Tulane University

2021
Greenhouse Gas Inventory Report

Introduction

Tulane University's 2021 Greenhouse Gas (GHG) Inventory aims to measure the university's annual emissions in Metric Tons Carbon Dioxide Equivalent (MTCO2e). This inventory is conducted as a part of Tulane's participation in the Presidents' Climate Leadership Commitments, a national conglomerate of universities working to address climate change. The year 2021 contained months with both strict and relaxed Covid-regulations, providing this report with months of relatively normal university operations as compared to 2020.

Greenhouse gas emissions in 2021 were reduced from 2020 levels by 9.61%. In 2021, either directly through university activities or indirectly through the purchase of energy, Tulane University emitted 70,812 Metric Tons Carbon Dioxide Equivalent (MTCO2e), a 7,525 MTCO2e reduction from the previous year. A substantial reduction in emissions from regional electrical grid (Appendix C), the completion of several energy conservation measures, and the temporary shutdown of the university caused by Hurricane Ida contributed to reduced total emissions.

The 2014 Tulane Climate Action Plan adopted in 2015 aims to reduce GHG emissions by 15% of 2007's emissions baseline by 2020; 30% of emissions by 2025; and achieve carbon neutrality by 2050. The year 2020 marked the university's first benchmark year for GHG emission reduction, reduce emissions to levels below 71,522 MTCO2e. In 2021, GHG emissions were reduced by 15.84% from emission levels in 2007, meaning the university surpassed its 2020 emission reduction goal.

Considering the increase in student population and building space since 2007, Tulane University has made great strides towards the goals set by the 2014 Tulane Climate Action Plan. Since 2007, MTCO2e per FTE student (Full Time Equivalent) has decreased by 39.63% while MTCO2e per 1,000 sq. ft. of building space has decreased by 26.62%. These calculations of emissions intensity contextualize Tulane's GHG emissions in relation to the university's growth.

Through Tulane's commitment to reducing its GHG emissions the university has regularly implemented strategies to facilitate improvement in its environmental impact. The purpose of the GHG emissions inventory is to provide Tulane community members with information that gives them an idea of where the university stands in its progress to reach its goals of carbon reduction and eventually carbon neutrality.

Boundaries

Tulane's 2021 GHG Inventory measures emissions from university operated facilities, transportation services, and rental properties between January 1st and December 31st, 2021. Areas and facilities covered in this report include: the uptown campus, downtown health science campus, and the Tulane National Primate Research Center (TNPRC). The Tulane Lakeside Hospital and Tulane Medical

Center, which are owned and operated by the Hospital Corporation of America, are not included in this inventory.

Greenhouse Gas Emissions Scopes

Scope 1 emissions are produced directly by the institution when using fossil fuels in equipment and vehicles and through fugitive emissions (for example, the escape of hydrofluorocarbon [HFC] refrigerants into the atmosphere).

Scope 2 emissions are generated indirectly by the university through the purchase of utilities including electricity, steam, and chilled water. In the case of Tulane, Scope 2 emissions are dominated by electricity we purchase from Entergy New Orleans, our electricity and natural gas utility. See Appendix C for discussion of the emissions factor for the university's purchased electricity in 2021 and previous years.

Scope 3 emissions are all other indirect emissions that result as a part of an institution or organization's operation that are not captured in Scopes 1 and 2. This includes but is not limited to academic travel, employee commuting, food sourcing, waste disposal, and manufacturing of materials used on campus.

Tulane University's Office of Sustainability **does not** include Scope 3 emissions in its GHG Inventory reporting because reliable and repeatable reporting methods for this broad scope have not yet been established. Awareness of Scope 3 emissions, however, is important in helping the university to understand its climate impact. Research must be conducted to explore the possibilities of optimizing the ways in which we calculate these emissions. Members of the Tulane community who are interested in researching or pursuing the challenge of calculating Scope 3 emissions are encouraged to contact the Office of Sustainability (recycle@tulane.edu).

