EO 80 Annual Report

Comprehensive Program Update
&
Cabinet Agency Utility Consumption, Utility Costs, &
Reductions in Energy Intensity

A Report to

Governor Roy Cooper

Pursuant to

Executive Order No. 80, Section 8

January 25, 2021

Prepared by:

North Carolina Department of Environmental Quality

State Energy Office

Utility Savings Initiative

(This page intentionally left blank)

Preface:

This report contains the Department of Environmental Quality's annual status update to Governor Cooper describing the Comprehensive Energy, Water, and Utility Use Conservation Program (hereinafter, "Comprehensive Program") for cabinet agencies pursuant to Executive Order No. 80, Section 8. In addition, the report contains an overview of how cabinet agencies are contributing to the goal of reducing energy consumption in all State-owned buildings by 40% of fiscal year 2002-03 levels by 2025.

Table of Contents

Tables and Figures

Appendices

List of Acronyms

Abbreviation	Definition
ACCBO	Association of Community College Business Officers
ACCFO	Association of Community College Facilities Operations
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
EE	Energy Efficiency
EO 80	Executive Order 80
ESCO	Energy Service Company
EST	Eastern Standard Time
EUI	Energy Use Intensity
FCAP	Facilities Assessment Program

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

1.0 Executive Summary

On October 29, 2018, Governor Cooper issued Executive Order No. 80 (EO 80) which directed the State Energy Office (SEO) - Utility Savings Initiative (USI) to develop an annual status update that describes the Comprehensive Energy, Water, and Utility Use Conservation Program ("Comprehensive Program") along with each cabinet agency's utility consumption, costs, and progress in reducing energy consumption. The directive expanded on the existing statutory authority in the North Carolina General Statutes (GS) §143-64.12(a) requiring all State-owned buildings to reduce energy usage intensity (EUI)[1] by 30%. EO 80 calls for State-owned buildings to exceed this legislative mandate and collectively reduce energy intensity by 40% of State fiscal year (FY) 2002-03 levels by 2025.

The purpose of this report is to summarize the progress of State-owned buildings overall, including cabinet agencies. Moreover, in accordance with EO 80 Section 8(d), this report describes how cabinet agencies are contributing to the collective 40% reduction goal along with providing each agency's most recent data, the projected forecast in energy usage trends, key messages for the agency leadership, and recommendations for further actions to meet the EUI goal for State buildings.

State-Owned Buildings Energy Use Intensity Reductions to Date

Accounting for all State-owned buildings includes utility consumption by cabinet agencies, Council of State agencies, and the University of North Carolina (UNC) System.[2] Within this group of governmental entities, the UNC system is the major contributor. They account for 63% of all energy consumed, 65% of the total gross square footage, and 69% of all utility spending. Fortunately, they have also proven to be the pinnacle of energy management. Over four years ahead of schedule, the UNC system currently shows a -48% EUI reduction from the 2002-03 baseline. This accomplishment occurred despite increasing square footage by 60% over the same timeframe. They have adopted a culture of energy efficiency, and many have designated full-time energy managers that consistently review bills, make energy retrofits, take advantage of federal and State funding opportunities, and plan for future initiatives. These actions and practices have resulted in annual utility savings of over $200 million; and cumulatively, they have avoided over $1 billion in utility costs since the program started. The UNC system sets a worthy example for all State agencies, and the strategic energy plans of the highest performing UNC System schools should be assessed to obtain insight into additional conservation measures.

Combining the remaining State-owned buildings with the UNC System's success results in an overall -35% EUI reduction from the 2002-03 baseline. This is well within the range of achieving the EO 80 goal by 2025. Table 1 summarizes EUI reductions to date for cabinet agencies, other State agencies, the UNC System, and the combined total for all State Governmental Units. However, further examination of this data also shows that State agencies

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

lag behind the UNC system in energy reductions. More energy conservation work must be done for State agencies to contribute proportionately[3] to the overall reduction goal.

Although State agencies only account for roughly 30% of all energy consumed, square footage, and utility spending, their combined conservation efforts can still have a major impact on achieving the collective State-owned building reduction goal by 2025. Cabinet agencies must improve their current -25% EUI reduction level in order to contribute relative to their size and energy usage levels. This report will recommend some definitive steps that these agencies can make in order to achieve a greater energy reduction.

