electricity from renewable energy suppliers, (2) purchasing RECs generated in the southwest region of Pennsylvania to promote renewable energy expansion and innovation in the area, and (3) implementing more renewable energy sources directly on campus such as solar tables, solar-powered sidewalk lights, and additional solar panels on rooftops.

6.2 IMPROVED EFFICIENCY

To further reduce GHG emissions at the University, buildings' energy and water efficiency should be improved. Recently, the Facilities Management department has begun renovating the HVAC systems in a majority of campus buildings. The new control systems will better regulate energy consumption in the buildings and will consequently decrease emissions by requiring less energy for operation. Another improvement to building efficiency at Duquesne is the installation of LED lighting and rain barrels to reduce stormwater runoff. Despite these improvements, the University needs to take further steps to improve overall campus efficiency for newly acquired campus buildings and old University in order to reduce their electrical, heating, and cooling needs. Improvements should include updated double-paned windows, installing new insulation, LED motion-activated lights and further renovating the HVAC systems. To improve water efficiency the university could consider updating faucets to be automatic and replacing toilets with 1.28 gallons-per-flush high-efficiency toilets for all campus facilities, as well as the installation of bioswales, rain gardens or porous pavements. These advances would decrease stormwater runoff and overall energy use by the University and reduce GHG emissions. Additionally, further improvements to the cogeneration facility's efficiency and capacity could have the potential to reduce GHG emissions by producing more of the required electricity for campus while decreasing the amount of purchased electricity from the grid.

6.3 TRANSPORTATION

Commuting has continually been an aspect of Duquesne's GHG emissions that could be improved upon. Firstly, an updated parking memorandum should be completed to ensure that commuting activity is accurately being portrayed in inventory data. There are also various ways for faculty, staff, and students to reduce their carbon footprint by driving vehicles with higher fuel efficiency or electric vehicles, carpooling with peers, or using alternative transportation such as bicycling, public transit, or utilizing the campus shuttle bus. However, Duquesne has a responsibility to improve students' knowledge of alternative transportation in Pittsburgh and provide shuttle options to other areas in Pittsburgh. Additionally, the University should consider installing electric charging stations in campus parking garages and provide incentives for students to use alternative transportation methods.

6.4 OFFSETS

Offsets provide an opportunity for Duquesne to counteract some of its GHG emissions from Scope 1 and Scope 3 sources. FY18 was the first year in which composting was recorded as an offset and the recording of composting continued for this report. Although small, this offset may incentivize University officials to improve their composting methods and educate students on its importance. Another way of offsetting Scope 1 and Scope 3 emissions could include the implementation of afforestation and reforestation projects. Alternatively, the University could look to counteract travel-associated emissions by purchasing carbon offsets through vendors. For example, *Terrapass*, a carbon offset vendor, sells offsets to counteract GHG emissions produced due to flight and ground travel.¹⁵

7. CONCLUSION

In FY21, Duquesne University emitted 41,562.40 metric tons of carbon dioxide equivalent (MT eCO₂), equating to 5.07 MT eCO₂ per weighted campus user. This is a 3.93% increase in total emissions compared to FY20. It is likely that the decrease in emissions observed from FY19 to FY20 were likely a result of COVID-19 lockdown measures, and subsequent increases in emissions from FY20 to FY21 were due to the return of students on campus. Despite these fluctuations, it appears that emissions are generally trending downward with an 18.48% reduction in emissions from FY18 to FY21. However, some campus activity, such as athletics and study abroad travel, was still operating at limited capacity during FY21, making it difficult to distinguish between emission changes related to COVID-19 safety measures and purposeful emission reduction strategies implemented by the university.

Consistent with previous GHG inventory reports, the cogeneration facility was responsible for the majority (63.65%) of campus emissions in FY21. This was followed by student and employee commuting, which accounted for 19.72% of emissions in FY21. Finally, purchased electricity accounted for 14.60% of emissions in FY21; however, these emissions were offset by Duquesne's purchasing of RECs, as has been the case for the past four fiscal years. Minor emission sources, such as the campus fleet, fertilizer, wastewater, paper purchasing and solid waste, each account for less than 1% of total emissions.