2021 Greenhouse Gas Emissions

In 2021, Tulane University's greenhouse gas emissions were reduced from the 2020 levels. The university emitted 70,812 Metric Tons Carbon Dioxide Equivalent (MTCO2e) in 2021, whereas in 2020, Tulane released 78,337 MTCO2e. In terms of percent reduction from 2020, Tulane emitted 9.61% less in 2021. Graph 1, as shown below, compares MTCO2e emissions data from 2021 are compared to those of each previous year until 2007. The graph differentiates Scope 1 (dark green bars) and Scope 2 (light green bars) emissions. The horizontal black dotted line indicates the university's target emissions reduction for 2020, a 15% reduction from 2007's MTCO2e levels. The data used to construct Graph 1 are presented numerically in Table 1, below. Table 2 reviews changes in the university's total emissions against the 2007 baseline year, 2020 goal, and 2025 goal. Table 4 further in this report records the university's annual energy and refrigerant use by scope and source.

Graph 1: Tulane University Annual Greenhouse Gas Emissions

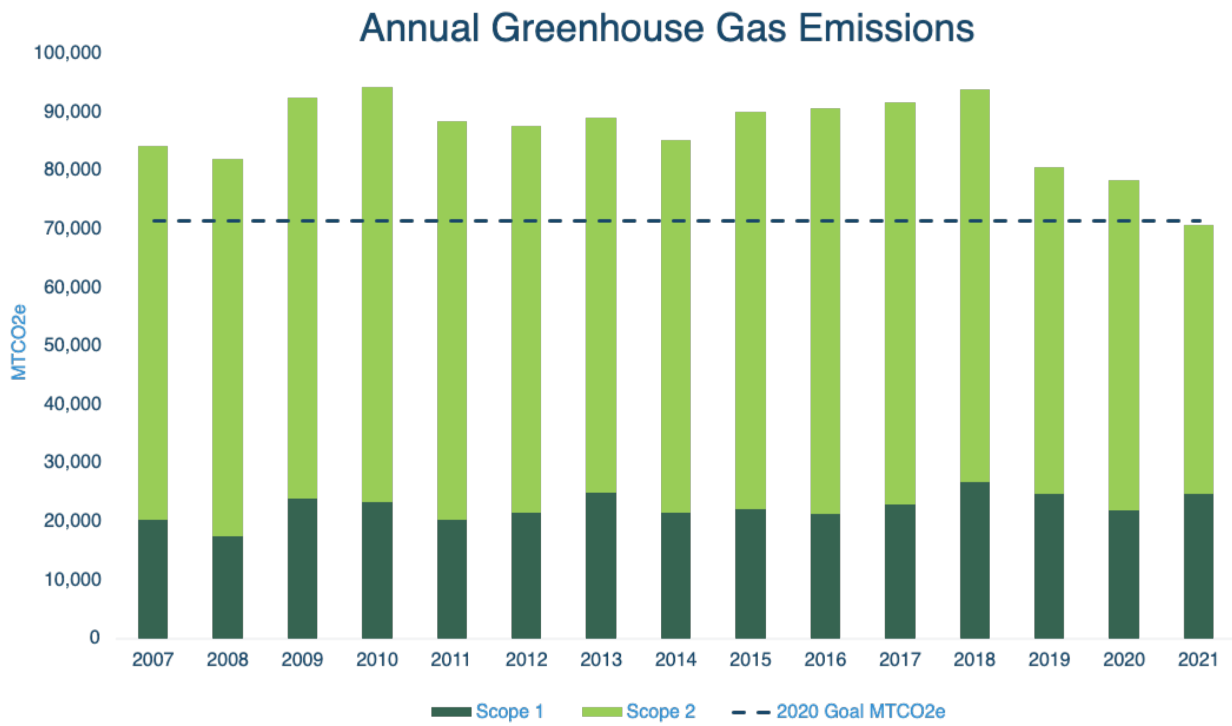


Table 1: Tulane University Annual Greenhouse Gas Emissions

GHG Emissions (MTeCO2)				
	Total Scope 1	Total Scope 2	Scope 1&2	Amount over 2020 Goal (71,522)
2007	20,244	63,900	84,144	12,622
2008	17,566	64,427	81,993	10,471
2009	23,953	68,571	92,524	21,002
2010	23,275	71,088	94,363	22,841
2011	20,303	68,097	88,399	16,877
2012	21,546	66,095	87,641	16,119
2013	24,971	64,004	88,975	17,453
2014	21,559	63,776	85,335	13,813
2015	22,089	67,900	89,989	18,467
2016	21,248	69,526	90,774	19,252
2017	22,938	68,765	91,703	20,181
2018	26850	67,046	93,895	22,373
2019	24,737	55,807	80,544	9,022
2020	21,949	56,388	78,337	6,815
2021	24,748	46,064	70,812	-710

Table 2: Greenhouse Gas Emissions Reduction Progress

Greenhouse Gas Emissions Reduction Progress	
Change 2020 to 2021	-9.61%
Change from 2007 emissions	-15.84%
Amount below 2020 Goal	710 MTCO2e
Annual Emission Reduction to Meet 2025 Goal	11,911 MTCO2e

Emissions Intensity

To help contextualize Tulane's greenhouse gas emissions, we have analyzed them with indicators of the university's size in 2021, Full Time Equivalent (FTE) student population and Tulane's total building area, to determine the university's emissions intensity. Full Time Equivalent student population is calculated using the total number of full-time students plus half the number of part time students. Since 2007, FTE student population and Tulane building area have grown almost every year, which is why it is important to assess GHG emissions considering these factors.

