Comprehensive Program to Manage Energy, Water, and Other Utility Use for State Agencies and State Institutions of Higher Learning

A Report to

Governor Roy Cooper

Pursuant to Executive Order No. 80, Section 8

And

The Joint Legislative Energy Policy Commission,

Joint Legislative Committee on Agriculture and Natural and Economic Resources, and the Fiscal Research Division

Pursuant to GS 143-64.12(j)

December 1, 2023

Prepared by:

North Carolina Department of Environmental Quality

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Preface:

This report contains the Department of Environmental Quality's status update to Governor Cooper for the Comprehensive Energy, Water, and Utility Use Conservation Program pursuant to Executive Order No. 80, Section 8.

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List of Acronyms

Abbreviation	Definition
BAS	Building Automation System
Btu	British Thermal Unit
DEQ	Department of Environmental Quality (formerly DENR)
DHHS	Department of Health & Human Services
DIT	Department of Information Technology
DMVA	Department of Military & Veterans Affairs
DNCR	Department of Natural & Cultural Resources
DOA	Department of Administration
DOC	Department of Commerce
DOI	Department of Insurance
DOJ	Department of Justice
DOR	Department of Revenue
DOT	Department of Transportation
DPI	Department of Public Instruction
DPS	Department of Public Safety
ECM	Energy Conservation Measure
EO80	Executive Order 80
ESCO	Energy Service Company
EUI	Energy Use Intensity
FCAP	Facility Condition Assessment Program

Abbreviation	Definition
FY	Fiscal Year
GESC	Guaranteed Energy Savings Contract
GHG	Greenhouse Gas
GS	General Statute
Gsf	Gross Square Foot
HB	House Bill
HVAC	Heating, ventilation, & air conditioning
kW	Kilowatt
kWh	Kilowatt Hour
LED	Light Emitting Diode
LGC	Local Government Commission
MM	Million
$MTCO_{2e}$	Metric Tons of Carbon Dioxide Equivalent
NCCCS	North Carolina Community College System
OSBM	Office of State Budget & Management
SB	Senate Bill
SEO	State Energy Office
SL	Session Law
UNC	University of North Carolina
USI	Utility Savings Initiative

1.0 Executive Summary

North Carolina General Statute (GS) §143-64.12 requires the State Energy Office (SEO) to develop a comprehensive program to manage energy, water, and other utility use for state agencies and state institutions of higher learning. The statute requires all state-owned buildings to reduce energy usage intensity (EUI)[1] by 30% based on fiscal year (FY) 2002-03 levels by 2015. On October 29, 2018, Governor Cooper issued Executive Order No. 80 (EO80) which extends these energy saving goals and requires a 40% FY2002-03 EUI reduction by 2025.

As part of these mandates, the Utility Savings Initiative (USI) program within the SEO was founded to annually collect utility consumption reports from state agencies, University of North Carolina (UNC) System schools and affiliates, and community colleges. The data collected from these governmental units is utilized to generate a report that describes the Comprehensive Energy, Water, and Utility Use Conservation Program (i.e., the "Comprehensive Program") along with a summary of efficiency gains as required every odd numbered year by statute. Additionally, in accordance with EO80, an annual status update is required for each cabinet agency's utility consumption, costs, and progress in reducing energy consumption. The purpose of this report is to meet EO80 requirements by summarizing the collective progress of state-owned buildings towards the 40% EUI reduction goal. This report also includes recommendations for further actions that may be necessary to meet the EO80 goal for state-owned buildings.

State-Owned Buildings Energy Use Intensity Reductions to Date

Accounting for all state-owned buildings includes utility consumption by cabinet agencies, other state agencies, and the University of North Carolina (UNC) System.[2] Collectively, for FY2022-23, all state-owned buildings attained an overall 33% reduction in EUI from the 2002-03 baseline. Without additional monetary investments to implement energy conservation measures, we are not on track to achieve the EO80 goal. Table 1 summarizes EUI reductions to date for cabinet agencies, other agencies, the UNC System, and the combined total for all state governmental units. This data emphasizes that significant energy conservation measures and resources are needed by all state sectors in order to achieve the EO80 40% EUI reduction goal by 2025.

[1] *Represents energy consumption per gross square foot (Btu/gsf)*
[2] *Excludes leased buildings whose utility bills are not paid by state governmental entities.*

Table 1: State Government Buildings Energy Efficiency Gains (FY03-FY23)

Participant		Cabinet Agencies	Other Agencies[1]	UNC System[2]	State Governmental Units Total
Gross Square Footage	**% Change**	+29%	-1%	+64%	+50%
Energy Usage Intensity (Btu/square foot)	**% Change**	-31%	-21%	-36%	-33%

[1]The main WRC campus was not built until 2005-06, and thus, is not included in baseline (FY03)

[2]UNC School of the Arts data was not reported prior to FY2005-06 and was assumed to be constant for all fiscal years prior

Within state governmental units, the UNC System is a major contributor since they account for 72% of all energy consumed, 67% of the total gross square footage, and 71% of all utility spending. Fortunately, they have also proven to be the pinnacle of energy management considering that the UNC System currently shows a 36% reduction in EUI from the 2002-03 baseline. This accomplishment occurred despite increasing square footage by 64% over the same timeframe. Many UNC System constituents have designated full-time energy managers or energy management teams that consistently review bills, make energy retrofits, take advantage of federal or state funding opportunities, and plan for future initiatives. Such practices resulted in avoided utility costs of over $150 million for the UNC System alone in FY2022-23. In addition, cumulatively, the UNC System has avoided $1.6 billion in utility costs since the Comprehensive Program began. Avoided utility costs represent the amount that would have been paid if energy efficiency retrofits or upgrades were not implemented. The UNC System makes up approximately 77% of avoided utility costs for FY2022-23 and sets an example for all state agencies; therefore, the utility management plans of the highest performing UNC System schools should be assessed to obtain insight into additional conservation measures that may be implemented. The UNC System Office, UNC Charlotte, UNC Wilmington, Western Carolina University, and Appalachian State University all achieved EUI reductions of 40% or more this fiscal year (FY2022-23) compared to baseline (FY2002-03).

The remaining totals for state governmental units consists of State agencies (both cabinet and other). Together, these agencies represent approximately 28% of state-building energy consumption, 33% of total state-owned square footage, and 29% of total state-owned utility spending. Since FY2002-03, agencies have avoided approximately $45 million in utility costs while their gross square footage has increased by 28%. Despite the lower rate of increasing square footage compared to the UNC System, agencies have not achieved EUI reductions to the same level. For example, cabinet agencies and other agencies have achieved a 31% and 21% reduction in EUI since FY2002-03, respectively. This shows that state agencies must improve their energy conservation efforts to make significant contributions to the EO80 goal that are relative to their size and energy usage levels. While smaller contributors, other agencies should achieve higher reductions since their conservation efforts still impact the collective state-owned building EUI. This report will recommend definitive steps that these agencies can make to achieve greater reductions in energy usage and costs.

While USI has collected annual utility consumption and cost data from community colleges since FY2007-08, their progress is not included in state-owned building metrics since they are considered local governmental units. This should not devalue the need for their energy conservation efforts since community colleges represent over 30 million gross square feet and $50 million in annual utility spending. Since their unique 2007-08 baseline, community colleges have achieved a 16% EUI reduction despite a 35% increase in square footage. In addition, they have cumulatively avoided over $62 million in utility costs through implemented energy conservation measures. To further environmental stewardship and management of local taxpayer dollars, USI recommends that community colleges replicate successful efforts from the UNC System to reduce utility consumption and costs.

Cost Savings and Air Pollution Benefits Related to Energy Conservation

While most energy efficiency projects require upfront initial investments, they are accompanied by energy savings and avoided costs in future years. Table 2 summarizes utility costs and avoided costs for cabinet agencies, other state agencies, the UNC System, and a combined total for all state governmental units. Together these sectors spent nearly $350 million on utilities which equates to approximately $956,164 per day. Of course, this would have been $198 million higher in FY2022-23 without the avoided costs from energy efficient building upgrades. As the data shows, the Comprehensive Program has achieved $1.96 billion in savings for North Carolina's taxpayers since the FY2002-03 baseline. Further investments in building efficiency improvements toward the EO80 goal can result in additional millions of dollars in utility savings for all state-owned buildings. Actual savings may be higher due to rising fuel and electricity costs.

Table 2: State Government Buildings Energy Costs and Savings (FY03-FY23)

Participant	Cabinet Agencies	Other Agencies	UNC System	State Governmental Units Total
Actual Utility Costs (FY23)	$101 million	$1 million	$247 million	$349 million
Avoided Utility Costs (FY23)	-$44 million	-$1 million	-$153 million	-$198 million
Cumulative Avoided Utility Costs (FY03-FY23)	-$352 million	-$12 million	-$1.6 billion	-$1.96 billion

Energy efficiency improvements have also provided air pollution benefits by avoiding fuel combustion directly at the buildings or indirectly at central electric power stations. FY2022-23 estimates show that the program avoided 1,041,351 metric tons of carbon dioxide equivalent ($MTCO_{2e}$)[3] in greenhouse gas (GHG) emissions for state governmental units.

[3] *$MTCO_{2e}$ is metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential. Carbon dioxide equivalents are commonly expressed as "metric tons of carbon dioxide equivalents ($MTCO_{2e}$)."*

Cumulatively since FY2002-03, approximately 10.1 million $MTCO_{2e}$ of GHGs have been avoided for state governmental units which is equivalent to annual CO_2 emissions from the electricity consumed in 1,272,940 homes annually, or 2.7 coal-fired power plants in one year.[4]

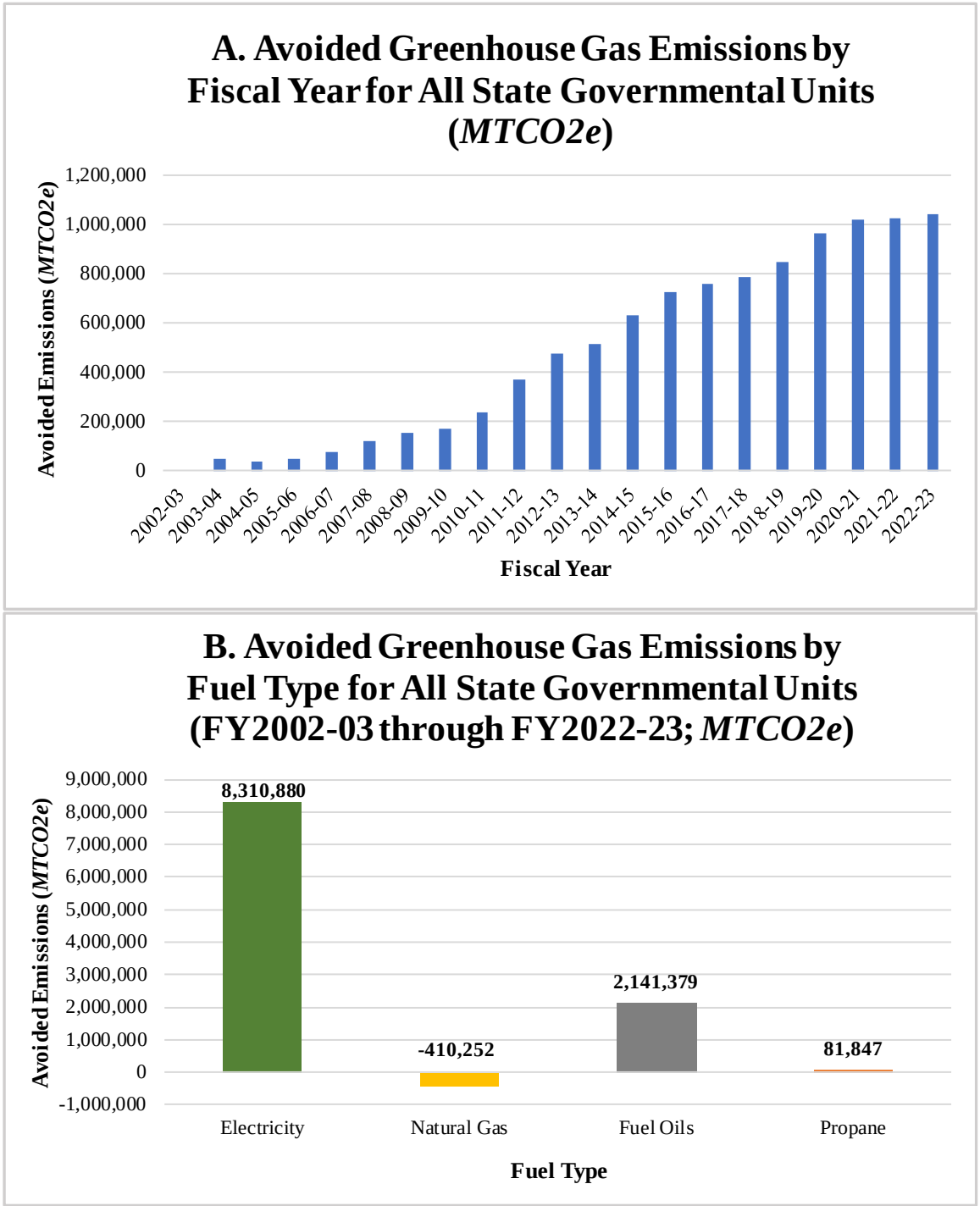


Figure 1: Avoided Greenhouse Gas Emissions for All State Governmental Units *($MTCO_{2e}$)* by (A) year and (B) fuel type.

[4] *See Appendix B for sources and assumptions used in calculating greenhouse gas amounts.*

Cabinet Agency Energy Projections to 2025

Although the EO80 goal is directed towards the collective efforts of all state-owned buildings, cabinet agencies should proportionately contribute to their share of the collective total. Separating cabinet agencies from the state-owned building total and evaluating individual efforts provides an estimate of additional energy reductions needed. This type of evaluation is critical to determine how each cabinet agency contributes to the cumulative total for state-owned buildings based on their individual EUI. With respect to these criteria, the SEO worked with energy managers across the largest five cabinet agencies (i.e., DAC/DPS, DHHS, DOT, DOA, DNCR) to target 104 buildings and nearly 200 energy efficiency projects to assist with equitably meeting the collective -40% EUI goal by 2025. Overall, the projects were inventoried under the following categories: (1) electrical upgrades [i.e., lighting]; (2) building envelope repairs [i.e., weatherization]; (3) mechanical upgrades [i.e., HVAC]; and (4) other [i.e., clean energy improvements, recommissioning, performance contracts]. When compared to the EO80 project pipeline from FY21-22, project costs have increased by roughly 33% largely due to inflation, while energy and monetary savings have decreased substantially, resulting in projects that are generally less financially attractive and more complex.

Table 3 illustrates that the cabinet agencies are collectively projected to achieve a -34% EUI by 2025 through $47 million in anticipated performance contracts and $158 million in unfunded projects. This combined with the exemplary reductions from the UNC System would assist with meeting the EO80 goal by 2025, however would still likely fall short of the -40% EUI goal. The challenge is that cabinet agencies will need to leverage alternative funding opportunities, complete construction of identified projects one FY prior to 2025, assure that usage and gsf trends remain constant, and offset competing energy priorities from executive directives or anticipated legislation. The main challenge remains the short timeframe left to reach the -40% EUI goal, as well as the pipeline of projects which have become more expensive due to inflation, with less energy savings due to higher complexity.

Table 3: Cabinet Agency Results from EO80 Projections

Cabinet Agency	FY2022-23 EUI Reduction	Estimated Reduction through FY2025 with Energy Projects	Performance Contract	Unfunded Project Amounts
DAC	-22%	-24%	$36MM	$32MM
DHHS	-37%	-42%	-	$41MM
DOT	-30%	-48%	-	$56MM
DOA	-36%	-39%	-	$10MM
DNCR	-38%	-11%	$11MM	$15MM
DIT*	-1%	-6%	-	$1MM
DOC**	-16%	-16%	-	-
DEQ*	-36%	-44%	-	$1MM
TOTALS	**-29%**	**-34%**	**$47MM**	**$158MM**

* Due to the smaller contributions of DEQ's and DIT's EUI to the collective total, it was assumed that $1MM in energy efficiency projects would reduce their raw Btu's by approximately 5%, respectively.
**DOC's sole facility reporting utilities was deemed surplus by DOA; therefore, no energy efficiency improvements were incorporated.

Recommendations to Meet the 40% Goal by 2025

USI consistently works with all government sectors to identify and suggest energy efficiency improvements. Some of these improvements are well-defined such as increasing building envelope insulation or converting to LED lighting, while other measures such as building controls and HVAC improvements are more abstract and can be harder to gain support for implementation. This is where all governmental sectors need to focus in order to achieve greater EUI reductions. Energy efficiency prioritization, reinforcement, and funding are needed to meet the energy reduction goal. A prudent step would be integrating the EO80 directive into statute to provide more legislative authority regarding this work. In addition, shifting the focus towards broad energy management concepts will help ensure energy efficiency becomes a cultural change with long-term commitments and results. This includes concepts such as the following:

- Offsetting competing energy priorities *(i.e., electric vehicle charging infrastructure vs. energy efficiency improvements)* with clean energy sources
- Designating full-time energy managers
- Investing in more sophisticated data collection, reporting, and analysis systems
- Considering alternative strategies for financing energy projects
- Utilizing Guaranteed Energy Savings Contracts
- Ensuring the content in utility management plans meets USI's best practices
- Establishing a mandate against purchasing non-LED lamps or fixtures (with exceptions incorporated, as needed)
- Evaluating whether to opt in or out of electric utility rebate programs
- Applying for federal grant or stimulus funding opportunities

To understand how operational and cultural changes are effective and ensure that the EO80 goal is achievable, state agencies can employ several methods used by the UNC System to reduce energy intensity. The UNC System utilizes full-time energy managers, takes advantage of performance contracting, improves building controls, converts to LED lighting, looks for rebate and funding opportunities, and continuously promotes and implements both large and small energy efficiency measures. These same initiatives and strategies should be utilized by all governmental sectors wherever and whenever possible.

In summary, the EO80 goal can only be achieved with immediate investment and implementation of substantial energy efficiency improvements within the next fiscal year (i.e., FY2023-24). State governmental units should make the necessary changes to prioritize energy efficiency, enlist the support of leadership and designate energy managers, and explore any and all pathways to funding these critical improvements. The remainder of this report's narrative provides the following: significant changes from FY21-22's report; background on the USI program; reporting requirements; recommendations for state governmental units to reduce energy consumption; and the conclusion. Additionally, the appendices to this report contain: (A) detailed agency-specific energy performance data; (B) sources and assumptions used to calculate greenhouse gas offsets; (C) utility management plans; (D) the text of EO80; (E) statutory authority; and (F) suggested revisions to general law.

2.0 Significant Changes from FY21-22 Report

During and after FY2021-22, several reporting entities implemented hybrid telework arrangements and health and safety measures to combat COVID-19. In theory, these arrangements could reduce energy use requirements; however, as the governmental entities rapidly transitioned to a modern work environment, the health and safety measures utilized to combat COVID-19 generally increased energy usage in occupied buildings. For FY2022-23, many of the hybrid work environments continued, and state governmental units expect it to remain for years to come. Nevertheless, after conversations with governmental entities we noted that most of these entities are back to normal pre-COVID 19 operations with few exceptions.

The Department of Public Safety (DPS) and The Department of Adult Corrections (DAC) split into separate entities this year. The Session Law 2021-180 established DAC as a new cabinet-level agency apart from DPS. The separation of DAC from DPS was accomplished over a year, with a final effective date of January 1, 2023. This split means that the reporting received from these two agencies should be separate, however this year's numbers for both DAC and DPS still rolled up into DPS. The goal for next year's report is to have separate line items for DPS and DAC; this will likely impact the overall EUI numbers reported for each agency given the dramatic change in square footage and lack of historical/baseline data particularly for DAC as a new, standalone agency.

The State Energy Office did not receive FY2022-23 energy usage information from the Department of Transportation (DOT). Due to the lack of data, the SEO duplicated DOT's data from their FY2021-22 usage to provide consistency in DOT's weight among agencies in the state. More information on this can be found in Appendix A of this report.

Staff turnover has been a part of each governmental entity and the USI program has had the same experiences for FY2022-23. North Carolina Department of Environmental Quality (DEQ) has a new State Energy Office Director and several new dedicated USI staff that have been equipped to provide technical assistance and guidance to whichever agency or entity that desires it.

3.0 Background on the USI Program

In February 2002, North Carolina's governor issued an executive order to create the *Commission to Promote Government Efficiency and Savings on State Spending*. At the time, the State was challenged with two sequential years of expenditures exceeding incoming revenue. By July 2002, the Commission recommended the establishment of a Statewide initiative for utility savings. Therefore, on July 17, 2002, North Carolina's Governor issued a memorandum to the Council of State members, Cabinet Secretaries, University of North Carolina (UNC) System president, and UNC Chancellors formally establishing the USI program in the State Energy Office.

Senate Bill 668 (Session Law 2007-546, Section 3.1.(a)) was a landmark bill that ratified the USI's goals, mission, and requirements into statute. The purpose of this action was to permanently promote energy efficiency, eliminate waste, and to reduce utility expenditures in state-owned buildings. The legislation required that State agencies and the UNC System develop and

implement a management plan, as well as providing annual updates that are consistent with the USI's Comprehensive Program. In addition, the legislation required that the energy consumption per gross square foot in all state-owned buildings be reduced relative to fiscal year 2003-04 levels as follows: (1) 20% by 2010; and (2) 30% by 2015. Furthermore, community colleges were required to submit an annual written report to the State Energy Office containing utility consumption and costs for review.

Senate Bill 845 (Session Law 2008-198, Section 11.1) revised the base fiscal year for the EUI reduction requirements in state-owned buildings to 2002-03 levels. The base year has remained unchanged since that time.

House Bill 1292 (Session Law 2010-196, Sections 1 and 2) permitted institutions in the UNC System to credit unused General Fund appropriations into the next fiscal year for realized energy savings accrued by implementing energy conservation measures. Of the savings achieved, 60% must be utilized for future energy conservation measures. The savings were designed not to affect the recommended continuation utility budget requirements by the Director of Budget. To receive the credit balance, affected institutions were required to submit annual updates to their utility management plans regarding the use of funds using the criteria in GS §143-64.12(a)(1) through (a)(4). For FY 2022-23, ten UNC System schools asked to carry forward over $17.2 million in savings and reported spending an additional $43.6 million for new energy efficiency projects.[5] These funds are specifically designated for energy efficiency improvements.

Senate Bill 734 (Session Law 2014-120, Section 55) revised the requirement that state-owned facilities provide updates regarding their utility usage and costs, as well as the implementation of management plans from an annual to a biennial-basis.

In October 2018, Governor Cooper's EO80 (Section 8) built on the statutory requirements in GS §143-64.12(a) by directing cabinet agencies to collectively strive to reduce energy consumption per square foot by at least 40% of fiscal year 2002-03 levels by 2025. The EO required that the DEQ's USI program update the Comprehensive Program with strategies to assist state-owned buildings in reducing energy consumption to meet the EO80 goal. In addition, the USI program was tasked with encouraging and assisting, upon request, the UNC System, K-12 schools, and local governments in reducing energy consumption. To meet the EO80 goals, the EO required that cabinet agencies designate an *"Agency Energy Manager"*, prepare a biennial *"Agency Utility Management Plan"*, submit utility data and progress towards the EO80 goal, and required the USI program to provide an annual progress report to the Governor's Office.

3.1 Roles and Responsibilities of Key Entities

Table 3 provides a breakdown of responsibilities that entities involved with the Comprehensive Program are required to perform with reference to the corresponding legislation or executive order.

[5] *The values in this report reflect the most accurate tabulation of the "savings claimed" and "cost of new projects" for FY2022-23 based on datasets provided by participating UNC System schools.*

Table 4: Roles and Responsibilities of Key Entities

Basis	Responsibility	Reference	Assigned Entity
EO80	Encourage and assist, as requested, higher education institutions, K-12 schools, and local governments in reducing energy consumption per square foot in state-owned buildings by at least 40% from FY 2002-03 levels by 2025.	EO80 Section 1(c) and 8	Cabinet Agencies; DEQ USI
	Designate an Agency Energy Manager that serves as an agency's primary point of contact.	EO80 Section 8(a)	Cabinet Agencies
	Implement strategies to support the energy consumption goal in EO80 and submit an Agency Utility Management Plan to the DEQ's USI program by March 1st of every odd-numbered year. The plan should describe the proposed strategies to reduce energy consumption per square foot in state-owned buildings by at least 40% from FY 2002-03 levels by 2025.	EO80 Section 8(b)	Cabinet Agencies
	Submit an Agency Utility Report to the DEQ's USI program by September 1st of each year. The report should contain the consumption, costs, and progress achieved towards meeting the statutory and EO80 directives.	EO80 Section 8(c)	Cabinet Agencies
	Assess the adequacy of agency Utility Management Plans and their compliance with EO80. Develop annual report describing the Comprehensive Program and summarize each cabinet agency's utility consumption, costs, and achieved reductions, completed by December 1st.	EO80 Section 8(b) and 8(d)	DEQ USI
	Develop and annually-update a Comprehensive Program to manage energy, water, and other utilities for state agencies and institutions of higher learning.	GS §143-64.12(a)	DEQ USI
	Submit a utility management plan consistent with the DEQ USI Comprehensive Program biennially. The plan should address findings or recommendations from the Department of Administration energy audits. In addition, the plan should include supporting strategies to reduce energy per gross square foot by at least 30% from FY 2002-03 levels by 2015.	GS §143-64.12(a) and (b1)	All state Agencies; UNC System
	Submit a biennial written report of utility consumption and costs.	GS §143-64.12(a)	Community Colleges
	Carry out the construction and renovation of facilities to further the energy conservation measures and ensure the use life-cycle cost analyses.	GS §143-64.12(a1)	All state Agencies; UNC System

Basis	Responsibility	Reference	Assigned Entity
GS	Create and implement the policies, procedures, and standards to ensure that state purchasing practices improve efficiency regarding energy, water, and utility usage. The cost of such products should be considered regarding their economic life. Administer the Building Energy Design Guidelines that include energy-use goals and standards, economic assumptions for life-cycle analysis, and other criteria on building systems and technologies. Modify the design criteria for constructing and renovating state buildings and the UNC System to require that a life-cycle cost analysis be conducted in accordance with GS §143-64.15.	GS §143-64.12(b); and GS §143-64.15	DOA
	Identify and recommend low-cost energy conservation maintenance and operating procedures that reduce energy consumption within state-owned buildings as part of the Facility Condition Assessment Program (FCAP). Consult with the DEQ USI program to develop an energy audit and procedure for conducting such audits. Conduct an energy audit for all state agencies and the UNC System every five years. The energy audit should serve as a preliminary energy survey.	GS §143-64.12(b1)	DOA
	Implement recommendations from Department of Administration and maximize the interchangeability and compatibility of energy management equipment components.	GS §143-64.12(b1)	All state Agencies; UNC System
	Conduct detailed system-level energy surveys every five years.	GS §143-64.12(b1)	DEQ USI
	Submit a report of the energy audit required in accordance with GS §143-64.12(b1) to the affected state agency or the UNC System.	GS §143-64.12(b1); and GS §143-64.12(b2)	DOA
	Review each energy audit conducted by the Department of Administration and consult with the affected state agency or the UNC System to incorporate the findings into the management plan required by GS §143-64.12(a).	GS §143-64.12(a); and GS §143-64.12(b2)	DEQ USI
GS	Identify and recommend facilities of state-agencies or the UNC System that are suitable for either: (1) building commissioning to reduce energy consumption; or (2) guaranteed energy savings contracts pursuant to GS §143-64.17.	GS §143-64.12(h); and GS §143-64.17.	DOA

Basis	Responsibility	Reference	Assigned Entity
	Develop a biennial report on the Comprehensive Program to the Joint Legislative Energy Policy Commission; the Oversight Committee on Agriculture and Natural and Economic Resources; and the Fiscal Research Division by December 1st of odd-numbered years. The report should contain the elements set forth in GS §143-64.12(j)(1) through (j)(5)	GS §143-64.12(j)	DEQ USI

4.0 Reporting Requirements

4.1 Comprehensive Program and Executive Order No. 80 Update

GS §143-64.12(a): *"The Department of Environmental Quality through the State Energy Office shall develop a comprehensive program to manage energy, water, and other utility use for state agencies and state institutions of higher learning and shall update this program annually"*

While GS §143-64.12(a) requires state agencies and the UNC System collectively to meet the goal of a 30% reduction in Btu's per square foot by 2015, some participants have not been able to individually reach the objective. USI will continue to assist them in reaching this goal. Additionally, EO80 established a new objective for state-owned buildings of a 40% EUI reduction by 2025 from a 2002-03 baseline. Each cabinet agency is required to appoint an Energy Manager to oversee the collection and reporting of utility data and development and implementation of the agency utility management plan in accordance with GS §143-64.12(a) and EO80, Section 8. The plans should include robust strategies that support statutory requirements and executive initiatives to reduce energy consumption in state-owned buildings.

The USI program prepares this annual update to Governor Cooper that tracks annual utility consumption and progress towards EUI reduction goals of the affected reporting entities under EO80. USI performs individual site visits to detail best practices and works to maintain savings already achieved by governmental units. Obtaining the mandated EUI reduction objectives will help improve the value of the State's infrastructure, increase the cumulative avoided utility costs, and reduce environmental pollution associated with fuel and electrical consumption.

Below are three primary focus areas of the Comprehensive Program managed by the USI:

Best Practices & Training

Site visits by the USI team remain the cornerstone of support to local and state government facility managers. USI provides preliminary energy audits, project evaluations, and implementation strategy assistance. USI also reviews utility bills and encourages participants to engage in current programs to reduce energy consumption. A core component of the USI program provides relevant energy efficiency training to local and state government facility managers. Historically, this training includes the Energy Management Diploma series (through North Carolina State University's Office of Professional Development), the creation of a utility management plan, analyses of utility bills, and conducting classes on building systems and programs to increase

efficiency. USI encourages engagement of community user groups and stakeholders along with fostering dialogue and sharing of best practices across governmental units.

Cost Estimates & Financial Options

USI assists state and local government building owners with developing cost estimates and prioritizing energy saving projects. Once project scopes are established, USI can then assist with recommending various types of funding mechanisms based on the situation. These often include equipment rebates, federal or state grants, tax incentives, Guaranteed Energy Savings Contracts (GESCs), and an assortment of utility provider programs. In addition, USI can review project proposals to ensure they best fit the needs of governmental units. On a more granular level, USI will review utility bills to look for saving opportunities such as rate classification changes or peak shaving. USI continuously seeks additional resources to expand energy efficiency programs within state and local government buildings.

Reporting Requirements

The USI team updates and submits reports on the Comprehensive Program, EO80 Section 8, GESCs, HB1292 credits, and utility management plans to stakeholders to provide a status update of key successes.

4.2 Overview of Utility Use and Efficiency Gains for all State Governmental Units and Community Colleges

GS §143-64.12(j)(1): [The report shall contain:] *"A comprehensive overview of how state agencies and state institutions of higher learning are managing energy, water, and other utility use and achieving efficiency gains."*

EO80 Section 8: *"DEQ shall develop an annual report that describes the Comprehensive Program and summarizes each cabinet agency's utility consumption, utility costs, and achieved reductions in energy consumption. DEQ shall complete this report for publication on its website and for the Council to submit to the Governor by February 1, 2019, and annually thereafter beginning December 1, 2019."*

The following tables provide a collective summary of energy and water reduction progress for the UNC System, state agencies, and community colleges. Agency-specific data is provided in Appendix A.

Table 5: State Agency and State Institutions of Higher Learning Efficiency Gains

Participant		Cabinet Agencies	Other Agencies[1]	UNC System[2]	State Governmental Units Combined Total
Gross Square Footage	Baseline 2002-03 (Mgsf)	34	1	56	91
	Current 2022-23 (Mgsf)	44	1	92	137
	% Change	+29%	-1%	+64%	+50%
EUI	Baseline 2002-03 (Btu/gsf)	128,615	75,305	170,329	153,665
	Current 2022-23 (Btu/gsf)	88,543	59,212	109,464	102,356
	% Change	-31%	-21%	-36%	-33%
Water	Baseline 2002-03 (gal/gsf)	63	15	49	54
	Current 2022-23 (gal/gsf)	45	6	23	30
	% Change	-29%	-58%	-54%	-45%

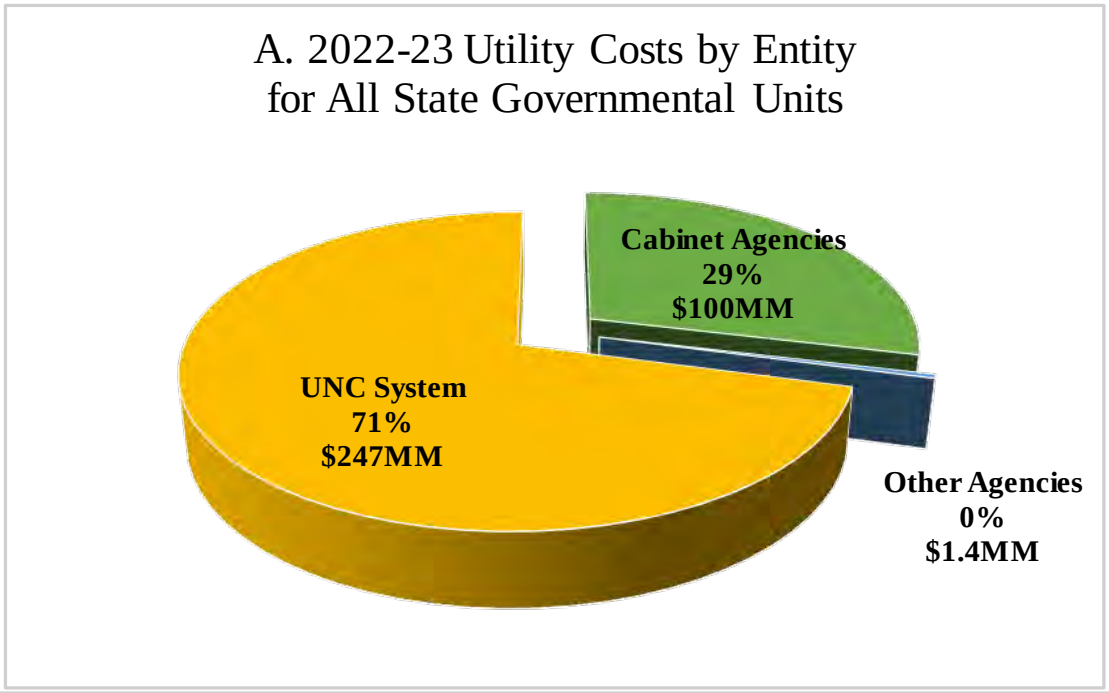
[1]The main WRC campus was not built until 2005-06, and thus, is not included in baseline (FY03)

[2]UNC School of the Arts data was not reported prior to FY2005-06 and was assumed to be constant for all fiscal years prior

Energy Consumption and Savings Highlights from Table 5

- EUI (Btu/gsf)
  - The Cabinet Agencies are at a 31% reduction from baseline
  - Other Agencies are at a 21% reduction
  - UNC System is at a 36% reduction
  - Total combined state-owned buildings are at a 33% reduction

- Change in Square Footage and Water Usage
  - Total combined state-owned building area has increased by 50% compared to baseline
  - Total combined water usage has decreased by 45% from the baseline



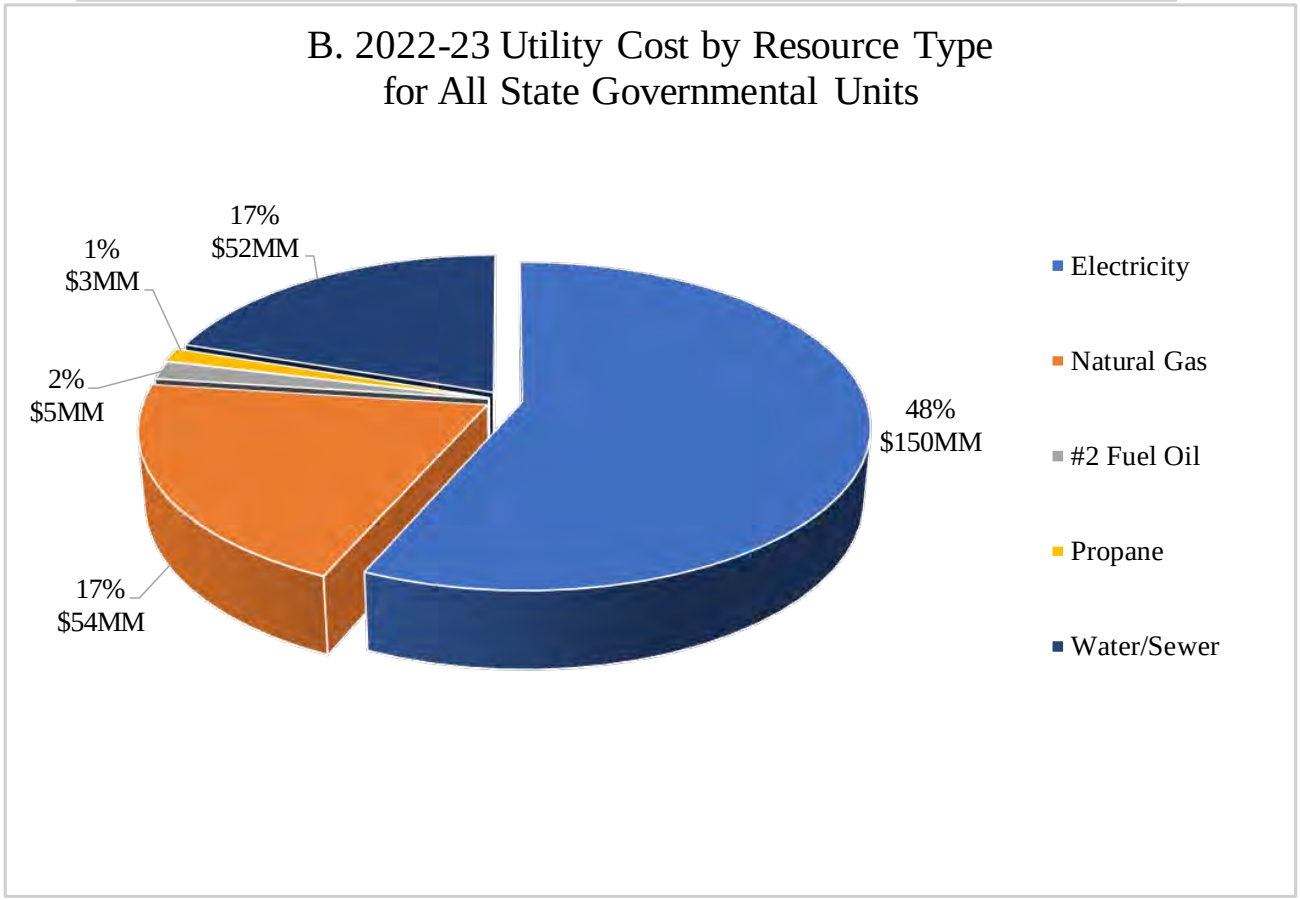


Figure 2: Total Utility Cost for All State Governmental Units ($349MM) by (A) Entity and (B) Resource Type.

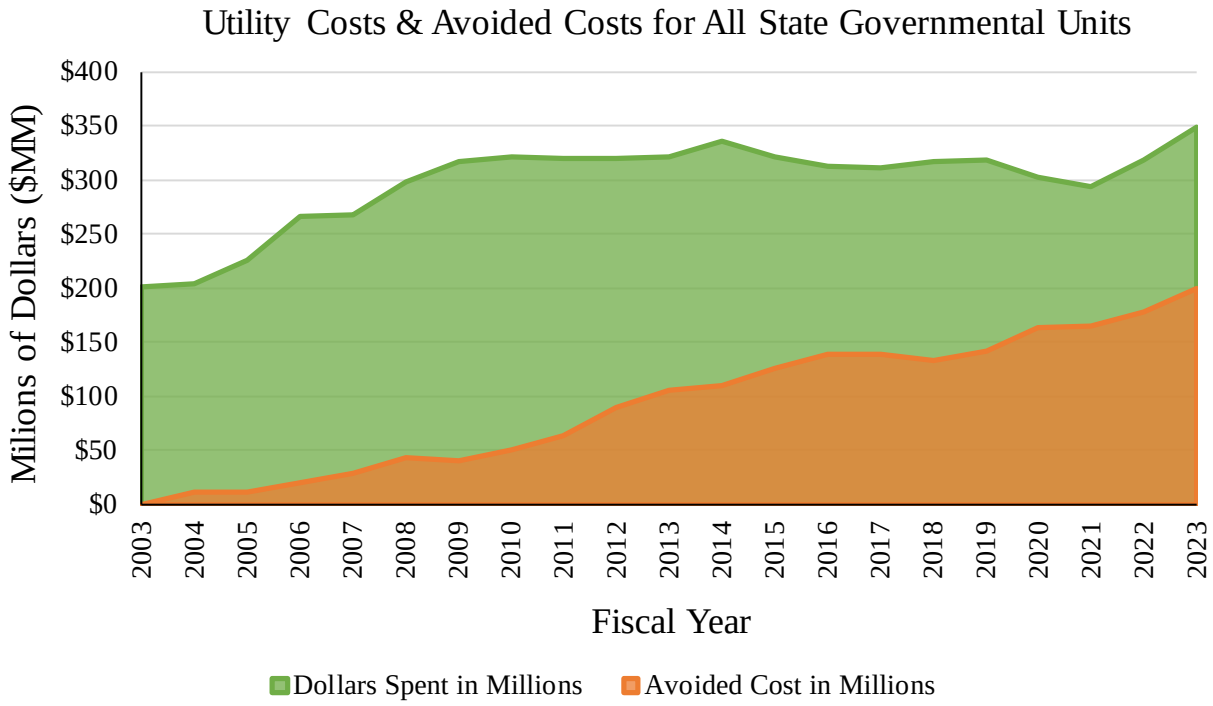


Figure 3: Avoided Utility Costs for All State Governmental Units

Utility Cost Highlights *(See Table 2 in the Executive Summary Section)*

- Avoided Utility Costs
  - Approximately $198 million in avoided utility costs in FY2022-23.
  - Approximately $1.96 billion avoided in utility costs since FY2002-03.

- Expenditures
  - Approximately $349 million in total utility costs (electricity, fuels, and water) for FY2022-23 (this includes all agencies and the UNC System). Over two thirds of this amount is paid by the UNC System.

UNC System

In 2011, a discussion started at Appalachian State University to put together an Energy Summit for UNC System members to discuss EUI reduction efforts and sustainability. With the UNC System Office on board, this started a system wide initiative with the objectives to educate students to be leaders of tomorrow, reduce and stabilize the UNC System energy expenditures, transform North Carolina's economy, position colleagues to be national leaders, and to create a culture of environmental and economic sustainability. The Summit successfully reconvened for its 12th year in June of 2023, bringing together UNC System members for another fruitful and positive discussion on all things energy management. Through the Summit, the UNC System has emphasized that knowledge sharing is crucial for energy management success.

The UNC System and its affiliates continue to work hard to be at the forefront of energy efficiency. With the encouragement of EO80, the UNC System has pursued the challenge to reduce their EUI by 40% of FY2002-03 levels by 2025. This goal, and more aggressive goals in some cases, was already being discussed and some of the UNC System were pushing towards this goal without EO80. This year's 2022-23 annual consumption reports for the UNC System shows that they are closest to independently achieving the 40% reduction goal by 2025. Overall, the UNC System achieved over $1.6 billion in avoided costs between 2002-03 to 2022-23. The leading universities have energy management teams that consistently reinvest in efficiency projects; the UNC System Office and Western Carolina University led the UNC System's efforts in EUI reductions by achieving a 61% and 55% reduction from baseline, respectively. The USI team will continue to lean on these leaders of EUI reductions to better understand the source of their success and share this knowledge with others. The UNC System's overall EUI decreased by one percentage point this FY (i.e., moving from -35% in 2022 to -36% in 2023). The SEO will continue to look to the UNC System for guidance and leadership in energy management and energy reduction efforts.

Table 6 shows the UNC System summary. Square footage has increased by 64% while utility costs have increased by 85%. The UNC System had a 36% EUI reduction this fiscal year. Water usage has decreased by 54%, which is significant considering water costs have increased by 214% over the same timeframe. The SEO did not receive utility consumption data from Elizabeth City State University for FY2022-23.

Table 6: UNC System Utility Assessment

Metric	Fiscal Year		% Change
	2002-03[1]	2022-23	
Total Gross Square Feet	55,874,023	91,767,896	+64%
Total Utility Cost	$133,681,014	$247,377,941	+85%
Energy Usage (Btu/gsf)	170,329	109,464	-36%
Energy Cost ($/MMBtu)	$12.96	$22.20	+71%
Water Usage (gal/gsf)	49	23	-54%
Water Cost ($/kgal)	$3.75	$11.77	+214%

[1]UNC School of the Arts data was not reported prior to FY06 and was assumed to be constant for all fiscal years prior

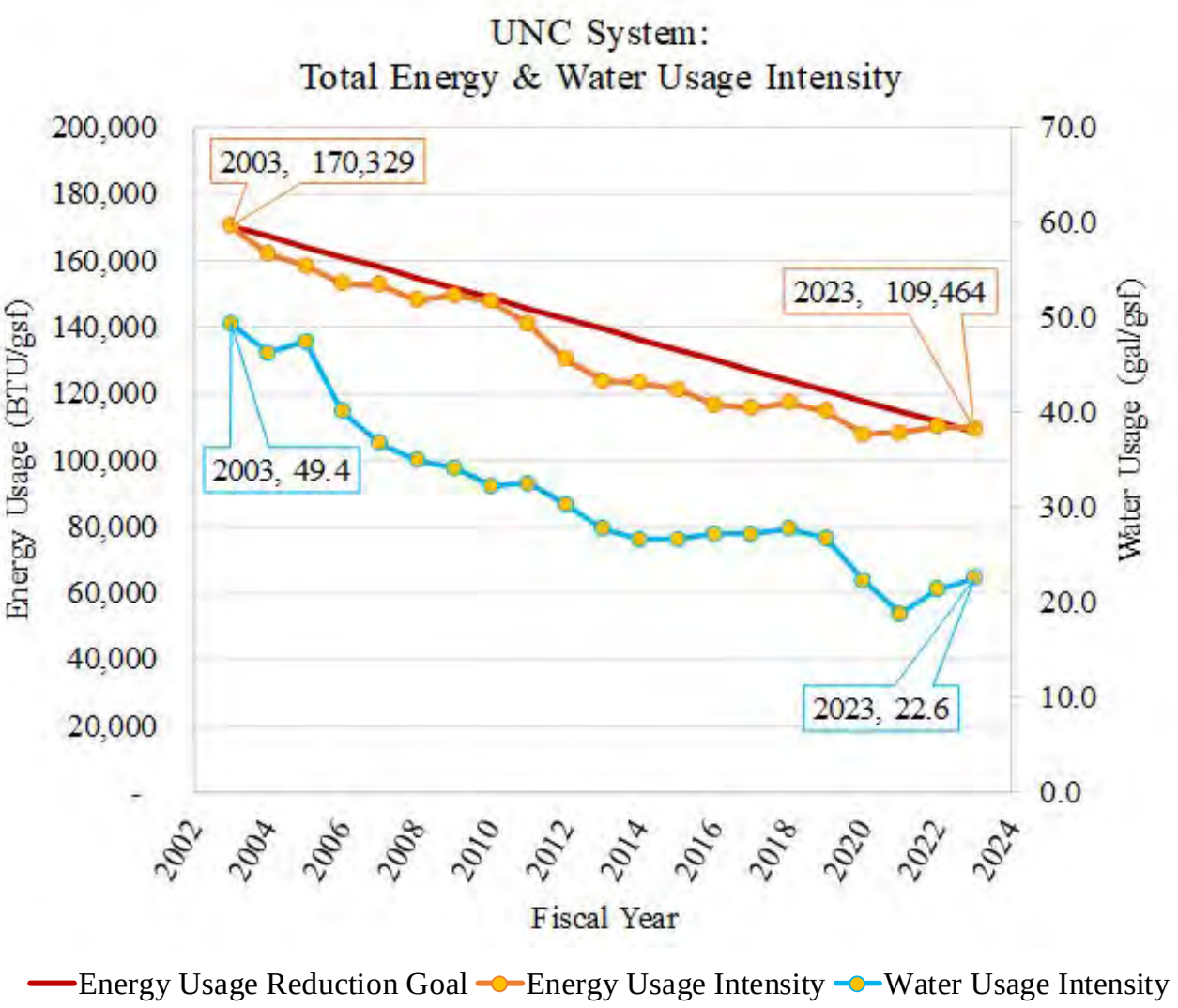


Figure 4: UNC System Utility Usage Over Time

Cabinet Agencies

As required by January 15, 2019, most cabinet agencies have appointed an energy manager to oversee the agency efforts in achieving the EO80 goal, with the exception of DPS since it split from DAC. DAC does have a designated energy manager, Paul Braese, who has done an exceptional job working with his team to prioritize energy efficiency in DAC's facilities. However most designated energy managers, with the exception of DAC, continue to have other full-time jobs and responsibilities beyond energy management. With the total dollar amount that most state agencies spend on utilities, the lack of a full-time commitment or dedicated energy management staff is having a negative impact on energy reduction goals. This is emphasized by the utility spending of state cabinet agencies, which was approximately $101 million this year; more effective energy management and dedicated energy management roles would decrease this spending. DPS, DHHS, DOT, DOA, and DNCR are the five largest agencies in the consumption of utilities making up 98% of the cabinet agency expenditures for FY2022-23.

Many of the agencies could benefit from pursuing Guaranteed Energy Saving Contracts (GESC) to quickly implement the necessary energy conservation measures. There are currently 20 projects within state governmental units. In addition, DAC and the Department of Natural and Cultural Resources (DNCR) are in the process of implementing GESCs for several of their facilities. The DAC project for six 1,000-cell prisons was recently approved at the September 12, 2023 Council of State meeting. The DNCR project includes the North Carolina Zoo, all three aquariums and five museums; their GESC is expected to be executed within FY23-24 pending Council of State approval. Both the DAC and DNCR GESCs combined are expected to save more than $70 million in energy savings over the life of the projects, a significant contributor toward the progress of EO80's goals.

Many agencies struggle with deferred maintenance, outdated equipment, antiquated technology, aging infrastructure, limited staff and most importantly, the financial resources required to make major comprehensive energy improvements. Many cabinet agencies provided funding requests to address some of these energy related needs, but more resources must be allocated if they are to reach the EO80 goal. Cabinet agencies are investing limited resources, as available, to move to LED lighting, provide staff the necessary resources and energy education, and to identify additional low- and no-cost energy conservation measures. The State Energy Office along with the cabinet agency energy managers are working together on this effort.

Table 7 shows the cabinet agency summary. Square footage has increased by 29% while utility costs have increased by a staggering 50%. The EUI usage for all cabinet agencies has a 31% decrease since baseline. Water usage has decreased by 29% while water costs have increased by 136%. More detailed information about individual agencies can be found in Appendix A.

Table 7: Cabinet Agencies Utility Assessment

Metric	Fiscal Year		% Change
	2002-03	2022-23	
Total Gross Square Feet	34,297,758	44,385,847	+29%
Total Utility Cost	$67,093,842	$100,575,616	+50%
Energy Usage (Btu/gsf)	128,615	88,543	-31%
Energy Cost ($/MMBtu)	$12.27	$18.39	+50%
Water Usage (gal/gsf)	63	45	-29%
Water Cost ($/kgal)	$5.98	$14.11	+136%

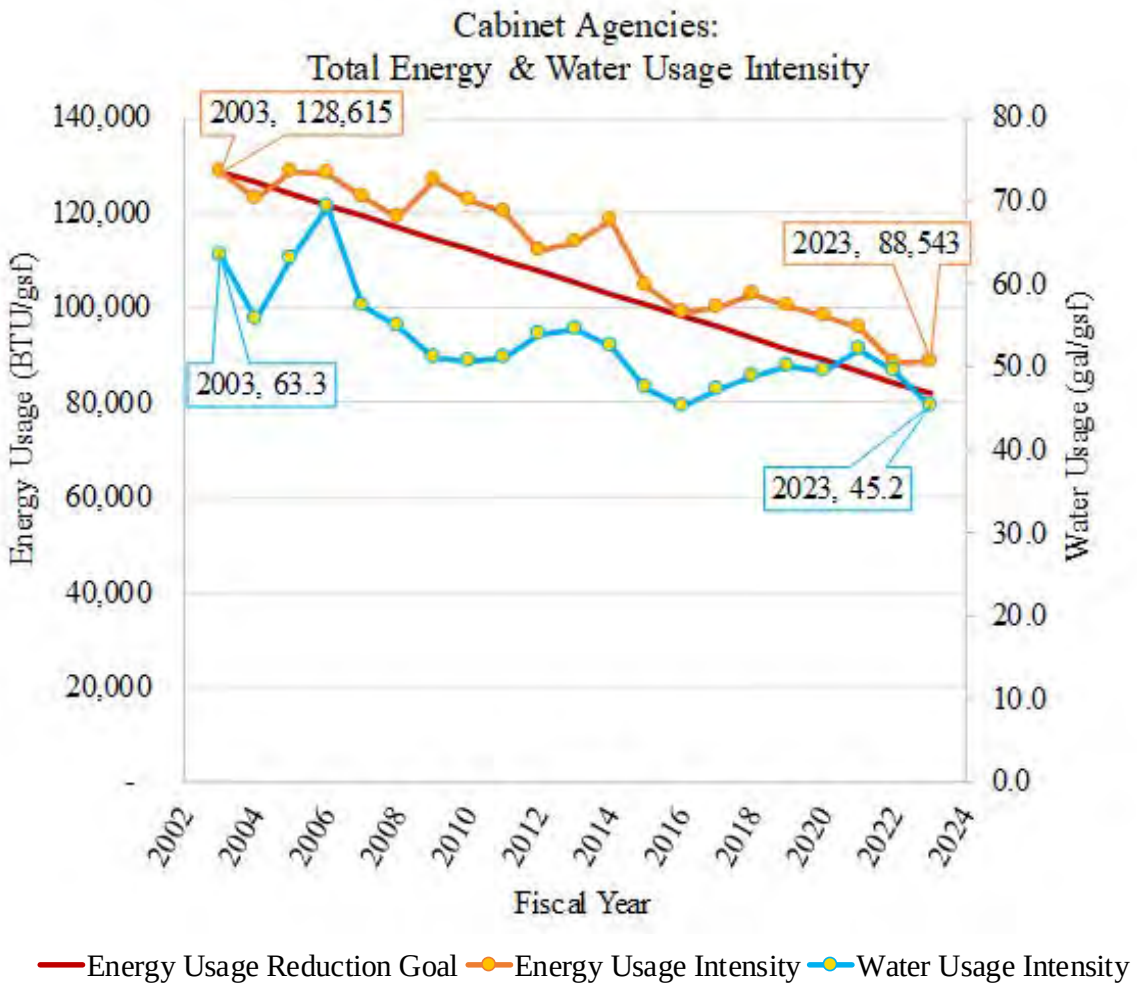


Figure 5: Cabinet Agencies Utility Usage Over Time

Other Agencies

While EO80 applies directly to the cabinet agencies, other state agencies are encouraged to adopt the same -40% EUI goal from FY2002-03 levels. Such agencies include the Department of Agriculture and Consumer Services, the Department of Justice, the Department of Public Instruction, and the Wildlife Resources Commission. Although these agencies were not required under EO80 to appoint an energy manager, they would benefit from hiring dedicated energy managers and energy policies. This would be a decisive step towards improving their current 21% reduction in EUI from the baseline. More conservation and efficiency efforts from these agencies would contribute towards the collective state-owned building energy reduction calculation and help with achieving the EO80 goal.

Table 8 shows the summary for these other state agencies. Square footage has essentially remained the same, while utility costs have increased by 35%. The EUI for all "other" agencies has decreased by 21%. Water usage has decreased by 58% while water costs have increased by 245%.

Table 8: Other Agencies Utility Assessment

Metric	Fiscal Year		% Change
	2002-03[1]	2022-23	
Total Gross Square Feet	917,553	906,266	-1%
Total Utility Cost	$1,017,407	$1,369,108	+35%
Energy Usage (Btu/gsf)	75,305	59,212	-21%
Energy Cost ($/MMBtu)	$13.45	$23.19	+72%
Water Usage (gal/gsf)	15	6	-58%
Water Cost ($/kgal)	$6.59	$22.77	+245%

[1]WRC campus was not built until 2005-06 is not included in baseline (FY03)

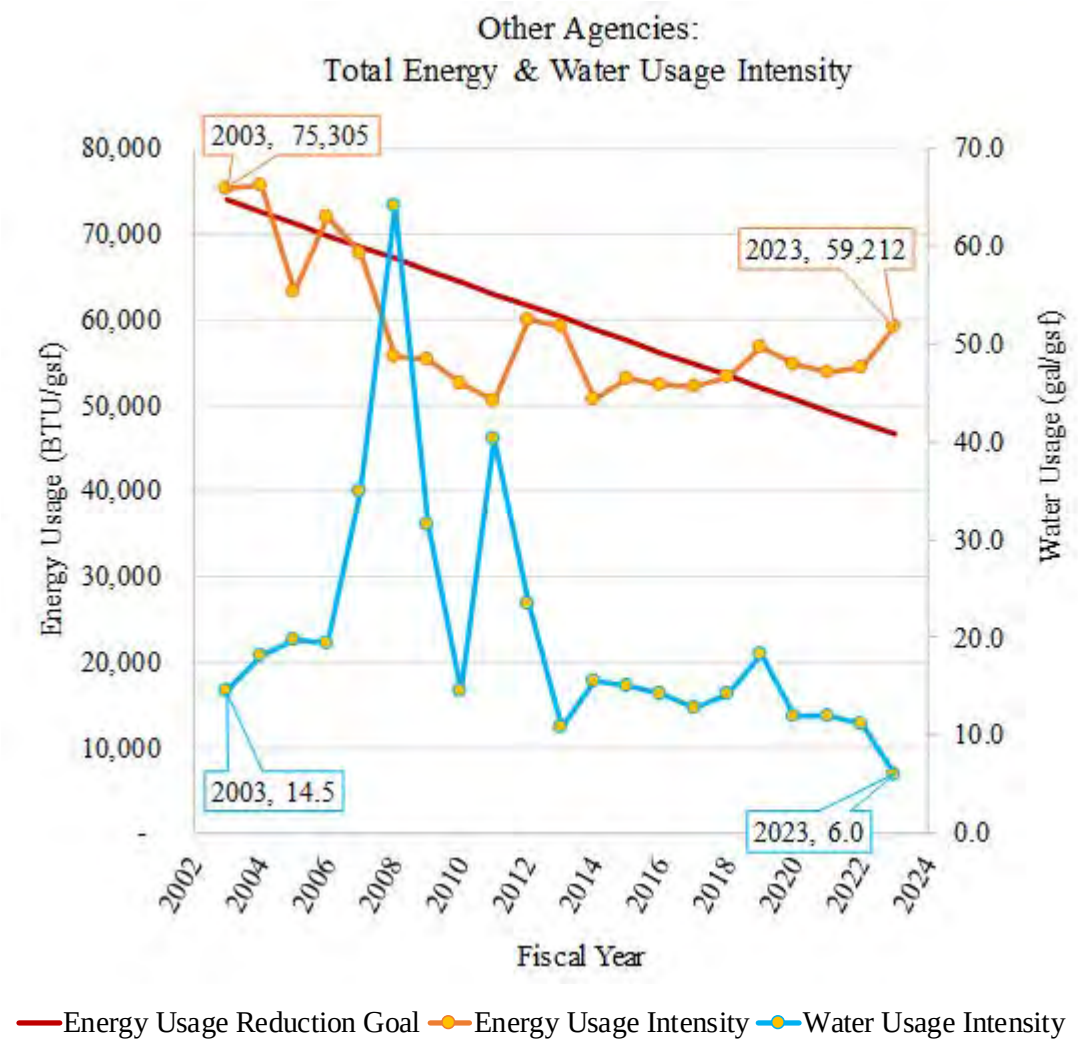


Figure 6: Other Agencies Utility Usage Over Time

Community Colleges

The North Carolina Community College System (NCCCS) is a key resource to provide accessible educational opportunities and to maximize student success. Since 2007-08, the NCCCS has been submitting annual utility consumption to the SEO. USI continues to meet several times a year with various community colleges to help identify energy efficiency projects and data collection issues. USI site visits are designed to assist with the development of utility management plans, to provide detailed understanding of the annual consumption reports, and to share best practices and successful EUI reduction strategies from other colleges. USI is often asked to guest lecture and to provide energy savings presentations to NCCCS faculty, staff, and students. There are two groups within the NCCCS that continue to address energy savings opportunities: the Association of Community College Business Officers (ACCBO) and the Association of Community College Facilities Operations (ACCFO). Both groups have annual meetings that USI attends and delivers an annual update. These annual meetings allow for open sharing of information, discussions on facility/financial issues and successes across the system. This allows the NCCCS schools to assist

each other in overcoming obstacles and with establishing networks for future collaboration. USI's attendance at these events continues to build relationships and often allows USI to meet new staff. During this past year, USI received annual utility consumption reports from all 58 community colleges.

Table 9 shows the community college summary. Square footage has increased by +35% while utility costs have also increased by +35%. The combined community college EUI is at -16%. Water usage has decreased by -1% while water costs have increased by +26%. As seen in Figure 7, water data for FY2022-23 spiked significantly; we will work with all community colleges in FY2023-24 to determine the source of this spike or whether this was a data error in reporting.

Table 9: Community Colleges Utility Assessment

Metric	Fiscal Year		% Change
	2007-08	2022-23	
Total Gross Square Feet	22,595,645	30,421,388	+35%
Total Utility Cost	$36,975,578	$50,029,886	+35%
Energy Usage (Btu/gsf)	79,411	66,920	-16%
Energy Cost ($/MMBtu)	$19.15	$22.43	+17%
Water Usage (gal/gsf)	15	15	-1%
Water Cost ($/kgal)	$7.88	$9.90	+26%

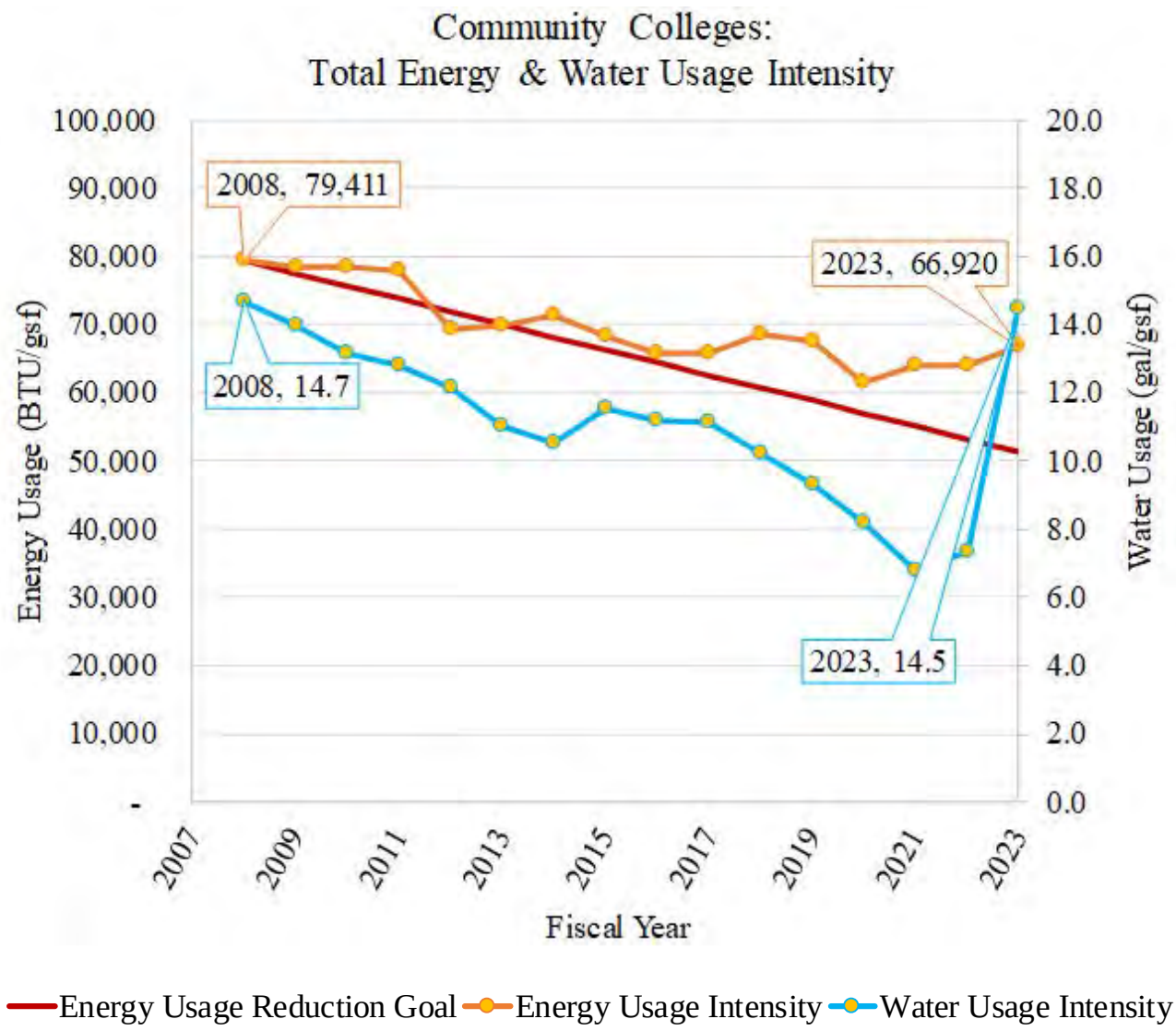


Figure 7: Community Colleges Utility Usage Over Time

4.3 Suggested Revisions to General Law

GS §143-64.12(j)(2): [The report shall contain:] *"Any new measures that could be taken by State agencies and State institutions of higher learning to achieve greater efficiency gains, including any changes in general law that might be needed."*

Appendix F of this report contains more detail regarding these suggested revisions to general law. USI recommends annual reports from governmental agencies and universities on how the funds are spent in order to review for OSBM. The USI program has not previously required annual submissions of energy management plans; those reports are submitted biennially and are due in September to coincide with the utility usage reports. The carry forward program (Session Law 2010-196) instead reports project descriptions, including cost and energy savings and date of completion, in the form of an annual spreadsheet and project tracking log. USI recommends that it be due annually as well to review the quoted energy savings for validity.

Reporting Intervals

In the past, state governmental units were statutorily required to report annual energy, water, and other utility use to the USI program. This allowed USI's staff to efficiently locate abnormalities, provide best practices, and suggest measures to reduce energy consumption and costs. Unfortunately, Session Law 2014-120 changed this reporting requirement to a biennial-basis which created difficulties for USI's staff to obtain robust data to assist governmental units with energy management. The USI program supports reinstating the annual requirement for governmental units to provide a written report of energy, water, and other utility use in GS 143-64.12(a). In addition, under the same provision, the program supports clarifying that utility reports are to be submitted by state agencies, institutions of higher learning, and community colleges by September 1st of each year. GS 116-30.3B(c) states Constituent institutions shall submit biennial documentation reports on the use of funds since it was changed in 2023, which unfortunately conflicts with the directive in GS 143-64.12(a).

Energy Reduction Goals

State-owned buildings may achieve greater efficiency gains and cost savings if GS 143-64.12(a) were updated to incorporate the EO80, Section 8, goal of reducing EUI by 40% of FY2002-03 levels by 2025. As the analytical data in this report shows, the 2025 target year is achievable only by developing robust planning strategies, prioritized investments, and innovative mindsets to leverage existing resources that may further reduce energy consumption and costs. The USI program supports updating the energy reduction requirements since they would provide additional environmental benefits and reduced energy costs for future generations.

4.4 Summary of Utility Management Plans

GS §143-64.12(j)(3) – (j)(5): [The report shall contain:] *"A summary of the state agency and state institutions of higher learning management plans required by subsection (a) of this section and the energy audits required by subsection (b1) of this section... a list of the state agencies and state institutions of higher learning that did and did not submit management plans required by*

subsection (a) of this section and a list of the state agencies and state institutions of higher learning that received an energy audit...

According to the United States Department of Energy, utility management plans are intended to clearly articulate goals that reduce waste, support environmental stewardship, and provide monetary savings to taxpayers.[6] Utility management plans are a necessary tool in helping governmental units achieve energy reductions. Significant planning and effort must be invested long before energy conservation measures can be realized. Projects require ownership, coordination, approvals, and funding. In order to achieve the EO80 goal by 2025, state governmental units should provide a defined path and plan via a utility management plan. A strong utility management plan must contain clear strategies, objectives, and identification of funding sources for implementation. Additionally, plans should specify dates, responsibilities, and assignments for specific individuals/departments to ensure tasks achieve completion and energy efficiency is prioritized. Furthermore, these plans should include broad input from multiple divisions within a state governmental unit to ensure buy-in at a high level, as well as leadership endorsement and participation in order for the plan to be impactful. Acknowledgement and support of energy priorities must be communicated to the entire organization. By incorporating all of these critical elements, the plans have a higher likelihood of success in achieving the stated goals and objectives, bringing the organization closer to a strong foundation of, and commitment to, energy efficiency and energy management practices.

USI has developed a list of best practices for utility management plans. A well-written plan should contain the following items:

1. Utility Reports with consumption and costs, and efficiency gains
2. Specific projects, strategies and responsibilities for achieving the goals
3. Assignment and authority of overall energy management success
4. Training of staff to communicate plan objectives
5. Financing options for funding energy savings projects
6. Signature page that shows upper management acknowledgement

Table 9 on the next page summarizes the governmental units that did and did not submit utility management plans for inclusion in this report for FY2022-23.

[6] https://www.energy.gov/sites/prod/files/2014/05/f15/cesp_guide.pdf

Table 10: Utility Management Plans Submitted FY2022-23

Cabinet Agencies	Plan Submitted?	
	Yes	No
Department of Administration		X
Department of Commerce		X
Department of Environmental Quality		X
Department of Health and Human Services		X
Department of Information Technology	X	
Department of Military and Veterans Affairs[1]		X
Department of Natural and Cultural Resources	X	
Department of Public Safety		X
Department of Revenue[2]	X	
Department of Transportation		X
Council of State Agencies		
Department of Agriculture and Customer Services	X	
Department of Justice	X	
Department of Public Instruction		X
North Carolina Wildlife Resources Commission		X

[1]Military and Veterans Affairs federal buildings previously excluded from State plan requirement.

[2]Revenue is a DOA tenant agency (utilities paid by DOA)

University of North Carolina System	Plan Submitted?	
	Yes	No
Appalachian State University	X	
East Carolina University	X	
Elizabeth City State University		X
Fayetteville State University	X	
North Carolina A&T University		X
North Carolina Central University	X	
North Carolina School of Science and Mathematics	X	
North Carolina State University	X	
The North Carolina Arboretum		X
University of North Carolina Asheville		X
University of North Carolina Chapel Hill		X
University of North Carolina Charlotte	X	
University of North Carolina Greensboro	X	
University of North Carolina Hospitals	X	
University of North Carolina Pembroke	X	
University of North Carolina School of the Arts	X	
University of North Carolina System Office	X	
University of North Carolina TV		X
University of North Carolina Wilmington	X	
Western Carolina University	X	
Winston-Salem State University	X	

In the utility management plans submitted, the following energy conservation measures were most frequently mentioned as being implemented:

Light Emitting Diode (LED) Lighting: LED lighting technology is growing exponentially while costs have decreased. LED area lighting improves safety, dramatically reduces maintenance requirements/costs and has a high return on investment. Maintenance staff are embracing LED lighting because this technology significantly reduces maintenance requirements. For example, such fixtures may require little to no maintenance over a period of 10 to 20 years.

Building Automation System (BAS): BAS improvements or installation continues to be needed in most facilities. Building automation is the centralized control of a building's HVAC, lighting, and other systems. This control is achieved through a building management system (BMS) or a BAS. The purpose of building automation is to improve occupant comfort, to improve the efficiency of building systems, to identify maintenance issues and to reduce energy consumption and operating costs. A centralized system also takes the control out of the hands of multiple occupants, which provides improved energy savings and helps prevent 24/7 operation by allowing both occupied and unoccupied set points.

Equipment Replacement: Energy consuming equipment replacement as related to HVAC (e.g., variable air volume boxes), chillers, and water heating (i.e., boilers) is increasing, primarily driven by the age of the equipment. Most facilities have been diligent in trying to maintain existing equipment, but as staff resources dwindle, this only reduces the life expectancy of this energy consuming equipment. Many facilities need extensive amounts of new equipment and improvements to aging infrastructure that supports this machinery. Equipment replacement can be easier to implement, yet costly, for institutions with central steam plants on campus.

Submetering: Metering and the increased ability to measure energy usage of buildings is needed. Energy metering and environmental monitoring provide valuable information regarding how buildings are performing. While this energy conservation measure does not technically provide energy savings, energy metering can help identify cost-cutting opportunities by detecting inefficiencies. Submetering is required to be able to benchmark each building and to help identify buildings that are out of line and where excessive energy usage needs to be addressed. Submetering with new sensors that monitor indoor temperature and humidity can help building operators track indoor air quality.

Employee Engagement: Energy awareness across campuses continues to be highlighted in almost all plans. Energy awareness helps define the governmental unit's energy mission and goals by establishing a direct relationship between saving energy and success in meeting these goals, all while assessing the constraints and opportunities within a facility. Evaluation of energy use patterns based on the types of equipment, size of staff, hours of operation, and current levels of energy use ensure obtainable goals are delivered and determine activities well-suited to the organization's planned needs. Upper management support endorses the program's messages while energy awareness uses various communications channels and program capability to produce printed materials, displays, videos, and handouts to drive this awareness.

Governmental units are contending with competing priorities and other primary responsibilities along with limited resources and staff to identify energy efficiency projects. Requests were made to expand financial resources so that identified energy projects can be performed. Prioritization and reinforcements are needed for the EO80 goal to be achieved. The mission of each governmental unit is critical, and there is a substantial amount of deferred maintenance, outdated equipment and technology, aging infrastructure, limited staff and most importantly, the financial resources required to make major comprehensive energy improvements. The State Energy Office, along with the governmental unit energy managers, are working together on this effort. Energy savings must be elevated in importance within each governmental unit's daily responsibilities.

5.0 Recommendations for State Governmental Units to Reduce Energy Consumption

In addition to achieving continued reductions in existing buildings' energy and water use, new buildings must be constructed to energy efficiency standards. As new buildings are constructed, governmental units have greater ability to operate and to monitor building performance thereby ensuring energy efficiency goals are met. Sectors that have aging buildings and infrastructure continue to experience difficulties in optimizing building operations and with monitoring energy usage. Transitioning from old, out of date technology to new technology and systems better enables buildings to meet energy goals. These improvements will also improve building comfort and indoor air quality. USI continues to recognize achievements and promotes best practices through programmatic and legislative means. The following are key areas to be addressed.

5.1 Energy Program Management

Offset Competing Energy Priorities

Electrification of space heating and transportation poses new load growth challenges for building energy use. As the adoption of electric vehicle increases in North Carolina, the charging infrastructure at the building level would cause the energy use of buildings to increase. This increase poses new challenges since while the load growth adds energy use (thereby increasing the EUI of the buildings), the load increase is more efficient and environmentally benign compared to gasoline-powered vehicles. Similarly with space heating, the high energy efficiency of heat pumps is beneficial, while adding new demand on the buildings. Demand-side management measures can be especially beneficial in this context. A recent report by the Department of Energy[7] found that buildings (which accounted for 35% of U.S. carbon dioxide emissions in 2021 and 39% of total U.S. energy consumption) can save $100-200 billion in power system costs by incorporating demand-side management measures like energy efficiency and demand response.

Technologies like rooftop solar paired with on-site energy storage can also offset some of this additional load increase and improve the overall energy efficiency of the building. The Department of Energy's Solar Energy Technologies Office provides guidance for local governments[8] to boost solar deployment by identifying key barriers and guidance on engaging in a robust stakeholder process. Other states have partnered with utilities to deploy solar on public buildings. For example,

[7] https://gebroadmap.lbl.gov/
[8] https://www.energy.gov/eere/solar/local-government-guide-solar-deployment

Consumers Energy and Michigan made a partnership in 2022 to deploy rooftop solar arrays on 1,274 public buildings, aiming to install 68 MW of solar capacity through the process.[9] Such efforts in North Carolina can bolster the ability to achieve the goals set forth by HB-951 while complementing the efforts of the USI.

The 2018 Commercial Buildings Energy Consumption Survey conducted by the Energy Information Administration provides new insights on how energy use in office buildings has changed from 2012 to 2018.[10] The survey is the only independent, statistically representative source of national-level data on the characteristics and energy use of commercial buildings. The preliminary results released this year showed that energy use in office buildings had statistically significant decrease in total energy from 2012 to 2018, with electricity and natural gas accounting for 94% of total energy consumption. The South census region, which includes North Carolina, had the largest share of electricity usage than any other region (2357 trillion Btu with 69% consumed by electricity). In 2018, the study found that commercial buildings spent, $1.47 per square foot, on average. Electricity use intensity was higher in hotter climates, but the impact of widespread space heating electrification remains to be seen.

Dedicated Energy Manager

Every successful energy program must have a champion. That is a person who is fully committed to and consistently works to further the program goals. An energy manager serves this role, and the importance cannot be overstated. A full-time, dedicated energy manager is an important asset and can recover energy savings and costs that exceed their salary multiple times. As such, USI has advocated for several years that every agency, university, and community college hire at least one full-time, dedicated energy manger. The UNC System has adopted this philosophy as evidenced by the fact that most UNC System universities currently employ at least one full-time energy manager, and several have whole dedicated energy management teams. As a result, the UNC System leads all public sectors in reducing their energy consumption from baseline levels. The UNC EUI is currently at -36% which exceeds cabinet agencies by -5% and other agencies by -15%. Governor Cooper also recognized the importance of energy managers and directed through EO80 that all cabinet agencies appoint energy managers. While energy managers are needed, most state agencies complied by appointing an existing employee who already had another full-time position. Energy management was added as an additional duty on top of the employee's existing workload. Without being able to dedicate full-time efforts, these employees are not able to be as effective nor achieve the energy efficiency results a full-time energy manager could. DAC is the only state agency who currently has a full-time, dedicated energy manager. We hope that agencies follow this leadership and will be able to find funding mechanisms for these positions.

Once a full-time energy manager is hired, other factors must also be considered in order to help this position succeed. First, leadership can assist by prioritizing the need for energy efficiency goals to be met within the organization. When upper management prioritizes and supports the importance of energy conservation, the rest of the organization will respond accordingly. This sets the tone and expectation for everyone to participate. Second, the energy manager must be positioned strategically within the organization. They are typically located within a facilities department but have close ties to the business office. That is because they need to know about the

[9] https://pv-magazine-usa.com/2022/08/11/michigan-pledges-to-cover-over-1200-public-buildings-with-solar/
[10] https://www.eia.gov/consumption/commercial/

equipment and building projects being planned but also be aware of budgets and utility spending. Every project from a stand-alone HVAC package unit to new building construction should be reviewed by the energy manager. Third, they should have the authority to influence and direct these projects for the selection of energy efficient equipment and other energy conservation design considerations. This involvement helps to ensure that a complete life cycle cost is weighed against the upfront costs. Often equipment which might be the cheapest to purchase will cost more in operation over the long run. Fourth, the energy manager could have a dedicated source of funding to implement conservation measures. Ideally, documented savings from energy efficiency measures can be tracked and those funds returned so that additional measures can be implemented. In this manner, the overall savings begins to grow and cascades as an organization becomes more efficient. That is a key indicator of a successful energy management program.

Utility Data Collection

Once an energy manager is hired, utility data is an essential part of their energy management program. Utility data is the key to determining which buildings are the highest energy users, which utilities cost the most, where conservation efforts should be focused, have savings been achieved, and whether there are leaks occurring. Without data providing measurements of utility usage, an energy manager is working without guidance and cannot properly manage the energy usage of an organization. However, some organizations receive thousands of utility bills from a multitude of providers every month. Merely collecting and compiling all these bills into a usable format can be an arduous task that subtracts from the goal and active work of managing energy. That's why several organizations have turned to third party data collection services to manage and to provide data from all their utility bills. This third party collects, verifies, reconciles, and records all bills so that the energy manager can access the data with ease. Formatted reports are available with up-to-date information so that energy managers can track utility usage from month to month and analyze fluctuations which can signal potential issues. This type of regular and consistent analysis is imperative to understanding and managing the utility consumption for an organization.

Recommended "Minimum Best Practices" for Stewardship of State-Owned Buildings

As 2025 approaches, USI created a list of five "minimum best practices" that should be implemented to maximize economic and environmental stewardship of state-owned buildings. These core principles are necessary to further progress towards the EO80 -40% EUI goal.

1. LED Lights

Light Emitting Diode (LED) is now the standard to which all lighting is compared. LEDs are made from non-toxic materials and can last from ten to fifteen years (which is around six times the life of regular bulbs). The price of LEDs has decreased significantly since they were first introduced while the cost for non-LED lighting has increased as those technologies are being phased out. As such, LEDs not only reduce energy but are also now cost efficient. Moreover, studies continue to show that lighting style, such as cooler colors, can increase office productivity.[11] LED's offer a variety of lighting options that are both controllable in the office environment and energy efficient.

2. BAS or Programmable Thermostats with Setbacks

Having the ability to control when and how the HVAC is operated will allow for better system operation and energy savings. These controls provide the ability to set systems back at night and

[11] https://onlinemba.unc.edu/news/how-lighting-affects-productivity/

weekends or during times that the facility is unoccupied. Most programmable thermostats have security settings that will lock the setting to prevent tampering. This allows for improved energy savings and control of operation when the building is occupied and when unoccupied.

3. HVAC and Water Heating System Condition

While it may not be economical to purchase new HVAC and water heating systems in all buildings, there should be a uniform requirement that existing equipment be recommissioned or retro-commissioned. According to the Department of Energy, this is accomplished to *"ensure that systems, and equipment in existing buildings meet the original design intent."*[12] This process would include the use of maintenance records that verify whether equipment is at peak performance and working according to factory specifications. State governmental units should maintain a detailed and enforceable annual service/maintenance plan for all equipment.

