UNC GREENSBORO
Facilities Operations

2023 Strategic

Energy and Water Annual Report

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Facilities Operations
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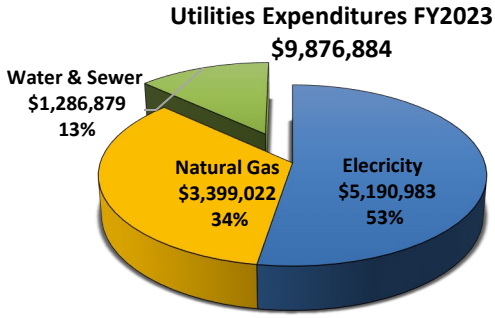
I. OVERVIEW

The University of North Carolina at Greensboro (UNCG) is continuing to reduce its energy footprint by using all available resources for more energy efficiency on campus while supporting the University's missions. Through the implementation of the UNC System's first performance contract, installation of several new technologies, improvements to the steam and chilled water infrastructures, and education and outreach efforts, UNCG energy, and water consumption have decreased significantly since the baseline year FY2002-2003 designated by the State. This report provides a top-level description of the campus utility infrastructure and an update on campus progress toward utility reduction goals with projects already implemented and those planned for next year.

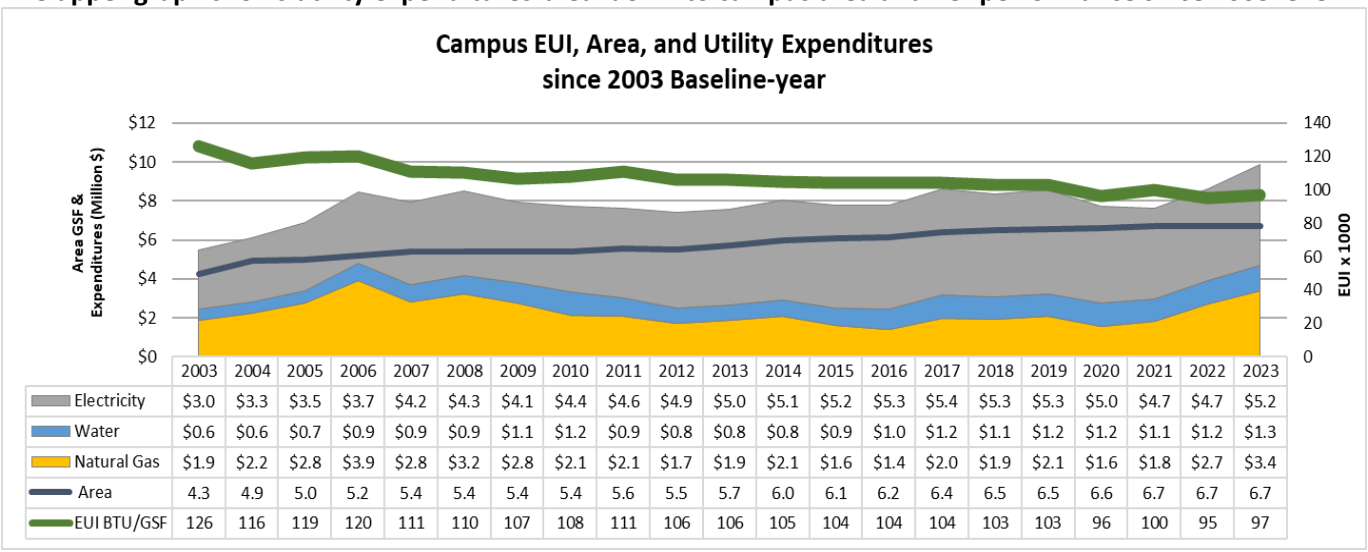
UNCG is currently at 96,856 EUI BTU/GSF, achieving a 23% EUI reduction from 125,963 EUI in the baseline year of 2003. Full-Time Equivalent (FTE) student enrollment has declined during and post-pandemic. The fall of 2022 showed 16,070 FTE, a 6% enrollment decline from the prior fall and a 38% increase from 12,345 FTE in the 2003 baseline year. FY2023, the campus footprint on the other hand stayed flat to the prior year, holding a 58% area increase of 2.5 million GSF of additional indoor spaces over the 2003 baseline area.

II. UTILITY EXPENDITURES FY2023 AND PERFORMANCE NARRATIVE

- **Energy Use Intensity EUI (BTU/GSF):** UNC Greensboro currently stands at 96,856 BTU/GSF overall campus Energy Use Intensity (EUI), achieving over 23% EUI reduction from the FY2003 baseline year, and a 2% increase to the FY2022 level.
  Despite the fact that UNCG has not met the 30% State-mandated EUI reduction goal from FY2015, the University dropped to 13% below the average 110,173 EUI UNC System FY2022 level after starting from 125,992 BTU/GSF/year in 2003, a lower baseline level.
- **Utility Expenditures**: The University utility expenditures were $ 9.9 million (Electricity: $ 5.2 million for 78.3 million kWh; Natural Gas: $ 3.4 million for 3.9 million therms; Water: $ 1.3 million for 123.2 million gallons of water; and only $ 2,262 dollars for 690 gal of #2 fuel oil that were used for tuning boilers at the Steam Plant). FY2023 utility costs showed a 16% higher expenditure of an extra one million dollars from the prior year.
- **Utility Key Performance Indicator (KPI)**: electricity, natural gas, and water total utility costs per campus area were 1.3 $/GSF, a 12% increase from $1.1 in the prior year and a 9% increase from the baseline year.
  FY2022 utility expenditures were affected by the global natural gas shortage and the cost crisis affected FY2022 and continued during the first half of FY2023. The natural gas costs increase has also affected electricity and water costs impacting the entire campus utility budget/expenditures. The following pie chart shows the FY2023 utility expenditures breakdown, while the next graph presents the expenditures versus EUI performance and campus area since the 2003 baseline year.



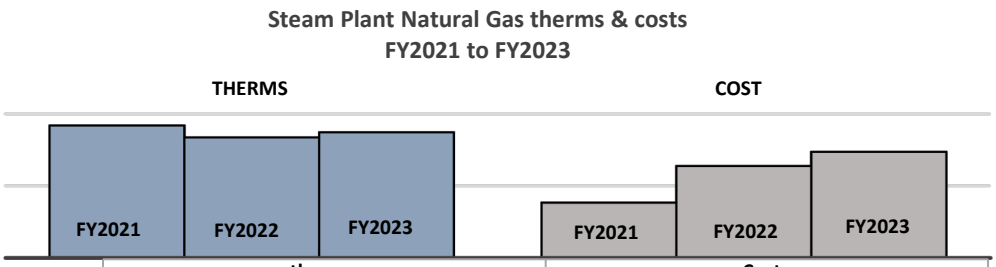
The upper graph shows utility expenditures breakdown to campus area and EUI performance since 2003 level.