Table 1: State Government Buildings Energy Efficiency Gains (FY03-FY20)

Participant		Cabinet Agencies	Other Agencies	UNC System	State Governmental Units Total
Gross Square Footage	**% Change**	+27%	+22%	+60%	+47%
Energy Usage Intensity (Btu/square feet)	**% Change**	-25%	+7%	-48%	-35%

Cabinet Agencies Energy Use Intensity Reductions to Date

As shown in Table 1 above, the cabinet agency overall EUI has been reduced by -25% from baseline 2002-03 levels while the UNC System has reduced by -48%. This means that cabinet agencies need to take further action to reduce their share of the collective statutory requirements set forth in GS §143-64.12(a) and the EO80 target. Five cabinet agencies (DPS, DOT, DHHS, DOA and DNCR) represent 92% of all energy consumed (total Btu) by all State agencies and 91% of annual utility expenditures which total more than $96 million per year. Within these five, only DPS has reduced their facilities EUI by -30%. Of the other four agencies, DOA has reduced consumption by -27%, DOT by -26%, DHHS by -23% and DNCR by -2%. At a minimum, the energy reduction focus must be on the top five agencies in order for the State agencies to meet their share of the EO 80 goal by 2025. To achieve this, significant changes, and targeted efforts within all agencies and especially these five agencies must take place quickly.

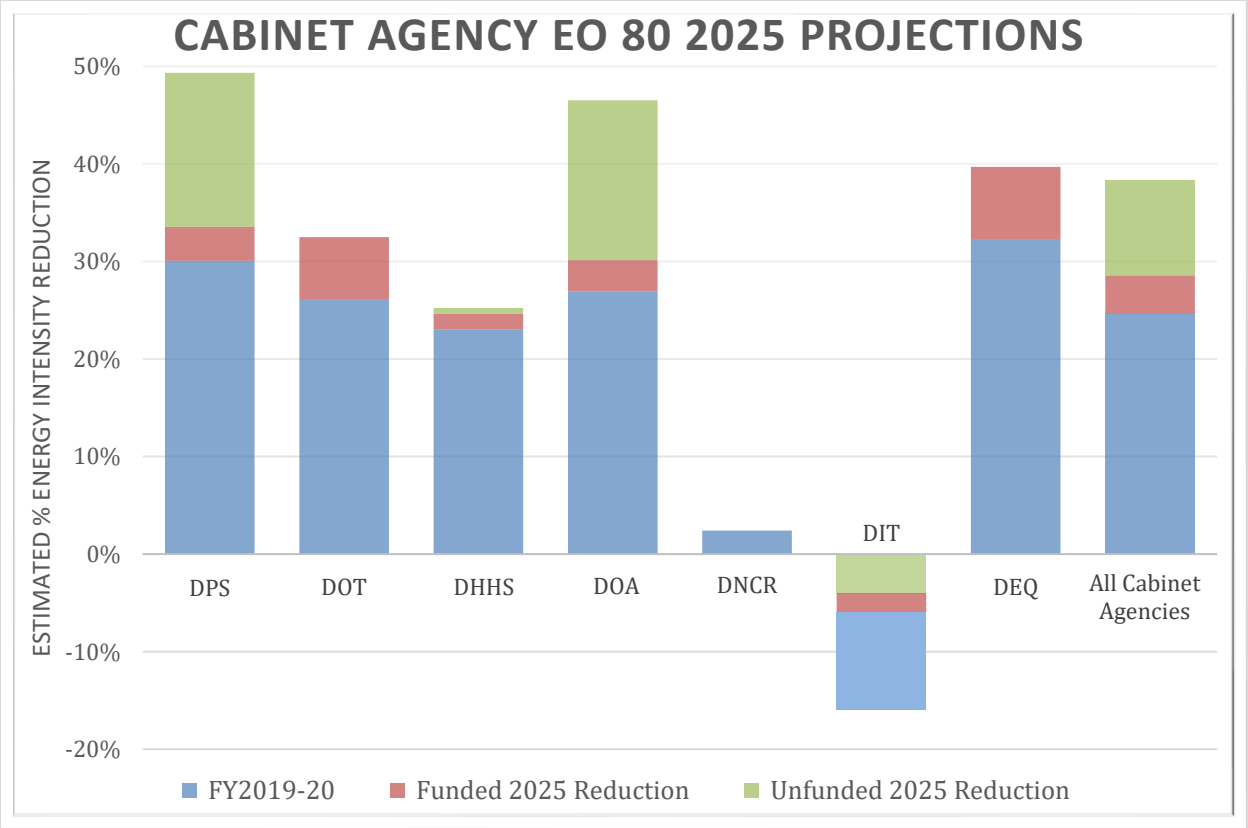
Cabinet Agencies Energy Projections to 2025

Although the EO 80 reduction goal is directed towards the collective efforts of all State-owned buildings, the cabinet agencies should proportionately contribute their share of the cumulative total. Separating the cabinet agencies from the State-owned building total and assessing individual efforts provided a sense of where the agencies currently stand and what additional energy reductions are needed. This evaluation was needed to determine how each agency contributes to the collective total for State-owned buildings. For this reporting cycle, USI requested that each agency provide an inventory of funded and unfunded projects they have planned. The projects identified by each individual agency assisted with projecting the percent reduction in EUI in future years.