4. Building Envelope Survey and Repairs

A building envelope survey should be done to assess and document the overall condition of the exterior of the facility. This survey should include things such as door weather-stripping, caulking around windows, and whether energy efficient windows and doors are in place. If possible, this survey should utilize thermo-imaging cameras to detect issues that cannot be seen with the human eye. The shell of the building is constructed only once but stands as the only protection from outdoor conditions. This shell is designed to eliminate the transfer of heat and cold both from the interior and exterior of the building. All efforts to improve building insulation and to repair air leaks will improve the overall efficiency of the building. Without these weatherization improvements, energy efficiency measures will be diminished or negated.

5. Energy Policy

Government entities should have an enforceable energy policy which covers both leased and owned properties. This policy should address temperature set points, plug load, occupant behavior, personal appliances, and efficiency of equipment within these facilities. In addition, the policy should provide direction to employees and specify operational parameters of equipment that can be controlled to ensure stewardship of taxpayer funds and environmental resources. Benchmarking of facilities should also be incorporated into energy policy; benchmarking is a key piece of this report but should also be done on a more localized level within each individual entity to provide more data-driven energy management decisions.

5.2 Funding Methods

Federal Stimulus Funds

A. Inflation Reduction Act

The 117th United States Congress enacted the Inflation Reduction Act (IRA) on August 16th, 2022 under President Joe Biden. The IRA delegates $369 billion to programs and initiatives addressing climate resilience, energy efficiency improvements, and energy security programs. Elective Pay, also known as Direct Pay, provisions within the IRA make it possible for tax-exempt entities such as state agencies to receive the equivalent of a tax credit in the form of a cash payment for the installation of clean energy technologies such as installing electric vehicle infrastructure, battery storage, or renewable energy installations. The Production Tax Credit (§

[12] https://www.energy.gov/eere/femp/commissioning-federal-buildings

45) and the Investment Tax Credit (§ 48) provisions in particular provide significant incentives for production of, or investment in, renewable energy projects or sources. These elective pay provisions, in conjunction with the Energy Efficient Commercial Buildings Tax Deduction (§ 179D) providing tax deductions via building designers for new energy efficient commercial buildings or efficiency improvements to existing buildings, provide meaningful financial pathways to help governmental entities make the business case for both renewable energy investment and energy efficiency improvements.

Section 60103 of H.R. 5376 expands the Clean Air Act, 42 U.S.C. § 7434 to include § 134, which ratifies the Greenhouse Gas Reduction Fund (GGRF). Under advisement of the Environmental Protection Agency (EPA), $27 billion are available in the form of competitive grants until September 30, 2024. State entities, such as SEO, are eligible for $7 billion of the GGRF to implement projects that will benefit low-income and disadvantaged communities by reducing GHG emission or implementing innovative, zero-emission technologies. SEO, in partnership with the North Carolina Clean Energy Fund, has applied for $250 million in funding from the Solar for All program within the GGRF; more information on the status of this application will be released in spring/summer 2024. This program would enable thousands of North Carolina households to access, for the first time in many cases, clean, resilient, and affordable solar energy through the design and launch of a low-income and disadvantaged community solar program. To maximize the benefits to North Carolina's low-income and disadvantaged communities, SEO plans to design programs that have the greatest impact with a focus on reducing greenhouse gas emissions, lessening energy burdens, and improving quality of life.

Section 60114 of the Inflation Reduction Act authorized the Climate Pollution Reduction Grants (CPRG) program under the EPA, providing $5 billion in grants to states, local governments, tribes, and territories to develop, strategize, and implement plans for reducing greenhouse gas emissions and other harmful sources of air pollution. North Carolina received a $3 million award this year for planning activities and intends to compete for the $4.6 billion implementation grants that EPA will start awarding next year. North Carolina is in the process of developing a Priority Climate Action Plan (PCAP) and a Comprehensive Climate Action Plan (CCAP). The PCAP, due March 1st, 2024, will identify North Carolina's highest priority greenhouse gas reduction measures and determine the method for ensuring equitable implementation of these measures for the benefit of all North Carolinians. The CCAP, due July 5th, 2025, will update and expand upon North Carolina's existing climate strategies, ensuring that these documents align with the latest available science, modeling, and best practices. If awarded implementation funding, state-owned facilities in North Carolina may be eligible to receive funding for projects where greenhouse gas emissions can be substantially reduced, leading to further implementation of EO80 goals.

B. Infrastructure Investments and Jobs Act

The bipartisan Infrastructure Investments and Jobs Act (IIJA) was signed into law on November 15th 2021, allocating $1.2 trillion to create opportunities for states, tribes, and local governments to invest in infrastructure towards green energy, energy equity, and climate resiliency. Under Section 40552 of H.R. 3684, the Energy Efficiency and Conservation Block Grant (EECBG) program provides $550 million to improve transportation and building infrastructure. The SEO has applied for approximately $2.2 million in EECBG funding and is awaiting further potential

award information from the Department of Energy. If awarded, North Carolina will provide government agencies subgrants to implement energy efficiency measures and renewable energy system installations in their facilities, providing a direct funding pathway to help meet the EO80 goal of a 40% energy usage intensity reduction by 2025.

The SEO applied for and has been awarded the Preventing Outages and Enhancing the Resilience of the Electric Grid grant under the IIJA Grid Resilience Formula Grant Program Section 40101(d). The Grid Resilience grant provides approximately $9.2 million annually for the next five (5) years in funding support for the deployment of grid modernization technologies, diversification of distributed generation assets, and hardening and improving adaptivity of transmission infrastructure to strengthen the resiliency of the electric grid against disruptions from extreme weather-related events and outages. Potential projects from eligible entities, including electric grid operators, distribution providers, and others, will be prioritized based on North Carolina's objectives of grid modernization, equitable access to resilient and reliable energy, and equitable workforce development initiatives. In FY23-24, SEO will conduct outreach events with stakeholders and the public to determine stakeholder and community priorities for this funding, determine and share how project proposals will be evaluated and awarded, and release an RFP for proposals.

Several other clean energy funding programs within the IIJA are being explored as pathways to promote EO80 implementation, including State Energy Program (SEP) funding and the North Carolina Energy Efficiency Revolving Loan Program (Section 40502). North Carolina has been awarded $10.4 million in additional SEP formula funding from the IIJA over the next 5 years to promote clean energy initiatives throughout the state, such as workforce development, energy efficiency, transportation, energy resilience, etc, which may include clean energy initiatives within governmental entities to further EO80 energy reduction goals. Under the Energy Efficiency Revolving Loan Program, North Carolina would receive roughly $2.3 million to fund energy audits, upgrades and retrofits for commercial entities which includes public buildings, nonprofit organizations and the industrial sector. This program can consist of loans and up to 25% of the total award can be used for grants and technical assistance.

Guaranteed Energy Savings Contracts (GESC)

Since 2002, GS §143-64.17 allows for governmental units to utilize the GESC process to implement and to finance major facility upgrades which save energy and reduce utility expenditures. Under the law, the energy savings resulting from the performance of the contract must equal or exceed the total cost of the contract. Furthermore, the contracts are not to exceed a term of 20 years from the date of the installation and acceptance. Based on the rules in *Title 01 NCAC Subchapter 41B*, an Energy Services Company (ESCO), in collaboration with the affected governmental units works to: (1) design and propose a package of energy conservation measures (ECMs); (2) install the selected ECMs; (3) provide measurement and verification of the annual savings for the duration of the contract; and (4) guarantee the dollar savings of the energy savings through a third-party reviewer. Utility budget savings realized by the implementation of the guaranteed ECMs provides repayment of the multi-year loans executed by governmental units to finance the initial energy upgrades. Governmental units are encouraged to utilize the GESC process to fund capital projects that will assist in meeting the EO80 goal. The USI program's staff are equipped to provide technical assistance and guidance throughout the GESC process.

Three cabinet agencies, DOA, DOT, and DPS, have historically used this financing method for energy efficiency improvements. To date, DOT has accumulated savings of more than $1.3 million above the guarantee for their two projects, and DPS has saved over $1.1 million above the guarantee for their project.[13] USI continues to oversee an additional seventeen projects within the UNC System that have an expected cumulated guaranteed savings of over $333 million through the life of the contracts.[14] With the success of these projects, DAC and DNCR are in the process of implementing GESCs for several of their facilities. The DAC project is for six 1,000 cell correctional facilities, and was recently approved at the September 12, 2023 Council of State meeting. The DNCR project includes the North Carolina Zoo, all three aquariums and five museums; their GESC is expected to be executed within FY23-24 pending Council of State approval. Both the DAC and DNCR GESCs combined are expected to save more than $70 million in energy savings over the life of the projects, a significant contributor toward the progress of EO80's goals.

Agencies and the UNC System have proven that GESC works and works well for completing energy projects. GESCs allow government entities to address issues associated with aging, inefficient buildings or equipment, high maintenance costs, and scarce budget resources through a unique funding mechanism that does not require any upfront capital, and provides guaranteed savings through a single vendor and a single contract. GESC continues to be a valuable method of analyzing, designing, and implementing energy improvement measures, and should be utilized to the maximum extent possible if EO80 goals are to be achieved.

Energy Efficiency Repair and Renovation Funds

Each agency makes annual requests for repair and renovation (R&R) budgets. These requests contain a variety of requests including capital projects, maintenance issues, aging equipment, and infrastructure necessary to maintain the current use of existing facilities. USI and OSBM have worked together to ensure that agencies target a portion of these funds for energy efficiency measures. For example, during FY2021-22, cabinet agencies collectively leveraged up to $30 million in much needed funding for energy projects that were pre-approved by USI's technical staff. In the most recent 2023-25 North Carolina budget, $200 million was approved for repairs and renovations for both state agencies and UNC System facilities. USI will continue to work with OSBM to ensure that agencies target a portion of these funds for energy efficiency improvements. Overall, this is a positive step towards achieving greater efficiency gains and providing stewardship of taxpayer funds.

Duke Energy's Energy Efficiency Opt-In Program

Duke Energy allows customers to choose whether to "opt-in" and take advantage of demand side management (DSM) and energy efficiency (EE) programs. The purpose of these programs is to reduce energy consumption and improve the efficiency of electrical equipment. Participants generally pay slightly more on their monthly power bills but can then purchase high efficiency equipment or lighting at a reduced price or with rebates. In this manner, Duke Energy incentivizes

[13] We were unable to verify DOT's accumulated savings for their two GESCs since a final third-party review was not provided to DEQ for the most recent performance year (per NC GS143-64.17M). Savings provided are from the most recent completed performance year.

[14] NC Ag and Tech State University's data was excluded from the total since they did not provide a final report or contract for USI's review.

a portion of the higher cost of energy efficient installations and maintenance activities. Alternately, customers may elect not to participate or "opt-out" of the DSM and/or EE programs and receive a monthly bill credit. Customers are encouraged to use these monthly savings to fund and implement their own efficiency measures. However, some customers that opt-out do not actually use their savings for energy efficiency measures as the program was intended; if governmental entities do choose to opt-out, it is important they are using those funds that would have otherwise been spent by opting-in, to actively and consistently fund energy efficiency improvements at their facilities. This can be accomplished by tracking a monthly "would be" spend amount in the same internal tracking mechanism used to track utility expenses, and ensuring these monies are actually set aside for energy efficiency expenditures.

Duke Energy's Small Business Energy Saver Program

Duke Energy's Small Business Energy Saver program pays up to 80% of the installation cost for energy efficiency improvements for eligible commercial customers with an average annual demand of 180 kilowatts or less. Duke Energy has a dedicated contractor that performs free energy assessments for potential program participants. Based on the assessment, energy efficiency recommendations are made related to lighting, refrigeration, heating and cooling, and water efficiency measures. The process is simple since the contractor counts all the light fixtures, calculates the savings/payback, and does the installation. The result is a turnkey project consultation and installation where the participant receives an upfront discount from Duke Energy to encourage the purchase and installation of high-efficiency lighting, HVAC systems, commercial and agricultural equipment, as well as equipment for eligible industrial and governmental facilities. Both DEQ and DPS have used this program successfully to upgrade lighting in several of their facilities within Duke Energy's service territory. The goal is that all eligible governmental entities will take advantage of this program when making energy efficiency upgrades in the future, where and when applicable.

Energy Savings Credits

One barrier all governmental energy programs face is a lack of funding for efficiency improvement projects. In this regard, the UNC System and affiliates benefit from a statutory provision that was created under SL 2010-196, Sections 1 and 2 (NCGS 116-30.3B). This provision allows the UNC System and affiliates to retain funds annually left over in their utility accounts by measuring and receiving third-party verification on energy savings associated with utility saving projects completed during the same fiscal year. These funds are credited into the next fiscal year's budget with the requirement that at least 60% of those funds must be used for more energy related projects. This provides an incentive to install projects which generate energy savings because a portion of the funds are credited back and can then be used for more energy efficiency projects. Over time, projects become larger thereby resulting in greater savings. For FY 2022-23, ten UNC System schools asked to carry forward over $17.2 million in savings and reported spending an additional $43.6 million for new energy efficiency projects; of this $43.6 million, $34.3 million is derived from new energy efficiency projects at Western Carolina University through the procurement of new high-efficiency boilers.[15] These funds are specifically designated for energy efficiency improvements.

[15] The values in this report reflect the most accurate tabulation of the "savings claimed" and "cost of new projects" for FY2022-23 based on datasets provided by participating UNC System schools.

Figure 7 shows the previous fiscal year's estimated avoided energy costs of the top agencies that totaled nearly $43 million. If these agencies had a more permanent, clear, and reliable mechanism like NCGS 116-30.3B (i.e., outside the dedicated energy efficiency R&R funds), some of these avoided costs could have been utilized to self-fund additional energy efficiency projects similar to the UNC System and its affiliates. USI recommends cabinet agencies have access to similar self-funding energy efficiency improvement funds as the UNC System has through NCGS 116-30.3B, also known as "carry forward" funds; these funds would be significant and would provide a clear pathway to increased implementation of valuable energy efficiency projects.

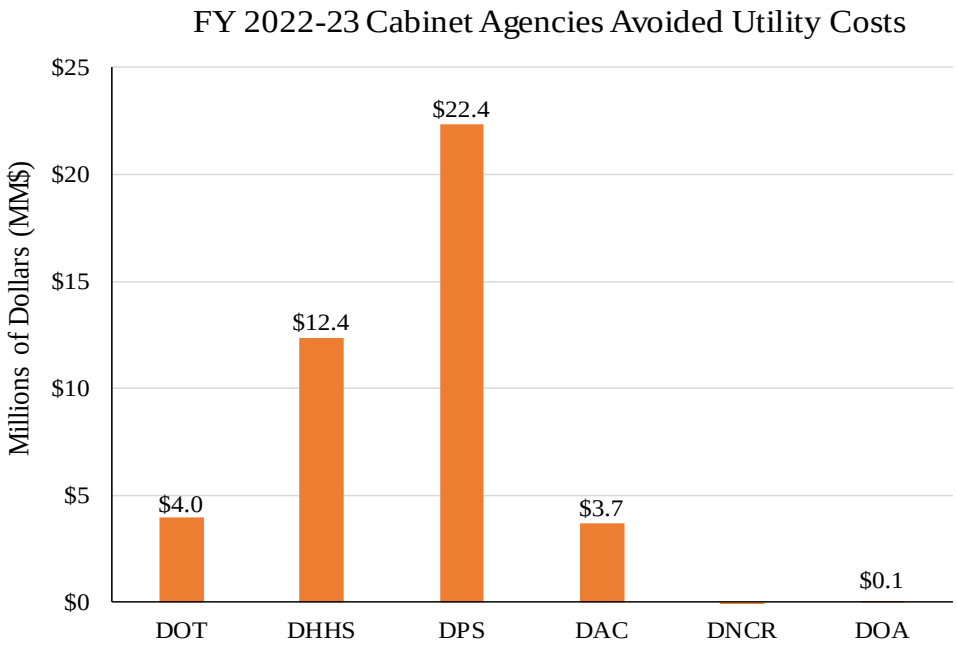


Figure 8: Cabinet Agencies Avoided Utility Costs

6.0 Best Practices for Leased Facilities

As USI continues to collect utility data from reporting entities, the subject of leased spaces remains. The annual report only collects utility data from state-owned buildings while excluding usage related to leased spaces. This decision was made as the reporting requirements were derived in GS 143-64.12. The primary reason is that the occupant of leased facilities lacks control of the type, style, or efficiency of the energy-consuming equipment within leased facilities. Secondly, most agencies lease only minimal space as needed and often for short terms. Over the years, government entities have requested specific requirements for these leased spaces, but energy related requirements have not been part of the prerequisites of those spaces. Often the energy efficiency of these spaces was not prioritized. With this knowledge, USI recommends leased spaces follow the same Recommended "Minimum Best Practices" for Stewardship of State-Owned Buildings as discussed in Section 5.1 of this report. These best practices should be requested whenever a leased space is being considered since they will indirectly promote the private sector to increase the efficiency of their buildings to obtain a state contract. Lease renewals are also a good time to negotiate and advocate for energy efficiency upgrades with building owners.

7.0 Eliminate Non-LED Lighting

The 2007 Energy Independence and Security Act established guidelines to reduce the wattage of incandescent bulbs, required the removal of magnetic ballasts, and set new standards for linear fluorescent lamps. Since 2007, there has been a continual shift in the market towards the elimination of older outdated lighting technology. In fact, in order to continue allowing the purchase of many of these outdated lamp technologies, manufacturers have creatively changed the names to designer lamps or labeled them as architectural. Meanwhile, prices have steadily climbed, and procurement has become more difficult. In 2021, a major lighting manufacturer announced an additional thirty percent price increase on non-LED lamps and ballasts to be effective in January 2022. This was on top of the price increases that have already taken place over the past decade. The message is clear that continued reliance on outdated lighting technology will result both in high costs from the energy to operate and from the price to purchase replacement bulbs. All state facilities that still use outdated technologies will pass this cost on to taxpayers until lighting upgrades are implemented.

With these increased costs and procurement difficulties, the time has come to move forward with newer LED lighting technologies. LEDs were invented in 1962 and have been around for more than sixty years. Originally as with any new technology, consumers were wary to adopt LEDs due to high prices and skepticism about manufacturer's quality. As a result, a group of utility companies in the northeast formed the Design Lighting Consortium (DLC) to create standards and performance requirements for LEDs. This has become the gold standard for LED lighting, and today, for any utility rebate to be obtained, the lamp or fixture must be DLC certified. This has cemented LED as a proven technology.

Most common linear florescent lamps have a rated wattage of 32 watts whereas the most common LED linear lamps have a rated wattage of only nine watts. When measuring the efficiency of a lamp, the lighting industry uses the term lumens per watt. This shows how much visible light is being delivered for a given amount of electricity. The higher the lumens per watt, the more energy efficient the lamp. A typical florescent 32-watt lamp will have an efficiency of 60 lumens per watt while a typical nine-watt LED lamp will have an efficiency of 110 lumens per watt. A fixture that has four 32-watt florescent lamps uses a total of 128 watts. The same fixture with four nine-watt LED will be using only 36 watts. That's a savings of 92 watts per fixture, and most office buildings have hundreds of fixtures. The math alone should prove that moving to LED is more cost effective on reducing the use of electricity.

Beyond the energy savings, moving to LEDs will have some additional benefits to any facility. Primarily, the longevity of LED lights leads to a drastic reduction in maintenance and labor costs due to increased bulb life. Secondarily, since new LEDs do not contain mercury like fluorescent bulbs, they are substantially more environmentally friendly. Lastly, LEDs provide better light quality and quantity as compared to older technology. Insufficient or improper lighting can create glares or reflections, making concentration and getting comfortable more difficult for employees. Poor lighting can also create workplace incidents or security risks due to lack of illumination. LED Lighting helps to mitigate all these issues.

There should be no reluctance to move all lighting away from older technologies; however, non-LED lighting continues to exist within many state-owned buildings. Steps need to be taken to remove and replace all non-LED bulbs and fixtures. At a minimum, state-owned buildings should stop purchasing inefficient, non-LED lamps and fixtures unless an exception is required for specialty circumstances and situations; this would require a directive against purchasing new non-LED lamps and fixtures. DPS/DAC is leading by example because they have initiated the "LED in'23" lighting campaign where their goal is to have every single building outfitted with LED lighting by the end of FY2023-24. The SEO recommends each state-owned building take the necessary steps to become more energy efficient and environmentally friendly by moving away from inefficient, non-LED lighting.

8.0 Conclusion

This report emphasizes the need for significant energy conservation measures and resources by all governmental units to achieve the EO80 40% EUI reduction goal by 2025. If substantial measures and resources are not implemented in FY2023-24, the EO80 40% EUI goal will likely not be achieved. Hiring full-time dedicated energy managers with decision-making authority and access to specific funding for energy improvements would help substantially in this effort. Management can empower these energy managers and fully support EUI reduction initiatives both by communicating energy efficiency goals and by providing leadership in making sure the goals are achieved. Energy managers and contacts within governmental units must engage and communicate with the USI team at the SEO consistently, who are there to provide technical assistance and guidance in all EUI reduction initiatives. Improved data collection efforts are underway within several state agencies, but all governmental units would benefit from a more sophisticated and centralized utility data collection system; this would reduce the risk of human error in data collection efforts, thereby increasing the accuracy and effectiveness of the data and allowing energy managers to more easily identify facilities that would benefit the most from energy efficiency efforts. Similarly, all governmental units need to consider alternative financing mechanisms for energy efficiency projects such as GESCs. A comprehensive and thoughtful utility management plan is also necessary for all governmental units to provide a long-term vision and structure for incorporating energy efficiency practices and principles into business decisions. Additionally, directives should be implemented to prevent purchasing non-LED lamps or fixtures throughout all government sectors, unless an exception is required for specialty circumstances or situations.

The State Energy Office (SEO) recommends the following overall improvements as it relates to energy efficiency for state-owned buildings:

- Invest in more sophisticated, state-of-the-art data collection tools and/or mechanisms to streamline and standardize utility data collection and increase the accuracy of the SEO's data collection efforts;
- Appoint a full-time energy manager, particularly for the top five largest agencies, where energy management is their sole responsibility;
- Maintain consistent and frequent communication with the SEO so we can better understand

and support USI entities' struggles and successes;

- Participate in energy efficiency assessments for state-owned facilities at least once every 3-5 years in order to identify and prioritize energy efficiency projects, and communicate these findings to the SEO;
- Explore and be creative with the various funding pathways for energy efficiency projects as outlined in Section 5.2, particularly with Guaranteed Energy Savings Performance Contracts;
- Implement a directive against purchasing new non-LED bulbs and/or fixtures, unless an exception is required for specialty circumstances or situations;
- The North Carolina General Assembly should consider establishing carry-forward funds for cabinet agencies as they have with UNC System institutions as a means of increasing funding and therefore implementation of energy efficiency projects.

Overall, cabinet agencies, other agencies, and the UNC System spent over $349MM on utilities in FY 2022-23. Proper stewardship of these funds requires robust energy conservation measures and a focus on energy efficiency. This message can come directly from leadership and filter through all levels of governmental sectors. Due to the plethora of upcoming stimulus and grant funding opportunities, state agencies and UNC System institutions have monetary opportunities for financial reinforcements that are necessary to move toward and reach the collective 40% EUI reduction goal by 2025. Now more than ever, an investment in energy efficiency is necessary for North Carolina to continue to lead-by-example both within our state and nationally. The USI team at the State Energy Office is prepared to support and assist with all energy efficiency efforts and to drive future energy savings across the state. We must continue to work together to conserve our valuable resources for the benefit of all North Carolinians.

Appendix A

Agency Summaries, Data, and Graphs

Department of Administration (DOA)

The Department of Administration acts as the business manager for North Carolina State government. The Department oversees Government Operations, which includes the maintenance of state-owned buildings and grounds. The DOA Division of Facility Management has been tracking electrical and natural gas consumption data for buildings owned and maintained by DOA monthly since 1998. The Division is also responsible for operating and maintaining DOA buildings, including paying the water, electric, and natural gas utility bills. DOA operates a central steam heating plant, two chilled water plants, and chilled water storage tanks. Most large DOA buildings are in the Downtown Government Complex with the majority being offices, but also includes the steam and chilled water plant. The buildings are mostly occupied by agencies other than DOA with DOA serving as landlord. Brittany Quinn and Ralph Taylor work together to improve the energy efficiency and sustainability of DOA facilities. DOA accounts for 12% of overall cabinet agencies' energy consumption impact.

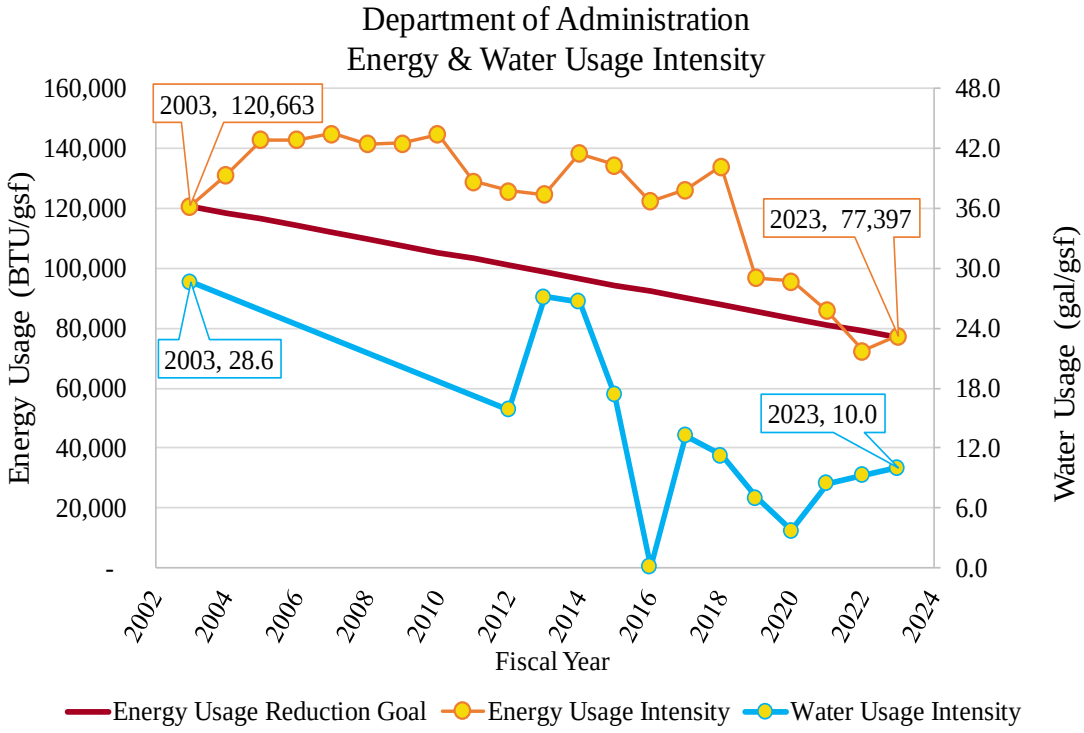


Figure A.1: DOA Utility Usage Over Time

Table A.1: DOA Progress

Metric	Fiscal Year		% Change
	2002-03	2022-23	
Total Gross Square Feet	4,798,719	5,686,982	+19%
Total Utility Cost	$7,491,785	$8,639,998	+15%
Energy Usage (Btu/gsf)	120,663	77,397	-36%
Energy Cost ($/MMBtu)	$12.41	$18.23	+47%
Water Usage (gal/gsf)	29	10	-65%
Water Cost ($/kgal)	$2.23	$10.80	+385%

Department of Commerce (DOC)

The DOC's mission is to *"work closely with local, regional, national, and international organizations to propel economic, community, and workforce development in the State."* To accomplish this task, the DOC is comprised of several divisions and programs that assist businesses with siting and workforce requirements, connecting the community with funding opportunities to attract new businesses, and publishing analytical reports for those interested in investing in North Carolina's economy. Except for the Division of Employment Security's (DES) Central Office, all business operations are housed in properties that are owned by the Department of Administration (DOA) or leased. Therefore, the DES is the only entity that is required to report utility consumption through the DOC in accordance with GS §143-64.12 and EO80, Section 8. Joe Katzberg is the Director of Support Services, and is designated as the energy manager for DES. DOC accounts for 1% of overall cabinet agencies' energy consumption impact.

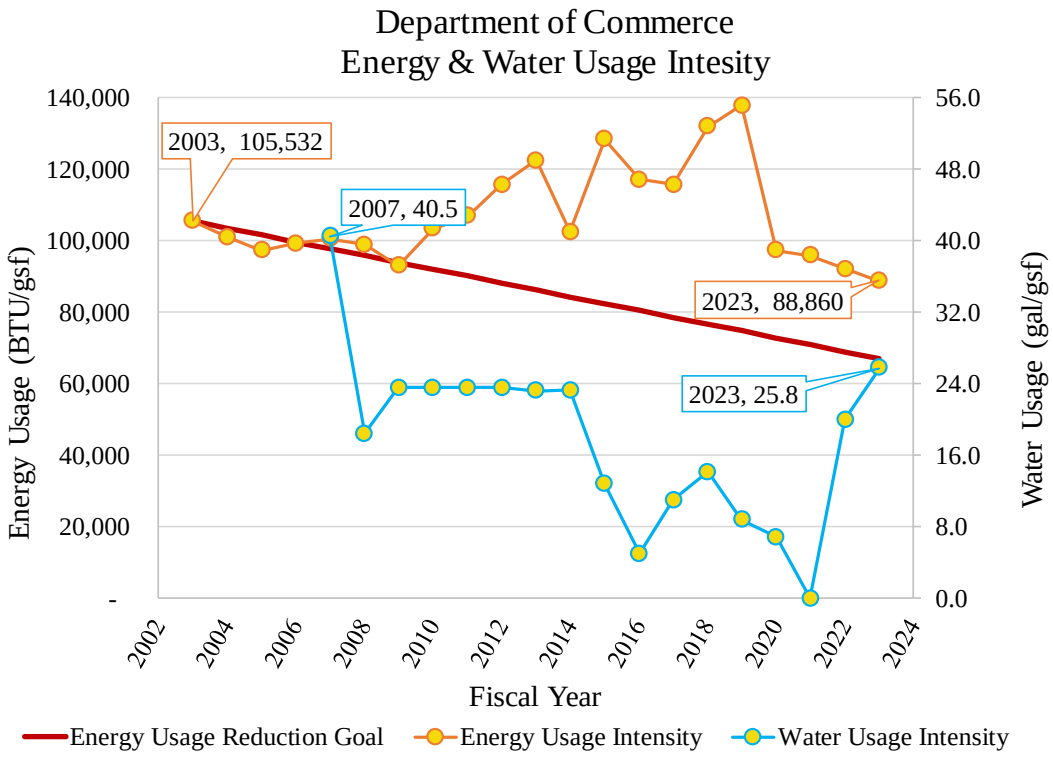


Figure A.2: DOC Utility Usage Over Time

Table A.2: DOC Progress

Metric	Fiscal Year		% Change
	2002-03	2022-23	
Total Gross Square Feet	8,784,848	9,628,207	+10%
Total Utility Cost	$9,341,426	$11,411,289	+22%
Energy Usage (Btu/gsf)	53,296	37,263	-30%
Energy Cost ($/MMBtu)	$17.02	$24.76	+45%
Water Usage (gal/gsf)	30	28	-6%
Water Cost ($/kgal)	$5.24	$9.40	+79%

Department of Environmental Quality (DEQ)

The DEQ is the lead stewardship agency for the protection of North Carolina's environmental resources and has offices from the mountains to the coast. Chief responsibilities include administering regulatory programs designed to protect air quality, water quality, and the public's health along with advancing energy efficiency. The majority of DEQ employees work in buildings owned by the DOA or in leased buildings which are not included in the utility data of this report. Only the state-owned facilities currently managed by DEQ are measured and tracked for the DEQ utility data, which include the Reedy Creek complex located in Raleigh primarily occupied by the Division of Air Quality, and Water Resources along with the Division of Marine Fisheries (DMF) located in Morehead City. Eric Turon based in Raleigh is the Division Director for DEQ's Division of Facilities Health & Safety. 2002-03 baseline data was estimated for DEQ to track EO80 progress, but this exercise could not be done for every year between 2002-03 and 2010-11 due to data availability limitations. Water consumption was not available for DEQ's Reedy Creek complex for FY2022-23. DEQ accounts for less than 1% of overall cabinet agencies' energy consumption impact.

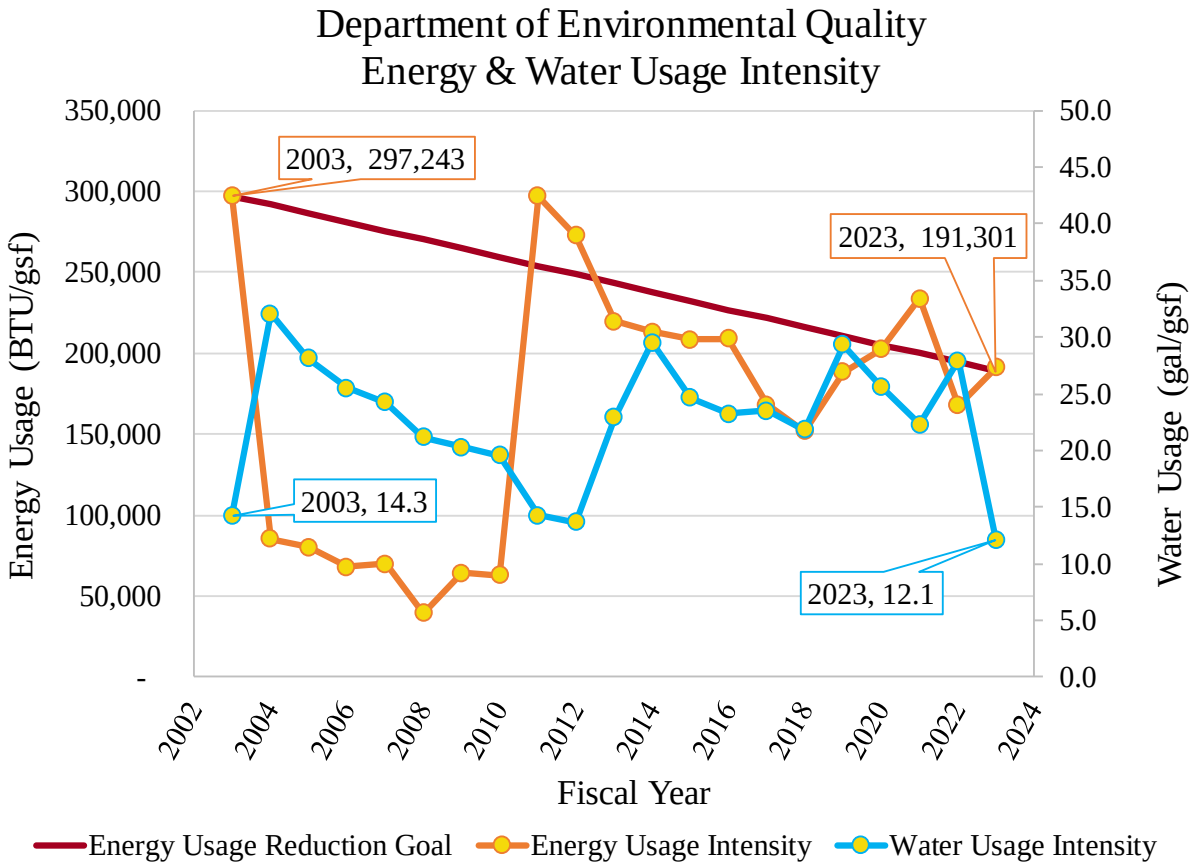


Figure A.3: DEQ Utility Usage Over Time

Table A.3: DEQ Progress

Metric	Fiscal Year		% Change
	2002-03	2022-23	
Total Gross Square Feet	105,527	95,182	-10%
Total Utility Cost	$572,246	$347,453	-39%
Energy Usage (Btu/gsf)	297,243	191,301	-36%
Energy Cost ($/MMBtu)	$17.56	$18.31	+4%
Water Usage (gal/gsf)	14	12	-15%
Water Cost ($/kgal)	$14.21	$12.19	-14%

Department of Health and Human Services (DHHS)

The DHHS manages the delivery of health and human-related services for all North Carolinians, especially our most vulnerable citizens; children, elderly, disabled and low-income families. The Department works closely with health care professionals, community leaders and advocacy groups; local, State, and federal entities; and many other stakeholders to make this happen. The Department is divided into 30 divisions and offices. DHHS divisions and offices fall under four broad service areas: (1) health; (2) human services; (3) administrative; and (4) support functions. DHHS has approximately 635 buildings at 14 different institutions across the State encompassing roughly 7.6 million square feet of space. These institutions include psychiatric hospitals, neuro-medical treatment centers, alcohol and drug abuse treatment centers, developmental centers, and vocational rehabilitation centers. The Energy Managers for DHHS are Greg Johnson, Luke Hoff, and Bill Stevens within the Division of Property and Construction. DHHS accounts for 21% of overall cabinet agencies' energy consumption impact.

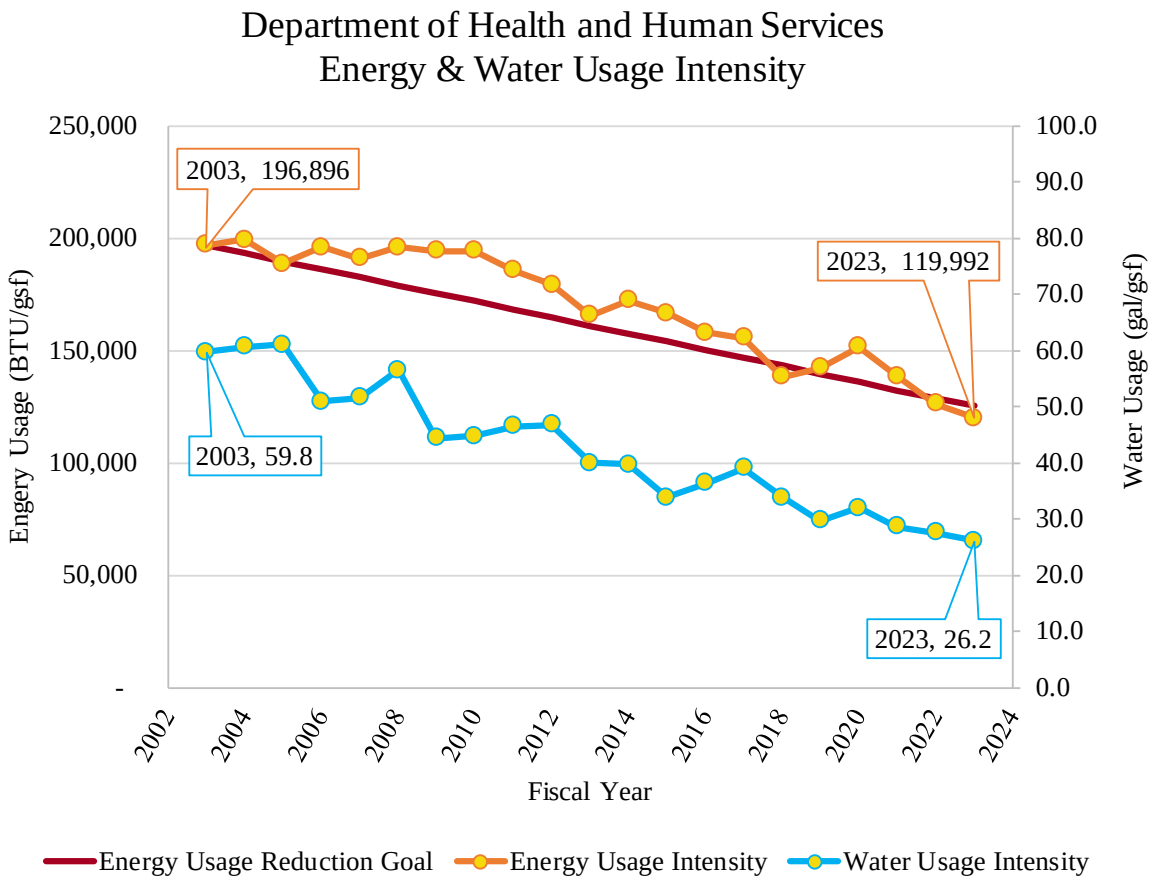


Figure A.4: DHHS Utility Usage Over Time

Table A.4: DHHS Progress

Metric	Fiscal Year		% Change
	2002-03	2022-23	
Total Gross Square Feet	6,381,007	7,926,889	+24%
Total Utility Cost	$12,834,405	$17,099,675	+33%
Energy Usage (Btu/gsf)	196,896	119,992	-39%
Energy Cost ($/MMBtu)	$9.23	$15.67	+70%
Water Usage (gal/gsf)	60	26	-56%
Water Cost ($/kgal)	$3.25	$10.59	$2.26

Department of Information Technology (DIT)

The DIT has two data centers totaling almost 150,000 square feet. The Eastern Data Center (EDC) located in Raleigh is nearly 40 years old. The Western Data Center (WDC) located in Forest City is 13 years old. The nature of DIT's Data center facilities differs from most State buildings since their energy consumption is constantly variable depending on the number of servers, network, and other types of information technology (IT) equipment in use at any given time. DIT offers numerous IT services supported by the Data centers to other state agencies. Floor hosted options are also offered to the agencies where they can utilize a spot on the Data floor with a DIT supplied rack, power, and cooling. As state agency's IT requirements change over time, there is a general upward trend in the power consumption needed. The Energy Manager for DIT is Tony Brackett. Mr. Brackett is housed at the WDC location where his primary role is the WDC Facilities Manager. DIT accounts for roughly 1% of overall cabinet agencies' energy consumption impact.

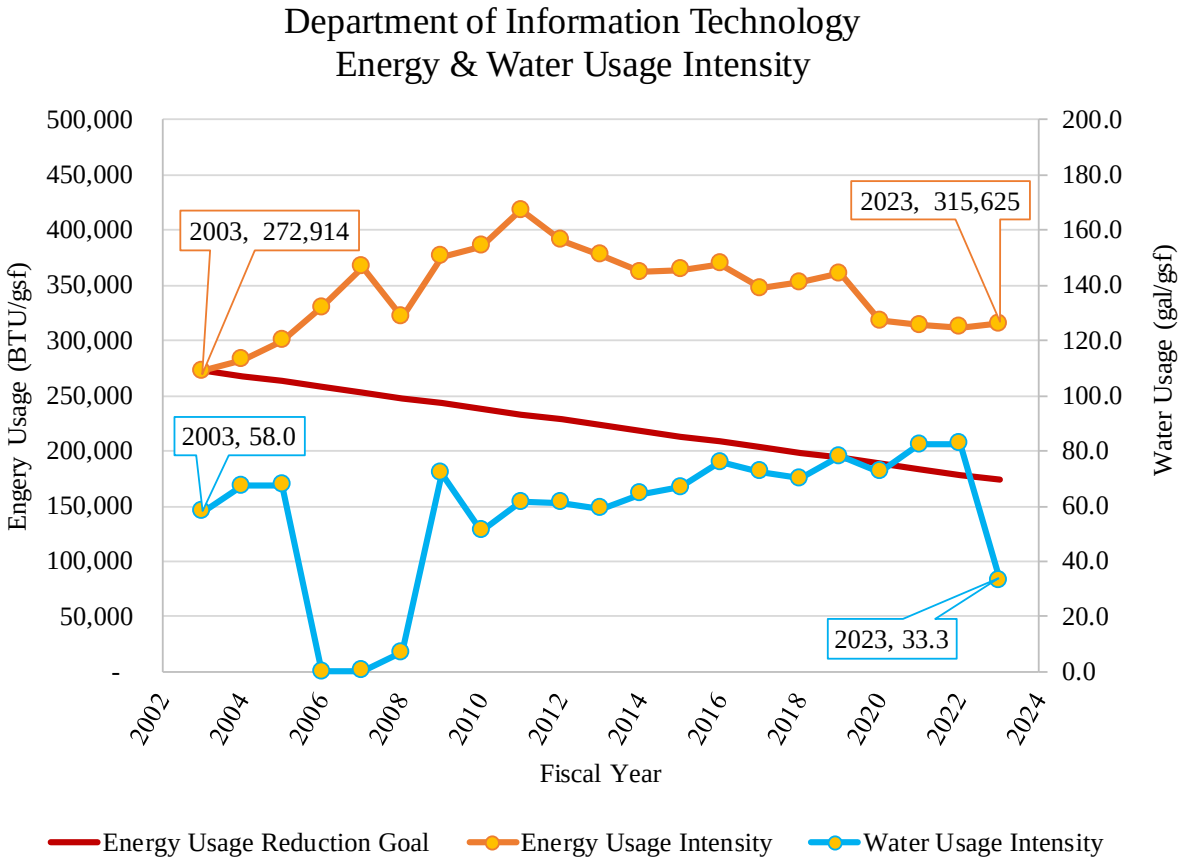


Figure A.5: DIT Utility Usage Over Time

Table A.5: DIT Progress

Metric	Fiscal Year		% Change
	2002-03	2022-23	
Total Gross Square Feet	94,343	163,866	+74%
Total Utility Cost	$362,255	$1,138,371	+214%
Energy Usage (Btu/gsf)	272,914	315,625	+16%
Energy Cost ($/MMBtu)	$13.67	$20.60	+51%
Water Usage (gal/gsf)	58	33	-43%
Water Cost ($/kgal)	$1.90	$13.34	+602%

Department of Military and Veteran's Affairs (DMVA)

The DMVA is the newest of the State agencies dedicated to helping veterans and active-duty men and women access the programs, benefits, and resources that they have earned. DMVA staff are committed to providing the highest level of service, responsiveness, and integrity in keeping the principles and values of this State and nation that military personnel and their families deserve. DMVA assists with the management of four military Skilled Care Nursing Homes housing almost 450 veterans and is in the construction phase of a 120-bed home with plans to build a sixth home. NC has one of the largest military footprints of any State, representing three out of the four branches. Military and defense industries are the second largest employers in our State and the military has an economic impact of over $66 billion annually. The energy managers are Cecil Holt and Jackie Bond. Mr. Holt is the DMVA Chief of Property & Construction, Consulting Services Section of the State Construction Office.

Previous reports indicated that DMVA utilities are paid through federal funds and therefore they did not have utility graphs/tables to report; however, the SEO was informed in late June 2023 that DMVA nursing homes and cemeteries *are* paid with state funds and therefore should be included in reporting efforts. The SEO received incomplete energy consumption data from DMVA for FY2022-23; we will continue to work with DMVA's energy managers to generate a complete report for next year's FY2023-24 report, which will give insights into the Department's contributions to agency totals.

Department of Natural and Cultural Resources (DNCR)

The NC Department of Natural and Cultural Resources oversees the State's resources for the arts, history, libraries and nature. This includes 27 historic sites, seven history museums, two art museums, two science museums, three aquariums, 39 State parks and recreation areas, the NC Zoo, the NC Symphony, the State Library, the State Archives, the NC Arts Council, State Preservation Office, Office of State Archaeology, the African American Heritage Commission, and the Office of Land and Water Stewardship. This comprises approximately 1,825 buildings across the State

which account for over three million gross square feet of space. Tony Romaine is the energy manager for DNCR, serving as the Construction Project Manager of the Capital Projects Unit. 2002-03 baseline data was estimated for DNCR to track EO80 progress, but this exercise could not be done for every year between 2002-03 and 2010-11 due to data availability limitations. DNCR accounts for 7% of overall cabinet agencies' energy consumption impact.

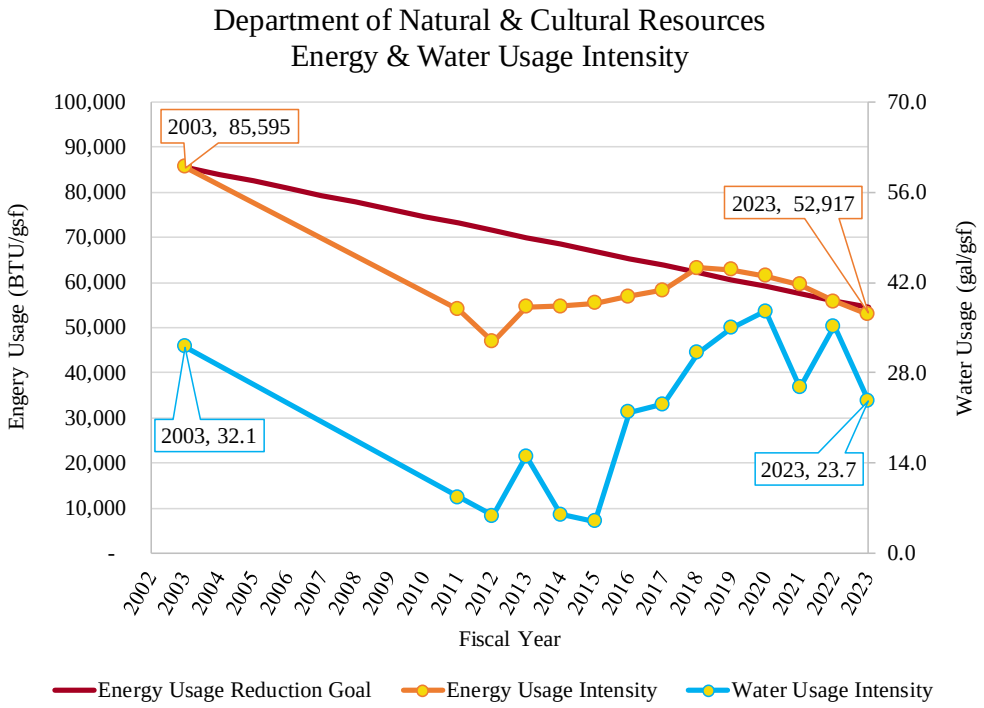


Figure A.6: DNCR Utility Usage Over Time

Table A.6: DNCR Progress

Metric	Fiscal Year		% Change
	2002-03	2022-23	
Total Gross Square Feet	2,291,088	3,679,750	+61%
Total Utility Cost	$3,808,442	$6,486,632	+70%
Energy Usage (Btu/gsf)	85,595	52,917	-38%
Energy Cost ($/MMBtu)	$17.08	$27.54	+61%
Water Usage (gal/gsf)	32	24	-26%
Water Cost ($/kgal)	$6.25	$12.91	+107%

Department of Transportation (DOT)

The NC Department of Transportation is responsible for all modes of transportation in North Carolina. This includes highways, rail, aviation, ferries, public transit, and bicycle and pedestrian transportation. The department also oversees the State's Division of Motor Vehicles and the Governor's Highway Safety Program, which promotes safety awareness to reduce highway crashes and fatalities. Additionally, DOT helps expand economic growth opportunities through oversight of the NC State Port Authority (NCSPA), NC Global TransPark and NC Turnpike Authority. DOT combined with the NCSPA occupies a total of 2,382 buildings which amount to over nine million gross square feet spread throughout the State. The energy manager for the DOT is Eric Frazier whose primary job title is Energy Management Engineer for the Facilities Management Unit. DOT accounts for 15% of overall cabinet agencies' energy consumption impact.

It should be noted that the SEO did not receive any utility usage information from DOT for FY2022-23. Energy and water consumption data was duplicated from FY2021-22 to carry forward their approximate usage in order to make reasonable assumptions based on their contribution to agency totals.

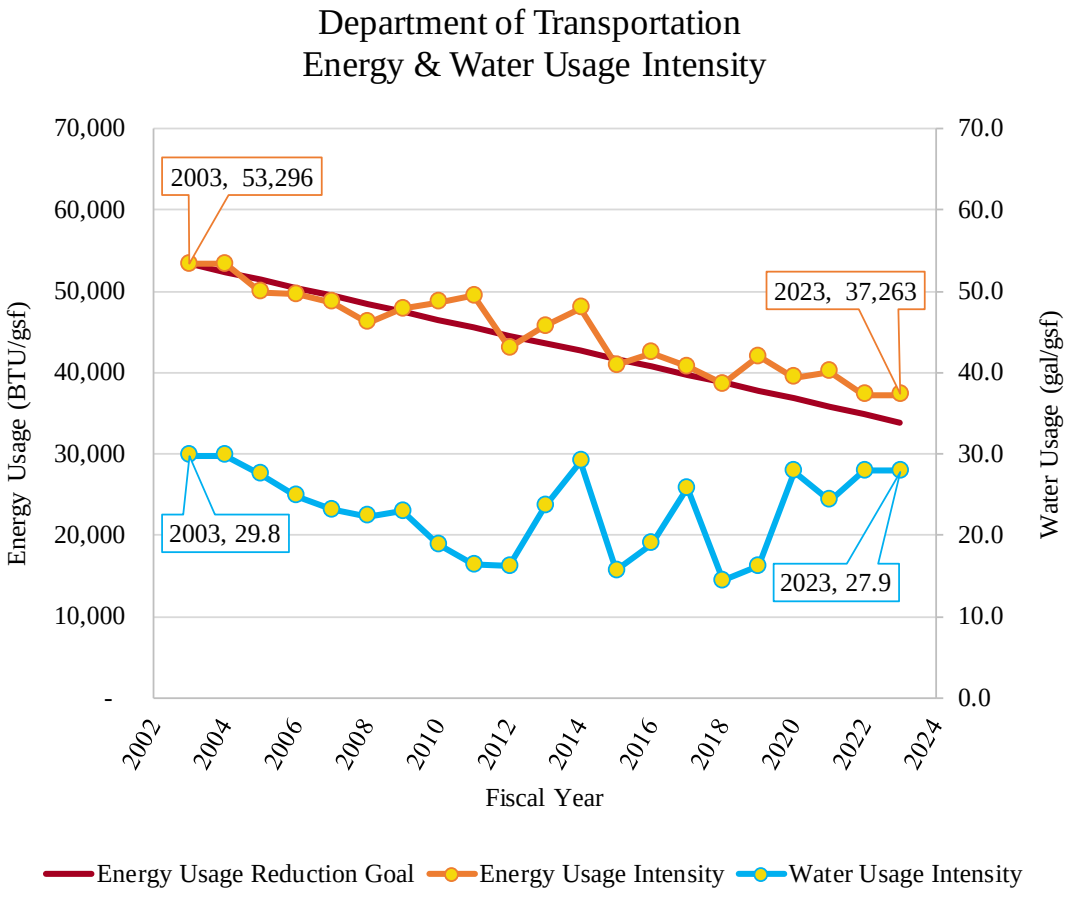


Figure A.7: DOT Utility Usage Over Time

Table A.7: DOT Progress

Metric	Fiscal Year		% Change
	2002-03	2022-23	
Total Gross Square Feet	8,784,848	9,628,207	+10%
Total Utility Cost	$9,341,426	$11,411,289	+22%
Energy Usage (Btu/gsf)	53,296	37,263	-30%
Energy Cost ($/MMBtu)	$17.02	$24.76	+45%
Water Usage (gal/gsf)	30	28	-6%
Water Cost ($/kgal)	$5.24	$9.40	+79%

Department of Revenue (DOR)

The DOR is tasked with administering tax laws and collecting tax revenue to fund public services for the citizens of North Carolina. The tax-funded public services include items such as schools, universities, roads, and public safety. To fulfill these tasks, the Department's vision is to protect customer information, maintain an expert workforce, achieve a high-level of understanding and compliance, respond with accurate information through innovative services, and to treat taxpayers fairly. The main DOR office building is located at 501 North Wilmington Street in Raleigh. This building is currently owned by the DOA, and utilities are reported through that agency. The DOR also occupies thirteen remote offices across the State that are housed in leased spaces so those utilities are not included in this report. Matthew King is designated as the energy manager for DOR, his primary role serving as Business Operations Facilities Manager.

No agency-specific utility graphs/tables are included below since the DOR reports utilities through the DOA.

Department of Public Safety (DPS)

The Department of Public Safety (DPS) manages facilities across the State that include prisons, juvenile detention centers, emergency management headquarters, and motor vehicle division sites. Also housed within DPS are the departments of Homeland Security and the National Guard. All of these divisions have the ability to be mobilized at any time and many of these facilities contain populations whose primary concern is not energy efficiency. In fact, many of these locations are required to maintain strict standards of comfort 24 hours a day, seven days a week. DPS is the largest user of utilities among all the state agencies, and that utility spending is overseen by Paul Braese, who is the DPS Energy Manager. DPS is the only agency that has a dedicated energy manager and a department focused solely on energy management. Paul's team supervises the collection of utility data through the Capturis program and works with other DPS departments performing energy projects and improvements. DPS accounts for 43% of overall cabinet agencies' energy consumption impact.

It should be noted that DPS and DAC formally split and became separate departments on January 1, 2023. Paul Braese is now the Energy Manager for DAC, while an energy manager for DPS is not yet identified. The SEO will continue to work with both departments in FY2023-24 to formally split their energy consumption details for next year's report, however this current report still includes DAC within DPS' overall energy consumption. The SEO recommends DPS work toward identifying and hiring a contact to serve as a full-time energy manager.

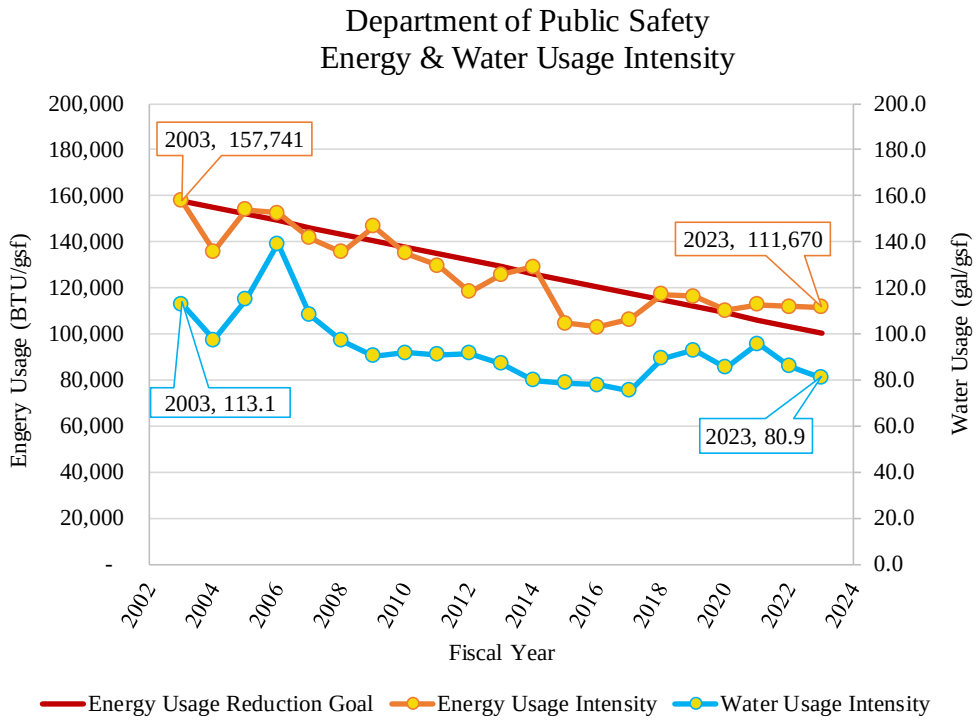


Figure A.8: DPS Utility Usage Over Time

Table A.8: DPS Progress

Metric	Fiscal Year		% Change
	2002-03	2022-23	
Total Gross Square Feet	11,581,135	16,943,880	+46%
Total Utility Cost	$32,284,715	$55,023,684	+70%
Energy Usage (Btu/gsf)	157,741	111,670	-29%
Energy Cost ($/MMBtu)	$12.43	$17.61	+42%
Water Usage (gal/gsf)	113	81	-28%
Water Cost ($/kgal)	$7.31	$15.83	+116%

Voluntary EUI Reduction Progress for Other State Agencies

Per EO80, the State of North Carolina strives to reduce energy consumption per square foot in state-owned buildings by at least 40% from fiscal year 2002-2003 levels. While the executive order applies directly to cabinet agencies, other state agencies are strongly encouraged to adopt the same goal. These other state agencies are the Department of Agriculture and Consumer Services, the Department of Justice, the Department of Public Instruction, and the Division of Wildlife Resources. Also, these agencies were not required under EO80 to appoint an energy manager.

Department of Agriculture and Consumer Services (NCDA&CS)

The North Carolina Department of Agriculture and Consumer Services has facilities across the State that include offices, storage, animal housing, chiller plants, food service, shops, housing, arenas, laboratories, greenhouses, and museums. In 2011, the department underwent major restructuring along with the Department of Natural Resources. The energy manager for DA&CS is Wendy Dudka.

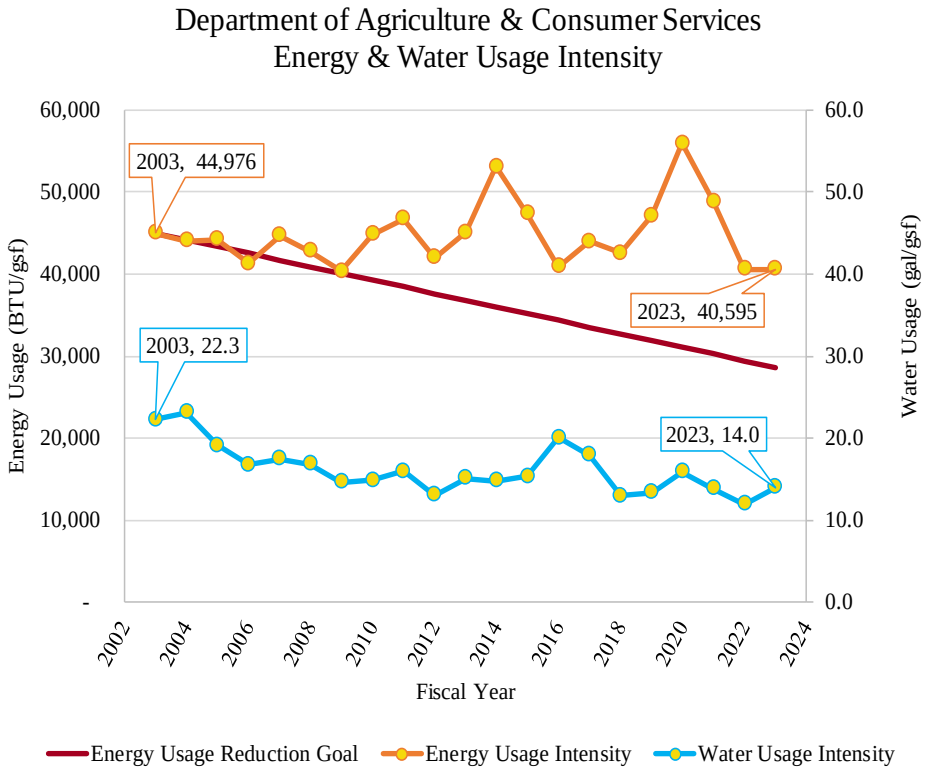


Figure A.9: NCDA&CS Utility Usage Over Time

Table A.9: NCDA&CS Progress

Metric	Fiscal Year		% Change
	2002-03	2022-23	
Total Gross Square Feet	2,995,262	4,437,478	+48%
Total Utility Cost	$2,374,024	$5,151,269	+117%
Energy Usage (Btu/gsf)	44,976	40,595	-10%
Energy Cost ($/MMBtu)	$15.41	$21.90	+42%
Water Usage (gal/gsf)	22	14	-37%
Water Cost ($/kgal)	$4.47	$18.66	+318%

Department of Justice (DOJ)

The DOJ has two training academies that provide training for law enforcement personnel. The NC Justice Academies (NCJA) are in Salemburg and Edneyville totaling almost 300,000 square feet. These academies provide basic, intermediate, and advanced training for law enforcement officers (LEOs) on topics including anti-terrorism, community-oriented policing, criminal investigation, traffic crash investigation, firearms, self-defense, and management and supervision. The Western Crime Lab is also located at the Edneyville campus. The energy manager for DOJ is Greg Raynor.

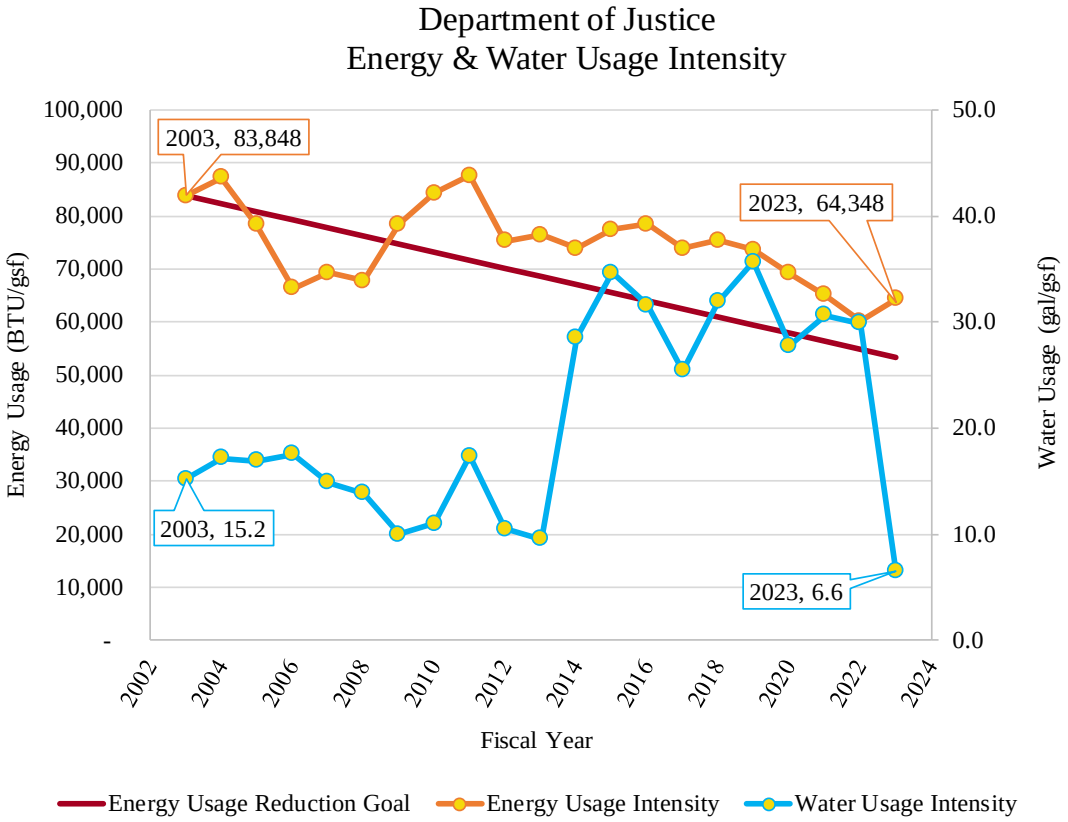


Figure A.10: DOJ Utility Usage Over Time

Table A.10: DOJ Progress

Metric	Fiscal Year		% Change
	2002-03	2022-23	
Total Gross Square Feet	204,206	298,220	+46%
Total Utility Cost	$269,833	$565,716	+110%
Energy Usage (Btu/gsf)	83,848	64,348	-23%
Energy Cost ($/MMBtu)	$15.09	$25.38	+68%
Water Usage (gal/gsf)	15	7	-57%
Water Cost ($/kgal)	$3.71	$40.21	+985%

Department of Public Instruction (DPI)

The DPI administers educational funding, oversees the licensure of teachers and administrators, provides curriculum support, and evaluates student success for public schools. North Carolina's public school system encompasses approximately 2,500 district schools and 180 charter schools that prepare students for the modern workforce and further education. Currently, the department's administrative staff are housed in the Central Office in Raleigh as well as four regional licensing centers in Catawba, Concord, Elm City, and Fayetteville. A fundamental component of DPI is management of the Western School of the Deaf in Cullowhee, Morehead Governor's School in Raleigh, and the Eastern School of the Deaf in Wilson. All three facilities are designed to be residential or day learning institutions for visually or hearing-impaired children. Furthermore, the department leads two North Carolina Centers for the Advancement of Teaching (NCCAT) in Cullowhee and Ocracoke Island that are designed to professionally-develop and improve the classroom effectiveness of teachers. Nathan Maune is assigned as the primary departmental energy manager for the DPI.

It should be noted that DPI's NCCAT and NCSD campuses were not included in FY2022-23 data due to the delay in receiving data for these campuses, hence the spike in EUI as seen below. This is due to the gross square footage from Western School for the Deaf (WNSD) being the only campus represented in FY2022-23's data. Next year's report will incorporate FY2022-23 data from NCCAT and NCSD, and will more accurately reflect this fiscal year's numbers.

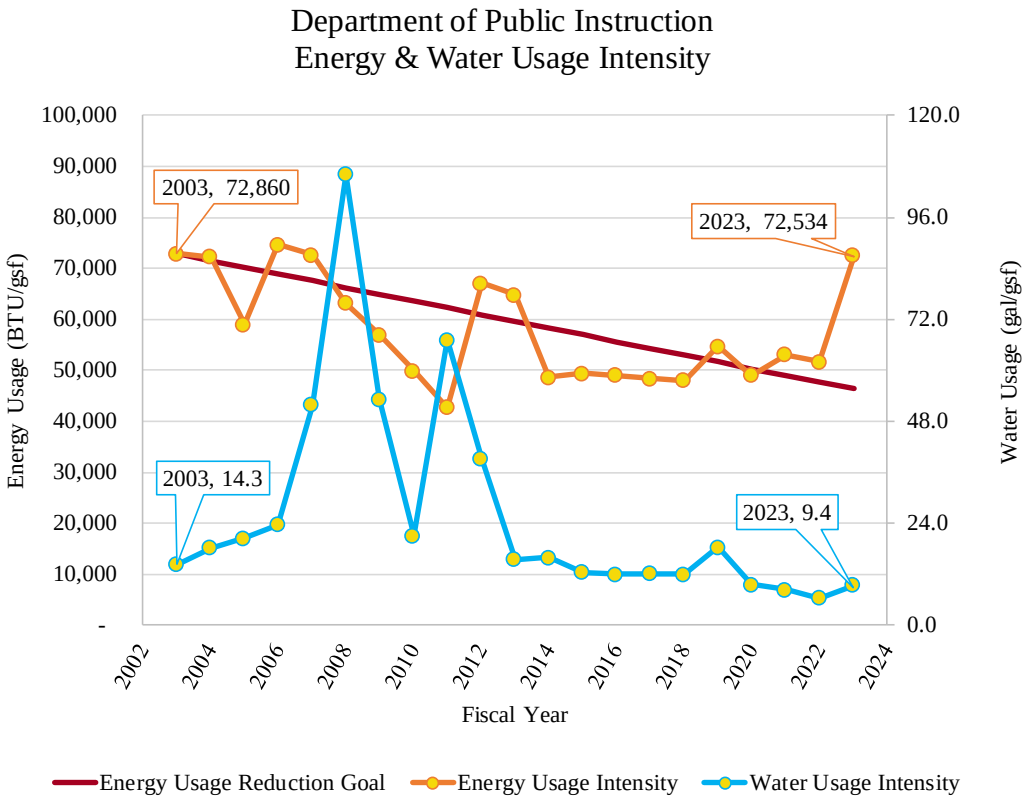


Figure A.11: DPI Utility Usage Over Time

Table A.11: DPI Progress

Metric	Fiscal Year		% Change
	2002-03	2022-23	
Total Gross Square Feet	713,347	291,112	-59%
Total Utility Cost	$747,574	$423,172	-43%
Energy Usage (Btu/gsf)	72,860	72,534	-0%
Energy Cost ($/MMBtu)	$12.91	$19.05	+48%
Water Usage (gal/gsf)	14	9	-34%
Water Cost ($/kgal)	$7.47	$7.58	+2%

Wildlife Resources Commission (WRC)

The NC Wildlife Resources Commission conserves and sustains the State's fish and wildlife resources through research, scientific management, wise use, and public input. The Commission is the regulatory agency responsible for the enforcement of fishing, hunting, trapping, and boating laws. Commission buildings are located across the State and include offices, pole barns, equipment storage, workshops, garages, residences, barns, animal housing, and laboratories. The energy manager for WRC is Gary Gardner, Chief of Engineering for WRC.

Data is only available for WRC dating back to the 2005-06 fiscal year.

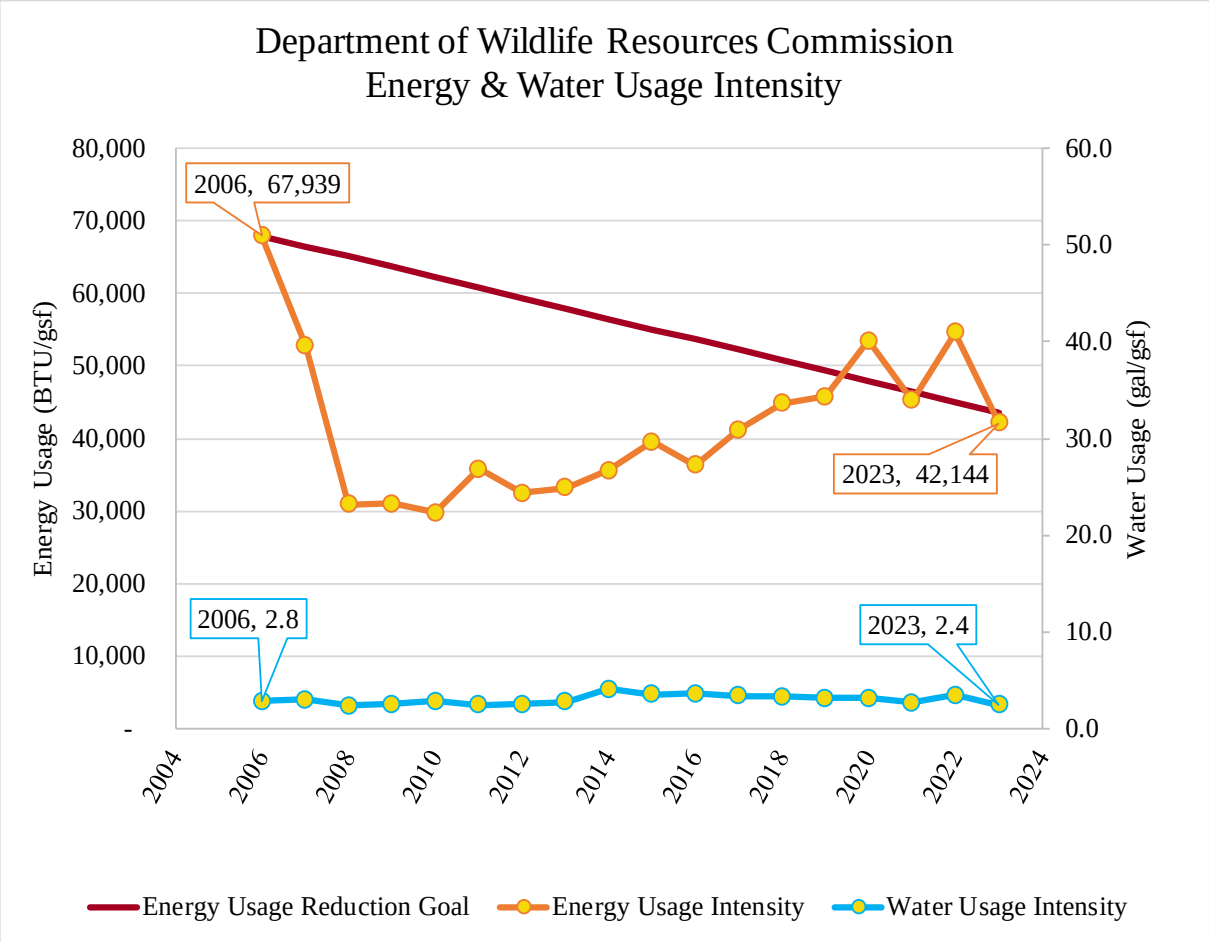


Figure A.12: WRC Utility Usage Over Time

Table A.12: WRC Progress

Metric	Fiscal Year		% Change
	2005-06	2022-23	
Total Gross Square Feet	161,093	316,934	+49%
Total Utility Cost	$222,601	$380,220	+41%
Energy Usage (Btu/gsf)	67,939	42,144	-61%
Energy Cost ($/MMBtu)	$20.00	$26.59	+25%
Water Usage (gal/gsf)	3	2	-17%
Water Cost ($/kgal)	$8.18	$32.65	+75%

Appendix B

Sources and Assumptions Used to Calculate Greenhouse Gas Offsets

Sources and Assumptions Used to Calculate Avoided Greenhouse Gas Emissions

Introduction and Scope

This appendix documents the process to revise the avoided greenhouse gas emissions contained in the December 1, 2023, version of the report titled *"Comprehensive Program to Manage Energy, Water, and Other Utility Use for State Agencies and State Institutions of Higher Learning"*. The emissions were revised by utilizing the latest emission factors presented in the *"State Inventory and Projection Tool"*[16] (SIT) and the *"Emissions & Generation Resource Integrated Database"*[17] (eGRID) developed by the United States Environmental Protection Agency (USEPA). Additionally, equivalency results to translate emissions measurements into relatable terms were calculated by utilizing the *"Greenhouse gas Equivalencies Calculator"*[18] developed by the USEPA.

Please note that prior to the December 1, 2021 report, the USI program historically applied one constant kilowatt-hour (kWh) emission factor for all fiscal years based on the most recent *"Emissions & Generation Resource Integrated Database"* (eGRID) data. However, it was later determined that this methodology was incorrect since the average generation mix changes over time for fossil fuel-fired electricity generating units. As such, the old methodology in addition to omitted chilled water and steam efficiency factors for the UNC System *(in previous reports)* significantly underestimated greenhouse gas emissions reductions.

Quality Assurance Measures

Staff from the Utility Savings Initiative (USI) program applied quality assurance measures to ensure that the data meets indicator goals and objectives. For example, all raw utility consumption data utilized to calculate avoided emissions were checked for reasonableness against historical data from the same data category and geographic area (i.e., county, city, or state). In addition, all automated calculations and data processing operations performed by spreadsheet macros and database queries were validated by comparing to hand-calculated results.

Methodology to Calculate Avoided Greenhouse Gas Emissions

To generate the emission calculation conversion factors Table 1, the USI program utilized the following methodology:

1) **Kilowatt hours (kWh):** Prior to last year's report, the USI program historically applied one constant kWh emission factor for all fiscal years based on eGRID data. However, it was later determined that this methodology was incorrect since the average generation mix changes over time for fossil fuel-fired electricity generating units. As such, the old methodology significantly underestimated greenhouse gas emissions reductions from the electricity sector.

   Based on these findings, the USI program utilized the following general formula to develop updated emission factors in for the electricity sector for each fiscal year:

   $MTCO_{2e}$ per kWh by Year = (eGRID Emission Rate by Year (lb CO2e/kWh)) / (2204.62 lb/metric ton)

[16] https://www.epa.gov/statelocalenergy/download-state-inventory-and-projection-tool
[17] https://www.epa.gov/egrid/download-data
[18] https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

Please note: 2005, 2007, 2009, 2010, 2012, 2014, 2016, 2018, 2019, and 2020 emission rate values *(lb/kWh)* were taken from eGRID data files released by the USEPA *(which is typically updated every two years).* Based on these values, emission factors are interpolated for intermediate years *(i.e., (base + future year) / 2))* and held constant for the beginning and end of the time series *(i.e., 2002 through 2004; and 2021 through 2022).*

2) **Therms:** The USI program utilized the SIT tool *(see Table 2)* and the following general formula to create the emission factors for the *"residential/commercial"* sector for natural gas:

> **Total CO_{2e} Emission Factor for Therms** = *(((SIT Tool's $MTCO_{2e}$/Btu * 1.00E-05 therm/Btu conversion factor)) + (((SIT Tool's $MTCH_4$/BBtu) / (1,000,000,000 Btu/BBtu conversion factor) / (1.00E-05 therm/Btu conversion factor)) * (25 global warming potential factor for CH_4)) + (((SIT Tool's MTN_2O/BBtu) / (1,000,000,000 Btu/BBtu conversion factor) / (1.00E-05 therm/Btu conversion factor)) * (298 global warming potential factor for N_2O)))*
>
> *-Or Simply-*
>
> **Total CO_{2e} Emission Factor for Therms** = *($MTCO_{2e}$/therm for CO_2) + ($MTCO_{2e}$/therm for CH_4) + ($MTCO_{2e}$/therm for N_2O)*

Please note: The same emission factor for therms was applied to all fiscal years since emissions from natural gas were assumed to remain relatively constant over time.

3) **Number 2 Distillate Oil:** The USI program utilized the SIT tool *(see Table 2)* and the following general formula to create the emission factors for the *"residential/commercial"* sector for distillate oil:

> **Total CO_{2e} Emission Factor for Number 2 Distillate Oil** = *(((SIT Tool's $MTCO_{2e}$/Btu * 138,690 Btu/gal conversion factor)) + (((SIT Tool's $MTCH_4$/BBtu) * (25 global warming potential factor for CH_4) * (138,690 Btu/gal conversion factor)) / (1,000,000,000 Btu/BBtu conversion factor)) + (((SIT Tool's MTN_2O/BBtu) * (298 global warming potential factor for N_2O) * (138,690 Btu/gal conversion factor)) / (1,000,000,000 Btu/BBtu conversion factor)))*
>
> *-Or Simply-*
>
> **Total CO_{2e} Emission Factor for Number 2 Distillate Oil** = *($MTCO_{2e}$/gal distillate oil for CO_2) + ($MTCO_{2e}$/gal distillate oil for CH_4) + ($MTCO_{2e}$/gal distillate oil for N_2O)*

Please note: The same emission factor for fuel oil was applied to all fiscal years since emissions were assumed to remain relatively constant over time.

4) **Number 6 Residual Oil:** The USI program utilized the SIT tool *(see Table 2)* and the following general formula to create the emission factors for the *"residential/commercial"* sector for residual oil:

> **Total CO_{2e} Emission Factor for Number 6 Residual Oil** = *(((SIT Tool's $MTCO_{2e}$/Btu * 149,690 Btu/gal conversion factor)) + (((SIT Tool's $MTCH_4$/BBtu) * (25 global warming potential factor for CH_4) * (149,690 Btu/gal conversion factor)) / (1,000,000,000 Btu/BBtu conversion factor)) + (((SIT Tool's MTN_2O/BBtu) * (298 global warming potential factor for N_2O) * (149,690 Btu/gal conversion factor)) / (1,000,000,000 Btu/BBtu conversion factor)))*
>
> *-Or Simply-*
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> **Total CO_{2e} Emission Factor for Number 6 Residual Oil** = *($MTCO_{2e}$/gal residual oil for CO_2) + ($MTCO_{2e}$/gal residual oil for CH_4) + ($MTCO_{2e}$/gal residual oil for N_2O)*

Please note: The same emission factor for residual oil was applied to all fiscal years since emissions were assumed to remain relatively constant over time.