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Electricity	$3.0	$3.3	$3.5	$3.7	$4.2	$4.3	$4.1	$4.4	$4.6	$4.9	$5.0	$5.1	$5.2	$5.3	$5.4	$5.3	$5.3	$5.0	$4.7	$4.7	$5.2
Water	$0.6	$0.6	$0.7	$0.9	$0.9	$0.9	$1.1	$1.2	$0.9	$0.8	$0.8	$0.8	$0.9	$1.0	$1.2	$1.1	$1.2	$1.2	$1.1	$1.2	$1.3
Natural Gas	$1.9	$2.2	$2.8	$3.9	$2.8	$3.2	$2.8	$2.1	$2.1	$1.7	$1.9	$2.1	$1.6	$1.4	$2.0	$1.9	$2.1	$1.6	$1.8	$2.7	$3.4
Area	4.3	4.9	5.0	5.2	5.4	5.4	5.4	5.4	5.6	5.5	5.7	6.0	6.1	6.2	6.4	6.5	6.5	6.6	6.7	6.7	6.7
EUI BTU/GSF	126	116	119	120	111	110	107	108	111	106	106	105	104	104	104	103	103	96	100	95	97

The global natural gas crisis has affected UNCG Steam Plant's expenditures mostly which comprise over 85% of total campus natural gas consumption. Since December 2015, UNCG purchases the Steam Plant's natural gas through 405N State Term Contract with NCDOA. Through this contract, costs of therms is directly driven by the New York Merchandise Exchange NYMEX Henry Hub commodity market, and "basis cost" for transporting therms to the "city gate" (a fixed rate per term when the contract is renewed). There is also a small cost for the local utility vendor transporting to the campus therms from the "city gate" which is Piedmont Natural Gas under 114-Interruptible Transportation Service for UNCG.

In FY2022, the supply shortage resulted in higher natural gas costs and a couple of curtailments through the wintertime. June 2022 therms cost delivered to UNCG peaked at $10.50 per Deka therms (broken down to $8.90 "NYMEX commodity cost" + $0.99 "basis cost" + $0.62 "local distribution PNG"). FY2022 Steam Plant had dropped consumption to 9% lower usage, yet the expenditures had 66% costs increase over FY2021. The following graph shows the Steam Plant consumption and cost for the past three years.

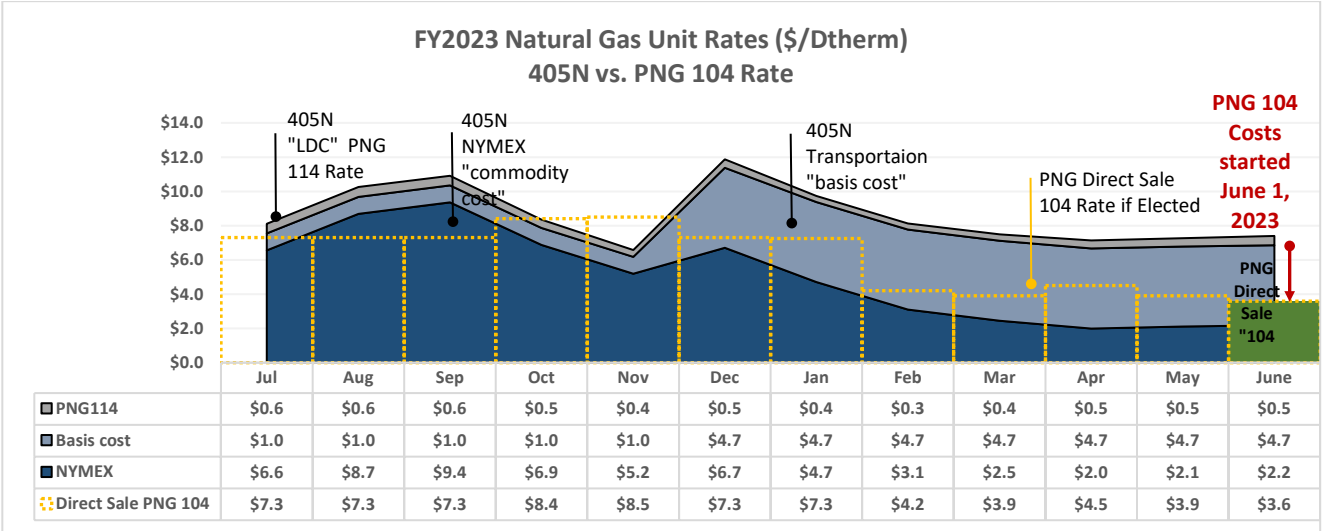


	therms	Cost
FY2021	3,682,227	$1,535,718
FY2022	3,350,347	$2,554,467
FY2023	3,493,838	$2,948,921

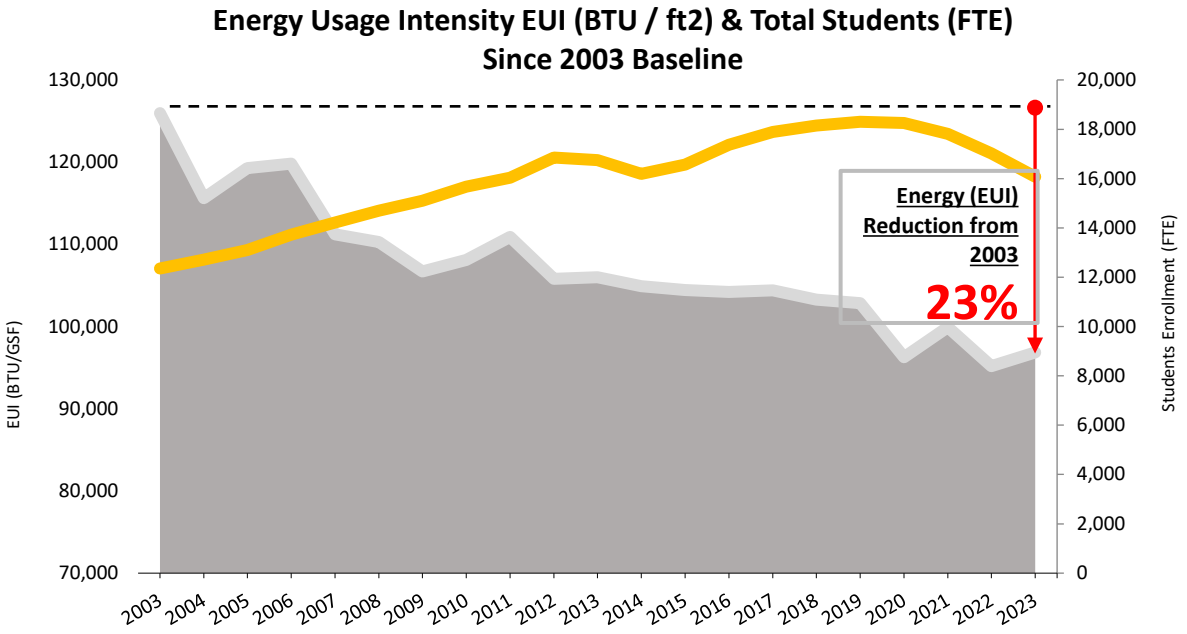
In FY2023, the commodity costs began to slow down in January 2023, but the basis cost was increased by 372% to $4.67 from $0.99 per Dekatherm through the new term December 1, 2022, to November 30, 2023. That peaked the cost of delivered therms to $11.80 per Deka therm ($6.6 "NYMEX commodity cost" + $4.67 "basis cost" + $0.46 "local distribution PNG").