Table 3 below catalogs our annual emissions together with institutional indicators and corresponding intensity figures. The FTE student population has grown by 40% since 2007. Tulane's MTCO2 emissions per FTE student have decreased immensely. Emissions per student decreased from 5.99 MTCO2e/FTE student in 2020 to 5.27 MTCO2e/FTE student in 2021.

The university's total building area has increased by 15% since 2007 with the acquisition of new properties, additions to existing buildings, and supplemental rental space. However, Tulane's emissions per square foot of building space have decreased by 27% since 2007. Temporary structures, including temporary tents currently housing the Tulane School of Architecture, are not included in the university's total building square footage. The power used by those structures is included in the overall energy emissions total. A chart visualizing the emissions intensity data presented in Table 3 is provided in Appendix A.

Table 3: Emissions Intensity

	MTCO2e (Scopes 1&2)	Students, Full Time Equivalent (FTE)	MTCO2e/ FTE Student	Building Area (1,000 sq. ft.)	MTCO2e/ 1,000 sq. ft.
2007	84,144	9,641	**8.73**	6,747	**12.47**
2008	81,993	10,091	**8.13**	7,038	**11.65**
2009	92,524	10,695	**8.65**	7,156	**12.93**
2010	94,363	10,945	**8.62**	7,168	**13.16**
2011	88,399	12,034	**7.35**	7,193	**12.29**
2012	87,641	11,699	**7.49**	7,210	**12.16**
2013	88,975	12,248	**7.26**	7,210	**12.34**
2014	85,335	12,341	**6.91**	7,475	**11.42**
2015	89,989	12,293	**7.32**	7,297	**12.33**
2016	90,774	12,397	**7.32**	7,303	**12.43**
2017	91,703	12,101	**7.58**	7,292	**12.58**
2018	93,895	12,413	**7.56**	7,441	**12.62**
2019	80,544	12,784	**6.30**	7,498	**10.74**
2020	78,337	13,071	**5.99**	7,651	**10.24**
2021	70,812	13,447	**5.27**	7,730	**9.16**

GHG Emissions and Energy Use

This inventory, as mentioned previously, considers Scope 1 and Scope 2 emissions generated by the university. Reviewing Table 3 provides more detail into changes in emissions sources found between 2020 and 2021 calendar years in Graph 1. The emissions categorized under these two scopes are dominated by energy used for university affiliated buildings, transport, and equipment. The objective of this section is to articulate energy use patterns by Tulane and record energy conservation initiatives implemented during 2021. Other relevant factors to consider are weather, climate, and electricity emissions factor, which measures the amount of GHG emissions released per unit of electricity.