5) **Propane:** The USI program utilized the SIT tool *(see Table 2)* and the following general formula to create the emission factors for propane:

> **Total CO_{2e} Emission Factor for Propane** = *(((SIT Tool's $MTCO_{2e}$/Btu * 91,648 Btu/gal conversion factor)) + (((SIT Tool's $MTCH_4$/BBtu) * (25 global warming potential factor for CH_4) * (91,648 Btu/gal conversion factor)) / (1,000,000,000 Btu/BBtu conversion factor)) + (((SIT Tool's MTN_2O/BBtu) * (298 global warming potential factor for N_2O) * (91,648 Btu/gal conversion factor)) / (1,000,000,000 Btu/BBtu conversion factor)))*
>
> *-Or Simply-*
>
> **Total CO_{2e} Emission Factor for Propane** = *($MTCO_{2e}$/gal propane for CO_2) + ($MTCO_{2e}$/gal propane for CH_4) + ($MTCO_{2e}$/gal propane for N_2O)*

Please note: The same emission factor for propane was applied to all fiscal years since emissions were assumed to remain relatively constant over time.

Table B.1: Emission Calculation Conversion Factors

Fiscal Year	$MTCO_{2e}$/kWh	$MTCO_{2e}$/Therm	$MTCO_{2e}$/Gal 2 Oil	$MTCO_{2e}$/Gal 6 Oil	$MTCO_{2e}$/Gal Propane
2002-03	0.000555763	0.005318772	0.010317173	0.011304793	0.005706251
2003-04	0.000555763	0.005318772	0.010317173	0.011304793	0.005706251
2004-05	0.000555763	0.005318772	0.010317173	0.011304793	0.005706251
2005-06	0.00055765	0.005318772	0.010317173	0.011304793	0.005706251
2006-07	0.000561424	0.005318772	0.010317173	0.011304793	0.005706251
2007-08	0.000554367	0.005318772	0.010317173	0.011304793	0.005706251
2008-09	0.000536479	0.005318772	0.010317173	0.011304793	0.005706251
2009-10	0.000533099	0.005318772	0.010317173	0.011304793	0.005706251
2010-11	0.000524392	0.005318772	0.010317173	0.011304793	0.005706251
2011-12	0.000495851	0.005318772	0.010317173	0.011304793	0.005706251
2012-13	0.000473062	0.005318772	0.010317173	0.011304793	0.005706251
2013-14	0.000456026	0.005318772	0.010317173	0.011304793	0.005706251
2014-15	0.000434589	0.005318772	0.010317173	0.011304793	0.005706251
2015-16	0.000408751	0.005318772	0.010317173	0.011304793	0.005706251
2016-17	0.000387544	0.005318772	0.010317173	0.011304793	0.005706251
2017-18	0.000370968	0.005318772	0.010317173	0.011304793	0.005706251
2018-19	0.000358137	0.005318772	0.010317173	0.011304793	0.005706251
2019-20	0.000324215	0.005318772	0.010317173	0.011304793	0.005706251
2020-21	0.000299371	0.005318772	0.010317173	0.011304793	0.005706251
2021-22	0.000303907	0.005318772	0.010317173	0.011304793	0.005706251
2022-23	0.000303907	0.005318772	0.010317173	0.011304793	0.005706251

Table B.2: State Inventory and Projection Tool Emission Factors[19]

Fuel Type	Carbon Dioxide		Methane		Nitrous Oxide	
Natural Gas (Res/Comm)	5.30549E-08	MTCO2e/ Btu	0.00475	MTCH4/ BBtu	0.00009	MTN2O /BBtu
Natural Gas (Res/Comm)	5.30E-03	MTCO2e/ therm	1.19E-05	MTCO2e/ therm	2.68E-06	MTCO2 e/therm
No. 2 Fuel Oil (Res/comm)	7.39609E-08	MTCO2e/ Btu	0.01002	MTCH4/ BBtu	0.0006	MTN2O /BBtu
No. 2 Fuel Oil (Res/comm)	0.010257634	MTCO2e/ gal	3.47418E-05	MTCO2e/ gal	2.47978E-05	MTCO2 e/gal
No. 6 Dist Oil (Res/comm)	7.50918E-08	MTCO2e/ Btu	0.01002	MTCH4/ BBtu	0.0006	MTN2O /BBtu
No. 6 Dist Oil (Res/comm)	0.011240531	MTCO2e/ gal	3.74975E-05	MTCO2e/ gal	2.67647E-05	MTCO2 e/gal
Propane	6.18334E-08	MTCO2e/ Btu	0.01002	MTCH4/ BBtu	0.0006	MTN2O /BBtu

[19] https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool

Propane	0.005666907	MTCO2e/ gal	2.29578E-05	MTCO2e/ gal	1.63867E-05	MTCO2 e/gal

Collective Avoided Greenhouse Gas Emissions

By utilizing the methodology described in the previous section, Table 3 and Table 4 represent the avoided greenhouse gas emissions for state agencies and the UNC System (i.e., state-owned buildings). Table B.3 provides avoided greenhouse gas emissions since the FY2002-03 baseline. In addition, Table B.4 provides a snapshot of avoided greenhouse gas emissions data to show the program's effectiveness during the most recent fiscal year (FY2021-22).

Table B.3: FY2002-03 to FY2022-23 Avoided Greenhouse Gas Totals

Fuel Source Usage	Cabinet Agencies (MTCO2e)	Other Agencies (MTCO2e)	UNC System (MTCO2e)	All State Government Units (MTCO2e)
Electricity	2,332,419	21,454	5,957,006	**8,310,880**
Nat Gas	-135,752	28,229	-302,730	**-410,252**
Fuel Oil	662,014	-3,128	1,482,493	**2,141,379**
Propane	62,980	-527	-238	**62,216**
Total	**2,921,662**	**46,028**	**7,136,532**	**10,104,222**

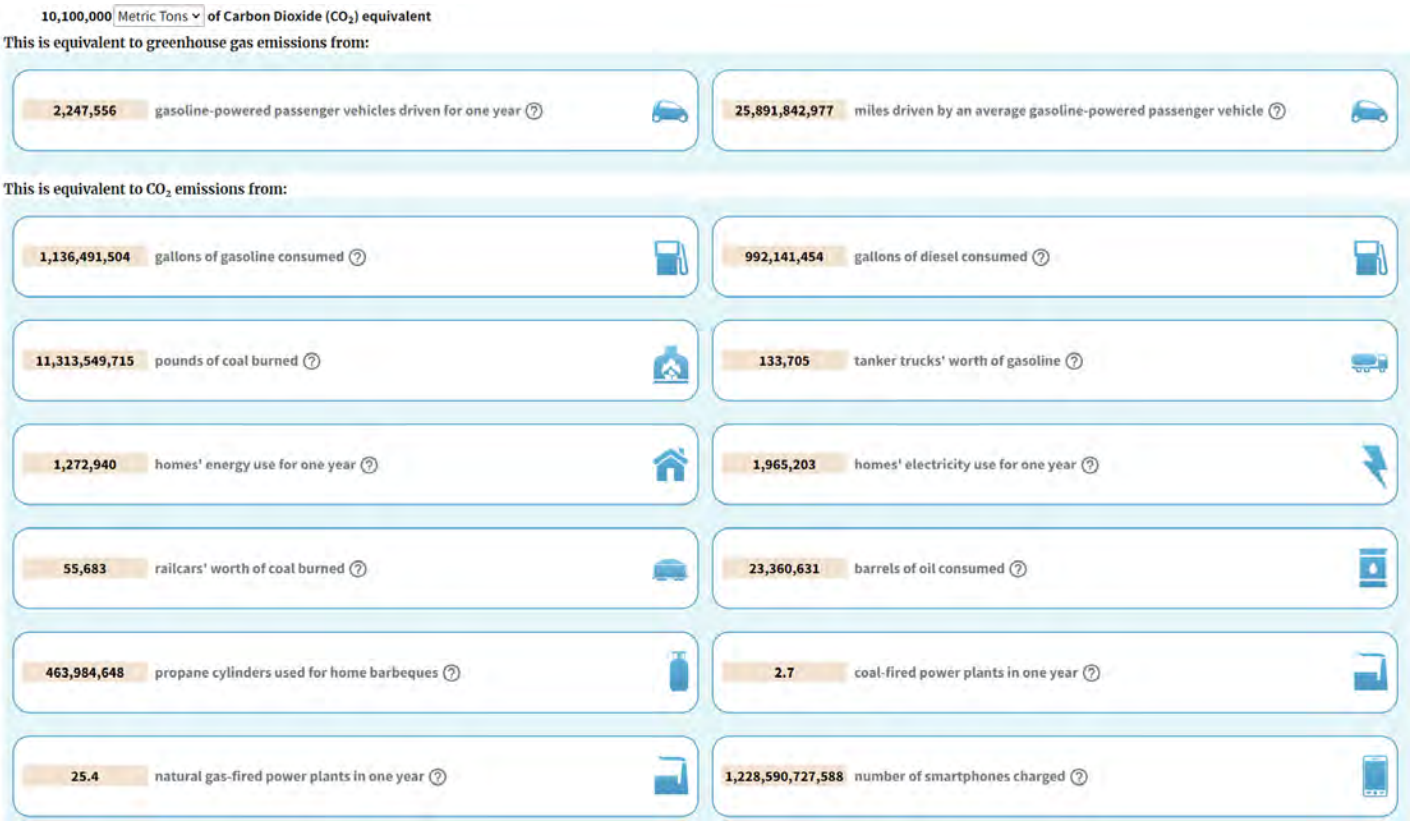
Table B.4: FY2022-23 Avoided Greenhouse Gas Totals

Fuel Source Usage	Cabinet Agencies (MTCO2e)	Other Agencies (MTCO2e)	UNC System (MTCO2e)	All State Government Units (MTCO2e)
Electricity	250,809	1,853	664,900	**917,562**
Nat Gas	12,812	1,114	-37,334	**-23,408**
Fuel Oil	45,566	-225	92,653	**137,995**
Propane	8,946	-40	296	**9,202**
Total	**318,133**	**2,703**	**720,515**	**1,041,351**

Greenhouse Gas Equivalencies

Figure 1 contains a screenshot of the USEPA's greenhouse gas equivalencies calculator[20] based on total avoided emissions since the 2002-03 baseline for state-owned buildings. As shown, the figure provides relatable terms for the program's environmental success.

Figure B.1: EPA Greenhouse Gas Equivalencies Calculator



[20] *EPA Greenhouse Gas Equivalencies Calculator;* https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

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Appendix C

Utility Management Plans

Appendix C Table of Contents

Utility Management Plan Submissions

North Carolina Department of Information Technology (DIT)

Strategic Energy Management Plan

Measure, Track, and Reduce Energy and Water Consumption at Eastern and Western Data Centers (EDC/WDC)

NCDIT-Facilities and Operations

Version 0.4

September 1, 2023, Forward

Prepared for

NC Department of Information Technology

P.O. Box 17209, Raleigh, NC 27619-7209

Prepared by

Department of Information Technology

DIT Facilities

P.O. Box 17209, Raleigh, NC 27619-7209

Contents

1 Executive Summary

The objective of this **Strategic Energy Management Plan** is to measure, track, and reduce energy and water consumption at NCDIT Eastern and Western Data Centers (EDC and WDC). Data Center management conducts annual reviews of the NCDIT Energy Management Plan. Tracking measures are based on the following Key Performance Indicators (KPI):

- Total Energy Use = Btu per square foot per year
- Water Usage = Gallons per square foot per year
- Power Usage Effectiveness (PUE) = Total Building Energy Divided by /Total IT loads

NCDIT recognizes that energy and water consumption can be managed, and it is the responsibility of the occupants at each facility. The NCDIT Strategic Energy Management Plan is described below and outlines the activities and expenditures required to reduce energy and water consumption in meeting the goals set forth in North Carolina's Executive Order EO 80 to achieve the goals of the program.

2 Overview of DIT's Eastern and Western Data Center Facilities

Both the Eastern and Western Data Center locations are open 24 hours per day, 365 days per year.

2.1 DIT Eastern Data Center (EDC).

- The NCDIT Eastern Data Center (EDC) is located at 3700 Wake Forest Rd, Raleigh, NC. It has operated for almost 36 years and has housed the State's primary Data Center for nearly 31 years. The property includes electrical and chiller buildings and an office building at 3900 Wake Forest rd.
- During the covid pandemic remote work was started to reduce the spread. Since then, remote work agreements have been adopted where feasible and they make up around 65% of the work force. There are approximately 30-50 people onsite daily during a regular workweek.

2.2 DIT Western Data Center (WDC)

- The Western Data Center (WDC) has been in operation for approximately 15 years. It has seen an increase in server load as it has transitioned from backup and recovery functions to handling a significant portion of the State of North Carolina's state agency consolidation efforts for information technology.

- WDC employs approximately 34 total employees counting security and janitorial. Typically, 10 to 12 employees are onsite from 8:00 AM – 5:00 PM, M-F with the remaining employees covering other shifts and weekends.

2.3 Energy Consumption

The nature of DIT's Data Center facilities differs from most State buildings in that the energy consumption is constantly variable depending on the number of servers, network, and other Information Technology equipment currently in use.

NCDIT offers IT hosting services and supports numerous IT services to other State Agencies which are supported by the Eastern and Western Data Centers. Much of the IT equipment which is used by these services are hosted and located within the NC DIT Data Centers.

Floor hosted options are offered to State agencies. These options utilize a place on the Data Center floor with a DIT supplied rack, power, and cooling. Customers can also supply their own racks and cabinets if needs dictate. The State agencies' needs change over time and is generally upward trending from a power consumption point of view.

Energy Consumption is based on square footage but does not give an accurate representation of the efficiency of a Data Center. The industry standard for Data Center efficiency is Power Usage Effectiveness **(PUE).** DIT currently runs in the **1.6 to 1.75** range overall.

PUE is the ratio between the Total Building Load and the IT load. The best way to increase PUE is to maximize the amount of IT equipment served and lower the energy consumption of the HVAC and lighting systems. Maximizing the PUE is very much dependent on the other State agencies participation in using more NCDIT services and/or bringing in more hosted equipment. That said, more equipment being brought in increases our energy consumption per square foot.

We could become vastly more efficient and yet be no closer to reaching the 40% energy reduction per square foot.

To reach a point where energy per square foot is more efficient, both the Eastern and Western Data Centers would need to operate at full capacity. This would have to happen to obtain a viable baseline. Again, because we are serving other State agencies, DIT has limited ability to fully utilize all the power and floor space available. An example would be an agency that pays for seven racks and only uses four of them with the other racks held for future growth. On a floor space basis, the Data Center utilization is approximately 50 percent.

2.4 Energy and Water Data Management

2.4.1 Eastern Data Center

EDC has been reporting energy and water data management to the Energy Office since the reports were initially required. Going forward, there is a renewed focus on monitoring energy consumption from the meter to the equipment level at both EDC and WDC Data Centers. This energy and usage focus allows us to discover areas of improvement and concentration. The objective and goals are to obtain a combined Power Usage Effectiveness (PUE) chart for both EDC and WDC. Readings are currently being done on a monthly basis.

2.4.2 Western Data Center

WDC began using spreadsheets to monitor water and diesel fuel in 2009 and Electricity in 2015. Annual data for cost and usage for electricity, fuels and water have been reported to the NC Energy Office since 2007-08 when the WDC was first built.

2.5 Energy and Water Supply Management

Electricity, water, and fuel bills are reviewed monthly and abnormal usage is investigated.

The Facility Manager's meet with Duke Energy representatives at least once a year to review rates and anything that may affect usage at each Data Center.

2.6 Equipment and Building Efficiency

Regular documented equipment maintenance enables the HVAC systems to run as efficiently as possible. Walls, windows and doors are resealed as needed.

2.6.1 Eastern Data Center

- EDC is a 91,500 sq. ft. facility with approximately 15,000 sq. ft. of data floor with the remainder being office space, warehouse, and shipping.
- Two Carrier Air Handlers
- Three Trane Chillers (each at 500 tons),
- One Rheem Round 120 Gallon Tank and Rheem Round 50 Gallon Tank for the building HOT water
- Novar Controls-for all HVAC points.
- Three 2500 kw Caterpillar generators.
- Three 750 kw UPS.

2.6.2 Western Data Center

- WDC is a 53,000 sq. ft. Data Center with 14451 sq.ft. Of data floor space.
- Two 500-ton and one 50-ton Trane Chillers
- Three 2500 kw Caterpillar generators
- Three 750 kw Emerson UPS.
- The building is designed to support the IT operations of the 14,451 sq. ft. data floor, office space, small warehouse and receiving.

2.7 DIT's Goals and Objectives in Meeting Executive Order No. 80 North Carolina's Commitment to Address Climate Change and Transition to a Clean Energy Economy

NCDIT is striving to meet the goals set forth in North Carolina's Executive Order EO 80 and to address climate change and the transition to a clean energy economy. DIT is working toward conservation of energy and water resources at all our locations by creating, implementing, and following an effective *NC DIT Energy and Water Management Plan.* The objective of the *NC DIT Energy Management Plan* is to guide the fiscally and environmentally responsible usage of valuable resources in accordance with State legislation, while striving to ensure a safe environment that provides an acceptable level of comfort for staff, and visitors.

2.8 Roles and Responsibilities

- NCDIT COO (Torre Jessup) serves on the Governors Climate Change Council. Works with the Operations Director and Energy Manager to reach EO-80 goals.

- Operations Director (Hank Kaylor) also serves on the Governors Climate Change Council. works with the Energy Manager to promote energy savings opportunities to Senior Leadership.
- DIT Energy Manager (Tony Brackett), Workplace Services Director with Energy Manager duties.
- Federico Madrigal, DIT Facilities, assist with tracking energy and water consumption at Both Data Centers.
- The Energy Manager interacts with DEQ as needed, attends the regular meetings, and works to manage and implement energy savings ideas. This includes cost benefit analysis of ideas and making a case to leadership to secure funding.
- The Energy Manager prepares the annual consumption report for DIT and collaborates on the Strategic Energy Plan.

2.9 Training and Communication

- Facilities team members regularly take online Data Center and HVAC focused energy management training/webinars.
- Bulletin board materials, and mass emails are used to raise awareness of DIT's commitment to lowering energy consumption.

3 NCDIT Data Center FY 2022-23 Usage

3.1 Factors Affecting 2022-2023 Energy Usage

Factors that came into play in 2023.

3.1.1 Eastern Data Center

- An existing customer increased their Data Center presence with a couple enclosed rows of power dense servers. This has increased the IT load significantly. The total load increase over 21-22 was 9.6% or 753,965 Kwh's. Most of the increase can be attributed to the new rows. There were no other major changes.

3.1.2 Western Data Center

- The IT load decreased at the WDC this past year leading a drop in consumption of about 3.5% or 214,130 Kwh's. Some of the equipment was phased out and has not been replaced.

3.2 Power, Water and Fuel

Metric	Base 2002-03	2021-22	% Change	2022-23	% Change
Gross Square feet	94,343	163,866	74%	163,866	74%
Utility cost	$362,255	$1,111,889	206%	$1,138,371	218%
Btu per square foot per year	272,914	311927	14%	313,948	15%
Cost per million Btu	$13.67	$18.72	37%	$19.45	42%
Water gallons per square foot	58.03	82.63	43%	33.33	-57%
Water cost per thousand gal	$1.90	$11.47	504%	13.34	602%

Current Year of 2022-2023 = 313984 BTUs versus 311,927 BTU's last year.

	Base 2002-03	2021-22	% Change	2022-23	% Change
Diesel Fuel Gallons	7,605	21503	183%	12592	66

Fuel consumption was down from the previous year. Weather is the primary driver of fuel consumption. We did go to monthly generator test vs Biweekly for several months when Diesel was in short supply.

4 2022-2023 Updates for Eastern and Western Data Centers

4.1 Western Data Center - Water and Lights

1. Replacing the remaining T-8 Fluorescent lamps with LED as they go out. Approximately 100 left to go.
2. Replacement of the 400-watt pole lighting with 150-watt LED replacements as they go out. 5 out of 18 completed.
3. Scheduling added to the BMS system to allow unoccupied areas at night to have the temp settings setback.

4.2 Eastern Data Center – Water and Lights

1. Several underground leaking pipes were repaired lowering water consumption at the EDC.
2. Half of the lighting has been replaced with LEDs at the 3900 Office building.

5 Eastern and Western Data Center Goals for 2023-24

5.1 Eastern Data Center (EDC) Focus Areas

1. Phase one of the electrical distribution project has been bid. Though it is not specifically an energy reduction project, when the project is completed, we expect greater electrical monitoring capabilities, higher efficiency equipment and reliability.
2. Connect the Computer Air Conditioning units to the BMS for better monitoring and precise control.
3. Roof replacement. The white TPO membrane roof is being replaced by a more durable PVC membrane and the insulation is being brought up to current building codes.
4. Install two Electric Vehicle Chargers to promote EV usage and to replace an ICE vehicle with an EV.
5. When new equipment is purchased, high efficiency must be part of the purchase criteria.

5.2 Western Data Center (WDC) Focus Areas

1. R&R funding was received for the third Chiller Project, and it has been designed and bid. We plan to have the project started this year and depending on Chiller lead time, completed. We expect a 10% increase in efficiency over our other Chillers.
2. R&R funding was received to replace our aging UPS units. A design contract is in place and under design. We hope to have those installed within about 12-16 months. These units are 15 to 20% more efficient than our current units.
3. When new equipment is purchased, high efficiency must be part of the purchase criteria.
4. Agency hosting customers must abide by and be a part of the process as well.
5. Reduction in energy usage by implementing computer power management for all ITS personal computers (where applicable).
6. Purchasing energy efficient computer equipment, servers, and storage units, where applicable.

5.3 Both EDC and WDC Focus Areas

1. For both EDC and WDC, it is necessary to conduct continual analysis of both Data Centers to potentially lower energy usage by focusing on increased energy efficiencies.
2. Continue with energy efficiency training opportunities.
3. Continue installing LEDs in the remainder of the WDC as the fluorescents fail. Replace the remainder in the 3900 building.
4. Create a combined Data Center PUE chart, for both EDC and WDC. (Still In progress)
5. Continue installing smart bars at both locations working toward being able to monitor power at the server level.
6. Continue monitoring both water and electrical metering to ensure it is correct and meet with Duke Energy representative twice per year to stay current on anything that may affect our rates or service.

6 Future Energy Projects – EDC and WDC

6.1 Eastern Data Center

1. EDC to complete the electrical distribution project. Phase one and two.
2. Enclosed Cold aisles in the Data room. Potential for savings. Not funded.

6.2 Western Data Center

1. Enclosed cold aisles in the Data room. Potential for savings. Not funded.

7 Graphical Representation of DIT Power and Water

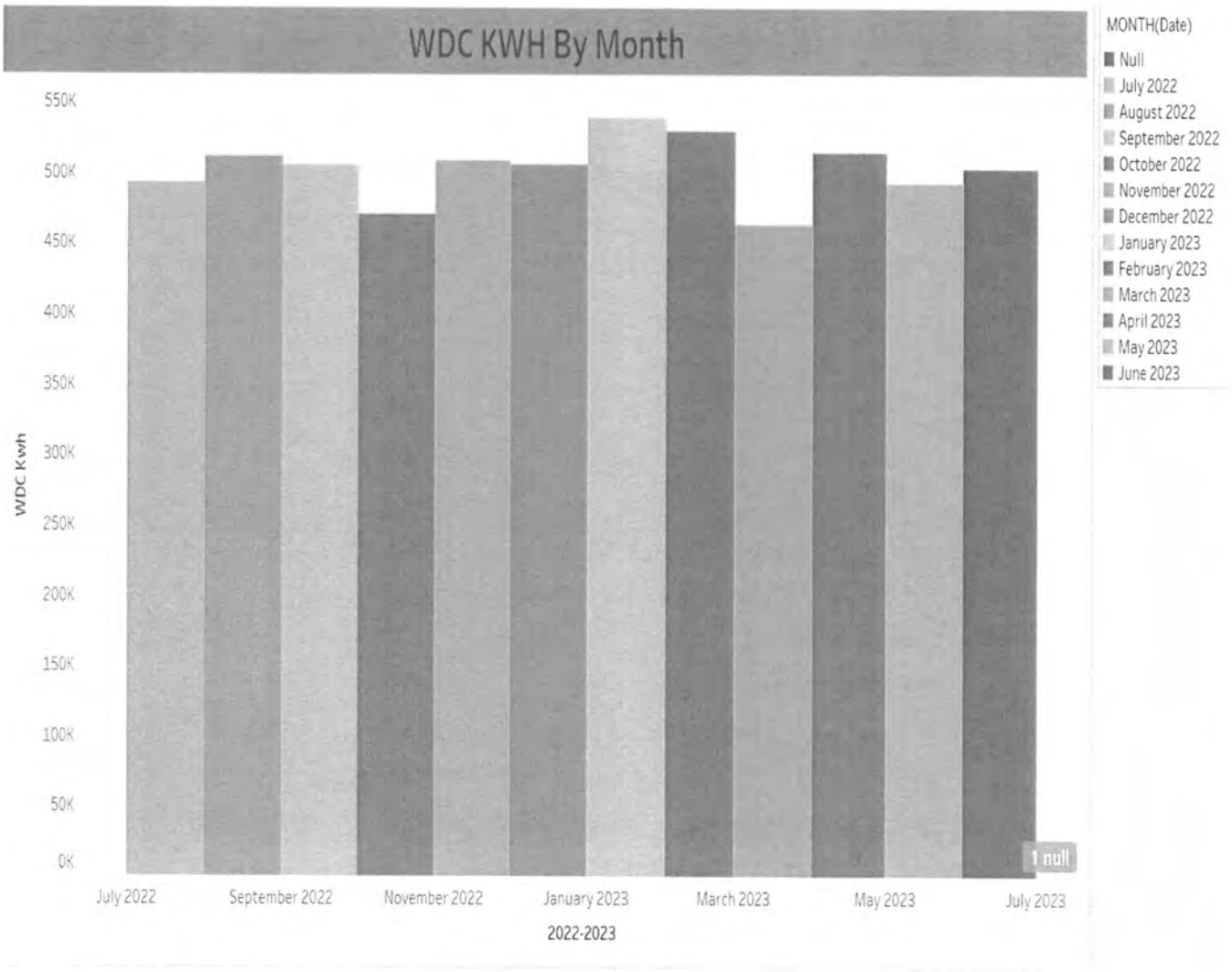


Figure 1. Western Data Center Sum of Total KWH (Actual) for Each Date (MY)

Trending down due to reduced IT loads in the Data Room

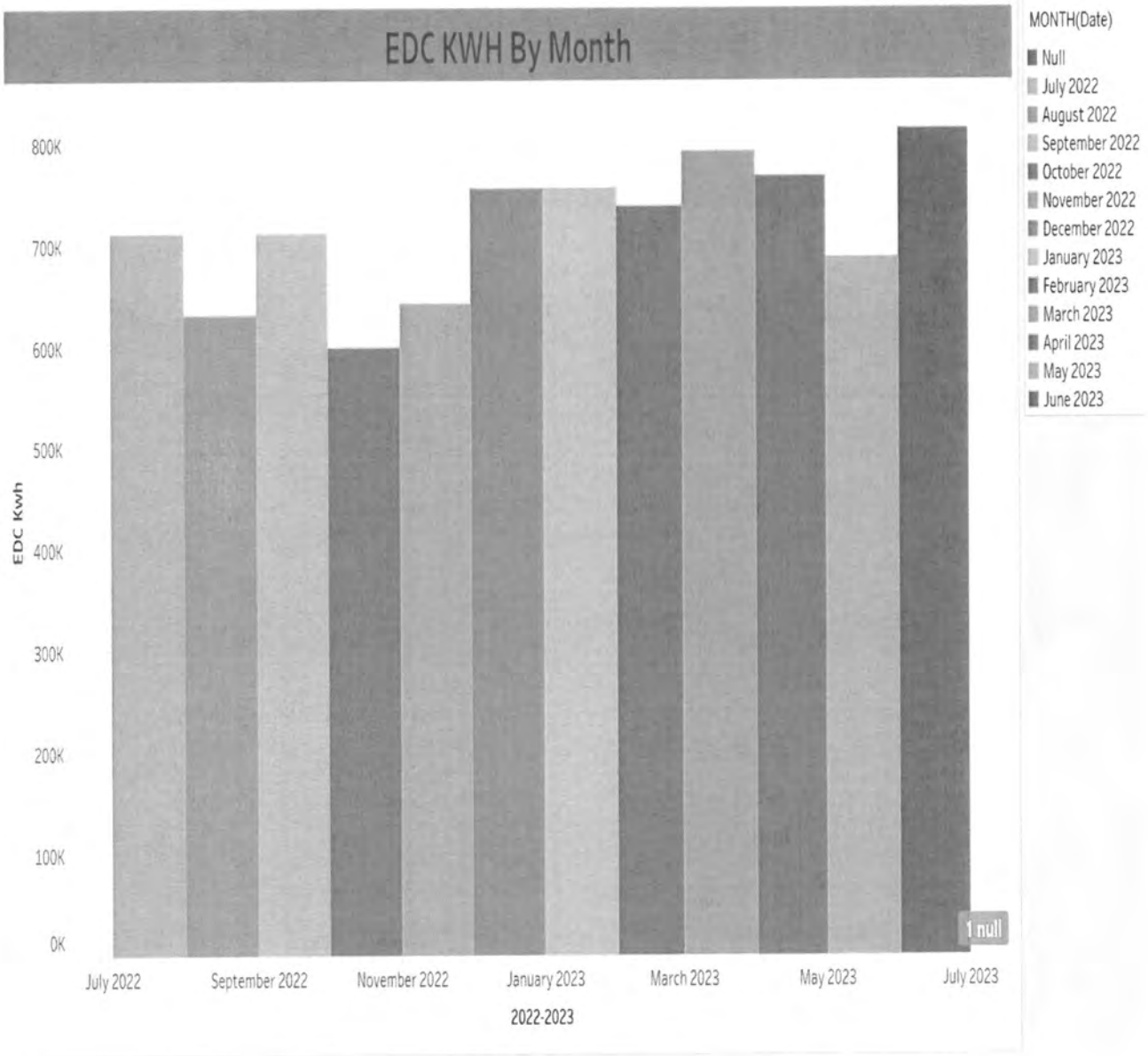


Figure 2. EDC Sum of Total KWH actual (MY)

Trending upward due to additional IT loads in the Data Room.

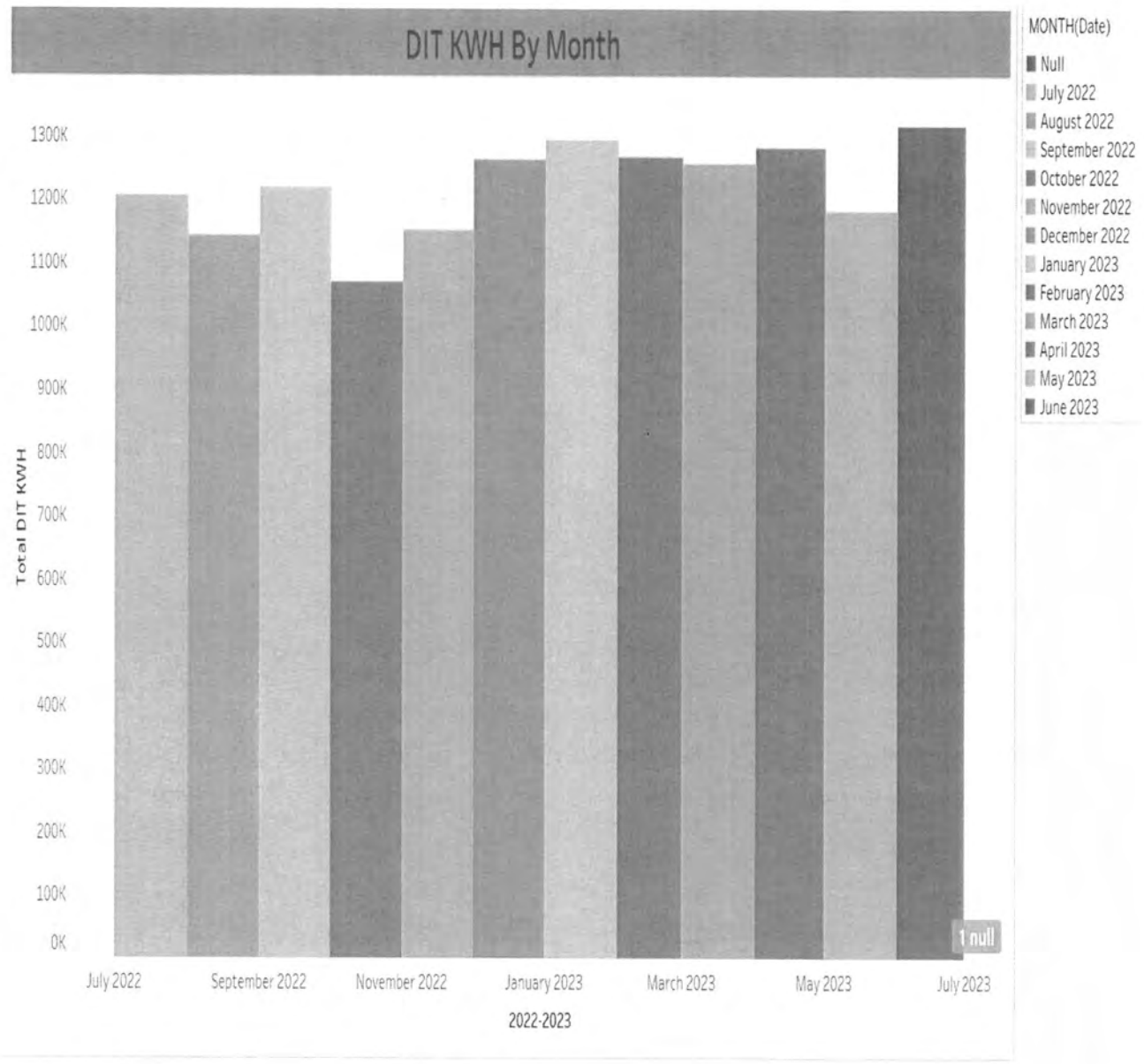


Figure 3. DIT Sum of Total KWH's, EDC/WDC (MY)

1. Trending upward due to increased IT loads at the EDC.

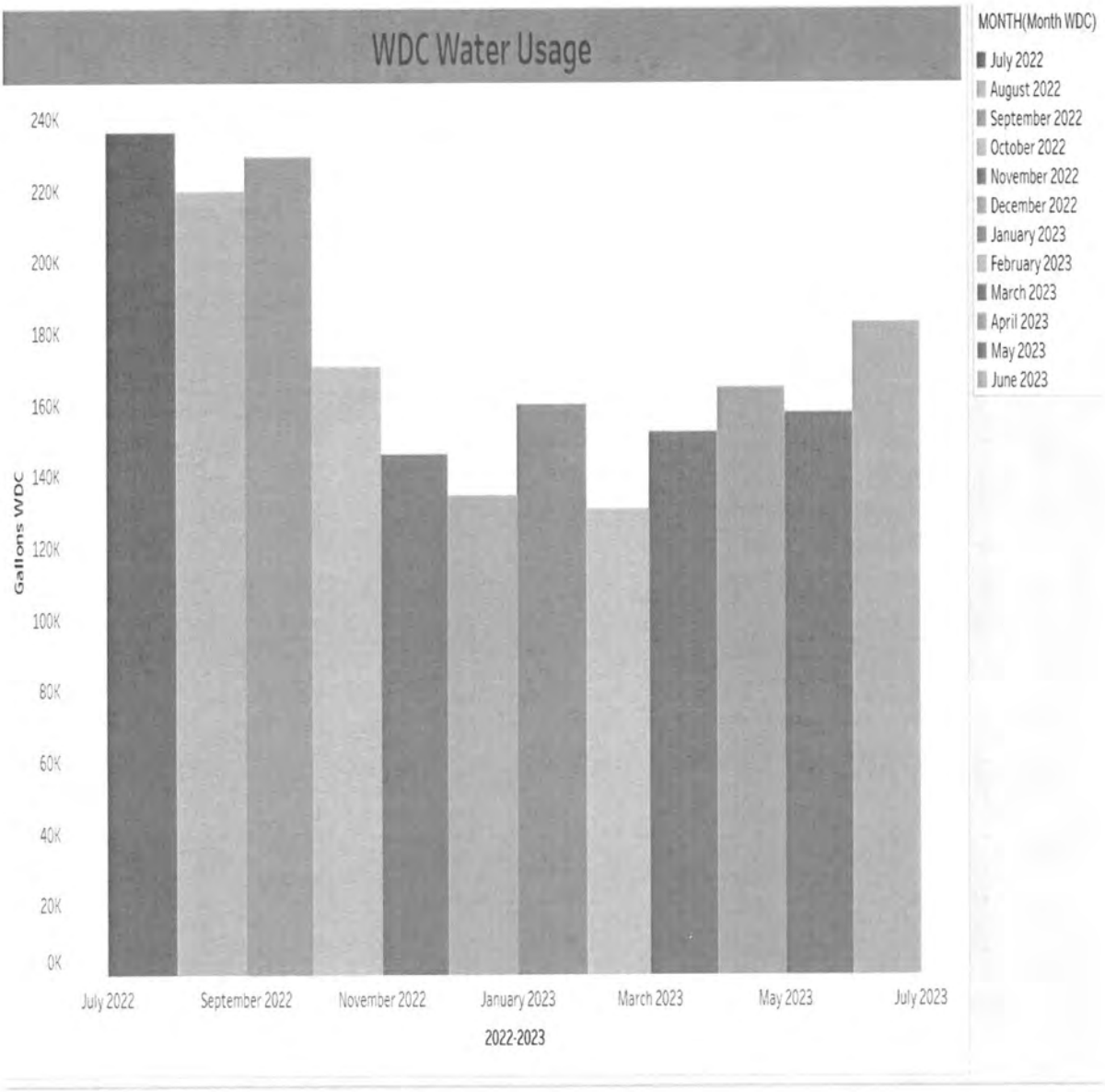


Figure 4. Sum of WDC Water Consumption for Each Date (MY).

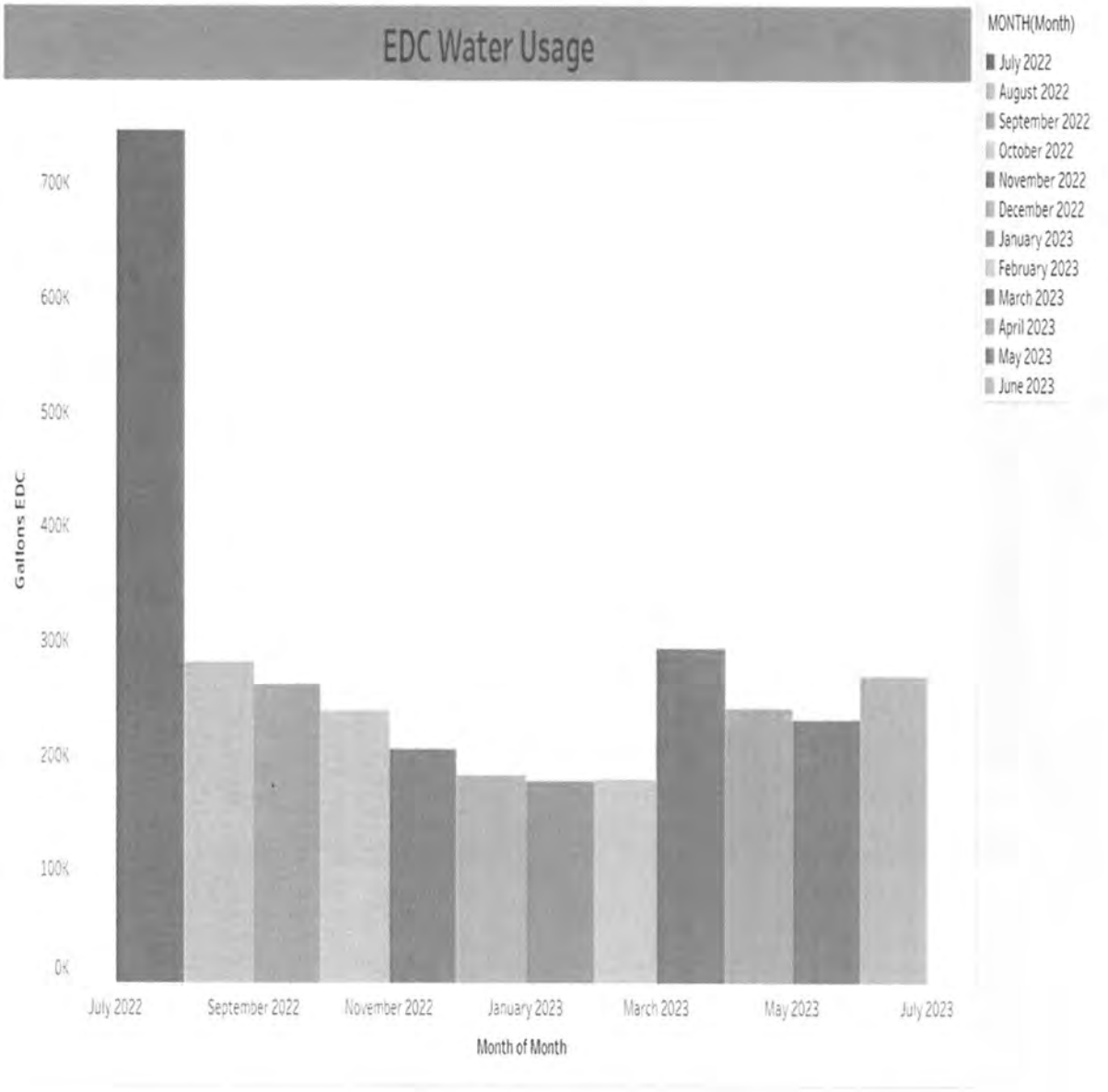


Figure 5. Sum of EDC Water Consumption for each Date (MY)

Large improvement this year after leak repairs.

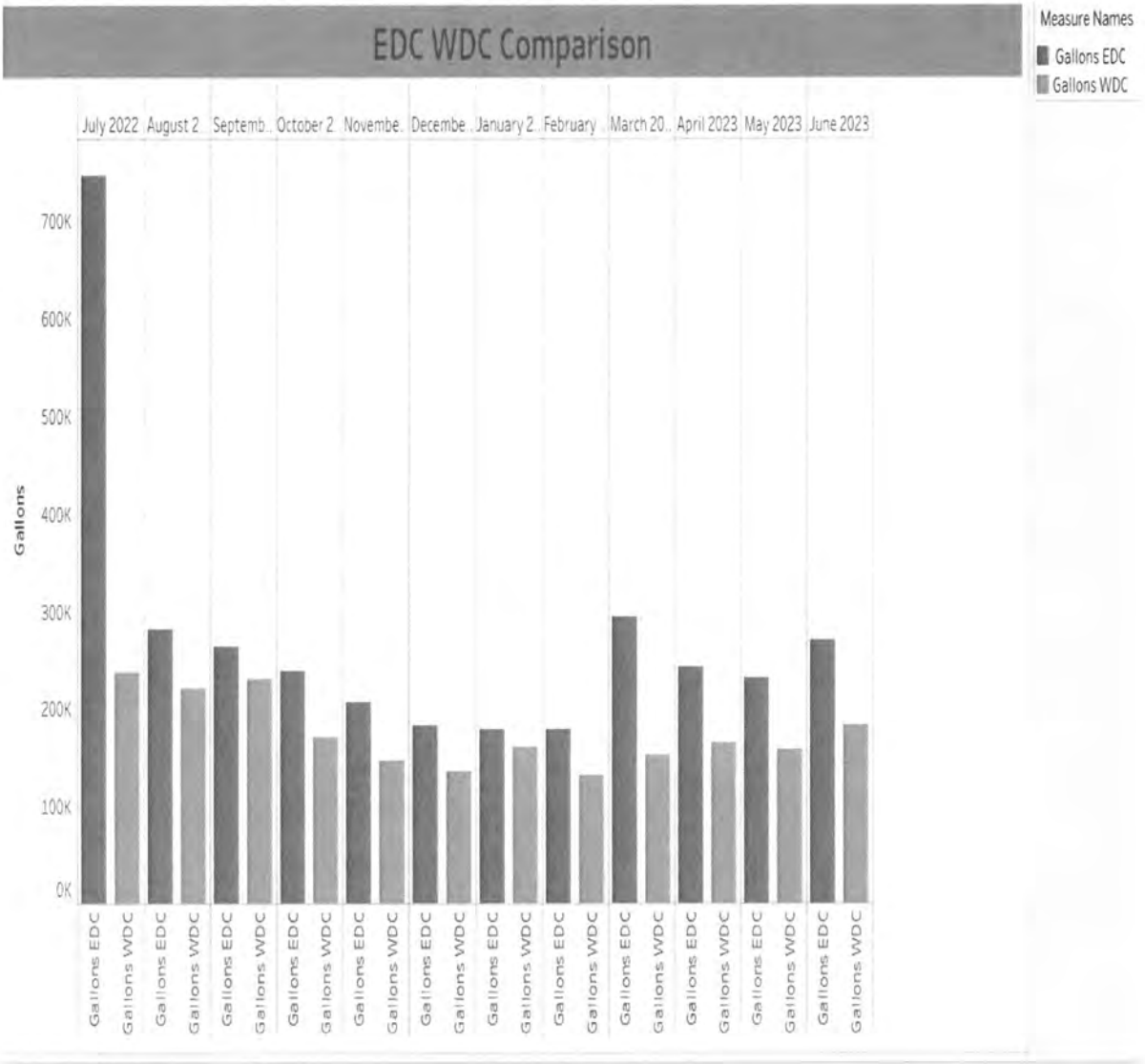


Figure 6. EDC/WDC water consumption for each Date (MY)

8 Data Center Progress Regarding Energy Consumption

For the 2022–2023-year DIT's consumption has increased to 16% over the 2002-2003 Btus per square foot levels. This is an additional 2% over last year.

NOTE: In the early 2000's NCDIT was a much smaller agency that did not house the number of servers and IT equipment that NCDIT Data Centers do today. This fact greatly contributes to the difficulty in achieving EO 80 requirements: however, it does not prevent each of the NCDIT data centers from working to reduce energy and water consumption as much as we can while maintaining Data center reliability.

	energy evaluation						water/sewer evaluation				
	energy $ avoided	energy $/gsf	$/mmbtu	$/mmbtu %change	btu/sf	btu/sf %change	water $ avoided	$/kgal	$/kgal %change	gal/sf	gal/sf %change
2002-03		$3.73	$13.67		272,914			$1.90		58.03	
2003-04	-$13,911	$4.17	$14.72	8%	282,930	4%	-$1,504	$1.69	-11%	67.46	16%
2004-05	-$36,880	$4.30	$14.31	5%	300,237	10%	-$1,551	$1.71	-10%	67.63	17%
2005-06	-$83,065	$5.09	$15.44	13%	329,943	21%	$85,297	$15.63	722%	0.17	-100%
2006-07	-$146,910	$6.09	$16.60	21%	366,747	34%	$53,728	$9.88	420%	0.37	-99%
2007-08	-$123,483	$5.58	$17.37	27%	321,172	18%	$94,500	$12.58	562%	7.03	-88%
2008-09	-$285,594	$6.74	$17.92	31%	375,794	38%	-$11,655	$5.46	187%	71.82	24%
2009-10	-$336,266	$7.03	$18.24	33%	385,416	41%	$8,572	$7.43	291%	50.99	-12%
2010-11	-$439,696	$7.72	$18.45	35%	418,371	53%	-$4,351	$7.54	297%	61.56	6%
2011-12	-$368,901	$7.48	$19.15	40%	390,467	43%	-$4,246	$8.18	331%	61.20	5%
2012-13	-$336,030	$7.40	$19.59	43%	377,583	38%	-$1,587	$8.21	332%	59.21	2%
2013-14	-$298,519	$7.41	$20.48	50%	361,852	33%	-$9,858	$9.39	394%	64.44	11%
2014-15	-$283,613	$6.93	$19.04	39%	363,819	33%	-$13,509	$9.44	397%	66.77	15%
2015-16	-$338,243	$7.91	$21.42	57%	369,266	35%	-$29,807	$10.18	436%	75.90	31%
2016-17	-$252,457	$7.16	$20.59	51%	347,729	27%	-$24,755	$10.42	448%	72.53	25%
2017-18	-$254,542	$6.87	$19.49	43%	352,622	29%	-$20,913	$10.64	460%	70.03	21%
2018-19	-$294,877	$7.39	$20.47	50%	360,839	32%	-$37,215	$11.39	499%	77.97	34%
2019-20	-$153,011	$6.56	$20.62	51%	318,196	17%	-$25,726	$10.84	471%	72.51	25%
2020-21	-$130,752	$6.10	$19.45	42%	313,948	15%	-$42,616	$10.75	466%	82.23	42%
2021-22	-$119,644	$5.84	$18.72	37%	311,927	14%	-$46,222	$11.47	504%	82.63	42%
2022-23	-$144,190	$6.50	$20.60	51%	315,625	16%	$54,007	$13.34	602%	33.33	-43%

DIT Data Center tracking measures will be the following Key Performance Indicators (KPI):

- Total Energy Use Btu per Square Foot per year
- Water gallons per Square Foot per year
- Power usage effectiveness

9 NCDIT Eastern and Western Data Center Commitments

Energy and Water Management Plan Mandate

NCDIT Data Center Department Heads will review progress and results annually and will support staff attendance at training in energy and water management.

Commitment

NCDIT Data Centers recognize that energy and water consumption can be managed to the benefit of NCDIT Data Center facilities. Energy and water management is a responsibility of the occupants at each facility. The attached Energy and Water Management Plan outlines the activities and expenditures required to reduce energy and water consumption in order to achieve the goals of the program.

Strategic Energy Management Plan Mandate- Commitments

I have read and support the NCDIT Strategic Energy Plan for the Eastern Data Center Implemented this ___ day of ____.

Workplace Services Director _____ Date: 08/22/2023

Operations Director Henry William Kaylor Jr Date: 08/22/2023

Chief Operating Officer _____ Date: 09/01/2023

Chief DSCIO _____ Date: 08/23/2023

10 Revision History

Ver.	Date	NCDIT Author or Reviewer	Revision Description
0.1	05.15.2020	Tony S. Brackett DIT, Western Data Center Tony.Brackett@nc.gov 828-247-8402	Initial draft version
0.2	09.11.2020	Jennifer Willard IT Technical Writer, NCDIT Cybersecurity and Compliance Jennifer.willard@nc.gov 919-754-6485 office 919-302-5107 mobile	Draft edits; formatting, Table of Contents, and headings/subheadings for content flow; hyperlinks, etc.
0.3	03.1.2021	Tony S. Brackett DIT, Western Data Center Tony.Brackett@nc.gov 828-247-8402	Revisions for March 1 DEQ update
0.4	09.1.2023	Tony S. Brackett DIT, Facilities Tony.Brackett@nc.gov 828-247-8402	Revisions for Sept 1, DEQ update

Strategic Energy and Water Management Plan
North Carolina Department of Natural and Cultural Resources

Prepared by:

DNCR Energy Management Team
109 East Jones Street
Raleigh, North Carolina 27601
September 2023

PURPOSE

The N.C. Department of Natural and Cultural Resources (DNCR) oversees the state's resources for the arts, history, libraries, and nature. We're home to the state's 27 historic sites, seven history museums, two art museums, two science museums, three aquariums and Jennette's Pier, 39 state parks and recreation areas, the N.C. Zoo, the N.C. Symphony, the State Library, the State Archives, the N.C. Arts Council, State Historic Preservation Office, Office of State Archaeology, the African American Heritage Commission, the American Indian Heritage Commission, and the Division of Land and Water Stewardship.

Our mission is to improve the quality of life in North Carolina by creating opportunities to experience excellence in the arts, history, libraries, and nature by stimulating learning, inspiring creativity, preserving the state's history, conserving the state's natural heritage, encouraging recreation and cultural heritage tourism, and promoting economic development.

DNCR's vision is to be the leader in using the state's natural and cultural resources to build the social, cultural, educational, and economic future of North Carolina. Every day, DNCR's places, programs, and ideas strengthen education, improve public health, enhance quality of life, and support robust economic growth across North Carolina.

OVERVIEW

DNCR finds that public buildings can be built and renovated using sustainable, energy efficient methods that save money, promote environmental sustainability, and make employees more productive. The main objective of this plan is to develop a strategic initiative which will evaluate departmental energy and water usage, identify inefficient buildings and systems, and determine measures to correct inefficiencies, establish corrective action priorities, identify funding sources, implement corrective actions, and ensure that corrective action results meet or exceed performance specifications. The goals of DNCR's plan should create buildings that at a minimum, meet the specific performance criteria and goals for sustainable, energy and water efficiency as mandated by 2007 Senate Bill 668 and Executive Order 80. Our plan will be considered successful when sustainable, energy efficient buildings avoid depleting the resources of energy, water, and raw materials; prevent environmental degradation caused by facilities and infrastructure throughout their life cycle; and create buildings that are livable, comfortable, safe, and productive.

DNCR spent $6,486,000 in FY 2022-23 on energy and water resources. A well-executed long-term energy efficient plan could result in cost savings of 10% or greater annually, which could lead to significant long-term operation cost savings. DNCR is responsible for the operation and maintenance of approximately 1,825 buildings per the State Property Office data. At least half of the buildings are more than 30 years old,

with over 100 built before 1900. Only around 25 structures are larger than 20,000 gross square feet.

This plan will initially focus on identifying energy and water consumers with older less efficient systems. DNCR will work closely with the State Energy Office and energy consultants to identify measures to correct major inefficiencies. It is anticipated that major renovations & upgrades will require significant funding. Low or no cost actions are being implemented at all facilities. As mechanical systems require replacement near the end of their useful life, DNCR is replacing them with more energy efficient equipment as part of our ongoing maintenance of our facilities across the State.

This plan will also implement sustainable, energy efficient standards for design and construction for new facilities, improvements in lighting systems, reduction of water usage, implementing high efficiency HVAC systems, utilization of energy conservation measures, and environmental sustainability.

FY 2023-2024 GOALS

- Reduce energy consumption per square foot towards the goal of a 40% decrease in comparison to FY 2010-2011 levels, as noted in the annual report.
- Conduct informal energy audits on highest energy consuming facilities to identify energy cost saving measures to reduce consumption by FY 2023-24.
- Continual annual self-audit procedure and checklist for facilities to identify low or no cost energy saving initiatives to reduce consumption in FY 2023-24.
- Establish annual energy and water usage reporting form to collect data and determine seasonal trends more accurately. Conduct assessment and evaluation of individual sites and energy billing rate schedules.
- Approve and initiate Performance Contract/ESCO projects.

DATA MANAGEMENT

As of February 2023, DNCR is using the Capturis utility data collecting and bill paying service. This should greatly improve the quality of our utility data and allow us to monitor use throughout the year.

REDUCING ENERGY USE

DNCR has made progress on the Executive Order 80 requirements related to reducing energy use. We have created and filled a time-limited energy manager position in August 2023. One of the roles of the energy manager is to collect and monitor utility data. Prior to this new addition, a project manager in the Capital Projects Unit at DNCR collected annual usage data and submitted it to the Department of Environmental Quality. This project manager worked part-time in the utility manager position, accomplishing the following:

- Initiated the use of Capturis starting in February 2023, an energy data gathering module and payment system, to help DNCR monitor energy usage and identify issues with any utilities. Capturis will help identify energy savings projects.
- Retained the services of an energy savings contractor to identify energy savings projects. DNCR is reviewing the Investment Grade Audit report submitted this year. DNCR will use the report to review and approve energy saving projects.
- Submitted the annual energy usage reports to the Department of Environmental Quality by the required deadline.
- Helped to create energy savings through repair and renovation ("R&R") projects.

DNCR will be able to manage more energy savings projects with the recently filled, time-limited energy manager position.

NON-FOOTPRINT ENERGY USE

To give the citizens and visitors of North Carolina the opportunity to experience the State's natural resources, campgrounds are continuously expanded throughout the State. Electric, water, and sewer connections for recreational vehicles and campsites are provided with our new campgrounds, expanded campgrounds, and campground improvement projects.

As part of the Executive Order 80 and efforts to increase the use of Zero-Emission Vehicles in the State, DNCR has been installing many electric vehicle (EV) chargers across the State at DNCR sites for use by staff and visitors. DNCR currently has 35 EV chargers in use today, 22 more in design with expectations to install in 2024, and are currently planning more for the future as funds become available.

These amenities add to our water and electric usage without adding to DNCR's building footprint and thus add to our btu/ft^2 usage.

ENERGY IMPROVEMENT INITIATIVES

Guaranteed Energy Savings Contract

- DNCR began a guaranteed energy savings contract for the evaluation, recommendation, and implementation of energy conservation measures across the Department, including the design and installation of equipment and the repair or replacement of existing equipment and meters. The contract states that all payments, except obligations on termination of the contract before its expiration, are to be made over time; energy savings are guaranteed to exceed costs. The draft Investment Grade Audit (IGA) Plan has been submitted by the ESCO and is under review. A Final IGA Plan should be completed and submitted shortly after the FY2023-2024 State Budget is approved. Once a Final IGA Plan is approved, we will start the process to secure a loan for the approved energy saving projects working with the Office of State Budget and Management, the Department of Treasury, the State Construction Office, and the Department of Environmental Quality.

New construction of facilities, even at current minimum energy standards, will perform at better btu/ft² levels than existing buildings.

- New Visitor Center at Fort Fisher State Historic Site, 24,000 ft² under construction.
- Expansion and major renovation of the Museum of History in downtown Raleigh will replace all existing mechanical systems with high efficiency systems – in design and expected to start construction in late 2024/early 2025 if fully funded.
- Several new or renovated State Park visitor centers have been recently completed – new visitor centers at Pilot Mountain, Lake James, and Eno River State Parks; expanded and renovated Visitor Center at Jockey's Ridge State Park include all new high efficiency HVAC units.
- Roof repair projects will include increased insulation value where applicable.

Energy Reductions at State History Museums

- Large HVAC system replacements are currently under design at the Museum of the Albemarle, Graveyard of the Atlantic, and the Maritime Museum in Beaufort and all expected to be installed in 2024/2025. These new high energy efficiency systems will reduce energy consumption at these sites.

Energy Reductions at State Library and Archives Building (109 E. Jones Street)

- DNCR is working to replace fluorescent lights in the Government & Heritage Library stacks with motion-detection LED fixtures.
- New Energy Efficient windows will replace existing single pane windows originally installed in the late 1960's.
- Expected to start construction in 2024 and complete in 2025.

Energy and Water Use Reductions at NC Aquariums

- Jennette's Pier installed energy efficient hand dryers and replaced metal halide entrance sign light fixtures with solar rechargeable LED fixtures.
- In the next 12 months, Jennette's Pier will save energy through repairing solar panel installations and improving the energy efficiency of a life support system. The site also plans to replace thirty CFL light fixtures with LED fixtures.

Energy and Water Use Reductions at State Historic Sites & State Parks

- DNCR is continuously making many energy reducing improvements at all sites. The department is replacing old mechanical systems with new energy efficient systems when applicable during renovations and/or repairs. These include HVAC systems, water heaters, boilers, and lighting to name a few.
- DNCR uses programmable thermostats to reduce energy usage when the buildings are unoccupied. DNCR staff are encouraging individual sites to adjust thermostat controls to cooler heating season temperatures and warmer cooling season temperatures where such changes will not affect artifact preservation.

Energy and Water Use Reductions at the NC Zoo

- Updating and upgrading a Building Automation System (BAS) used to control 13 AHUs at multiple facilities. The new BAS will provide remote analysis of facility cost of operations to identify opportunities for energy efficiency improvements. It will further help to identify low cost and no cost improvements for immediate implementation. Ongoing monitoring of the new BAS will help analyze and recommend facility improvement measures.
- Demolition of the 40+ year old Aviary Exhibit Building is planned for 2024. This will remove an energy inefficient facility from the Zoo's inventory. This inefficient energy facility will hopefully be replaced in the next couple of years with a much more energy efficient Aviary Exhibit Building.
- The Desert Exhibit Building has started construction for the replacement of the old inefficient HVAC system. This new system will reduce energy consumption at this very popular exhibit.
- Construction of the new Asia continent and associated 7 new facilities within this exhibit should be completed in 2024/2025 and open to the public in 2026. All the new facilities in this new exhibit will have high energy efficient HVAC and lighting systems.
- The NC Zoo currently has 9,600 square feet of solar panels generating up to 104 kW/hr. The current installation is grid-connected, so the Zoo receives cost-saving credits from its electricity provider (Randolph Electric Membership Cooperative). The Zoo is always looking to increase this amount.

ENERGY MANAGEMENT PLAN BUY-IN

Goal

- Continue to reduce annual Total Energy Consumption per square foot year after year and maximize energy efficiencies.

Measurement

- Total Energy Use in Btu per Square Foot per Year

Commitment

- DNCR recognizes that energy and water consumption can be managed to our benefit. Energy and water management is a responsibility of the occupants at each facility, guided and supported by DNCR leadership, our Energy Manager, and Utility Savings Initiative (USI) Liaison.
- This plan outlines the activities recently completed, in process, and future plans required to reduce energy and water consumption to achieve the goals of the program.
- The Division Heads will review progress and results and will support staff attendance at training in energy and water management.

NC Department of Revenue

Agency Utility Management Plan

Fiscal Years 2020-2025

Prepared by Business Services and Support
August 2023

NCDOR NORTH CAROLINA DEPARTMENT OF REVENUE

Executive Summary

The Department of Revenue (DOR) administers the tax laws and collects taxes due in an impartial, consistent, secure and efficient manner to fund public services benefitting the people of North Carolina. As a cabinet agency, the Department is fully committed to supporting Executive Order 80 and working with other agencies to meet the established goals:

- Reduce statewide greenhouse gas emissions to 40% below 2005 levels
- Increase the number of registered, zero-emission vehicles to at least 80,000
- Reduce energy consumption per square foot in state-owned buildings by at least 40% from fiscal year 2002-2003 levels

This document outlines the agency's Utility Management Plan in support these goals.

Background

The main DOR facility is state-owned and maintained by the Department of Administration (DOA). The DOR also has 13 remote offices across the state which are leased facilities. Actions identified in the utility management plan address initiatives associated with the main building as well as the remote offices. Operationally, the agency will evaluate impacts of climate change on programs with the intention of integrating climate change mitigation and adaption practices into our operations. Participating as a member of the North Carolina Climate Change Interagency Council will provide an opportunity to collaborate and share ideas across agencies to enhance DOR programs and initiatives associated with the executive order.

NCDOR NORTH CAROLINA DEPARTMENT OF REVENUE

Utility Management Plan
2020 - 2025

Focus Area 1: Comprehensive Plan	
Strategy 1.	Provide energy saving project recommendations in the DOR Repair and Renovations Request to DOA
Strategy 2.	Update internal plans to reflect energy efficiency strategy and support for Executive Order 80
Strategy 3.	Work with the State Energy Office (SEO) to assist with review of strategy and timeline
Strategy 4.	Continue to provide internal education and update existing marketing plan to support the strategy
Strategy 5.	Implement Plan

2020-2025 Planned Activities	**Expected Measurement**	**Assigned To**	**Occurrence**
Meet with SEO to develop content for the plan	Discuss the Utility Management Plan content and focus areas	Agency Designee, Energy Manager and SEO staff	As needed
Evaluate operations to identify potential energy savings initiatives	Create list of planned and potential future initiatives to be included in the Utility Management Plan	Agency Designee, Energy Manager and Agency Staff	Annually
Update Utility Management Plan	Complete the plan and timeline for the agency and submit plan to SEO	Agency Designee, Energy Manager and staff	Due September 1, 2023
Participate in Energy Manager meetings with other State Agency's	Attend monthly meetings and provide updates on Utility Management Plan progress	Energy Manager	Monthly
Meet with stakeholders and internal teams to implement initiatives included in the plan	Designate a team or teams to implement portions on the plan	Agency Designee, Energy Manager and staff	Quarterly
Update existing marketing and communication program	Continue to improve and implement program	Agency Designee, Energy Manager and staff	Annually
Review Utility Management Plan progress	Review plan; revise and adjust initiatives and timelines as needed	Agency Designee, Energy Manager and staff	Quarterly
Update R&R Requests to recommend energy saving projects to support Executive Order 80	Work with DOA to help prioritize recommended energy saving projects.	Energy Manager and DOA	Annually

Focus Area 2: Initiatives to Implement	
Strategy 1.	Review opportunities with staff to determine high priority initiatives
Strategy 2.	Work with staff to determine the best timeframe to implement initiatives
Strategy 3.	Create a schedule for planned initiatives
Strategy 4.	Communicate initiatives to staff
Strategy 5.	Implement initiatives

2020-2025 Planned Activities	Expected Measurement	Assigned To	Occurrence
HVAC improvements	Support DOA in installing new fans in primary air handling units	Energy Manager and DOA	Complete
Evaluate aging equipment in various areas and develop a master plan for replacement	Replacement of aging equipment based on funding availability (CRAC Units replaced in Scan Room and UPS replacement)	Energy Manager, DOA and staff	FY23 – CRAC Units FY25 – UPS Replacement
Downsize Headquarters Data Center footprint	Continue consolidating server equipment to save energy in our Data Center	Energy Manager and staff	Ongoing through FY23
LED Lighting Upgrades	Work with DOA to have lighting switched to LED's in our HQ facility. Some lighting has already been switched over to LED in our Elevator corridors and our restrooms.	Energy Manager and DOA	FY24
Elevator Upgrades	Work with DOA to replace existing obsolete elevators with new, more energy efficient elevators.	Energy Manager and DOA	FY25
Promote teleworking; review and revise agency telework policy	Updated telework policy; Continued replacement of desktops with laptops	Agency Designee and staff	Annually
Continue to evaluate potential use of ZEVs	Review use of long term lease and motor fleet vehicles; Review and update internal policies	Agency Designee and staff	Annually
Promote electronic filing	Increase in electronic filing, reduction in time scanners operate	Agency Designee and staff	Annually

Focus Area 3: Marketing and Communication Plan	
Strategy 1.	Identify marketing and communication initiatives
Strategy 2.	Work with team to identify delivery methods
Strategy 3.	Create a schedule for marketing and communications
Strategy 4.	Develop and Implement initiatives

2020-2025 Planned Activities	Expected Measurement	Assigned To	Occurrence
Maintain internal employee education campaign	Employee awareness of Executive Order 80 and opportunities to support energy efficiency	Agency staff	Annually
Update marketing plan for electronic filing	Identification of action items to support increased electronic filing	Agency staff	Annually

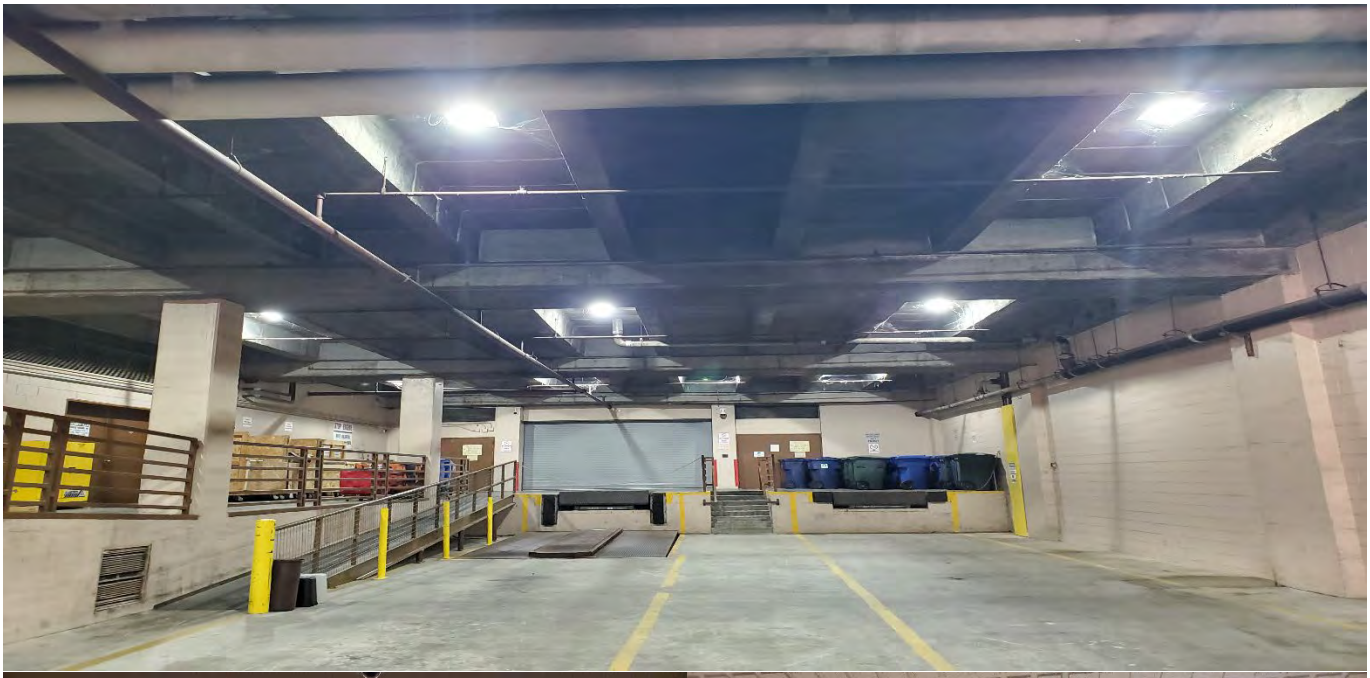
Focus Area 4: Remote Office Energy Savings (Leased Facilities)	
Strategy 1.	Identify opportunities to downsize leased space
Strategy 2.	Work to identify jobs eligible for permanent teleworking
Strategy 3.	Develop and Implement Initiatives

2020-2025 Planned Activities	Expected Measurement	Assigned To	Occurrence
Downsize the footprint of Charlotte Office	Move from occupying 24,000 square feet to less than 10,000 square feet.	Agency Designee and staff	Complete
Close Service Center in Winston Salem	Transition employees from the Winston Salem office to other offices, or move employees to permanent teleworking.	Agency Designee and staff	Complete
Downsize the footprint of Wilmington Office	Move from occupying 8,774 square feet to 6,290 square feet.	Agency Designee and staff	FY23
Analyze space needs for remaining remote offices to identify opportunities to reduce footprint	Reduction in square footage for remote offices as leases expire	Agency Designee and staff	Annually

NCDOR NORTH CAROLINA DEPARTMENT OF REVENUE

Agency Accomplishments

- In 2022-2023, the Department of Revenue supported the Department of Administration (DOA) in making HVAC upgrades to the main DOR building. The project included replacement of fans that makes our HVAC system more efficient. This project supports the Executive order by making the HVAC system more energy efficient as well as make it easier to control temperature throughout the facility.
- The Department of Revenue funded and worked with DOA electrical shop to make upgrades to LED lighting in our Loading Dock area. DOA funded and DOR worked with DOA's vendor to upgraded lighting in the restrooms, main lobby, and elevator corridors throughout the main facility. (Upgrades pictured on next page) These changes included moving from high energy use lighting to LED lighting on each floor. The agency continues working with DOA to move towards replacing lights in other areas of our main building with LED lighting.
- The Department of Revenue is prepared to fund a project to replace outdated computer room air conditioning (CRAC) units located inside of our Scan Room, which is critical to processing tax documents. With the assistance of DOA, we plan to downsize both units with the result being better utilization and efficiency of air flow. We plan to have a digital network connection that can turn off or slow down the speed in which the CRAC units cool (not always running at 100% cooling). The older units did not have the ability to regulate the temperature in the same way. The new equipment is helping save energy while still accommodating temperature requirements inside the Scan Room. We plan to have these units replaced and operational by the end of FY23.
- The most significant impact this thus far has been the agency's increase in teleworking. A new policy was created and implemented. In March 2020, an estimated 5% of the agency was part-time or full time teleworking. As a result of Covid-19, the agency quickly took action to move employees to teleworking while maintaining agency operations and service levels. To date, approximately 90% of employees are teleworking. Due to the number of employees able to telework, overall power usage in the main facility has been reduced.
- The Department of Revenue has been able to transfer the majority of long term rental vehicles to hybrid vehicles and continues focusing on switching out the remaining vehicles.
- The Department of Revenue has successfully downsized our Charlotte Service Center. We were able to downsize more than 14,000 square feet, which reduces energy usage at this location.



NCDOR NORTH CAROLINA DEPARTMENT OF REVENUE

NC Department of Revenue
Agency Utility Management Plan

- The NC Department of Revenue recognizes that energy and water consumption can be managed for the benefit of our agency. Energy and water management is impacted by all employees and the responsibility of the Energy Manager for Department of Revenue with support from the Department of Administration.
- The Department of Revenue has developed an Agency Utility Management Plan. The Assistant Secretary of Tax Research and Equity is responsible for the success of the program for Department of Revenue.
- The Agency Utility Management Plan outlines the activities identified to support reduction in energy and water consumption goals with support from the Department of Administration.

Agency Utility Management Plan Goals

- As required in Executive Order 80, NC Department of Revenue will support efforts to reduce energy consumption per square foot in state owned buildings by at least 40% below fiscal year 2002-2003 levels and reduce state-wide greenhouse gas emissions to 40% below 2005 levels.

Strategic Energy and Water Plan Mandate – Commitment

I have read the Agency Utility Management Plan for the NC Department of Revenue. The plan, as presented, supports the reduction goals in Executive Order 80.

Implemented this 28th day of February 2019
Updated this 25th day of August 2023

STRATEGIC ENERGY MANAGEMENT PLAN

NC DEPARTMENT OF AGRICULTURE & CONSUMER SERVICES

Plan 2021- 2023

Prepared By:

Property & Construction Division

1001 Mail Service Center

Raleigh, NC 27699-1001

EXECUTIVE SUMMARY Current Status

The North Carolina Department of Agriculture & Consumer Services (NCDA&CS) has been using an excel spreadsheet to track utility usage since 2002. In 2011, the NC Forest Service and Soil & Water Divisions were transferred from what was at that time the NC Department of Environment and Natural Resources (NCDENR) to NCDA&CS. Energy utilization for these divisions was incorporated into the existing data maintained by NCDA&CS. Because the information from the prior periods was not available for the additional buildings, a new benchmark for data tracking and energy usage was created.

NCDA&CS manages over 300 locations across the state with a total of approximately 1125 state owned buildings with an approximate gross square footage of 4,437,478.

The range in size of the facilities varies from a single office building to a 400-acre research station with 87 buildings, to the State Fair with 40 buildings and supports 500 year-round events. The diversity of sites varies in size, use, number, and type of building, which presents a challenge in monitoring utilities and identifying energy savings initiatives.

Seventy-two percent (72%) of the buildings are less than 2,500 square feet and used as a field office for 1 – 4 employees or for storage. The approximate leased facilities count is 90 locations throughout North Carolina, including County offices.

Prior to November of 2016, NCDA&CS utilities were submitted directly to Accounts Payable for payment. Invoices were scanned and sent to Divisions for review. Either throughout the year or annually when requested, Divisions would gather energy usage and cost information to be submitted for the Annual Energy Report. This system provided inconsistencies in the reporting because data collection was completed at the site level. In November of 2016, NCDA&CS transitioned to a 3rd party service for utility data collection. The first full year of data collection was 2017-18 and after reviewing the report for 2018-2019, data from the energy evaluation had a significant decrease from the prior years. In 2019-2020 there was also a decrease in energy consumption with the COVID19 Pandemic occurring and less people in the workplace, this was an extremely difficult year to assess energy evaluation because of the decrease in office space usage, the utilities had to remain on even though employees were working remotely. Many employees started returning to work in 2022-2023 which generated an influx in utility consumption.

NCDA&CS will continue to work to develop and implement efforts to improve energy and water conservation at all locations. The initial step being to create, implement and follow an effective Strategic Energy/Water Conservation Plan. The objective of the Strategic Energy/ Water Conservation Plan is to foster economically and environmentally responsible usage of valuable resources in accordance with State legislation.

Future Planned Activities - Ongoing

- Identify low or no cost initiatives.
- Evaluate energy savings from lighting upgrade projects at Farmer's Markets and Ag Centers, evaluate other sites for lighting upgrades.
- Identify unused and underutilized buildings; disconnect utilities and demolish.
- Design new buildings to be energy efficient, utilizing green technology if applicable.

Focus for Past Planned Activities 2019-2021

- Identify training modules for all NCDA&CS staff to be assigned through LMS to aid in identification of no cost and low cost savings opportunities.

- Pilot program through State Property Fire Insurance to allow sensors on equipment such as Hot Water Heaters, Pipes and condenser Units to notify staff about freezing pipes or differential temperatures.
- Demolition and severance of multiple hazardous Buildings to eliminate current utility bills.
- Roof replacement and repairs on approximately 53 Buildings throughout NCDA & CS sites to minimize excessive energy consumption.
- The Completion of the NCDA & CS new Agricultural Science Center Lab in Raleigh which will house 5 existing Laboratories into 1 shared building complex. Estimated completion time to be end of October 2020. This will be more cost effective and energy efficient because the currently used aged buildings do not have upgraded mechanical/electrical/ components that aren't using today's standards in construction.

Focus for Past Activities & updates for 2020-2021:

Overview: In March 2020, the COVID 19 pandemic hit the Country, most employees worked remotely throughout the year which has contributed to a reduction in savings and energy consumption. At this time, many of the employees are still working remotely throughout the Department across the State. The Governor placed an Executive order on the State, therefore reducing many work and in person activities to be put on hold. During this time NCDA & CS's IT team implemented the Team's software which allowed many employees to have virtual meetings which conserved gas, utilities, and travel time.

- July 2020- June 30th-2021 there were approximately 15 new roofs replaced.

- July 2020- June 30th 2021 there have been approximately 10 Buildings that have been demolished and many more planned in the future.

- The New Steve Troxler Agriculture Science Center was completed with a move in date of August 2021.

The new Agriculture Science Center will accommodate approximately 200 employees in one large facility consisting of 223,000 sq. ft. The move will combine many offices into cubicles, therefore eliminating the use of many buildings and even rented space. We will surplus 2 NCDA Buildings (at this time) consisting of over 70,000 q. ft.

Features of the new Agriculture Science Facility

- Ultraviolet Lighting
- Bipolar Ionization
- R-19 Insulation in Walls
- R-56 Roofing (the expected was R-30 resulting in more savings

Overview for July 1, 2021- June 30, 2023: The NCDA & CS Administrative employees started returning back to offices in a remote/hybrid scenario in July 2021. Most of the Division employees were reporting to work 2-3 days per week and this is still the norm at the end of June 30, 2023. With the uptick in returning to work, the Energy Consumption slightly increased from 2021-2023. The significant cost increase was also due to inflation across the nation of fuel, oil, propane, and electricity contributed to higher Energy Consumption and dollars spent this physical year.

- There have been Approximately 11 Buildings demolished belonging to multiple Divisions within NCDA, the funding for these projects came from Capital Repair and Renovation fund.
- There have been "approximately" seventeen buildings added to the inventory consisting of small storage sheds to large Hangars ranging from 600 sq. ft up to 24,000 square ft. Funding has been approved through the Capital Funding Account approved by Legislature.
- There have been 11 buildings allocated to Several different Agencies which will eliminate future repairs needed on these facilities.
- Numerous buildings are being up fitted with new roofs, new HVAC systems, and new ventilation systems, which will also come from the Capital repair and renovation fund.

The Office of the State Fire Marshall plays an integral part of the repair and renovations that need to be addressed with NCDA properties. First, they will submit a report of their findings of each building inspected and recommend they be repaired or demolished, this report also identifies any safety issues that need to be addressed, secondly, the Manager at the facility will prepare a plan of action to correct all of the issues in the report.

The new buildings that have recently been added to NCDA inventory will be more energy efficient, (updated materials, lighting etc.) if utilities are included, however; not all these

buildings require electricity and water. The new buildings will not be constructed in a FEMA hazard area or watershed areas which will eliminate flooding and damage.

NCDA & CS no longer pays the City of Raleigh water utilities through the Capturis Software, they are not input into the system, so this information is recorded separately. In 2024, there will be a new Accounting System implemented which will include a new software for billing and recordkeeping which is currently be evaluated within all state Agencies.

The new Ag Science Center has added an additional Boiler/Chiller and cooling tower which is more efficient than the expected 0.55KW/ ton resulting in more savings. Currently, this building is saving 14% compared to the baseline of the original estimates.

Based on the Utility Consumption report, the findings are consistent with last year's report with a slight increase in Total Energy dollars and BTUs. The North Carolina Department of Agriculture and Consumer Service will continue to do its part in the overall success of energy conservation.