UNCG managed to opt out of the 405N contract to elect PNG direct sale service “104-Interruptible Sales Service” starting June 1, 2023. This will result in a huge cost reduction in purchasing natural gas to the Steam Plant at least to the end of the term November 30, 2023.

June and July 2023, the first two months with PNG direct sales show an accumulated $164,461 avoided cost of the two months combined from what would have been if continued with the 405 N State Term contract. The following graph shows FY2021 to FY2023 therms usage and expenditures of the Steam Plant. The following graph shows the Steam Plant 405N contract unit rates breakdown versus what PNG direct sales 104 Interruptible Sales Service would have been.



	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
PNG114	$0.6	$0.6	$0.6	$0.5	$0.4	$0.5	$0.4	$0.3	$0.4	$0.5	$0.5	$0.5
Basis cost	$1.0	$1.0	$1.0	$1.0	$1.0	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7
NYMEX	$6.6	$8.7	$9.4	$6.9	$5.2	$6.7	$4.7	$3.1	$2.5	$2.0	$2.1	$2.2
Direct Sale PNG 104	$7.3	$7.3	$7.3	$8.4	$8.5	$7.3	$7.3	$4.2	$3.9	$4.5	$3.9	$3.6



III. FY2023 ENERGY AND WATER USAGE AND EXPENDITURES:

- **National Weather Service**: showed Greensboro observed 3,178 Heating Degree Days (HDD), only 56 more than the 3,122 HDDs in the prior year. On the cooling side, Greensboro and the campus observed a milder summer with 1,320 Cooling Degree Days (CDD), registered 298 fewer than 1,618 CDDs in the prior year.

- **Electricity:** paid $5.2 million for using 78.3 million kWh which is a 10% cost increase of almost half a million dollars for a consumption decrease of less than half percent = 230,000 fewer kWh over FY2022.

- **Natural Gas:** paid $3.4 million for using 3.8 million therms at $0.88 per therm blended rate, an increase of 17% over $0.75 per therm of the prior year. Consumption-wise, the referenced year had 7% therms increase over the prior year's combined natural gas and #2 fuel oil used through FY2022 winter-time curtailments.

- **Water and Sewer:** paid $1.3 million for using 123,246 kGal of water, a 6% increase in potable water consumption = 6,660 additional kGal to 116,586 kGal the prior fiscal year. The campus water KPI is 18.3 Gallons/GSF showing a 77% reduction from the 2003 level, surpassing the UNCG System goal. UNCG avoided about $268,000 of total water and sewer costs by reporting 47,404 kGal of non-sewer water from campus irrigation, and evaporative cooling towers that do not go to the sewer system.
  Since the baseline level in 2003, FY2022 showed the University has expanded by a 58% in campus area with only a 21% increase in million BTU used for the operation to make it up to the 23% EUI reduction to the baseline level.

Utilities Expenditures, Campus Area, and Key Performance Indicators (KPI).

Fiscal Year	*Area*	*All Utilities*	*Utility/Area*	*Energy*	*Energy/Area*	*Energy*	*Energy Cost*
	GSF	*Cost $*	*$ / GSF*	*Cost $*	*$ / GSF*	*MMBTU*	*$ / MMBTU*
2003	**4,269,699**	**$5,537,461**	1.3	**$4,990,987**	**1.2**	**537,824**	**$9.3**
2004	4,942,520	$6,085,348	1.2	$5,527,654	**1.1**	571,384	$9.7
2005	4,987,544	$6,878,519	1.4	$6,248,603	**1.3**	594,916	$10.5
2006	5,177,689	$8,455,503	1.6	$7,622,474	**1.5**	620,424	$12.3
2007	5,415,496	$7,674,070	1.4	$6,884,414	**1.3**	602,349	$11.4
2008	5,415,496	$8,500,093	1.6	$7,593,983	**1.4**	597,302	$12.7
2009	5,415,496	$7,906,663	1.5	$6,861,603	**1.3**	577,867	$11.9
2010	5,415,496	$7,713,099	1.4	$6,530,241	**1.2**	585,475	$11.2
2011	5,551,245	$7,653,606	1.4	$6,753,156	**1.2**	615,587	$11.0
2012	5,510,548	$7,402,485	1.3	$6,663,983	**1.2**	582,985	$11.4
2013	5,716,735	$7,571,726	1.3	$6,853,774	**1.2**	605,897	$11.3
2014	5,999,437	$8,034,092	1.3	$7,234,731	**1.2**	629,295	$11.5
2015	6,086,061	$7,859,390	1.3	$6,959,803	**1.1**	635,534	$11.0
2016	6,163,784	$7,776,021	1.3	$6,783,434	**1.1**	642,376	$10.6
2017	6,408,406	$8,569,900	1.3	$7,435,123	**1.2**	668,955	$11.1
2018	6,531,155	$8,621,691	1.3	$7,521,794	**1.2**	674,606	$11.1
2019	6,542,163	$8,601,691	1.3	$7,435,361	**1.1**	672,766	$11.1
2020	6,586,747	$7,739,359	1.2	$6,554,646	**1.0**	634,193	$10.3
2021	6,737,988	$7,668,308	1.1	$6,536,559	**1.0**	673,406	$9.7
2022	6,737,988	$8,874,661	1.3	$7,646,990	1.1	641,316	$11.9
2023	**6,737,988**	**$9,876,884**	**$1.5**	**$8,590,005**	**$1.3**	**652,616**	**$13.2**
% to FY2022	0%	11%	11%	12%	12%	2%	10%
% to FY2003	58%	78%	13%	72%	9%	21%	42%

Student's Enrollment, Area, Energy, and Water Expenditures, and KPIs.