In August of 2021, New Orleans was heavily impacted by Hurricane Ida. Measured as a Category 4 storm, Hurricane Ida knocked out power in the region, causing campus to close from August 26th to September 13th. Students were not able to return until September 22nd, which is when normal campus operations returned. This natural disaster likely decreased the university's total GHG emissions for 2021. For information on other external factors influencing university energy use and the resulting GHG emissions, see Appendix B on climate and weather impacts and Appendix C on the greenhouse gas emissions factor used for purchased electricity.

Energy & Refrigerant Based Emissions

The energy used by Tulane is principally purchased from Entergy New Orleans, the local utility for the city. The university uses electricity to power artificial lighting, electronics, pumps, fans, refrigerators, and other equipment. Likewise, chillers in power plants use electricity to remove heat from liquid coolant to create chilled water, which is used for cooling in buildings.

Boilers in the power plant utilize natural gas to make steam which is used to create heat and hot water for buildings. The natural gas is also burned to create steam which is used to drive a turbine and generate electricity via the Combined Heat and Power Unit (CHP). In 2020, to reduce purchased electricity and fuels, the installation of a chiller which utilizes waste steam from the CHP to create chilled water for buildings was completed. The amount of natural gas purchased varies from year to year and depends on the level of reliance on the CHP unit. Tulane's downtown campus purchases steam and chilled water from district utilities as a backup source of heating and cooling buildings.

The use of gasoline and diesel are primarily used by Tulane vehicles such as shuttles and transportation for university community members, athletics, and police. Facilities Services powers some equipment using these fuels as well. In emergency situations, during Hurricane Ida in August, for example, diesel fuel is used in mobile generators.

HFC refrigerants are purchased for the university's cooling equipment and are included in our GHG emissions inventory. Being that they are more damaging to the environment than other GHG emitters, extreme measures are taken to ensure that they are not released into the atmosphere. See Table 4 below.

Table 4: Energy & Refrigerant-Based Emissions

Scope, Source, & Units			2017	2018	2019	2020	2021
1	Natural Gas	MMBTU	384,869	478,366	443,341	392,797	445,871
1	Propane	Gallons	339	0	121	477	612
1	Gasoline	Gallons	84,383	88,681	83,913	70,670	61,094
1	Diesel	Gallons	30,369	39,960	34,419	24,111	34,565
1	Refrigerant HCFC-22	Lbs	n/a	n/a	n/a	125	132
1	Refrigerant HFC-134a	Lbs	1750	290	125	n/a	4
1	Refrigerant HFC-410a	Lbs	n/a	n/a	n/a	144	105
2	Electricity, Grid	kWh	147,236,649	142,884,447	142,375,463	143,998,808	135,591,816
2	Purchased Steam	MMBTU	2,485	1,098	933	999	4999
2	Purchased Chilled Water	MMBTU	5,737	5,281	4,235	33	5,073

Projects Affecting Energy Use

Several lighting upgrades were completed in 2021. These upgrades consisted of replacing old, inefficient lightbulbs with LED lights, which use substantially less electricity. These LED bulb upgrades began in 2021 and were implemented in three Downtown garages: 131 S Robertson, 1430 Tulane Ave, and 1440 Canal St. In Uptown, Butler Residence Hall, Monroe Residence Hall, and Percival Stern Hall received similar lighting upgrades. Each of these lighting upgrades were approved for and received monetary incentives from the Energy Smart program for improving efficient use of electricity. For detailed accounting of projected energy and emissions reductions from these projects, see Appendix D. The implementation and development of these projects will help the university decrease its overall energy usage and will, in turn, reduce Tulane's total GHG emissions.

Alexander Green Revolving Loan Fund

Lighting upgrades in Butler residential hall are projected to reduce annual electricity usage by 94,164 kwh. This energy conservation measure was funded in part by the Alexander Green Revolving Loan Fund. Green revolving loan funds make capital available for energy reduction projects whose reduced energy expenses in turn replenish the fund for similar future projects.