2023 Strategic Energy Plan – North Carolina Justice Academy

This energy plan will illustrate the following:

1. Illustrate utility consumption, costs, and efficiency gains over time.
2. Define specific projects, costs, funding sources, provide estimated energy savings, and estimated payback periods.
3. Assign roles, responsibilities, training, and communication for overall energy management success.
4. Explore financing options for funding energy savings projects.
5. Include a signature page that shows upper management acknowledgement.

year	name	total utility $	total energy $	total btu	kwh	kwh $	ng therms	ng $
2002-03	DOJ Combinec	$269,833	$258,314	17,122,313,344	2,632,712	$189,409	81,395	$68,905
2003-04	DOJ Combinec	$298,713	$286,032	17,810,124,964	2,774,597	$196,854	83,432	$89,178
2004-05	DOJ Combinec	$296,858	$281,315	15,995,513,160	2,545,930	$192,367	73,088	$88,948
2005-06	DOJ Combinec	$304,436	$288,335	13,551,459,296	2,186,008	$196,257	60,928	$92,078
2006-07	DOJ Combinec	$296,743	$278,704	14,146,398,124	2,475,527	$205,188	56,999	$73,516
2007-08	DOJ Combinec	$312,626	$293,978	13,830,280,144	2,591,612	$225,232	49,877	$68,746
2008-09	DOJ Combinec	$485,562	$466,479	22,203,766,086	3,981,143	$346,826	53,896	$70,976
2009-10	DOJ Combinec	$505,735	$483,264	23,875,236,781	4,021,397	$342,397	66,635	$77,237
2010-11	DOJ Combinec	$510,290	$484,359	24,807,344,242	4,236,641	$345,544	67,550	$65,562
2011-12	DOJ Combinec	$500,309	$476,050	22,316,897,917	4,184,891	$361,174	50,792	$45,489
2012-13	DOJ Combinec	$553,502	$490,344	22,641,537,468	4,063,369	$367,645	56,735	$49,965
2013-14	DOJ Combinec	$543,171	$480,100	21,918,582,734	4,189,363	$375,856	52,204	$47,614
2014-15	DOJ Combinec	$544,829	$479,106	23,099,360,415	4,405,359	$393,806	57,390	$45,737
2015-16	DOJ Combinec	$538,506	$471,045	23,410,545,842	4,517,526	$401,601	59,262	$45,723
2016-17	DOJ Combinec	$510,916	$441,834	22,017,282,013	3,805,834	$347,390	53,948	$49,215
2017-18	DOJ Combinec	$560,187	$491,876	22,473,556,016	4,215,963	$389,535	50,689	$55,341
2018-19	DOJ Combinec	$556,375	$488,848	21,968,758,042	4,190,281	$402,881	50,231	$46,409
2019-20	DOJ Combinec	$509,067	$438,734	20,646,379,206	3,749,537	$361,377	48,471	$39,079
2020-21	DOJ Combinec	$438,097	$399,929	19,400,738,138	3,317,390	$311,416	47,995	$47,195
2021-22	DOJ Combinec	$495,967	$422,277	17,931,364,095	3,289,826	$299,799	35,199	$47,259
2022-23	DOJ Combinec	$565,716	$486,981	19,189,772,205	3,651,178	$370,505	34,290	$46,303
2023-24	DOJ Combinec	$0	$0	0	0	$0	0	$0
2024-25	DOJ Combinec	$0	$0	0	0	$0	0	$0
2025-26	DOJ Combinec	$0	$0	0	0	$0	0	$0
2026-27	DOJ Combinec	$0	$0	0	0	$0	0	$0
2027-28	DOJ Combinec	$0	$0	0	0	$0	0	$0
2028-29	DOJ Combinec	$0	$0	0	0	$0	0	$0
2029-30	DOJ Combinec	$0	$0	0	0	$0	0	$0

2oil gals	2oil $	6 oil gals	6oil $	propane gals	propane $
0	$0	0	$0	0	$0
0	$0	0	$0	0	$0
0	$0	0	$0	0	$0
0	$0	0	$0	0	$0
0	$0	0	$0	0	$0
0	$0	0	$0	0	$0
23,293	$48,677	0	$0	0	$0
25,169	$63,630	0	$0	0	$0
25,935	$73,253	0	$0	0	$0
20,695	$66,740	0	$0	967	$2,647
21,428	$69,855	0	$0	1,440	$2,879
15,209	$48,662	0	$0	3,216	$7,968
14,752	$32,493	0	$0	3,091	$7,070
13,005	$18,202	0	$0	2,912	$5,519
23,972	$39,054	0	$0	3,408	$6,175
19,584	$41,059	0	$0	3,313	$5,941
16,195	$34,404	0	$0	4,390	$5,154
19,817	$35,460	0	$0	2,809	$2,818
22,238	$38,174	0	$0	2,162	$3,144
20,002	$67,300	0	$0	4,502	$7,919
21,820	$65,949	0	$0	3,020	$4,225
0	$0	0	$0	0	$0
0	$0	0	$0	0	$0
0	$0	0	$0	0	$0
0	$0	0	$0	0	$0
0	$0	0	$0	0	$0
0	$0	0	$0	0	$0
0	$0	0	$0	0	$0

kgal water	water sewer $	gsf	constructio n gsf
3,107	$11,519	204,206	0
3,512	$12,681	204,206	0
3,452	$15,543	204,206	0
3,589	$16,101	204,206	0
3,033	$18,039	204,206	0
2,826	$18,648	204,206	0
2,820	$19,083	283,035	66,000
3,120	$22,471	283,035	66,000
4,919	$25,931	283,035	66,000
3,116	$24,259	296,444	38,880
2,826	$63,158	296,444	0
8,457	$63,071	296,444	38,880
10,325	$65,724	298,220	38,880
9,427	$67,461	298,220	0
7,585	$69,082	298,220	0
9,513	$68,311	298,220	0
10,634	$67,527	298,220	0
8,285	$70,333	298,220	0
9,130	$56,729	298,220	0
8,911	$73,690	298,220	0
1,958	$78,735	298,220	0
0	$0	0	0
0	$0	0	0
0	$0	0	0
0	$0	0	0
0	$0	0	0
0	$0	0	0
0	$0	0	0

The North Carolina Justice Academy has two campuses, one in Sampson County (Salemburg) and one in Henderson County (Edneyville). Within the past four years, the Justice Academy has renovated two of the three residence halls on the Salemburg campus and is in the process of renovating the residence hall on the Edneyville campus.

These renovated residence hall buildings have newly installed and more efficient lighting and HVAC systems to help reduce energy costs.

Both Campuses are continuing to make improvements and move toward energy savings through the following:

1. Replacement of older halogen and fluorescent lights with new highly efficient LED lighting throughout both campuses.
2. Installation of lighting timers and photocells.
3. Replacement of HVAC equipment with new highly efficient equipment as old equipment fails or nears the end of life.
4. Replacement and monitoring of automated HVAC control systems.
5. Monitoring of utility bills to address any unusual spikes in energy usage.

NCJA maintenance staff consistently monitors its infrastructure and systems, assuring preventative maintenance is performed. Preventative maintenance will increase the efficiency of the equipment, bringing costs down.

The Facilities Manager is responsible for assessing energy needs for the campus and communicating a plan of action with management and staff that would be involved. The Facility Manager is also responsible for training staff in ways to reduce energy consumption on the campuses.

The Maintenance department is responsible for carrying out repairs and projects to aid in energy consumption. Maintenance is also responsible for monitoring the campuses for issues that may cause energy loss.

Even with funding being limited, the NCJA is always exploring ways for funding to support projects in aiding energy conservation for the campuses. Since 2016, NCJA has requested and received direct legislative funding and/or repair and renovation (R&R) funding annually to renovate additional facilities. NCJA requested direct legislative funding to renovate four (4) additional buildings across both campuses in the current 2023-24 legislative budget, yet funding was not approved. These projects have also been prioritized and await potential funding via the R&R budget later this year.

North Carolina Justice Academy

Strategic energy plan for the NCJA

The undersigned recognized that our utilities usage is a controllable expense, and that energy efficiency is the responsibility of all staff.

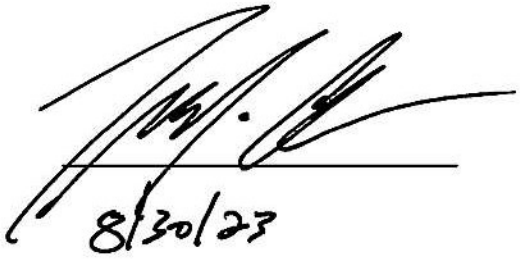
The development of the Strategic Energy Plan is the responsibility of the Campus Deputy Director. The undersigned directors will support this Plan and report on progress annually.

Energy Mandate -Goal

The goal of this plan is to reduce the annual total energy consumption per square foot on both campuses by 30% from year 2022-2023 in the following years.

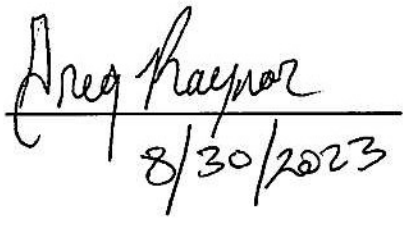
Trevor Allen

NCJA Academy Director



Greg Raynor

Facility Operation Manger



Appalachian
STATE UNIVERSITY

2023 – 2024 Strategic Energy and Water Management Plan

August 2023

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Note from the Associate Vice Chancellor for Facilities Management

Appalachian State University is excited to share its Strategic Energy and Water Management Plan for the 2023/24 school year. Energy and water efficiency are essential to the success of the university's push towards climate neutrality. We invite students, faculty, staff, and the public to review the plan and reach out to energymanager@appstate.edu with any questions, concerns or requests for additional information.

Nick Katers,
Associate Vice Chancellor for Facilities Management

Executive Summary

Appalachian State University has a long-standing commitment to sustainability. Various university commitments and state mandated benchmarks all drive towards one overarching goal, climate neutrality.

For the purpose of this Strategic Energy and Water Management Plan (SEP), climate neutrality is defined in relation to the university's campus energy and water consumption. Appalachian State University's Office of Sustainability has a broader focus that encompasses additional considerations such as the impacts of food consumption, material sourcing, travel, commuting, etc. This SEP is written with the goal of eliminating energy and water-related greenhouse gas emissions by 2050. This target year is set as the latest possible timeline and used as a way of measuring progress. Actual energy and water reductions are intended to be made as aggressively as possible.

Strategic Planning

A data driven analysis of the university's energy and water consumption provides an opportunity to evaluate progress, identify issues, and prioritize solutions that can help the university reach its energy-based goals. Establishing specific, measurable, and realistic goals allows for the development an informed strategy. The SEP evaluates three target areas for the fiscal year (FY) from July 2023 through June 2024:

1. Energy and Water Use
2. Energy and Water Expense
3. Greenhouse Gas Emissions

Year in Review

This past year combined several challenges and achievements related to App State's utility consumption. With a 9% increase in campus building square footage, the university was able to limit an increase in total energy consumption to 3.3% and maintained its energy use intensity (energy per square foot) just under 80,000 BTUs per square foot. Although the goal it to reduce overall energy consumption, there were several success stories that support continued investment in energy efficiency.

- **1292 Carryforward Funding** helped the university implement several efficiency projects. Facilities Operations staff leveraged the $681k in 1292 carryforward funding to secure an additional $140k in funding for campus efficiency projects.

- **Energy Efficiency** - Despite a campus increase in energy consumption, state-funded academic and administrative buildings continued to see sustain reductions in energy consumption. Steam use decreased 9.7% and electrical use decrease 7.3% in these buildings that have access to 1292 carry forward funds and where Facilities Operations staff maintains a degree of autonomy of how these buildings operate. These reductions should be attributed to both the daily commitment from Facilities Operations staff to consistently ensure campus operates reliably and efficiently as well as several recently completed efficiency and renovation projects. Specific examples of total energy (electricity and steam combined) reductions include:

- Anne Belk Hall – 14% reduction (all compared to the four previous years' average)
- BB Dougherty – 13% reduction
- Beasley Media Complex – 15% reduction
- Chapell Wilson – 10% reduction
- College of Education – 8.6% reduction
- DD Dougherty – 45% reduction
- Holmes Convocation Center – 7.8% reduction
- Living Learning Center (Academic Wing only) – 20.3% reduction
- Sanford Hall (Renovation) – 58.4% reduction
- Watson Brummit Hall – 41.1% reduction

App State remains committed to its energy and sustainability goals as the university expands its ability to reach perspective students. As the university's physical footprint increases, competing priorities impact the amount of campus energy consumption. Two major initiatives currently underway will have lasting impacts on App State's energy goals:

- **App State Hickory** – Purchased during the previous fiscal year, App State opened a new campus in Hickory, NC. This 225,800 square foot, all-electric building represents significant efficiency opportunities. Last updated in the 1980's, the Hickory building consumes significant amounts of electricity and has already become the 15th highest energy consuming building in App State's portfolio before renovations are complete and the building is fully occupied. The Hickory campus serves as an opportunity to showcase how renovating an existing building can significantly reduce energy consumption.

- **Innovation District** – App State began construction on its Innovation District in Boone, NC during FY 22/23. The goal is for the Innovation District is to be net zero and achieve Living Building Challenge certification. The first phase of the project consists of a zero-carbon district energy system (DES) that will begin to transition campus away from steam-based heat. The DES will consist of a mix of renewable technologies including geothermal, photovoltaics, and wind energy. Also included in phase one is the development of 150 staff and faculty housing units.

The cost of energy is another key metric for Appalachian State University. In FY 22/23, the cost of electricity increased 9.7% per kWh and the cost of natural gas increased 42.9% per therm. To reduce the impact on the university, App State left the state contract (405N) in June when the two natural gas futures contracts expired. App State negotiated a separate six-month contract with Texican Natural Gas that will save the university $291k through December when compared to the state's current 405N contract. Depending on the terms of the new state contract that is supposed to be renegotiated by November 2023, App State will determine if rejoining the state contract or issuing a request for proposals to the five other authorized natural gas companies is more advantageous.

As the University determines how best to reduce both its energy consumption and costs, it is important to track changes annually. Figure 1 details FY 22/23 consumption metrics.

Figure 1. Annual Campus-Wide Consumption Figures

	2022/23 Totals	2021/22 Totals	2020/21 Totals
Facility Greenhouse Gas Emissions	37,308 MT eCO_2	37,803 MT eCO_2	37,942 MT eCO_2
Vehicle Greenhouse Emissions	851 MT eCO_2	788 MT eCO_2	666 MT eCO_2
Energy Use Intensity	80 kBTU / sq.ft.	79.9 kBTU / sq.ft.	81.9 kBTU / sq.ft.
Water Use Intensity	16.3 gal / sq. ft.	14.5 gal / sq. ft.	11.4 gal / sq.ft.
University Energy Expense	$9.13 million	$7.39 million	$5.86 million
Water and Sewer Expense	$1.5 million	$1.3 million	$1 million

Moving Forward

Figure 2 represents goals for FY 2023/24 to ensure the university is on track to meet target reductions for achieving climate neutrality by 2050. Realistically, progress is not likely to follow an annual linear curve as the university's building footprint continues to expand but these targets provide the university with the opportunity to monitor progress and determine how limited resources can most effectively be spent.

Figure 2. FY 23/24 Energy and Water Goals

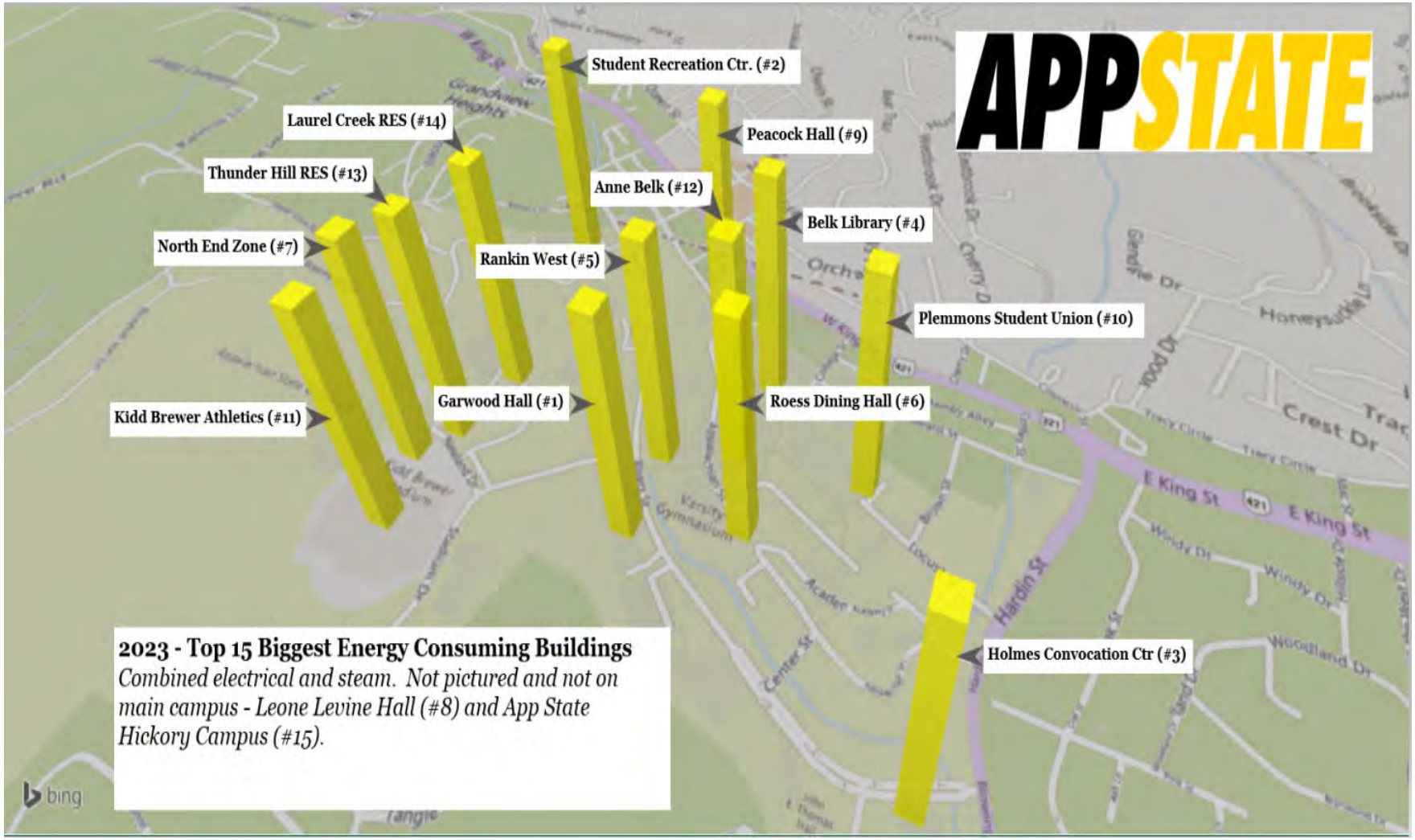
	FY 23/24 Goals
Facility Greenhouse Gas Emissions	Reduce 13% to 32,589 MT eCO_2.
Vehicle Greenhouse Gas Emissions	Reduce 7.4% to 845.1 MT eCO_2.
Energy Use Intensity	Reduce 2.5% to 77,997 BTU per sq. ft.
Water Use Intensity	Reduce WUI 5% to 15.5 gallons per sq. ft.
Energy Expenses	Identify strategic approach for natural gas procurement.
Water & Sewer Expenses	Reduce 3% to $1.49 million

Strategies for Achieving Energy and Water Goals

Also included in this plan is a list of recently completed energy conservation measures (ECMs) as well as identified potential ECMs that would reduce utility cost and consumption. Prior to completing an ECM, the university considers the cost effectiveness and overall impact it will have on the university.

To ensure that limited funds are spent effectively, Facilities Operations must prioritize conservation measures that maximize potential savings and can be reasonably completed within the fiscal year. Figure 3 highlights the 15 most energy intensive campus buildings. While ongoing efficiency work occurs in every building, this map serves as guide of where some of the most significant potential savings may exist.

Figure 3. FY 22/23 – Biggest Energy Consumers



Sustainability Commitments and State Mandates

The following provides a brief background on several university and state-mandated initiatives that guide energy and water consumption goals.

- **Climate Action Plan** – Appalachian State University published the 'AppCAP 1.0" A vision for Climate Neutrality' was published in 2020 and serves as a roadmap to guide the University with actionable and achievable steps to reach climate neutrality.[1]
- **American College & University Presidents' Climate Commitment –** 2008
- **Second Nature Climate Commitment** - Signed by Chancellor Sheri Everts in 2016, this is a commitment from Appalachian State University to reach climate neutrality by 2050.[2]
- **Faculty Senate –** Passed a resolution to achieve climate neutrality by 2035.[3]
- **North Carolina Senate Bill 668** – Passed in 2007, SB 668 promotes the conservation of energy and water use in state, university, and community college buildings. New buildings must be built 30% more energy efficient, renovations must be 20% more energy efficient, and water efficiency in new buildings must be improved by 20%.[4]
- **House Bill 1292** - 2009 – HB 1292 allowed institutions of the University of North Carolina to carryforward unspent annual utility funds that could be documented as a result of installed energy conservation measures. Once awarded, those funds can be spent during the following fiscal year, 60% of which must go towards additional efficiency measures.[5]
- **The UNC Policy Manual** – In 2013, the UNC System stated that UNC institutions must develop plans to become carbon neutral as soon as possible and 2050 at the latest. [6]
- **Executive Order No. 80 –** In 2018 Governor Cooper established North Carolina's Commitment to Address Climate Change and Transition to a Clean Energy Economy. The plan called to reduce statewide greenhouse gas emissions to 40% below 2005 levels, increase the number of state-owned and leased zero emission vehicles to 80,000, and reduce the energy consumption per square foot in state owned buildings by 40%.[7]

For the purpose of this SEP, the goal of climate neutrality by 2050 is used as a target for reducing energy and water usage and emission levels. A specific year is selected so that annual reduction goals can be assigned. However, the 2050 timeline should not be a limiting factor as reductions in energy and water use will be pursued as aggressively as possible.

[1] https://sustain.appstate.edu/initiatives/climate-action/
[2] https://secondnature.org/signatory-handbook/the-commitments/#climate-commitment
[3] https://today.appstate.edu/2019/12/20/climate-neutrality
[4] https://www.ncleg.gov/Sessions/2007/Bills/Senate/PDF/S668v0.pdf
[5] https://www.ncleg.gov/Sessions/2009/Bills/House/PDF/H1292v0.pdf
[6] https://sustain.appstate.edu/_documents/UNC-System-Sustainability-Policy.pdf
[7] https://www.ncdhhs.gov/about/department-initiatives/climate-change-and-clean-energy-plans-and-progress

Greenhouse Gas Emissions

In order to achieve climate neutrality, net greenhouse gas (GHG) emissions[8] will need to be effectively reduced to zero metric tons of equivalent carbon dioxide (MT eCO_2). In order to eliminate university GHG emissions, a realistic understanding of current emission levels is required. Included in this document are the emissions from electricity and fossil fuels consumed by university facilities and vehicles. Other GHG emissions related to broader university activities are tracked by the Office of Sustainability.

GHG emissions in this SEP are broken down into two categories: facilities and vehicles. Facilities include all campus buildings and other infrastructure that consume energy (leased facilities, parking decks, athletic fields, etc.) Vehicle emissions track university-owned and leased vehicles from academic departments, App State Police, Food Services, Facilities Operations, Athletics, Traffic, etc. Not included are the AppalCART busses and New River Light and Power who both provide services beyond the university.

Renewably Sourced Electricity

Appalachian State University has seen sustained reductions in GHG emissions, however, significant work remains to ensure these downward trends continue. Beginning January 2022, university-owned, New River Light and Power (NRLP) began purchasing electricity from a new provider, Carolina Power Partners (CPP). While CPP provides electricity that is 100% produced by natural gas, the company allows customers to enter contracts with third parties to supply renewably sourced electricity, an option not previously available from Blue Ridge Energy. During FY 22/23, App State and the Renewable Energy Initiative committed to purchasing 15% of its electricity from zero-carbon hydropower facilities under NRLP's new Green Power program.

After NRLP's switch to CPP, Blue Ridge Energy began offering the option to purchase solar generated electricity. The university offset electricity for the College of Health Science Leone Levine Building, the university's largest Boone building that is not served by NRLP. Blue Ridge Energy's Brighter Future program represents new generation from the co-op's 11 MW photovoltaic array located in Caldwell County, NC. Figure 4 details specific amounts of renewably generated electricity that the university purchased for FY 22/23.

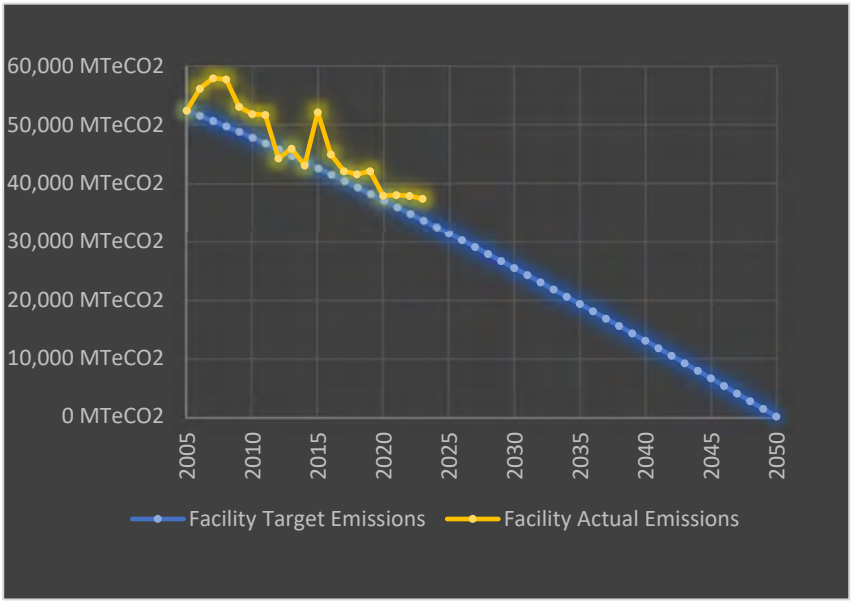
Figure 4. Breakdown of University Commitments to Renewably Generated Electricity

Building	Renewable Energy Provider	Funded By	Annual Electricity
10% Campus-Wide	New River Light and Power	Appalachian State University	5,000,000 kWh
5% Campus-Wide	New River Light and Power	Renewable Energy Initiative	2,500,000 kWh
Leone Levine	Blue Ridge Energy	Appalachian State University	1,610,793 kWh
		Total Annual Commitment	**9,110,793 kWh**

[8] GHG estimates are calculated using SIMAP® the greenhouse gas tracking tool used by Second Nature participating schools and universities.

Facility GHG Emissions

Figure 5. Facility GHG Emissions Compared to Net Zero by 2050

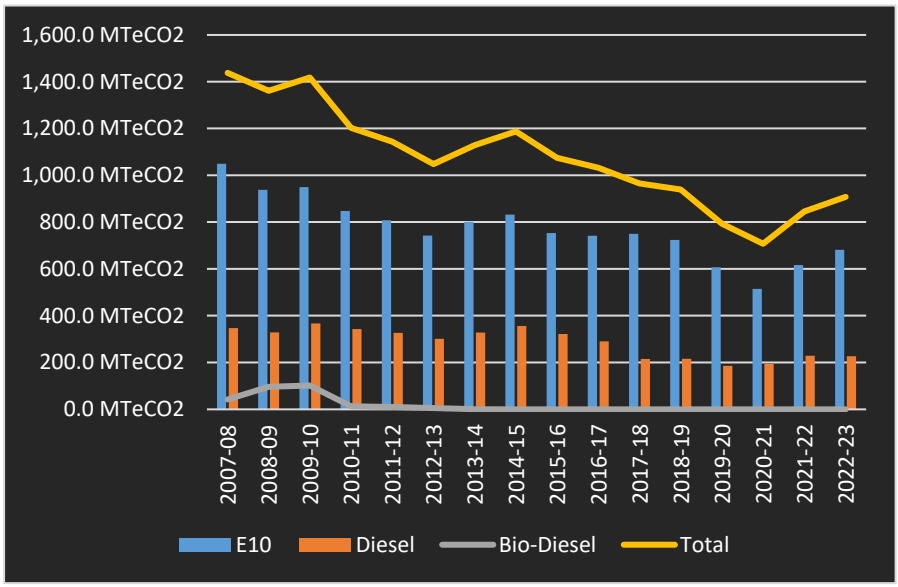


During FY 22/23, two primary factors contributed to increased energy demands; continued increase to pre-pandemic occupancy levels as well as over 500k of additional building square footage. While the increased the amount of energy required, commitments to energy efficiency and purchasing renewable energy allowed the university to slightly reduce its facility related GHG emissions to 37,308 MT eCO_2. Purchased renewable electricity helped the university avoid 4,298 MT eCO_2. Electrical consumption in campus buildings was responsible for 21,574 MT eCO_2 while steam consumption was responsible for 15,734 MT eCO_2.

Facility GHG Goal

For FY 22/23, the university set an 11% reduction goal of 33,752 MT eCO_2 with an anticipated increase in the amount of purchased renewable energy. Despite GHG emissions not increasing, actual GHG emission levels were still 3,556 MT eCO_2 above the linear emissions target goal for the year. These annual GHG emission goals will only be attainable with significant commitments to renewably generated electricity, increased campus efficiency, and a realistic solution for delivering carbon-free space heating. To meet the calculated, linear reduction goal, App State needs to reduce its emissions by 13% to 32,589 MT eCO_2 during FY 23/24.

Figure 6. Vehicle GHG Emissions



Vehicle GHG Emissions

University-related travel continued to increase compared to the last three years that could be attributed to COVID-19 and reduced campus travel. Additionally, App States' newly acquired Hickory Campus requires daily travel for numerous faculty and staff. Figure 6 represents the university's vehicle related GHG emissions. While there is an overall reduction trend, significant commitments will be required to achieve carbon neutrality by 2050.

Vehicle emissions increased 7.4% to 907.9 MT eCO_2 during the past year. As can be seen in Figure 6, Vehicle emissions have decreased 36.8% since the university began tracking in 2007 but to reach net zero, university needs to make a significant impact toward more efficient vehicles as well as implement strategic policies e.g., new vehicle requirements, enforce no idling, and continue to research options for zero emission vehicles.

Vehicle GHG Emissions Goal – Reduce 7.4% back to 845.1 MT eCO_2.

Electric Vehicles With a relatively low amount of required daily mileage, electric vehicles are likely suitable replacements for most daily campus activities. In order to reduce emissions and strengthen the argument for purchasing electric utility vehicles, the university leased four all-electric vehicles (EVs) as well as several other hybrid vehicles.

Figure 7. 2019 Chevrolet Bolt at the Broyhill Wind Turbine

Though not included in Vehicle GHG emissions, AppalCART received its first all-electric bus and several other departments that are included in campus vehicle GHG emissions have begun incorporating EVs into their fleet, including Parking and Traffic, App State Police, App State Campus Mail, and several other of the smaller GEM vehicles. Broad acceptance and adoption of work trucks and passenger vehicles is largely dependent on the affordability and availability of commercially available options. There is also some resistance to EVs surrounding battery longevity and human and environmental impacts of lithium-ion battery production.

With a relatively small fleet of EVs, charging infrastructure has not yet been an issue. Most vehicles came standard with a phase two (240v) charger which the university has installed in select locations that charge specific vehicles. App State is currently in the process of applying for funding for EV chargers at its Hickory Campus. As EVs become more prevalent, the university will need to determine how many chargers to offer, electrical infrastructure requirements, and whether or not to charge fees for that energy.

Energy and Water Use

Appalachian State University's campus buildings represent approximately 6 million square feet with an additional 257,083 sq.ft. under construction. Campus buildings require significant amounts of energy and water so that occupants are comfortable and safe. Raw FY 22/23 energy and water consumption data is detailed below:

Figure 8. FY 20/21 Campus Consumption

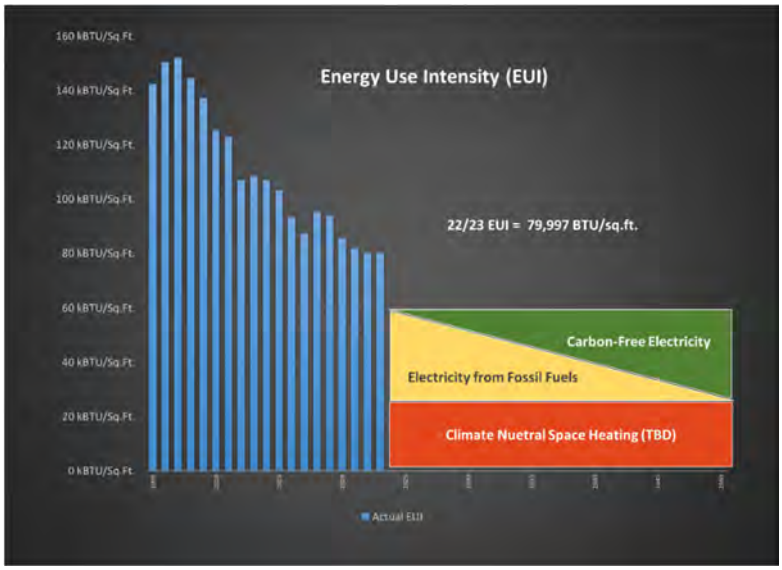
Utility	FY 222/23 Consumption	Percent Change from FY 21/22
Electricity	54,811,994 kWh	4%
Natural Gas	2,932,555 therms	2.80%
Gallons of Water	98,244,683 gallons	14.60%

Several factors can be attributed to these increases and while most are reasonable explanations, it is important not to 'explain away' net increases in energy use when the university is striving for climate neutrality. Factors to consider include, nearly 500k square feet of additional buildings, including the actively being renovated but energy intensive Hickory campus and a return to fully occupied campus during Jully 2022 as summer camps and conferences return after the COVID pandemic.

Energy Use Intensity

The university maintains various types of buildings (academic, housing, dining, arts, athletics, etc.). Because buildings vary in size, use, and design, comparing the amount of energy and water consumed between buildings requires establishing comparable metrics. Energy use intensity (EUI) and water use intensity (WUI) allow different types of buildings to be compared by analyzing consumption on a per square footage basis. For EUI, everything that uses energy (lighting, heating, etc.) is compared to the gross square footage of campus buildings.

Figure 9. Actual and Target Energy Usage Intensity



There is currently no shortage of efficiency opportunities at App State but determining the absolute lowest achievable EUI is based on three main factors: remaining efficiency opportunities, available funding, and leadership commitments. Facilities Operations has set the target EUI goal at 60,000 BTU per square foot (sq.ft.). Figure 9 shows that App State's current EUI is 79,997 BTU per sq.ft.

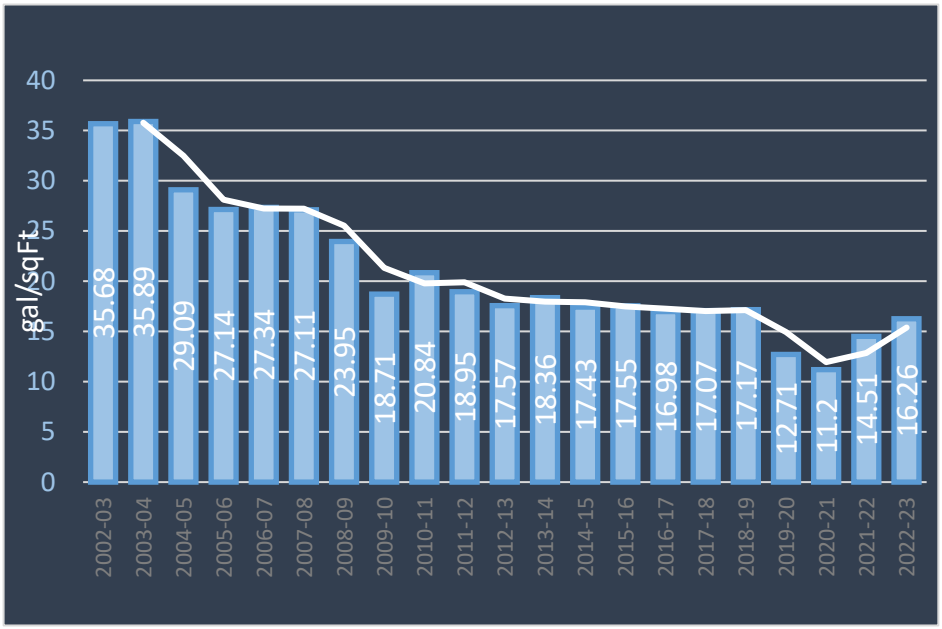
With campus activity returning to pre-pandemic levels and several new energy intensive buildings and major renovations, long term and significant EUI reductions will be challenging. Continued commitment to energy efficiency projects will be an essential component to reducing EUI but ensuring that new construction and large renovation projects are designed and constructed with aggressive energy efficiency standards will have an even greater impact on the university's future EUI and must be prioritized.

EUI Goal for 2023/24

With adequate financial and leadership support, achieving an EUI of 60,000 BTU per sq.ft. can be a realistic goal. The required commitment will impact every building on campus. For FY 22/23, the university will attempt to reduce its EUI by 2.5% to 77,997 BTU per sq.ft.

Water Use Intensity

Figure 10. Water Usage Intensity History



Like EUI, water use intensity (WUI) analyzes water consumption across the entire campus. In this report, WUI is expressed in gallons per square foot. Figure 10 tracks the university's WUI which has decreased significantly since 2002 due to increased attention to maintenance and installing low flow fixtures during the university's two energy saving performance contracts. Despite the downward trend, water usage increased in FY 22/23. While increased end user consumption played a factor, there were several major leaks that contributed to water usage increases. Both Peacock Hall and Living Learning Center experienced large, long-term leaks that wasted over 1 million gallons per month at each site.

Prior to FY 22/23 WUI remained flat during recent years following the implementation of the performance contracts (2008 and 2011). While most low flow fixtures are still in use, low flow upgrade opportunities do exist, but many water efficiency opportunities are related to campus chilled water usage for active cooling of buildings. App State's energy management team intends to highlight and prioritize these opportunities during FY 23/24.

FY 22/23 WUI was 16.3 gallons per square foot. This is a 12% increase from FY 21/22 and other years in the beginning of the COVID pandemic.

WUI Goal for 2022/23 - Identifying water efficiency projects and WUI reduction goals have to be a bigger priority for the university. The FY 23/24 goal is to reduce WUI 5% to 15.5 gallons per square foot as well as identify and develop at least 10 actionable water efficiency projects.

On-Campus Renewable Energy

The university has an increasing number of renewable energy systems on campus. Appalachian State University's Renewable Energy Initiative (ASUREI), a student-led, student-funded committee has been the primary funder of on-campus renewable energy installations including a 99kW photovoltaic system behind the university's data center that was energized in March of 2023.

In FY 22/23, on-campus renewable energy systems produced 290,668 kWh of electricity and 27.7 MMBTUs from solar thermal systems. On-campus renewable energy provided 0.21% of the university's total energy use. Figure 11 details the breakdown of on-campus renewable energy production.

Unfortunately, there is significantly more solar thermal capacity installed on campus than what is being operated. The lack of utilization has been due to unanticipated maintenance costs and labor requirements to keep systems operational. Less than 10% of the total solar thermal capacity on campus was operating during FY 22/23.

Figure 11. On-Campus Renewable Energy

Due to limited site and resource availability as well as the associated maintenance costs of wind energy, the university is currently prioritizing photovoltaic (solar-electric) as the preferred on-campus type of renewable energy system though the Innovation District previously described will include a significant increase in on-campus solar, wind, and geothermal technologies.

Opportunities – Both the University and ASUREI are actively considering several additional locations for future renewable energy systems including Chappell Willson roof PV, State Farm covered parking PV, and a 165-kW roof mounted PV system on the Hickory campus though none have been funded or designed.

Figure 12. On-Campus Renewable Energy Production 2022/23

	Annual Production
Broyhill Wind Turbine	78,190 kWh
Leone Levine Photovoltaic (PV)	79,042 kWh
Legends Electric Vehicle Charging Station PV	6,940 kWh
Library Traffic Circle PV	6,387 kWh
Frank Hall PV	49,137 kWh
Kathrine Harper/Kerr Scott PV	1,295 kWh
Peacock Mountain PV	2,236 kWh
Data Center PV	68,736 kWh
Plemmons Student Union Solar Thermal	27,727,112 BTU

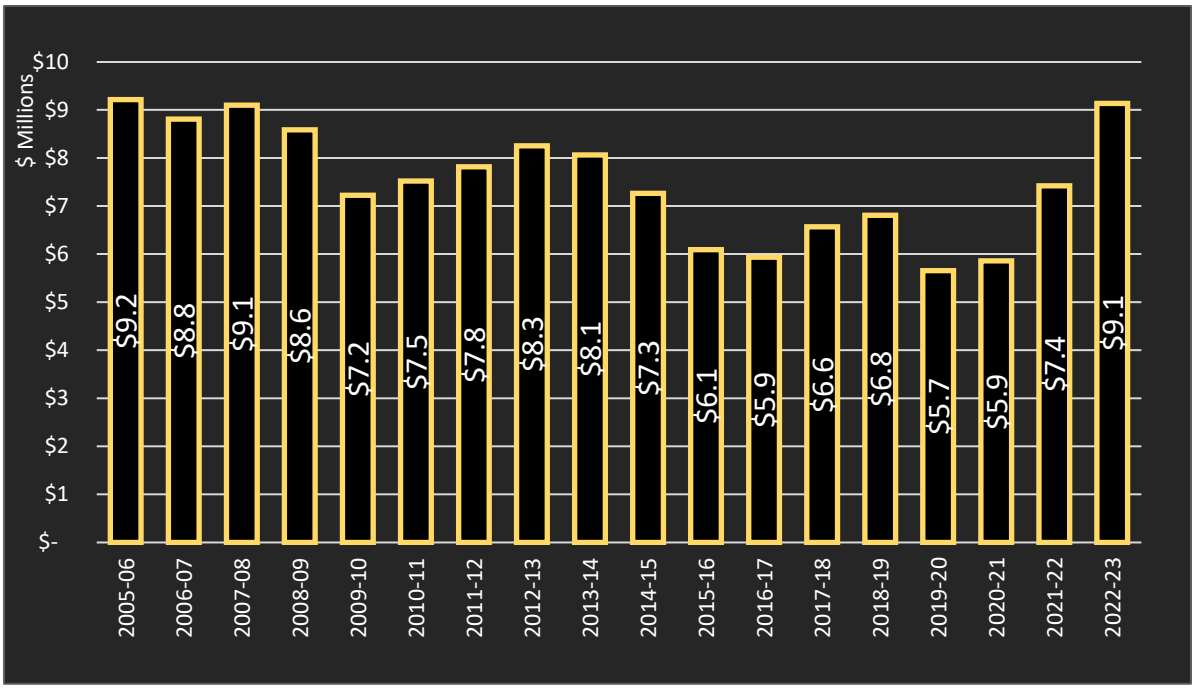
Energy and Water Expense

The amount of energy and water required by the university creates significant financial obligations and must be considered when determining future strategies. Reducing utility costs for the university helps strengthen resiliency and creates more opportunity for 1292-funded efficiency projects.

Energy

Figure 13 tracks total annual energy expense for all campus buildings. This includes the raw cost of electricity and natural gas but does not include billed rates from the steam plant that cover operating costs. Energy expenses increased significantly to their highest point since 2013-14.

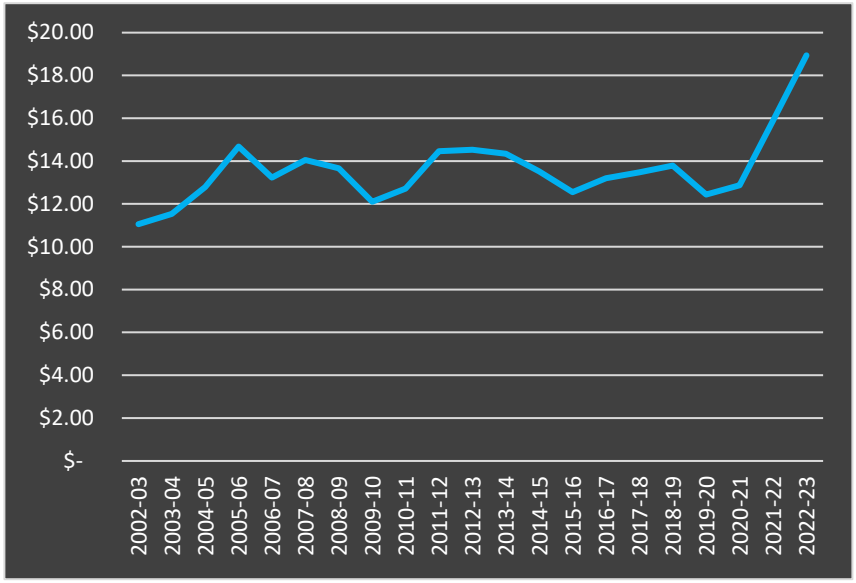
Figure 13. Total Annual University Energy Expense



The cost of energy has a direct impact on the university's overall utility costs. There has been a historical decline in the amount of energy consumed but the combined cost of electricity and natural gas (measured in $/ MMBTU) had not had a discernable trend in recent years. FY 22/23 marked the most significant change in the cost of energy with electrical prices rising 9.7% per kWh and the cost of natural gas increased 42.9% per therm.

With various factors affecting cost such as fuel supply, weather, and political influences, the price of energy over the last 20 years makes predicating future energy costs difficult. The conventional assumption is that the long-term cost of energy will increase but as the adoption of renewable energy increases and as the commercially-available supply of natural resources fluctuates, predicting future energy prices remains challenging.

Figure 14. Historical Energy Cost per MMBTU



During FY 22/23, Facilities Operations worked with the UNC system natural gas marketer, Texican, to purchase futures that locked in approximately 60% of the university's typical natural gas consumption at $5.39 / dekatherm (DTh) and $7 per DTh during winter fears when forecasters were predicting a price increase to $10 per DTh but the 2022/23 winter was exceptionally mild resulting in a significant drop in retail natural gas costs. Separate from the actual cost of natural gas, the state contract inexplicably allowed Texican to increase its basis (transportation) fee from $0.99 per DTh to $4.67 per DTh in December 2022 resulting in over $500k in additional transportation fees in the last 6 months of FY 22/23.

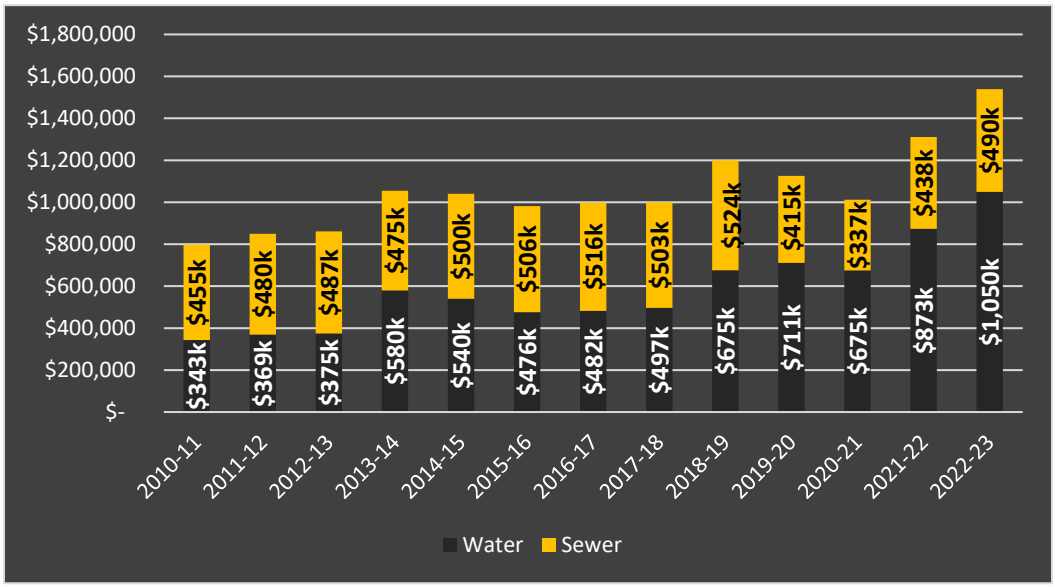
Facilities Operations spent considerable time reaching out to Texican's competitors and drafted a request for proposal with the goal of saving between $200k and $300K in the first 6 months of FY 23/24. When Texican learned that App State was planning on leaving the state contract, they drafted a separate agreement for the university that changed the basis fee from $4.67 per DTH to $2.25 per DTh. Additionally, the university purchased natural gas futures for 60% of their anticipated usage at $2.65 per DTh resulting in approximately $291k in savings for the first 6 months of FY 23/24.

Energy Expense Goal – Rather than making an educated guess of energy price futures, Appalachian State's energy expense goal is to identify and execute the most advantageous strategy for the second half of FY 23/24. Whether it includes rejoining the state contract or issuing the already prepared RFP to Texican's 5 competitors who are authorized to use Frontier Natural Gas' pipelines, App State will actively seek the most cost-effective energy options for the university.

Water and Sewer

The university has two costs associated with the water that is consumed on campus, water supplied and sewer costs. The majority of campus receives water from the university owned and operated water plant. The Town of Boone supplies water to 14 additional meters. The Town of Boone charges sewer fees for all of the water consumed on campus whether supplied from the University or the town.

Figure 15. Yearly Water and Sewer Expenses



Current water and sewer costs increased significantly as actual water consumption was up sharply compared to the previous two years when campus buildings, especially residence halls, were not at full capacity. With increased use and App State's water plant having built-in overhead and repair costs that are not necessarily correlated to the amount of water consumed, total water and sewer expenses both increased to its highest cost since 2009.

Water & Sewer Expense Goal – Reduce combined costs by 3% to $1.49 million. This reduction will only be possible with increased attention towards identifying leaky systems and other efficiency opportunities in existing buildings as well as a focused water efficiency approach in new buildings and large renovation projects.

Funding Energy Projects

Limited project funding requires consideration of potential efficiency measures as well as funding sources. The following is a list of previously used and potential funding sources for on-campus energy projects.

- **Appalachian State University** – In addition to student and faculty commitment to sustainability, Facilities Operations has an engrained and pragmatic approach toward efficiency and self-sufficiency. With ongoing operations and maintenance, Facilities staff work to increase the longevity and efficiency of equipment at the university. The university's Electricians, HVAC, Controls, Mechanical, Preventative Maintenance, Zone Maintenance, Motor Pool, and Steam shops continue to provide reliable services that extend the lifespan of university-owned facilities and equipment. Facilities Operations intends to continue to make significant investments in energy efficiency as funding allows.
- **Energy Saving Performance Contracts (ESPC)** – The university has used ESPCs as a way to fund energy measures installed with no upfront cost to the university. The energy service company (ESCO) claims savings throughout the life of the contract and while this has been an effective way to get a number of efficiency projects installed on campus, actual savings have been much less than what are claimed. Since ESPCs are not responsible for maintenance, reliability and occupant comfort, university staff have devoted significant resources towards troubleshooting installed ESPC efficiency measures.

  Alternatively, efficiency measures installed by university staff have reduced energy with less overhead and have typically resulted in high occupant satisfaction and system reliability.
- **Renewable Energy Initiative (ASUREI)** – A student-funded and student-led program that implements on-campus renewable energy systems and energy efficiency projects. The ASUREI has been the primary funder of on-campus renewable energy projects and has also contributed to a large number of Facilities Operations efficiency upgrades and projects.
- **North Carolina House Bill 1292** – provides UNC system schools the opportunity to retain unspent utility funding to be used for efficiency projects. Colleges and Universities must show that the 1292 savings being claimed have been a direct result of previously installed efficiency projects on academic and administrative buildings.
- **Grant Funding** – App State is currently in the process of applying for several grant opportunities from entities such as the Department of Energy, Frankenthaler Climate Initiative, State of North Carolina Department of Environmental Quality, and several others as funding opportunities that are anticipated.

  The university submitted a 1292 application for 2022/23 that identified nearly $1.2 million in 1292-eligible energy savings. App State expects to be able to access $926k in actual 1292 funding for FY 23/24/ Potential projects include: upgrading HVAC control systems, LED upgrades, window film, duct sealing, transformer upgrades, and several other projects detailed below that are intended to reduce the amount of energy consumed by the university.

Recently Completed Efficiency Projects

The following list of energy conservation measures were implemented during the past several years. Many of the projects were completed in stages as funding and labor availability allowed. This is not a complete list of energy saving projects, as regular improvements are engrained in day-to-day operations and are difficult to capture.

- **Campus-wide temperature and scheduling policy** – despite gaining campus-wide approval from the university's Energy Council, intra-departmental complexities have prevented several buildings from adopting the 68 – 74 deg F setpoints. There has also been significant pushback from several faculty and staff that these temperatures are too extreme. Overcooling is also a persistent issue in several buildings where the minimum occupied flow CFM brings the zone temperature well below 74 degrees.
- **Building Automation System Retuning –** following guidance from Pacific Northwest National Laboratories (PNNL) BAS Retuning training as well as strategies from Life Cycle Controls and App State staff expertise, energy management staff regularly completes trend analysis to identify optimization issues. Trends that were most commonly analyzed this past year included:
    - HVAC scheduling analysis to ensure buildings are not being conditioned when mostly empty and supply and return fans are staying off for the majority of unoccupied periods.
    - Discharge air temperature (DAT) versus discharge air temperature setpoints (at the air handler) to determine if DAT resets were in place and/or working correctly.
    - Discharge air pressure (DAP) versus DAP setpoint to ensure that static pressures from air handlers were effectively being reset based on building demand for heating/cooling.
    - Optimal Start Stop (OSS) – Easily overlooked, OSS actively determines the latest possible time a building can begin cooldown/warm up. While technically existing in many buildings, OSS was not operating as intended in most buildings. Through considerable efforts of one of the Controls programmers, OSS was corrected in the following buildings: Peacock Hall, College of Education. Anne Belk, BB Dougherty, Leone Levine, Sandford Hall, and Schaeffer Auditorium.
        - For example, the six air handlers in the College of Education were scheduled to be occupied by 7 AM. The existing OSS programming was almost always going to the maximum of 2 hours and going occupied at 5 AM. Now with programming changes (looking at zone average temperature instead of single hottest/coldest zone as well as going straight to max cooling/heating), OSS has been on average 30 minutes or less even on the hottest/coldest mornings.
    - Operator Override Audits – To identify settings that were temporarily modified but unintentionally left active.
- **ASUREI Data Center PV Array** – Completely funded and designed under the leadership of committed students, this 99-kW photovoltaic solar array began construction and is expected to be

completed during the fall of 2022. The array is behind the university's main data center which consistently has a load of approximately 90-100 kW. Estimated annual output: 120,000 kWh.

- **Anne Belk Telecom HVAC -** App State's IT department runs a central internet server in the basement of Anne Belk for 7 surrounding buildings. Air Handler One that serves that building is the largest AHU in that building and was being occupied 24/7 to keep the telecom room cool enough so that the main internet server would not shutdown. Additionally, there was no supply vent to the room that is located next to the air handler so at some point a hole was cut into the main supply duct. This was effective in keeping the room cool but it also reduced static duct pressure for the remainder of the unit's zone. App State HVAC installed a mini split for the room and is in the process of sealing the hole cut in the supply duct. Air handler 1 is now being scheduled in accordance with the building's occupancy schedule.
    - Total FY 20/21 Project Budget: $7,635
    - Simple payback: 0.7 years

- **Chapell Wilson Window Film** (ASUREI funded) – With direct south/southwest exposure on half of the windows in the building, the university contracted the installation of ceramic window film.
    - Total FY 20/21 Project Budget: $17,875
    - Simple payback: 2.0 years (Energy Modeling with eQuest)
    - Additional comments: In addition to the energy savings from reduced chiller operation, wintertime convection loops from the temperature differences between outside and inside should improve occupant comfort year-round.

- **College of Education Window Film** (1292 funded) – Two sides of the building were treated with ceramic window film to reduce the demand for chilled water. Previously the building had difficulties maintain modest cooling setpoints between 73 and 74 deg F in many south and west facing zones. App State HVAC and Controls shops along with energy management staff put considerable effort into optimizing that building's systems. The window film installation is an additional measure intended to improve the building envelope and ease demands on the HVAC system
    - Total FY 20/21 Project Budget: $76,000
    - Simple payback: 4.9 years (Energy Modeling with eQuest)
    - Additional comments: In addition to the energy savings from reduced chiller operation, wintertime convection loops from the temperature differences between outside and inside should improve occupant comfort year-round.

- **DD Dougherty VAV Controls Upgrade (1292 Funding)** – Although not the highest energy consuming building DD Dougherty represents a great example of efficiency opportunities in an older building. With an entire building LED upgrade, there has been a marked decline in energy use. With the completion of the DD Dougherty VAV Controls project, App State can implement its most aggressive controls sequences that include: demand-based ventilation, discharge air

temperature resets, static pressure resets, hot water resets, chilled water differential pressure reset, improved scheduling functionality, and improved remote monitoring/diagnosing.

- Total FY 20/21 Project Budget: $89,235
- Estimated annual avoided energy: 45,455 kWh and 361 MMBTU of steam
- Simple payback: 4.2 years

- **Belk Library N2 Upgrade** (1292 Funded over two years) – Upgrade the Belk Library outdated building automation system communication protocols from N2 to BACnet. These upgrades will allow App State Controls Shop to implement numerous control strategies that will reduce energy se including discharge air temperature resets, static pressure resets, hot water resets, chilled water differential pressure, improved scheduling functionality, and improved remote monitoring/diagnosing.
  - Cost - $229,976. Materials - $183,876 and labor - $46,100
  - Anticipated Energy Savings - 76,953 per year between electricity and steam with a 2.9-year simple payback.

- **Belk Library LED Upgrade (**1292 funded with a $20k match from ASUREI) **–** This project upgraded every existing fluorescent T8 lighting to LED. This building had over 8,000 single 4ft T8 bulbs, nearly 800 2'x2' T8 troffers, and nearly 500 other lighting fixtures. The library generally operates 24 hours a day, 5 days a week and at least 16 hours on the other two days. This project was able to capitalize on significant de-lamping opportunities. Additionally, instead of installing one LED for every 4-foot fluorescent that was removed, light levels were more than sufficient so for every two fluorescent that were taken out, only one LED replacement was installed.
  - Final Cost: $248,223
  - Anticipated Energy Savings: $56,648 per year (537,975 kWh per year) with a 4.4-year payback.
  - Additional: The contracted electricians that completed the majority of the installation was also able to repair the lighting control system for the third-floor stacks that had not worked in at least 12 years.

- **Holmes Convocation Center Lighting Upgrade** (1292 Funded) – Appalachian State purchased and installed over 1,300 LED fixtures in the second highest energy consuming building on campus. This initial phase of the project upgraded 90% of the building. With anticipated future 1292 funding, Facilities operations will complete the lighting upgrades for the entire building.

  Project data:
  - Total Project Budget: $145,070 (Phase 1) + $24,899 (Phase 2) = $169,969
  - Estimated Avoided Annual Energy: 262,261 kWh/year
  - Estimated Simple Payback: 6.5 years.

  - Additional: This project was a large push for in-house electricians with competing priorities. University preference is for in-house installation because of associated cost savings but also because of the high quality of work. App State did have to contract with local electricians to complete some of the work and was a good example of how some projects can be completed by combining in-house and contracted resources.

- **Steam Meters Academic Buildings -** If the university cannot accurately measure building specific steam use, steam energy cannot be effectively managed. Existing condensate meters are hand read and go through four different staff before being analyzed on a monthly basis. This makes making financial efficiency decisions challenging as a number of buildings have inconsistencies with their monthly readings.

  The university's two existing performance contracts included ECMs that installed Spirax Sarco steam meters. After two years, the meters were excluded from the contract because the ESCO was not confident in the data being used. Many of those meters were not serviced and most were never brought into the building automation systems. This project was broken down into two categories:

  - Survey of Existing Meters – App State contracted with Spirax Sarco to inventory existing meters to determine which ones were still reliable and could be recalibrated. Of the 30 meters surveyed, 19 were determined to be capable of being brought back into service. App State Controls shop is in the process of connecting these meters to the BAS. This will allow much more impactful energy management.
  - Purchased 11 new meters – Endress & Hauser won the competitive bid process and App State is currently in the process of installing these meters. Half were contracted out to a local installer and half will be competed in house with non-1292 funding.
- **Pipe Insulation – Multiple Buildings** – Funded by both Facilities Operations and the ASUREI, several pipe insulation improvement projects were completed. These include pipe insulation on steam, hot water, and chilled water lines. Additionally, App State has begun reinsulating deteriorated insulation on chillers. Primarily using the software 3E Plus V4.1 to verify cost effectiveness, virtually every campus pipe insulation project has a payback of less than 1 year, even with being installed by an outside contractor.
- **BB Dougherty Window Film**
  - Objective: Apply ceramic window film to the east, south and west sides of the building to reduce solar heat gain and chilled water demand while also minimizing wintertime convection loops that impact occupant comfort.
  - Cost: $40,049 with an anticipated payback of less than 5.0 years.
- **Pipe Insulation (Multiple Buildings)**
  - Objective: Continue to improve the existing condition of pipe insulation on various campus mechanical systems. include pipe insulation on steam, hot water, chilled water lines, and chillers. The majority of pipe insulation that is installed is permanent but on equipment that

receives regular service (e.g. valves, meters, etc.), removable custom blankets will be applied.

  - Estimated Cost: $29,086 has been allocated
  - Payback: 1.0 years or less. Confirmed using 3E Plus V4.1

- **Rankin North and South – Aerosolized Duct Sealing** (1292 and ASUREI)
  - Objective: Seal HVAC ducts to improve the efficiency of the system that operates 24/7, every day of the year. Rankin North's fume hood system and the vivarium with living animals requires constant flow and temperatures. On the supply side, duct sealing will more efficiently deliver air where it is intended to go. On the exhaust side, duct sealing will prevent excess conditioned air from being exhausted outside.
  - Cost: $76,000 (Rankin North) and $79,297 (Rankin South) – ASUREI contributed $40k
  - Payback: 3.7 years* - Aeroseal overestimated their CFM reduction goals by more than 6,000 CFM but because the guarantee a certain CFM reduction, App State has a credit that can be applied to other buildings. Currently analyzing feasibility at Garwood Hall, Belk Library, Convocation Center, and the Student Rec Center.

Anticipated 1292 Projects – FY 2023/24

The following projects are currently being developed to be funded with $926,805 of 1292 carryforward funding. App State intends to leverage this funding with grant funding and ASUREI's continued support. Depending on contract bids, material availability and available labor, projects are subject to change.

- **John E. Thomas HVAC N2 Controls Upgrade** – Similar to recently completed projects at the Belk Library and DD Dougherty, Facilities Operations will purchase HVAC controls materials from Johnson Controls to upgrade communications protocols from the unsupported N2 to BACnet. This change allows the Controls shop to implement energy saving controls sequences that include demand-based ventilation, discharge air temperature resets, static pressure resets, hot water resets, chilled water differential pressure reset, improved scheduling functionality, and improved remote monitoring/diagnosing.
  - Cost - $248,396 (Materials - $195,404 and labor - $52,992)
  - Anticipated Savings – Neither of the two AHUs in John E Thomas have submetering on the supply or return fans making avoided energy calculations challenging. Because the HVAC operates 24/7 (with a partial supply fan output nightly reset) and has very few energy saving programming in the BAS, it is reasonable to apply the same rate of savings as was calculated for the Belk Library. Increasing the payback period to ensure conservative assumptions, a 5-year payback would yield an annual savings of $49,679, representing a 21% reduction in energy costs.
- **Rankin West Aerosolized Duct Sealing** – Rankin West AHU operates 24/7 because oof several sensitive areas but also because the HVAC technology prevents the Controls Shop to monitor

conditions unless the AHU is operating. Facilities Operations recently implemented a nightly AHU static pressure reset that maintains temperature but backs down the AHU during unoccupied times. By sealing Rankin West's ducts that were measured to be approximately 20% leaky, the university anticipates recovering the project's cost of $56,538 in less than 4 years. App State is currently applying for a grant that would provide matching funds for several ECMs in Rankin West.

- **Student Rec Center Pool Heating** – Replacing dehumidifier unit pumps and control valves so that the pool is heated the way it was intended. Estimating anticipated energy savings is challenging because the dehumidifier recovery units have not worked as designed. With a total project cost of $43,444, App State is confident that this project will be cost-effective.
- **Chapell Wilson – LED Lighting Upgrade –** Upgrade all remaining non-LED lights, de-lamp where possible, and install dual technology occupancy and dimmer switches in all offices and classrooms. Because Chapell Willson lighting was not included in either performance contract, original fluorescent ballast improves the payback period of this project.
    - Cost - $66,115 (Materials - $50,615 and labor - $15,500)
    - Estimated Savings - $9,237 per year (87,802 kWh per year) with a 7.1-year simple payback. Actual savings should improve significantly as occupancy sensors / dimmer switch default comes on at 50% light level with reduce operating times anticipated.

- **Chapell Wilson – Ceramic Window Film (Phase 2)** – Installed on the south side of the building in March of 2022, there has been a considerable difference in areas that received ceramic window film. App State intends to treat the remaining windows as summer sunlight impacts the rest of the building as well.

- **Facilities Operations Complex – LED Lighting Upgrade** – When App State completed the Belk Library LED project, it was determined that one 4-ft LED bulb provided sufficient lighting for every two fluorescent bulbs removed. This left the university with approximately 1,800 4-foot LEDs that could be installed elsewhere. App State will upgrade all remaining LEDs at the Facility Operations buildings with minimal costs.
- **Belk Library and/or Convocation Center – Duct Sealing** – App State is currently working with Aeroseal to determine which building would be most appropriate to apply CFM reduction credits from the Rankin North and South projects. Minimal anticipated costs to the university.
- **Turchin Center Efficiency Upgrades (Grant Match**) – App State recently was awarded a grant from the Frankenthaler Climate Initiative for several efficiency upgrades at the Turchin Center for the Arts. The project will consist of upgrading all remaining non-LED lights, upgrading the HVAC N2 controls to BACnet and applying ceramic window films to exterior windows. 1292 funds are expected to provide a 30% match to the $100k awarded for the project.
- **Belk Library Outside Air/Free Cooling Design –** The Belk Library and 4 other campus buildings are served by the College Street Chiller plant. Currently, the chiller plant operates 12-months per year to satisfy the cooling requirements at the library. The College Street chiller plant has an inoperable plate and frame heat exchanger that was intended to provide free-cooling but the system

has never operated as intended. Alternatively, the library's outside air capacity is limited at 20%. App State intends to work with a mechanical engineer to evaluate the most practical and cost-effective solution for non-chiller based, winter-time cooling whether it be replacing the plate and frame heat exchanger or increasing the amount of outside air at the library so that the air handlers can economize.

- **Garwood Hall Chiller Variable Speed Drive –** Facilities Operations recently replaced the chiller at Garwood Hall with a less efficient unit. The previous unit was an ultra-efficient magnetic bearing chiller, but the unit had continued maintenance issues that had costed the university more than $200k in maintenance costs over the last several years. Leadership decided to replace the unit with a more conventional, less efficient unit. Unfortunately, the new machine is unable to unload beyond 40% of its capacity, meaning that the Controls shop had to temporarily disable several energy-saving control strategies until a variable speed drive can be added to the unit that will allow the chiller to unload down to 20% of its rated capacity.
- **Phoenix Fume Hood Control System –** The Phoenix system controls fume hoods in Garwood Hall, Rankin North, and Rankin South. This upgrade will increase reliability and resiliency as the existing Windows 7 devices cannot be replaced when the computer dies. Currently these PCs that operate one of the most energy intensive systems on campus are significantly outside of their expected lifespan. When the computer goes out, the university would lose global control and visibility into the Phoenix system for that building. Because these facilities are monitored and commanded by the Aircuity system, a global failure would prevent the system from reacting if the laboratory becomes unsafe due to a spill or failed hood, there will be no automatic response from the system which would result in significantly higher energy consumption.
- **Rankin West Efficiency Project (Potential Grant Match) –** App Sate is listed as a potential subrecipient on a grant that Second Nature applied for to the DOE Energy Efficient Pilot Program. If awarded, $200k would be funded by DOE and Second Nature while 1292 funds would represent $100k match. If selected, App State would complete three ECMs:
    - Upgrade remaining non-LEDs.
    - Upgrade building transformers to 99%+ efficient,
    - Aerosolized duct sealing.
- **Anne Belk LED -** Upgrade all remaining non-LED lights, de-lamp where possible, and install dual technology occupancy and dimmer switches in all offices and classrooms.
    - Cost - $139,550 (Materials - $115,000 and labor - $24,550)
    - Estimated Savings - $14,953 per year (142,001 kWh per year) with a 9.3-year simple payback. Actual savings should improve significantly as occupancy sensors / dimmer switch default comes on at 50% light level with reduce operating times anticipated.
- **Anne Belk Aerosolized Duct Sealing –** Ducts were measured to be losing 10% of conditioned air leaving the air handlers for AHUs 1, 2, and 7. Anne Belk operates longer than most other buildings throughout the day and much of the areas served by AHU 1 and 2 are zoned so temperature and

humidity conditions cannot be seen in the building automation system. Cost will be $20,000 with an estimated annual savings of $4,000.

- **Professional Development –** Association of Energy Engineers offers two trains that App State's energy management team would pursue (one per team member) – Certified Energy Auditor and Certified Building Commissioning Professional. These trainings would provide additional competency for identifying and addressing building deficiencies, especially during periods when access to funds is limited.
- **Water Plant – LED Upgrade –** With 16 large 300w metal halide lights that are extremely difficult to reach, the App State water plant is not sufficiently lit for the operators that maintain the plant that serves safe drinking water to up to 22,000 people daily. Upgrading the existing LEDs will save 1,176 per year (11,755 kWh) and also improve the quality of light of this essential university facility. Costs are estimated to be $6,127 with a payback of 5.1 years. Actual project cost is likely to be lower depending on what type of lift is required to reach the existing fixtures.
- **Multiple Buildings – Building Envelope Improvements –** Weatherstripping and Door Sweeps – Multiple buildings have doors that need improved weatherstripping and/or door bottoms. One of the Fall 2023 energy management intern's first projects will be to inventory exterior doors and prioritize entryways.
- I**dentify and Prioritize Significant Water Efficiency Projects**

ECU Strategic Energy & Water Plan (2023-2024)

TABLE OF CONTENTS

EXECUTIVE SUMMARY

General

The preparation of the 2023 - 2024 ECU Strategic Energy and Water Plan involved consolidating responses by the departments in Campus Operations related to procedural changes or projects that contributed to the conservation of energy or water. This year's plan documents Campus Operations' successes related to energy and water conservation based on the availability of funding sources, be they operating, repair and renovation, or energy savings carry forward.

Analysis

Through the continued efforts of Campus Operations and the East Carolina University community, the institution has realized a 30% decrease in its energy consumption and a 54% reduction in water consumption in 2022-2023 from the FY 2003 baseline. When compared to the previous year, electrical consumption increased 4.7% per gross square foot while natural gas usage decreased by 1.4%.

"The institution has realized a 30% decrease in its energy consumption and a 54% reduction in water consumption since our FY 2003 baseline."

The energy consumption data included in this report is "raw" metered data (i.e., it does not take temperature variations into account). To better appreciate ECU's effort to improve energy efficiency, the top chart on page 4, "ECU Annual Energy Consumption" includes a weather-normalized view of the total energy usage per square foot. The weather-normalized EUI (Energy Utilization Index) shows a decrease of 15.3% since our 2002-2003 baseline. Over this same period, we experienced an increase in the campus gross square footage of 64.7%.

"When compared to the previous year, electrical consumption increased 4.7% per gross square foot, while natural gas usage saw a 1.4% decrease."

During FY 2023, ECU completed ASHRAE Level I audits on 11 buildings and Level II audits on 5 buildings. These audits will provide us with projects to implement with HB 1292 funds in future years. For Fiscal Year 2024, we plan to conduct ASHRAE Level I and Level II audits on additional buildings. We also plan to conduct our first building optimization Kaizen event on a high energy consuming building.

Excluding the COVID period anomaly, ECU maintained nearly the exact same water usage in total and per gross square foot as fiscal year 2022. We did not expand our Rain Bird Smart Irrigation coverage area last year as Grounds Services was still backfilling vacant positions from the pandemic. We hope to add another coverage zone this fiscal year, which will enable our grounds team to optimize the irrigation program as this system utilizes weather and evapotranspiration data to automate the irrigation schedules.

"ECU maintained nearly the exact same water usage in total and per gross square foot as fiscal year 2022, which is still a reduction of 53.5% since the 2002-2003 baseline."

ECU continued replacing the failing steam infrastructure serving our College Hill housing neighborhood, completing the third of three phases this summer. These projects have replaced the old, deteriorating lines with new, pre-insulated ones that will improve condensate return to the plant and reduce our energy losses in transmission.

Now that the ECU Sustainability Program has a Sustainability Outreach Specialist position filled, we plan to make our energy consumption data more visible to students, staff, and faculty. Beginning in fall 2023, we intend to start including energy data for our Main Campus and Health Sciences Campus in our monthly newsletter. We will present a chart of consumption for each campus and a link to our website where we will host monthly consumption data in more detail. Hopefully, this will make some people think more about the energy they consume while working and learning on campus.

On October 29, 2018, Governor Roy Cooper issued Executive Order No. 80 establishing targets for Greenhouse Gas (GHG) emission reductions throughout North Carolina. One of the order's specific actions directs a 40% reduction in energy consumption (per square foot) of state-owned buildings by the end of fiscal year 2025. The baseline continues to be our FY 2003 level. More recently, in January of 2022, Governor Roy Cooper issued Executive Order No. 246, affirming North Carolina's commitment to a clean energy economy, and directing next steps in the state's plan to achieve net-zero GHG emissions and create economic opportunities across the state of North Carolina. This increased the statewide goal to a 50% reduction from the 2005 levels by 2030 and achieving net-zero GHG emissions by 2050.

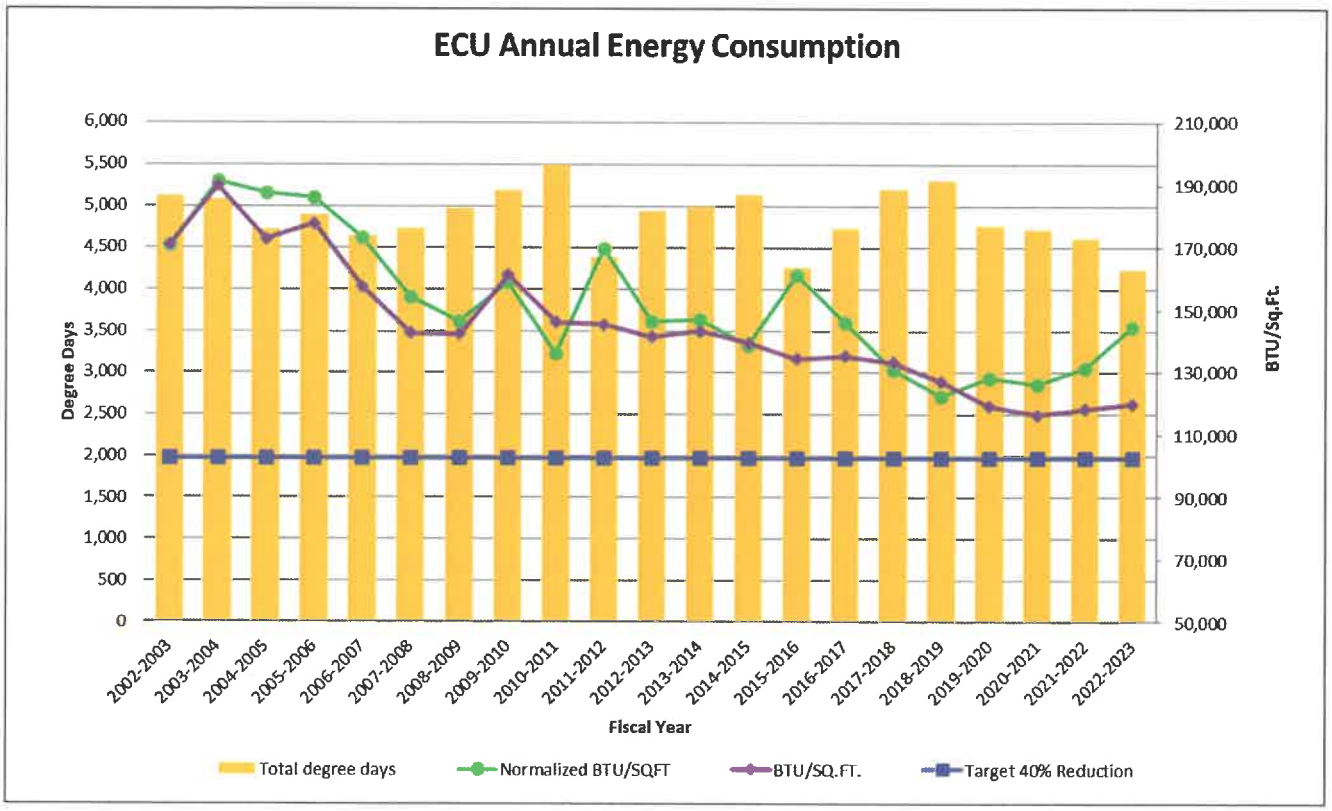
For ECU to achieve targeted energy consumption goals, substantial reductions must still be realized. These reductions will require both the continued replacement of less efficient equipment utilized on campus as well as making behavioral changes in how campus facilities are occupied and operated. Over the next twelve months, ECU will continue to pursue equipment upgrades, retrofits, and conversions, while also ensuring the campus is operated as efficiently as possible. These endeavors will be undertaken without compromising our primary missions of education and research. This will include such actions as continuing to establish and maintain building operating schedules and defining optimal building operating parameters for energy intensive locations, such as research labs. These efforts, combined with continued campus community education and involvement, will continue to allow ECU to move closer to targeted reductions.

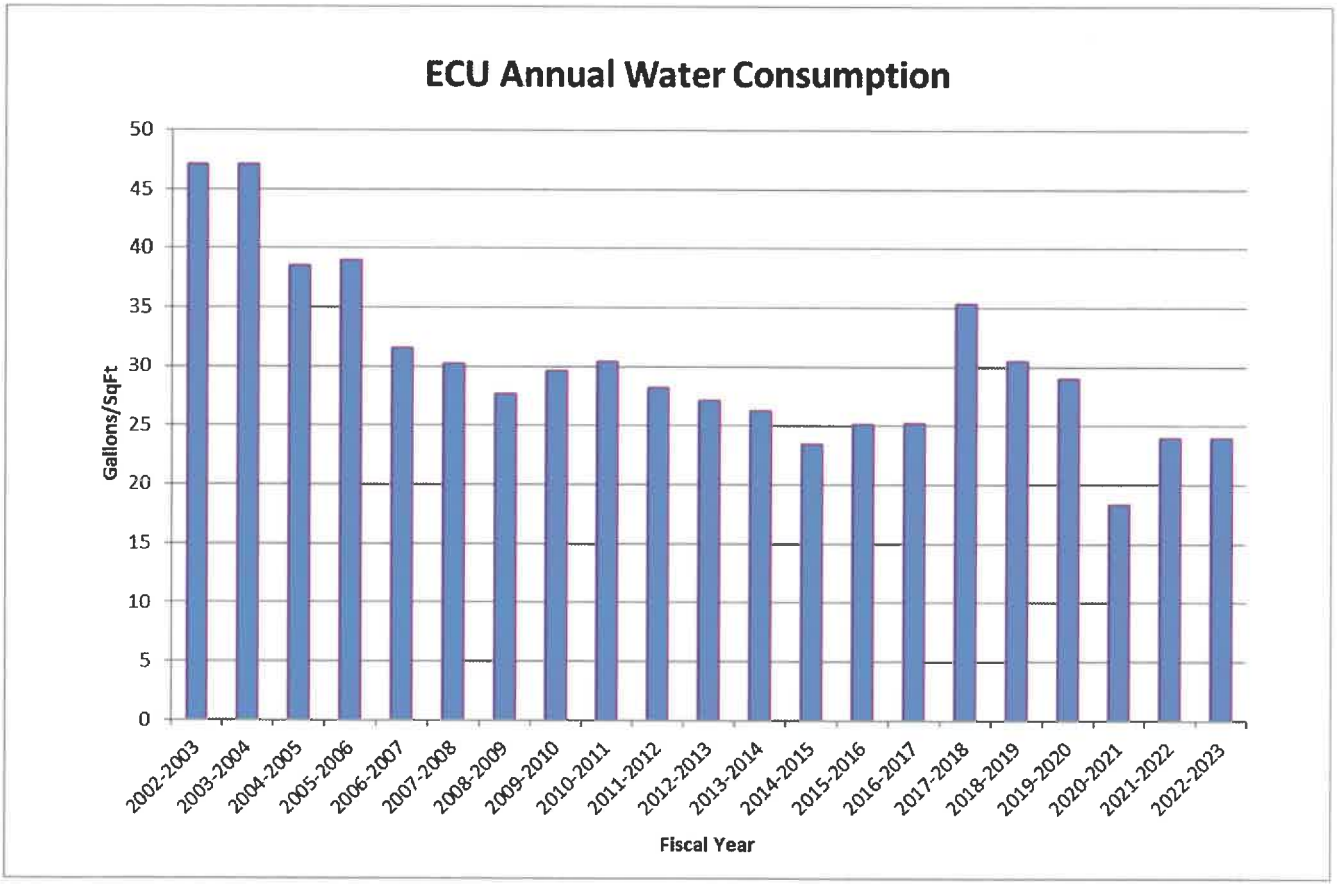
Griffin Avin
Chief Sustainability Officer

Chad Carwein
University Sustainability Manager

Sammy Snead
University Energy Manager

Summary of referenced data





ENERGY PERFORMANCE SUMMARY

(Data is not weather-normalized)

Fiscal Year	Total Utility Costs	Cost / MMBTU	Cost / GSF	BTU / GSF	% Change from 2003
2002-2003	$11,021,822	$12.50	$2.13	170,724	-
2003-2004	$12,661,561	$12.32	$2.33	189,287	10.9%
2004-2005	$14,277,138	$14.29	$2.47	172,569	1.1%
2005-2006	$17,129,124	$16.66	$2.96	177,567	4.0%
2006-2007	$17,297,153	$16.30	$2.56	157,404	-7.8%
2007-2008	$17,569,897	$17.14	$2.44	142,573	-16.5%
2008-2009	$18,924,248	$19.16	$2.72	142,207	-16.7%
2009-2010	$19,658,784	$17.71	$2.86	161,238	-5.6%
2010-2011	$18,392,943	$17.84	$2.61	146,059	-14.4%
2011-2012	$18,151,180	$17.58	$2.56	145,433	-14.8%
2012-2013	$17,942,582	$17.15	$2.42	141,416	-17.2%
2013-2014	$17,883,685	$17.13	$2.43	141,752	-17.0%
2014-2015	$18,628,334	$17.97	$2.51	139,480	-18.3%
2015-2016	$16,361,605	$15.93	$2.14	134,410	-21.3%
2016-2017	$15,864,576	$15.35	$2.08	135,262	-20.8%
2017-2018	$15,364,652	$14.88	$1.98	133,158	-22.0%
2018-2019	$16,022,036	$15.18	$1.93	127,096	-26.0%
2019-2020	$15,604,175	$15.50	$1.85	119,270	-30.1%
2020-2021	$14,372,208	$14.96	$1.72	116,452	-31.8%
2021-2022	$17,037,778	$16.66	$1.97	118,377	-30.7%
2022-2023	$17,213,868	$16.55	$1.98	119,914	-29.8%

SUPPLY

Strategies

- Continue to implement programs and initiatives to make University's energy management more effective.
- Strive to obtain reasonable cost of interruptible natural gas from local provider.

Tactics

PAST 12 Months' Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				
Schneider Electric PME Technical Support	Subscription renewed	Subscription renewed	$0	$0	$15,000	0	Griffin Avin	HB1292 Funds
Brightly Energy Management Software Technical Support	Subscription renewed	Subscription renewed	$0	$0	19,464	0	Griffin Avin	HB 1292 Funds
Fill Energy Manager Position	Position Filled	Position Filled	$0	$0	N/A	1	Griffin Avin	Campus Operations Funds
Fill Sustainability Outreach Specialist position	Position Filled	Position Filled	$0	$0	$42,000 / year	1	Griffin Avin	Campus Operations Funds
Complete Engineering Evaluation for installing rooftop solar arrays at HSC (Warren Life, ECHI, and CUP)	Rooftop Solar Design Report	Completed	TBD	TBD	TBD	0	Griffin Avin / Chad Carwein	HB1292 Funds

SUPPLY

Strategies

- Continue to implement programs and initiatives to make University's energy management more effective.
- Strive to obtain reasonable cost of interruptible natural gas from local provider.