			Energy (Electricity + Natural Gas)*				*Water*		
Fiscal Year	*Area GSF*	*Students Eq. FTE*	*Total MMBTU*	*Energy Cost $*	*Energy/Area EUI BTU/GSF*	*Energy/FTE MMBTU/FTE*	*Water Gallons*	*Water/Area Gal / GSF*	*Gallon/FTE Gal / FTE*
2003	**4,269,699**	**12,354**	**537,824**	**$4,990,987**	**125,963**	**44**	**336,408,512**	**79**	**27,231**
2004	4,942,520	12,708	571,384	$5,527,654	115,606	45	290,356,396	59	22,848
2005	4,987,544	13,099	594,916	$6,248,603	119,280	45	543,824,424	109	41,516
2006	5,177,689	13,723	620,424	$7,622,474	119,827	45	175,592,520	34	12,795
2007	5,415,496	14,219	602,349	$6,884,414	111,227	42	154,828,520	29	10,889
2008	5,415,496	14,704	597,302	$7,593,983	110,295	41	155,922,844	29	10,604
2009	5,415,496	15,097	577,867	$6,861,603	106,706	38	171,504,432	32	11,360
2010	5,415,496	15,670	585,475	$6,530,241	108,111	37	183,458,968	34	11,708
2011	5,551,245	16,036	615,587	$6,753,156	110,892	38	141,496,916	25	8,824
2012	5,510,548	16,855	582,985	$6,663,983	105,794	35	122,794,672	22	7,285
2013	5,716,735	16,754	605,897	$6,853,774	105,987	36	130,566,923	23	7,793
2014	5,999,437	16,195	629,295	$7,234,731	104,892	39	123,906,620	21	7,651
2015	6,086,061	16,568	635,534	$6,959,803	104,424	38	126,757,984	21	7,651
2016	6,163,784	17,365	642,376	$6,783,434	104,218	37	133,052,004	22	7,662
2017	6,408,406	17,891	668,955	$7,435,123	104,387	37	143,057,700	22	7,996
2018	6,531,155	18,153	674,606	$7,521,794	103,290	37	132,712,640	20	7,311
2019	6,542,163	18,303	672,766	$7,435,361	102,835	37	131,447,729	20	7,182
2020	6,586,747	18,249	634,193	$6,554,646	96,283	35	130,134,944	20	7,131
2021	6,737,988	17,811	673,406	$6,536,559	99,942	38	115,987,304	17	6,512
2022	6,737,988	17,025	641,316	$7,646,990	95,179	38	116,586,312	17	7,239
2023	**6,737,988**	**16,070**	**652,616**	**$8,590,005**	**96,856**	**41**	**123,246,447**	**18**	**7,669**
% to 2022	0%	-6%	2%	12%	2%	8%	6%	6%	6%
% to 2003	58%	30%	21%	72%	-23%	-7%	-63%	-77%	-72%

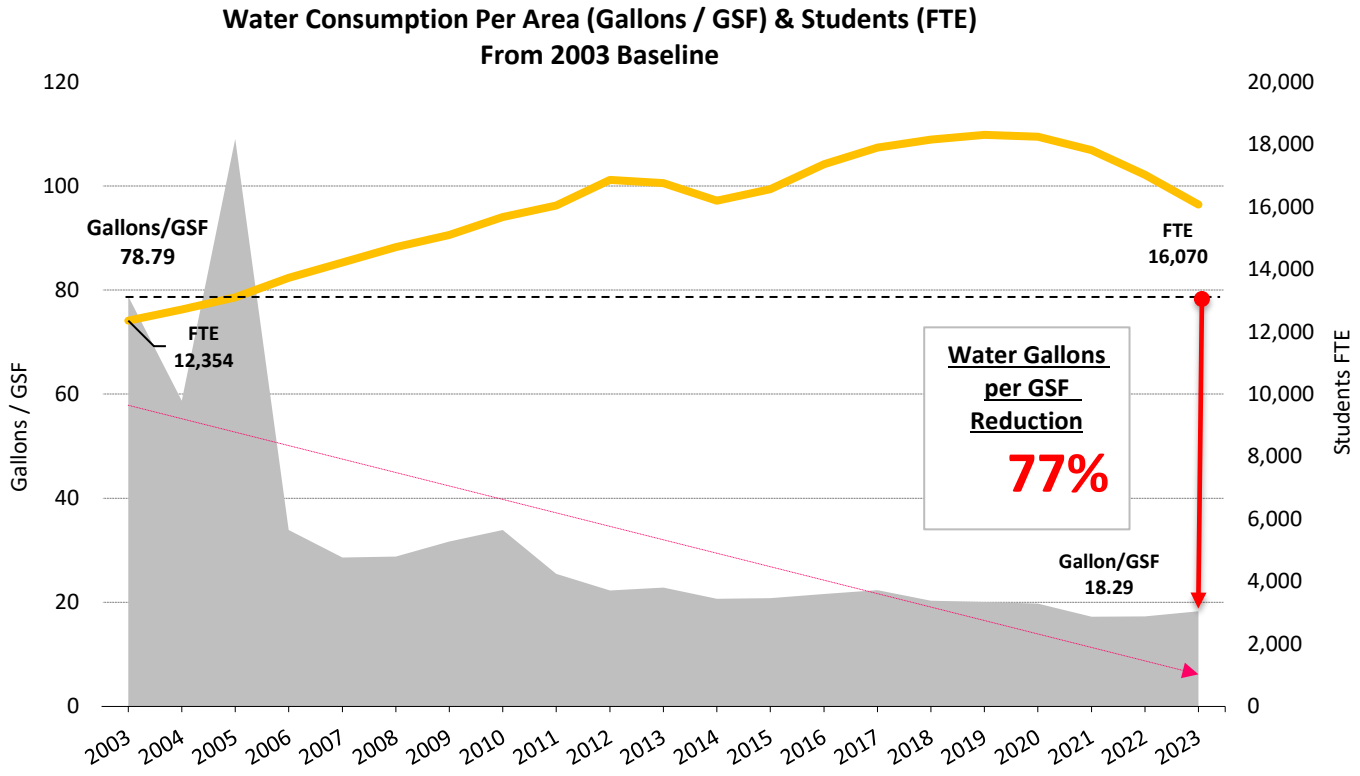
IV. BASELINE & UTILITY OVERVIEW

- WATER

UNCG receives water and sewer service from the City of Greensboro. The University owns and maintains a distribution system that receives water through three (3) City master meters and distributes it to over 60 buildings. UNCG also has water service for several outlying properties as well. Most buildings on campus have UNCG-owned water meters that are read, and data is subsequently entered into a database. Where water is used for irrigation or cooling towers, submeters have been installed so that the University can take monthly meter readings of water that does not enter the sanitary sewer system in order to receive appropriate credits from the City of Greensboro Water Resources Department.