[3] *Cabinet agencies comprise approximately one-third of State-owned energy consumption, gross square footage, and utility spending. As such, the cabinet agencies should strive to meet or exceed at least one third of the reductions necessary for all State-owned buildings.*

Figure 1 illustrates that collectively, the cabinet agencies are projected to achieve a -29% EUI reduction by 2025 through $26 million in funded projects (a decrease of -4% relative to their current usage levels). If all currently identified projects are fully funded at a total cost of $132 million ($26 million funded; and $106 million unfunded), the cabinet agencies would collectively achieve a -38% overall EUI reduction. This combined with the exemplary reduction the UNC system has already achieved would help exceed the EO 80 goal. The difficulty is that cabinet agencies will most likely need to utilize alternative funding opportunities to secure that amount of capital investment.

Figure 1: EUI Reduction Projections



Cost Savings and Air Pollution Benefits Related to Energy Conservation

While energy efficiency projects require upfront costs, they are accompanied by a great deal of 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 combined total for all State Governmental Units. The avoided costs represent the amount of money that would have been paid if the entity did not implement any of the energy efficiency retrofits or upgrades. As the data shows, this program has achieved over $1.5 billion in savings for North Carolina's taxpayers. Further investments into building efficiency improvements towards the EO 80 goal can result in additional millions of dollars in utility savings for all State-owned buildings. For example, if all currently identified projects for cabinet agencies are fully-funded at a cost of $132 million, the estimated annual savings is $23 million. This translates to a return on

investment of approximately six years. True savings may actually be higher due to rising fuel and electricity costs.

Energy efficiency improvements have also provided air pollution benefits by avoiding fuel combustion directly at the buildings or indirectly at central electric power stations. FY2019-20 estimates show that the program avoided 460,670 metric tons of carbon dioxide equivalent ($MTCO_{2e}$)[4] in greenhouse gas (GHG) emissions. Cumulatively since FY2002-03, approximately 4,336,497 $MTCO_{2e}$ of GHGs have been avoided which is equivalent to the annual electricity consumed in 734,195 homes.[5]

Table 2: State Government Buildings Energy Costs and Cost Savings (FY03-FY20)

Participant	Cabinet Agencies	Other Agencies	UNC System	State Governmental Units Total
Actual Utility Costs in FY20	$90 million	$6.3 million	$211 million	$307 million
Avoided Utility Costs in FY20	-$27 million	-$0.7 million	-$200 million	-$175 million[a]
Cumulative Avoided Utility Costs (FY03-FY20)	-$294 million	-$16 million	-$1.3 billion	-$1.5 billion[a]

[a] These are estimates based on governmental unit intensity factors which vary based on fuel type and building size. That is why the totals do not match the individual estimate sum.

Recommendations for Collective Action

USI has suggested and has been working with agency staff to evaluate alternative strategies for financing to achieve further reduced energy consumption in future years. These strategies include items such as:

- Designating full-time energy managers
- Retrofitting buildings with cost-effective EUI reduction measures
- Investing in automated data collection, reporting, and analysis system
- Prioritizing the content in Agency Utility Management plans
- Expanding legislative authority to carry-forward energy savings credits to State agencies
- Applying for federal grant funding opportunities
- Utilizing Guaranteed Energy Savings Contracts
- Opting into an electric utility's rebate programs

Prioritization and reinforcement are needed from cabinet agency officials, the Governor's Office, and the legislature to meet the reduction goal.

[4] *$MTCO_{2e}$ 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 ($MTCO_{2e}$)."*
[5] *See Appendix D for sources and assumptions used in calculating greenhouse gas amounts.*

To understand how operational and cultural changes are effective and that the EO 80 goal is achievable, State agencies can employ a number of different methods used by the UNC System to reduce their energy intensity. The UNC System utilizes full time energy managers, takes advantage of performance contacting, improves building controls, converts to LED lighting, looks for rebate opportunities, etc. They also continue to promote and seek energy efficiency even in small measures. These same type of initiatives can be used by all State agencies.