NEXT 12 Months' Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				
Schneider Electric PME Technical Support	Subscription renewed	Renewal in process	$0	0	$15,000	0	Sammy Snead	FY 2022 HB1292 Funds
Brightly Utility Manager utility data collection	Subscription renewed	Renewal in process	$0	0	$20,000	0	Sammy Snead	FY 2022 HB1292 Funds
Create Energy Analyst position	Position approved	Under Review	$0	$0	N/A	1	Griffin Avin	Campus Operations Funds
Rooftop and Parking Lot Solar Energy Modeling Senior Engineering Capstone	Report Produced	TBD	TBD	TBD	$0	0	Chad Carwein	Campus Operations Funds

DEMAND

Strategies

- Continue to implement programs and initiatives, install equipment, and renovate buildings to make University buildings more efficient.

Tactics

PAST 12 Months' Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				
Replaced obsolete building automation system Carol Belk Bldg	Project Complete	Completed Dec-23	$16,927	$16,927	$115,125	0	Chris Brown	HB 1292 Funds
Replace Failed steam traps HSC distribution	Project Complete	Completed Jun-22		$8,013	$10,870	0	David Skinner	HB 1292 Funds
Upgrade building automation system Brewster	Project Complete	Completed Jun-22		$28,203	$1,546,376	0	Chris brown	HB 1292 Funds
Lighting Performance Contract surplus savings	Project Complete			$113,957	0	0	Griffin Avin	N/A
Replace old gas packs with higher SEER units	Project Complete	Completed Mar-22		$1,121	$47,529	0	Chris Phelps	HB 1292 Funds
Replace obsolete building automation system Cotanche	Project Complete	Completed Apr-22		$39,825	$94,563	0	Chris Brown	HB 1292 Funds
Implement occupancy schedules - 8 SLC, Family Medicine, HSC Student Center, ECU Physicians, Neuro and Spine	Project Complete	Completed Feb-23		$9,907	0	0	Gray Hamill	N/A
ASHRAE Level I Audits of 11 buildings with high EUI relative to benchmarks	Final Reports	Rec Reports		0	$20,000	0	Sammy Snead	HB 1292 Funds
ASHRAE Level II Audits of 5 buildings with high EUI relative to benchmarks	Final Reports	Rec Reports		0	$142,500	0	Sammy Snead	HB 1292 Funds

DEMAND

Strategies

- Continue to implement programs and initiatives, install equipment, and renovate buildings to make University buildings more efficient.

Tactics

NEXT 12 Months' Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				
VAV Controller Replacements - Rivers	Improved Operational efficiency	In Process	20,000	TBD	$147,600	0	Dan Durham	HB 1292 Funds
VAV Controller Replacements - Flanagan	Improved Operational efficiency	In Process	$25,000	TBD	$228,200	0	Dan Durham	HB 1292 Funds
VAV Controller Replacements - Old Café	Improved Operational efficiency	In Process	$5,000	TBD	$68,200	0	Dan Durham	HB 1292 Funds
De-Commission/Reassign Spaces - Old Life Sciences	Energy Savings	In Process	$40,000	TBD	$52,200	0	Sammy Snead	HB1292 Funds
LED Lighting Upgrade - Jenkins Art	Energy Savings	In Process	$50,000	TBD	$424,000	0	Sammy Snead	HB1292 Funds
Conduct Pilot Project to create an In-House Building Optimization Kaizen Program	Final Report	In Process	NA	TBD	0	0	Griffin Avin	HB 1292 Funds
Occupancy Schedule Resets and Controls Updates - Speight	Energy Savings	In Process	$15,631	TBD	$10,000	0	Sammy Snead	HB1292 Funds
Install two 3.6kW solar trees	Trees Installed	Project Complete	$766	TBD	$147,296	0	Sammy Snead	HB1292 Funds
Audit Sterilizer Equipment - Warren Life Sciences	Energy Savings	In Process	$46,956	TBD	$11,900	0	Sammy Snead	HB1292 Funds
Space Level Systems Resets - Warren Life Sciences	Energy Savings	In Process	$50,000	TBD	$10,000	0	Sammy Snead	HB1292 Funds
Upgrade BAS - West Research Campus	Improved Operational Efficiency	In Process	$33,347	TBD	$210,000	0	Gray Hammit	HB1292 Funds
ASHRAE Level I Audits of 10 buildings with high EUI relative to benchmarks	Final Report	TBD	TBD	TBD	$20,000	0	Sammy Snead	HB1292 Funds
ASHRAE Level II Audits of 5 buildings with high EUI relative to benchmarks	Final Report	TBD	TBD	TBD	$150,000	0	Sammy Snead	HB1292 Funds
Occupancy Schedule Resets - Joyner Library	Energy Savings	In Process	$50,000	TBD	$10,000	0	Sammy Snead	HB1292 Funds
Occupancy Schedule Resets - Jenkins Art	Energy Savings	In Process	$20,000	TBD	$10,000	0	Sammy Snead	HB1292 Funds
Remove Steam Coils & Replace with Heating Hot Water Coils in 6 AHUs - Science & Tech	Energy Savings	In Process	$54,755	TBD	$416,900	0	Sammy Snead	HB1292 Funds
Evaluate Lighting Upgrades - McGinnis and Messick (4 phases @ $450k each)	Energy Savings and Educational Value	In Process	TBD	TBD	$1.6 million	0	Chad Carwein	TBD

DEMAND

Strategies

- Continue to implement programs and initiatives, install equipment, and renovate buildings to make University buildings more efficient.

Tactics

NEXT 12 Months' Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				
Advanced Energy Recovery/ AHU-1, AHU-2 - Warren Life Sciences	Energy Savings	In Process	$118,000	TBD	$382,400	0	Sammy Snead	HB1292 Funds
Lighting Controls - Jenkins Art	Energy Savings	In Process	$15,700	TBD	$15,734	0	Sammy Snead	HB1292 Funds
Space Consolidation - Warren Life Sciences	Energy Savings	In Process	$50,000	TBD	$194,100	0	Sammy Snead	HB1292 Funds
Install Advanced AHU Metering - Speight, S&T, Joyner, Jenkins, Warren	Energy Monitoring	N/A	N/A	N/A	$144,000	0	Sammy Snead	HB1292 Funds
Install Advanced Building AHU Metering - Speight, S&T, Joyner, Jenkins, Warren	Energy Monitoring	N/A	N/A	N/A	$379,000	0	Sammy Snead	HB1292 Funds

AWARENESS & TRAINING

Strategies

- Continue to focus efforts on developing and expanding resources of the ECU Sustainability Committee. Expand efforts to recognize and document efforts to reduce energy consumption and realize savings.

Tactics

PAST 12 Months' Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				
University - Participated in the Appalachian Energy Summit	Attend Energy Summit	Energy Summit attended by faculty and staff in June 2023	N/A	N/A	$0	0	Chad Carwein / Griffin Avin / Sammy Snead	State Funds - HSC Sustainability
University - Participated in the UNC Sustainability Alliance meeting	Attend Alliance Meeting	Participated in Alliance calls and annual meetings during the App Energy Summit	N/A	N/A	$0	0	Chad Carwein / Griff Avin	State Funds - HSC Sustainability
Attended AASHE Conference	Attend conference in October 2022	Attended virtually	N/A	N/A	$300	0	Chad Carwein	State Funds - HSC Sustainability
Hosted Campus Sustainability Day Fair	Hosted by ECU Sustainability Program and Student Clubs	Over 300 students, staff, faculty, and community members stopped by and learned about campus sustainability efforts	N/A	N/A	$500	0	Chad Carwein	State Funds - HSC Sustainability
Hosted Earth Day Festival	Hosted by ECU Sustainability Program, Campus Departments, and Student Clubs	Over 500 students, staff, faculty, and community members stopped by and learned about campus sustainability efforts	N/A	N/A	$800	0	Chad Carwein	State Funds - HSC Sustainability
Hosted 7th Annual Sustainability Film and Discussion Series	Monthly screenings in fall 2022 and spring 2023	~ 30 attendees at each event on average	N/A	N/A	$500	0	Chad Carwein	State Funds - HSC Sustainability
Sustainability Manager gave guest lectures and group presentations	About 10-12 presentations per semester	Completed	N/A	N/A	$0	0	Chad Carwein	N/A
Updated Construction Standards	Incorporate Energy and Water Efficiency Measures	Work in progress, long-term process	N/A	N/A	$0	0	Griffin Avin	N/A
Continued implementation of the ECU Sustainability Plan	Continued implementation	In process	N/A	N/A	$0	0	Chad Carwein	N/A
Completed Greenhouse Gas Emissions Inventory	Complete FY 2021-22 Report	Completed in Fall 2022	N/A	N/A	$400	0	Chad Carwein	State Funds - HSC Sustainability
Submitted third AASHE STARS Report for ECU	Maintain STARS Silver	STARS Silver earned in February 2023	N/A	N/A	$600	1 (intern)	Chad Carwein	State Funds - HSC Sustainability
Increased ECU presence on social media	Weekly activity on Facebook, Twitter & Instagram	Increased followers	N/A	N/A	$0	0	Chad Carwein	N/A
Established a Building Air Barrier Standard for New Construction (blower door testing)	Post to Construction Standards Webpage				$0	0	Griffin Avin	N/A

AWARENESS & TRAINING

Strategies

- Continue to focus efforts on developing and expanding resources of the ECU Sustainability Committee. Expand efforts to recognize and document efforts to reduce energy consumption and realize savings.

Tactics

NEXT 12 Months' Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				
University - Participate in the Appalachian Energy Summit	Attend Energy Summit in 2024	TBD	N/A	N/A	N/A	0	Chad Carwein / Sammy Snead / Griffin Avin	State Funds - HSC Sustainability
University - Participate in the UNC Sustainability Alliance meeting	Attend Alliance Meeting in 2024	TBD	N/A	N/A	N/A	0	Chad Carwein / Sammy Snead / Griff Avin	State Funds - HSC Sustainability
Attend AASHE Conference	Sustainability Manager will attend in Boston in October 2023	TBD	N/A	N/A	$2,000	0	Chad Carwein	State Funds - HSC Sustainability
Host Campus Sustainability Day Fair	Hosted by ECU Sustainability Program, Campus Departments, and Student Clubs	TBD	N/A	N/A	$500	0	Chad Carwein / Kim Fox	State Funds - HSC Sustainability
Host Earth Day Festival	Hosted by ECU Sustainability Program, Campus Departments, and Student Clubs	TBD	N/A	N/A	$800	0	Chad Carwein / Kim Fox	State Funds - HSC Sustainability
Host 8th Annual Sustainability Film and Discussion Series	Monthly screenings will be held in fall 2023 and spring 2024	TBD	N/A	N/A	$4,500	0	Chad Carwein / Kim Fox	State Funds - HSC Sustainability
Sustainability Outreach Specialist will give guest lectures and group presentations	About 10 presentations per semester	TBD	N/A	N/A	N/A	0	Kim Fox	N/A
Continue updating Construction Standards	Hiring AEI to finish updating the construction standards	TBD	N/A	N/A	TBD	TBD	Griffin Avin	Campus Operations Funds
Continue implementation of first ECU Sustainability Plan	Continue Implementation	TBD	N/A	N/A	TBD	0	Chad Carwein	State Funds - HSC Sustainability
Complete Greenhouse Gas Emissions Inventory	Complete FY 2022-23 Report in Fall 2023	TBD	N/A	N/A	$300	0	Chad Carwein	State Funds - HSC Sustainability
Continue Green Office Program	Certify 1-2 Departments per Semester	TBD	N/A	N/A	TBD	1 (intern)	Kim Fox	State Funds - HSC Sustainability
Increase ECU presence on social media	Weekly activity on Facebook, Twitter & Instagram	TBD	N/A	N/A	$0	0	Kim Fox	N/A

Water Management

Strategies

- Continue to implement programs, initiatives, and equipment that conserve water resources.

Tactics

PAST 12 Months' Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				

NEXT 12 Months' Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				
Complete feasibility study to assess reuse of ground water from Ross Hall for thermal rejection and cooling tower makeup	Complete Study	TBD	TBD	TBD	TBD	0	Griffin Avin	Campus Operations Funds

DECLARATION

I have read the 2023-2024 Strategic Energy & Water Plan for East Carolina University. The plan, as presented, supports the reductions required in Senate Bill 668.

William E. Bagnell
Associate Vice Chancellor for Campus Operations

FAYETTEVILLE STATE UNIVERSITY™

Strategic Energy & Water Plan

July 2023 – June 2024

Executive Summary

Fayetteville State University's **2023-24 Strategic Energy & Water Plan** is in direct support of several key documents.

- American College and University President's Climate Commitment Signatory (2010)
- FSU's Strategic Plan Refresh 2022-2027, Strategic Priority 5 – University Sustainability and Advancement.
- American College and University President's Climate Commitment Signatory (2010)
- FSU's Sustainability Policy (2011)
- FSU's Climate Action Plan (2012)
- FSU's Climate Action Plan (2015)

The purpose of the **Strategic Energy & Water Plan** is to guide the fiscally and environmentally responsible usage of valuable resources per state legislation. Also, striving to educate and encourage students, staff, faculty, and visitors regarding the benefit of energy and water conservation that provide an acceptable level of comfort within the FSU.

Key elements of this **2023-24 FSU Strategic Energy & Water Plan** include:

- Re-implementation of the FSU Sustainability Coalition with reporting of progress and status on this plan's goals and objectives.
- Implement a Building Manager Program at all FSU facilities.
- Incorporate sustainability principles in at least 1 course per semester in the 2023-24 academic year
- Continue working with all departments with energy, water, and other resources consumption, so FSU can reduce its carbon footprint and become more environmentally friendly.
- Identify key opportunities to simultaneously optimize space utilization and energy management goals.
- Identify incentive programs from utility providers to reduce utility expenses.

North Carolina Legislative Basis for the Plan

Session Law 2007-546 / Senate Bill 668 – Energy consumption per gross square foot to be reduced by 20% by 2010 and 30% by 2015 based on the 2003-2004 fiscal year. Each State institution of higher learning to update its management plan annually and include strategies for supporting consumption reduction requirements. Each university shall submit an annual Strategic Energy Plan to the State Energy Office.

Session Law 2008-203 / Senate Bill 1946 – Energy Efficiency: 30% reduction for new construction projects, 20% reduction for renovation projects (both based on 2004 codes). Water efficiency: for construction/renovation projects 20% reduction in indoor potable water use, and sum of outdoor potable water use and harvested storm water use will be reduced by 50% (based on 2006 NC Building Code). These requirements are mandatory for universities 8/8/2008.

NC Executive Order 156 – State Government Environmental Sustainability, Reduction of Solid Waste, and Procurement of Environmentally Preferable Products.

General Statute 143 64.12 – Utility Saving Initiative for State Agencies and State Institutions of Higher Learning.

UNC-GA Sustainability Policy – Adopted into the UNC Policy Manual on October 9, 2009. References both NC Senate Bills above, as well as portions of UNC Tomorrow.

NC Executive Order 80 – To address climate change and transition to a clean energy economy. Minimum of 40% reduction in energy consumption per square foot in state-owned buildings by 2025 from the baseline fiscal year of 2002-2003 level.

Plan Goals and Objectives

1. **Increase institutional sustainability by efficiently managing campus resources**
   - 1.1. Educate faculty, students and staff about their roles and responsibilities in energy and water conservation
   - 1.2. Convene regularly and create interactive learning projects to champion culture change
   - 1.3. Coordinate with key external partners to improve FSU's sustainability efforts
2. **Reduce campus energy and water consumption**
   - 2.1. Design and construct only LEED-Certified or equivalent, high-performing, energy and water efficient buildings
   - 2.2. Include building commissioning in new construction projects
   - 2.3. Implement energy and water conservation measures in campus facilities and operations
3. **Reduce utility expenses by working with utility providers on rates, incentives and other strategies**
   - 3.1. Ensure appropriate utility rate schedules and accurate billing
   - 3.2. Identify and participate in all available utility incentive programs
   - 3.3. Implement electrical demand management strategies to take advantage of utility Critical Peak Pricing structure

Goal 1: Increase institutional sustainability by efficiently managing campus resources.					
Objective 1.1	Educate faculty, staff, and students about their roles and responsibilities in energy and water conservation.				
Objective 1.2	Convene regularly and create interactive learning projects to champion culture change.				
Objective 1.3	Coordinate with key external partners to improve FSU's sustainability efforts.				
2022-23 Activities	**Measurement** **Expected**	**Actual**	**Investment**	**Assigned to**	**Funding Source**
The Green Team / Integrating sustainability into co-curriculum projects and event.	Host at least 4 educational/awareness projects/events targeting faculty, staff, and students.	Complete; multiple events successfully held.	Staff Time	Sustainability Coordinator	State
Making climate neutrality and sustainability into FSU academic curriculum and other educational experiences for all students.	Educate the Early College and FSU students about environmental science and sustainability in at least 1 class in every academic year.	Complete; on-going	Staff Time	Sustainability Coordinator	State
Making climate neutrality and sustainability into a topic of discussion available to staff and faculty at FSU to implement sustainable changes.	Convene a staff & faculty-led committee from multiple departments to begin a formal process that discusses sustainable development on campus.	Sustainability Coordinator vacancy limited progress in this area.	Staff Time	Sustainability Coordinator	State
Increase of engagement in waste management/recycling initiative among resident halls.	Coordinate with Housing and Residence Life as well as the Building Environment Department. Train and educate students, staff, and faculty.	Complete; on-going	Staff Time	Sustainability Coordinator	State
Promote Environmental and Sustainability Program at freshman orientation week.	Recruit new students into the Green Team as well as inform new students with message and guidance for green living at FSU.	Complete; on-going	Staff Time	Sustainability Coordinator	State
2023-24 Activities	**Measurement** **Expected**		**Investment**	**Assigned to**	**Funding Source**
Prepare for FSU GHG inventory for Second Nature	Begin data gathering effort of Scope 1, 2, & 3 inventory for GHG inventory reporting.		Staff Time	Sustainability Coordinator	State
Implement energy and water conservation measures.	Continue to implement measures to improve EUI reductions.		Staff Time	Sustainability Coordinator	State
Making climate neutrality and sustainability into a topic of discussion available to staff and faculty at FSU to implement sustainable changes.	Re-implement a staff & faculty-led committee from multiple departments to begin a formal process that discusses sustainable development on campus.		Staff Time	Sustainability Coordinator	State
Increase of engagement in waste management/recycling initiative among the residential halls.	Coordinate with Housing and Residence Life as well as the Building Environmental Department. Train and educate students, staff, and faculty on sustainable practices in your home.		Staff Time	Sustainability Coordinator	State

Goal 2: Reduce campus energy and water consumption.					
Objective 2.1	New construction and major building renovations standard to be LEED-certified and/or high performance.				
Objective 2.2	Include building commissioning in new construction projects.				
Objective 2.3	Implement energy and water conservation measures in campus facilities and operations.				
2022-23 Activities	**Measurements** **Expected**	**Actual**	**Investment**	**Assigned to**	**Funding Source**
Incorporate energy use into campus space planning and utilization efforts.	Identify key opportunities to simultaneously optimize space utilization and energy management goals.	Complete; on-going	Staff Time	Sustainability Coordinator	State
Apply for HB 1292 Carry-Over funds.	Certify savings and lobby for a utility budget surplus so that we can take advantage of carry forward funds toward energy conservation projects.	Complete; Successful carry forward of funds.	Staff Time	Sustainability Coordinator	State
PV Solar and Battery Energy Storage for FSU	Clean Power & Industrial Efficiency and PWC to provide a statement of work to support the cost benefit analysis of multiple alternatives for PV solar and battery energy storage.	Sustainability Coordinator vacancy limited progress in this area.	Staff Time	PWC, NC Clean Power & Industrial Efficiency, and FSU Facilities Management	State
Create light switch and water reduction stickers to all buildings.	Reduce energy consumption by creating this awareness/reminder.	Complete; on-going	Staff Time	Sustainability Coordinator	State
Install/replace motion lighting to both old and new buildings.	Implement the installation of motion lighting in new buildings and major renovations to produce energy consumption reductions.	Complete; on-going	Staff Time	Electrical Team/Dept.	State
Create sustainability competitions for Residence Halls to commit to promote the reduction of energy, water, recycling, and food waste.	Targeting Residence Halls and UPA for invigorating education in sustainable practices at home.	Complete; on-going	Staff Time	Sustainability Coordinator	Sustainability Office
2023-24 Activities	**Measurements** **Expected**		**Investment**	**Assigned to**	**Funding Source**
Incorporation of energy/water conserving fixtures and appliances.	Installation of energy/water conserving fixtures and appliances whenever applicable in new constructions and major renovations.		Staff Time	Sustainability Coordinator, Facilities Management, P&C	State
Apply for HB 1292 Carry-Over Funds	Certify savings and lobby for a utility budget surplus so that we can take advantage of carry forward funds toward energy conservation projects.		Staff Time	Sustainability Coordinator	State
Incorporate energy usage in campus space planning and utilization efforts.	Identify key opportunities to simultaneously optimize space utilization and energy management goals.		Staff Time	Sustainability Coordinator	State

Goal 3: Reduce utility expenses by working with utility providers on rates, incentives, and other strategies.					
Objective 3.1	Ensure appropriate utility rate schedules and accurate billing.				
Objective 3.2	Identify and participate in all available utility incentive programs.				
Objective 3.3	Implement electrical demand management strategies to take advantage of utility Critical Peak Pricing structure.				
2022-23 Activities	**Measurements** **Expected**	**Actual**	**Investment**	**Assigned to**	**Funding Source**
Review all utility accounts to ensure appropriate rate schedule and accurate billing.	Input monthly account invoice for all electric, natural gas, propane, and water/sewer accounts in database.	Complete; on-going	Staff Time	Sustainability Coordinator	State
Work with utility providers to identify incentive programs to reduce FSU utility.	Document responses and pursue opportunities with all providers.	Complete; on-going	Staff Time	Sustainable Coordinator	State
Work with higher administrations to identify the setpoint during winter and summer for greater energy savings.	Propose the setpoint at 75 degrees for summer and 68 degrees for winter during peak hours.	Sustainability Coordinator vacancy limited progress in this area.	Staff Time	Sustainability Coordinator	State
Submit Acceleration Fund from Second Nature	To install EV Charging Stations on FSU campus and/or other carbon neutrality projects.	Incomplete; awaiting release of phase 2 for funding availability.	Staff Time	Sustainability Coordinator	Second Nature
Identify funding opportunities to conservation energy generation and renewable energy projects.	Continue the search for a viable financed energy project.	Complete; on-going	Staff Time	Sustainability Coordinator	State & NGOs
2023-24 Activities	**Measurements** **Expected**		**Investment**	**Assigned to**	**Funding Sources**
Review all utility accounts to ensure appropriate rate schedule and accurate billing.	Input monthly account invoice for all electric, natural gas, propane, and water/sewer accounts in database.		Staff Time	Sustainability Coordinator	State
Work with utility providers to identify incentive programs to reduce FSU utility expense.	Document responses and pursue opportunities with all providers.		Staff Time	Sustainability Coordinator	State
Identify funding opportunities for conservation energy generation and renewable energy projects.	Continue the search for a viable financed energy project.		Staff Time	Sustainability Coordinator	State & NGOs
Investigate electrical demand management strategies to take advantage of utility Critical Peak Pricing structure.	Increase active building level submetering in key large facilities, especially for electricity.		Staff Time	Sustainability Coordinator	State
	Investigate the implementation of a web-based, real-time energy and sustainability dashboard application.				

Declaration

I have read the FSU 2023-24 Strategic Energy & Water Plan. The plan, as presented, supports reductions required in G.S.143-64.12a (minimum 40% reduction in annual energy/water consumption by 2017) and NC Executive Order 80 which calls for a minimum of 40% reduction in energy consumption per square foot in state-owned buildings by 2025 from the baseline fiscal year of 2002-2003 level.

Commitment

- Energy and water management is the responsibility of the occupants at each facility, guided and supported by the FSU Energy and Sustainability Coordinator and FSU Facilities Management and Operations staff.
- The attached plan outlines the activities and expenditures required to reach energy and water consumption reduction goals.
- FSU Department Heads will review progress and results quarterly and will support the FSU Energy Sustainability Coordinator's attendance at Departmental meetings as required.

Strategic Energy & Water Plan Mandate – Goal

Reduce annual energy consumption per gross square foot by a minimum of 40% by fiscal year 2025 from the baseline fiscal year of 2002-2003.

Strategic Energy & Water Plan Mandate - Measure

Our Key Performance Indicator is *Total Energy Use in BTU per Square Foot per Year.*

Strategic Energy & Water Plan Mandate - Commitment

I have read and support the FSU 2023-24 Strategic Energy & Water Plan.

Tai Davis

Tai Davis
Director of Facilities Operations

Gene Cottrell
Director of Facilities Administration & Budget

Jon Parsons
Associate Vice Chancellor, Facilities Management

Lillian Wanjagi
Vice Chancellor, Business & Finance

2023-2024 Strategic Energy & Water Plan

Final Audit Report 2023-08-31

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NC Central University

Utility Savings Initiative
Strategic Energy and Water Management Plan Report

Fiscal Year 2022-2023

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Executive Summary

This report is North Carolina Central University's Fiscal Year 2022-2023 Strategic Energy and Water Management Plan as required by NC General Statute 143 Article 3B - 'Conservation of Energy, Water, and Other Utilities in Government Facilities' and House Bill 330. It summarizes energy and water usage, completed, current, and planned energy and water consumption reduction projects, and the University's strategy for supporting the energy consumption reduction required by legislation. Along with an energy consumption report, this report is submitted annually to the NC Department of Environmental and Natural Resources / Environmental Assistance and Customer Service (formerly the NC State Energy Office) as part of the Utility Savings Initiative project which is managed by that office.

The University's overall strategy for supporting the energy and water usage reduction goals of the State is to complete projects that conform to accepted best practices and guidelines for reducing energy and water usage and cost, and by working closely with colleagues and organizations in North Carolina and throughout the country.

The University continues to reduce the amount of energy and water used on campus through numerous energy reduction projects. During FY 2022-2023 a 16% reduction in energy usage and a 7% increase in water usage were achieved as measured from a baseline year of FY 2002-2003. Those reductions have resulted in a total savings of $15,831,635 in avoided energy costs and $1,824,266 in avoided water costs for a **total of $17,655,889 in avoided utility costs**. Therefore, the University is making a significant contribution to achieving the legislated energy reduction goal of 30% for all State buildings by 2025.

We had an error in the data being reported and shows an increase in water usage this fiscal year. The report reflects updates to the data for all known fiscal years. There are continued effort in replacing and repairing steam leaks. The long term goal is to reduce water consumption and sewer usage. The targets are some consistent and troublesome leaks and issues with makeup water associated with cooling towers.

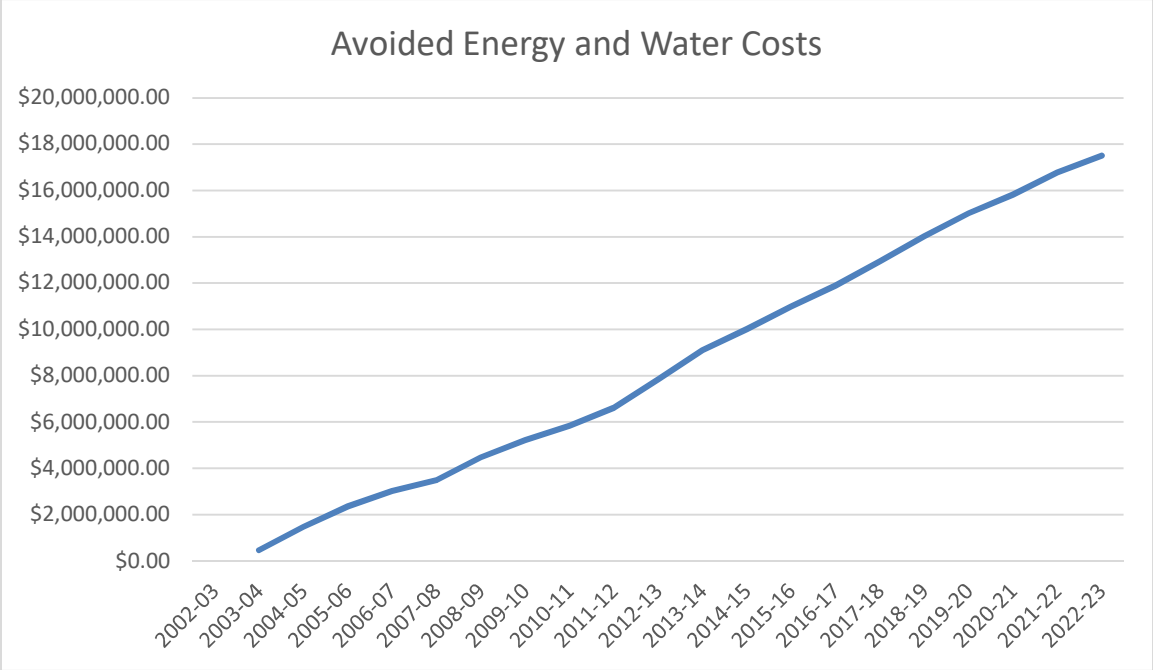
As a result of ongoing and planned energy saving projects and the completion of repairs to the aforementioned steam pipes, energy usage, as measured in BTUs / square foot, will decline by at least 1% during FY 2023-2024. Water usage should also decline as a result of that repair work.

The balance of this report summarizes energy usage during FY 2022-2023. NCCU has completed 7 larger energy related projects during the fiscal year. NCCU also has 25 projects underway (along with current energy initiatives) that we believe will further reduce energy and water usage on the campus.

Energy and Water Data

The following are tables and graphs that summarize cost, trends, and the amounts of energy and water used from FY 02-03 through FY 22-23.

Fiscal Year	Energy Usage (% Change in btu/sf)	Water Usage (% Change in gal/sf)	Avoided Energy Cost 2002-03 Baseline	Avoided Water Cost 2002-03 Baseline
2002-03				
2003-04	-16%	-1%	$ 474,209	$ 5,191
2004-05	-27%	-8%	$ 1,002,965	$ 34,167
2005-06	-19%	-12%	$ 889,961	$ 54,759
2006-07	-16%	-10%	$ 667,336	$ 45,259
2007-08	-10%	-29%	$ 461,673	$ 160,665
2008-09	-22%	-19%	$ 984,460	$ 135,565
2009-10	-17%	-31%	$ 739,981	$ 272,909
2010-11	-13%	-28%	$ 626,297	$ 223,868
2011-12	-17%	-31%	$ 768,820	$ 261,809
2012-13	-24%	-24%	$ 1,231,607	$ 189,941
2013-14	-23%	-16%	$ 1,268,176	$ 146,002
2014-15	-17%	-16%	$ 907,418	$ 144,803
2015-16	-21%	6%	$ 971,905	$ (49,076)
2016-17	-19%	13%	$ 900,788	$ (60,829)
2017-18	-22%	27%	$ 1,058,909	$ (134,985)
2018-19	-24%	-1%	$ 1,080,160	$ 7,300
2019-20	-23%	-13%	$ 997,238	$ 84,914
2020-21	-19%	-32%	$ 799,732	$ 587,532
2021-22	-20%	14%	$ 948,304	$ (190,270)
2022-23	-16%	7%	$ 738,894	$ (95,260)


Avoided Energy and Water Costs
$20,000,000.00
$18,000,000.00
$16,000,000.00
$14,000,000.00
$12,000,000.00
$10,000,000.00
$8,000,000.00
$6,000,000.00
$4,000,000.00
$2,000,000.00
$0.00
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
2014-15
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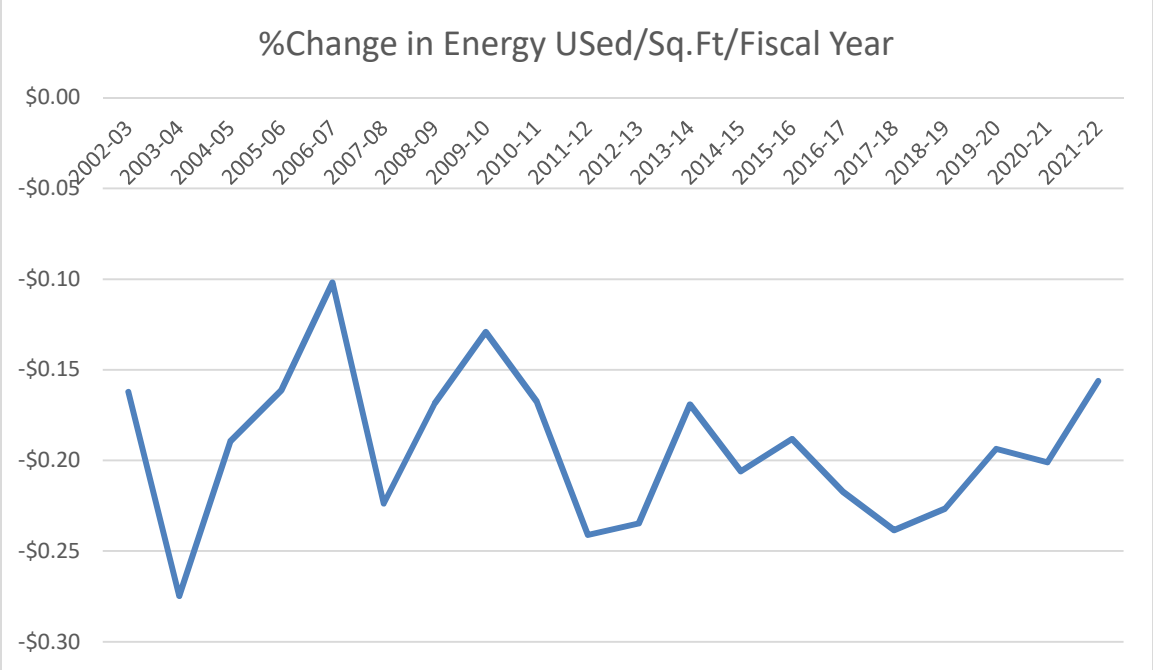
2020-21
2021-22
2022-23


%Change in Energy USed/Sq.Ft/Fiscal Year
$0.00
-$0.05
-$0.10
-$0.15
-$0.20
-$0.25
-$0.30
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
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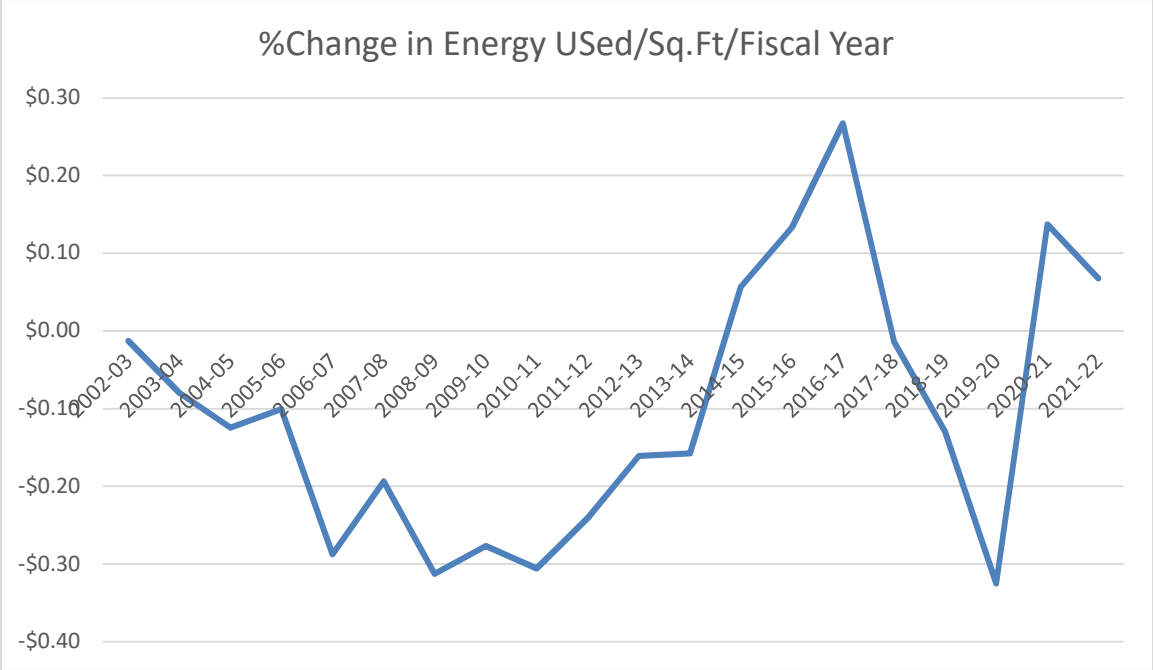
2019-20
2020-21
2021-22



Additional Energy and Water Data

Fiscal Year	Energy Usage	Electrical Energy Usage	Electrical Cost	Natural Gas Usage	Natural Gas Cost
	(btu)	(kWh)		(therm)	
2002-03	310,001,659,180	26,958,780	$ 1,348,145	1,925,440	$ 1,270,790
2003-04	263,084,750,240	27,148,520	$ 1,352,206	1,704,540	$ 1,099,235
2004-05	238,650,189,752	30,439,446	$ 1,503,913	1,347,908	$ 1,143,892
2005-06	279,437,231,084	38,930,607	$ 2,162,900	1,466,060	$ 1,650,357
2006-07	289,103,249,804	39,627,667	$ 2,087,877	1,538,937	$ 1,385,148
2007-08	316,954,153,256	46,850,338	$ 2,471,029	1,571,008	$ 1,606,073
2008-09	277,460,384,312	44,156,326	$ 2,356,020	1,267,990	$ 1,058,906
2009-10	306,219,205,966	46,267,798	$ 2,614,799	1,445,463	$ 964,524
2010-11	323,568,455,880	47,810,270	$ 3,029,995	1,494,478	$ 994,083
2011-12	312,483,761,936	48,257,228	$ 3,012,430	1,478,301	$ 808,914
2012-13	310,033,679,216	46,100,668	$ 3,045,683	1,527,382	$ 834,308
2013-14	312,571,657,096	45,004,158	$ 3,032,385	1,502,800	$ 950,844
2014-15	334,978,036,696	51,139,958	$ 3,514,012	1,604,885	$ 948,569
2015-16	320,084,779,460	44,601,095	$ 3,012,633	1,659,603	$ 715,361
2016-17	327,306,722,700	44,558,975	$ 2,941,456	1,697,239	$ 876,578
2017-18	315,509,555,172	43,834,981	$ 2,871,702	1,659,446	$ 942,931
2018-19	307,007,010,944	35,872,512	$ 2,350,067	1,846,100	$ 629,162
2019-20	310,403,833,908	36,663,609	$ 2,661,330	1,853,076	$ 741,699
2020-21	350,358,929,444	41,488,637	$ 2,564,043	2,087,997	$ 768,942
2021-22	347,101,705,502	43,583,461	$ 2,462,310	1,970,839	$ 1,281,661
2022-23	366,591,922,132	42,501,616	$ 2,680,355	2,194,980	$ 1,260,382

Fiscal Year	#2 Fuel Oil Usage	#2 Fuel Oil Cost	Water Usage	Water Cost
	(gallons)		(1,000 gallons)	
2002-03	183,678	$142,223	71,500	$404,894
2003-04	-	$0	71,500	$404,894
2004-05	-	$0	69,874	$396,631
2005-06	-	$0	69,617	$386,029
2006-07	-	$0	71,500	$404,894
2007-08	-	$0	58,000	$398,545
2008-09	-	$0	66,480	$564,577
2009-10	27,451	$68,628	58,400	$600,199
2010-11	79,256	$198,140	62,000	$585,669
2011-12	-	$0	60,111	$594,728
2012-13	-	$0	71,560	$600,213
2013-14	63,000	$151,298	79,046	$761,292
2014-15	-	$0	78,334	$774,939
2015-16	14,028	$19,765	98,263	$911,252
2016-17	40,000	$72,336	105,385	$516,381
2017-18	-	$0	117,853	$639,341
2018-19	-	$0	91,676	$516,848
2019-20	-	$0	80,624	$572,961
2020-21	-	$0	67,665	$1,222,014
2021-22	9,453	$25,413	113,963	$1,575,244
2022-23	14,986	$52,441	107,001	$1,498,224

Notes:

A discrepancy was corrected in the water usage. It was found that the water usage was not the total water consumed. Fiscal years 2020-21, 2021-22, and 2022-23 reflect this update.

sf = Square Foot
btu = British Thermal Unit – a measure of heat energy
therm = 100,000 btu - a measure of heat energy
kWh = Kilowatt-Hour - a measure of electrical energy
gal = Gallons

Energy and Water Savings Projects

Energy and Water Projects - Completed in FY 2022-2023

1	Mary Townes/Brite Chillers Redundancy Re-piping	Created a centralized cooling plant between the two buildings to share the load between existing chillers.
2	BBRI Cooling System Upgrades	Replaced chillers, cooling towers, pumps and associated controls.
3	Residence Hall 1 &2 Chiller Upgrade	Replace chiller serving both buildings.
4	CT Willis Cooling Tower Replacement	Replaced the end of life cooling tower.
5	Miller Morgan Building	Replaced older inefficient chiller servicing the building.
6	Utility Savings Initiative	Annual report to DEACS / USI summarizing energy and utility use at NCCU as well as current and planned projects in support of the energy savings goals outlined in SB 668
7	Campus Wide Steam Repairs	Steam repairs to address severe steam and condensate leaks.

Energy and Water Projects – Active in FY 2022-2023

1	Pearson Dining Hall	Upgrade Building Automation System
2	Steam Plant Boiler #1 Replacement	Replacement of boiler #1 at the Steam Plant. Will allow for better load sharing and efficiency.
3	Residence Hall 1 Water Leak Repair	Repair chilled water line leak.
4	BN Duke Steam to Natural Gas Conversion	Remove BN Duke from central steam since that steam leg is in poor shape.
5	Shepard Administration Building	Replace steam station which is leaking and not providing adequate steam to the building.
6	EPC - Engie (formerly Chevron)	Ongoing monitoring and maintenance of Energy Performance Contract project in 10 buildings on campus. On-going maintenance on the control system.
7	EPC - Lighting	Support efforts and monitor energy savings.
8	Pearson Dining Hall	Replace steam station which is leaking and not providing adequate steam to the building.
9	HVAC Controls Improvements	Document and support work to improve those systems as that they are very important for reducing energy consumption, energy costs, and the cost of HVAC maintenance campus-wide. Current efforts are to eliminate older non-supported systems with newer technologies. Effort is to achieve 95% visibility of all campus buildings with newer systems

10	HVAC Retro-commissioning	Support current retro-commissioning projects at 4 buildings on campus.
11	BBRI Steam Station	Replace PRV station which is causing significant steam loss.
12	Utility Data - Automatic Download of Data	Pilot project for automatically downloaded utility data into Portfolio Manager. Data analytics being considered.
13	Utility Data - Automatic Downloading of Data from Campus Water Meters	Radio monitoring equipment to automatically collect and record water meter data
14	Utility Data Monitoring	Daily monitoring utility usage, bills, contracts, and generate required reports
15	Utility Savings Initiative	Annual report to DEACS / USI summarizing energy and utility use at NCCU as well as current and planned projects in support of the energy savings goals outlined in SB 668
16	Central Utility Plant	Mary Townes & B.R.I.T.E chilled water & heating system
17	Efficiency Upgrades	Upgrades to aging variable frequency drives at Miller Morgan
18	Nursing Building	Upgrade to the chillers with more efficient models
19	Shepard Library	ITS NOC HVAC upgrades with more efficient and appropriately size unit.
20	William Jones Building	Replace deteriorating chiller with new appropriately sized unit.
21	Robinson Science Building	Replace chiller, cooling and controls system serving the building.
22	O'Kelly-Riddick Locker Room	Replace HVAC unit serving the locker room with appropriately sized unit.
23	Infrastructure Feasibility Study	A comprehensive look at medium voltage and steam distribution across campus. Identify and prioritize projects due to risk of failure, severity and energy loss.
24	Taylor Education Renovation	As part of a comprehensive renovation, energy and water savings techniques will be implemented to reduce consumption.
25	Lee Biology Renovation	As part of a comprehensive renovation, energy and water savings techniques will be implemented to reduce consumption.

Utility Reduction Project Development

The University's overall strategy for supporting the energy and water usage reduction goals of the State is to implement energy reduction and conservation projects that conform to industry best practices and by working closely with colleagues and organizations in the UNC system, NC State Government, and throughout the US.

The game plan is to address the consumption at a building level. Our continued plan is to separate the buildings by use and size (Lab Spaces, Residence Halls, Academic & Auxiliary). Once separated, the buildings will be evaluated for baseline consumption data for similar buildings (in size and use). The performance of the building will be analyzed and energy projects will be designed. The sub-meters will be utilized to analyze energy usage. The water and natural gas will be analyzed as well. The goal is to target the high consumption buildings (Lab Spaces & Residence Halls) and develop energy-cutting ECM's. Beyond this, there are drawing board projects that we believe will greatly increase our consumption reductions goals. A feasibility study is ongoing to prioritize improvements to the medium voltage and steam system distributions across campus. Upgrades to these systems will provide some energy reduction as the infrastructure support these systems is deteriorating and is a major cause of a loss of energy, especially the steam system.

There will also be an increased effort to develop Lighting Control upgrades along with Lighting fixtures upgrades to LED.

Lab Spaces:

- ✓ Buildings will be considered for Solar PV to reduce energy usage
- ✓ Data Analytics for building automation systems
- ✓ Building automation systems upgrades

Residence Halls:

- ✓ Replace aging Fan Coil Units (FCU's) with new units (with Outdoor air capabilities).
- ✓ Install DDC controls on new FCU's for Humidity Control and Setback capabilities.
- ✓ Consider water saving or water free urinals
- ✓ Fix chilled water leaks

Academic Buildings

- ✓ Consider Solar PV for Nursing & School of Education
- ✓ Consider water saving or water free urinals
- ✓ Fix chilled water leaks

Auxiliary Buildings

- ✓ Consider Solar PV & Heating for Cafeteria
- ✓ Consider water saving or water free urinals

Campus Wide

- ✓ Rainwater capture system upgrades for lawn irrigation
- ✓ Replace stadium lights with LED
- ✓ Steam system improvements to condensate and supply lines

Summary

At the end of FY 2022-2022, North Carolina Central University as achieved a total of **$17,655,899 in avoided utility costs** in support of the ongoing effort to reduce utility energy costs by 40% in all State buildings by 2025. That goal was specified in NCGS 143 Article 3B, and is administered by NC DENR / DEACS through the Utility Safety Initiative project and further supported by House 330.

During FY 2022-2023 energy reduction efforts at NCCU were supported 9 energy related projects during the fiscal year. NCCU also has 25 projects underway (along with current energy initiatives) that we believe will further reduce energy and water usage on the campus.

Please note that as the focus of this report is on energy and water savings, details of completed and ongoing sustainability projects are not included in this report.

September 1, 2023

Ms. Natalie Narron
NC Department of Environmental Quality
217 West Jones St.
Raleigh, NC 27699

Subject: Strategic Energy Plan – NCSSM

Dear Ms. Narron:

Attached is a copy of the 2023 Annual Utility Consumption Report and the 2023 Strategic Energy Plan of the North Carolina School of Science and Mathematics.

Thank you for your outstanding support and advice to help NCSSM on energy awareness and conservation. As a small institution, your efforts have made it a successful project.

If you have any questions or comments, please contact me at (919) 416-2667 or covington@ncssm.edu.

Sincerely,

Garry D. Covington

Garry Covington
Director of Plant Facilities

Attachment

c: Dr. Todd Roberts – w/Attachment
Mr. Robert Allen – w/Attachment
Ms. Miriam Tripp – w/Attachment

North Carolina School of Science and Mathematics

Strategic Energy Plan

September 1, 2023

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Appendix

Executive Summary

NCSSM Background

The North Carolina School of Science and Mathematics (NCSSM) opened in 1980 on the site of the former Watts Hospital in Durham, NC. Most of the buildings on campus were built between 1909 and 1953, which is the major cause of many of the energy-related problems, and regular maintenance and repair issues. NCSSM's campus is on the National Register of Historic Places because of the Watts Hospital.

NCSSM is the first residential public high school in the country for juniors and seniors with an interest in science and mathematics. NCSSM is a constituent high school member of the UNC System, and is a public high school. It does not charge tuition or student fees for students to attend the school. The legislation creating NCSSM was strongly advocated by Governor Hunt, and it was approved in 1978 with the Speaker of the House of Representatives casting the deciding vote since the NC House was evenly divided about NCSSM.

Since its fledgling start, NCSSM has continued to be under funded and neglected since it opened in 1980. NCSSM continues to direct its limited funding to the academic and student residential program. However, NCSSM's physical plant infrastructure needs a significant infusion of additional funds to keep the plant facilities in operation. One explanation for the under-funding of NCSSM is that there was significant doubt whether or not NCSSM would survive ten years. It should be noted that Durham County donated the Watts Hospital to the State of North Carolina with the provision that if the school closed within 12 years, the facility would be returned to Durham County.

There are over 350 other public high schools in North Carolina, but NCSSM is the only high school that has been required to absorb the various State of North Carolina budget reductions just like state agencies and the University of North Carolina institutions. In the past NCSSM has often been required to absorb these cuts even though it has no student fees or tuition, or local funds to support it like the other public high schools or UNC System institutions.

In 2022, NCSSM opened its Morganton campus to 150 Class of 2024 high school juniors. The Morganton campus will reach its capacity of 300 students in the fall of 2023 when it admits the class of 2025.

Scorecard Results

Considering the impact of a growth of 69% student equivalents, 81% staff, and 199,705 (44%) square feet, NCSSM reduced its annual Total Energy Consumption since the base year of 2002-03. **Comparing energy consumption per staff-student equivalent in 2022-2023 with the baseline year of 2002-2003, electricity usage decreased 34.5%, natural gas usage increased 2.4%, and water usage decreased 53.6%. Total energy consumption per student equivalent decreased by 12.1% from the baseline year.** In

2022 – 2023, there were 461 online, 1456 distant learning students, and 412 workshop students. The on-line students stay on campus during extended weekends. The student equivalents are calculated using conservative estimates of 5% of a full-time residential student for on-line students, 20% for workshop students, and 1% for distance learning students. The student-staff equivalents are calculated as: number of staff, plus number of student equivalents.

Baseline Utility Use

The energy use mix of the North Carolina School of Science and Mathematics is approximately 49% electricity, 39% natural gas, 12% water and sewer, and 0% fuel oil.

NCSSM's Annual Utility Report is included in the Appendix. It identifies the usage and cost information for each type of energy source at NCSSM. As noted in the Scoreboard Results, NCSSM increased its annual Total Energy Consumption in 2022-23 compared to the base year of 2002-03, due to opening a new campus in Morganton, and the increase in the number of students, staff, workshops, and online students coming to campus. However, **comparing the total staff-student equivalents in 2022 with 2003, total energy consumption (BTU) per staff-student equivalent decreased by 12.1%, and water usage per student equivalent decreased by 53.6%**

Key Actions

The following actions have helped NCSSM reduce its overall net energy usage:

- Monitor natural gas usage
- Plan to Continue Utility Accounting
- Energy Management Awareness
- Conservation Awareness Team
- State Energy Office Recommendations
- HVAC – Chiller Repairs and Renovations
- Lighting Performance Contract
- Steam Leak Repairs
- Guaranteed Energy Saving Performance Contract
- Replacing Air Handler Units and Controls

Savings Estimate & Financial Evaluation

A detailed review of the financial evaluation of the energy usage is included in Section 1 of the Strategic Energy Plan. NCSSM is continuing to develop and implement an energy conservation program. It is continuing to explore various energy management projects such as performance contracts. NCSSM has upgraded the lighting throughout the campus to LED through the system wide performance contract. NCSSM has recently completed a guaranteed energy savings performance contract. This contract includes water savings areators and flush valves, LED parking lot and gymnasium lightings and HVAC controls. The reduction in usage (per staff-student equivalent) of 34.5% in electricity, 53.6% in water, and the increase of 2.4% in natural gas resulted in a $327,810 cost avoidance.

During COVID, all air filters were changed to MERV 13 filters. This change added to the heating/cooling loads due to the air handlers having to work harder to overcome the added filtration.

Goals and Measures

NCSSM has an overall goal to reduce the annual Total Energy Consumption. The goal will reflect the impact of conservation activities, enrollment growth of NCSSM's students, additional buildings on campus, and added staff members.

1. Baseline Energy Use

Based on NCSSM's growth of 69% in student equivalents, 81% in staff, 44% in square feet, total energy consumption has decreased since the baseline year of 2002-03 by 12.1%. Other items affecting NCSSM's energy consumption is the addition of two emergency (natural gas) generators for student safety, students remaining on campus during the summer months for research, additional summer workshops with more residential participants, running one boiler during the summer months to maintain reheat and reduce mold, and online students residing on campus during extended weekends.

NCSSM Energy Consumption

	2021-22	2002-2003	Increase/Decrease	Percentage	Increase/Decrease per Staff-Student Equivalent
Electricity Use (kwh)	9,366,622	7,774,573	+1,592,049	+20.5%	-34.5%
Natural Gas Use (therms)	829,700	440,442	+389258	+88.4%	+2.4%
Water Use (1,000 Gal.)	14,443	16,714	-2,271	-13.6%	-53.6%

As indicated in the table above, **electricity usage decreased by 34.5%, natural gas consumption increased by 2.4%, and water usage decreased by 53.6% (based on staff-student equivalent) from the baseline year 2002 – 2003.**

The budget reductions during the past several years have made it difficult to compare the usage and expenditure information between years. The Office of State Budget and

Management's required reversions forced NCSSM to carry over June 2003 expenditures to be paid in July 2003. The carry over caused the expenditures to be understated in 2002-03 and overstated in 2003-04. The energy consumption information above and in the Appendix has been restated to show the actual June 2003 expenditures and usage in 2002-03 and 2003-04. The adjustment shows the expenditures and usage in the year in which the consumption actually occurred.

The energy use mix of the North Carolina School of Science and Mathematics is approximately 49% electricity, 39% natural gas, 12% water and sewer, and 0% fuel oil. The natural gas is used to provide heat for the campus buildings, the 830 residential high school students from throughout North Carolina, 461 online students, and 416 staff (permanent and temporary) positions. Natural gas is also used to provide hot water and emergency power to the campus.

2. Planned Actions & Projects

2.1 Plan to Continue Utility Accounting

During 2023-24 NCSSM will continue to maintain the Utility Accounting process to track the cost and usage of electricity, water, natural gas, and fuel oil. The Utility Accounting database will follow the guidelines of the State Energy Office, and it will remain in an electronic spreadsheet format. The data will be used to prepare the Annual Utility Cost and Usage Summary Report in August 2024 to the State Energy Office.

2.2 Energy Management Awareness

NCSSM will use various methods to make the NCSSM community (students and staff) aware of the impact of energy management, and the importance of reducing the energy consumption at NCSSM.

- The Sustainability Awareness Group will hang signs/posters in key locations encouraging people to conserve energy and water.
- Include energy management messages in the "Daily Unicorn," which is a daily publication of current events on campus.
- Provide electronic updates about energy management to all students and staff through the Sustainability Awareness Group.
- Include Energy Management as an All School Day Session at NCSSM / for all students and staff.

2.3 Conservation Awareness Team

The NCSSM Conservation Awareness Team will promote conservation education and behavioral changes for all facility users. Since NCSSM is a residential public high school for juniors and seniors, it is a continuing process since there is a 50% turnover in

the student body each year. The team includes the following NCSSM staff and students:

Name	Position
Robert Allen	Vice Chancellor for Finance and Operations
Garry Covington	Director of Plant Facilities
Dr. Katie O'Conner	Vice Chancellor for Academic Programs (Leader of Sustainability Group)
Todd Bollinger	Grounds Supervisor (Sustainability Advisory Group)
Jon Davis	NCSSM Faculty (Sustainability Advisory Group)
NCSSM Students	Student Sustainability Advisory Group

See Section 5, Goals and Measures, for a listing of goals for the Conservation Awareness Team.

2.4 Long-Term Water Efficiency Plan – NCSSM
NCSSM developed a Long-Term Water Efficiency Plan in 2004 to reduce water usage.

2.5 State Energy Office Recommendations
NCSSM will implement any proposed rate change recommendations from the State Energy Office after the recommendations are provided.

2.6 HVAC - Chiller Repairs and Renovations Project
The HVAC - Chiller repairs and renovations project to add a new chiller was completed in 2007 and provided more efficient HVAC services since an inefficient 20+ year old chiller was replaced. An investigation was completed during 2004-05 that recommended building a closed loop chilled water system at NCSSM, which will provide cooling to all parts of the campus even if one chiller is not working. The closed loop portion of the project was completed in fall of 2008.

2.7 Steam Leak Repair
Numerous underground steam leaks were repaired in June 2013 and reflected a reduction in gas and water usage for 2014.

2.8 Performance Contract – Lighting Upgrades
The lighting upgrade performance contract was completed in 2016. This project replaced existing lighting with energy efficient LED lighting.

2.9 Guaranteed Energy Savings Performance Contract. During 2017 – 2018, NCSSM negotiated a performance contract. This project was completed in early 2019-20. This project includes water savings opportunities, LED lighting for gymnasium and parking lots, new cooling tower, and HVAC controls. This performance contract is projected to have an energy savings of $4,500,000 over the first 15 years

3. Savings Opportunity Assessment

The combination of the planned actions and projects, and activities in Sections 2 and 3 will help NCSSM achieve its goal to reduce the annual Total Energy Consumption while considering the impact of a growth of 69% student equivalents, 81% staff, and 44% square feet since the base year of 2002-03.

3.1 FCAP Operation and Maintenance Energy Survey Recommendations

NCSSM is continuing to implement the recommendations of the Operations and Maintenance Energy Survey. The recommendations included HVAC and Lighting-related issues.

1. Modify Thermostat Settings. In response to the survey recommendations, NCSSM adjusted the thermostat settings and reset the thermostats at the beginning of each year when the students return for the school year.

2. Deduct Sewer Costs for Cooling Tower Make-Up Water. Included in the guaranteed energy savings performance contract was to install metering that will allow the school to deduct the sewer cost for water make up to the cooling towers for the main and Hunt chillers.

3. Turn Off Lights in Unoccupied Rooms. NCSSM will continue its efforts to have the lights turned off in unoccupied rooms. Occupancy sensors for classrooms and conference rooms are included in the system-wide lighting performance contract.

4. Convert Incandescent Lighting to Compact Fluorescent. NCSSM will continue to install compact fluorescent lights as funds permit. **Complete**: Incandescent lighting has been replaced with compact fluorescent or LED lighting throughout the campus.

5. Replace Royall Heat Recovery Wheel. This will use the building exhaust air to condition the fresh air intake before sending it to the coils. **Complete**

6. Reduce Boiler Operating Pressures. Reduce the operating pressures of the boilers to reduce the natural gas usage. - **Complete**

4. Financial Assessment

NCSSM has delayed using its Repairs and Renovations projects to fund energy-related conservation projects since the primary focus has been on student safety for Electronic Access Upgrades Phase I and Phase II, and Sprinklers in Residence Halls Phase I and Phase II. See Section 6, Budgets, for a listing of various current and planned projects. NCSSM is considering the Performance Contracting as an additional option to fund energy-related projects. As a small under-funded educational institution, NCSSM does not have reserves to pay for unforeseen utility or other maintenance and repair projects. The UNC System lighting performance contract was an excellent approach that met NCSSM's needs. The school completed a guaranteed energy savings performance contract in early 2019-2020. This contract is projected to have an energy savings of $4,500,000 over the first 15 years.

North Carolina School of Science and Mathematics

5. Goals and Measures

NCSSM has an overall goal to reduce the annual Total Energy Consumption while considering the impact of a growth of 69% student equivalents, 81% staff, and 44% square feet since the base year of 2002-03. The goal will reflect the impact of conservation activities, enrollment growth of NCSSM's students, additional square feet of new plant facilities, and added staff members.

5.1 Key Performance Indicators (KPI)

The tracking measures will be used to develop and compare the results for the following State Key Performance Indicators (KPI):

- Total Utilities Cost per Square Foot
- Total Utilities Cost per Student Equivalent
- Electric KWH Use per Square Foot
- Electric KWH Use per Staff-Student Equivalent
- Total Gallons Water per Square Foot
- Total Gallons Water per Staff-Student Equivalent
- Gas Btu Use per Square Foot
- Gas Btu Use per Staff-Student Equivalent

It is critical to note that due to the recent budget shortfall situations, NCSSM was forced to carryover its electrical utility costs for June 2003 into 2003-04 to be paid. The forced reversion continued to cause significant hardships to NCSSM and has made it difficult to compare annual energy costs between years.

5.2 Conservation Awareness Team

NCSSM has established the goals and specific items listed below for the Conservation Awareness Team to encourage acceptance from the NCSSM community. Since NCSSM's 830 students are high school juniors and seniors in a residential program, it will include specific difficulties in getting teenagers to accept and follow utility savings measures. It is difficult enough for families to get teenagers in their home to make utility conservation measures, much less when the students are in a residential setting of 830 students.

1. Students and staff will be encouraged to turn off lights and equipment, other than computers, when leaving a room.
2. Turn off all lights and unnecessary equipment at the end of the day.
3. Monitor management software has been installed on NCSSM's computers by the Information Technology Services Department.
4. Vending machines were de-lamped in the Fall 2002 to reduce utility usage of vending machines.
5. Incandescent and compact fluorescent lighting have been replaced with energy efficient LED lights throughout the campus. This was done through the system-wide lighting performance contract.
6. The Guaranteed Energy Savings Performance Contract was completed in early 2019 – 2020. This project replaced parking lot lights and gymnasium lighting with LED as well as replacing HVAC controls. It is projected to have an energy savings of $4,500,000 over the first 15 years.

5.3 Sustainability Advisory Group

During 2012, NCSSM formed a Sustainability Advisory Group. This group consists of NCSSM administrators, faculty, staff, and students. The main functions of this group are:

1. Create awareness
2. Coordinate sustainability-related activities on campus
3. Develop measures for success
4. Determine measures to disseminate NCSSM's progress

The student led groups, Accept the Greener Challenge (AGC) and Sustainability Project Leaders (SPL) are a part of the group. Some of the activities include

- Publicity and educational awareness
- Construction of a rain garden
- Develop goals for composting and recycling
- Sustainability Cup – energy conservation contest between residence halls
- Greener Unitiative Challenge – year long competition in 3 categories (research, awareness, and outreach)

6. Budget

NCSSM has completed its two projects funded by the Higher Education Bond Program. Both the Royall Center (fully operational in 2003-04) and the Bryan Center (completed in July 27, 2004) included energy conservation design features in the $5.2 million projects. The projects resulted in a more effective use of energy since the Bryan Center converted the Physics area to the central HVAC system for cooling. Previously, the areas had either window air conditioning units or no air conditioning for the Physics Department. It was the only academic area on NCSSM's campus that had not been renovated since NCSSM opened in 1980. Project effort in 2009-10 was student safety; therefore, less spending was on utility projects than in previous years.

2011 – 2012 R&R funds, which were received in December 2012, allocated funds to repair underground steam leaks. Some of the small underground leaks were located and repaired in December 2012. The major leaks were located and repaired in June 2013. The repairs of these steam leaks resulted in a savings in natural gas for 2013- 2014.

2013 – 2014 R&R funds allocated funds for the construction of the new Fab Lab which is equipped with new energy efficient HVAC units. Funds were also allocated to maintain equipment and infrastructure, tune the main boilers, and clean chiller evaporator tubes which help provide for more energy efficient operation.

2014 – 2015 R&R funds allocated funds for the renovation of Engineering and Robotics which improved the controls for the HVAC units. Funds were also allocated to maintain equipment which will provide for more energy efficient operation.

2015 2016 The system-wide lighting performance contract was completed. This contract replaced incandescent and compact fluorescent lighting with energy efficient LED lighting.

2016 – 2017 Grant funds were obtained to install solar panels at the sustainability garden. These efforts will help reduce energy usage.

2018 – 2019 Construction will begin on the guaranteed energy savings performance contract. This project is expected to save $4,500,000 during the life of the loan.

2019 – 2020 The guaranteed energy savings performance contract was completed in early 2019-2020 and the school has begun receiving the savings. Energy saving features will be incorporated in the design and construction of the NCSSM Western Campus.

2020 – 2021 Five fan coil units were replaced with new, more efficient units, as well as energy efficient controls. Steam leaks were also repaired providing additional savings.

2021 – 2022 Two fan coil units were replaced with new, more efficient units as well as energy efficient controls.

2022 – 2023 NCSSM opened a new campus in Morganton, North Carolina with 150 students. Th will increase to 300 students in 2023 - 2024

7. Planned Future Projects

Energy related projects (if funded) that are included in our Capital and R&R Six Year Plan are as follows:

2023 – 2024 Chiller Replacement at an estimated cost of $3,000,000
2023 – 2024 Replace additional AHU & Controls at an estimated cost of $450,000
2024 – 2025 Boiler Replacement at an estimated cost of $350,000
2024 – 2025 Window Replacement at an estimated cost of $3,000,000

Strategic Energy Plan Biennial Update

("Utility Management Plan")

FISCAL YEAR 2024

Energy and water are among NC State's most necessary and costly expenses. For more than a decade, the university's campus-wide energy management strategies have enabled significant conservation of fiscal and environmental resources. This report provides an update on campus energy management goals, progress toward utility reductions, current and planned conservation projects and outlines funding, training, and communication initiatives for the next fiscal year that will contribute to further reductions.

Goals

The foundation of NC State's Utility Management plan is the establishment of university goals. These goals provide a direction and target for all energy and water conservation efforts. They also provide a benchmark against which progress can be measured. NC State University has committed to the following goals related to energy, water, and climate neutrality.

GOAL 1: By 2025, reduce total campus energy use intensity (EUI) by 40% from the FY2003 baseline.

GOAL 2: Expand the amount of renewable energy used to meet NC State's needs.

GOAL 3: Reduce campus water consumption by 65% from the FY2002 baseline.

GOAL 4: Contribute to NC State's total greenhouse gas (GHS) emissions reduction by 25% from the FY 2008 baseline.

GOAL 5: Collaborate to inform and to empower the campus community for energy and water savings.

KEY PERFORMANCE INDICATORS

NC State tracks year-over-year change as well as change vs. baseline years of 2002/2003. These metrics are measured against the 40% energy and 65% water reduction goals. Overall performance vs. baseline shows a 35% decrease in Energy Use Intensity (EUI) and a 55% reduction in total water use per square foot on campus. Potable water consumption has decreased by 61%. During this same time, NC State's gross square footage has increased by 54%. That means although a significant number of new buildings have been added, total campus energy consumption has still decreased by over one-third.

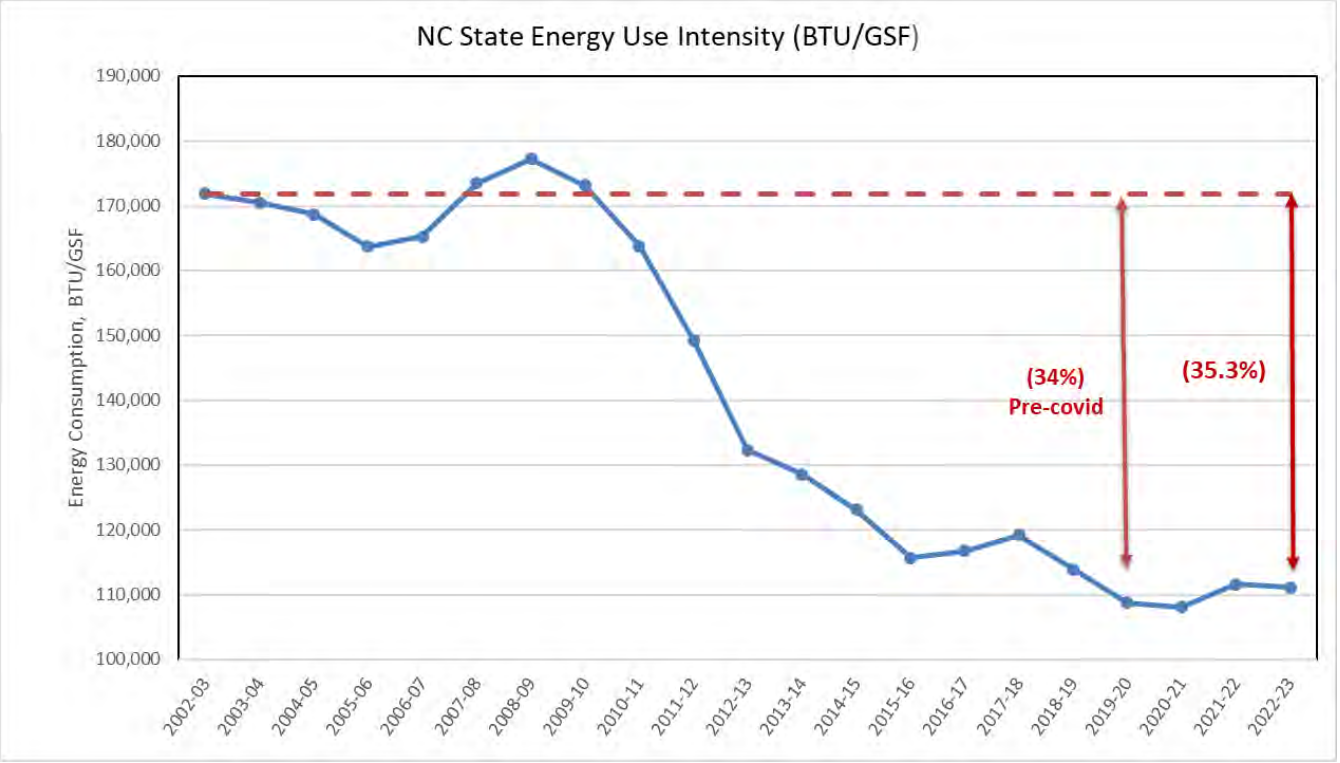
Fiscal Year	FY02 *	FY03	FY19	FY20	FY21	FY22	FY23	% Change from Baseline
Energy Consumption BTU / GSF		171,810	113,859	108,737	108,079	111,602	111,114	-35%
Potable Water Consumption CCF / GSF	0.066	0.054	0.033	0.030	0.024	0.027	0.026	-61%
Total Water Consumption CCF / GSF	0.066	0.054	0.037	0.035	0.029	0.033	0.030	-55%
Campus Area, Gross Square Feet (GSF)	9,796,638	9,910,619	14,963,604	14,999,125	15,133,063	15,316,354	15,293,378	54%

** Baseline year for water cost and consumption per gsf is 2001-2002 as defined in Executive Order Number 26. For all other KPIs, the baseline year is 2002-2003.*

ENERGY

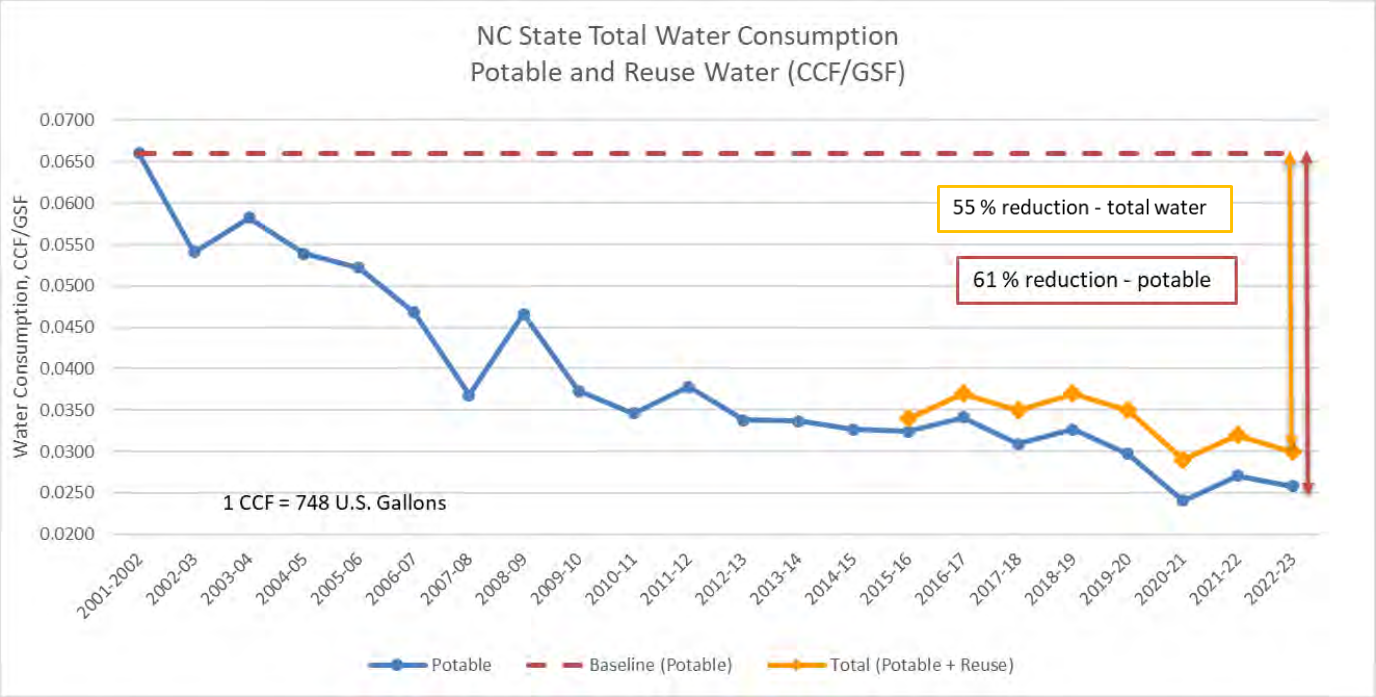
Campus energy consumption peaked in fiscal year 2009 and has trended downward since. The biggest reductions can be attributed to North Carolina G. S. § 143-64.12 which was enacted in 2008 and the university's four performance contracts which were enacted

in 2012, 2014, and 2019. Cogeneration has been a major contributor to decreasing consumption as NC State is able to produce almost 50% or our own electricity. During the pandemic, reduced occupancy on campus produced a greater energy reduction in 2020 and 2021 than would have otherwise been achieved. Energy-intensive Covid-19 mitigation strategies such as higher air filtration, increased outdoor air levels and longer hours of HVAC operation increased energy usage in 2021-2022. Compared to the FY 2003 baseline, total energy consumption per gross square foot (GSF) has decreased by 35.3% in FY 2023.



WATER

In fiscal year 2016, NC State began utilizing non-potable reuse water supplied by the City of Raleigh on Centennial Campus. Reuse water is wastewater treated to a high standard and reused instead of being discharged into a waterway. Reuse water provides a more cost-effective and drought resistant supply of water for cooling towers, irrigation and toilet flushing. For total water consumption (potable and reuse), FY 2023 marked a level 55% below the FY 2002 baseline with potable water consumption decreased by 61%.

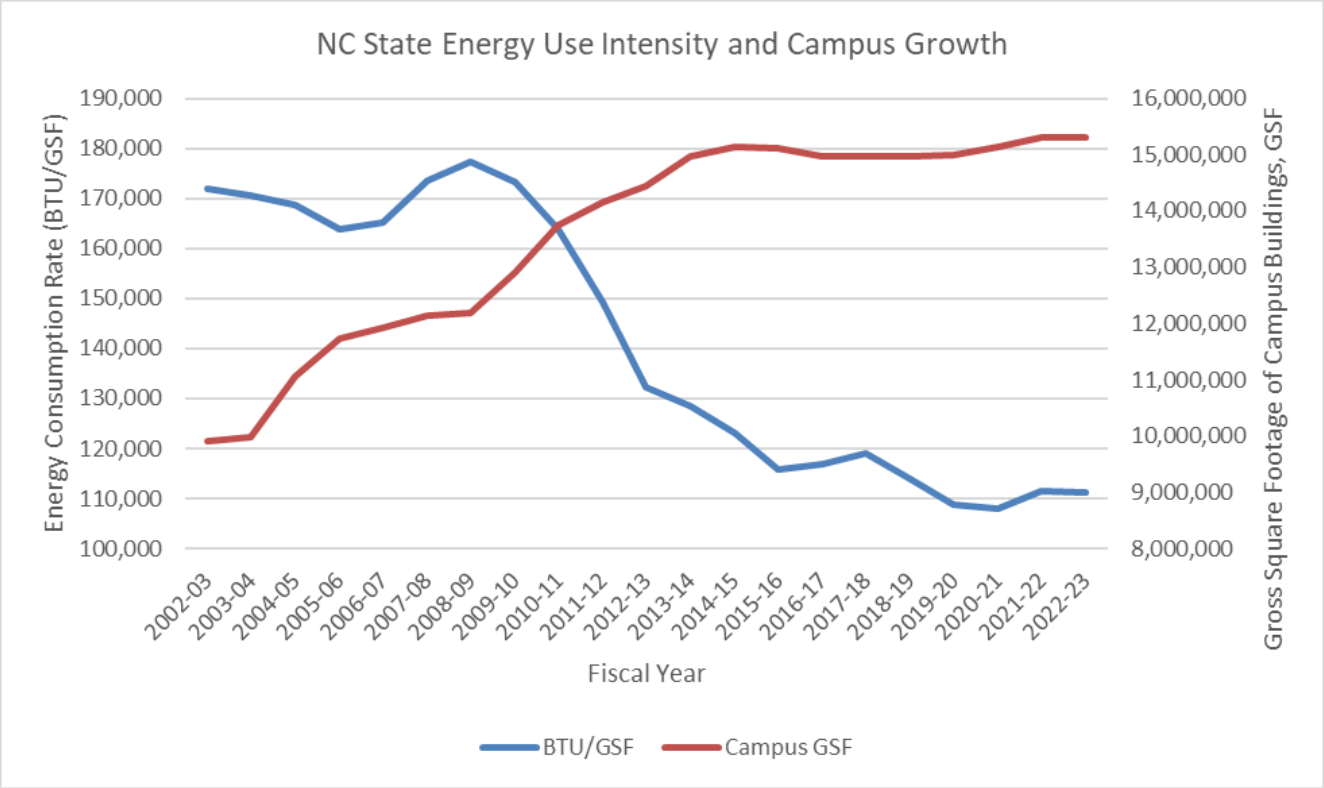


WHY DOES REUSE WATER INCREASE TOTAL WATER CONSUMPTION?

Reuse water is less expensive and more sustainable than potable water because it has received less processing, and thus embedded energy in its production. Because of this, Centennial Campus Utility Plant cooling towers primarily use reuse water. Cooling towers work by evaporating heat to the outdoor air. As water evaporates, impurities in the water build up and require that the water be replaced periodically. Because reuse water has more impurities than potable water, it must be replaced more frequently. However, the benefits of reuse water – primarily the decreased costs and embedded energy savings – outweigh the additional water use.

CAMPUS GROWTH VS. PERFORMANCE

The university's growth versus Energy Use Intensity over time is illustrated below. As indicated by this figure, although campus GSF has increased by 55% since the 2002/2003 baseline, EUI has decreased by 35%. The university continues to make significant progress in reducing energy use through energy efficiency strategies such as operational improvements, facility upgrades, communication and outreach.



Funding Sources

An ongoing challenge with development and execution of energy and water conservation projects is securing funds to pay for these efforts. NC State utilizes a variety of financing options to fund these types of projects.

Government Appropriations: The state legislature provides appropriated funds through the General Fund budget process. Some of these funds are allocated for facility improvements or building expansions.

Facilities & Administrative (F&A): NC State is a research powerhouse. Research being done on campus can have different funding sources such as federal, state, local or private grants and contracts. Set rates have been developed and are charged to this type of research in order to offset costs for goods and/or services. Energy Management competes with other departments to receive an allocation of these funds to use for conservation projects.

Guaranteed Energy Saving Performance Contracts (GESPC):

North Carolina G. S. § 143-64 Article 3B Part 2 allows governmental units to enter into GESPCs with qualified providers. Under a GESPC, the provider evaluates and recommends energy conservation measures and then implements selected measures. These may include installing higher efficiency equipment, repairs to existing equipment or changes to how buildings are controlled and operated. The monetary utility savings generated by these conservation measures are then used to pay back the cost of all the upgrades over time. The provider guarantees that energy savings will exceed costs or they are required to reimburse any shortfall. To date, NC State has four GESPC projects. A table is provided below with more details on each performance contract project.

Performance Contract & Year Completed	Term & Investment	Description
COGENERATION ON CENTRAL AND NORTH CAMPUS 2012	17-year contract $56.1 million investment	This project replaced aging boilers in both the Cates and Yarbrough Central Utility Plants with new high efficiency boilers and a cogeneration system. The cogeneration system, or "combined heat and power," utilizes natural gas to produce 11 MW of electricity while the waste heat from the process produces steam. Utility savings are realized due to a reduction in the total cost of electricity and steam production through increased efficiency.
13 BUILDING UPGRADES 2012	19-year contract $19.7 million investment	The 13 Building project encompasses the following buildings: Cox Hall, Poe Hall, Tompkins Hall, Caldwell Hall, Winston Hall, Wilson College of Textiles, McKimmon Center, Monteith Research Center, Research I, Dabney Hall, Carmichael Gym, Constructed Facilities Lab and MRC Parking Garage. Renovations and operational changes were completed with the HVAC systems and fume hood controls, lighting upgrades, and water reduction strategies along with a solar hot water system in Carmichael Gym.
PHYTOTRON BUILDING 2014	15-year contract $6.2 million investment	Constructed in 1968, the Phytotron Building performs plant, animal and insect research by simulating environments from desert heat and drought to Alpine cold and jungle humidity. The Phytoron project addressed HVAC and lighting upgrades, a connection to the central chilled water loop and research equipment improvements.
CENTENNIAL CAMPUS COGENERATION 2019	18-year contract $17 million investment	This project removed a boiler in the Centennial Central Utility Plant and installed a high efficiency cogeneration system. The cogeneration system includes a combustion turbine generator (CTG) which generates 5.5 MW of electricity, and a steam turbine generator (STG) which is capable of generating an additional 1 MW of electricity from the excess steam. Utility savings are due to a reduction in the total cost of electricity and steam production through increased efficiency.

Demand Side Management Energy Efficiency (DSM/EE) Program:

Per North Carolina Public Utilities Rule R8-69, each year, the electric public utility establishes a DSM/EE rider that consists of a reasonable and appropriate estimate of the expenses expected to be incurred by adopting and implementing new demand-side management and energy efficiency measures. Pursuant to G.S. 62-133.9(f), any industrial customer or large commercial customer may elect not to participate in the public utility's DSM/EE program and implement their own demand-side management or energy efficiency measures instead. These "opted-out" customers receive a monthly credit on their bills of the rider amount. NC State has chosen to opt-out of the DSM/EE program on qualifying accounts. The value of the monthly bill credits are tracked and paid from the utility fund to a special fund for implementing energy conservation measures throughout the campus.