UNC Greensboro has made tremendous progress in reducing water consumption. UNCG's Facilities organization places special emphasis on leak investigation and underground steam repairs, as well as on identifying and eliminating any wasteful operational practices. Installation of water-conserving fixtures during new construction and renovations has also been implemented. These practices have led to a 77% reduction in water consumption (per GSF) since the 2003 baseline year and a 6% increase when compared to the prior fiscal year 2022.

Decreased water consumption (Gal per GSF) by 77% compared to the baseline year FY2003.

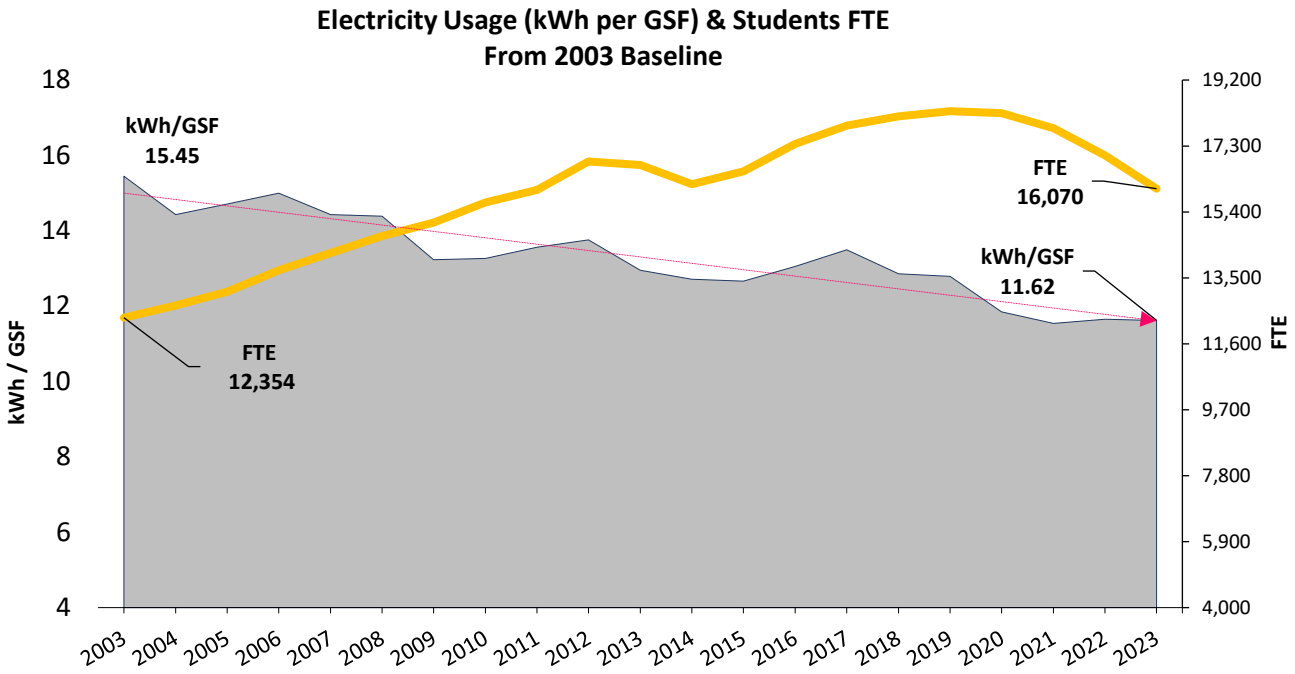


ENERGY (ELECTRICITY, NATURAL GAS, and #2 FUEL OIL)

ELECTRICITY

Duke Energy provides electric power to UNCG facilities through over a hundred accounts. By far the largest account is the main campus substation that feeds an underground medium voltage electrical distribution system connected to more than 60 buildings. The campus substation is on a time-of-use electricity rate schedule that is reviewed annually to evaluate the best rate options and the incentive programs for which UNCG qualifies. In addition to reviewing the main substation account, all other UNCG accounts with Duke Energy are evaluated for best rate options on an annual basis. All buildings served by the substation have electricity submeters that are read monthly, and the values are entered into a database. UNCG has taken steps toward automating the UNCG-owned meter reading process by giving the UNCG meter readers a comprehensive electronic form using an iPad with a customized Google Sheet. The new approach is more efficient because it replaces using the cumbersome Logbook where the meter readers had to write down each meter reading which was subsequently manually entered by others into a spreadsheet.

In FY2023, the University's total electricity bill was $5.2 million for 78.31 million kWhs, reflecting 11.62 kWh per GSF in electricity KPI, and 4,873 kWhs per FTE student**.** FY2023 showed less than half a percent decrease to 11.66 kWh/GSF in FY2022 and a 25% reduction to 15.45 kWh/GSF baseline year KPI.