Outlook

On January 27, 2022, Tulane announced a 30-year Energy-as-a-Service partnership with Bernhard, LLC, which includes the goal of reducing annual greenhouse gas emissions toward reaching carbon neutrality in 2050. Launching under the name "Project RISE," Bernhard will implement energy optimization projects on the uptown and downtown campuses. Evaluation of energy use systems on each campus is central to Bernhard's plans and will be accessible to the campus community through Bernhard Connect for use in energy reduction outreach challenges, individual course projects, and instruction. Over $80 million in capital improvements will upgrade and strengthen the Universities Plant operations, HVAC and energy infrastructure. The partnership includes a 1-megawatt solar generation facility on the uptown campus to generate up to 10% of the university's total electricity needs. Improving reliability and resilience of campus infrastructures is the primary goal. Bernhard takes on responsibility for risk of energy operations and maintenance.

Projects on Deck, 2022

Energy-as-a-Service partnership with Bernhard, LLC has several projects on the calendar for 2022 that may begin impacting emissions data as soon as next year's annual inventory.

Lighting Upgrades. As in past years, lighting upgrades are among the most straightforward and easily implemented energy conservation efforts. With the Bernhard agreement, upgrades to LED lighting will roll out more quickly and comprehensively across both the Uptown and Downtown campuses in 2022.

Sub-Metering. Submetering is of special value to large campuses where institutional expansion has traditionally proceeded without the addition of new meters to track electricity, steam, gas, and water by building or project. For several decades, as buildings were brought into use on campus, they were integrated into the campus infrastructure without individual meters. This leaves building managers without regular and reliable data on individual building performance by which to identify energy conservation needs and opportunities. With Bernhard's assistance, new meters downstream of the utility meters are being installed to monitor performance in more discrete and actionable units to improve resource efficiency. Installation of sub-meters will begin in 2022 and continue into 2023.

Future Thinking

by Gabe Kusiatin, Class of 2022

In 2021, Tulane University met its 2020 greenhouse gas emissions reduction of 15% from 2007 emissions. By reducing our emissions by 15.84% this past year, we can now begin shifting our focus to meeting our 2025 goal of reducing emissions by 30% from 2007 levels. In 2021, Tulane University emitted 70,812 MTCO2e and will need to achieve an annual emission reduction of 11, 911 MTCO2e to meet their 2025 goal. To meet this objective, Tulane University must continue to implement strategies and projects to reduce energy use as well as transitioning to cleaner forms of energy such as renewables.

Climate change mitigation strategies can be further implemented and developed over the coming years. The purchase of RECs (Renewable Energy Credits) and SRECs (Solar Renewable Energy Certifications) is a way to support the renewable energy markets and offset its carbon emissions. Sourcing some energy from on-campus solar panels, for example, is another way in which Tulane can help mitigate climate change.

As mentioned above in this report, Scope 3 emissions are not included in this GHG emissions inventory. The primary reason for this is the challenges of calculating these emissions due to a lack of established methodology. For Tulane to truly understand its total GHG emissions for a given year, a methodology for accurately calculating Scope 3 emissions annually must be developed. As Tulane University continues to make improvements in food, travel, and waste management, there should be a reflection of this progress in the GHG emissions inventory.