HB1292:

North Carolina G. S. § 116-30.3B provides that any energy savings realized by constituent institutions of the University of North Carolina shall remain available to the institution and a portion of those energy savings shall be used for other energy conservation measures. Annually, the Energy Management department tracks energy savings and submits a report to the State Energy Office. The end of year appropriated utility budget surplus is carried forward within the new fiscal year budget, capitalized and reinvested in additional energy conservation projects.

Other:

As NC State Energy Management becomes aware of any new funding sources that may become available, they will be investigated for possible inclusion.

Conservation Projects

Once funding has been secured, the Energy Management department works with the Facilities Division and campus leadership to fund and to install conservation projects throughout campus. Below is a list of projects in progress for fiscal years 2023 and planned for 2024. FY24 projects are pending approval.

FISCAL YEAR 2023 PROJECTS

PROJECT	STATUS	BUDGET	FUNDING SOURCE	ESTIMATED ANNUAL SAVINGS	SIMPLE PAYBACK (YEARS)
ULT Freezer Rebate Program	Ongoing	$ 50,000	DSM/EE	$ 10,000	5
Annual Steam Trap Survey	Ongoing	$ 2,500	DSM/EE	$ 10,000	0
Fume Hood Decommissioning Program	Ongoing	$ 15,000	DSM/EE	$ 5,000	3
Energy Risk Management Consultant	Ongoing	$ 34,800	DSM/EE	NA	NA
Purchase Trial Energy Management System	Completed	$ 41,636	DSM/EE	NA	NA
Recommissioning of Carmichael Recreation Center & Gym, Joyner Visitor Center, & Schaub	Completed	$ 170,000	DSM/EE	$ 315,000	0.54
Language and Computer Labs - Network Engine Upgrades	Completed	$ 2,929	DSM/EE	TBD after RCx	TBD after RCx
Phytotron - Network Engine Upgrades	Completed	$ 3,394	DSM/EE	TBD after RCx	TBD after RCx
Main Distribution Frame - Network Engine Upgrades	Completed	$ 3,394	DSM/EE	TBD after RCx	TBD after RCx
Public Safety Building - Actuator Upgrade	Completed	$ 39,200	DSM/EE	TBD after RCx	TBD after RCx
Turlington & Alexander - Replace Mechanical Fan Coil Thermostat Controllers	In Progress	$ 160,000	DSM/EE	$ 31,500	5.1
EB II Aeroseal Duct Work	Completed	$ 86,687	DSM/EE	$ 68,000	1.3
Biltmore Fume Hood Removal	Completed	$ 12,000	DSM/EE	$ 5,000	2.4
BTEC LED Tube Lighting Upgrades	Completed	$ 7,733	DSM/EE	$ 5,000	1.5
Cates Plant LED Upgrade Lighting in Plant Room	Completed	$ 11,316	DSM/EE	$ 4,600	2.5
Toxicology Hallways & Common Spaces LED Upgrades	Completed	$ 27,407	DSM/EE	$ 6,000	4.6
Carmichael Gym (Gymnastics Facilities) Lighting Upgrade	Completed	$ 44,325	DSM/EE	$ 6,000	7.4
Headhouse 1 LED Upgrade	Completed	$ 252,292	DSM/EE	$ 68,000	3.7
Chiller Pump VFD Upgrades - Yarbrough & Cates	Completed	$ 251,607	DSM/EE	$ 40,000	6.3
Recommissioning of EBI	In Progress	$ 150,000	DSM/EE	TBD	TBD
Page Hall Mechanical & Electrical Upgrade	In Progress	$ 468,948	HB1292	NA	NA
Fitts-Woolard Hall Solar Photovoltaic Array	In Progress	$ 509,625	HB1292	$ 23,800	21.4

FISCAL YEAR 2023 PROJECTS CONTINUED

PROJECT	STATUS	BUDGET	FUNDING SOURCE	ESTIMATED ANNUAL SAVINGS	SIMPLE PAYBACK (YEARS)
Battery Storage - Centennial Campus Infrastructure	In Progress	$ 500,000	HB1292	$ 85,400	5.6
LED Conversion - CVM Main	In Progress	$ 740,000	HB1292	$ 220,000	3.4
LED Conversion - Williams Hall	In Progress	$ 360,000	HB1292	$ 96,000	3.8
LED Conversions (Exterior Lighting) - South & Centennial Campuses	In Progress	$ 889,880	HB1292	$ 277,700	3.2
Controls Upgrades - MRC & PSC	In Progress	$ 338,731	HB1292	TBD after RCx	TBD after RCx
Schaub Phase II Ventilation Study & Implementation	In Progress	$ 43,500	F&A	$ 108,900	0.4
Mary Anne Fox Phase II Ventilation Study & Implementation	In Progress	$ 40,000	F&A	$ 42,420	1
Schaub Steam Trap Replacements	In Progress	$ 10,000	F&A	$ 40,000	0.3
Schaub Energy Improvements Phase I - Resolve RCx Findings	In Progress	$ 36,500	F&A	$ 30,000	1.2
Meter Upgrades - Multiple Buildings	In Progress	$ 57,500	F&A	NA	NA

FISCAL YEAR 2024 PROJECTS

PROJECT	STATUS	BUDGET	FUNDING SOURCE	ESTIMATED ANNUAL SAVINGS	SIMPLE PAYBACK (YEARS)
ULT Freezer Rebate Program	Ongoing	$ 50,000	DSM/EE	$ 10,000	5
Annual Steam Trap Survey	Ongoing	$ 2,500	DSM/EE	$ 10,000	0.3
Fume Hood Decommissioning Program	Ongoing	$ 15,000	DSM/EE	$ 5,000	3
Energy Risk Management Consultant	Ongoing	$ 40,200	DSM/EE	NA	NA
Turlington & Alexander - Replace Mechanical Fan Coil Thermostat Controllers	In Progress	$ 160,000	DSM/EE	$ 31,500	5.1
Recommissioning of EBI	In Progress	$ 150,000	DSM/EE	TBD	TBD
Page Hall Mechanical & Electrical Upgrade	In Progress	$ 468,948	HB1292	NA	NA
Fitts-Woolard Hall Solar Photovoltaic Array	In Progress	$ 509,625	HB1292	$ 23,800	21.4
Battery Storage - Centennial Campus Infrastructure	In Progress	$ 500,000	HB1292	$ 85,400	5.6
LED Conversion - CVM Main	In Progress	$ 740,000	HB1292	$ 220,000	3.4
LED Conversion - Williams Hall	In Progress	$ 360,000	HB1292	$ 96,000	3.8

FISCAL YEAR 2024 PROJECTS CONTINUED

PROJECT	STATUS	BUDGET	FUNDING SOURCE	ESTIMATED ANNUAL SAVINGS	SIMPLE PAYBACK (YEARS)
LED Conversions (Exterior Lighting) - South & Centennial Campuses	In Progress	$ 889,880	HB1292	$ 277,700	3.2
Controls Upgrades - MRC & PSC	In Progress	$ 338,731	HB1292	TBD after RCx	TBD after RCx
Nelson & MRC - Purchase materials to support Lighting Project	Proposed	$ 758,156	HB1292	TBD	TBD
Schaub Phase II Ventilation Study & Implementation	In Progress	$ 43,500	F&A	$ 108,900	0.4
Mary Anne Fox Phase II Ventilation Study & Implementation	In Progress	$ 40,000	F&A	$ 42,420	1
UCOMM - EM Outreach/Communication Strategy Development	In Progress	$ 25,000	F&A	NA	NA
Professional Study and testing of potential eDNA replacement	In Progress	$ 50,000	F&A	NA	NA
Advanced Planning/Design Sullivan Shops PV	In Progress	$ 40,000	F&A	NA	NA
Advanced Planning/ Phased Design Varsity Lot Solar PV	In Progress	$ 50,000	F&A	NA	NA
Schaub Steam Trap Replacements	In Progress	$ 10,000	F&A	$ 40,000	0.3
Schaub Energy Improvements Phase I - Resolve Rcx Findings	In Progress	$ 36,500	F&A	$ 30,000	1.2
Meter Upgrades - Multiple Buildings	In Progress	$ 57,500	F&A	NA	NA

Overall Energy Management Success

Roles and Responsibilities

NC State Facilities Division staffs a dedicated Energy Management department. Energy Management's mission is to cost-effectively manage energy resources purchased and consumed by the university. This department tracks energy and water consumption, always seeking more efficient ways to use the minimum possible energy while maintaining comfort levels for building occupants and enabling the university to achieve its mission. The composition of the current Energy Management team is shown below.

Person	Title	Role
Damian Lallathin	Director	Oversees Energy Management Department
Alex Freeman	Energy Project Manager	Manages Energy & Water Projects
Elizabeth McGowan	Energy Data Analyst	Analyzes, Tracks, and Reports Data
Julie Snead	Energy Engineer	Reduces Energy & Water Use or Costs
Raheem Ariwoola	Energy Engineer	Reduces Energy & Water Use or Costs
Zack Wenning	Energy Data Systems Administrator	Maintains Energy Data Systems

Training

NC State Energy Management diligently cultivates their expertise, continually keeping pace with the latest emerging technologies and trends in energy and water conservation. Staff actively participates and presents in conferences such as the State Energy Conference of North Carolina and the Appalachian State Energy Summit. Notably, two members of the staff have achieved the Professional Energy Manager certification, while the remaining members are determined to earn this certification in the current fiscal year through State Energy Office classes.

Energy Management staff is currently participating in a Building Automation System (BAS) series of classes which enhances their understanding of BAS systems along with their ability to identify and to address potential issues. Individual staff members consistently attend webinars hosted by relevant agencies and vendors to gain valuable insights of the latest developments in the field. Additionally, the team conducts bi-weekly sessions where individual team members share a training topic with their colleagues. This practice ensures that everyone remains well informed and up-to-date.

Moreover, Energy Management department is committed to the training of future energy professionals. The department has welcomed several student interns in the past, and in the current fiscal year, three more interns are gaining hands-on experience. Providing this kind of real-world training is invaluable to students as it helps them explore their interests and discover their roles in the energy arena.

Communication

Consistent and timely communications are essential to helping the Energy Management department achieve the university's energy and water conservation goals. The department maintains a website https://sustainability.ncsu.edu/energy-management/ for anyone who wishes to learn more about campus energy use, existing conservation programs and NC State's progress against reduction goals. The team continues to analyze and to improve communication channels and is looking to update this website by the end of this fiscal year.

Energy Management also manages and promotes annual energy saving initiatives that take place over the winter and summer sessions. These initiatives are widely publicized to help increase energy conservation awareness and engagement with faculty, staff, and students. In addition, various online articles are regularly submitted to campus weekly and monthly publications in order to advertise special events, project successes and upcoming conservation opportunities.

Energy Management maintains a close working relationship with Utilities Engineering, Building Maintenance and Operations (BM&O) and the University Sustainability Office. This ensures that team members are well informed of campus-planned outages to maintain utility meters and to advise equipment scheduling of replacements. These relationships also ensure that energy saving initiatives and building operating schedules are effectively coordinated. In addition, these partnerships guide and support strategic planning and engagement activities. This teamwork ensures that the Facilities Division shares and works towards the university's energy and water conservation goals.

Declaration of Commitment

This NC State Utility Management Plan supports the energy reductions required in North Carolina G. S. § 143-64.12a and Governor Cooper's Executive Order 80: North Carolina's Commitment to Address Climate Change and Transition to a Clean Energy Economy.

The university recognizes that energy and water consumption is a controllable expense and that energy and water management is a responsibility of all campus students, faculty, and staff.

The Energy Management department is responsible for the development and implementation of this plan.

The undersigned has read and will support this Utility Management plan for NC State University.

Damian Lallathin

Damian Lallathin
Director of Energy Management
Facilities Division

Strategic

Energy Plan

2023 UPDATE

August, 2023

Contents

Strategic Energy Plan

Executive Summary

Campus Energy Overview

Size and Growth

UNC Charlotte is an urban research-intensive university, located primarily on a 1,000-acre campus in the state's largest city. In the Summer of 2023, the University had a campus community (students, faculty, and staff) of approximately 30,300 with nearly ten (9.97) million gross square feet (GSF) of built space, including parking decks. Plans continue for an enrollment increase to approximately 35,000 students in the next (5) years. Additional Academic / Research, Auxiliary Services and Residence Life space continue to be built to support campus population growth. There is also significant growth with the Universities Athletics and Recreation organizations. In FY24 the University will also be bringing a new residence hall online.

Since 2003, the full time equivalent (FTE) Faculty / Staff campus population has grown to 3,700 and built space has more than doubled. In that same period, energy consumption has grown by 52%, and energy costs have grown by 107%; however, energy consumption per GSF has fallen by 35%. In addition, water consumption has dropped by 3%, but water costs have grown by 170%; however, water consumption per GSF has fallen by 59%.

Strategic Energy Plan

Energy Conservation Challenges, Accomplishments and Goals

Accomplishments and Goals

UNC Charlotte's energy use reduction of 35% per building GSF provided an avoided cost of approximately $6.2 million this year alone over the 2003 baseline. New buildings continue to have energy recovery and high efficiency equipment / systems installed. As noted previously these results may not be indicative of actual performance due to operational increases associated with full operations post COVID-19.

UNC Charlottes energy management program is structured around the key areas below:

- Monthly Monitoring of Energy Usage
- Internal Building Energy Audits
- Capturing Energy Savings from Repair Work
- Organization Integration & Awareness Training

The University is now in Year 9 of its "Guaranteed Energy Savings Performance Contract" w/ Year 8 M&V verifying $61,795 and Year 9 M&V non-verified $101,330 in excess savings. The "Performance Contracts" through Ameresco and JCI (UNC – Gen. Admin. Lighting) continue to provide energy savings through the energy related capital improvements to roughly twenty-eight (28) different campus facilities.

Planned Activities 2023-2024	Measurement	Savings Estimated	Cost	Funding Source	Area
Continue to monitor all utility bills, BAS, and submeter data for billing errors and areas of high energy usage.	kWh, Therms	$75k	N/A	FM	Monthly Monitoring of Energy Usage
Complete Internal Facility Energy Audits for (20) university buildings.	kWh, Therms	TBD	TBD	Utility Carry Forward	Internal Facility Energy Audits
Implement ten (10) findings from the ASHRAE Level II Energy Audits conducted.	kWh, Therms	$300k	$250k	Utility Carry Forward / FM	Internal Facility Energy Audits
Monitor Work Order System for Energy Savings Opportunities	kWh, Therms	$70k	TBD	Utility Carry Forward / FM	Capturing Energy Savings from Repair Work
Project Planning for a Solar PV System	Proposal for one Facility	TBD	TBD	Utility Carry Forward / FM	Renewables
Energy Efficiency Goals for BAS technicians	kWh, Therms	$70k	TBD	FM	Organization Integration & Awareness Training
Reclaimed Water System Water Quality Instrumentation (includes academic access to data)	Sensors purchased	N/A	$35,000	Student green fund	Organization Integration & Awareness Training

Strategic Energy Plan

Past Year Accomplishments	Measurement	Savings Estimated	Cost	Funding Source	Area
Continue maintenance on the existing submetering infrastructure and expand where needed.	Monthly	N/A	$48k	Utilities Carry forward	Monthly Monitoring of Energy Usage
Continue to monitor all utility bills for billing errors and miscalculations by major utilities.	$ per month	N/A	N/A	FM	Monthly Monitoring of Energy Usage
Discontinue firm & interruptible transportation of nat. gas w/ well head pricing for RUP's.	$ per month	$612k	$1.5k	FM	Monthly Monitoring of Energy Usage
Reviewed rate schedules with DEC and PNG to assure the University is on the most favorable rate sch.	kWh /therms	N/A	N/A	FM	Monthly Monitoring of Energy Usage
Energy Audits will be conducted by FM in conjunction with university faculty at ten (10) university buildings.	kWh, Therms	$907k	TBD	Utility Carry Forward	Internal Facility Energy Audits
Implement ten (10) findings from the Energy Audits conducted.	kWh, Therms	$324k	$75k	Utility Carry Forward / FM	Internal Facility Energy Audits
Implement Economizer Control, Supply Air Temp, & Demand Based Reset Strategies	Implement in 5 Buildings	$139k	$73k	Utility Carry Forward / FM	Internal Facility Energy Audits
RUP2 VFD Replacement	kWh, Therms	$11k	$45k	FM	Capturing Energy Savings from Repair Work
Energy Efficiency Goals for BAS technicians	kWh, Therms	$60.4k	$0k	FM	Organization Integration & Awareness Training
Develop Periodic Communications to FM and the Campus regarding Energy Efficiency	Published	N/A	N/A	FM	Organization Integration & Awareness Training
Continue to follow Temperature Control Policy within Administrative Facilities	Implement	TBD	TBD	FM	Organization Integration & Awareness Training
Grants to depts for upgrade costs for 6 EnergyStar ultralow freezers for new Science Building	kWh	$18,000	$12,000	Student green fund	Organization Integration & Awareness Training

Strategic Energy Plan

North Carolina G.S. 143-64.12 and LEED principles for sustainability, particularly relating to energy and water use, are included in the UNC Charlotte Design and Construction Manual. UNC Charlotte has (11) certified green buildings to date (5 LEED, 6 Green Globes) and is currently pursuing Green Globes certification for the new Phase XVI Housing. Since the first campus building was certified under LEED in 2009, UNC Charlotte has certified construction and design on 71% of eligible construction based on occupied gross square feet. With smaller buildings that are not certified, the university continues to emphasize energy and water efficiency standards detailed in the Design and Construction Manual. Updates to the manual were formally adopted in 2018-19 in areas of lighting, lighting controls, insulation, solar thermal heating systems, plumbing fixtures and construction/demolition waste diversion to align with ASHRAE 189.1 (2014) *Standard for the Design of High-Performance Buildings* and ASHRAE 90.1 (2016) *Energy Standard for Buildings*. The University is in the process of making updates to the design and construction manual. Starting in 2020, the university has maintained a Gold-level membership in the US Green Building Council to make over 900 online courses available free to staff, faculty and students.

To gain an external comparison, UNC Charlotte has participated in two rounds of the USEPA Energy Star Higher Education Benchmarking Initiative. The most recent feedback from EPA was based on energy data for the Main Campus for calendar year 2021. A scorecard report was generated by EPA to compare UNC Charlotte to different institutional peer groups (from 88 participating campuses) in terms of energy use intensity (EUI). UNC Charlotte Main Campus EUI ranked: 12 of 15 for campuses in Climate Zone 3; 16 of 28 for Carnegie classification Doctoral; and 5 of 7 for campuses providing separate EUI for residential buildings. In summary, UNC Charlotte's Main Campus EUI was higher than the median in every comparison group the EPA assembled. This report challenges us to consider whether university and state standards, goals, and investments for energy conservation are too modest.

Energy Plan

UNC Charlotte's energy plan is structured into four (4) areas to accomplish specific goals in each of the categories below.

Monthly Monitoring of Energy Usage – The cornerstone UNC Charlotte's energy management program is evaluating the data available from the monthly utility billing information as well as the Campus Building Automation System (BAS). With this information the team is able identify operational issues, prioritize areas of high energy usage, and compare facilities of a common use type to identify candidates for Energy Audits. This is an ongoing effort and will continue in FY24.

2023 Project Highlights

Miltimore-Wallis – Failed Preheat Control

Due to higher than anticipated hot water usage and review of the campus BAS it was found that the preheat control valves for AHU 18 & 20 weren't working properly. The valve actuators failed open and were preheating the air to the cooling coil by 17 – 24 deg F on average. This was wasting heating energy as well as providing unnecessary load on the cooling coil.

The points of failure were identified. Corrective action was taken to provide appropriate control for the system.

Estimated Cost: $200
Estimated Savings: $54,847
Payback: 0 Years

RUP 5 – CHW Bypass

While performing routine Campus BAS checks, it was found that a bypass valve was left open after completion of the new RUP5 plant one the secondary chilled water loop. This bypass led to excess pumping causing the required pumping to be close to 930 GPM on average. After the open bypass was identified and closed the average pumping required dropped to 420 GPM on average.

The bypass was located with in-house staff and adjusted to the appropriate position to maintain the necessary flow requirements.

The savings for this is based on the reduction in pumping energy required to meet the chilled water load of the loop and BAS tend data.

Estimated Cost: $1,000
Estimated Savings: $30,156
Payback: 0 Years

Science – Tertiary Hot Water Pump DP

While performing routine Campus BAS checks, it was found that the hot water differential pressure setpoint for the 3 10 HP tertiary hot water pumps was set to 25 psi. This caused all 3 pumps to run at nearly 90% of maximum speed all the time.

The setpoint was periodically dropped while monitoring building operation to allow the pumps to slow down. This resulted in a new setpoint of 10 psi. As a result, only 1 pump is currently running at approximately 75% on average. This led to significant energy savings.

The savings for this project is associated with reducing the pumps running from 3 to 1 and dropping the pump speed from 90% to 75%. This will reduce the overall pumping required by the systems.

Estimated Cost: $0
Estimated Savings: $6,654
Payback: 0 Years

Candidates for Energy Audits – In order to prioritize facilities for energy audits it is important to organize campus facilities into peer groups based on primary use. In doing so, it was found that there seven (7) primary facility use types: Education, Dining, Housing, Office, Plant, Research, and Events. Once each facility on campus was organized into peer groups all utility information from the previous FY was cataloged to obtain a picture of what the average looked like for each category and where each category ranked overall. In addition, each facility was compared to the average for each peer group not only from an overall utility usage perspective but the components of Electricity, Natural Gas, Heating Hot Water, and Chilled Water Usage as well as energy intensity (usage per square foot). Based on this methodology it was determined that the following facilities were found to stand out in their respective peer groups and selected for energy audits.

Cat.	Facility	SQ FT	kWh	Therms (NG)	Therms (H)	mmBtu (C)	Est. Spend	EUI
Plant	Regional Utility Plant 1	12,069	5,251,796	624,740	0	0	$913,917	6,661.6
Events	Barnhardt Student Activity Center	285,079	4,998,952	8,390	167,040	0	$520,936	795.2
Education	College of Health and Human Services	161,701	1,935,445	0	38,620	14,638	$203,725	360.0
Plant	Regional Utility Plant 3	3,838	1,905,641	182,920	0	0	$270,081	6,460.6
Events	Belk Gymnasium	129,910	1,285,793	30,590	93,530	4,977	$204,013	966.0
Education	McEniry	108,724	2,067,382	58,600	19,242		$165,653	340.0
Housing	Miltimore Hall	171,646	2,024,602	71,920	0	0	$259,635	82.2
Housing	Belk Hall	167,920	1,891,021	54,140	0	0	$187,865	70.7
Dining	South Village Dining	55,087	2,252,560	36,965	0	0	$198,374	206.7
Housing	Lynch Hall	142,121	1,701,584	60,545	0	0	$151,230	83.5
Housing	Wallis Hall	158,114	1,445,640	45,528	0	0	$166,398	60.0
	Totals	**1,396,209**	**26,760,416**	**1,174,338**	**318,432**	**19,615**	**$3,241,826**	

The facilities above also represent a significant portion of the campus's footprint, energy usage, and expenditure. Further confirming the selection of the facilities for energy audits.

SQ FT	kWh	Therms (NG)	Est. Spend
14%	22%	34%	29%

The Results of the Energy Audits are reviewed in the next section.

In FY24, the methodology will shift in order to adhere to the Preliminary Practicality and Economic Feasibility Analysis target of HB 570, however monthly monitoring will continue. This new requirement will call for energy audits to be performed in facilities that are 20,000 square feet or greater, at least 10 years old, and that haven't been audited in the last 3 years would need to be audited by October 2024. UNC Charlotte will need to audit twenty-eight facilities under these new guidelines.

Internal Facility Energy Audits – UNC Charlotte has a growing energy management work unit as well as a partnership with the Universities Energy Production & Infrastructure Center (EPIC) in order to complete energy audits as well as implement the findings. In FY23 a full-time energy engineer was brought on board and an addition engineer should be brought on board in FY24. With the partnership with EPIC this will dedicate four (4) personnel towards conducting energy audits. The program is structured to develop investment grade audits. With the primary components of evaluating four (4) year's worth of utility information, review of facility infrastructure characteristics/performance, as well as reviewing Building Automation System (BAS) trends and real time data. As mentioned in the previous section, the audit program will be ramping up to adhere to HB 570.

FY23 Results

Identified – Below is a summary of the energy audit results listed by building. In each facility one or more of the Energy Efficiency Measures noted below was identified. The table notes the overall projected savings by facility. The therm savings below are a combination of Natural Gas and Hot Water noted in the previous table.

	Energy Audit Projected Reduction			
Facility	kWh	Therms (NG)	kGal	Est. Spend
Regional Utility Plant 1	2,740,374	66,296	4,923	$323,846
Barnhardt Student Activity Center	1,425,369	56,209	0	$163,760
College of Health and Human Services	137,306	0	0	$7,415
Regional Utility Plant 3	458,960	19,292	0	$89,239
Belk Gymnasium	340,720	53,845	0	$76,605
McEniry	509,525	27,766	0	$53,457
Miltimore Hall	300,988	22,769	0	$44,675
Belk Hall	274,746	13,463	0	$38,272
South Village Dining	236,483	13,585	174	$30,092
Lynch Hall	608,101	4,573	0	$43,198
Wallis Hall	633,223	3,802	0	$36,232
Totals	**7,665,794**	**281,600**	**5,098**	**$906,791**

Implemented – Below is a summary of energy audit projects that were implemented. A description is provided below. The table notes the overall projected savings by EEM.

Facility	Measure	kWh	Therms	CCF	Estimated Savings	Estimated Cost	Payback (Yrs)	1292 Funded
Duke	AHU 2: DAT Reset	42,434	47,640	0	$47,416	$34,892	0.7	Yes
Duke	AHU 2: Winter Night Setback & Dual Setpoint Control	34,498	10,920	0	$12,178	$2,400	0.2	Yes
Duke	ERU: Integration of Economizing Control	46,658	7,756	0	$9,826	$19,900	2.0	Yes
FOPS	AHU 1 & DAT Reset	10,515	4,076	0	$4,421	$2,100	0.5	Yes
Bio	AHU 5 & 6 DAT Reset	33,488	16,750	0	$17,654	$13,200	0.7	Yes
Bio	AHU 5 & 6 Economizer	67,760	0	0	$3,591	$1,000	0.3	Yes
Atkins	AHU 1 HD SAT Reset Stpt Adj	0	8,329	0	$7,896	$0	0.0	No
UREC	Manage Heating of UREC's Outdoor Pool during Fall and Winter Months	0	6,945	0	$6,584	$0	0.0	No
RUP1	Cooling Tower Make Up Control	0	0	12,358	$187,855	$1,005	0.0	No
Woodward	AHU 1 and 2 – Enable and Troubleshoot Economizing	232,315	0	0	$12,313	$200	0.0	No
Robinson	Economizer Upgrades	263,238	0	0	$13,952	$0	0.0	No
	Totals	**730,906**	**102,416**	**12,358**	**$323,686**	**$74,697**	**0.2**	

Common Energy Efficiency Measures Identified/Implemented

- **AHU DAT Reset** – It was observed that the common AHU supply air temperature (SAT) setpoint is cooler than needed year-round. So, we've been identifying and implementing a SAT reset strategy based on the actual demand of the building.
- **Arena AHU Improvements** – During the audit of the Student Activity Center (SAC) it was found that the occupancy-based ventilation system is not operating as intended which has led to excess ventilation air increasing the building load during low occupancy periods. So, we've identified a strategy to have the ventilation accurately track the occupancy of the area.
- **HW & CHW Delta T Pumping Controls** – We've found that the temperature drop on hot water and chilled water distribution loops is lower than design criteria. Typically, the loops would be designed for a 30 deg drop on hot water and a 10 deg drop on chilled water. We've been seeing much lower than this and are identifying and implementing strategies to reduce the cause which is excess pumping.
- **Cooling Tower Make Up Water Control** – It was found that the Cooling Tower Make Up Water Control system was not working properly. This led to the cooling towers continually overflowing and wasting a significant amount of water. This system was repaired reducing the excess water usage.
- **Cooling Tower Sewer Credit** – Charlotte Water offers a credit on sewer charges for Cooling Tower Water that is not discharged to the sewer. The work required is to install metering on the make up and blowdown of the towers with transmitters the utility can read each month, after being registered.
- **Kitchen Ventilation Upgrade** – We've found that the kitchen ventilation system at one of our dining facilities operates 24/365 regardless of whether cooking activities are taking place. We've identified a strategy to automate the system in order to respond directly to cooking activities by monitoring the temperature of the cook tops.
- **Pool Heating Controls** – It was found that the outdoor pool was being heated during periods when it wasn't necessary. We've corrected the root cause and set up alarming to notify if this occurs in the future.
- **Economizer Control** – We've found that economizer control is either not working or set up with a less efficient strategy to take advantage of free cooling from outdoor air. So we've been identifying, implementing, and fixing economizer controls throughout campus based on a dry bulb sequence which allows for taking advantage of long periods of the year of free cooling.

Strategic Energy Plan

FY24 Plans

Identified – The following facilities have been selected for energy audits in FY24, with the overall goal of auditing 20 facilities.

Fretwell, Cameron Hall, Burson, Friday, Smith, Witherspoon, Football Center, Cone, Sanford Hall, Martin Hall, Center City Building, Student Union, Oak Quad, Laurel Hall, Hunt Hall, Scott Hall, Holshouser Hall, Storrs, Rowe, & Hawthorn

Implement

Planning has started to proceed with implementing the ECMs identified for RUP1, Belk Gym, South Village Dinning, and the Student Activities Center.

Capturing Energy Savings from Repair Work – UNC Charlotte's energy management work unit has partnered with the operational trades in order to capture the energy savings associated with the ongoing work they are doing. Below is a table of repair work we were able to capture the energy savings for and a list of identified work that is planned to be completed in FY24. We plan on continuing this partnership in FY24.

Implemented

Facility	Measure	kWh	Therms	CCF	Estimated Savings	Estimated Cost	Payback (Yrs)	1292 Funded
Robinson	Economizer Control Upgrades	263,238	0	0	$13,952	$400	0.0	No
Motorsports	Economizer Control Upgrades	45,054	0	0	$2,388	$400	0.2	No
Miltimore Wallis	Economizer Control	104,463	0	0	$5,537	$600	0.1	No
	Totals	**412,756**	**0**	**0**	**$21,876**	**$1,400**	**0.1**	

Planned

Facility	Measure	kWh	Therms	CCF	Estimated Savings	Estimated Cost	Payback (Yrs)	1292 Funded
Burson	LAMU 1 & 4 Leaking HW Valves	58,273	38,076	0	$39,185	$3,000	0.1	No
Woodward	AHU A – Fix Faulty CHWV	34,205	8,140	0	$9,530	$2,500	0.3	No
Levine	HW Control RCx	95,155	43,490	0	$46,272	$30,000	0.6	No
	Totals	**187,633**	**89,706**	**0**	**$94,986**	**$35,500**	**0.4**	

Strategic Energy Plan

Organization Integration & Awareness Training – The Energy Manager will continue to work closely with the University Sustainability Officer for various energy conservation measures and training efforts within the appropriate University departments. The Office of Sustainability priorities include addressing compliance with compliance with the UNC Sustainability Policy (600.6.1), and to address the University's Strategic Plan goals for climate action and creating a culture of sustainability. Energy and water conservation strategies are critical to success on these sustainability goals. In FY24, specific goals include completing relevant revisions to the university's Design and Construction Manual, writing/publishing Standard Operating Procedures aligned with high-performance stands (e.g. ASHRAE, LEED) in relevant areas like Indoor Air Quality, Energy Management, and Purchasing (e.g. EnergyStar criteria). The Office of Sustainability is launching a Green Workplace certification program that will include energy and water categories for staff engagement. These efforts are aimed at improving behavior and awareness in ways that contribute to the University's continued ability to exceed the state of North Carolina mandated conservation goals.

Appendices

A. G.S. 143-64.12(a) Declaration

B. SEO Annual Report Form FY ‘23 (Attachment)

UNIVERSITY OF NORTH CAROLINA CHARLOTTE

Appendix A

(To be updated at later date)

I have read the Strategic Energy Plan for my Organization. The plan, as presented, supports the reductions required in G.S. 143-64.12(a).

Implemented this 1st day of September, 2023

Jason Bernstein, PE, CEM, SFP
Energy Manager – Engineering

Don Janus
Director of Engineering

- **See signed attached pdf.**

UNC GREENSBORO
Facilities Operations

2023 Strategic

Energy and Water Annual Report

August 22, 2023
Facilities Operations
Prepared by: Nihal Raees

CONTENTS

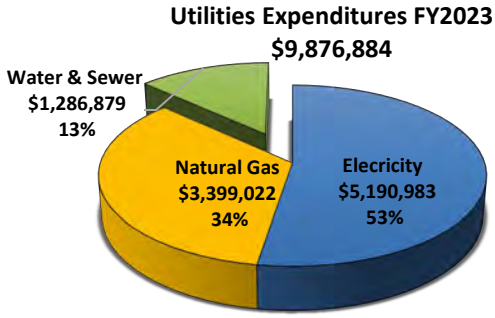
I. OVERVIEW

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.

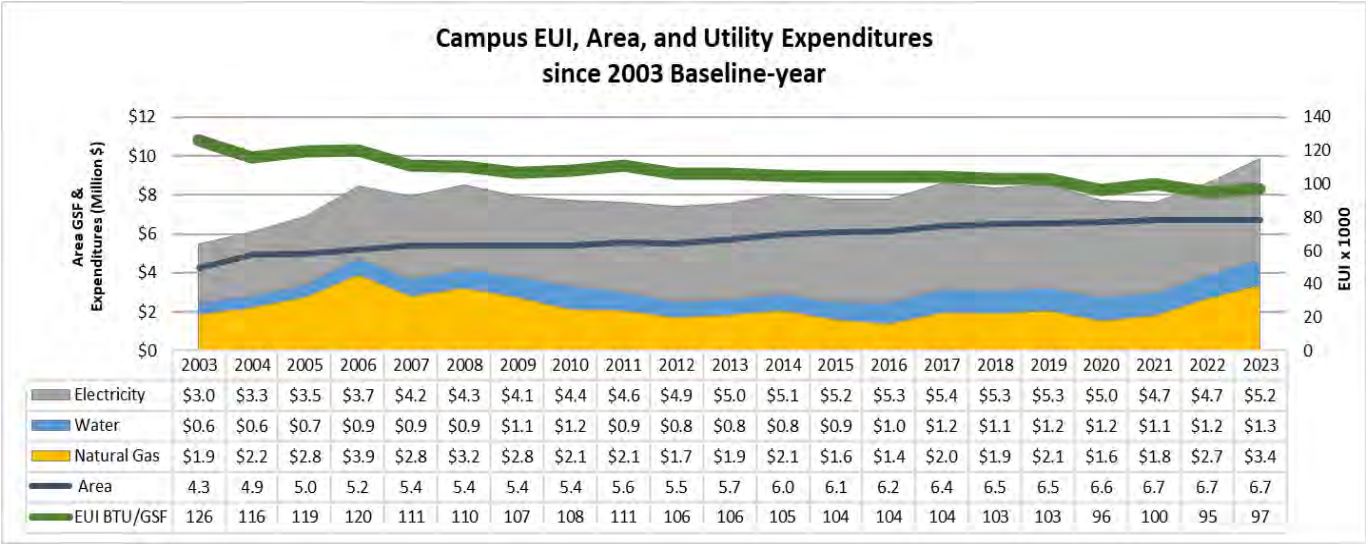
UNCG is currently at 96,856 EUI BTU/GSF, achieving a 23% EUI reduction from 125,963 EUI in the baseline year of 2003. Full-Time Equivalent (FTE) student enrollment has declined during and post-pandemic. The fall of 2022 showed 16,070 FTE, a 6% enrollment decline from the prior fall and a 38% increase 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.



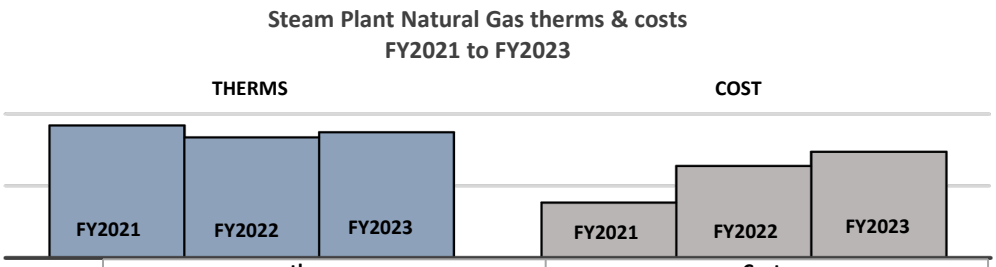
The upper graph shows utility expenditures breakdown to campus area and EUI performance since 2003 level.



	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.

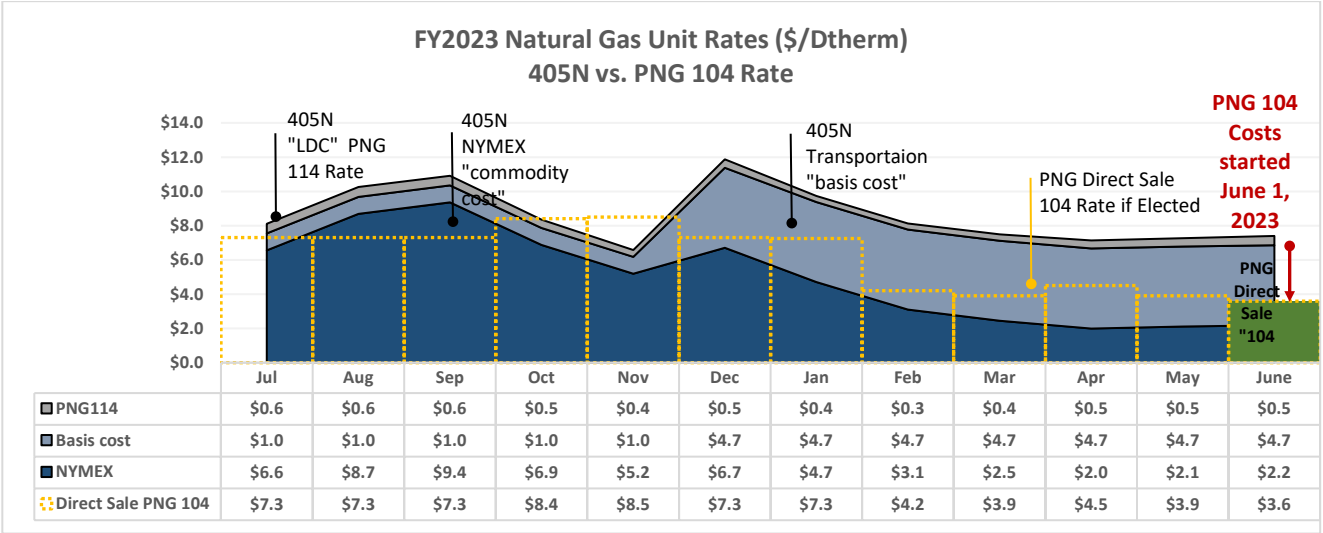


	therms	Cost
FY2021	3,682,227	$1,535,718
FY2022	3,350,347	$2,554,467
FY2023	3,493,838	$2,948,921

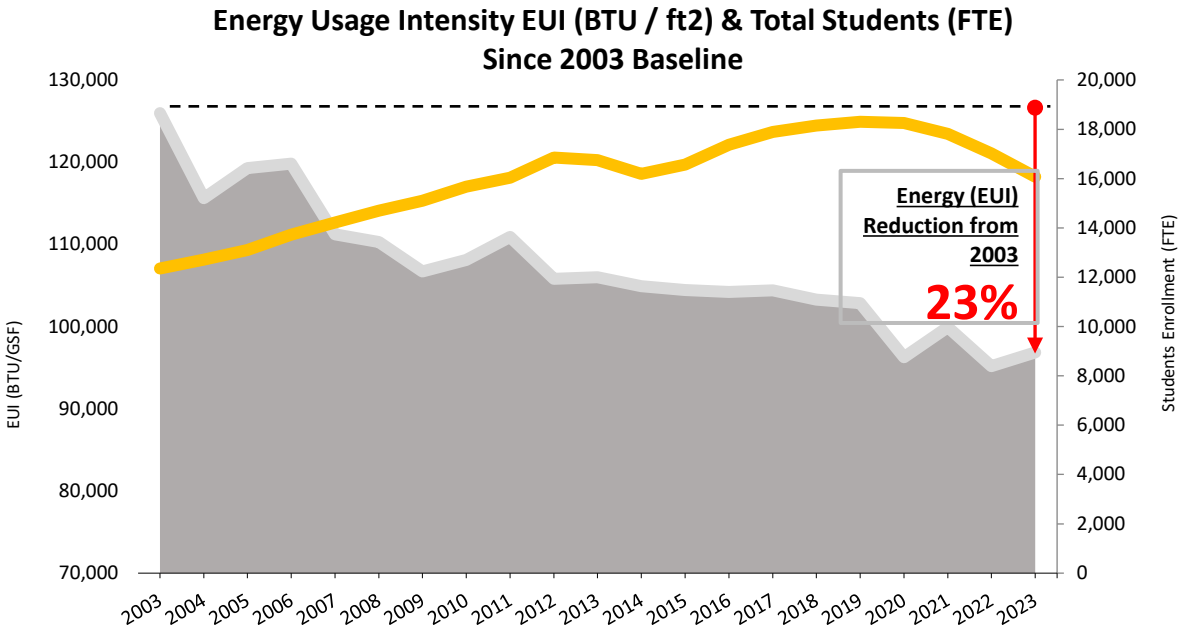
In FY2023, the commodity costs began to slow down in January 2023, but the basis cost was increased by 372% to $4.67 from $0.99 per Dekatherm through the new term December 1, 2022, to November 30, 2023. That peaked the cost of delivered therms to $11.80 per Deka therm ($6.6 "NYMEX commodity cost" + $4.67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

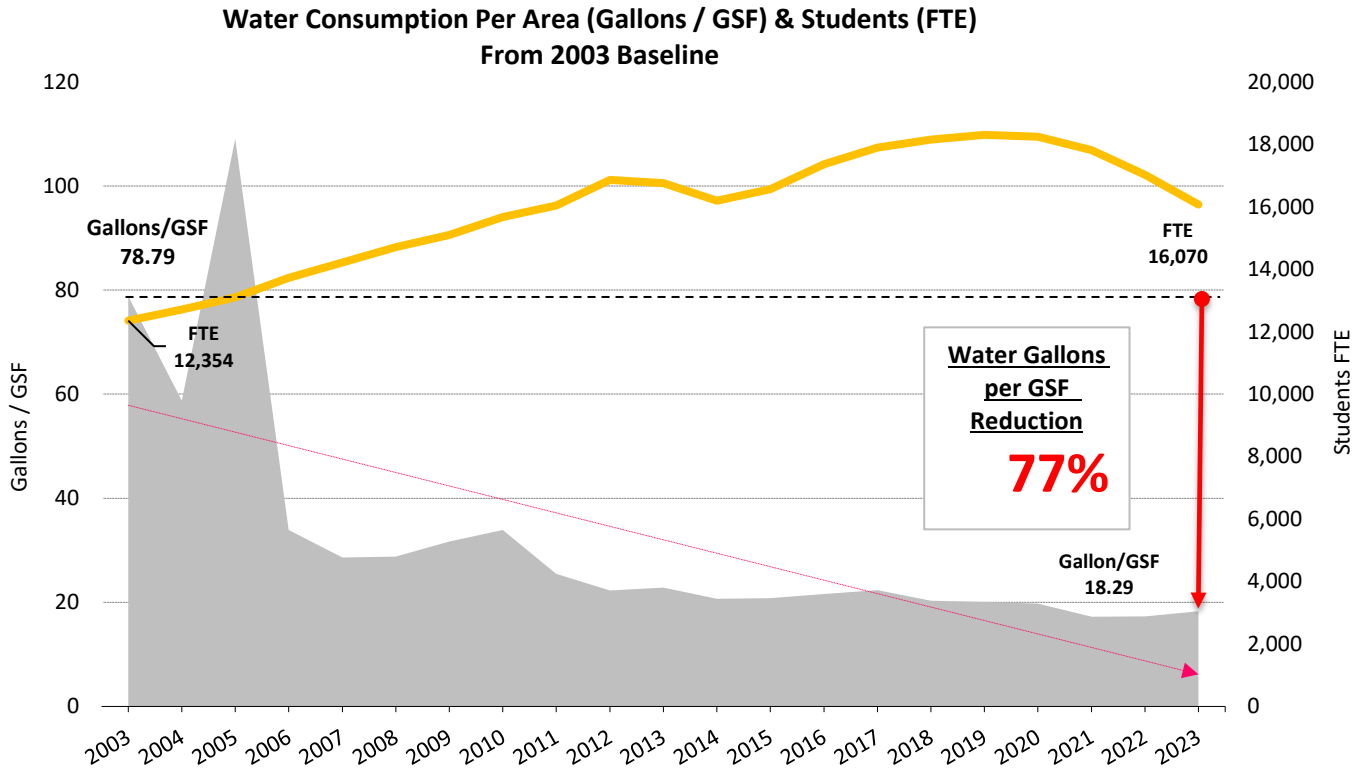
IV. BASELINE & UTILITY OVERVIEW

- 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.

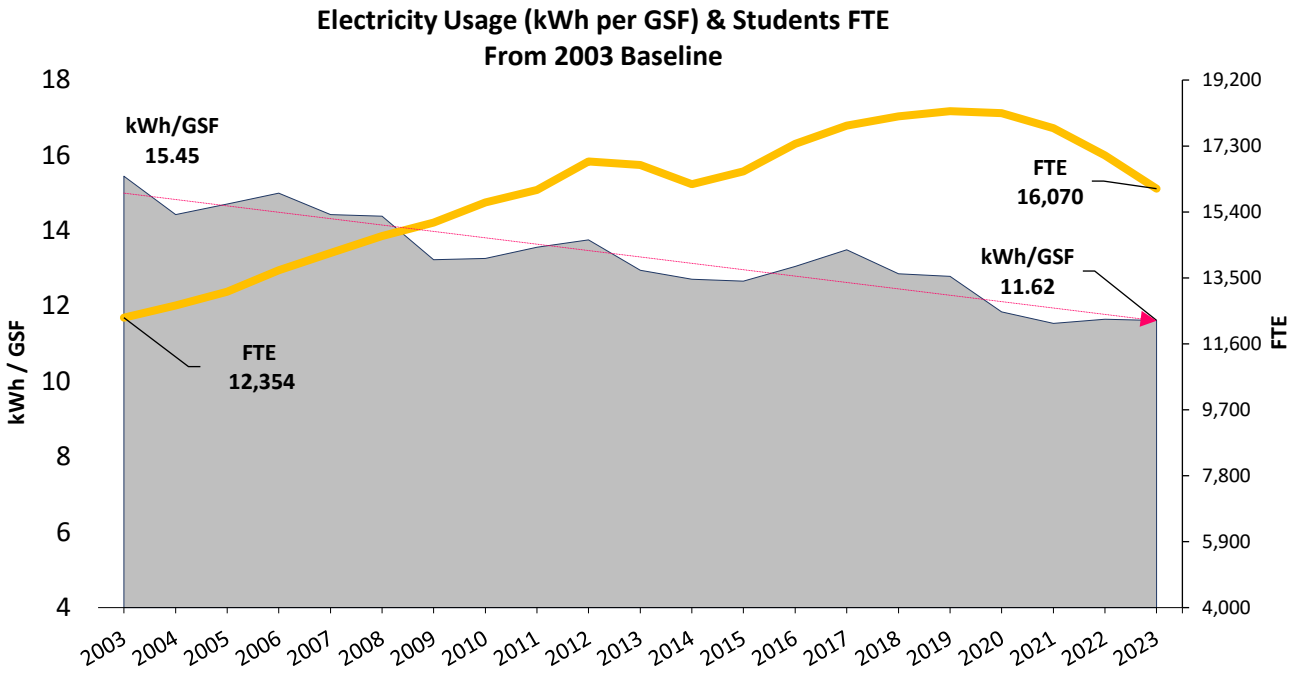


ENERGY (ELECTRICITY, NATURAL GAS, and #2 FUEL OIL)

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

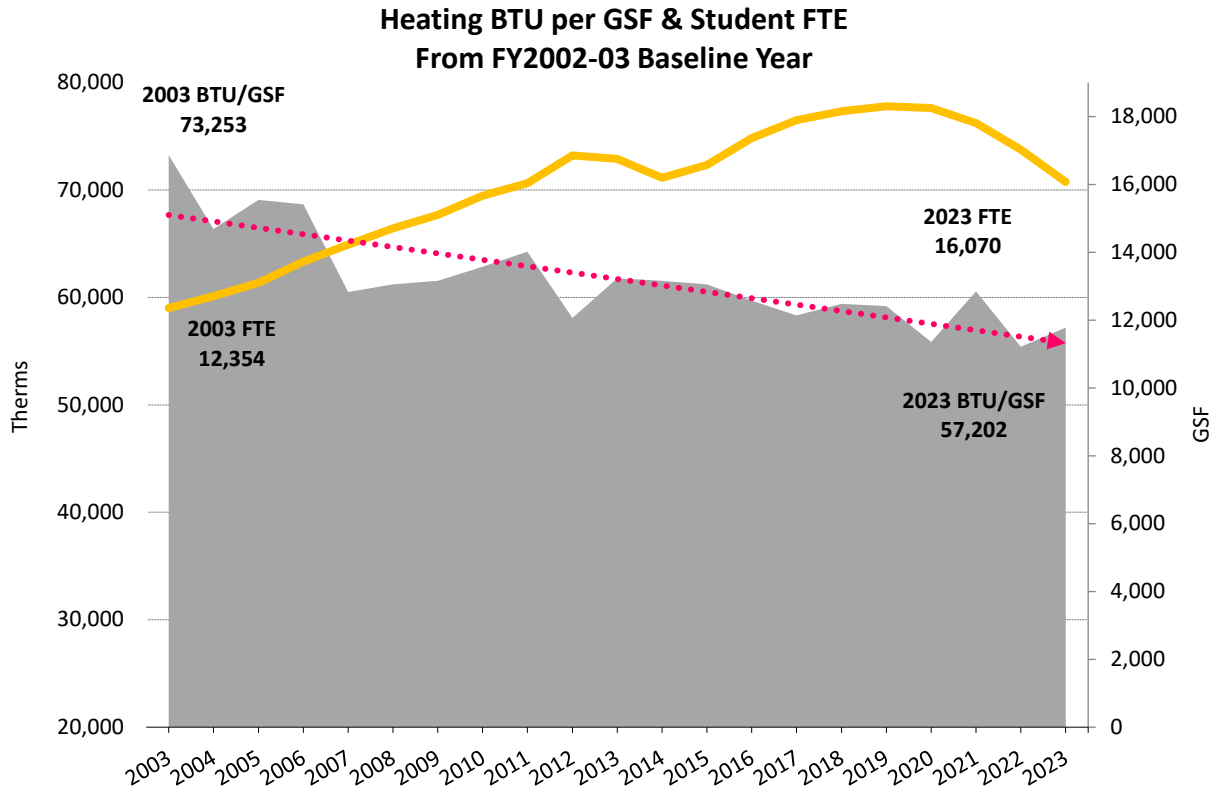
From December 1, 2015, UNCG purchased natural gas for the Steam Plant through State Term Contract 405N, which is currently held by Texican Natural Gas Company, LLC. As mentioned earlier in this report, starting June 1, 2023, UNCG Steam Plant natural gas like all other accounts on the campus and outlying 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.

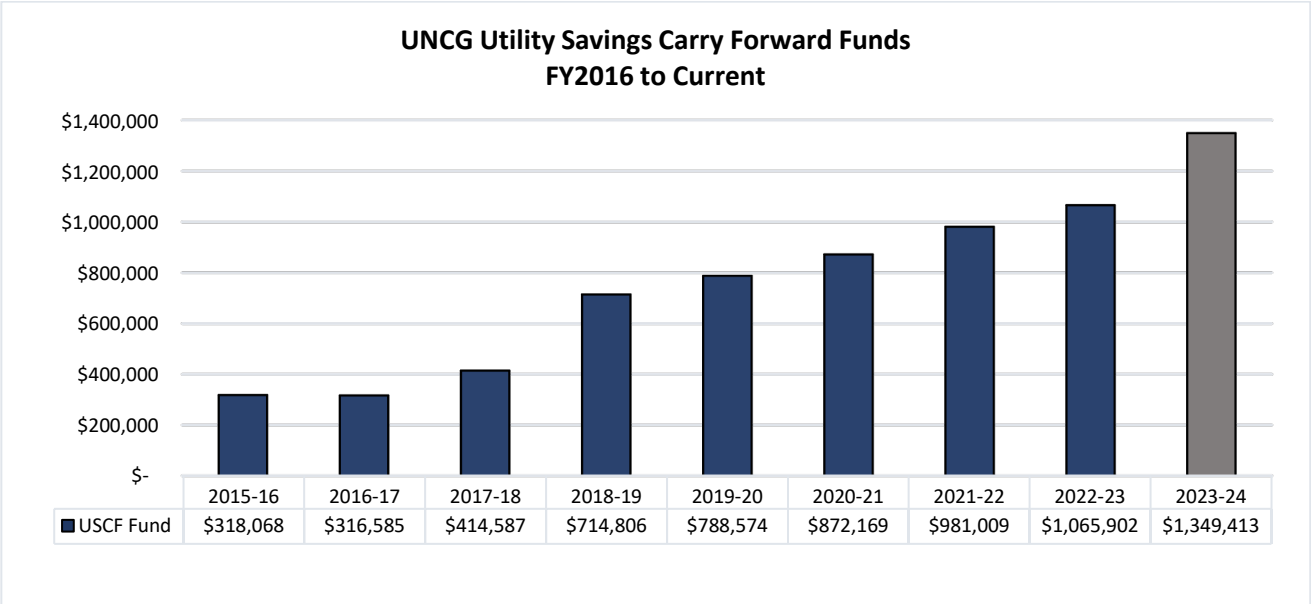
ENERGY DATA MANAGEMENT & BAS

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

UNC Hospitals
Chapel Hill, NC

Strategic Energy and Water Plan

September 2023

Executive Summary

During fiscal year 2023, UNC Hospitals at Chapel Hill, NC continued its commitment towards energy conservation and utility cost avoidance. This past year's primary focus was on monitoring the improvements made through American Energy Assets, LLC which was originally contracted in 2016 to review and improve the facility's utility patterns, system operations, and explore ways to reduce consumption. AEA's initial contract ended at the end of fiscal year 2019, and a maintenance-based agreement was entered into in fiscal year 2020 with AEA to prevent savings slippage. The maintenance-based agreement expired in July of 2021 and was not renewed due to budget constraints resulting from the pandemic.

UNC Hospitals continues to maintain a program of facility maintenance, improvements, and renovations that has a significant effect on controlling overall energy consumption and costs. As interior building renovations are completed, the latest energy codes are utilized to ensure that the equipment and systems being installed are compliant. In addition, Life Cycle Cost analysis and performance guidelines complying with the State Building Code, the NCAC, and the State Construction Office Construction Manual are utilized to achieve the best cost and energy performance on these projects as applicable.

The following tables summarize UNC Hospitals' performance: (1) Table 1 – Net Energy Performance, (2) Table 2 – Water/Sewer Performance, and (3) Table 3 - Energy Cost Avoidance since 2002-2003.

Table 1: Net Energy Performance (Excludes Water, Sewer, Non-potable) Fiscal Year 2002/03 to 2022/23

Fiscal Year	*Total Fiscal Year Energy Cost ($)*	*$/MMBTU*	*$/GSF*	*BTU/SQFT*	*Change in BTU/SQFT (Compared to 2002-2003)*
2002-2003	$8,089,456	$12.74	$4.18	327,754	-
2003-2004	$7,341,105	$11.75	$3.79	322,415	-2%
2004-2005	$8,247,839	$11.22	$4.26	379,383	+16%
2005-2006	$9,943,314	$14.88	$5.13	344,912	+5%
2006-2007	$10,072,484	$16.53	$5.20	314,520	-4%
2007-2008	$11,098,732	$22.16	$5.73	258,574	-21%
2008-2009	$12,369,412	$23.45	$6.39	272,312	-17%
2009-2010	$14,933,832	$24.19	$6.51	269,296	-18%
2010-2011	$15,724,242	$26.07	$6.76	259,123	-21%
2011-2012	$16,301,419	$28.44	$7.00	246,331	-25%
2012-2013	$15,580,123	$26.04	$6.69	257,094	-22%
2013-2014	$17,095,789	$27.84	$7.35	263,887	-19%
2014-2015	$16,231,427	$26.80	$6.97	260,289	-21%
2015-2016	$15,537,130	$26.68	$6.68	250,205	-24%
2016-2017	$15,342,884	$26.74	$6.59	246,508	-25%
2017-2018	$14,844,728	$28.55	$6.38	223,432	-32%
2018-2019	$14,652,897	$27.78	$6.30	226,681	-31%
2019-2020	$15,185,924	$28.45	$6.53	229,354	-30%
2020-2021	$15,102,753	$28.38	$6.49	228,647	-30%
2021-2022	$15,516,292	$29.29	$6.67	227,662	-31%
2022-2023	$19,363,817	$36.78	$8.32	226,242	-31%

Table 2: Water/Sewer/Non-potable Consumption Performance Fiscal Year 2002/03 to 2022/23

Fiscal Year	*Total Fiscal Year Cost ($) [Water + Sewer + Non-potable]*	*$/1,000 Gallons*	*Gallons/SQFT*	*Gallons/SQFT % Change (Compared to 2002-2003)*
2002-2003	$601,556	$5.61	55.39	-
2003-2004	$758,021	$6.19	63.24	+14%
2004-2005	$814,305	$6.01	69.94	+26%
2005-2006	$912,412	$6.51	72.31	+31%
2006-2007	$947,363	$7.19	68.00	+23%
2007-2008	$939,363	$7.79	62.27	+12%
2008-2009	$1,019,309	$8.47	62.15	+12%
2009-2010	$1,244,033	$9.73	55.77	+1%
2010-2011	$1,355,235	$6.61	88.13	+59%
2011-2012	$1,389,014	$10.22	58.39	+5%
2012-2013	$1,192,381	$9.40	54.49	-2%
2013-2014	$1,438,305	$11.38	54.33	-2%
2014-2015	$1,378,546	$11.09	53.42	-4%
2015-2016	$1,347,634	$10.83	53.48	-3%
2016-2017	$1,321,025	$11.02	51.52	-7%
2017-2018	$1,437,922	$11.01	56.11	+1%
2018-2019	$1,377,440	$11.77	50.31	-9%
2019-2020	$1,304,625	$12.10	46.32	-16%
2020-2021	$1,475,234	$13.62	46.55	-16%
2021-2022	$1,535,647	$13.30	49.61	-10%
2022-2023	$1,683,922	$14.71	49.17	-11%

Table 3: Energy Cost Avoidance (Excludes Water, Sewer, Non-potable), Fiscal Year 2002/03 to 2022/23

Fiscal Year	*Cost Avoidance*
2002-2003	$0 (Baseline Set)
2003-2004	$121,573
2004-2005	-$1,122,418
2005-2006	-$494,632
2006-2007	$423,842
2007-2008	$2,969,439
2008-2009	$2,518,375
2009-2010	$3,241,790
2010-2011	$4,164,737
2011-2012	$5,388,389
2012-2013	$4,282,085
2013-2014	$4,137,616
2014-2015	$4,207,090
2015-2016	$4,815,635
2016-2017	$5,056,887
2017-2018	$6,931,126
2018-2019	$6,533,517
2019-2020	$6,515,232
2020-2021	$6,546,289
2021-2022	$6,821,808
2022-2023	$8,688,358

Total Energy Costs Avoided =$81,746,738

A. Accomplishments

1. The renovation of one of our chiller plants has been completed which has improved our energy consumption.
2. A fourth high-efficiency chiller has been added to this plant to complete its build-out.
3. Replacement of three cooling towers in chiller plant 2 with higher efficiency cooling towers has been completed.
4. Implementation of the use of Reuse Water has been completed.
5. Yearly tracking of energy consumption is now being performed by Plant Engineering for determining budgeting needs and for tracking usage levels overall.

6. Replaced the inefficient single pane windows located in our Bed Tower section of the Hospital.
7. Replaced exterior building seals on our APCF building to ensure that the building's exterior envelope is intact.
8. Replaced our liquid ring (water based) medical air compressors with oil-less scroll medical air compressors.
9. Replaced two MRI chillers that were at the end of their life cycle.
10. Replaced portions of the Ambulatory Patient Care Facility's North and South side roofing systems that were at the end of their life cycle.
11. Replaced one domestic water booster pump that was at the end of its life cycle.
12. Contracted with American Energy Assets, LLC in 2016 to provide energy savings through operational optimization.
13. Completed operational optimization contract with American Energy Assets, LLC at the end of fiscal year 2019.
14. Replaced the custom fluorescent tube lighting throughout the Women's & Children's Hospital with CFL and LED lighting. This project was spread across multiple years and was completed in FY2019.
15. Entered a monitoring and maintaining agreement with American Energy Assets, LLC in fiscal year 2020 to monitor optimization.
16. Completed redesign and implementation of variable flow for chillers in both chiller plants to optimize chiller loading and minimize chilled water flow thus increasing actual chilled water delta loading and off peak loads in FY2020.
17. In FY2022, implemented a renewable annual maintenance agreement with Optimum Energy LLC for diagnostic and analytic services and energy management services for maximizing central chilled water system energy efficiency under the CPO-30 control platform.
18. In FY2022, implemented a renewable annual maintenance agreement with Siemens Controls for trend-based data analytics and energy management services for HVAC systems under the Siemens Desigo platform.
19. In FY2022, implemented ongoing semi-annual factory calibration program of master outdoor air temperature/humidity sensor used by all air-handler controllers for outdoor air economizer controls.
20. Began project in FY2022 to replace liquid ring vacuum pumps with electro-mechanical vacuum pumps requiring no water.
21. In FY23, continued to replace existing lighting with LED lighting.
22. In FY23, completed the project to replace liquid ring vacuum pumps with electro-mechanical vacuum pumps which require no water use.

B. Energy Supply Management

1. The University of North Carolina at Chapel Hill's Energy Services Group is the provider of electrical, steam, and some chilled water services to the Hospital.

2. Orange Water and Sewer Authority is the provider of water and sewer service to the Hospital.
3. Dominion Energy is the provider of natural gas service to the Hospital.

C. Energy Use in Facilities

The hospital utilizes a state of the art Building Automation System for monitoring, tuning, and calibrating the Hospital's mechanical systems to maintain optimum control and energy efficiency.

D. Equipment Efficiency

Major new equipment purchases are based on Life Cycle Cost Analysis and replacement equipment is selected based on current efficiency guidelines.

E. Goals

1. Finish the construction of the NC Surgical Hospital and place into operation. This project is spread across multiple years. Patient use is tentatively to begin in May 2024.
2. Continued fine tuning of the chiller plant variable flow logic to maximize load profiles and improve energy savings.

Date of Report: *September 22, 2023*

I have read the Strategic Energy & Water plan for my organization. The plan aligns with the reductions set forth in Senate Bill 668.

Michael S. Elks, Director, Plant Engineering
UNC Hospitals

UNIVERSITY of NORTH CAROLINA
PEMBROKE

STRATEGIC ENERGY / WATER PLAN

2021 / 2022

UNIVERSITY of NORTH CAROLINA
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EXECUTIVE SUMMARY

UNC Pembroke continues to develop and maintain its efforts towards conservation of energy and water resources within all campus facilities. We are creating, implementing, and following an effective Strategic Energy/Water Conservation Plan. The Strategic Energy/Water Conservation Plan aims to foster economically and environmentally responsible usage of valuable resources per state legislation, while providing a positive and comfortable learning environment for students, faculty, staff, and visitors.

Key Elements of the plan include:

- Educate and engage faculty, staff, and students in energy and water conservation through presentations, emails, events, web pages, and other effective forms of communication that help in understanding that effective energy conservation supports the primary mission of the university and the environment.
- Rebuilding a "Sustainability" Council program to be reinstated in the 2022-2023 academic year. The Council will get faculty, staff, and student organizations more involved with conservation as part of a larger scope of campus environmental stewardship efforts.
- Continue accurate measurements and analysis of electricity, fossil-based fuels, and water usage. Yearly reviews of consumption, trends, and costs will be posted on the UNCP website for the campus community to review.
- Continue to conduct annual reviews of utility billing rates with each supplier and audits of each utility invoice by our energy management efforts.
- Implement up-to-date training for Facility Operations staff to perform planned service and upgrades that improve the performance of all facility equipment and university-owned vehicles to reduce energy waste.
- Continue to benchmark and develop KPIs (key performance indicators) that clearly measure real energy and water conservation progress while factoring for facility and student growth.

UNIVERSITY of NORTH CAROLINA
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NORTH CAROLINA LEGISLATIVE BASIS FOR PLAN

GENERAL ASSEMBLY OF NORTH CAROLINA
SESSION 2007 / SENATE BILL 668
RATIFIED BILL

AN ACT TO PROMOTE THE CONSERVATION OF ENERGY AND WATER

SECTION 3.1.(a) G.S. **143-64.12. Authority and duties of State agencies. The Department; State agencies and State institutions of higher learning.**

(a) The Department of Administration through the State Energy Office shall develop a comprehensive program to manage energy, water, and other utility use for State agencies and State institutions of higher learning and shall update this program annually. Each State agency and State institution of higher learning shall develop and implement a management plan that is consistent with the State's comprehensive program under this subsection to manage energy, water, and other utility use. The energy consumption per gross square foot for all State buildings in total shall be reduced by twenty percent (20%) by 2010 and thirty percent (30%) by 2015 based on energy consumption for the 2002-2003 fiscal year. Each State agency and State institution of higher learning shall update its management plan annually and include strategies for supporting the energy consumption reduction requirements under this subsection. Each community college shall submit to the State Energy Office an annual written report of utility consumption and costs.

NORTH CAROLINA EXECUTIVE ORDER 80

NORTH CAROLINA'S COMMITMENT TO ADDRESS CLIMATE CHANGE AND TRANSITION TO A CLEAN ENERGY ECONOMY

c. The State of North Carolina will support the 2015 Paris Agreement goals and honor the state's commitments to the United States Climate Alliance.

The State of North Carolina will strive to accomplish the following by 2025:

a. Reduce statewide greenhouse gas emissions to 40% below 2005 levels;

b. Increase the number of registered, zero-emission vehicles ("ZEVs"; individually, "ZEV") to at least 80,000;

c. Reduce energy consumption per square foot in state-owned buildings by at least 40% from fiscal year 2002-2003 levels.

UNIVERSITY of NORTH CAROLINA
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EXECUTIVE SUPPORT FOR ENERGY CULTURE CHANGE

a) Maintain work with key members of Senior Administration Staff to develop and publicize Strategic Energy & Water Management Policies that define:

   i. The University's commitment to a fiscally and environmentally responsible Energy and Water Management Plan.

   ii. Measurable and achievable goals and objectives with reasonable timelines.

   iii. Accountability and resources for plan implementation

   iv. Continuous improvement efforts after initial implementation.

b) Expand our comprehensive Strategic Energy and Water Management Plan to guide:

   i. Working on the identification of energy and water conservation opportunities, concept development of projects and process changes, and prioritization of improvement efforts.

   ii. Provide funding and staff resources to define, develop, and execute approved energy and water-related capital projects, expense projects and process improvements.

   iii. Schedule reviews of conservation and efforts and regular updates to the plan.

c) Continue to educate faculty, staff, and students through scheduled presentations, emails, and other effective forms of communication about the Strategic Energy and Water Management Plan. This will provide guidance into conservation measures and techniques they can implement in our daily campus environment and within home activities.

d) Include Strategic Energy and Water Management Plan presentations in appropriate campus and department meetings.

e) Create a Strategic Energy and Water Management Plan "Professional Development" presentation for faculty and staff.

f) Reinstate a "Sustainability" Committee to get faculty, staff, and student organizations involved as part of larger scope environmental stewardship efforts.

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BASELINE ENERGY COST & KEY PERFORMANCE INDICATORS FY 21/22

a. Financial Evaluation Detailed Cost and Percentage of Total Expenditures

Fiscal Year	Electricity	Natural Gas	Water/Sewer	LP Gas	Heat Oil #2	Total Utility Expenditures	BTU Consumption
02-03	$1,031,658	$487,910	$657,512	$0	$25,179	$2,202,259	115,427,334,610
03-04	$1,036,199	$441,680	$739,701	$0	$22,890	$2,240,470	110,599,887,476
04-05	$1,068,894	$399,653	$821,890	$0	$28,500	$2,318,937	108,632,852,564
05-06	$1,071,394	$443,081	$897,456	$0	$9,622	$2,421,553	113,122,320,944
06-07	$1,481,650	$375,742	$983,536	$11,802	$20,115	$2,872,845	115,078,523,722
07-08	$1,756,487	$532,958	$1,124,397	$30,910	$43,072	$3,487,824	132,549,716,325
08-09	$1,783,521	$485,908	$954,511	$48,431	$29,311	$3,301,682	137,770,773,116
09-10	$1,843,824	$343,171	$1,031,474	$57,386	$35,584	$3,311,439	132,608,024,829
10-11	$1,836,240	$334,134	$1,012,310	$58,874	$34,030	$3,275,588	134,720,295,219
11-12	$1,744,547	$284,852	$944,904	$49,524	$12,217	$3,036,044	128,493,972,556
12-13	$1,627,136	$285,569	$910,777	$31,274	$9,925	$2,864,681	121,321,248,560
13-14	$1,618,507	$309,944	$847,432	$45,359	$7,789	$2,829,031	118,019,626,708
14-15	$1,578,102	$206,252	$833,050	$37,826	$10,275	$2,665,505	109,594,192,089
15-16	$1,577,367	$177,822	$820,197	$33,062	$2,998	$2,611,446	108,204,191,024
16-17	$1,518,906	$219,918	$853,716	$20,961	$1,824	$2,615,325	102,662,196,586
17-18	$2,043,441	$200,938	$1,063,134	$33,062	$2,998	$3,343,573	125,172,988,312
18-19	$1,642,877	$272,133	$892,676	$32,432	$2,411	$2,842,529	159,565,764,293
19-20	$1,592,255	$192,924	$810,429	$34,456	$5,000	$2,635,064	145,840,347,894
20-21	$1,920,363	$210,084	$890,128	$48,608	$0	$3,069,183	155,914,389,536
21-22	$2,189,653	$342,981	$780,111	$71,820	$0	$3,384,565	117,847,582,196

b. Utility Cost per SF.

Fiscal Year	Electrical	Natural Gas	Water/Sewage	LP Gas	Heat Oil #2	Total Utility
2006-07	$1.80	$0.36	$0.94	$0.011	$0.019	$2.74
2007-08	$2.12	$0.48	$1.01	$0.028	$0.039	$3.13
2008-09	$2.10	$0.44	$0.86	$0.043	$0.026	$2.96
2009-10	$2.04	$0.31	$0.93	$0.051	$0.032	$2.97
2010-11	$2.03	$0.30	$0.91	$0.053	$0.031	$2.94
2011-12	$1.66	$0.23	$0.75	$0.039	$0.010	$2.42
2012-13	$1.45	$0.21	$0.68	$0.023	$0.007	$2.13
2013-14	$1.47	$0.23	$0.63	$0.034	$0.006	$2.10
2014-15	$1.36	$0.15	$0.62	$0.028	$0.008	$1.98
2015-16	$1.33	$0.13	$0.61	$0.025	$0.002	$1.94
2016-17	$1.31	$0.16	$0.63	$0.016	$0.001	$1.94
2017-18	$1.32	$0.12	$0.62	$0.019	$0.002	$1.93
2018-19	$1.13	$0.16	$0.52	$0.019	$0.001	$1.64
2019-20	$1.06	$0.11	$0.47	$0.020	$0.003	$1.52
2020-21	$1.21	$0.12	$0.50	$0.027	$0.000	$1.71
2021-22	$1.45	$0.19	$0.43	$0.040	$0.000	$1.88

c. Utility Cost per Student

Fiscal Year	GSF	Enrollment	Utility Cost/ Student
2002-03	879,823	4,432	$496.90
2003-04	879,823	4,722	$474.47
2004-05	879,823	5,027	$461.30
2005-06	958,724	5,632	$429.96
2006-07	1,048,602	5,937	$483.89
2007-08	1,115,102	5,937	$587.47
2008-09	1,115,102	6,303	$523.83
2009-10	1,115,102	6,664	$496.91
2010-11	1,115,102	6,940	$471.99
2011-12	1,257,102	6,251	$485.69
2012-13	1,344,695	6,269	$456.96
2013-14	1,344,695	6,222	$454.68
2014-15	1,344,695	6,269	$425.19
2015-16	1,344,695	6,441	$405.44
2016-17	1,344,695	6,268	$417.25
2017-18	1,728,143	7,137	$468.48
2018-19	1,728,143	7,698	$369.26
2019-20	1,728,143	8,262	$318.94
2020-21	1,796,733	8,318	$368.98
2021-22	1,796,733	7,666	$441.50

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a. Fiscal Year's Energy Evaluations via State Energy Office Annual Report

Year	ENERGY EVALUATION					
	Energy $ Avoided	Energy $/GSF	$/MMBtu	$/MMBtu %Change	Btu/Sf	Btu/Sf % Change
2004-05	$93,633	$1.70	$13.78	3%	123,471	-6%
2005-06	$170,519	$1.59	$13.47	1%	117,993	-10%
2006-07	$378,379	$1.79	$16.40	23%	109,189	-17%
2007-08	$266,327	$2.09	$17.76	33%	117,749	-10%
2008-09	$183,001	$2.06	$16.96	27%	121,520	-7%
2009-10	$281,692	$1.99	$17.12	28%	116,437	-11%
2010-11	$237,857	$1.98	$16.69	25%	118,417	-10%
2011-12	$618,574	$1.62	$16.13	21%	100,687	-23%
2012-13	$919,851	$1.43	$16.11	20%	88,738	-32%
2013-14	$1,012,366	$1.44	$16.71	25%	86,150	-34%
2014-15	$1,150,098	$1.33	$16.69	25%	79,955	-39%
2015-16	$1,162,784	$1.31	$16.56	24%	78,968	-40%
2016-17	$1,302,480	$1.29	$17.25	29%	75,042	-43%
2017-18	$1,850,044	$1.32	$18.22	36%	72,432	-45%
2018-19	$841,417	$1.11	$12.17	-9%	91,181	-30%
2019-20	$1,028,428	$1.04	$12.43	-7%	83,325	-36%
2020-21	$1,115,364	$1.21	$13.98	4%	86,777	-34%
2021-22	$2,605,061	$1.45	$22.10	65%	65,589	-50%

b. Fiscal Year's Water/Sewer Evaluations via State Energy Office Annual Report

Year	WATER/SEWER EVALUATION				
	Water $ Avoided	$/KGal	$/KGal %Change	Gal/Sf	Gal/Sf %Change
2004-05	-$164,370	$21.21	0%	44.05	25%
2005-06	-$180,955	$21.21	0%	44.14	25%
2006-07	-$199,872	$21.21	0%	44.22	26%
2007-08	-$231,956	$22.71	7%	44.40	26%
2008-09	-$18,032	$23.83	12%	35.92	2%
2009-10	$3,621	$26.34	24%	35.11	0%
2010-11	$17,146	$26.20	24%	34.65	-2%
2011-12	$305,186	$28.22	33%	26.63	-24%
2012-13	$402,599	$27.72	31%	24.44	-31%
2013-14	$494,013	$28.31	33%	22.26	-37%
2014-15	$508,395	$28.31	33%	21.88	-38%
2015-16	$521,248	$28.31	33%	21.54	-39%
2016-17	$487,727	$28.31	33%	22.43	-36%
2017-18	$388,954	$23.85	12%	25.80	-27%
2018-19	$790,721	$27.64	30%	18.69	-47%
2019-20	$959,106	$29.06	37%	16.14	-54%
2020-21	$795,714	$26.63	26%	18.61	-47%
2021-22	$976,708	$27.75	31%	15.65	-56%

GSF = Gross Square Feet MMBtu = Metric Million British Thermal Unit KGal = Kilogallon (1,000 Gal)

UNIVERSITY of NORTH CAROLINA
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UPCOMING ACTION PLANS

Because utility consumption is impacted and consumed in some manner by everyone interacting with the campus facilities we will continue to expand and implement the following actions:

a) The UNCP Sustainability Council includes and involves all divisions of the campus community. This council will meet quarterly with an agenda to discuss past, present, and future conservation efforts. Their primary purpose will be to invite and involve the entire campus community to participate in helpful and constructive sustainability/conservation practices for the upcoming semester. The council will also discuss topics such as utility rates, conservation initiatives, and resolve account billing resolutions when needed.

b) The Energy Utility/Sustainability Coordinator Position was filled in November of 2022 by Courtney Page. Courtney plans to implement rainwater harvesting on campus, partnering with the Agriculture Club and Sodexo to provide campus dining with crops, decrease food waste in the dining hall, improve the recycling program to decrease waste sent to landfills, and develop a plan for solar energy in some areas of campus. In addition to projects, she plans to hold events to encourage student involvement and increase education on sustainable topics and environmentally friendly practices.

c) The University has plans to continue upgrades on lighting in the Jones Health and Physical Education Center, Old Main, and the Oxendine Science Building. The new fixtures will decrease energy consumption and provide a higher quality of illumination and an increased number of lumens.

d) Four new car-charging stations are being implemented in the parking lot outside of Grace P. Johnson Stadium in 2023. These charging stations will be open to the public for use while charging their vehicles at no cost. These new stations will increase the campus total of electric car charging stations to 10.

e) A pilot project for rainwater harvesting is beginning in the Spring of 2023 to offset the water used for landscaping on the campus. The intention is to expand the project to other suitable buildings on campus to create an ample supply of water for exterior uses.

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EFFICIENCY MEASURES COMPLETED

Energy Awareness Campaign & Strategy

a) Over 50% percent of energy consumption was avoided with the assistance of Siemens' Guaranteed Savings Program, employee and student awareness, and conservation choices.

- We spent $2,604,454 and saved $2,605,454 on utilities in the 2021-22 Fiscal Year.

b) We continue to calculate the yearly impact of utilities based on campus-wide consumption and cost.

c) Updated the Energy and Sustainability webpage to provide accurate initiatives and news.

d) The following projects were completed between 2021-2022:

Moore Hall
1. Replaced existing chiller

Livermore Library
1. Lighting upgrade on 2nd floor

Jones Health & PE
1. Lighting upgrade at the pool area
2. Lighting upgrade main and aux gym areas

Bio-Tech Facility
1. Replaced boiler with higher efficiency boiler

Weinstein Health Science
1. Replaced existing chiller

Regional Center
1. Lighting upgrade

Oxendine Science Bldg.
1. Replaced Energy Recovery Coil

UNIVERSITY of NORTH CAROLINA
PEMBROKE

SIGNATURE PAGE

Strategic Energy & Water Plan

I have read and support this Strategic Energy & Water Plan for my Organization

Mark Vesely, *Director of Facilities Operations*

Signed: _____ **Date:** 3/16/23

Victor Deese, *Assistant Vice Chancellor / Facilities Management*

Signed: _____ **Date:** 3/16/23

Gabriel Eszterhas, *Vice Chancellor for Finance and Administration*

Signed: _____ **Date:** 6/15/23

Dr. Robin G. Cummings, *Chancellor*

Signed: _____ **Date:** 6/16/23

****

This Strategic Energy & Water Mandate serves as a Memorandum of Agreement to support Strategic Energy & Water Plans for the state Utility Savings Initiative.

_____ _____

Director State Energy Office **Date**

Strategic Energy Plan

September 2023

University of North Carolina School of the Arts
Strategic Energy Plan
2023-24

1. Table of Contents

2. EXECUTIVE SUMMARY

Established by the N.C. General Assembly in 1963, the University of North Carolina School of the Arts was America's first state-supported arts school. It opened in Winston-Salem "The City of Arts and Innovation" in 1965 and became part of the University of North Carolina System when it was formed in 1972.

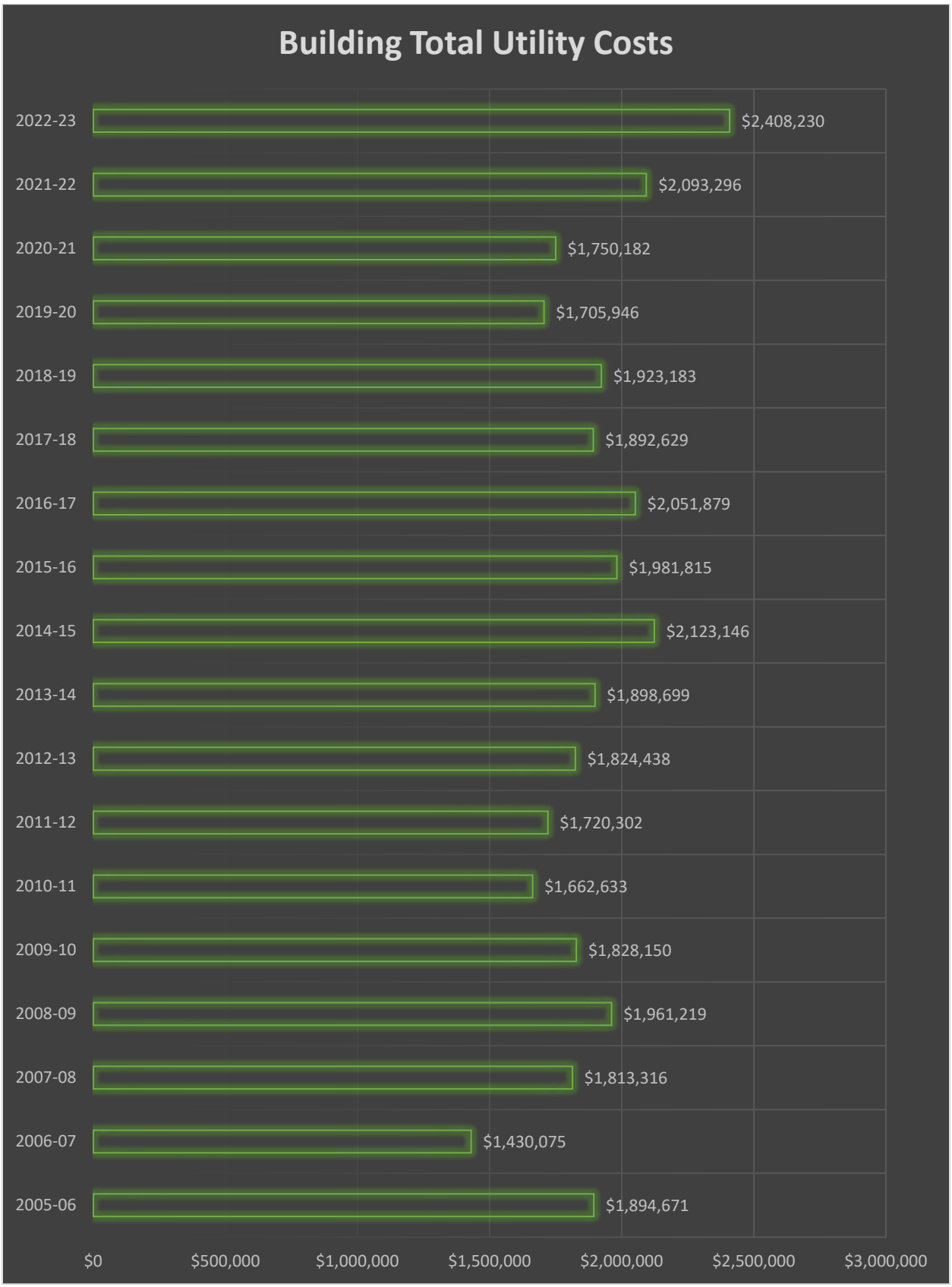
UNCSA is a unique, stand-alone public university consisting of five arts conservatories. These conservatories are: Dance, Design & Production, Drama, Filmmaking, and Music. On average more than 1,300 high school, undergraduate and graduate students are enrolled annually. The campus is south of downtown Winston-Salem and is comprised of 54 buildings with 1.25 million square feet of conditioned space, nestled on 70 acres. There are roughly 600 full-time, part-time & adjunct faculty and staff members employed at UNCSA.