There are several recommendations Duquesne University can follow to reduce their carbon footprint in coming years. Some of these recommendations include (1) increasing the purchasing and use of renewable energy, (2) improving the energy and water efficiencies of campus facilities, (3) providing alternative transportation options for commuters and/or incentivizing them to utilize sustainable transportation, and (4) increasing composting or considering additional offsets that will help neutralize Scope 1 and Scope 3 GHG emissions. Global concern regarding the reduction of GHG emissions will continue to impact the University as the institution continues to grow. However, if Duquesne makes sustainability a key mission by following the Catholic commitment to "the integrity of creation," campus GHG emissions can be diminished.⁵ Continuation of environmental efforts will drive Duquesne University towards a sustainable future, one step at a time.

Appendix A: Acronyms

- AASHE – Association for the Advancement of Sustainability in Higher Education
- AR - Assessment Report
- BTS - Bureau of Transportation Statistics
- CERE – Center for Environmental Research and Education
- DDC - Direct Digital Control
- EIA - Energy Information Administration
- FTE - Full-Time Equivalent
- FY – Fiscal Year
- GHG – Greenhouse Gas
- HECC - Higher Education Climate Consortium
- HVAC – Heating, ventilation, and air conditioning
- IPCC - Intergovernmental Panel on Climate Change
- kWh – Kilowatt hour
- MCF – Million cubic feet
- Mlbs – Million pounds
- MMBTU – Million British thermal units
- MTeCO₂ – Metric tonnes carbon dioxide equivalent
- MWh – Megawatt hour
- RECs – Renewable Energy Credits
- SIFL – Standard Industry Fare Level
- SIMAP – Sustainability Indicator Management & Analysis Platform
- STARS - Sustainability Tracking, Assessment and Rating System
- T&D - Transmission & Distribution
- WCU – Weighted Campus User

Appendix B: GHG Inventory Data from FY18 to FY21

Emissions Source	FY18	FY19	FY20	FY21
Co-gen Electricity	19.07	18.94	12.13	14.67
Co-gen Steam	35663.47	31890.11	25168.99	29659.14
Other On-Campus Stationary	1702.33	1106.39	804.06	1277.77
Direct Transportation	130.04	120.25	127.98	108.47
Fertilizer & Animals	1	0.84	0.84	0.48
*Purchased Electricity	9705.82	8016.01	7277.47	7097.93
Faculty Commuting	1244.1	1446.39	1452.35	1415.06
Staff Commuting	2349.48	1854.96	1823.64	1729.69
Student Commuting	3798.84	6654.65	6710.66	6442.64
Directly Financed Air Travel	2139.96	1902.72	1982.49	173.57
Other Directly Financed Travel	278.12	251.06	189.84	102.52
Study Abroad Air Travel	2777.8	1916.55	991.19	0
Solid Waste	190.97	150.59	150.77	97.22
Wastewater	174.24	158.88	121.58	98.21
Paper Purchasing	18.71	15.28	11.77	12.99
T&D Losses	498.16	430.79	407.29	397.24
Market-based total (includes REC purchasing)	50986.49	47918.54	39989.15	41562.41
Location-based total (does not include REC purchasing)	60692.11	55934.41	47233.05	48627.6

*Purchased electricity is entirely offset by Duquesne's REC purchasing over the past four fiscal years. This offset is accounted for in the market-based totals, but not in the location-based total.

*All values were calculated using the 2021 version of SIMAP emissions factors.

Appendix C. University Statements Regarding COVID-19 (Coronavirus)

Updated Information as of March 19, 2020

Students

At around 5 p.m. today, Pennsylvania Governor Tom Wolf ordered the closure of all non-life-sustaining businesses by 8 p.m. today, March 19, 2020. The governor's order does not categorize colleges and universities as life-sustaining businesses, with the exception of staffing the needs of our student residents who remain in our residence halls who have no other housing option.

As a result, **all University operations not related to the feeding and housing of the students remaining in our residences are supposed to cease all *on-campus* operations effective 8 p.m. tonight, March 19, 2020.**

IT IS IMPERATIVE THAT ALL STUDENTS WHO ARE ABLE TO LEAVE CAMPUS DO SO IMMEDIATELY. We recognize that those families at a distance may need time to complete this move. Please note that Governor Wolf has indicated that enforcement of this order will begin at **midnight on Saturday**. Therefore, time is of the essence in moving out of the residences.