NATURAL GAS

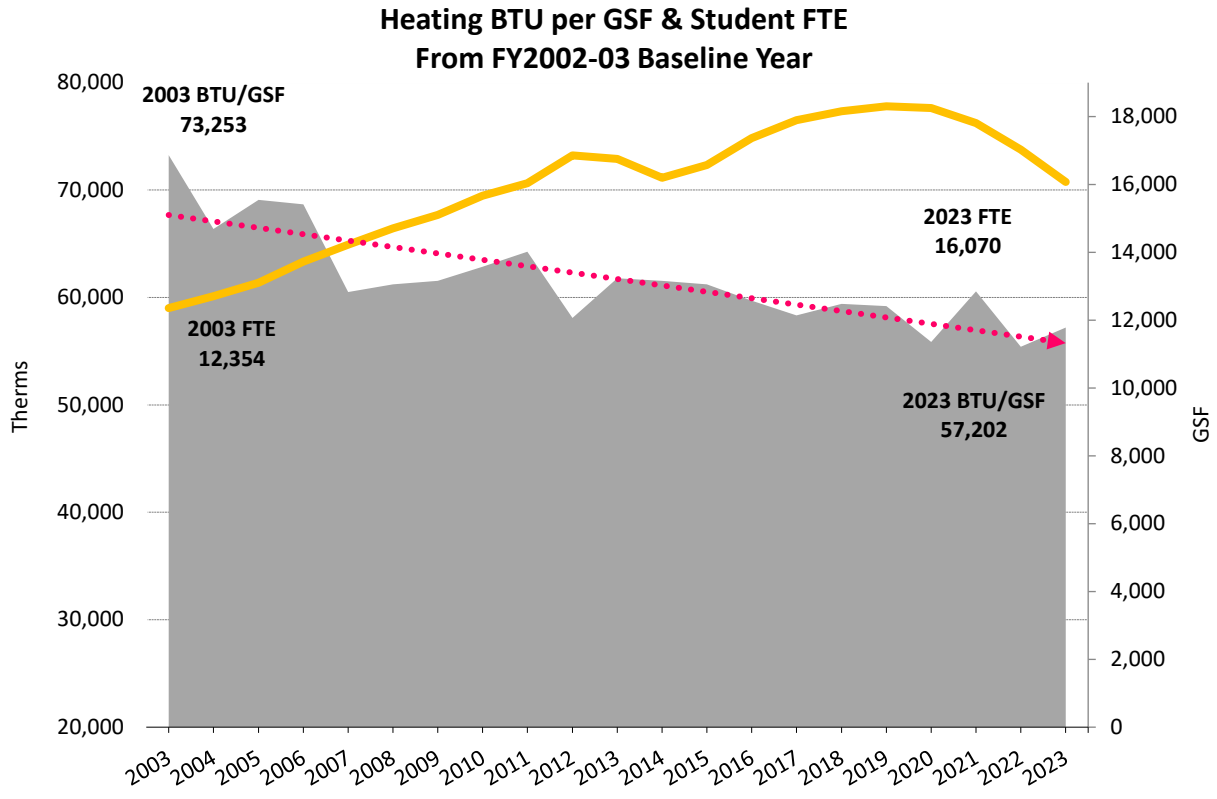
From December 1, 2015, UNCG purchased natural gas for the Steam Plant through State Term Contract 405N, which is currently held by Texican Natural Gas Company, LLC. As mentioned earlier in this report, starting June 1, 2023, UNCG Steam Plant natural gas like all other accounts on the campus and outlying properties is directly served by different Piedmont Natural Gas (PNG) direct tariffs. Complying with N.C. Gen. Stat. § 105-164.13(52) which provides tax exemption to State agency accounts, all University natural gas accounts are tax-free.

In FY2023, the Steam Plant's total natural gas expenditures were $2.95 million purchasing 3.5 million therms. Therms consumption-wise, this is a 29% increase over the baseline year and a 7% increase of approximately 243,000 additional therms to FY2022. However, the prior fiscal year had purchased about 89,000 of #2 fuel oil through natural gas curtailments in the prior winter that had not happened in the current winter. With that being said, the total therms from combining natural gas and fuel oil would result in 3% therms increase = 120,000 therms in FY2023 over the prior year. Natural Gas consumption increase over the prior year was mainly due to higher makeup water used in the Steam Plant due to some leaks that the University is working on as resources are available.

FY2023 Natural gas's KPI (BTU/GSF) recorded 57,202, showing a 3% increase over the last year and a 22% decrease to 73,253 BTU/GSF in FY2003. Natural gas energy per student is 24 MMBTU/FTE, which shows a 9% increase compared to FY2022 and a 5% decrease from the baseline KPI.

NO. 2 FUEL OIL

The UNCG Steam Plant is capable of using No. 2 fuel oil as a backup fuel to natural gas. This provides the University with an emergency fuel source and allows Piedmont Natural Gas (PNG) to interrupt natural gas service to the campus during times of peak gas demand. In FY2023, UNCG did not have any curtailment that required using fuel oil as a backup for natural gas. Only a few gallons of fuel oil were used to tune the boilers as part of the Steam Plant's annual preventive maintenance.



STEAM AND CHILLED WATER

The University uses purchased power and natural gas to create chilled water and steam that are distributed to the campus. Most buildings connected to the Steam Plant and Chiller Plants do not have a steam meter or chilled water meter; however, the University has developed a comprehensive Campus Metering Plan to install steam meters and chilled water meters in all buildings. Facilities Operations uses an assigned building's gross square footage to allocate the total steam and chilled water cost for each entity.

Steam: to 63 buildings on the main campus, the Steam Plant sends steam through underground pipes that return back in a condensed form. The UNCG Steam Plant has four boilers with 190,000 pounds per hour (PPH) total capacity. Steam distribution capacity covers the campus steam peak load including the recently constructed Nursing and Instructional Building (NIB) that came online in December, 2020.

UNCG used HB 1292 Utility Savings Carry Forward funds to maintain and improve the Steam Plant's performance. In FY2020, new boiler controls were installed to replace outdated ones with a new burner management system and master controller. In FY2022, Boiler #4 Economizer was replaced with a new one, and Boiler #1 feedwater pump was downsized, and added a new variable frequency drive VFD to optimize performance. Boiler #3 Economizer was replaced in 2023. And Boiler #2 Economizer is planned for FY2024.

Much of the campus steam infrastructure and piping system is 50 years old. The system has been periodically serviced in response to failures or normal wear and tear. Using renovation and repair funds, the University replaced three different sections over the years so far. Phase-4 section of manholes #73 to #74 EUC to Bryan Building Service Drive at Theta Street was designed to replace steam and condensate pipes, manhole refurbishment, and site work and planned for two phases due to budget constraints. Phase-A between the Elliott University Center and Sterling St completed in Summer 2019. In the summer of 2023, Phase-B construction work is in progress, between Sterling St. and the Bryan Building. The current Campus Master Plan updated recently by Affiliated Engineers and Sasaki, UNCG has included five (5) high-priority steam projects with a $3.9 million estimated cost to replace and renew critical portions of the steam distribution system.

UNCG Steam Plant serves over 3.9 million GSF including the NIB building. In FY2023 the Steam Plant produced over 277 million pounds of steam. The steam produced reflects a 1% increase of over 3 million more pounds for 56 HDDs in additional wintery weather over FY2022. Steam makeup water was 7.3 million gallons, a 55% increase = 2.6 million additional gallons of water used in 2022. The steam production energy and water consumption and costs can be further controlled if UNCG has the funds to move forward with replacing the critical portions of the steam and condensate distribution system.

Chilled Water: UNCG McIver Chiller Plant (4 chillers 6,000-ton total capacity) and South Chiller Plant (2 chillers 3,000-ton current capacity) produce chilled water to serve HVAC needs in 43 buildings including the recently constructed NIB facility. The two chiller plants both serve over 2.8 million GSF including NIB and Ragsdale Mendenhall Residence Hall which were recently (2019-2020) connected to the campus chilled water loop.

A new project is under design to complete the campus chilled water loop which would result in a more efficient and reliable chilled water distribution infrastructure. The project is also planned to abandon the dedicated chiller plants of four buildings on campus after being served by the campus loop.