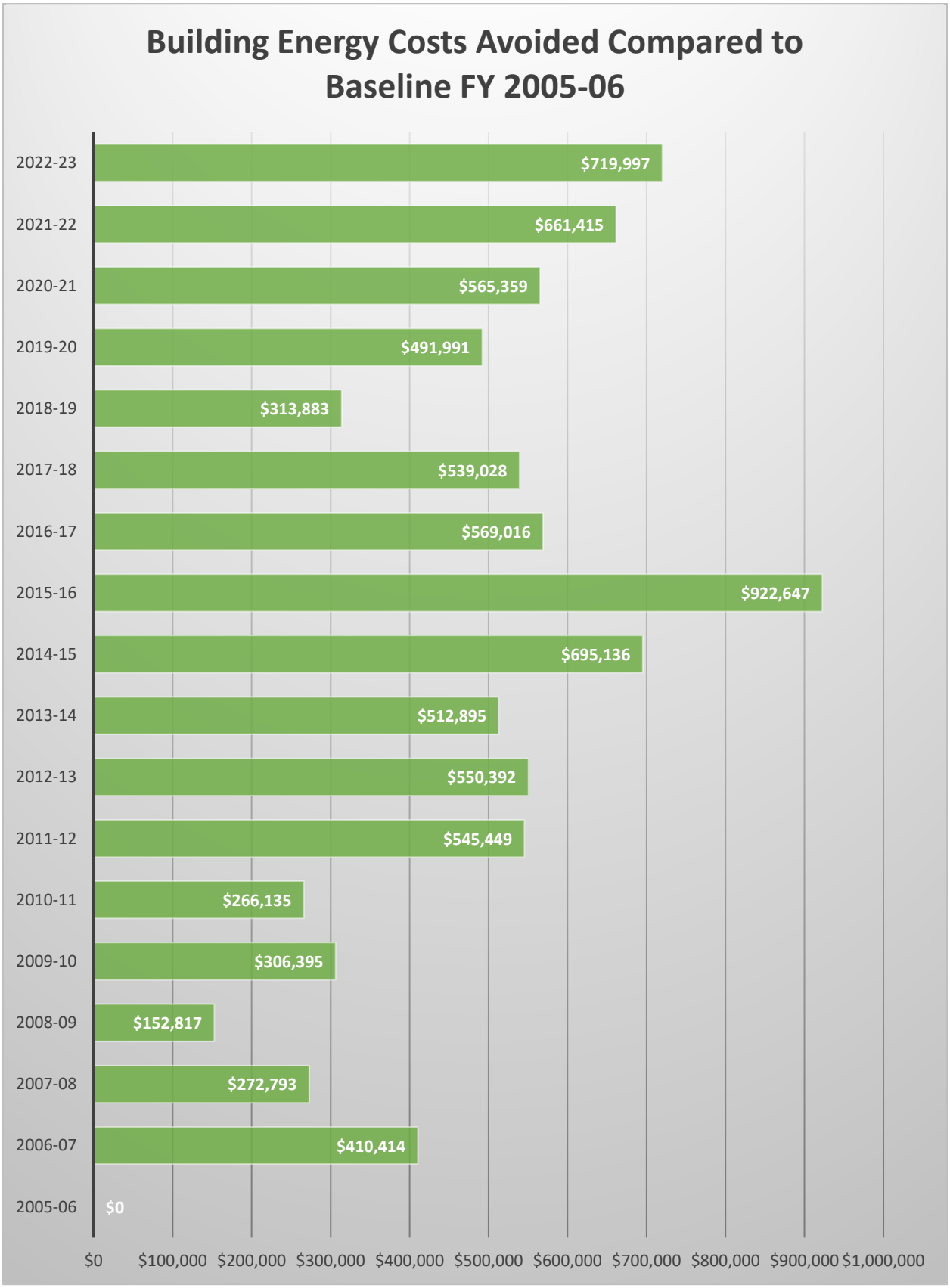
UNCSA's utility mix is approximately 60% electricity, 30% natural gas and 10% water. As compared to the baseline fiscal year of 2005-06, UNCSA was able to produce a cost avoidance of $719,997.00 in the 2022-23 fiscal year. This was due to UNCSA's ongoing approach and commitment to energy conservation methods to better manage and reduce our campus' energy usage, purchase higher efficiency HVAC equipment, striving to reduce water consumption by using low use water fixtures and continually replacing any incandescent bulbs on our campus with LED's. The University strives to replace aging and energy inefficient equipment, with higher efficiency equipment in order to meet our goals and be more sustainable when our operational and capital budgets allow. The Facilities Management technicians work in conjunction with contractors to progressively look for opportunities to conserve energy and be better stewards of our resources.

The combined energy dollar amounts per square foot is $1.66 this fiscal year, this is an increase of $0.16 as compared to the previous fiscal year. The increase is largely due to rate increases from our utility providers during the FY

2022-23. The total energy BTU's used per square foot for FY 2022-23, was 95,575, which is 26% below our baseline FY 2005-06.

UNCSA continues to strive to lower our energy consumption per square foot, as mandated by Executive Order No. 80. This Governor mandated Executive Order asks that we strive to reduce our energy consumption per square foot by at least 40% from fiscal year 2002-03 levels, by the year 2025 for all state-owned buildings. While UNCSA is one of the smaller universities in the UNC System, we are on par with other smaller universities in the system reducing our consumption per square foot and will continue to make that a priority at UNCSA.


Building Total Utility Costs
2022-23
$2,408,230
2021-22
$2,093,296
2020-21
$1,750,182
2019-20
$1,705,946
2018-19
$1,923,183
2017-18
$1,892,629
2016-17
$2,051,879
2015-16
$1,981,815
2014-15
$2,123,146
2013-14
$1,898,699
2012-13
$1,824,438
2011-12
$1,720,302
2010-11
$1,662,633
2009-10
$1,828,150
2008-09
$1,961,219
2007-08
$1,813,316
2006-07
$1,430,075
2005-06
$1,894,671
$0
$500,000
$1,000,000
$1,500,000
$2,000,000
$2,500,000
$3,000,000


Building Energy Costs Avoided Compared to Baseline FY 2005-06
2022-23
$719,997
2021-22
$661,415
2020-21
$565,359
2019-20
$491,991
2018-19
$313,883
2017-18
$539,028
2016-17
$569,016
2015-16
$922,647
2014-15
$695,136
2013-14
$512,895
2012-13
$550,392
2011-12
$545,449
2010-11
$266,135
2009-10
$306,395
2008-09
$152,817
2007-08
$272,793
2006-07
$410,414
2005-06
$0
$0 $100,000 $200,000 $300,000 $400,000 $500,000 $600,000 $700,000 $800,000 $900,000 $1,000,000

University of North Carolina School of the Arts
Strategic Energy Plan
2023-24

3. ENERGY PLAN, GOALS & STRATEGY

The Facilities Management Department strives to raise the awareness of our energy savings initiatives on our campus. We continue to educate and inform our campus community of where we are trying to move the University in respect to energy conservation. Our focus continues to be placed on pursuing higher efficiency HVAC equipment, water heaters, low use water fixtures, lighting controls, etc. We strive to work towards lowering our energy use; measured against the comfort and health of our students, faculty, and staff learning and working in our buildings. We continue to consume more energy due to the changes made related to our HVAC equipment to lessen the potential impact of COVID-19, due to how it is spread. The HVAC equipment outside air dampers have been increased to bring in more air to dilute with the buildings recirculated air.

The FY 2022-23 had various energy efficient strategies employed in an effort to reduce our energy consumption and utilities cost. We replaced several small older and less efficient HVAC systems with much higher efficient equipment in mechanical, electrical, and elevator equipment rooms on campus. The HVAC Shop is continually searching for non-compliant BAS controls parts that are not functioning and correcting them to ensure we do not waste energy. The Plumbing Shop replaced two gas fired water heaters at Costume, Wig & Makeup with higher efficiency water heaters that will lower that buildings' BTU per square foot consumption. Currently we have two significant mechanical projects that will be completed in 2023-24, and they will no doubt lower our energy usage and be more reliable at the same time providing better climate control. Also, we have a total of five air handler units and two cooling towers that will be replaced in Gray Building. This project will lead to less energy being consumed and hopefully offset rising energy rates. We have a project that is installing new LED fixtures and dimmers for three film theaters at the ACE Theatre Complex and will lower operational costs for that building. All of these projects mentioned are funded and hope to be completed this coming fiscal year, they will provide energy savings and energy avoidance for years to come.

4. COMMITMENT STATEMENT

As a University we understand that energy and water consumption can and needs to be managed to our benefit. The energy and water management is a responsibility of the occupants at each facility, led and supported by Facilities Management.

The Department Heads will review progress and results semi-annually and will support staff attendance in training within energy and water management at least annually.

Strategic Energy & Water Plan Mandate – Goals

1. Reduce energy consumption by 40% per gross square foot by 2025 for all buildings, as compared to the baseline of 2005-06.
2. Require that lights be turned off in interior spaces of unoccupied buildings and upward-directed flood lighting on buildings from midnight to 6am unless required for safety, emergency, or insurance purposes.
3. Require a feasibility analysis for energy conservation measures with a specified schedule and target building sizes. The initial wave would cover buildings greater than 20,000 square feet, in operation for more than 10 years, which have not already been so evaluated within the last three years.

Strategic Energy & Water Plan Mandate – Commitment

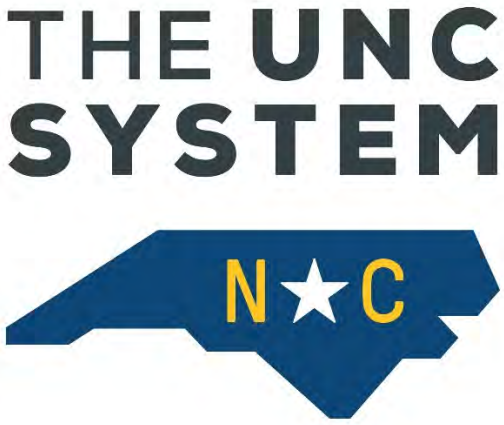
I have read and support the Strategic Energy & Water Plan for my Organization Implemented this 1st day of September in the year 2023.

Director - Mechanical Maintenance

AVC – Facilities Management

Vice Chancellor Finance & Administration

The University of North Carolina System Office



Strategic Energy and Water Management Plan

September 2023

Executive Summary

The UNC System Office has undergone significant facilities changes within the last year, with a move in December 2022 from the Spangler Complex in Chapel Hill to leased office space in downtown Raleigh. In addition, the North Carolina State Education Assistance Authority (NCSEAA) building occupants relocated to leased space in mid-February 2022. The System Office divested itself of the C. D. and Meredith Spangler buildings in Chapel Hill, transferring responsibility for these facilities and their energy use effective March 1, 2023 and the Center for School Leadership Development building in August 2023.

Reported energy use clearly reflected the changes in building occupancy, with the resulting calculations including a reduction of just over 60% in BTUs per square foot and continuing a more than 70% reduction in gallons per square foot water usage. However, these results from the Department of Environmental Quality reporting format may be misleading as the calculations are based solely on the original square footages for the year. The resulting usage per square foot numbers may overstate savings. Data is available in Exhibit 1.

Energy Supply

The System Office's energy needs are now supplied under its office lease agreement, while services for NCSEAA continue to be provided directly by the local utilities serving Research Triangle Park (Duke Energy, City of Durham, and Dominion Energy NC, formerly Public Service Gas).

Energy Demand

All UNC System Office facilities were a part of the system-wide lighting performance contract executed in 2014. The project included the installation of approximately 1,800 new or retrofit lighting fixtures, 250 replacement light bulbs, and more than 100 lighting control sensors across the System Office's four office/administrative buildings. The performance contract concluded this year, with final System Office results listed below.

Performance Year	Guaranteed Savings	Actual Savings	Shortfall Paid
2017 (Year 1)	$37,702	$35,812	$ 1,891
2018 (Year 2)	$45,432	$48,313	$ 0
2019 (Year 3)	$46,363	$43,766	$ 2,597
2020 (Year 4)	$47,312	$44,668	$ 2,644
2021 (Year 5)	$48,281	$45,783	$ 2,498
2022 (Year 6)	$49,269	$45,697	$ 3,572
2023 (Year 7)	$50,276	$50,215	$ 61
Total	$324,635	$314,254	$13,263*

*This amount is the sum of the shortfall paid column. It is not equal to total guaranteed savings less total actual savings because of the inclusion of amounts from the $0 shortfall year.

The remaining office facility under the System Office's purview, NCSEAA, has been previously identified among its least energy efficient facilities. It is served by a combination of systems including air handling and condensing units at the end of their useful lives, packaged terminal air conditioners (PTAC units), and a mixture of pneumatic and digital controls. The system's various components range in age from 1974 to 2019. While current occupancy is extremely limited, allowing much of the building to be operated as

unoccupied, a significant investment would be required to improve operating reliability and energy efficiency prior to any greater occupancy or repurposing.

Water Resources

The US Energy Information Administration reports average water use in office buildings in the range of 15 gallons per square foot annually or about 15 gallons of water use per day per employee. System Office water use continued well below this average at 6.6 gallons per square foot. Continued good stewardship is expected in the System's leased space which includes modern water-saving devices such as automatic sensor handwashing and automatic flushing.

Communications and Training

As a tenant, the impact of behavior on energy and water use will not be as apparent to System Office staff as previously, but the behaviors of good energy and environmental stewardship are expected to continue. The System Office will also continue to facilitate the sharing of best practices among the institutions throughout the system, engaging facilities operations, capital, and energy staff in discussing how best to construct, operate, and maintain facilities in ways that contribute to long-term cost effectiveness, including energy efficiency.

Exhibit 1
UNC System Office Utilities Data

	energy evaluation						water/sewer evaluation				
year	energy $ avoided	energy $/gsf	$/mmbtu	$/mmbtu %change	btu/sf	btu/sf %change	water $ avoided	$/kgal	$/kgal %change	gal/sf	gal/sf %change
2002-03		$3.49	$15.07		231,932			$7.27		22.41	
2003-04	$36,361	$2.52	$13.12	-13%	191,787	-17%	$2,300	$7.52	3%	17.98	-20%
2004-05	$35,251	$2.52	$13.07	-13%	192,857	-17%	$2,307	$8.15	12%	18.31	-18%
2005-06	$36,185	$3.02	$15.27	1%	197,608	-15%	$1,564	$8.74	20%	19.82	-12%
2006-07	$27,851	$2.89	$14.19	-6%	203,508	-12%	$2,960	$9.55	31%	17.92	-20%
2007-08	$31,159	$3.06	$15.16	1%	202,156	-13%	$3,295	$10.53	45%	17.88	-20%
2008-09	$33,572	$3.33	$16.44	9%	202,354	-13%	$5,663	$12.00	65%	15.57	-31%
2009-10	$40,262	$3.05	$15.68	4%	194,746	-16%	$7,362	$13.61	87%	14.57	-35%
2010-11	$64,007	$2.82	$16.15	7%	174,523	-25%	$8,430	$14.48	99%	13.98	-38%
2011-12	$260,955	$2.42	$18.55	23%	130,738	-44%	$11,294	$14.74	103%	16.90	-25%
2012-13	$270,479	$2.82	$20.56	36%	137,330	-41%	$34,109	$18.53	155%	9.17	-59%
2013-14	$242,335	$3.13	$21.00	39%	148,928	-36%	$39,956	$20.11	177%	8.12	-64%
2014-15	$263,447	$2.94	$20.83	38%	140,955	-39%	$35,894	$19.00	161%	8.82	-61%
2015-16	$317,293	$2.65	$21.27	41%	124,671	-46%	$32,967	$18.72	157%	9.75	-57%
2016-17	$332,294	$2.44	$20.82	38%	117,177	-49%	$34,788	$18.53	155%	8.91	-60%
2017-18	$296,002	$2.19	$18.64	24%	117,709	-49%	$32,714	$17.83	145%	9.21	-59%
2018-19	$275,697	$2.45	$19.13	27%	128,261	-45%	$34,676	$18.24	151%	8.74	-61%
2019-20	$311,150	$2.32	$19.66	30%	118,106	-49%	$30,953	$18.09	149%	10.10	-55%
2020-21	$260,024	$2.34	$18.16	21%	128,965	-44%	$51,556	$22.60	211%	6.00	-73%
2021-22*	$295,400	$2.53	$20.05	33%	126,001	-46%	$56,039	$24.00	230%	5.62	-75%
2022-23	$426,711	$1.95	$21.65	44%	90,169	-61%	$36,713	$16.70	130%	6.60	-71%

*Minor changes in this year's statistics would result from reflecting the data corrections in natural gas and water/sewer noted below.

year	total utility $	total energy $	total btu	kwh	kwh $	ng therms	ng $	chw tons	chw $	kgal water	water sewer $	gsf
2002-03	$252,484	$241,234	16,010,927,596	1,763,783	$90,282	99,929	$150,952	0	$0	1,547	$11,250	69,033
2003-04	$183,040	$173,713	13,239,648,160	1,869,680	$94,880	68,603	$78,833	0	$0	1,241	$9,327	69,033
2004-05	$184,289	$173,987	13,313,486,784	1,854,832	$100,497	69,848	$73,490	0	$0	1,264	$10,302	69,033
2005-06	$220,279	$208,324	13,641,449,888	1,889,024	$100,397	71,961	$107,927	0	$0	1,368	$11,955	69,033
2006-07	$211,220	$199,409	14,048,781,620	1,739,385	$101,616	81,140	$97,793	0	$0	1,237	$11,811	69,033
2007-08	$224,541	$211,550	13,955,435,692	1,857,191	$118,268	76,187	$93,282	0	$0	1,234	$12,991	69,033
2008-09	$242,581	$229,684	13,969,102,924	1,870,927	$139,048	75,855	$90,636	0	$0	1,075	$12,897	69,033
2009-10	$224,546	$210,855	13,443,894,620	1,769,635	$144,263	74,059	$66,593	0	$0	1,006	$13,690	69,033
2010-11	$208,557	$194,580	12,047,815,584	1,752,232	$140,683	60,692	$53,897	0	$0	965	$13,977	69,033
2011-12	$371,788	$337,144	18,179,394,934	2,884,426	$231,448	78,906	$64,239	195,593	$41,457	2,350	$34,644	139,052
2012-13	$416,266	$392,645	19,096,001,297	2,464,312	$194,525	94,494	$80,634	595,969	$117,486	1,275	$23,621	139,052
2013-14	$457,505	$434,805	20,708,696,921	2,507,821	$207,515	107,371	$93,349	657,190	$133,941	1,129	$22,700	139,052
2014-15	$431,491	$408,175	19,600,110,226	2,450,732	$195,943	99,275	$76,892	622,606	$135,339	1,227	$23,316	139,052
2015-16	$394,172	$368,796	17,335,743,908	2,219,322	$174,785	83,578	$55,416	633,789	$138,595	1,355	$25,376	139,052
2016-17	$362,271	$339,309	16,293,702,576	1,970,242	$154,995	81,299	$58,035	653,919	$126,279	1,239	$22,962	139,052
2017-18	$327,875	$305,039	16,367,737,128	1,958,783	$149,576	84,532	$48,860	555,131	$106,603	1,281	$22,836	139,052
2018-19	$363,257	$341,095	17,835,003,880	1,897,286	$148,631	99,470	$72,470	637,778	$119,993	1,215	$22,162	139,052
2019-20	$348,266	$322,850	16,422,823,958	1,935,751	$150,856	85,238	$57,636	583,570	$114,357	1,405	$25,416	139,052
2020-21	$344,549	$325,676	17,932,792,502	1,918,842	$149,822	102,318	$67,092	520,292	$108,763	835	$18,872	139,052
2021-22	$370,113	$351,370	17,520,715,410	1,783,145	$143,541	99,871*	$86,241*	640,150	$121,633	781	$18,343*	139,052
2022-23	$286,747	$271,414	12,538,239,132	1,222,099	$107,099	73,970	$76,528	395,712	$87,787	918	$15,332	78,321**

*Corrections to previous reporting.

**Square footage as of 6/30/2023. Square footage was reduced by 60,373 gsf 12/1/2022, another 50,000 gsf 3/1/2023, and to 28,321 as of 8/22/2023.

ANNUAL REPORT
STRATEGIC ENERGY & WATER PLAN
of
UNCW

This strategic plan was developed **August , 2023 by**
Steve Sharpe, UNCW Energy Manager

Table of Contents

Executive Summary

Purpose
The purpose of this report is to summarize UNCW's utility performance (energy and water) for FY 21-22, and to list objectives and strategies for the next fiscal year. Energy usage is compared to the 2002-2003 FY as a baseline.

NC Legislative and Executive Basis for this Plan
(a.) Session Law 2007-546 / Senate Bill 668 requires that energy consumption per gross square foot be reduced 20% by 2010 and 30% by 2015 based on the 2002-2003 fiscal year as a baseline. Each State of NC institution of higher learning is to update its management plan annually and include strategies for supporting consumption reduction requirements.

(b.) Session Law 2008-203 / Senate Bill 1946 - Energy Efficiency Improvement requires an energy reduction of 30% for major construction projects and 20% for major renovation projects based on 2004 codes. Similarly, indoor potable water use for major construction or renovation projects must be 20% less, and sum of outdoor potable water use and harvested storm water use must be at least 50% less based on 2006 NC Building Code.

(c.) Executive Order No. 80 – North Carolina's Commitment to Address Climate Change and Transition to a Clean Energy Economy – The State of North Carolina will strive to accomplish by 2025 the reduction of energy consumption per square foot in state-owned buildings by at least 40% from fiscal year 2002-2003 levels.

Existing Conditions
UNCW operates a total of 171 buildings, varying in age and totaling 5.1 million square feet. In addition to the buildings, we also maintain related facilities.

Key Elements and Focus Areas of the Plan
● Data collection including accurate measurement and analysis of electricity, fossil based fuels, and water usage to benchmark and to allow for regular review of costs and performance.
● Annual summary that reviews activity related to Energy Supply, Energy Demand, Communication and Training, and Water consumption.
● Identifying and implementing energy 1292 efficiency projects.
● Identifying and implementing receipt supported energy efficiency projects.

Summary of FY 22-23 Accomplishments

Energy consumption per gross square foot decreased this year. UNCW energy consumption has now been reduced by 48% compared to the FY 2002-2003 baseline, exceeding both the 30% reduction target mandated to occur by June 30, 2015 and the Governor's Executive Order of a 40% reduction by 2025. University EUI has been reduced to 83 MBTU/SF.

Significant accomplishments the past year include:

- Upgrades to LED lighting in various buildings
- Cooling Tower Improvements at Center for Marine Science Main Building
- HVAC Replacements in Housing apartments at Seakawk Landing, Seakawk Village, and Seakawk Crossing,
- Expand Pond Irrigation System to Library Commons, Kenan, and DeLoach
- Expand Pond Irrigation to Wagoner Central Energy Plant to Village Parking Lot SS

Summary of FY 23-24 plans

- Investigation of demand control
- Metering Initiative
    - Continue identifying and repairing meters
    - Identify buildings deficient in metering
    - Continue tying meters into campus building management system
    - Work with billing to establish process of automating meter reading and billing.
- Investigation of demo sized PV project and/or lease contract for larger systems

- Construction of New Student Rec Pavilion building with PV add alternate
- Construction of Randall Library Addition
- Limited Renovation of Alderman Hall and King Hall
- Expansion of Westside Chiller Plant
- Establish utility corridors to match updated campus master plan
- Upgrade Lighting CMS Ops, Oyster Hatchery, and Parking Area
- Expansion of Irrigation to front of campus, Library Commons, Kenan, DeLoach, Cultural Arts, New Housing Area, Green Track, and Soccer Area
- Investigation of UV-C Coil Cleaning and disinfection at various academic buildings.
- Investigation of bi-polar ionization at various academic buildings.
- Set up Engineering/Controls Department
- Put together long term Utilities and Infrastructure Plan for University.
- Put together long term Upgrade Plans for all campus buildings
- Geothermal Feasibility Study
- Central Plant Control Improvements
- Retro-Commissioning of buildings
- HVAC Improvements at Film Studies Building
- Cultural Arts Building LED lighting Improvements
- Improve Center for Marine Science energy recovery system
- Use of infrared analysis to correct energy issues
- Expand Pond Irrigation System to Housing Area
- Expand Pond Irrigation to Village Parking Lot SS
- Expand Pond Irrigation to Kenan Auditorium
- Expand Rec Center Pond Irrigation to Belk Hall
- Irrigation Green Track Tie In (Track, Softball, Soccer Entrance & Field)

- DECLARATION & MANDATE

Declaration

I have read the Strategic Energy & Water Plan for my organization. The plan, as presented, supports reductions required in G.S.143-64.12a.

Implemented September 2017

Commitment

- We recognize that energy and water consumption can be managed to our benefit. Energy and water management is a responsibility of the occupants at each facility, guided and supported by the Energy Manager and/or the USI (Utility Savings Initiative) liaison.
- The attached plan outlines the activities and expenditures required to reduce energy and water consumption to achieve the goals of the program.

Strategic Energy & Water Plan Mandate - Goals

(In accordance with the NC legislative and Executive basis previously described herein)
Reduce annual Total Energy Consumption by a minimum of 40% by fiscal year 2024-2025 from a baseline fiscal year of 2003.

Strategic Energy & Water Plan Mandate - Measures

Our tracking measures will be
Total Energy Use in BTU per Square Foot per Year

Strategic Energy & Water Plan Mandate - Commitment

I have read and support the Strategic Energy & Water Plan for my organization implemented August 2022.

Approval Signature(s)

(Approval is for both the Declaration and the Mandate above)

_____ Energy Manager

_____ Assoc. VC, Facilities

_____Vice Chancellor, Business Affairs

FOCUS A: SUPPLY SIDE

FY 22-23 Activities	Measurement Expected	Measurement Actual	Savings Expected	Savings Actual	Cost	Assigned to	Funding Source
Check for billing errors		Monthly review		None	20 hours	Facilities	Salary
Meter verification		Quarterly		Several suspect sub-meters were identified and corrective action taken	20 hours	Facilities	Salary

Planned FY 23-24 Activities	Measurement Expected	Measurement Actual	Savings Expected	Savings Actual	Cost	Assigned to	Funding Source
Check for billing error and meter verification	Monthly				30 hours	Energy Manager	Salary
Review continued use of marketer vs. utility for natural gas purchases	1 per year		$30,000		8 hours	Physical Plant	Salary
Conduct review of complete sub-metering system to ensure data is available remotely wherever possible, check data accuracy, etc.			Will allow accurate data collection and correct billing errors			Physical Plant	Salary budget

FOCUS B: DEMAND SIDE

FY 22-23 Activities	Measurement		Annual Savings		Cost	Assigned to	Funding Source
	Expected	Actual	Expected	Actual			
Campus Lighting Replacements FY 22-23 Replace Fluorescent fixtures with LED in Various Buildings	Annual		$466		$26,592	Energy Manager	1292
Replace HVAC system in Facilities Building	Annual		$2,312		$77,775	Energy Manager	1292
CMS Main Building Cooling Tower Improvements	Annual		$4,760		$161,101	Energy Manager	1292
Seahawk Crossing 1- Replace All HVAC	Calculated Annual		$5,372		$299,500	Project Management - Bob Williams	Housing
Seahawk Landing 3 & 6 - Replace all HVAC Units	Calculated Annual		$4,424		$299,500	Project Management - Bob Williams	Housing
Seahawk Landing Seahawk Village Seahawk Crossing Com Rooms Replace HVAC Units	Calculated Annual		$1,260		$102,000	Project Management - Bob Williams	Housing

Planned FY 23-24 Activities	Measurement Expected	Measurement Actual	Savings Expected	Savings Actual	Cost	Assigned to	Funding Source
Investigate feasibility of implementing demand control	Monthly review		$25,000		$25,000	Facilities	TBD
Installation of Demonstration solar PV	Monthly		$2,500		50000	Energy Manager	Student Green Funding
Geothermal Feasibility Study			???		$30,000	Energy Manager	1292
Investigation control improvements for regional energy plants	Monthly		$30,000		$200,000	Energy Manager	Capital / R&R / 1292
Retro-commission Various Buildings	Annual		$70,000		$350,000	Energy Manager	Capital / R&R / 1292
Upgrade Lighting CMS Ops, Oyster Hatchery, Parking	Annual		$6,481		$116,445	Energy Manager	Capital / R&R / 1292
Film Studies HVAC Modifications Increase efficiency of HVAC system	Annual		$7,500		$190,000	Energy Manager	Capital / R&R / 1292
Replace Fluorescent fixtures with LED in Cultural Arts Building	Annual		$5,640		$60,000	Energy Manager	Capital / R&R / 1292
Renovate Heat recovery system in CMS Biotech Building	Annual		$31,218		$160,000	Energy Manager	Capital / R&R / 1292
Inspection and Correction of Energy Issues through Infrared analysis			???		$10,000	Energy Manager	Capital / R&R / 1292

FOCUS C: COMMUNICATION & TRAINING

FY 22-23 Activities	Measurement Expected	Measurement Actual	Savings Expected	Savings Actual	Cost	Assigned to	Funding Source
Communicate expected results of Performance Contract projects with building occupants	Many contacts	Ongoing	??	TBD	20 hours	Facilities	Salary budget
Met with Housing staff on several occasions to identify projects to reduce monthly energy costs	Monthly	Monthly	??	Capital project being generated for 3 Dorms and CHW/HHW Plant	10 hours	Facilities	Salary budget

Planned FY 23-24 Activities	Measurement Expected	Measurement Actual	Savings Expected	Savings Actual	Cost	Assigned to	Funding Source
Provide information to new employees about campus energy costs	12 times		Increased awareness		4 hours	Facilities	Salary budget
Continue to tell customers of campus space temperature standards.	On-going		Increased awareness		6 hours	Facilities	Salary budget
Continue meetings with Housing staff to discuss energy consumption data	Monthly		Make decisions for future projects	TBD	10 hours	Facilities	Salary budget
Publicize successful energy projects through various methods (on campus, local media, etc)			Increased awareness	Increased awareness	10 hours	Facilities	Salary budget

FOCUS D: WATER

FY 22-23 Activities	Measurement Expected	Measurement Actual	Savings Expected	Savings Actual	Cost	Accountability	Funding Source
Expand Pond Irrigation System to Library Commons, Kenan, and DeLoach	Monthly	Monthly	$10,000		$15,000	Landscaping	R&R
Expand Pond Irrigation to Wagoner Central Energy Plant to Village Parking Lot SS	Monthly	Monthly	50,000		50,000	Landscaping	R&R

Planned 23-24 Activities	Measurement Expected	Measurement Actual	Savings Expected	Savings Actual	Cost	Assigned to	Funding Source
Expand Pond Irrigation System to Housing Area	Monthly	Monthly	$30,000		$100,000	Landscaping	R&R
Expand Pond Irrigation to Village Parking Lot SS	Monthly	Monthly	50,000		50,000	Landscaping	R&R
Expand Pond Irrigation to Kenan Auditorium	Monthly	Monthly	19,000		10,000	Landscaping	R&R
Expand Rec Center Pond Irrigation to Belk Hall	Monthly	Monthly	24,000		12,000	Landscaping	R&R
Green Track Tie In (Track, Softball, Soccer Entrance & Field	Monthly	Monthly	30,000		6,000	Landscaping	R&R

year	name	total utility $	total energy $	total btu	kwh	kwh $	ng therms	ng $	2oil gals	2oil $	6 oil gals	6oil $	propane gals	propane $	kgal water	water sewer $	gsf	construction gsf	renovated A/C gsf
2002-03	UNC Wilmington	$4,594,973	$4,183,096	312,009,125,764	54,777,997	$3,171,476	1,251,066	$1,011,620	0	$0	0	$0	0	$0	111,049	$411,877	1,937,834	0	0
2003-04	UNC Wilmington	$5,024,377	$4,578,423	315,878,095,466	56,644,518	$3,293,435	1,224,510	$1,283,104	953	$1,503	0	$0	260	$381	109,431	$445,954	2,042,844	0	0
2004-05	UNC Wilmington	$5,461,252	$5,035,814	334,462,634,646	58,790,273	$3,485,560	1,335,106	$1,546,164	2,593	$4,090	0	$0	0	$0	100,927	$425,438	2,194,234	0	0
2005-06	UNC Wilmington	$6,305,216	$5,819,083	356,665,765,618	62,664,798	$3,931,897	1,426,857	$1,883,943	989	$2,707	0	$0	334	$536	112,160	$486,133	2,579,000	0	0
2006-07	UNC Wilmington	$6,913,056	$6,206,573	397,575,530,782	67,048,936	$4,563,704	1,687,581	$1,642,192	335	$677	0	$0	0	$0	140,382	$706,483	2,935,001	0	0
2007-08	UNC Wilmington	$7,553,608	$6,771,936	404,891,148,976	72,108,933	$5,068,098	1,586,638	$1,699,330	1,382	$4,508	0	$0	0	$0	154,807	$781,672	3,047,215	0	0
2008-09	UNC Wilmington	$7,228,146	$6,546,751	381,042,138,460	71,915,955	$5,320,135	1,356,649	$1,226,616	0	$0	0	$0	0	$0	133,008	$681,395	3,303,907	101,458	30,081
2009-10	UNC Wilmington	$7,575,106	$6,806,789	428,199,570,784	74,226,280	$5,686,770	1,749,154	$1,119,398	0	$0	0	$0	263	$621	144,721	$768,316	3,728,109	0	0
2010-11	UNC Wilmington	$7,443,987	$6,502,579	411,542,508,648	72,530,379	$5,489,054	1,639,371	$1,010,991	950	$2,534	0	$0	0	$0	165,005	$941,408	3,692,732	0	0
2011-12	UNC Wilmington	$7,348,125	$6,232,953	397,115,995,226	71,737,753	$5,381,834	1,521,289	$845,874	1,571	$5,245	0	$0	0	$0	168,584	$1,115,172	3,824,972	0	67,360
2012-13	UNC Wilmington	$7,292,192	$6,311,731	407,827,581,602	71,975,831	$5,403,168	1,618,566	$900,091	2,699	$8,250	0	$0	165	$222	147,479	$980,461	3,977,995	0	0
2013-14	UNC Wilmington	$7,584,074	$6,674,317	406,742,227,902	75,002,326	$5,725,493	1,506,386	$944,045	1,411	$4,779	0	$0	0	$0	137,257	$909,757	3,978,116	46,714	0
2014-15	UNC Wilmington	$7,560,049	$6,598,713	425,198,543,168	74,355,464	$5,802,399	1,714,977	$796,314	0	$0	0	$0	0	$0	141,650	$961,336	3,986,810	0	4,454
2015-16	UNC Wilmington	$7,509,526	$6,538,267	433,180,643,980	77,369,415	$5,796,850	1,691,962	$741,416	0	$0	0	$0	0	$0	135,561	$971,259	3,991,136	9,836	0
2016-17	UNC Wilmington	$7,129,932	$6,244,737	409,050,844,708	73,662,696	$5,333,883	1,574,374	$907,538	1,992	$3,316	0	$0	0	$0	126,624	$885,195	4,006,035	0	0
2017-18	UNC Wilmington	$6,950,625	$6,171,611	405,140,677,980	69,838,915	$5,223,739	1,668,503	$947,872	0	$0	0	$0	0	$0	106,735	$779,014	3,987,923	182,595	0
2018-19	UNC Wilmington	$7,192,789	$6,165,440	364,419,381,928	66,235,194	$5,338,311	1,384,249	$827,130	0	$0	0	$0	0	$0	146,209	$1,027,349	3,960,221	362,080	110,951
2019-20	UNC Wilmington	$6,774,746	$5,895,389	365,516,219,093	64,758,299	$5,206,301	1,439,334	$679,310	4,525	$9,778	0	$0	0	$0	126,084	$879,357	3,991,200	584,845	110,951
2020-21	UNC Wilmington	$7,187,625	$6,282,150	382,338,211,189	63,126,324	$5,469,147	1,662,088	$799,886	5,353	$13,117	0	$0	0	$0	108,302	$905,475	4,837,267	223,092	0
2021-22	UNC Wilmington	$8,597,074	$7,477,780	428,552,533,127	76,596,317	$6,168,914	1,672,059	$1,308,867	0	$0	0	$0	0	$0	133,173	$1,119,294	5,085,579	0	0
2022-23	UNC Wilmington	$9,255,485	$8,011,645	426,528,629,884	76,050,602	$6,496,052	1,666,010	$1,501,802	3,194	$13,791	0	$0	0	$0	134,352	$1,243,840	5,108,621	111,036	0

		energy evaluation						water/sewer evaluation					
		energy $ avoided	energy $/gsf	$/mmbtu	$/mmbtu %change	btu/sf	btu/sf %change	water $ avoided	$/kgal	$/kgal %change	gal/sf	gal/sf %change
2002-03	UNC Wilmington		$2.16	$13.41		161,009			$3.71		57.31	
2003-04	UNC Wilmington	$188,985	$2.24	$14.49	8%	154,627	-4%	$31,117	$4.08	10%	53.57	-7%
2004-05	UNC Wilmington	$283,501	$2.30	$15.06	12%	152,428	-5%	$104,604	$4.22	14%	46.00	-20%
2005-06	UNC Wilmington	$955,697	$2.26	$16.32	22%	138,296	-14%	$154,437	$4.33	17%	43.49	-24%
2006-07	UNC Wilmington	$1,170,621	$2.11	$15.61	16%	135,460	-16%	$139,958	$5.03	36%	47.83	-17%
2007-08	UNC Wilmington	$1,434,005	$2.22	$16.73	25%	132,873	-17%	$100,057	$5.05	36%	50.80	-11%
2008-09	UNC Wilmington	$2,592,937	$1.98	$17.18	28%	115,331	-28%	$288,550	$5.12	38%	40.26	-30%
2009-10	UNC Wilmington	$2,735,123	$1.83	$15.90	19%	114,857	-29%	$365,897	$5.31	43%	38.82	-32%
2010-11	UNC Wilmington	$2,891,830	$1.76	$15.80	18%	111,447	-31%	$265,924	$5.71	54%	44.68	-22%
2011-12	UNC Wilmington	$3,433,240	$1.63	$15.70	17%	103,822	-36%	$334,774	$6.61	78%	44.07	-23%
2012-13	UNC Wilmington	$3,600,852	$1.59	$15.48	15%	102,521	-36%	$535,060	$6.65	79%	37.07	-35%
2013-14	UNC Wilmington	$3,835,998	$1.68	$16.41	22%	102,245	-36%	$601,250	$6.63	79%	34.50	-40%
2014-15	UNC Wilmington	$3,363,223	$1.66	$15.52	16%	106,651	-34%	$589,201	$6.79	83%	35.53	-38%
2015-16	UNC Wilmington	$3,161,043	$1.64	$15.09	13%	108,536	-33%	$667,427	$7.16	93%	33.97	-41%
2016-17	UNC Wilmington	$3,602,226	$1.56	$15.27	14%	102,109	-37%	$719,662	$6.99	88%	31.61	-45%
2017-18	UNC Wilmington	$3,609,545	$1.55	$15.23	14%	101,592	-37%	$888,937	$7.30	97%	26.76	-53%
2018-19	UNC Wilmington	$4,622,357	$1.56	$16.92	26%	92,020	-43%	$567,287	$7.03	89%	36.92	-36%
2019-20	UNC Wilmington	$4,469,389	$1.48	$16.13	20%	91,581	-43%	$715,807	$6.97	88%	31.59	-45%
2020-21	UNC Wilmington	$6,514,944	$1.30	$16.43	23%	79,040	-51%	$1,412,124	$8.36	125%	22.39	-61%
2021-22	UNC Wilmington	$6,809,836	$1.47	$17.45	30%	84,268	-48%	$1,330,153	$8.40	127%	26.19	-54%
2022-23	UNC Wilmington	$7,438,335	$1.57	$18.78	40%	83,492	-48%	$1,466,490	$9.26	150%	26.30	-54%

		$/kwh	$/therm	2 oil $/gal	6 oil $/gal	propane$/gal	coal $/ton	wood $/ton	steam $/mlb	chw $/ton
2002-03	UNC Wilmington	$0.0579	$0.809	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2003-04	UNC Wilmington	$0.0581	$1.048	$1.58	$0.00	$1.47	$0.00	$0.00	$0.00	$0.00
2004-05	UNC Wilmington	$0.0593	$1.158	$1.58	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2005-06	UNC Wilmington	$0.0627	$1.320	$2.74	$0.00	$1.60	$0.00	$0.00	$0.00	$0.00
2006-07	UNC Wilmington	$0.0681	$0.973	$2.02	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2007-08	UNC Wilmington	$0.0703	$1.071	$3.26	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2008-09	UNC Wilmington	$0.0740	$0.904	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2009-10	UNC Wilmington	$0.0766	$0.640	$0.00	$0.00	$2.36	$0.00	$0.00	$0.00	$0.00
2010-11	UNC Wilmington	$0.0757	$0.617	$2.67	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2011-12	UNC Wilmington	$0.0750	$0.556	$3.34	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2012-13	UNC Wilmington	$0.0751	$0.556	$3.06	$0.00	$1.35	$0.00	$0.00	$0.00	$0.00
2013-14	UNC Wilmington	$0.0763	$0.627	$3.39	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2014-15	UNC Wilmington	$0.0780	$0.464	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2015-16	UNC Wilmington	$0.0749	$0.438	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2016-17	UNC Wilmington	$0.0724	$0.576	$1.66	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2017-18	UNC Wilmington	$0.0748	$0.568	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2018-19	UNC Wilmington	$0.0806	$0.598	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2019-20	UNC Wilmington	$0.0804	$0.472	$2.16	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2020-21	UNC Wilmington	$0.0866	$0.481	$2.45	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2021-22	UNC Wilmington	$0.0805	$0.783	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2022-23	UNC Wilmington	$0.0854	$0.901	$4.32	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

		Cost per Therm (100,000 Btu) all Energy Sources								
2002-03	UNC Wilmington	$1.70	$0.81	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2003-04	UNC Wilmington	$1.70	$1.05	$1.13	$0.00	$1.59	$0.00	$0.00	$0.00	$0.00
2004-05	UNC Wilmington	$1.74	$1.16	$1.13	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2005-06	UNC Wilmington	$1.84	$1.32	$1.96	$0.00	$1.74	$0.00	$0.00	$0.00	$0.00
2006-07	UNC Wilmington	$1.99	$0.97	$1.44	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2007-08	UNC Wilmington	$2.06	$1.07	$2.33	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2008-09	UNC Wilmington	$2.17	$0.90	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2009-10	UNC Wilmington	$2.25	$0.64	$0.00	$0.00	$2.57	$0.00	$0.00	$0.00	$0.00
2010-11	UNC Wilmington	$2.22	$0.62	$1.91	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2011-12	UNC Wilmington	$2.20	$0.56	$2.38	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2012-13	UNC Wilmington	$2.20	$0.56	$2.18	$0.00	$1.46	$0.00	$0.00	$0.00	$0.00
2013-14	UNC Wilmington	$2.24	$0.63	$2.42	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2014-15	UNC Wilmington	$2.29	$0.46	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2015-16	UNC Wilmington	$2.20	$0.44	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2016-17	UNC Wilmington	$2.12	$0.58	$1.19	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2017-18	UNC Wilmington	$2.19	$0.57	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2018-19	UNC Wilmington	$2.36	$0.60	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2019-20	UNC Wilmington	$2.36	$0.47	$1.54	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2020-21	UNC Wilmington	$2.54	$0.48	$1.75	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2021-22	UNC Wilmington	$2.36	$0.78	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2022-23	UNC Wilmington	$2.50	$0.90	$3.08	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Western Carolina University

AUGUST 1, 2023

WCU ANNUAL REPORT AND STRATEGIC ENERGY MANAGEMENT PLAN

Western Carolina University

Energy Management will review progress and results monthly and will support staff attendance and training in energy and water management as needed.

Utility Management Plan Goals

Western Carolina University has reached the mandated goals set by GS 143-64.12 (30% reduction in BTUs/sqft by 2015) and Governor Cooper's Executive Order 80 (40% reduction in BTUs/sqft by 2025) from the baseline years of 2002-03. Moving forward, Western Carolina University will strive to lead the UNC System in reduction of BTUs/sqft.

Utilities Management Plan Measures

Our Tracking measures will continue to use Total Energy Use in BTU per Square Foot per Year

Utilities Management Plan Commitment

I have read and support the Strategic Energy Plan for Western Carolina University as signed on

August 15, 2023

Western Carolina University Commitment

We recognize that energy and water consumption can be managed to our benefit. Energy and water management is a responsibility of the occupants at each facility. Guided and supported by the Energy Management Department within Facilities Management. The attached plan outlines the activities and expenditures required to reduce energy and water consumption to achieve the goals of the program.

Senior Energy Manager	**Energy Manager**	**Director of Facilities**
T. Reid Conway, PEM	**Duane Strain**	**Jason Turner**

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What is Energy Management

Energy management is the proactive and systematic monitoring, control, and optimization of Western Carolina University's energy consumption to conserve use, decrease energy costs, reduce emissions and energy security risks all while maintaining a conducive learning environment.

Executive Summary

General Statute 143-64.12 requires that Western Carolina University (WCU) submit to the State Energy Office an Annual Consumption Report and an Annual Strategic Energy Plan. This report will provide an overview of the key activities within the WCU Energy Management Program. The Annual Strategic Energy Management Plan for the university highlights the achievements and efforts of the entire campus related to energy conservation.

The main campus is in Cullowhee, North Carolina, with an additional instructional site in Asheville at Biltmore Park Towne Square. Our campus is situated on 600 acres housing almost 4 million square feet of academic, athletic, and residential living facilities with a current enrollment just under 11,700. During the fiscal year 2022-23, WCU spent $5,283,825 in utilities. This number includes electricity, natural gas, #2 oil, propane and water. Based on this year's numbers, WCU is at an energy intensity of 81,197 BTU/sqft and 24.42 gal/sqft for water intensity. All state-owned buildings use the metric of energy use intensity (EUI) and water use intensity (WUI) which allow different types of buildings to be compared by analyzing consumption per square foot. For EUI, everything that uses energy (lighting, heating, etc.) is compared to the gross square footage of campus. With campus activity returning to pre-pandemic levels and with new facilities coming online, EUI must continually be tracked. Facilities Management will continue aggressively implementing efficiency projects to minimize the impact. There are efficiency opportunities at WCU but continuing to achieve a lower EUI requires two factors: continuing to identify energy efficiency opportunities and funding for essential projects. Moving forward with energy efficiency projects in existing buildings is vital to reducing campus EUI. Ensuring that newly constructed and renovated campus buildings are designed and constructed with aggressive energy efficiency standards will have an even greater impact on the university's future EUI and must be prioritized.

General Statute 143-64.12 that became law in 2007 stated that all state-owned buildings achieve a 20% reduction in BTUs/sq ft by 2010 and a 30% reduction in BTUs/sqft by 2015. In October of 2018, Governor Roy Cooper issued Executive Order 80 which mandated that state-owned buildings achieve a 40% reduction in BTUs/sqft by 2025.

Based on the annual BTUs/sqft of 81,197, WCU is at an all-time low of -55% from the 2002-03 baseline by statute. **WCU leads the UNC System universities in BTU/sqft reduction.** This is something that should be recognized, celebrated, and was achieved by hard work across campus.

Chart 1 below shows the efforts across campus comparing the 2022-23 WCU averages to the UNC System Averages from 2021-22 fiscal years.

Chart 1 UNC WCU Annual Comparison

How WCU Compares to the FY 21-22 UNC System Averages

	UNC System Averages FY 21-22	WCU FY 22-23 Averages
Cost Per Square Foot	$2.20	$1.24
BTUs/sqft reduction	-35%	-55%
Total BTU/sqft	110,269	81,197
Cost Per Million BTU	$19.95	$15.24
Annual Cost Per Student	$946.22	$444.88
Cost Per 1000 Gallons Water	$11.65	$4.38
Water Usage per Gross Sqft	21.47	24.42

As for gallons per square foot, WCU is at a 53% reduction from the same 2002-03 baseline. While this is good for WCU, the UNC System average is 21.47 gal/sqft. WCU still has some work to do on lowering this number. It should be noted that WCU has one of the lowest costs in the UNC System based on thousands of gallons at just $4.38/1000 gallons. While conserving water is important, at this cost WCU continues to look first at reducing electricity and natural gas usage for the best value. WCU continues to place importance on work orders where hot water is leaking, since either electricity or natural gas is used to heat the water. Energy management is concerned about the amount of makeup water being used monthly in the steam plant and has elevated the conversation to get this under control.

An often-overlooked metric tracked on the Annual Report is the Total Avoided Cost. This metric provides a continued look at how well an energy management program is doing. By looking at the annual costs and the annual savings in BTUs/sqft, the Total Avoided Costs are monies that WCU would have needed to pay utility bills if WCU had not had an

energy management program in place. Since 2002-03, WCU has avoided over $54.1 million dollars. This year alone WCU avoided more than $6.3 million dollars. While these monies cannot be pulled out of a bucket to pay bills, it is extremely clear that the energy management program has continued to be highly successful on campus.

One of the funding opportunities that WCU takes advantage of every year was created by General Statute 116-30.3B. This statute is more commonly referred to as the UNC System 1292 Carry Forward. This year, WCU requested $611,455 in Carry Forward funds which is WCU's largest request to date, more than doubling last years' request of $256,000. Facilities Management and Finance working together have shown this to be a repeatable source of energy project funds. The 1292 goal for FY22-23 was to request to $500,000 per year. That was blown away by this year's $611,455 request. The new goal for FY 23-24 is to request over $1 million dollars in 1292 Carry Forward. That is an audacious goal for sure.

Primary Impacts to Energy Management FY22/23

As campus changes and grows, this continues to enforce the need for an energy management program. With an annual budget for utilities of over $5 million dollars, having an energy management department is critical to manage this large amount of university expenditures as well as the associated environmental resources and emissions. While campus is served by two electricity providers (Duke Energy Carolinas and Western Carolina Power), monthly energy management is reading, reporting, and identifying opportunities on more than 135 electric and sub accounts, 16 natural gas (Dominion), 5 propane (Blossman), 4 fuel oil (Colonial) accounts and 120 water (Western Carolina University Water Plant), steam, condensate, and cooling tower meters.

While everything is moving forward, WCU must continue to be aware of the instability currently within the cost of natural gas. As described below in the Natural Gas section, global challenges continue to cause a disruption and market volatility. The basic principle is that natural gas must have pipelines and without the creation of new pipelines then the issue becomes how much can the pipeline support and who owns the capacity within the pipeline? These fluctuations have significantly increased the monthly costs to WCU, and the costs will continue to be monitored. Energy management has been a leader within the UNC System to address these issues. WCU was asked to lead a discussion panel on the issue with natural gas at this year's Appalachian Energy Summit in June 2023.

FY 21-22 closed with the creation and hiring of a Senior Energy Manager position within Facilities Management. This position provides leadership and direction for the university for all energy related matters, systems, and especially our Building Automation System. Bringing in a local resource that has spent many years working statewide for the State Energy Office was a tremendous gain for the WCU family. Especially one with a rich

family history at WCU. This hire has created a renewed interest in faculty and staff interaction and most importantly a new set of eyes on what will make WCU grow to be more energy efficient and sustainable. One of the primary tasks identified was a much-needed improvement in the WCU data collection of utility spending. WCU is in the process of converting to a new Energy Management Software, by the Siemens based company Brightly. This should all be fully up and running by the end of Q3 of 2023. More importantly, this new software will allow WCU, for the first time, to have a dashboard that will display up to date campus spending. Thanks should go out to the Campus Sustainable Initiative, who funded this new software and dashboard through their grant process.

The new Senior Energy Manager came in and went right to work figuring out where WCU could become more efficient and sustainable. As highlighted above, the annual 1292 request was doubled and is heading towards $1MM by the end of 2024. A new set of eyes also spotted issues with the current rates being charged for water and steam across campus. Both steam and water rates have been increased after many years from lack of oversight. Moving forward these increases will be passed along across campus to auxiliary services. By using the old rates this meant that expenses were being paid out of the facilities management budget when it should have been passed along. This saving alone is over $200,000 per year that is being redirected to repairs across campus. This new position in a short time has worked hard to change the culture across facilities to highlight the holistic need for energy efficiency to be included in all daily activities, repairs, and conversations. Efforts toward doing more on campus is the goal for the coming year.

Conclusion:

Having an Energy Management Department along with a good Strategic Energy Management Plan enables WCU to:

- **Reduce costs** – as energy costs rise.
- **Reduce carbon emissions** and the environmental damage they cause and to reduce its carbon footprint to promote a green, sustainable image.
- **Reduce risk** – the more energy WCU consumes, the greater the risk that as energy prices increase or supply shortages happen, this could affect the programs offered by the university.
- **Identify** – energy savings projects by using Life Cycle Cost Analysis (LCCA) and other methods to measure and verify potential energy savings.

Annual Report

Chart 1 shows the costs associated with fuel sources purchased this year. The cost of electricity and natural gas make up the largest expenses with water coming in third. Electricity makes up 56% of the WCU utility spending while Natural Gas makes up 30%. WCU continues to use smaller amounts of #2 oil and propane, but this year's #2 Fuel Oil has increased as a temporary boiler has been installed as the steam plant is currently under construction. These lesser fuels make up 6% of the WCU utility costs with water being 8% of the overall total utility spend. The Energy Management program will look at saving money by reducing the kilowatt hours and will save BTUs/sqft by looking at reducing natural gas and other fuels.

Chart 1 WCU Cost Pie Chart

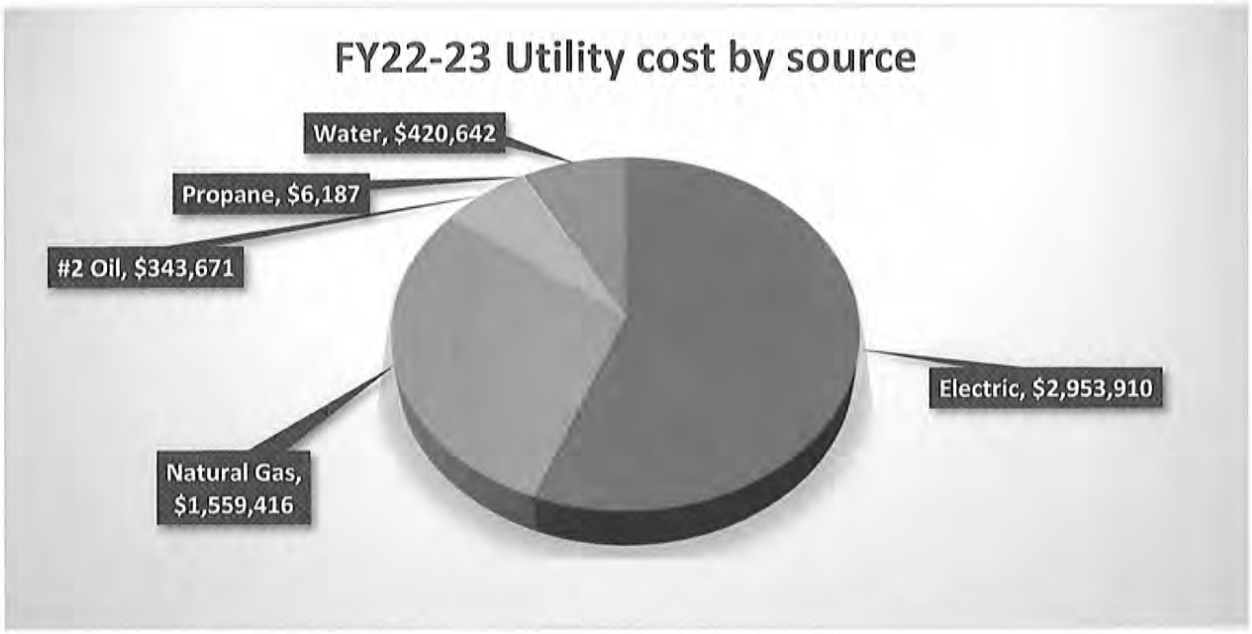
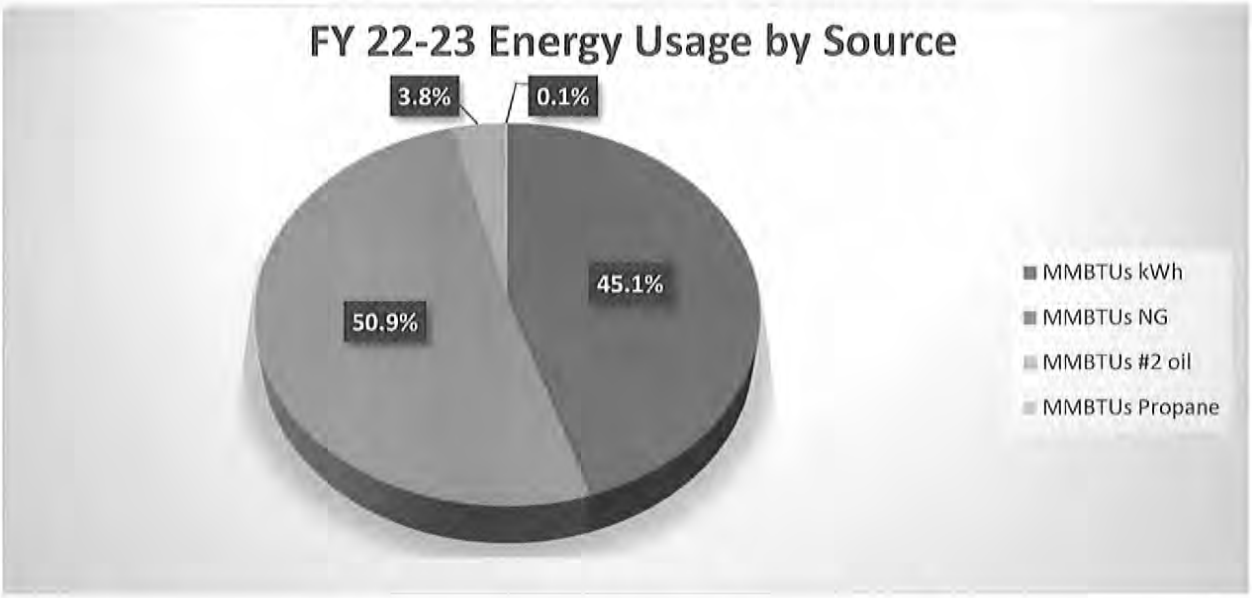


Chart 2 shows purchased fuel sources with a common denominator based on the BTUs of energy held within each source. There are significantly more BTUs in natural gas than in electricity. The Energy Management program will continue to identify energy conservation projects that reduce Natural Gas and thus reduce WCUs BTUs/sqft annually. With the completion of the new Steam Plant and an estimated 30% reduction in natural gas usage, energy management will keep watch to see that these savings are achieved.

Chart 2 WCU Energy Usage by Source



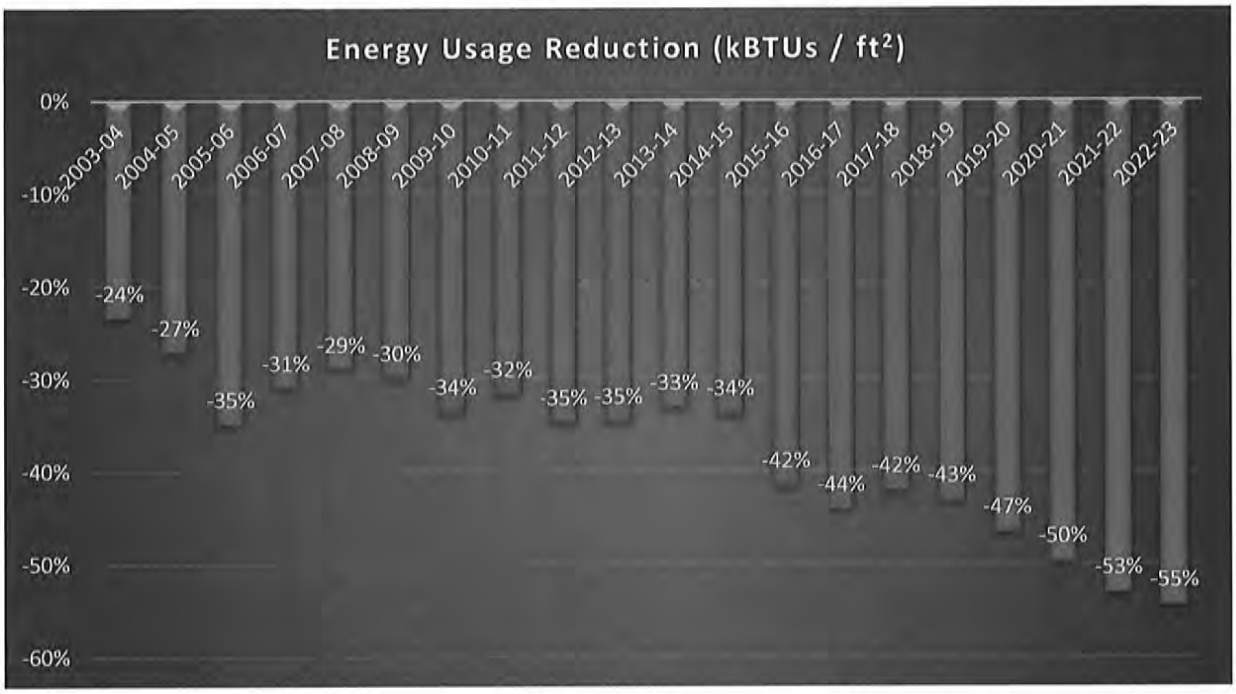
These two charts provide an explanation of the work done by the energy management program and shows the relationship between cost and BTUs. While electricity has a much higher cost, natural gas has a higher BTU count per therm. The UNC System is required to achieve a 40% reduction in BTUs/sqft by 2025 from a 2002-03 baseline as required by Governor Cooper's Executive Order 80. The goal of our energy management program is to reduce natural gas usage on campus, while at the same time maintaining comfort levels during the winter in our facilities. This is partly achieved by making sure the steam plant is operating properly with minimum steam leakage and making sure the Steam System is returning a maximum amount of condensate to the plant.

As shown in Chart 1 above the individual cost associated with electricity is by far our largest cost. The energy management program is keenly aware of the cost differences shown between electricity and natural gas. Another goal of the program is to try and reduce the amount annually paid for utilities. While this is a great goal, it is seldom achieved. With the continued growth on campus with both new buildings and increased students, and the ever-increasing utility rates, it is all but impossible to reduce cost. The energy management program looks at all energy conservation measures and calculates the savings in both cost and BTUs/sqft. This provides a better model for project identification. The bottom line is that if WCU wants to save BTUs/sqft then WCU must reduce natural gas usage and if WCU wants to reduce cost, WCU needs to reduce the amount of electricity used.

Based on General Statute 143-64.12 the State Agencies and the UNC System were required to achieve a 20% reduction in BTUs/sqft from a 2002-03 baseline by 2010 and

a 30% reduction by 2015. Governor Cooper's Executive Order 80 added on to the statute stating that state-owned buildings are to achieve a 40% reduction by 2025. Graph 1 shows that WCU has surpassed these mandates and has achieved a record 55% reduction. **WCU now leads all state-owned universities in BTU/sqft reductions**.

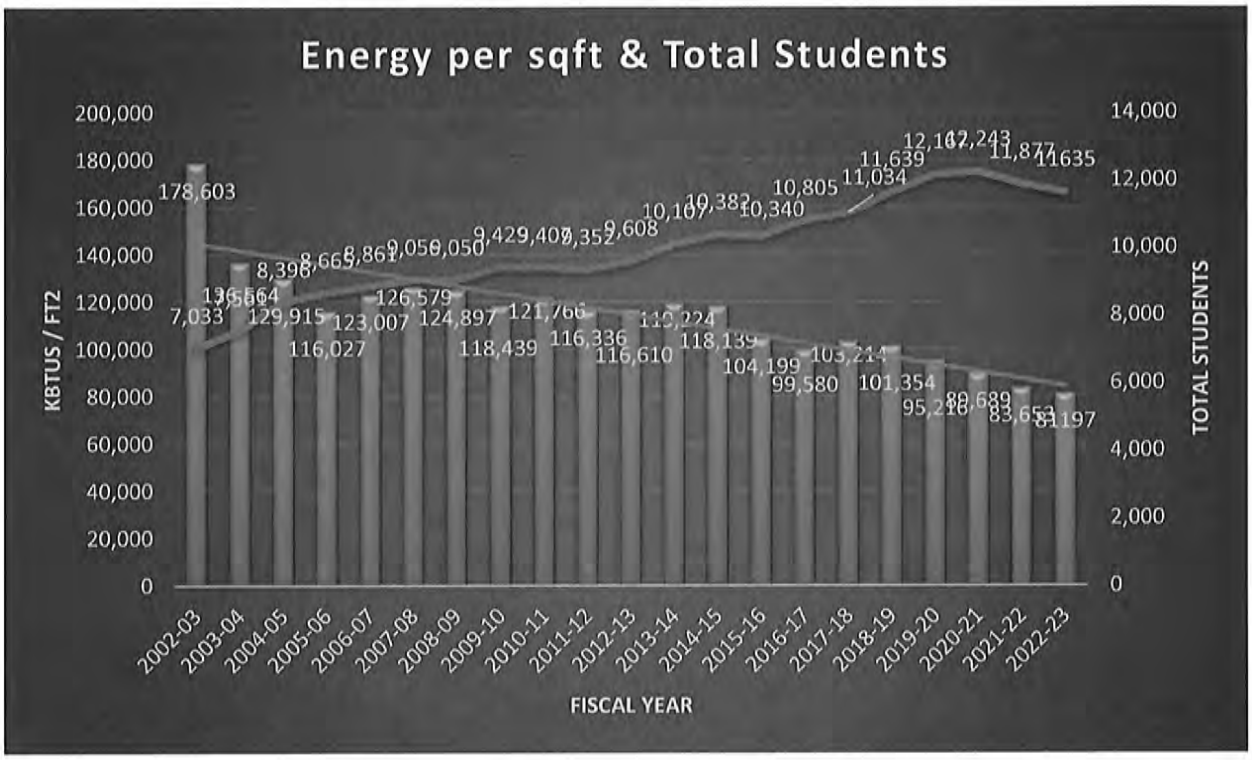
Graph 1 Annual Percentage Reduction in Btus/sqft



Graph 2 shows the correlation as it relates to the increase of the WCU student population. WCU has continued to drive down the energy usage intensity while at the same time the number of students attending WCU continues to rise. Not included in this graph is the number of additional facility and staff required to provide for both the educational programming and facility needs of the additional students.

Growth can be seen across campus the new additions this year including Black Rock, Shining Rock, and Water Rock, our three new residence halls and a long-awaited Steam Plant. We will add three new residential living facilities and an updated steam plant. All these additions make the students time here at WCU valuable and will provide lifelong memories.

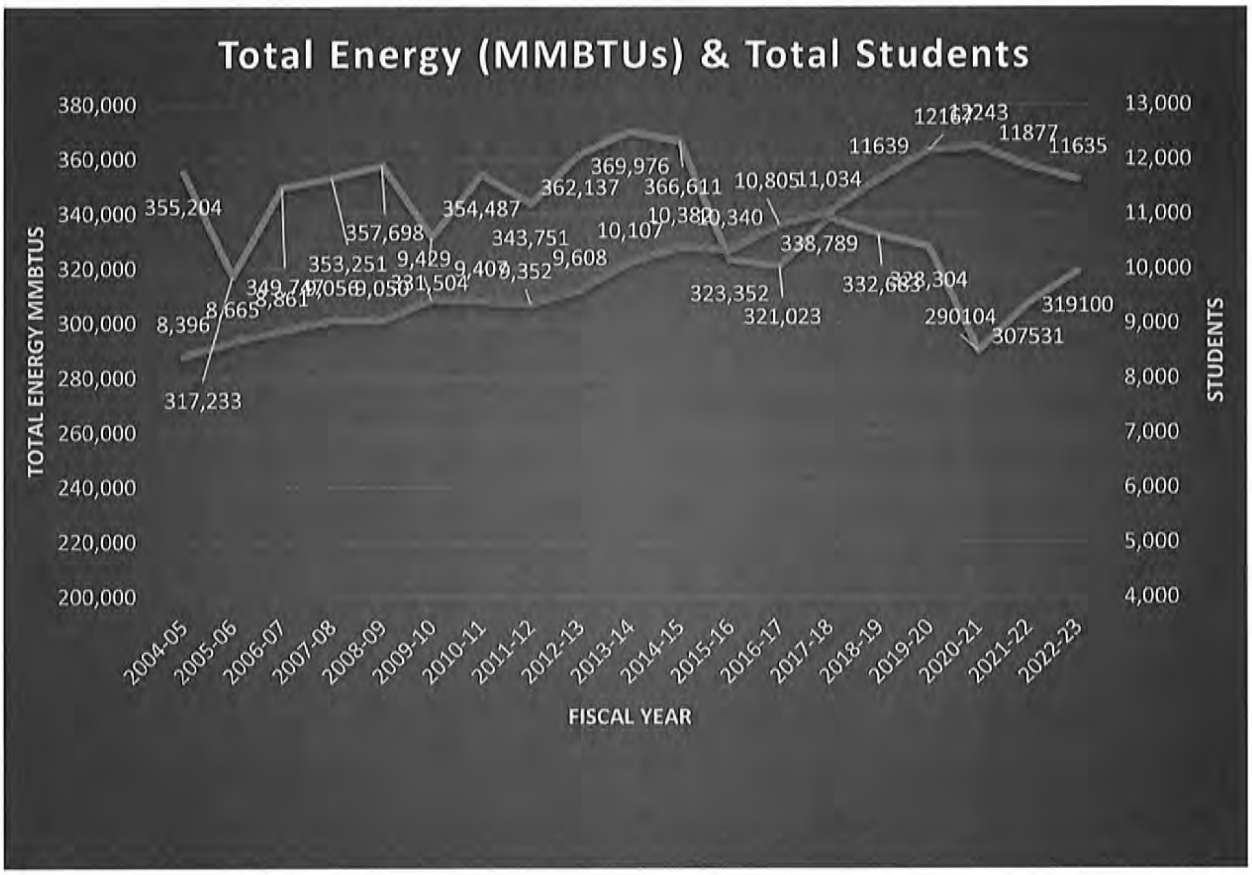
Graph 2 Annual Reduction in BTUs/sqft versus Total Enrollment



To look further at the relationship between the students and energy on campus the metric that was used above was BTUs/sqft. The total number of BTUs used on campus will continue to show that WCU has a successful energy management program.

Graph 3 shows the total number of students in relation to the total BTUs. The red line shows the slight reduction of students this year and the blue line shows an uptick in BTU usage. This uptick is due to the increase in #2 Oil to power the temporary boiler sitting in front of McKee. This was temporary until the steam plant was back in operation in early August. With the new steam plant #2 Fuel Oil on campus will only be used at times when our natural gas is curtained on campus.

Graph 3 Annual Reduction in Total Campus BTUs versus Total Enrollment



Natural Gas

There continues to be a move away from coal as the primary fuel source for power plants. As coal plants are being retired, natural gas plants are taking their place. Natural Gas is now the biggest fuel source used to produce electricity in North Carolina. According to US Energy Information Administration, natural gas use for electricity generation in NC has more than quadrupled in the past decade. Natural gas primarily moves one way, through a pipeline. Before the transition away from coal, natural gas was primarily used for heating and industrial processes. Now as natural gas becomes the primary fuel source for electricity, this creates a competition for pipeline space to serve the growing need for natural gas. Notwithstanding arguments on both sides as to the use of fossil fuels, the problem stems from the lack of pipeline capacity and the increased need to move more natural gas. NC is beginning to have pipeline capacity issues. When pipeline capacity becomes an issue, the companies running the pipelines can charge more to the customers using the pipelines. Those additional costs get passed along to WCU and the students in the end.

During FY 22/23, WCU has seen a huge cost increase in natural gas. This is due to several factors to include the War in Ukraine, the explosion of both NORSTROM 1 and 2 pipelines and the increase in the amount of LNG being transported from the US to other countries to help supply NG to help pick up the gap left behind by the war. These events caused a spike in the cost of NG for WCU to the highest point in September 2022 where WCU paid $10.34 per dekatherm. The calendar year for 2022 finished the year with an average monthly cost of $7.54 per dekatherm. This is more than double costs of previous seven years.

At WCU we have taken advantage of the UNC State Contract 405N for the transportation of NG to our Steam Plant. Under this contract Texican Natural Gas Company provides NG for many State Agencies and many UNC System Schools. Texican is paid to transport large amounts of NG to our Steam Plant under this contract. In FY 21/22, WCU paid an additional commodity charge above the final monthly settlement price of $0.989 per dekatherm per the 405N contract. This changed in December 2022 when the Department of Administration (DOA) picked up the final year option with Texican and renegotiated a new commodity charge. The renegotiated price shocked all the participants under this contract. DOA agreed to a new commodity charge of $4.67 above the monthly settlement price for NG. Texican as well as other NG companies have claimed to have been "under-collected" during much of 2022. Meaning that these companies paid more for the transportation of the NG to customers and thus lost revenue. However, you spin this information, WCU will continue to pay more for NG through December 2023 if WCU remains on the State Rate.

WCU worked closely with UNC Greensboro to expose this information from DOA and then WCU set up a conference call with the other UNC System Schools to discuss this huge increase. Without the leadership shown by WCU, the whole UNC System would not have known about this issue until the bills came due. WCU Energy Management has spent many hours calculating the effects of this increase and passed along the need for additional funds within this utility account. Based on the size of the NG need, only the steam plant gets NG from Texican, the other campus facilities rely on Dominion for NG.

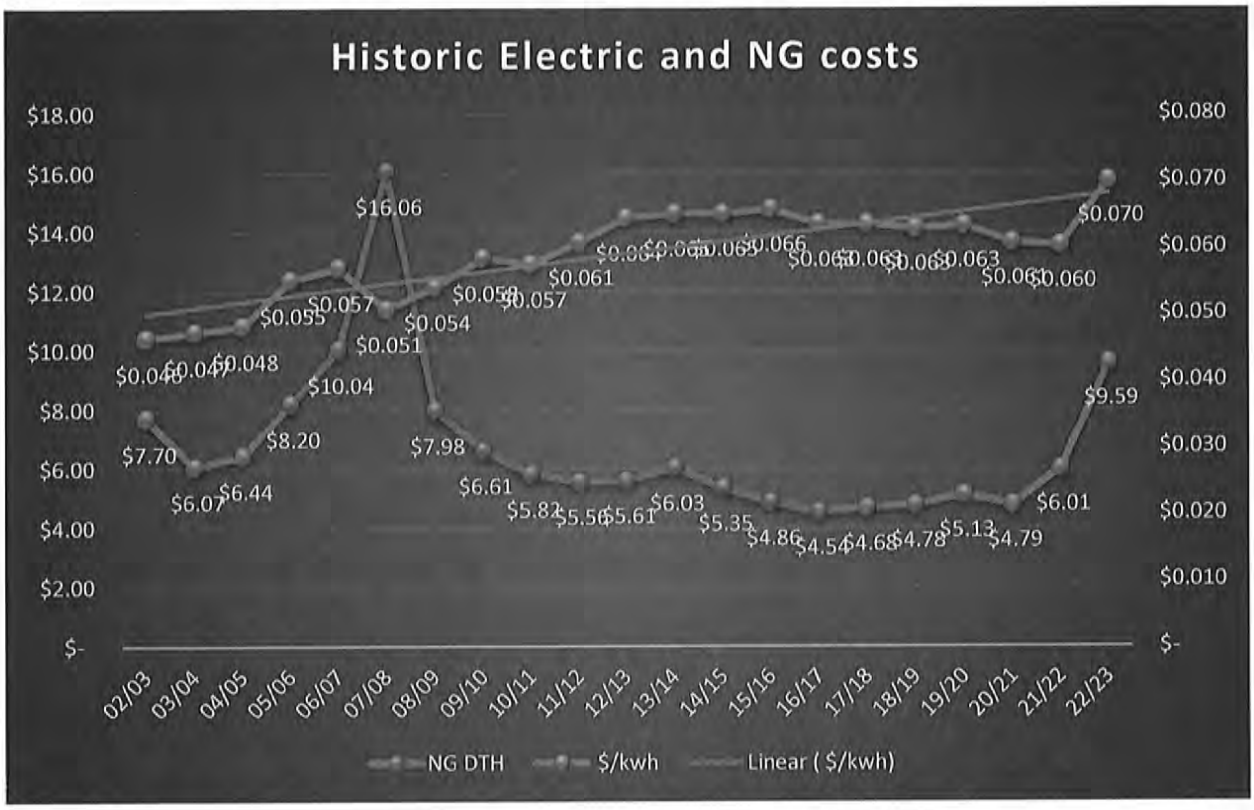
During this time, Energy Management has been working with Dominion to figure out if switching the steam plant off Texican and over to Dominion. The primary issue has been that Dominion continues to have both rate increases and decreased throughout the year. Dominion has been unable to provide a long-range rate schedule to WCU. This long-range rate schedule must be available for Energy Management to accurately calculate the annual cost of NG for budgetary needs. At this point, it has been determined that the best path is to switch our transportation for the steam plant from Texican back to Dominion.

Part of this decision is that for the first time in many years the new steam plant can be swapped from natural gas over to #2 Fuel Oil. This allows for WCU to move to an interruptible NG rate. This will save additional costs for this account as well. WCU filled out and submitted the required paperwork to Dominion in May 2023 and will move to Dominion for the steam plant full time in September. The WCU approval was helped with the closing of the paper mill in Canton as Dominion looks to gain more customers after losing such a big account.

WCU will not be alone in switching off Texican. Already, UNC Greensboro and UNC Wilmington have both moved away from Texican and to Piedmont Natural Gas. It will be interesting to see how the 405N contract changes during the bidding process in Q3 of this year. Based on research of the natural gas market and from other actions, the cost for Texican basis will most likely be in the $3.00 - $4.00 range per dekatherm. With more UNC System accounts coming off the Texican contract, this will mean that natural gas marketer who gets the 405N contract will have a lower volume of NG to purchase. This lower volume will mean a higher price to access the pipeline per customer. While not the current $4.67 it is still more expensive than what WCU will be paying with Dominion.

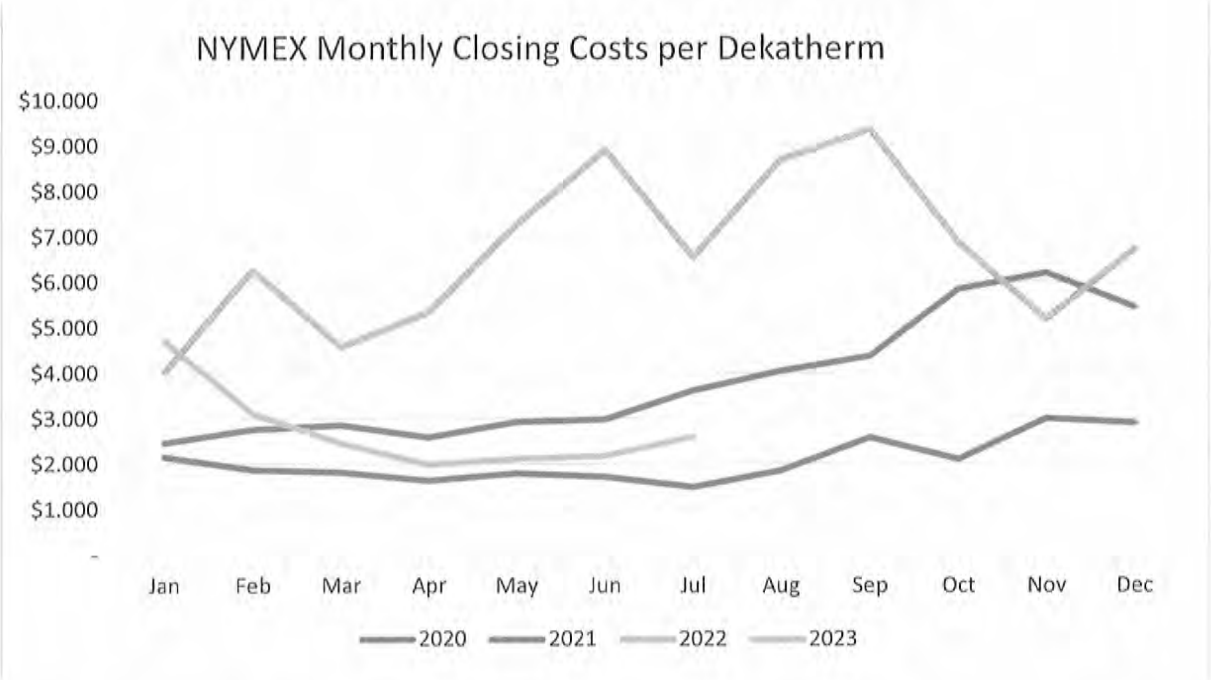
Graph 4 provides a clear understanding of these metrics. While the cost of electricity has risen over the years, WCU had been fortunate to see a stagnation in this cost for the past few years. But as you can see in the graph, electricity rates have risen this year and that is reflected in the graph below. Graph 4 also shows the uptick over the last two years of the cost per Dekatherm and the overall tread for natural gas since 2002-03. With everything going on in the world, natural gas costs seem to be the most impacted. As you can see the cost for natural gas jumped significantly this year. As discussed above, Energy Management has taken steps to lower this cost for FY 23-24.