Only students with no other safe housing option should remain on campus as we wind down operations dramatically.

Please share or update your plans for departure as soon as possible with the Office of Student Life through the [web forms](#).

IMPORTANT:

- Because our faculty have planned well and transitioned to online delivery of courses, **classes will continue.**
- **Library services will remain available online**, as will other academic support provided remotely.
- All **academic and student services** offices will be open, staffed remotely. Phone numbers and emails for those offices, available on our website, all have been forwarded so that service can continue.
- **Administrative offices** will be open with staff working remotely.

Efforts will continue to ensure students intending to leave are able to do so, with full support of the University.

The state will take enforcement actions for non-compliance with this order starting at 12:01 a.m. on Saturday, March 21. Those businesses found non-compliant "will forfeit their ability to receive any applicable disaster relief and/or may be subject to other appropriate administrative action . . . includ[ing] termination of state loan or grant funding, including Redevelopment Assistance Capital Project (RACP) grant funding and/or suspension or revocation of licensure for violation of the law."

The Governor's measures are intended to slow the spread of COVID-19 and therefore align with the measures Duquesne already has adopted.

Employees

At around 5 p.m. today, Pennsylvania Governor Tom Wolf ordered the closure of all non-life-sustaining businesses by 8 p.m. today, March 19, 2020. The governor's order does not categorize colleges and

universities as life-sustaining businesses, with the exception of staffing the needs of our student residents who remain in our residence halls and who have no other housing option.

As a result, **all University operations not related to the feeding and housing of the students remaining in our residences are supposed to cease all on-campus operations effective 8 p.m. tonight, March 19, 2020.**

The state's enforcement will begin at 12:01 a.m. on Saturday, March 21. **Employees who wish to retrieve items from their offices that are essential to their ability to work remotely must do so by noon tomorrow, March 20, 2020.** Individuals will not be able to return to their offices for an indefinite period of time.

All administrative offices and academic offices must be prepared to move to remote work immediately. **No employees are to come to campus offices** other than those identified as proving for the needs of our student residents.

Efforts will continue as possible to ensure students intending to leave are able to do so, with full support of the University.

Vice presidents and deans will be in contact with directors, department heads and other supervisors regarding business continuity of their respective units. Remote working will continue per plans already established, for those whose work permits such arrangements.

Once you have removed your essential belongings, DO NOT RETURN TO YOUR CAMPUS OFFICE UNTIL NOTIFIED.

The state will take enforcement actions for non-compliance with this order starting at 12:01 a.m. on Saturday, March 21. Those businesses found non-compliant "will forfeit their ability to receive any applicable disaster relief and/or may be subject to other appropriate administrative action . . . includ[ing] termination of state loan or grant funding, including Redevelopment Assistance Capital Project (RACP) grant funding and/or suspension or revocation of licensure for violation of the law."

The governor's measures are intended to slow the spread of COVID-19 and therefore align with the measures Duquesne already has adopted.

I'm writing to share with you some specific details regarding our updated plans for the fall 2020 semester at Duquesne. Now that we've received input from students and their families, faculty, staff, and other members of the University community, we are able to provide you with a clearer report on key decisions even before the full Master Plan for fall 2020 is presented to the University's Board of Directors for approval on Monday, June 29.

More than 6,000 people—faculty, staff, students, and parents—participated in the surveys we conducted in the last few weeks. Your opinions and suggestions proved extremely helpful to the Master Plan team. We also consulted with leaders in Duquesne's Student Government, the Faculty Senate, the Staff Advisory Council, our Parents Advisory Council, and various others either through the work of the Task Forces or in other efforts. We listened carefully and the decisions we have made reflect the overwhelming preferences of all concerned and match with Pennsylvania Governor Tom Wolf's guidelines. While we continue to finalize the Master Plan for fall 2020, our efforts have progressed to the point that we can provide several key specifics to help you make relevant plans and preparations.

Last week, my leadership team and I met with the executive committee of the University's Board. The decisions outlined below were approved:

DUQUESNE WILL RE-OPEN FOR FALL 2020

All constituents showed overwhelming support for having students **return to campus for the fall semester** and for classes and student life to operate in the **hybrid/blended model** outlined in my previous communication.