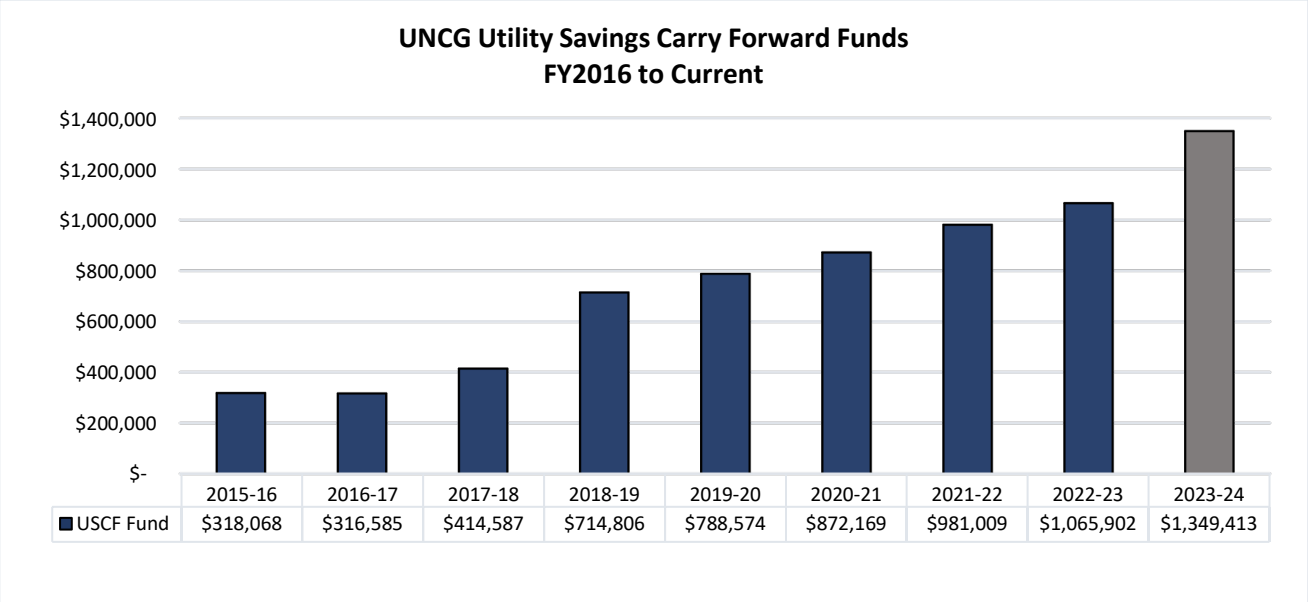
ENERGY DATA MANAGEMENT & BAS

UNCG collects energy consumption and billing information on a monthly basis for all buildings and facilities not served directly by utility companies. Currently, meters are still read manually, and the data is analyzed via MS Excel. This data are used to discover trends in energy consumption and identify facilities that warrant more detailed evaluations. UNCG Facilities Operations staff also examine the monthly data to find and correct billing errors and to identify any anomalies in the energy and water consumption of specific facilities.
Currently, UNCG has 65 buildings on the Tridium Niagara AX JACEs Building Automation System (BAS). In FY2021, when Tridium alert stop supporting Niagara AX Supervisor licenses, UNCG contracted with Schneider Electric to migrate Niagara AX to Niagara 4 licensing model to maintain Tridium BAS on campus.

V. PROJECTS AND ENERGY SAVINGS

To achieve energy consumption and utilities cost reduction goals, UNC Greensboro focuses first on low- and no-cost energy conservation measures (ECMs) considering the available resources. The HB 1292 Utility Savings Carry Forward (USCF) program supported by Utility Savings Initiatives (USI) group is greatly utilized for energy-saving projects and ECMs as the main supportive resource.

UNCG had only one energy savings contract (ESCO), a $7.2 million performance contract in 2008. In FY2011, UNCG started reporting/requesting the USCF credits. FY2012 funds were around $232,000 since the guaranteed energy savings contract pre-dated the HB 1292 legislation. All the way to FY2018, the approved/executed funds stayed below half a million dollars. Starting in FY2019, the funds continued to increase at a faster pace all the way to $1,065,902 for 2023, and $1,349,413 approved by the USI to carry forward to FY2024.



VI. PROJECTS SUMMARY

In FY2023, the University used approximately $1,065,902 of Utility Savings Carry Forward HB 1292 (USCF) funds for different projects on campus to improve efficiency and to back up Repairs & Renovation (R&R) funds when needed. Facilities Operations in-house managed all the projects to cut costs and time:

Projects implemented in FY2023 Using Carry Forward Funds:

- Affiliated Engineers (AEI) performed a study for replacing the aging machine Room DX System (Data Aire) in the McNutt Building data center. The study explored options to use chilled water (cabinets) for continuous server cooling and DX for ambient and standby cooling.
- Replace with new Boiler #3 Economizer originally installed in 1989 and replaced in 2014. Three leaks were detected in three tubes from a total of five tubes in this economizer.
- Contract Retro-commissioning by Schneider Electric for three buildings on campus which verified proper HVAC systems operation, including economizer cycles, identifying controls-based energy conservation measures, and calibrating sensors & controls equipment.
- McIver Chiller Plant Cooling Tower refurbishment work to improve performance, integrity, and structure reliability.
- Replaced with a new and more efficient 30-year-old natural gas furnace at 500 Forest St, and 536 Highland Ave. Also upgraded from 10 to 14 SEER an HVAC gas pack unit in the 117 McIver St Carter Child Care Center.
- Integrated Esports Arena HVAC equipment into the Tridium BAS for better control.
- LED progress on campus:
  - McIver and Oakland Parking Decks LED upgrade for all the existing metal halide fixtures in the two decks. UNCG purchased the fixtures, and an outside contractor installed them all.
  - Graham Building (full) and Cone Art Building (partial) were both upgraded to LED through in-house projects.
  - Purchased and in-house installed Growlight LEDs to replace 600-watt high-pressure sodium lamps at the Northridge Greenhouse facility. In-house LED upgrade activities continued to replace different types of T8/T12 fluorescent lamps and can-lights to line-voltage, ballasts bypass fixtures in a couple of other buildings: UNCG Police Building, Bryan Building, Forney Building, Cone Art Building, and the Elliott University Center. Also installed vacancy sensors to control the lighting load of two Gyms in the Kaplan Center for Wellness.

Capital Projects Managed by UNCG Facilities Design and Construction.

In the Construction Phase:

- Steam Distribution System Replacement Phase 4 replacement of steam and condensate piping including manhole refurbishment and all associated sitework, from a manhole at the intersection of Stirling St. and Theta to Bryan Building Service Drive.