Graph 4 Historic Electric and Natural Gas Costs



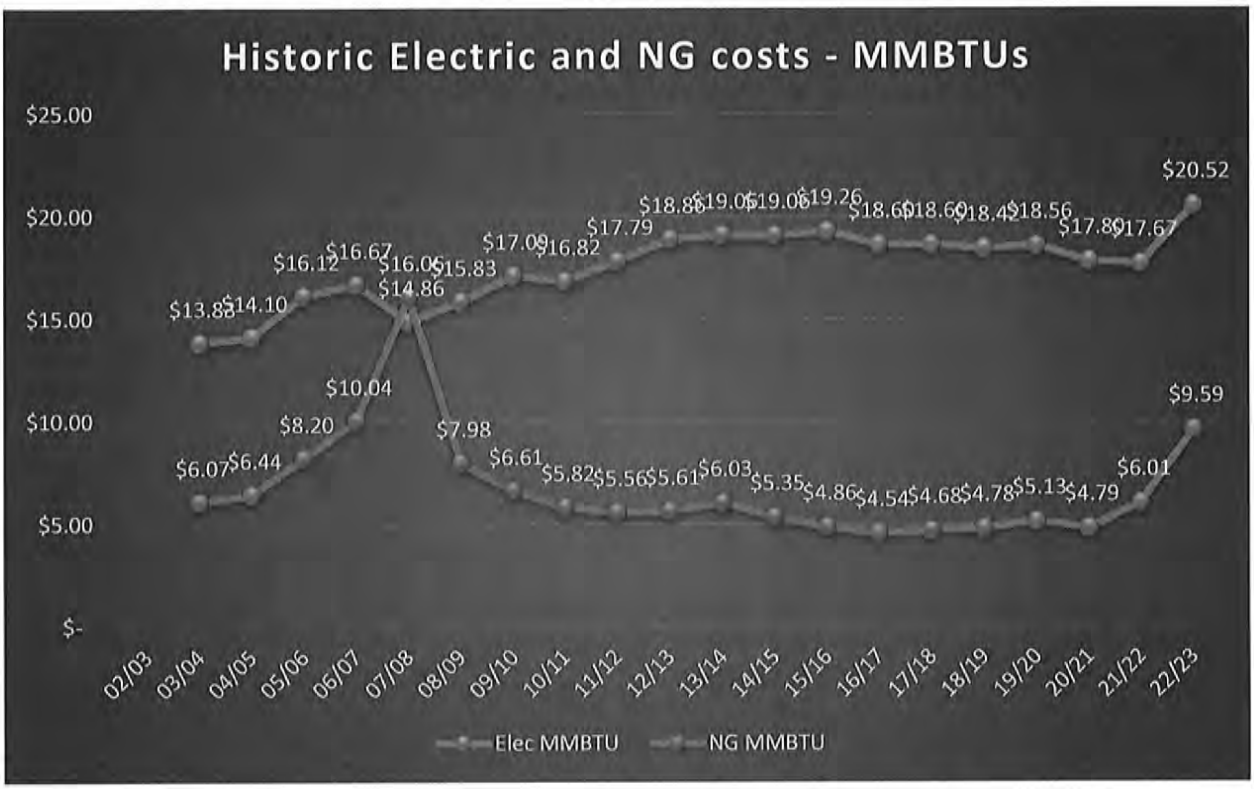
Graph 5 shows the overall volatility of natural gas costs for 2022 as compared to the last three years. It is easy to realize that world events are causing issues here in Cullowhee and WCU. The gray line below shows that volatility and the associated costs with natural gas for FY 22-23. Both graphs clearly show the effect of those costs on WCU and the campus. The yellow line for this year shows that natural gas has gone back to more historic levels and in a range where it should be. While you may have read about the reduction in gas reserves around gasoline, natural gas storage right now is at a five-year high and looks to continue that way soon. This will help keep prices down for FY23-24, but as you can see as we get closer to winter, the price could rise as usual. As mentioned above, WCU and other state entities were not consulted prior to DOA's and Texican's extension and the associated cost increase. It is not up to WCU to make Texican whole for lost revenue.

Graph 5 Monthly Closing Costs per Dekatherm



There continues to be a push for electrification across the nation. The Energy Management Program continues to monitor what that impact might look like here at WCU. Graph 6 shows the cost comparison for both electricity and natural gas using the same common denominator of 1,000,000 BTUs. This is commonly referred to as a Dekatherm. As the graph points out the cost per dekatherm of electricity is $20.52 and the cost per dekatherm of natural gas is $9.59. It must be noted that natural gas is not 100 percent efficient. In most cases it is at least 80% or better. This small lack of efficiency will slightly increase the cost of natural gas. If at any time there is a switch from natural gas to 100 percent electricity as the sole fuel source on campus, additional measures will need to be accommodated. Natural gas using equipment within the affected facilities will need to be replaced with equipment that only use electricity for heating. All of this can be accomplished if that is the direction WCU would like to explore. Based on the information contained within this graph, WCU will need to significantly increase the annual energy budget to ensure resources are budgeted for increased cost for electricity.

Graph 6 Historic Electric and Natural Costs per Million BTUs



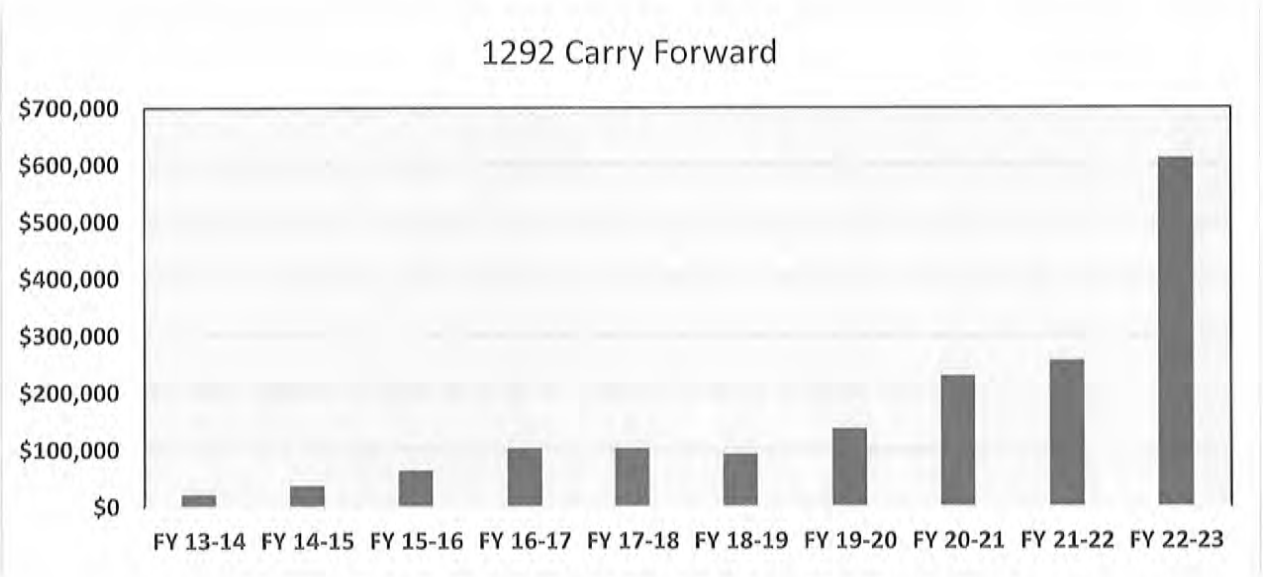
1292 Carry Forward

General Statute 116-30.3B, more commonly known as the UNC System 1292 Carry Forward, allows UNC System schools who have funds left over in the utility account at the end of the fiscal year and who have identified and measured energy savings projects through the year to carry funds forward left-over funds into the next fiscal year. These Carry Forward funds must be used for new energy efficiency projects in the next fiscal year. This year, WCU requested $611,455 in Carry Forward funds which is the largest request to date. With Facilities Management and Finance working together, this continues to be a repeatable source of funds. The goal of the Energy Management program for FY 22-23 was to get this year's Carry Forward request to $500,000. With this year's request of $611.455 the goal was clearly shattered. As noted last year, to date through FY 21-22 WCU had been able to Carry Forward just over $1 million dollars in the last nine years. Having hired a Senior Energy Manager to work more closely with the departments to identify additional projects and to calculate the savings increases, the 1292 Carry Forward has greatly improved from this renewed focus. The new goal for

FY23-24 is to get the 1292 Carry Forward saving to $1 Million Dollars a year. This is a bold new goal for Energy Management indeed.

Graph 7 provides an annual look at the past 1292 submissions and the total requested. This year's efforts can clearly be seen. Already additional ECMs have been identified for next year's 1292. These projects include some chiller and cooling tower replacements, and more building envelope upgrades. Energy Management is working with Design and Construction to have vendors provide energy savings calculations as they submit proposals. This will help to identify the best projects and allow for increased 1292 savings moving forward. WCU is allowed to Carry Forward savings for 12 years for all ECMs. This provides WCU a great opportunity to add projects each year that really affect the overall 1292 goals.

Graph 7 Annual 1292 Carry Forward



Future Facility Energy Management Projects and potential 1292 Projects

1. There are 5 buildings on campus that are on an outdated Schneider BAS system that is no longer supported. WCU has moved forward with a special service agreement with Harris Integrated Solutions, our preferred BAS vendor of Automated Logic on campus. With the creative use of a Service Agreement and with permission of State Construction, this project will kick off in October of 2023. The total annual savings is expected to be almost $50,000 per year.
2. The Stillwell Science Lab is going through a $1MM renovation to replace many of the fume hoods after the recent construction of Apodaca STEM Building. This project was engineered by McKim and Creed and work is set to begin the week of July 17th July and will continue through November. McKim and Creed will provide energy savings calculations as part of the requirements as stipulated by energy management.
3. In the Killian building, WCU is doing a complete replacement of the HVAC system including new duct work. Energy management is happy that this project will also include new energy efficient windows as well. The total project cost is approximately $3,570,000 and will be done in several phases over the next 3 years. As part of this project, we must upgrade the BAS in Killian Annex as the Annex BAS is also powered by the BAS in Killian. So, care must be taken with this project. The buildings will be operational and occupied as much as possible while construction is being completed.
4. Energy Management has identified the cost of installing demand response on campus through an integration with the campus BAS and Campus Power. This would allow EM to set a monthly demand limit and then shed load across campus. The proposed cost of $30,000 and further details is being examined.
5. For the first time in many years, WCU has a new steam plant with adequate back up fuel. WCU will now move to an interruptible gas rate for this new facility. Based on recent calculations, this will provide increased 1292 savings for the coming year.
6. There are several cooling towers and chillers that need to be replaced on campus to include Hunter Library and Judaculla Residence Hall Cooling Towers Replacement, HFR Chiller Replacement and CAT Building Chiller Replacement. These are in different steps of bidding, but the total cost to WCU will be $2MM dollars. The savings will be calculated, and paybacks will be in the 20-year range.
7. There are several roof replacements that include Bird Roofing Replacement, Facilities Roof Replacement, Reid Gym Roof Replacement and HFR Roof Replacement. While these are not all out to bid yet, the associated energy saving is minimal but is required by the roofing contractor by energy management.
8. The Health and Human Services Building is the last big building on campus that has not been converted to LED. The preliminary cost for this project is $350,000 with an estimated payback of 7 years. Funding for this project has not yet been identified.

9. The Intramural Field currently is still using 1500-watt Metal Halide lamps. Energy Management has worked with GE to provide 8 free sample LEDs to try out. This project would replace 50 existing lamps with new LEDs. The cost of this project is estimated to be $40,000 with a longer payback of 12 years since these lights are not used very much.
10. The WCU Athletics Office has been looking at changing out the football stadium lights to LEDs. This project will cost an estimated $350,000. While there will be savings, it will again be a long payback based on hours of operation. This would again be a good project for baseball and softball, but those projects are years out.

WCU Annual Strategic Plan

Based on the WCU Campus Master Plan, the WCU Strategic Energy Plan must support and collaborate with the goals and objectives of the Campus Master Plan. Many of the Strategic Directives to include Academic Excellence, Student Experience, Employee Excellence and Responsible Stewardship cannot be fully achieved without the work of the Energy Management Program. The Energy Management Program must provide an optimal learning environment for the students, a healthy living and workplace by providing enhanced indoor air quality and being good stewards of the taxpayer resources used to pay utility bills, update facilities and equipment. These plans must work together to be successful.

The Strategic Plan must address the requirements mandated to WCU found within General Statutes 143-64.12, 116-30.3B and Executive Order 80. The plan must address requirements from the UNC Board of Governors Sustainability Policy. The Strategic Plan will identify daily, weekly, monthly, and yearly activities to be performed by the Energy Management Team. Many of these tasks will move around based on the urgency within a project, equipment failure or time constraints. Currently the Energy Management Team consists of a Senior Energy Manager, the Campus Energy/BAS Manager, and a BAS Controls Technician.

Yearly Tasks to be completed by Energy Management Staff

1. Annual Consumption Report Due **August 15th.**
   This involves the collection of all utility data to include electricity (Duke and WCU Power), natural gas (PSNC and Texican), #2 Oil, propane and water (WCU Water and TWSA).
2. Annual Program Update Due **August 15th.**

This report provides an annual look at how WCU is doing to meet the requirements found within the statutes and policies.

3. Annual Strategic Energy Plan Due **August 15th**
   This report provides the annual direction and activities of the energy management program and team.
4. Annual 1292 Report **Due May 15th**
   This report provides WCU the ability to potentially carry forward identified energy savings from one fiscal year's budget into the next.
5. Attending the State Energy Conference (**April 25-26, 2023**)
   This provides a networking and learning opportunity for staff.
6. Attend Appalachian Energy Summit Mid-Year if held.
7. Attend Appalachian Energy Summit Annual Meeting (**June 2023**)
8. Identify training opportunities for staff to increase overall and specific knowledge directly related to WCU mission.
9. Manage the WCU utility budget and utility spending.
10. Provide leadership across WCU as it relates to energy issues.
11. Aid Sustainability during Student Orientation.
12. Communicate energy management goals and achievements to faculty, staff, and students.

Monthly Tasks to be completed by Energy Management and Facilities Staff

1. Oversee the reading of all electric, gas and water meters on campus.
   This is completed by the electrical and plumbing shop.
2. Compile the data into a monthly report.
   This information is compiled by the energy manager. Once approved, it is sent out and used to charge residential living and others on campus for utilities used.
3. Insert this data into spreadsheets and data base.
   Information is manually entered into the proper locations for annual tracking.
4. Analyze and investigate any anomalies.
   During the monthly data entry any readings that are out of range will be investigated and tracked down.
5. Report any meters that are not functioning for repair.
   Work orders will be filled out and submitted for repair.
6. Walk a selected number of facilities across campus to identify potential energy savings opportunities and projects.
   These will be Level 1 energy assessments to identify savings opportunities. Work orders will be created on identified issues.
7. Talk to Electrical Shop Supervisor and HVAC/Plumbing Shop Supervisor to identify potential 1292 report projects.
   If projects are identified, energy management will calculate savings and fill out 1292 paperwork and store in proper folder.
8. Energy/BAS manager and BAS Tech will monitor alarms on the BAS system.

The goal is to have only the most important alarms that are being monitored. Minimizing unnecessary alarms that are of limited value.

9. BAS Tech will run a locked value report.
   This allows energy management to see equipment that is in hand and running without the control of the BAS.
10. Monthly communication with Design and Construction to help manage projects across campus.
11. Energy Management will work with Design and Construction to ensure energy management is included in all energy related projects across campus.
12. Senior Energy Manager and Energy/BAS Manager will provide specific energy management training for internal growth and knowledge.
13. Senior Energy Manager will work with Chief Sustainability Officer to identify ways to collaborate and provide education to faculty, staff, and students.

Weekly/Daily Tasks to be completed by Energy Management Staff

1. Provide daily team updates with energy management staff.
2. Attend other meetings as they are required.
3. Provide oversight of contractors on site as it relates to BAS improvements.
   Guiding contractors through buildings, unlocking doors, or other duties as needed to ensure job is completed.
4. Assist contractors as needed with controls upgrades/testing and balancing.
5. Aid end users with operation and scheduling of Buildings as necessary.
6. Attend weekly commissioning meeting as required for all HVAC projects on campus.
7. Attend weekly small projects meeting to gain knowledge of potential energy savings projects.
8. Assist with commissioning of new buildings and re-tuning/calibrating older buildings. Replace/repair/calibrate controls systems as needed.
9. Energy Management will communicate weekly with design and construction to continue to identify energy saving within projects.
10. Review and comment on all construction related documents in a timely fashion.
11. Continue to be a resource/facilitator for HVAC shop and HVAC technician as needed for repair and replacement of BAS and HVAC parts and equipment.
12. Daily monitoring of the BAS to identify issues and submit work orders for repairs.
13. Provide additional data to vendors as required in a timely fashion.
14. Identify energy savings opportunities through the BAS system. Once identified, Senior Energy Manager will calculate potential savings.
15. Senior Energy Manager will meet weekly with the Chief Sustainability Officer to coordinate and communicate projects that Energy Management is currently working on.

WCU Energy Management Program

To address the requirements of General Statute 143-64.12 the State Agencies and the UNC System were required to achieve a 20% reduction in BTUs/sqft from a 2002-03 baseline by 2010 and a 30% reduction by 2015. Governor Cooper's Executive Order 80 added on to the statute stating that state-owned buildings are to achieve a 40% reduction by 2025. WCU has developed this Energy Management Program to effectively manage the ongoing use of electricity, natural gas and other fuel as well as water. As the campus continues to grow in square footage, staff, faculty and students it is even more important to manage utility spending. This allows WCU to remain good stewards of all the resources that are awarded to us. When it comes to saving energy, the goal of the Energy Management Program is simple. WCU must constantly monitor, control, and conserve energy in all buildings and across campuses. Typically, this involves the following steps:

1. Metering energy consumption and collecting the data.
2. Finding opportunities to save energy and estimating how much energy each opportunity could save. By analyzing our meter data, WCU can find and quantify routine energy waste and investigate the energy savings that could be made by replacing equipment (e.g., lighting) or other building upgrades.
3. Taking action to target the opportunities to save energy (i.e., tackling the routine waste and replacing or upgrading the inefficient equipment). Typically, you'd start with the best opportunities first.
4. Tracking your progress by analyzing your meter data to see how well your energy-saving efforts have worked.

(And then back to step 2, and the cycle continues...)

It is critical that Energy Management continue to focus on the 5 areas below. By focusing on these areas, WCU can maintain the great work that has been accomplished to this point.

Energy Data Management – WCU has a program for collecting and analyzing monthly utility billing information using spreadsheets. This data is compared year to year and month to month to assess fluctuations and abnormalities that may occur. The problem is that by the time the data is reviewed it is 30 days old. While this has worked well for years, WCU needs the ability to see energy usage data today and not the end of the month. The goal is to move the progress to more real time data. This would allow WCU to see changes immediately as they take place allowing actions to be taken when problems are occurring in real time.

Energy Supply Management – WCU is proactive in selection of electrical rates and cost-effective fuel rates for all campus buildings. Energy supply management must also demonstrate choices that achieve the campus and UNC System goals to be carbon neutral by 2050, the state goal of 40% reduction in greenhouse gas emissions by 2025. Facilities Management thoroughly reviews utility invoices for deviations indicating billing

errors. Work is being done to incorporate a demand-side management program that aims to lower electricity demand at peak times to help save WCU money. The goal of this plan would create a program that would reduce demand charges in real time. By being able to measure demand, WCU could set a limit on the actual demand being used at any time. If tied to the building automation system would allow for additional energy savings and a reduction in the overall electricity bought by WCU.

Energy Use in Facilities – Building HVAC and lighting controls are updated as renovations occur or as Retro-Commissioning takes place. New buildings have state-of-the-art Building Automation System (BAS) controls. New and existing building control systems will be evaluated and adjusted for optimum energy usage. The work of both the Energy Manager and Controls technician is critical to ensure optimum operation and most of all maintain the best learning environment possible. As a new requirement of the energy management team, every building will be walked every 3 months. This provides an ideal time to identify projects, spot issues and communicate with campus staff and students. These building assessments are fundamental to controlling unnecessary plug loads while allowing us to see changes in use and occupancy more often.

Equipment Efficiency – WCU requires all equipment replacements to meet or exceed code requirements. Preventive Maintenance (PM) has been moved primarily to second shift and is key to our energy efficiency program. PM has a major impact on any energy management program. It is no different here at WCU. By performing PM, WCU can keep energy using equipment running in the most efficient way. Energy Management will continue to help specify energy consuming equipment and will continue to identify and evaluate cost-effective modifications or replacements. All equipment shall be selected by Life Cycle Cost Analysis as required by statute. While funding for replacement and equipment upgrades can have their challenges, WCU will continue to take advantage of the UNC System 1292 Carry Forward funds. Larger and more capital intense equipment and projects will be identified and are normally funded through R&R capital projects.

Organization Integration & Awareness Training – The Senior Energy Manager will continue to work closely with the University Sustainability Officer for various energy conservation measures and training efforts within the appropriate University departments. The Sustainability Office priorities since 2018 are to pursue compliance with the UNC Sustainability Policy (600.6.1). Energy management is recognized in the sustainability plan under a category of "Operational Priority" with an expectation for continuous improvement for all campuses. These efforts are aimed at improving behavior and awareness in ways that contribute to the WCU continued ability to exceed the state of North Carolina mandated conservation goals. In communicating with staff, faculty, and students the goals of the Energy Management Program, WCU is hoping for continued assistance and most of all new ideas that may help the campus save energy and the environment.

Appendix 1

Executive Order 80

State of North Carolina

ROY COOPER
GOVERNOR

October 29, 2018

EXECUTIVE ORDER NO. 80

NORTH CAROLINA'S COMMITMENT TO ADDRESS CLIMATE CHANGE AND TRANSITION TO A CLEAN ENERGY ECONOMY

WHEREAS, North Carolina residents deserve to be better educated, healthier, and more financially secure so that they may live purposeful and abundant lives; and

WHEREAS, N.C. Const. art. XIV, ss 5 requires the conservation, protection, and preservation of state lands and waters in public trust; and

WHEREAS, North Carolina is well positioned to take advantage of its technology and research and development sectors, along with its skilled workforce, to promote clean energy technology solutions and a modernized electric grid; and

WHEREAS, public-private partnerships in North Carolina foster market innovations and develop clean energy technology solutions that grow the state's economy; and

WHEREAS, the effects of more frequent and intense hurricanes, flooding, extreme temperatures, droughts, saltwater intrusion, and beach erosion have already impacted and will continue to impact North Carolina's economy; and

WHEREAS, climate-related environmental disruptions pose significant health risks to North Carolinians, including waterborne disease outbreaks, compromised drinking water, increases in disease-spreading organisms, and exposure to air pollution, among other issues; and

WHEREAS, to maintain economic growth and development and to provide responsible environmental stewardship, we must build resilient communities and develop strategies to mitigate and prepare for climate-related impacts in North Carolina.

NOW, THEREFORE, by the authority vested in me as Governor by the Constitution and the laws of the State of North Carolina, IT IS ORDERED:

1. The State of North Carolina will support the 2015 Paris Agreement goals and honor the state's commitments to the United States Climate Alliance.

   The State of North Carolina will strive to accomplish the following by 2025:

   a. Reduce statewide greenhouse gas emissions to 40% below 2005 levels;
   b. Increase the number of registered, zero-emission vehicles ("ZEVs"; individually, "ZEV") to at least 80,000;
   c. Reduce energy consumption per square foot in state-owned buildings by at least 40% from fiscal year 2002-2003 levels.

2. Cabinet agencies shall evaluate the impacts of climate change on their programs and operations and integrate climate change mitigation and adaptation practices into their programs and operations. Council of State members, higher education institutions, local governments, private businesses, and other North Carolina entities are encouraged to address climate change and provide input on climate change mitigation and adaptation measures developed through the implementation of this Executive Order. Consistent with applicable law, cabinet agencies shall actively support such actions.

3. The Secretary or designee of each cabinet agency and a representative from the Governor's Office shall serve on the North Carolina Climate Change Interagency Council ("Council"), which is hereby established. The Secretary of the North Carolina Department of Environmental Quality, or the Secretary's designee, shall serve as the Council Chair. The North Carolina Department of Environmental Quality shall lead the Council by providing strategic direction, scheduling and planning Council meetings, determining the prioritization of activities, facilitating stakeholder engagement, and assisting in the implementation of pathways to achieve the goals provided in Section 1 of this Executive Order.

   The duties of the Council shall include the following:

   a. Recommend new and updated goals and actions to meaningfully address climate change;
   b. Develop, implement, and evaluate programs and activities that support statewide climate mitigation and adaptation practices;
   c. Establish workgroups, as appropriate, to assist the Council in its duties;
   d. Consider stakeholder input when developing recommendations, programs, and other actions and activities;
   e. Schedule, monitor, and provide input on the preparation and development of the plans and assessments required by this Executive Order;

f. Review and submit to the Governor the plans and assessments required by this Executive Order.

4. The North Carolina Department of Environmental Quality ("DEQ") shall develop a North Carolina Clean Energy Plan ("Clean Energy Plan") that fosters and encourages the utilization of clean energy resources, including energy efficiency, solar, wind, energy storage, and other innovative technologies in the public and private sectors, and the integration of those resources to facilitate the development of a modern and resilient electric grid. DEQ shall collaborate with businesses, industries, power providers, technology developers, North Carolina residents, local governments, and other interested stakeholders to increase the utilization of clean energy technologies, energy efficiency measures, and clean transportation solutions. DEQ shall complete the Clean Energy Plan for the Council to submit to the Governor by October I , 2019.

5. The North Carolina Department of Transportation ("DOT"), in coordination with DEQ, shall develop a North Carolina ZEV Plan ("ZEV Plan") designed to increase the number of registered ZEVs in the state to at least 80,000 by 2025. The ZEV Plan shall help establish interstate and intrastate ZEV corridors, coordinate and increase the installation of ZEV infrastructure, and incorporate, where appropriate, additional best practices for increasing ZEV adoption. DOT shall complete the ZEV Plan for the Council to submit to the Governor by October 1, 2019.

6. The North Carolina Department of Commerce ("DOC") and other cabinet agencies shall take actions supporting the expansion of clean energy businesses and service providers, clean technology investment, and companies with a commitment to procuring renewable energy. In addition, DOC shall develop clean energy and clean transportation workforce assessments for the Council to submit to the Governor by October I , 2019. These assessments shall evaluate the current and projected workforce demands in North Carolina's clean energy and clean transportation sectors, assess the skills and education required for employment in those sectors, and recommend actions to help North Carolinians develop such skills and education.

7. Cabinet agencies shall prioritize ZEVs in the purchase or lease of new vehicles and shall use ZEVs for agency business travel when feasible. When ZEV use is not feasible, cabinet agencies shall prioritize cost-effective, low-emission alternatives. To support implementation of this directive, the North Carolina Department of Administration ("DOA") shall develop a North Carolina Motor Fleet ZEV Plan ("Motor Fleet ZEV Plan") that identifies the types of trips for which a ZEV is feasible, recommends infrastructure necessary to support ZEV use, develops procurement options and strategies to increase the purchase and utilization of ZEVs, and addresses other key topics. DOA shall complete the Motor Fleet ZEV Plan and provide an accounting of each agency's ZEVs and miles driven by vehicle type for the Council to submit to the Governor by October 1, 2019, and annually thereafter.

8. Building on the energy, water, and utility use conservation measures taken pursuant to N.C. Gen. Stat. 143-64.12(a), DEQ shall update and amend, where applicable, a Comprehensive Energy, Water, and Utility Use Conservation Program ("Comprehensive Program") by February 1, 2019, and biennially beginning December I, 2019, to further reduce energy consumption per gross square foot in state buildings consistent with Section I of this Executive Order. The Comprehensive Program shall include best practices for state government building energy efficiency, training for agency staff, cost estimation methodologies, financing options, and reporting requirements for cabinet agencies. DEQ and cabinet agencies shall encourage and assist, as requested, higher education institutions, K-12 schools, and local governments in reducing energy consumption. To achieve the required energy consumption reductions:

a. By January 1 5, 2019, each cabinet agency shall designate an Agency Energy Manager, who shall serve as the agency point of contact.
b. Each cabinet agency shall develop and submit an Agency Utility Management Plan to DEQ by March I , 2019, and biennially thereafter, and implement strategies to support the energy consumption reduction goal set forth in Section I of this Executive Order. DEQ shall assess the adequacy of these plans and their compliance with this Executive Order.
c. By September I, 2019, and annually thereafter, each cabinet agency shall submit to DEQ an Agency Utility Report detailing its utility consumption, utility costs, and progress in reducing energy consumption.
d. DEQ shall develop an annual report that describes the Comprehensive Program and summarizes each cabinet agency's utility consumption, utility costs, and achieved reductions in energy consumption. DEQ shall complete this report for publication on its website and for the Council to submit to the Governor by February 1, 2019, and annually thereafter beginning December I, 2019.

9. Cabinet agencies shall integrate climate adaptation and resiliency planning into their policies, programs, and operations (i) to support communities and sectors of the economy that are vulnerable to the effects of climate change and (ii) to enhance the agencies' ability to protect human life and health, property, natural and built infrastructure, cultural resources, and other public and private assets of value to North Carolinians.

a. DEQ, with the support of cabinet agencies and informed by stakeholder engagement, shall prepare a North Carolina Climate Risk Assessment and Resiliency Plan for the Council to submit to the Governor by March I , 2020.
b. The Council shall support communities that are interested in assessing risks and vulnerabilities to natural and built infrastructure and in developing community-level adaptation and resiliency plans.

10. DEQ shall prepare and manage a publicly accessible Web-based portal detailing the Council's actions and the steps taken to address climate-related impacts in North Carolina. Cabinet agencies shall submit data, information, and status reports as specified by the Council to be published on the portal. In addition, DEQ shall develop, publish on the portal, and periodically update an inventory of the state's greenhouse gas emissions that, among other things, tracks emissions trends statewide by sector and identifies opportunities for additional emissions reductions.

I I . By October 15, 2019, and annually thereafter, the Council shall provide to the Governor a status report on the implementation of this Executive Order.

12. This Executive Order is consistent with and does not otherwise abrogate existing state law.
13. This Order is effective October 29, 2018 and shall remain in effect until rescinded or superseded by another applicable Executive Order.

IN WITNESS WHEREOF, I have hereunto signed my name and affixed the Great Seal of the State of North Carolina at the Capitol in the City of Raleigh, this the 29th day of October, in the year of our Lord two thousand eighteen.

Roy Cooper
Governor

ATTEST:

Rodney S. Maddox
Chief Deputy Secretary of State

Appendix 2

143-64.10

Article 3B.

Conservation of Energy, Water, and Other Utilities in Government Facilities.

Part 1. Energy Policy and Life-Cycle Cost Analysis.

§ 143-64.10. Findings; policy.

(a) The General Assembly finds all of the following:

(1) That the State shall take a leadership role in aggressively undertaking the conservation of energy, water, and other utilities in North Carolina.

(2) That State facilities and facilities of State institutions of higher learning have a significant impact on the State's consumption of energy, water, and other utilities.

(3) That practices to conserve energy, water, and other utilities that are adopted for the design, construction, operation, maintenance, and renovation of these facilities and for the purchase, operation, and maintenance of equipment for these facilities will have a beneficial effect on the State's overall supply of energy, water, and other utilities.

(4) That the cost of the energy, water, and other utilities consumed by these facilities and the equipment for these facilities over the life of the facilities shall be considered, in addition to the initial cost.

(5) That the cost of energy, water, and other utilities is significant and facility designs shall take into consideration the total life-cycle cost, including the initial construction cost, and the cost, over the economic life of the facility, of the energy, water, and other utilities consumed, and of operation and maintenance of the facility as it affects the consumption of energy, water, or other utilities.

(6) That State government shall undertake a program to reduce the use of energy, water, and other utilities in State facilities and facilities of the State institutions of higher learning and equipment in those facilities in order to provide its citizens with an example of energy-use, water-use, and utility-use efficiency.

(b) It is the policy of the State of North Carolina to ensure that practices to conserve energy, water, and other utilities are employed in the design, construction, operation, maintenance, and renovation of State facilities and facilities of the State institutions of higher learning and in the purchase, operation, and maintenance of equipment for these facilities. (1975, c. 434, s. 1; 1993, c. 334, s. 2; 2001-415, s. 1; 2006-190, s. 8; 2007-546, s. 3.1(b).)

§ 143-64.11. Definitions.

For purposes of this Article:

(1) "Economic life" means the projected or anticipated useful life of a facility.

(2) "Energy-consumption analysis" means the evaluation of all energy- consuming systems, including systems that consume water or other utilities, and components of these systems by demand and type of energy or other utility use, including the internal energy load imposed on a facility by its occupants, equipment and components, and the external energy load imposed on the facility by climatic conditions.

(2a) "Energy Office" means the State Energy Office of the Department of Environmental Quality.

(2b) "Energy-consuming system" includes but is not limited to any of the following equipment or measures:

a. Equipment used to heat, cool, or ventilate the facility;

b. Equipment used to heat water in the facility;

c. Lighting systems;

d. On-site equipment used to generate electricity for the facility;

e. On-site equipment that uses the sun, wind, oil, natural gas, liquid propane gas, coal, or electricity as a power source; and
f. Energy conservation measures, as defined in G.S. 143-64.17, in the facility design and construction that decrease the energy, water, or other utility requirements of the facility.

(3) "Facility" means a building or a group of buildings served by a central distribution system for energy, water, or other utility or components of a central distribution system.
(4) "Initial cost" means the required cost necessary to construct or renovate a facility.
(5) "Life-cycle cost analysis" means an analytical technique that considers certain costs of owning, using, and operating a facility over its economic life, including but not limited to:
a. Initial costs;
b. System repair and replacement costs;
c. Maintenance costs;
d. Operating costs, including energy costs; and
e. Salvage value.
(6) Repealed by Session Laws 1993, c. 334, s. 3, effective July 13, 1993.
(7) "State agency" means the State of North Carolina or any board, bureau, commission, department, institution, or agency of the State.
(8) "State-assisted facility" means a facility constructed or renovated in whole or in part with State funds or with funds guaranteed or insured by a State agency.
(9) "State facility" means a facility constructed or renovated, by a State agency.
(10) "State institution of higher learning" means any constituent institution of The University of North Carolina. (1975, c. 434, s. 2; 1989, c. 23, s. 1; 1993, c. 334, s. 3; 2001-415, s. 2; 2006-190, ss. 9, 10, 11; 2007-546, s. 3.1(c); 2009-446, s. 1(f); 2013-360, s. 15.22(o); 2015-241, s. 14.30(u).)

§ 143-64.12. Authority and duties of the Department; State agencies and State institutions of higher learning.

(a) The Department of Environmental Quality through the State Energy Office shall develop a comprehensive program to manage energy, water, and other utility use for State agencies and State institutions of higher learning and shall update this program annually. Each State agency and State institution of higher learning shall develop and implement a management plan that is consistent with the State's comprehensive program under this subsection to manage energy, water, and other utility use, and that addresses any findings or recommendations resulting from the energy audit required by subsection (b1) of this section. The energy consumption per gross square foot for all State buildings in total shall be reduced by twenty percent (20%) by 2010 and thirty percent (30%) by 2015 based on energy consumption for the 2002-2003 fiscal year. Each State agency and State institution of higher learning shall update its management plan biennially and include strategies for supporting the energy consumption reduction requirements under this subsection. Each community college shall submit to the State Energy Office a biennial written report of utility consumption and costs. Management plans submitted biennially by State institutions of higher learning shall include all of the following:

(1) Estimates of all costs associated with implementing energy conservation measures, including pre-installation and post-installation costs.
(2) The cost of analyzing the projected energy savings.
(3) Design costs, engineering costs, pre-installation costs, post-installation costs, debt service, and any costs for converting to an alternative energy source.
(4) An analysis that identifies projected annual energy savings and estimated payback periods.

(a1) State agencies and State institutions of higher learning shall carry out the construction and renovation of facilities in such a manner as to further the policy set forth under this section and to ensure the use of life-cycle cost analyses and practices to conserve energy, water, and other utilities.

(b) The Department of Administration shall develop and implement policies, procedures, and standards to ensure that State purchasing practices improve efficiency regarding energy, water, and other utility use and take the cost of the product over the economic life of the product into consideration. The Department of Administration shall adopt and implement Building Energy Design Guidelines. These

guidelines shall include energy-use goals and standards, economic assumptions for life-cycle cost analysis, and other criteria on building systems and technologies. The Department of Administration shall modify the design criteria for construction and renovation of facilities of State buildings and State institutions of higher learning buildings to require that a life-cycle cost analysis be conducted pursuant to G.S. 143-64.15.

(b1) The Department of Administration, as part of the Facilities Condition and Assessment Program, shall identify and recommend energy conservation maintenance and operating procedures that are designed to reduce energy consumption within the facility of a State agency or a State institution of higher learning and that require no significant expenditure of funds. Every State agency or State institution of higher learning shall implement these recommendations. Where energy management equipment is proposed for any facility of a State agency or of a State institution of higher learning, the maximum interchangeability and compatibility of equipment components shall be required. As part of the Facilities Condition and Assessment Program under this section, the Department of Administration, in consultation with the State Energy Office, shall develop an energy audit and a procedure for conducting energy audits. Every five years the Department shall conduct an energy audit for each State agency or State institution of higher learning, and the energy audits conducted shall serve as a preliminary energy survey. The State Energy Office shall be responsible for system-level detailed surveys.

(b2) The Department of Administration shall submit a report of the energy audit required by subsection (b1) of this section to the affected State agency or State institution of higher learning and to the State Energy Office. The State Energy Office shall review each audit and, in consultation with the affected State agency or State institution of higher learning, incorporate the audit findings and recommendations into the management plan required by subsection (a) of this section.

(c) through (g) Repealed by Session Laws 1993, c. 334, s. 4.

(h) When conducting a facilities condition and assessment under this section, the Department of Administration shall identify and recommend to the State Energy Office any facility of a State agency or State institution of higher learning as suitable for building commissioning to reduce energy consumption within the facility or as suitable for installing an energy savings measure pursuant to a guaranteed energy savings contract under Part 2 of this Article.

(i) Consistent with G.S. 150B-2(8a)h., the Department of Administration may adopt architectural and engineering standards to implement this section.

(j) The State Energy Office shall submit a report by December 1 of every odd-numbered year to the Joint Legislative Energy Policy Commission, the Joint Legislative Oversight Committee on Agriculture and Natural and Economic Resources, and the Fiscal Research Division describing the comprehensive program to manage energy, water, and other utility use for State agencies and State institutions of higher learning required by subsection (a) of this section. The report shall also contain the following:

(1) A comprehensive overview of how State agencies and State institutions of higher learning are managing energy, water, and other utility use and achieving efficiency gains.

(2) Any new measures that could be taken by State agencies and State institutions of higher learning to achieve greater efficiency gains, including any changes in general law that might be needed.

(3) A summary of the State agency and State institutions of higher learning management plans required by subsection (a) of this section and the energy audits required by subsection (b1) of this section.

(4) A list of the State agencies and State institutions of higher learning that did and did not submit management plans required by subsection (a) of this section and a list of the State agencies and State institutions of higher learning that received an energy audit.

(5) Any recommendations on how management plans can be better managed and implemented. (1975, c. 434, s. 3; 1993, c. 334, s. 4; 2000-140, s. 76(f); 2001-415, s. 3; 2006-190, s. 12; 2007-546, s. 3.1(a); 2008-198, s. 11.1; 2009-446, s. 1(e); 2010-31, s. 14.3; 2010-196, s. 2; 2013-360, s. 15.22(p); 2014-120, s. 55; 2015-241, s. 14.30(u); 2017-57, s. 14.1(f).)

§ 143-64.13: Repealed by Session Laws 1993, c. 334, s. 5.

§ 143-64.14: Recodified as § 143-64.16 by Session Laws 1993, c. 334, s. 7.

§ 143-64.15. Life-cycle cost analysis.

(a) A life-cycle cost analysis shall be commenced at the schematic design phase of the construction or renovation project, shall be updated or amended as needed at the design development phase, and shall be updated or amended again as needed at the construction document phase. A life-cycle cost analysis shall include, but not be limited to, all of the following elements:

(1) The coordination, orientation, and positioning of the facility on its physical site.
(2) The amount and type of fenestration and the potential for daylighting employed in the facility.
(3) Thermal characteristics of materials and the amount of insulation incorporated into the facility design.
(4) The variable occupancy and operating conditions of the facility, including illumination levels.
(5) Architectural features that affect the consumption of energy, water, and other utilities.

(b) The life-cycle cost analysis performed for any State facility shall, in addition to the requirements set forth in subsection (a) of this section, include, but not be limited to, all of the following:

(1) An energy-consumption analysis of the facility's energy-consuming systems in accordance with the provisions of subsection (g) of this section.
(2) The initial estimated cost of each energy-consuming system being compared and evaluated.
(3) The estimated annual operating cost of all utility requirements.
(4) The estimated annual cost of maintaining each energy-consuming system.
(5) The average estimated replacement cost for each system expressed in annual terms for the economic life of the facility.

(c) Each entity shall conduct a life-cycle cost analysis pursuant to this section for the construction or the renovation of any State facility or State-assisted facility of 20,000 or more gross square feet. For the replacement of heating, ventilation, and air-conditioning equipment in any State facility or State-assisted facility of 20,000 or more gross square feet, the entity shall conduct a life-cycle cost analysis of the replacement equipment pursuant to this section when the replacement is financed under a guaranteed energy savings contract or financed using repair and renovation funds.

(d) The life-cycle cost analysis shall be certified by a registered professional engineer or bear the seal of a North Carolina registered architect, or both. The engineer or architect shall be particularly qualified by training and experience for the type of work involved, but shall not be employed directly or indirectly by a fuel provider, utility company, or group supported by fuel providers or utility funds. Plans and specifications for facilities involving public funds shall be designed in conformance with the provisions of G.S. 133-1.1.

(e) In order to protect the integrity of historic buildings, no provision of this Article shall be interpreted to require the implementation of measures to conserve energy, water, or other utility use that conflict with respect to any property eligible for, nominated to, or entered on the National Register of Historic Places, pursuant to the National Historic Preservation Act of 1966, P.L. 89-665; any historic building located within an historic district as provided in Chapters 160A or 153A of the General Statutes; any historic building listed, owned, or under the jurisdiction of an historic properties commission as provided in Chapter 160A or 153A; nor any historic property owned by the State or assisted by the State.

(f) Each State agency shall use the life-cycle cost analysis over the economic life of the facility in selecting the optimum system or combination of systems to be incorporated into the design of the facility.

(g) The energy-consumption analysis of the operation of energy-consuming systems utilities in a facility shall include, but not be limited to, all of the following:

(1) The comparison of two or more system alternatives.
(2) The simulation or engineering evaluation of each system over the entire range of operation of the facility for a year's operating period.
(3) The engineering evaluation of the consumption of energy, water, and other utilities of component equipment in each system considering the operation of such components at other than full or rated outputs. (1993, c. 334, s. 6; 2001-415, ss. 4, 5; 2006-190, s. 13; 2007-546, s. 4.1.)

§ 143-64.15A. Certification of life-cycle cost analysis.

Each State agency and each State institution of higher learning performing a life-cycle cost analysis for the purpose of constructing or renovating any facility shall, prior to selecting a design option or advertising

for bids for construction, submit the life-cycle cost analysis to the Department for certification at the schematic design phase and again when it is updated or amended as needed in accordance with G.S. 143-64.15. The Department shall review the material submitted by the State agency or State institution of higher learning, reserve the right to require an agency or institution to complete additional analysis to comply with certification, perform any additional analysis, as necessary, to comply with G.S. 143-341(11), and require that all construction or renovation conducted by the State agency or State institution of higher learning comply with the certification issued by the Department. (2001-415, s. 6; 2007-546, s. 4.2.)

§ 143-64.16. Application of Part.

The provisions of this Part shall not apply to municipalities or counties, nor to any agency or department of any municipality or county; provided, however, this Part shall apply to any board of a community college. Community college is defined in G.S. 115D-2(2). (1975, c. 434, s. 5; 1989, c. 23, s. 2; 1993, c. 334, s. 7; 1993 (Reg. Sess., 1994), c. 775, s. 2.)

Appendix 3

1292 CARRY FORWARD

GENERAL ASSEMBLY OF NORTH CAROLINA
SESSION 2009
SESSION LAW 2010-196
HOUSE BILL 1292
H1292-v-6

AN ACT TO PROVIDE THAT ANY ENERGY SAVINGS REALIZED BY CONSTITUENT INSTITUTIONS OF THE UNIVERSITY OF NORTH CAROLINA SHALL REMAIN AVAILABLE TO THE INSTITUTION AND A PORTION OF THOSE ENERGY SAVINGS SHALL BE USED FOR OTHER ENERGY CONSERVATION MEASURES; AND TO EXPAND THE USE OF OPERATIONAL LEASES BY LOCAL BOARDS OF EDUCATION.

The General Assembly of North Carolina enacts:

SECTION 1. Article 1 of Chapter 116 of the General Statutes is amended by adding a new section to read:

"**§ 116-30.3B. Energy conservation savings.**

(a) In addition to the funds carried forward under G.S. 116-30.3, the General Fund current operations appropriations credit balance remaining at the end of each fiscal year for utilities of a constituent institution that is energy savings realized from implementing an energy conservation measure shall be carried forward by the institution to the next fiscal year. Sixty percent (60%) of the energy savings realized shall be utilized for energy conservation measures by that institution. The use of funds under this section shall be limited to onetime capital and operating expenditures that will not impose additional financial obligations on the State. The Director of the Budget, under the authority set forth in G.S. 143C-6-2, shall establish the General Fund current operations credit balance remaining in each budget code of each institution.

(b) The Director of the Budget shall not decrease the recommended continuation budget requirements for utilities for constituent institutions by the amount of energy savings realized from implementing energy conservation measures, including savings achieved through a guaranteed energy savings contract.

(c) Constituent institutions shall submit annual reports on the use of funds authorized pursuant to this section as required under G.S. 143-64.12.

(d) As used in this section, 'energy savings,' 'guaranteed energy savings contract,' and 'energy conservation measure' have the same meaning as in G.S. 143-64.17."

SECTION 2. G.S. 143-64.12(a) reads as rewritten:

"(a) The Department of Commerce through the State Energy Office shall develop a comprehensive program to manage energy, water, and other utility use for State agencies and State institutions of higher learning and shall update this program annually. Each State agency and State institution of higher learning shall develop and implement a management plan that is consistent with the State's comprehensive program under this subsection to manage energy, water, and other utility use. The energy consumption per gross square foot for all State buildings in total shall be reduced by twenty percent (20%) by 2010 and thirty percent (30%) by 2015 based on energy consumption for the 2002-2003 fiscal year. Each State agency and State institution of higher learning shall update its management plan annually and include strategies for supporting the energy consumption reduction requirements under this subsection. Each community college shall submit to the State Energy Office an annual written report of utility consumption and costs. Management plans submitted annually by State institutions of higher learning shall include all of the following:

(1) Estimates of all costs associated with implementing energy conservation measures, including pre-installation and post-installation costs.

(2) The cost of analyzing the projected energy savings.

(3) Design costs, engineering costs, pre-installation costs, post-installation costs, debt service, and any costs for converting to an alternative energy source.

(4) An analysis that identifies projected annual energy savings and estimated payback periods."

SECTION 3. G.S. 115C-530 reads as rewritten:

"**§ 115C-530. Operational leases of school buildings and school facilities.**

(a) Local boards of education may enter into operational leases of real or personal property for use as school buildings or school facilities. Operational leases for terms of less than three years shall not be subject to the approval of the board of county commissioners. Operational leases for terms of three years or longer, including periods that may be added to the original term through the exercise of options to renew or extend, are permitted if all of the following conditions are met:

(1) The budget resolution includes an appropriation authorizing the current fiscal year's portion of the obligation.

(2) An unencumbered balance remains in the appropriation sufficient to pay in the current fiscal year the sums obligated by the lease for the current fiscal year.

(3) The leases are approved by a resolution adopted by the board of county commissioners. If an operational lease is approved by the board of county commissioners, in each year the county commissioners shall appropriate sufficient funds to meet the amounts to be paid during the fiscal year under the lease.

(4) Any construction, repair, or renovation of the property is in compliance with the requirements of G.S. 115C-521(c) relating to energy guidelines.

For purposes of this section, an operational lease is defined according to generally accepted accounting principles. principles and may be for new or existing buildings.

(b) Local boards of education may enter into contracts for the repair construction, repair, or renovation of leased property if (i) the budget resolution includes an appropriation authorizing the obligation, (ii) an unencumbered balance remains in the appropriation sufficient to pay in the current fiscal year the sums obligated by the transaction for the current fiscal year, and (iii) the repair construction, repair, or renovation is in compliance with the requirements of G.S. 115C-521(c) relating to energy guidelines. Construction, repair, or renovation work undertaken or contracted by a private developer is subject to the requirements of Article 8 of Chapter 143 of the General Statutes. Contracts for new construction and renovation that are subject to the bidding requirements of G.S. 143-129(a) and which do not constitute continuing contracts for capital outlay must be approved by the board of county commissioners.

(c) Operational leases and contracts entered into under this section are subject to approval by the Local Government Commission under Article 8 of Chapter 159 of the General Statutes if they meet the standards set out in G.S. 159-148(a)(1), 159-148(a)(2), and 159-148(a)(3). For purposes of determining whether the standards set out in G.S. 159-148(a)(3) have been met, only the five hundred thousand dollar ($500,000) threshold shall apply."

SECTION 4. This act becomes effective July 1, 2010, and applies to contracts entered into on or after that date.

In the General Assembly read three times and ratified this the 9th day of July, 2010.

s/ Walter H. Dalton
President of the Senate

s/ Joe Hackney
Speaker of the House of Representatives

This bill having been presented to the Governor for signature on the 9th day of July, 2010 and the Governor having failed to approve it within the time prescribed by law, the same is hereby declared to have become a law. This 10th day of August, 2010.

Appendix 4

UNC Sustainability Policy 600.6.1

The University of North Carolina Sustainability Policy

The University of North Carolina ("The University") is committed to leading the State of North Carolina as an environmental steward that endeavors to proactively and effectively manage its impact on energy, water and other natural resources. Further, The University is obligated to ensure full compliance with all applicable local, state, and federal environmental laws and regulations. Therefore, it is the policy of The University's Board of Governors (the "Board") that The University, including General Administration, the constituent institutions, and affiliated entities, shall establish sustainable development and resource management, or "sustainability" as a core value of institutional operations, planning, capital construction, and purchasing practices.

Budgetary constraints, capital improvement and modernization requirements, and training and management needs required to facilitate the implementation of these sustainable practices are limiting factors and, as such, the University's General Administration, in collaboration with the constituent institutions and affiliated entities, shall pursue the appropriate enabling legislation and funding to implement this policy. The Board recognizes that the goals of this policy range from short-term to long-term and adds further emphasis on the importance of the aspirational nature of the highest ideals of sustainability. In addition, the Board values Return on Investment (ROI) as a factor in institutional resource planning and decision making and requires an ROI calculation for any new project.

The Board delegates authority to the President to implement the following sustainable practices to apply to each constituent institution and, when appropriate, General Administration and affiliated entities:

Systematic Integration of Sustainability Principles: Systematically incorporate sustainability throughout the institution by integrating the policy goals into the institution's processes, administration, teaching, research, and engagement. Each constituent institution and affiliated entity and General Administration shall designate an appropriate individual to serve as "Chief Sustainability Officer" to be responsible for implementation of this policy.

Master Planning: Sustainability principles related to infrastructure, natural resources, site development, and community impact shall be incorporated into comprehensive master plans.

Design and Construction: Capital project planning and construction processes shall meet statutory energy and water efficiency requirements and deliver energy, water, and materials efficient buildings and grounds that minimize the impact on and/or enhance the site and provide good indoor environmental quality for occupants.

Operations and Maintenance: The operation and maintenance of buildings and grounds shall meet or exceed statutory requirements to reduce energy and water use, provide excellent air quality and comfort, improve productivity of faculty, staff and students, and minimize materials use. Further, priority shall be given to the purchase and installation of high-efficiency equipment and facilities as part of an ongoing sustainability action plan following life cycle cost guidelines where applicable.

Climate Change Mitigation and Renewable Energy: The University shall develop a plan to become carbon neutral as soon as practicable and by 2050 at the latest, with an ultimate goal of climate neutrality.

Transportation: The University shall develop and implement a comprehensive, multimodal transportation plan designed to reduce carbon emissions and dependency on single occupant vehicles.

Recycling and Waste Management: The University shall develop policies and programs that work toward achieving zero waste and will comply with the provisions of NC General Statute 130A-309.14 regarding recycling and waste management.

Environmentally Preferable Purchasing (EPP): Any purchasing shall, to the extent practicable, improve the environmental performance of its supply chain with consideration given to toxicity, recycled content, energy and water efficiency, rapidly renewable resources, and local production and shall also improve the social performance of its supply chain with consideration given to working conditions and historically underutilized businesses.

The President shall develop and implement best practices, guidelines, and implementation plans necessary to achieve the goals of this policy to the constituent institutions and affiliated entities. This policy shall be reviewed every two (2) years by the President, and any necessary revisions and modifications shall be recommended to the Board for its consideration.

WINSTON-SALEM
STATE UNIVERSITY

Strategic Energy Plan

August 2023

EXECUTIVE SUMMARY

Existing Conditions/Background

Winston-Salem State University (WSSU) is a comprehensive, Historically Black University offering innovative undergraduate programs and exceptional graduate programs grounded in the tradition of liberal education. Since its founding in 1892, WSSU has grown from a one-room frame structure to more than forty-five buildings located on a picturesque 117-acre campus in the heart of Winston-Salem NC. Currently university buildings comprise approximately 2,000,000 gross square feet (GSF).
With a student-to-faculty ratio of 14:1 and a student body of more than 5,100, the university offers thirty-four baccalaureate degrees, seven master's degree programs, two professional doctorate programs and six certificate programs.

Control of utility costs and usage are one of the Goals of the WSSU Campus Strategic Plan. Stewardship of university resources and awareness of our environment is critical to successful operations at WSSU. The university will continue to collaborate with designers, contractors, and staff to improve energy efficiency of existing buildings through renovations. In the design and construction of new facilities the university will adhere to GS. 143-64.12 and continue to work towards the goals mandated within. To achieve the goal, replacement of HVAC systems, monitoring through the campus BAS, the change out of fluorescent lamps with LED bulbs or installation of thermostats with limited in room control are our objectives.

Energy Conservation Requirements

SB668 (GS 143-64.12) mandated that UNC System schools achieve a 30% reduction in BTUs/Sq. Ft by 2015 from a 2002-03 baseline year. While 30% goal was not an individual goal for each institution, the UNC System met the overall goal. To date, WSSU has achieved a 13% reduction from the 2002-03 baseline year as stated in the statute. Governor Cooper's Executive Order

80 released in October 2018 mandates a 40% reduction in BTUs/Sq. Ft for Cabinet Agencies only. Although Executive Order 80 does not specifically apply to the UNC system, it states that "North Carolina state owned facilities will strive to meet the goal by 2025. Currently, a bill has passed the house (HB330) that would incorporate the 40% goal of the Executive Order into GS 143-64.12 making it a statutory requirement for the UNC System if passed.

It is noted that the UNC System Policy Manual section 600.6.1 states: *The University of North Carolina ("The University") is committed to leading the State of North Carolina as an environmental steward that endeavors to proactively and effectively manage its impact on energy, water and other natural resources. Further, The University is obligated to ensure full compliance with all applicable local, state, and federal environmental laws and regulations. Therefore, it is the policy of The University's Board of Governors (the "Board") that The University, including General Administration, the constituent institutions, and affiliated entities, shall establish sustainable development and resource management, or "sustainability" as a core value of institutional operations, planning, capital construction, and purchasing practices.*

Energy and Water Consumption

During the 2022-23 fiscal year total utility expenditures amounted to approximately $3,824,065. During the same period WSSU purchased 28,676.844 kWh of electricity at a cost of $1,922,069; 1,275,778 therms of natural gas at a cost of $1,186,457; and WSSU purchased 14 gallons of #2 fuel oil at a cost of $ 35. Water consumption for the university was in the amount of 94,021 gallons at a cost of $706,911. To date WSSU has achieved a 2% reduction in BTUs per square foot. The university continues to address steam leaks that are due to an old system. As the new Director of Design and Construction, in my first 6 months I have witnessed steam leaks for an aging steam distribution system. Buildings with pneumatic controls that no longer work effectively. We have lost countless gallons of processed water from ruptured cooling, heating coils and broken make-up water valves. All of which translates to loss of energy and higher water consumption. Due to the age and condition of equipment the campus is faced with the difficulty of energy reduction.

Implementation

The University continues to struggle with a shortage of staffing in Design and Construction and Facilities Operations departments. Employing a Sustainability Director will allow a concentrated effort of educating students, faculty, and staff on measures that can yield reductions in energy usage and the university's carbon footprint. Upon filling vacant positions, D&C will make a concerted effort to continue to work with the State Energy Office to explore ways to enhance energy conservation on campus and to stay abreast of best practices.

WSSU will maximize opportunities to derive benefits from the 2010 Guaranteed Energy Savings Performance Contract (PC) with Siemens. Staff will work with Siemens, to ensure that the maximum energy is conserved that is planned to provide costs avoidance. In conjunction with Siemens Performance Contract, D&C will collaborate with designers and vendors to correct any equipment that may need attention to function properly because of the time that has passed since the equipment has been installed.

The university will continue to develop projects, procedures and processes that concentrate on energy use reduction, water conservation and sustainability. The following are some upcoming projects funded out of existing capital accounts:

Building	Project	Year
Gaines/Whitaker	Pneumatic controls replacement with BAS, heating and ventilation equipment replacement.	2022-2023
Hill Hall	Lighting Control Replacement with occupancy seasons and dimming switches.	2022-2023
Gaines Natatorium	Heating and Ventilation Equipment Replacement and new BAS.	2022-2023
West Campus Steam Line Repair	TBD, Engineer Selected	2022-2023
Old Maintenance Building	Boiler Replacement	2022-2023
Chiller Plant	New Chiller	2022-2023

While the university will continue to look to employ a sustainability director we will also look to serve the campus with projects that reduce energy and water consumption.

KEY PERFORMANCE INDICATORS

		energy evaluation						water/sewer evaluation				
		energy $ avoided	energy $/gsf	$/mmbtu	$/mmbtu %change	btu/sf	btu/sf %change	water $ avoided	$/kgal	$/kgal %change	gal/sf	gal/sf %change
2017-18	Winston Salem State University	$516,697	$1.36	$12.74	26%	106,567	-17%	$841,308	$9.28	294%	32.04	-60%
2018-19	Winston Salem State University	$483,977	$1.30	$12.04	19%	107,560	-16%	$948,783	$9.16	289%	27.13	-66%
2019-20	Winston Salem State University	$474,883	$1.17	$10.97	8%	106,990	-17%	$929,613	$8.22	249%	24.94	-69%
2020-21	Winston Salem State University	$355,066	$1.11	$9.99	-1%	110,837	-14%	$1,132,301	$9.47	302%	21.73	-73%
2021-22	Winston Salem State University	$73,166	$1.49	$11.86	17%	125,399	-2%	$1,085,741	$9.22	291%	22.60	-72%
2022-23	Winston Salem State University	$466,341	$1.55	$13.83	36%	111,740	-13%	$521,289	$7.52	219%	46.60	-42%

FOCUS AREAS

Focus Area 1 - Energy Data Management

2023-2024 Planned Activity
The university will continue to update its established Excel spreadsheets for collecting and analyzing monthly energy billing information. This effort is designed to enhance the evaluation of energy usage variations and to assist in determining the corrective action required.

Responsible: Administrative Assistant, Project Managers
Funding Source: Salary
Metric: All necessary data recorded and reviewed

2023-2024 Planned Activity
Investigate and have BAS updated for campus buildings.

Responsible: Project Manager
Funding Source: Salary and Repairs and Renovation Funds
Metric: Ensure that all building that are on the BAS can be controlled remotely.

Focus Area 2 – Outreach, Training, Communication

2023-2024 Planned Activity
Present the WSSU Strategic Energy Plan and energy usage to university Leadership.

Responsible: Assistant Vice Chancellor
Funding Source: Salary
Metric: Presentation occurs

2023-2024 Planned Activity
Attend NC State University Energy Management Training Series

Responsible: Project Managers and Assistant Vice Chancellor
Funding Source: Salary, State Energy Office (class & materials fees); WSSU (travel, lodging, and meals)
Metric: Passing the class

2023-2024 Planned Activity
Seek out opportunities for staff training by vendors

Responsible: Project Manager, Vendors, Assistant Vice Chancellor
Funding Source: No cost
Metric: Presentations occurs

Focus Area 3 – Facility and Resiliency Projects

2023-2024 Planned Activity
Continue to repair and replace steam and condensate lines throughout campus.

Responsible: Project Manager, Contractor
Funding Source: Repairs and Renovations Funds
Metric: Steam pipes and condensate lines repaired or replaced

2023-2024 Planned Activity
Continue to change existing exterior lights to energy efficient LED lamps

Responsible: Maintenance Department
Funding Source: Repairs and Renovation Funds
Metric: Change outs occur

APPENDIX 1

2023-2024 PLANNED ACTIVITY COMPLETION

Focus Area 1 - Energy Data Management Activity Completion

2023-2024 Planned Activity
The University will continue to update its established Excel spreadsheets for collecting and analyzing monthly energy billing information. This effort is designed to enhance the evaluation of energy usage variations and to assist in determining the corrective action required.

Results
Monthly energy information was collected, recorded in the Excel spreadsheet, and analyzed.

2023-2024 Planned Activity
Investigate and have BAS updated for campus buildings.

Results
The university continues to contract with Siemens to assist with monitoring the BAS and make adjustments to ensure the system is properly functioning.

Focus Area 2 – Outreach, Training, Communication Activity Completion

2023-2024 Planned Activity
Identify an opportunity to communicate the Strategic Plan and energy usage to university Leadership with the help of the State Energy Office.

2023-2024 Planned Activity
Attend NC State University Energy Management Training Series.

2023-2024 Planned Activity
Seek out opportunities for staff training by vendors.

Results
Facilities Operations HVAC Team Members receive continuous training from Siemens in concerning the campus BAS.

Focus Area 3 - Facility and Resiliency Projects Activity Completion

2023-2024 Planned Activity
Repair steam and condensate lines on campus.

Results Steam and condensate lines and valves at various locations on campus were repaired and replaced.

2023-2024 Planned Activity
Change existing exterior lights to energy efficient LED lamps.

Results A continuous effort is being made to replace exterior lights with more efficient LED lamps. Changing the lamps provides energy efficiency and safety measures by providing a brighter lighting.

Mandate for Energy Management

WSSU has not met the statuary goal of a 30% reduction of BTUs per square foot from the baseline fiscal year 2002-03 through 2015. Executive Order 80 requires a 40% reduction by 2025 for state owned buildings. In addition, the UNC System has a goal to be carbon neutral by 2050.

Energy and energy management must be recognized as a controllable operating expense wherein savings can result in funding being available for other program needs. If the energy management program is to be successful, all members of the Winston-Salem State University Community, Students, Faculty, and Staff, have important roles to play. Energy cost reduction must become a vital part of the University Strategic Energy Plan. WSSU will endeavor to achieve 104,000 BTUs per square foot by fiscal year 2023- 2024 from 2021-2022 baseline.

The attached plan outlines the activities required to reduce energy and water consumption to achieve the goals of the programs.

Assistant VC Facilities

VC Finance and Administration

Chancellor

Appendix D

Executive Order No. 80

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State of North Carolina

ROY COOPER
GOVERNOR

October 29, 2018

EXECUTIVE ORDER NO. 80

NORTH CAROLINA'S COMMITMENT TO ADDRESS CLIMATE CHANGE AND TRANSITION TO A CLEAN ENERGY ECONOMY

WHEREAS, North Carolina residents deserve to be better educated, healthier, and more financially secure so that they may live purposeful and abundant lives; and

WHEREAS, N.C. Const. art. XIV, § 5 requires the conservation, protection, and preservation of state lands and waters in public trust; and

WHEREAS, North Carolina is well positioned to take advantage of its technology and research and development sectors, along with its skilled workforce, to promote clean energy technology solutions and a modernized electric grid; and

WHEREAS, public-private partnerships in North Carolina foster market innovations and develop clean energy technology solutions that grow the state's economy; and

WHEREAS, the effects of more frequent and intense hurricanes, flooding, extreme temperatures, droughts, saltwater intrusion, and beach erosion have already impacted and will continue to impact North Carolina's economy; and

WHEREAS, climate-related environmental disruptions pose significant health risks to North Carolinians, including waterborne disease outbreaks, compromised drinking water, increases in disease-spreading organisms, and exposure to air pollution, among other issues; and

WHEREAS, to maintain economic growth and development and to provide responsible environmental stewardship, we must build resilient communities and develop strategies to mitigate and prepare for climate-related impacts in North Carolina.

NOW, THEREFORE, by the authority vested in me as Governor by the Constitution and the laws of the State of North Carolina, **IT IS ORDERED**:

1. The State of North Carolina will support the 2015 Paris Agreement goals and honor the state's commitments to the United States Climate Alliance.

   The State of North Carolina will strive to accomplish the following by 2025:

   a. Reduce statewide greenhouse gas emissions to 40% below 2005 levels;
   b. Increase the number of registered, zero-emission vehicles ("ZEVs"; individually, "ZEV") to at least 80,000;
   c. Reduce energy consumption per square foot in state-owned buildings by at least 40% from fiscal year 2002-2003 levels.

2. Cabinet agencies shall evaluate the impacts of climate change on their programs and operations and integrate climate change mitigation and adaptation practices into their programs and operations. Council of State members, higher education institutions, local governments, private businesses, and other North Carolina entities are encouraged to address climate change and provide input on climate change mitigation and adaptation measures developed through the implementation of this Executive Order. Consistent with applicable law, cabinet agencies shall actively support such actions.

3. The Secretary or designee of each cabinet agency and a representative from the Governor's Office shall serve on the North Carolina Climate Change Interagency Council ("Council"), which is hereby established. The Secretary of the North Carolina Department of Environmental Quality, or the Secretary's designee, shall serve as the Council Chair. The North Carolina Department of Environmental Quality shall lead the Council by providing strategic direction, scheduling and planning Council meetings, determining the prioritization of activities, facilitating stakeholder engagement, and assisting in the implementation of pathways to achieve the goals provided in Section 1 of this Executive Order.

   The duties of the Council shall include the following:

   a. Recommend new and updated goals and actions to meaningfully address climate change;
   b. Develop, implement, and evaluate programs and activities that support statewide climate mitigation and adaptation practices;
   c. Establish workgroups, as appropriate, to assist the Council in its duties;
   d. Consider stakeholder input when developing recommendations, programs, and other actions and activities;
   e. Schedule, monitor, and provide input on the preparation and development of the plans and assessments required by this Executive Order;
   f. Review and submit to the Governor the plans and assessments required by this Executive Order.

4. The North Carolina Department of Environmental Quality ("DEQ") shall develop a North Carolina Clean Energy Plan ("Clean Energy Plan") that fosters and encourages the utilization of clean energy resources, including energy efficiency, solar, wind, energy storage, and other innovative technologies in the public and private sectors, and the integration of those resources to facilitate the development of a modern and resilient electric grid. DEQ shall collaborate with businesses, industries, power providers, technology developers, North Carolina residents, local governments, and other interested stakeholders to increase the utilization of clean energy technologies, energy efficiency measures, and clean transportation solutions. DEQ shall complete the Clean Energy Plan for the Council to submit to the Governor by October 1, 2019.

5. The North Carolina Department of Transportation ("DOT"), in coordination with DEQ, shall develop a North Carolina ZEV Plan ("ZEV Plan") designed to increase the number of registered ZEVs in the state to at least 80,000 by 2025. The ZEV Plan shall help establish interstate and intrastate ZEV corridors, coordinate and increase the installation of ZEV infrastructure, and incorporate, where appropriate, additional best practices for increasing ZEV adoption. DOT shall complete the ZEV Plan for the Council to submit to the Governor by October 1, 2019.

6. The North Carolina Department of Commerce ("DOC") and other cabinet agencies shall take actions supporting the expansion of clean energy businesses and service providers, clean technology investment, and companies with a commitment to procuring renewable energy. In addition, DOC shall develop clean energy and clean transportation workforce assessments for the Council to submit to the Governor by October 1, 2019. These assessments shall evaluate the current and projected workforce demands in North Carolina's clean energy and clean transportation sectors, assess the skills and education required for employment in those sectors, and recommend actions to help North Carolinians develop such skills and education.

7. Cabinet agencies shall prioritize ZEVs in the purchase or lease of new vehicles and shall use ZEVs for agency business travel when feasible. When ZEV use is not feasible, cabinet agencies shall prioritize cost-effective, low-emission alternatives. To support implementation of this directive, the North Carolina Department of Administration ("DOA") shall develop a North

Carolina Motor Fleet ZEV Plan ("Motor Fleet ZEV Plan") that identifies the types of trips for which a ZEV is feasible, recommends infrastructure necessary to support ZEV use, develops procurement options and strategies to increase the purchase and utilization of ZEVs, and addresses other key topics. DOA shall complete the Motor Fleet ZEV Plan and provide an accounting of each agency's ZEVs and miles driven by vehicle type for the Council to submit to the Governor by October 1, 2019, and annually thereafter.

8. Building on the energy, water, and utility use conservation measures taken pursuant to N.C. Gen. Stat. § 143-64.12(a), DEQ shall update and amend, where applicable, a Comprehensive Energy, Water, and Utility Use Conservation Program ("Comprehensive Program") by February 1, 2019, and biennially beginning December 1, 2019, to further reduce energy consumption per gross square foot in state buildings consistent with Section 1 of this Executive Order. The Comprehensive Program shall include best practices for state government building energy efficiency, training for agency staff, cost estimation methodologies, financing options, and reporting requirements for cabinet agencies. DEQ and cabinet agencies shall encourage and assist, as requested, higher education institutions, K-12 schools, and local governments in reducing energy consumption. To achieve the required energy consumption reductions:

    a. By January 15, 2019, each cabinet agency shall designate an Agency Energy Manager, who shall serve as the agency point of contact.
    b. Each cabinet agency shall develop and submit an Agency Utility Management Plan to DEQ by March 1, 2019, and biennially thereafter, and implement strategies to support the energy consumption reduction goal set forth in Section 1 of this Executive Order. DEQ shall assess the adequacy of these plans and their compliance with this Executive Order.
    c. By September 1, 2019, and annually thereafter, each cabinet agency shall submit to DEQ an Agency Utility Report detailing its utility consumption, utility costs, and progress in reducing energy consumption.
    d. DEQ shall develop an annual report that describes the Comprehensive Program and summarizes each cabinet agency's utility consumption, utility costs, and achieved reductions in energy consumption. DEQ shall complete this report for publication on its website and for the Council to submit to the Governor by February 1, 2019, and annually thereafter beginning December 1, 2019.

9. Cabinet agencies shall integrate climate adaptation and resiliency planning into their policies, programs, and operations (i) to support communities and sectors of the economy that are vulnerable to the effects of climate change and (ii) to enhance the agencies' ability to protect human life and health, property, natural and built infrastructure, cultural resources, and other public and private assets of value to North Carolinians.

    a. DEQ, with the support of cabinet agencies and informed by stakeholder engagement, shall prepare a North Carolina Climate Risk Assessment and Resiliency Plan for the Council to submit to the Governor by March 1, 2020.
    b. The Council shall support communities that are interested in assessing risks and vulnerabilities to natural and built infrastructure and in developing community-level adaptation and resiliency plans.

10. DEQ shall prepare and manage a publicly accessible Web-based portal detailing the Council's actions and the steps taken to address climate-related impacts in North Carolina. Cabinet agencies shall submit data, information, and status reports as specified by the Council to be published on the portal. In addition, DEQ shall develop, publish on the portal, and periodically update an inventory of the state's greenhouse gas emissions that, among other things, tracks emissions trends statewide by sector and identifies opportunities for additional emissions reductions.

11. By October 15, 2019, and annually thereafter, the Council shall provide to the Governor a status report on the implementation of this Executive Order.

12. This Executive Order is consistent with and does not otherwise abrogate existing state law.

13. This Order is effective October 29, 2018 and shall remain in effect until rescinded or superseded by another applicable Executive Order.

IN WITNESS WHEREOF, I have hereunto signed my name and affixed the Great Seal of the State of North Carolina at the Capitol in the City of Raleigh, this the 29th day of October, in the year of our Lord two thousand eighteen.

Roy Cooper
Governor

ATTEST:

Rodney S. Maddox
Chief Deputy Secretary of State

Appendix E

General Statute Chapter 143-64.12, *Authority and Duties of the Department; State Agencies and State Institutions of Higher Learning*

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§ 143-64.12. Authority and duties of the Department; State agencies and State institutions of higher learning.

(a) The Department of Environmental Quality through the State Energy Office shall develop a comprehensive program to manage energy, water, and other utility use for State agencies and State institutions of higher learning and shall update this program annually. Each State agency and State institution of higher learning shall develop and implement a management plan that is consistent with the State's comprehensive program under this subsection to manage energy, water, and other utility use, and that addresses any findings or recommendations resulting from the energy audit required by subsection (b1) of this section. The energy consumption per gross square foot for all State buildings in total shall be reduced by twenty percent (20%) by 2010 and thirty percent (30%) by 2015 based on energy consumption for the 2002-2003 fiscal year. Each State agency and State institution of higher learning shall update its management plan biennially and include strategies for supporting the energy consumption reduction requirements under this subsection. Each community college shall submit to the State Energy Office a biennial written report of utility consumption and costs. Management plans submitted biennially by State institutions of higher learning shall include all of the following:

(1) Estimates of all costs associated with implementing energy conservation measures, including pre-installation and post-installation costs.

(2) The cost of analyzing the projected energy savings.

(3) Design costs, engineering costs, pre-installation costs, post-installation costs, debt service, and any costs for converting to an alternative energy source.

(4) An analysis that identifies projected annual energy savings and estimated payback periods.

(a1) State agencies and State institutions of higher learning shall carry out the construction and renovation of facilities in such a manner as to further the policy set forth under this section and to ensure the use of life-cycle cost analyses and practices to conserve energy, water, and other utilities.

(b) The Department of Administration shall develop and implement policies, procedures, and standards to ensure that State purchasing practices improve efficiency regarding energy, water, and other utility use and take the cost of the product over the economic life of the product into consideration. The Department of Administration shall adopt and implement Building Energy Design Guidelines. These guidelines shall include energy-use goals and standards, economic assumptions for life-cycle cost analysis, and other criteria on building systems and technologies. The Department of Administration shall modify the design criteria for construction and renovation of facilities of State buildings and State institutions of higher learning buildings to require that a life-cycle cost analysis be conducted pursuant to G.S. 143-64.15.

(b1) The Department of Administration, as part of the Facilities Condition and Assessment Program, shall identify and recommend energy conservation maintenance and operating procedures that are designed to reduce energy consumption within the facility of a State agency or a State institution of higher learning and that require no significant expenditure of funds. Every State agency or State institution of higher learning shall implement these recommendations. Where energy management equipment is proposed for any facility of a State agency or of a State institution of higher learning, the maximum interchangeability and compatibility of equipment components shall be required. As part of the Facilities Condition and Assessment Program under this section, the Department of Administration, in consultation with the State Energy Office, shall develop an energy audit and a procedure for conducting energy audits. Every five years the Department shall conduct an energy audit for each State agency or State institution of higher learning, and the energy audits conducted shall serve as a

preliminary energy survey. The State Energy Office shall be responsible for system-level detailed surveys.

(b2) The Department of Administration shall submit a report of the energy audit required by subsection (b1) of this section to the affected State agency or State institution of higher learning and to the State Energy Office. The State Energy Office shall review each audit and, in consultation with the affected State agency or State institution of higher learning, incorporate the audit findings and recommendations into the management plan required by subsection (a) of this section.

(c) through (g) Repealed by Session Laws 1993, c. 334, s. 4.

(h) When conducting a facilities condition and assessment under this section, the Department of Administration shall identify and recommend to the State Energy Office any facility of a State agency or State institution of higher learning as suitable for building commissioning to reduce energy consumption within the facility or as suitable for installing an energy savings measure pursuant to a guaranteed energy savings contract under Part 2 of this Article.

(i) Consistent with G.S. 150B-2(8a)h., the Department of Administration may adopt architectural and engineering standards to implement this section.

(j) The State Energy Office shall submit a report by December 1 of every odd-numbered year to the Joint Legislative Energy Policy Commission, the Joint Legislative Oversight Committee on Agriculture and Natural and Economic Resources, and the Fiscal Research Division describing the comprehensive program to manage energy, water, and other utility use for State agencies and State institutions of higher learning required by subsection (a) of this section. The report shall also contain the following:

(1) A comprehensive overview of how State agencies and State institutions of higher learning are managing energy, water, and other utility use and achieving efficiency gains.

(2) Any new measures that could be taken by State agencies and State institutions of higher learning to achieve greater efficiency gains, including any changes in general law that might be needed.

(3) A summary of the State agency and State institutions of higher learning management plans required by subsection (a) of this section and the energy audits required by subsection (b1) of this section.

(4) A list of the State agencies and State institutions of higher learning that did and did not submit management plans required by subsection (a) of this section and a list of the State agencies and State institutions of higher learning that received an energy audit.

(5) Any recommendations on how management plans can be better managed and implemented. (1975, c. 434, s. 3; 1993, c. 334, s. 4; 2000-140, s. 76(f); 2001-415, s. 3; 2006-190, s. 12; 2007-546, s. 3.1(a); 2008-198, s. 11.1; 2009-446, s. 1(e); 2010-31, s. 14.3; 2010-196, s. 2; 2013-360, s. 15.22(p); 2014-120, s. 55; 2015-241, s. 14.30(u); 2017-57, s. 14.1(f).)

Appendix F

Suggested Revisions to General Law

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PART I. SAVE NORTH CAROLINA TAXPAYER DOLLARS BY REQUIRING REDUCTIONS IN ENERGY AND WATER CONSUMPTION IN PUBLIC BUILDINGS BY 2025.

Section 1. G.S. 143-64.12(a) reads as rewritten:

"§ 143-64.12. Authority and duties of the Department; State agencies and State institutions of higher learning.

(a) The Department of Environmental Quality through the State Energy Office shall develop a comprehensive program to manage energy, water, and other utility use for State agencies and State institutions of higher learning and shall update this program annually. Each State agency and State institution of higher learning shall develop and implement a management plan that is consistent with the State's comprehensive program under this subsection to manage energy, water, and other utility use, and that addresses any findings or recommendations resulting from the energy audit required by subsection (b1) of this section. The energy consumption per gross square foot for all State buildings in total shall be reduced by twenty percent (20%) by ~~2010~~ 2010, and thirty percent (30%) by ~~2015~~ 2015, and forty percent (40%) by 2025 based on energy consumption for the 2002-2003 fiscal year. Each State agency and State institution of higher learning shall update its management plan biennially by September 1st of odd-numbered years and include strategies for supporting the energy consumption reduction requirements under this subsection. Each State agency, State institution of higher learning, and community college shall submit to the State Energy Office ~~a biennial~~ an annual written report of utility consumption and ~~costs.~~ costs by September 1st. Management plans submitted biennially by State agencies and State institutions of higher learning shall ~~include all of the following:~~ contain:

~~(1) Estimates of all costs associated with implementing energy conservation measures, including pre-installation and post-installation costs.~~

~~(2) The cost of analyzing the projected energy savings.~~

~~(3) Design costs, engineering costs, pre-installation costs, post-installation costs, debt service, and any costs for converting to an alternative energy source.~~

~~(4) An analysis that identifies projected annual energy savings and estimated payback periods.~~

(1) Total utility consumption, costs, and efficiency gains.

(2) Findings or recommendations resulting from an energy audit to determine potential energy conservation measures.

(3) An analysis of energy conservation measures that may be implemented to reduce energy, water, and other utility use, including but not limited to:

a. Total design costs, engineering costs, pre-installation costs, post-installation costs, debt service, and any costs for converting to an alternative energy source;

b. Projected annual energy savings and estimated payback periods;

c. Finance options; and

d. Defined roles, responsibilities, and training needs for staff that manage energy, water, or other utility use.

(4) A signature from senior leadership, or an appropriate designee, of a State agency or State institution of higher learning.

PART II. EFFECTIVE DATE

Section 2. Except as otherwise provided, Section 1 of this act is effective when it becomes law.

§ 116-30.3B. Energy conservation savings.

(a) In addition to the funds carried forward under G.S. 116-30.3, the General Fund current operations appropriations credit balance remaining at the end of each fiscal year for utilities of a constituent institution that is energy savings realized from implementing an energy conservation measure shall be carried forward by the institution to the next fiscal year. Sixty percent (60%) of the energy savings realized shall be utilized for energy conservation measures by that institution. The use of funds under this section shall be limited to onetime capital and operating expenditures that will not impose additional financial obligations on the State. The Director of the Budget, under the authority set forth in G.S. 143C-6-2, shall establish the General Fund current operations credit balance remaining in each budget code of each institution.

(b) It is the intent of the General Assembly that appropriations to the Board of Governors on behalf of a constituent institution not be reduced as a result of the institution's realization of energy savings. Instead, the General Assembly intends that the amount of appropriations be determined as if no energy savings had been realized. The Director of the Budget shall not decrease the recommended base budget requirements for utilities for constituent institutions by the amount of energy savings realized from implementing energy conservation measures, including savings achieved through a guaranteed energy savings contract.

(c) Constituent institutions shall submit ~~biennial~~ annual documentation reports on the use of funds authorized pursuant to this section ~~as required under G.S. 143-64.12~~.

(d) As used in this section, "energy savings," "guaranteed energy savings contract," and "energy conservation measure" have the same meaning as in G.S. 143-64.17. (2010-196, s. 1; 2011-145, s. 9.6D(c); 2014-100, s. 6.4(e).)