Classes will start on Monday, August 24, as originally planned. Students who wish to take courses remotely for any reason will be able to do so. Students who wish to take face-to-face courses in a hybrid fashion, on campus, will be able to do so. New protocols are being finalized that will ensure that these classes are conducted safely, with appropriate social-distancing and de-densification measures.

Living Learning Centers—the residence halls on campus—will be open, de-densified, and operating with new safety protocols. To ensure no students currently signed up for an on-campus residence will be turned away, the University has leased back St. Martin Hall (which had been acquired by a third-party partner and was to have been closed for renovations this academic year) to expand on-campus housing capacity. The Living Learning Centers will be arranged to lessen the number of students in each building and hygiene protocols will be implemented.

MOVE-IN AND ORIENTATION

To ensure safety for the arrival of all students and provide a positive orientation experience for freshmen, Duquesne has adjusted the **arrival schedule** as follows:

- **Freshmen will be able to move in** starting Sunday, August 16, and continuing through Tuesday, August 18. This early arrival will help to ensure social distancing during move-in and also provide time for freshmen to acclimate to campus, purchase books, and settle in prior to the start of classes.
- Freshmen also will have the opportunity to engage in various small-group orientation activities offered in the days leading up to the official freshman **orientation** on Wednesday, August 19. All events will be adapted to meet health and safety guidelines of the Master Plan.
- All upper-class students living on campus will be able to schedule times to **place their belongings** into their residences early, starting on Saturday, August 1, and continuing through Saturday, August 15. Upperclassmen can then move in completely during the times outlined

below. This process of moving belongings in early provides for greater safety and for families to avoid the denser conditions of typical move-in days.

- Upperclassmen who were unable to participate in early move-in may select time slots to complete their move-in from Friday, August 21, until Sunday, August 23, after Mass of the Holy Spirit.
- Move-in times will begin at 8 a.m. and end at 8 p.m. daily and be segmented in three-hour time slots: 8 – 11 a.m., 11 a.m. – 2 p.m., 2 – 5 p.m., and 5 – 8 p.m.
- In total, upperclassmen will have 70 different blocks to select from.

Overwhelming support was shown for our ensuring that **coursework ended prior to the Thanksgiving holiday**. This will ensure that students do not have to go home and then return to campus, which could increase the risk of potentially carrying infection or exposing others.

In order to accomplish this without a serious overhaul of the schedule that would have entailed Saturday classes or extended days—which students did NOT support—the **University will hold classes on Labor Day as well as Monday, November 23, and Tuesday, November 24**, prior to Thanksgiving break. We confirmed that by making these adjustments, we can meet the standards established by our accrediting body while allowing students to return home on Wednesday, November 25, having completed the coursework necessary for the semester.

To ensure students will have sufficient time to study and enjoy a true break with families over Thanksgiving, the academic calendar will build in **three reading days** immediately after Thanksgiving, from Monday, November 30, through Wednesday, December 2, for studying. **Final exams** will then occur on Thursday, December 3, and Friday, December 4, followed by the weekend for additional study, and then continuing from Monday, December 7, through Friday, December 11. Winter commencement will occur as scheduled on Friday, December 18.

Calendars for the School of Law and the School of Pharmacy are unchanged.

Since Duquesne employees will be working on Labor Day, the University will identify another day off for employees, in consultation with the Staff Advisory Council.

SAFETY MEASURES

The University already has prepared in numerous ways to ensure we can operate with proper social distancing protocols in place. Students should know that it will be mandatory and a matter of student conduct policy to **wear masks in all public spaces**. Faculty and staff will have to adhere to the same policy. Many other safety measures will be detailed in our Master Plan. These specifics will be shared with you, in early July, after the plan is approved by the University's Board of Directors at its June 29 meeting.

As we complete this planning process, however, I thought it was important to ensure you knew about these key decisions, understanding that it is time for students and families, as well as faculty and staff, to plan for the fall. I continue to be grateful for the great support and goodwill everyone has shown throughout this process.

I look forward to updating you again soon. In the meantime, I hope that you and your families remain safe and healthy. Most of all, I look forward to an excellent semester when Duquesne University re-opens in the fall, thanks to all of your input and collaboration.

Warm regards,
Ken Gormley

Appendix D: Previous GHG Inventories

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