In the Design Phase:

- Jackson Library Addition & Renovation to the original 1950's Jackson Library, and the 1973 Tower. The State Construction Office (SCO) approved an Advance Planning Report and issued a Full Design Contract for LS3P.
- Taylor Theatre Infrastructure Renovation project to update the original 1966 construction building's mechanical, electrical, plumbing, fire alarm, and sprinkler systems. The Construction Documents (CD) package is under review by the SCO.

- Campus Chilled Water Infrastructure & Equipment Improvement: the project will complete the main campus chilled water loop and connect four campus buildings to the chilled water loop to increase reliability and overall energy savings. This project will also examine the feasibility of replacing an aging chiller at the McIver Deck and potentially adding capacity to the plant.
- Cone Art Building: museum lighting and controls replacement Phases 2&3.
- Phillips-Hawkins and Moore Strong Residence Halls: HVAC Replacement in the CD phase.
- Mossman Building Roof Replacement of the existing IRMA system roof with a new lightweight insulating concrete roof system in order to meet current performance requirements that would result in energy savings.
- Armfield-Preyer Undergraduate Admissions Office exterior renovation, in the bidding process.
- Cone Building (Weatherspoon) A comprehensive review of the HVAC system by an HVAC engineer with art museum experience, including the system's performance in providing environmental conditions suitable for Weatherspoon Art Museum artifacts.

UNCG Green Fund Projects

The UNCG Green Fund has awarded $509,000 toward 93 projects during its 8 years of existence to support sustainability initiatives on campus. In FY23, the Green Fund awarded a one-year record of 18 grants, totaling $69,358 for an average of $3,853 per grant. Facilities-related projects in FY23 included:

- $5,597 to update plumbing and install a water bottle refill station in the Sullivan Science building.
- $15,550 to purchase Feather Friendly bird-window collision mitigation decals to be installed on the glass façade of the Sullivan Science building.
- $3,329 to purchase four water bottle refill stations in Guilford and Mary Foust Residence Halls (2 each).
- $2,693 to purchase 305 emergency lighting LEDs for North & South Spencer & Quad residence halls.

Potential Future Projects.

- Pneumatic to DDC HVAC system upgrade for a couple of academic/administrative buildings on campus such as Curry Building, and Ferguson Building.
- Coleman Building, HVAC system replacement, and lighting upgrade.
- Eberhart Building HVAC system, infrastructure, and lighting systems replacement.
- Continue indoor LED conversion for academic and administration buildings on campus.
- Outdoor LED conversion for parking lots.

VII. SUSTAINABILITY AND ENERGY

For FY22, UNCG's carbon footprint was 66,203 MTeCO2 which is a 14% reduction from our baseline FY09 footprint of 77,046 MTeCO2. However, this represents a 2.5% increase from our FY21 footprint, which mirrors regional and global trends as industries and countries continue to rebound to pre-pandemic levels of production and activity.

The major contributors to the University's rebound in emissions were increases in spending on directly financed air and ground travel (restrictions by the State were lifted in early FY21, but at that time people were still hesitant to travel and conferences remained mostly virtual); students reported traveling a longer average distance for their commute to campus in combination with an increase in residential students and a return to in-person learning. Compared to FY21, emissions from student commuting increased by 3,110 MTeCO2, air travel increased by 860 MTeCO2, and refrigerants were responsible for 662 more tons. Despite the rebound, UNCG's CO2 emissions are still on a downward trend compared to pre-pandemic levels, achieving a 7% decrease since 2019.

Furthermore, the university has achieved a 32% MTeCO2 reduction per 1000 gross square feet and a 14% MTeCO2 reduction per weighted campus compared to our 2009 baseline. UNCG also achieved a 23% reduction in total energy consumption per square foot, which is a 3% improvement compared to FY21.

VIII. UNCG ENERGY MANAGEMENT

UNC Greensboro's energy management group consists of an Energy Team and an Energy Committee working together to closely monitor campus energy performance, identify anomalies, implement energy-related projects, and recognize gaps for improvements to achieve the University's energy and sustainability goals while supporting education and research requirements.

The Energy Committee is led by the Associate Vice Chancellor for Facilities, the Director of Facilities Operations, the Sustainability Office, and the Energy Team. The Energy Team includes the Campus Mechanical Engineer, the Energy Analyst, the Utilities Manager, and the Electric Shop and the HVAC Shop Supervisors. The Energy Team is the working group that operates and maintains campus facilities, manages and implements the carry-forward projects, tracks performance, identifies anomalies and areas of improvement, and provides recommendations to the committee. The group meets on a monthly basis to review and monitor campus energy performance and establish plans to improve campus infrastructure and progress toward goals.

On an annual basis, members of the Energy group attend State Energy Conference, Appalachian Energy Summit, and NC APPA conference. Both the Campus Mechanical Engineer and the Energy Analyst have completed Energy Management Diploma and obtained a certificate.

IX. GOALS

UNC Greensboro continues to grow including the increase in the campus indoor footprint. Since the baseline year, FY2003, the campus GSF has increased by 58%. However, during that same time period, UNCG decreased its Energy Use Intensity by 23%. As of FY 2023, the University has achieved a 77% reduction in water gallons/GSF surpassing the State water reduction mandate.

For FY22, UNCG's carbon footprint was 66,203 MTeCO2 which is a 14% reduction from our baseline FY09 footprint of 77,046 MTeCO2. However, this represents a 2.5% increase from our FY21 footprint, which mirrors regional and global trends as industries and countries continue to rebound to pre-pandemic levels of production and activity.

UNCG supports the State greenhouse gas emissions goal of a 40% reduction below 2005 levels. An official 2022 UNCG Greenhouse Gases footprint report showed 66,203 MTeCO2 which is a 14% reduction from our baseline FY09 footprint of 77,046 MTeCO2 (as far back as the inventory goes). This also represents a 2.5% increase from the 2021 level.

Despite budgetary constraints, and not reaching the 2015 energy reduction mandate, UNCG will continue embracing Executive Order 80 and UNC System energy goals. Utility Savings Carry Forward funds (HB1292 / General Statute 143-64.12(a)) will continue to be invested in energy conservation measures throughout State-supported campus facilities. UNCG has a goal of reducing the campus energy consumption per-square-foot EUI by at least 1% each fiscal year, and efforts will continue, guided by the UNCG Climate Action Plan and the responsible stewardship approach of the Facilities Operations Energy Management Team.

The University of North Carolina Greensboro

We have read the Strategic Energy & Water Plan for our University. The plan, as presented, supports the reductions required in Executive Order 80 (EO80) and G.S. 143-64.12(a).

Implemented August 2023.

Nihal Al Rawi
Energy Analyst

Director of Facilities Operations

Associate Vice Chancellor for Facilities