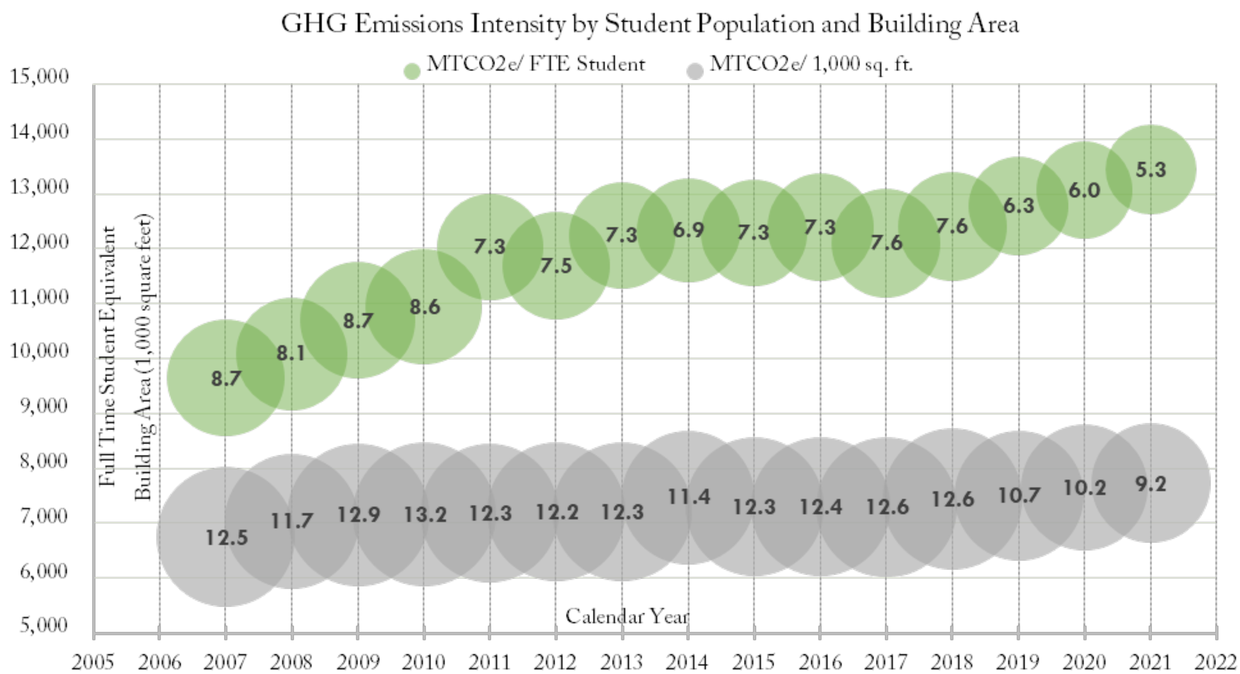
Being that New Orleans is a low-lying, coastal city, climate change poses a huge risk to those living in the area. Increasingly intensifying storms, flooding, and extreme land loss are a few of the major issues already impacting Southeast Louisiana. Tulane still can reduce its GHG emissions to meet the 2025 goal of 30% reduction to help combat climate change.

Tulane University's 2021 Greenhouse Gas Inventory Report was prepared by the Office of Sustainability with data from colleagues across the university. Data collection was conducted by student intern Gabriel Kusiatin, '22. The document was drafted by Gabriel Kusiatin and edited by Liz Davey, Director, and Jordan Stewart, Assistant Director.

Appendix A

Emissions Intensity

Graph 2: Tulane University Annual Greenhouse Gas Emissions Intensity



This chart draws on emissions intensity data shared in Table 3 to visualize changes in institution size against climate emissions annually since 2007, our climate action benchmark year. The intensity of climate emissions per full time student equivalent for each year, MTCO2e/FTE, is indicated by the area of the **green circles,** with the numerical value presented inside each circle. Similarly, the magnitude of climate emissions per 1,000 square feet of building area is indicated by the area of the **grey circles**. The position of each circle on the y-axis indicates the corresponding full time student equivalent or building area that year. The data show decreasing emissions intensity for each indicator with an upward institutional growth trend.

Appendix B

Climate & Weather

Energy usage and GHG emissions are partially influenced by the weather and climate over a given year. Heating Degree Days (HDD) and Cooling Degree Days (CDD) measure the amount of heating and cooling required to sustain a temperature of 65 degrees in buildings based in actual weather patterns at New Orleans International Airport weather station (KMSY). As indicated in the table below, 2021 had more Heating Degree Days and fewer Cooling Degree Days, indicating that in 2021, Tulane used more energy to warm buildings and less energy to cool them when compared to 2020.

The heating systems at Tulane utilize natural gas to create steam, which is then used to generate heat, heat for buildings whereas cooling systems utilize electricity to chill water in a central location or use electricity to power air-conditioning systems.

As noted above, extreme weather events also affected university GHG emissions. Hurricane Ida, which struck the New Orleans area in August of 2021 and closed the uptown campus for several weeks, significantly impacted energy use during the month of September.

Table 5: Climate & Weather

KMSY New Orleans International Airport Weather Station	2007		2017	2018	2019	2020	2021
Heating Degree Days (HDD)[1]	1,116		1,247	1,247	1,182	835	1,101
Cooling Degree Days (CDD)[2]	3,433		3,538	3,538	3,455	3,672	3,374

[1] Fahrenheit-based heating degree days with a base temperature of 65 F

[2] Fahrenheit-based cooling degree days with a base temperature of 65 F

Data Source: BizEE Weather Data for Energy Saving, www.degreedays.net.

Appendix C

Emissions Factors

Emissions factors, or emissions coefficients, measure the amount of greenhouse gas emissions released per one unit of fuel or energy. In terms of coal or gasoline, the emissions factor is calculated depending on the chemical properties of the fuel and are constant regardless of when or where it was burned. The emissions factor for purchased electricity is dependent on the types of fuel or energy sources utilized to generate the electricity. This means that emissions factors for purchased electricity will vary depending on where and when the electricity was created.

The SERC Mississippi Valley electric grid emissions factors, calculated annually by the Environmental Protection Agency, are the basis of emissions calculations and projections for Tulane's current Climate Action Plan, including the 2007 baseline year emissions, emissions reduction goals, and steps to achieve those goals. The SERC Mississippi Valley emissions factor has decreased by 13.7% between 2020 and 2021. This reduction in emissions from the regional grid explains, in part, reduced Scope 2 greenhouse gas emissions for the university in 2021.

The SERC Mississippi Valley electric grid includes Entergy New Orleans, Tulane's main electricity and natural gas provider. In May of 2021, the City of New Orleans adopted the Renewable and Clean Portfolio Standard (RCPS)[1] which requires Entergy New Orleans to provide customers with electricity from zero carbon sources by 2050. Intermediate performance goals are to provide electricity from 80% clean sources by 2030 and 100% clean (net-zero carbon emissions) by 2040. These improvements and others in the regional grid will help the university reach its carbon reduction goals for 2030 and 2050.

Table 6 below provides a location and time-based perspective on the emissions factor of purchased electricity in the university's Scope 2 emissions which currently dominate the university's annual greenhouse gas emissions. Image 1 shows the current EPA eGRID map. Scope 2 emissions receive special attention in this report because of their magnitude and, unlike Scope 1 emissions, both the buyer and seller of the utilities are responsible for the emissions released. The purchaser, in this case Tulane University, determines how much electricity they will consume through selection, maintenance, and repair of low energy and efficient systems their facilities and electric vehicles. Whereas the utility provider determines how they will generate their electricity and thereby the emissions factor and the emissions released.

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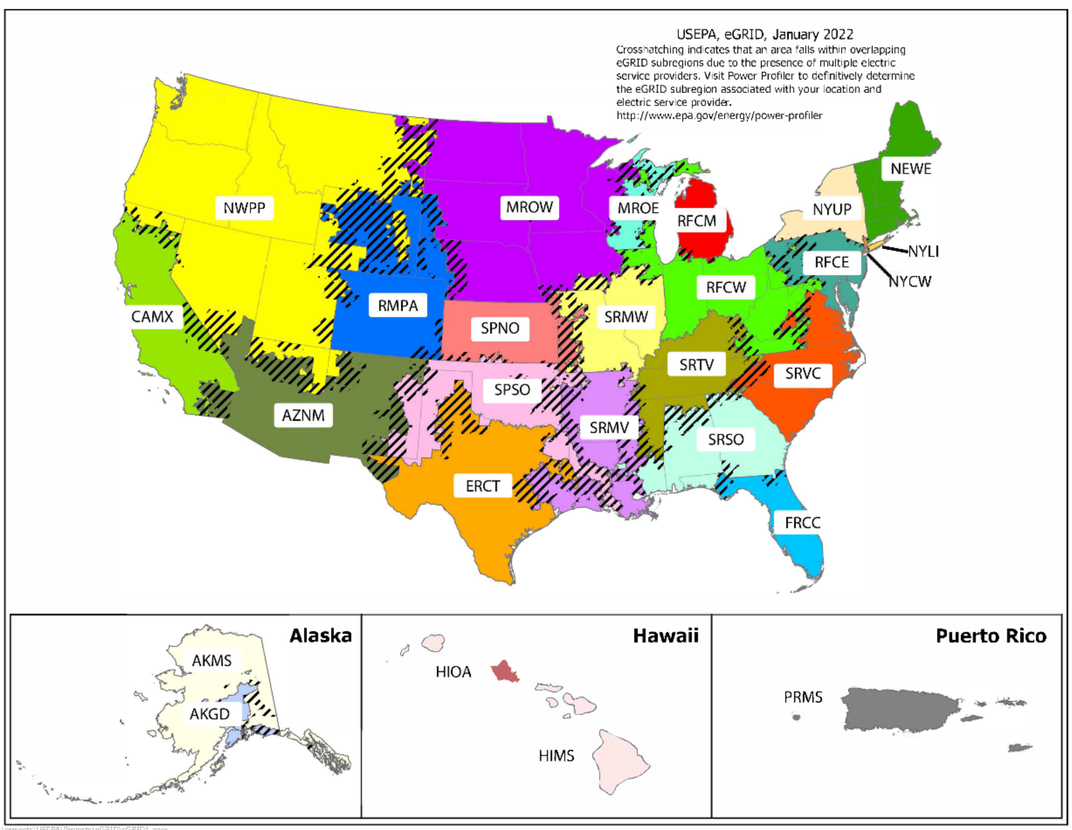
[1] The Renewable and Clean Portfolio Standard, retrieved May 31, 2022 online: https://cityofno.granicus.com/MetaViewer.php?view_id=&clip_id=3852&meta_id=538696

Table 6: Scope 2 Electric Grid Emissions Factors

Scope 2 Electric Grid Emissions Factors					
Tulane GHG Inventory Year	2017	2018	2019	2020	2021
eGrid Region	SRMV: SERC Mississippi Valley, 2007 and beyond				
Emission Factors Version	AR4	AR4	AR5	AR5	AR5
Emission Factors Database	eGRID2014	eGRID2016	eGrid2018	eGrid2018 Unchanged in 2020 update	eGrid2020
CO2e	1027.1 lb/MWh	842.2 lb/MWh	858.4 lb/MWh	858.4 lb/MWh	740.36 lb/MWh

For more information on electricity emissions factors and the eGrid regions at the U.S, visit the EPA's Power Profiler website, accessed June 1, 2022: https://www.epa.gov/egrid/power-profiler#/

Image 1: US EPA eGRID Map, January 2022



US EPA eGRID Map, January 2022, accessed June 2, 2022: https://www.epa.gov/egrid/maps

Appendix D

2021 Emissions Abated & Projected Reductions

This table records projected emissions abatement projects impacting university emissions in 2021 and forward. Each project utilized Energy Smart electricity reduction incentives to reduce the capital cost of these projects to the university.

Table 3: 2021 Emissions Abated & Projected Reductions

Total Scope 1	Completion Season	Estimated Annual Electricity Reductions kWh	Estimated Annual GHG Reductions MTCO2e
131 S Robertson Parking Garage	Summer 2021	101,467	34.1
1430 Tulane Ave Parking Garage	Summer 2021	80,618	27.1
1440 Canal St Parking Garage	Summer 2021	94,494	31.7
Butler Residence Hall	Summer 2021	94,164	31.6
Monroe Residence Hall	Summer 2021	129,361	43.4
Percival Stern Hall	Winter 2020	181,037	60.8
Total Projected Annual Reductions		681,141	228.7

Electricity SRMV eGRID2020 Emissions Factor 740.36 lb CO2e / MWh 0.000335825 MTCO2e/kWh