However, even with a proactive energy efficiency mindset, the existing cabinet agency energy managers may be limited in what they can achieve. The issue is that most of the assigned energy managers are functionally not fulling this role on a full-time basis as it is essential to oversee the operation of large volume of building space. They have other unrelated full-time responsibilities thereby making energy management an ancillary duty to be fulfilled as time permits. Only DPS has full time energy managers specifically dedicated to overseeing utility data collection and resolution of errors, the identification of energy efficiency projects, and the creation of energy specific policies and procedures. The remaining agencies are spending millions of dollars annually on utilities with limited direct oversight and accountability. They need effective energy managers who are properly positioned within their organization and given the authority to direct that energy efficiency goals will be accomplished. Moreover, each agency must be specifically allocating resources to ensure that energy saving projects are adequately funded and take precedent. Reducing energy intensity should become a priority to ensure EO 80 goals are met.

Likewise, energy managers cannot manage energy that they cannot measure. Data collection continues to be an issue with most agencies. USI continues to find errors in agency utility reporting due to the fact that collecting data is spread out across the State and across many different sections within each agency. The overall number of bills an agency generates per month from many different utility providers can be overwhelming. Having a third-party collect and consolidate all of this data makes the task much more manageable. DPS is the only agency using a third-party service available on State contract for the collection and payment of utility bills. Through the work of Paul Braese, (DPS Energy Manager), DPS has created an energy dashboard that could be utilized by the other agencies if they were to move their utility data collection to the same State contract. Having the dashboard would benefit energy managers because utility data would be available to be checked and monitored on a frequent basis. Access to accurate data that is easily available is the first step to managing utilities. Without proper data collection, an agency loses the ability to accurately show the savings related to energy efficiency projects and the ability to prove return on investment.

Approximately $106 million in additional funding is necessary for identified projects to achieve -38% EUI reduction from those agencies that have developed a forecast. Additional funding may be required to achieve target reductions from DOT, DHHS, and DNCR once these agencies develop a forecast beyond the current budgeted projects. There are a number of funding options detailed later in this document. Agencies must specifically budget funds for energy efficiency improvements for the goals to be achieved. The State has completed over 23 GESC (Guaranteed Energy Savings Contracts) with more than $153 million in guaranteed savings for FY2019-20. The UNC System realized more than $4 million in House Bill 1292 Carry-Forward savings for FY2019-20. Several agencies have “Opted-In” to the Duke Energy Rebate programs in order to gain additional savings from completing routine equipment replacement and lighting. Agencies must continue to allocate specific percentages of Repair and Renovation funds along with other

sources of funding for energy savings projects for the EO 80 goal to be accomplished. Furthermore, the USI program suggests that agencies explore federal and State storm recovery and resiliency funding opportunities that may enhance the energy efficiency of State-owned buildings.

In summary, the EO 80 goal is achievable in 4.5 years through advanced energy planning. Each agency's leadership must make the necessary changes in project priority, energy manager support, and energy program funding. The remainder of this report's narrative provides the: (1) effects of COVID-19 on energy and water usage; (2) background on the USI program; (3) agency progress towards the EO 80 goal; and (5) recommendations for State-owned buildings to meet the mandate. Additionally, the appendices to this report contain: (A) detailed agency-specific energy performance data; (B) agency utility management plans; (C) trends in weather and utility rates; (D) sources and assumptions used to calculate greenhouse gas offsets; (E) the text of EO 80; and (F) statutory authority.

2.0 Effects of COVID-19 on Energy and Water Usage

On March 27, 2020, Governor Cooper issued Executive Order No. 121 directing North Carolina's citizens to stay at home and for non-essential businesses to close due to the coronavirus disease 2019 (COVID-19) pandemic. On May 20, 2020, the stay-at-home order was lifted and businesses meeting the governor's health and safety criteria began to reopen. As a result of the pandemic, energy and water usage in most State-owned buildings changed instantly and are still changed to date. All public buildings in North Carolina have seen some, if not major changes to operations and operational schedules. At the same time, some agencies like DHHS and DPS are responding to the health emergency and their responsibilities to keep North Carolinians informed and safe.

While the reported data for FY 2019-20 includes a reduction in utility costs of over $20 million, only three months of data are potentially affected by COVID-19. Most of this savings is attributed to reductions in energy intensity and a milder winter. The expectation is that data for the upcoming fiscal year will show more direct effects from COVID-19.

Facilities that continue to have occupants (essential employees, correctional centers, medical facilities, etc.) have implemented modifications and building adaptations specifically for COVID. While most modifications involve ventilation and filtration, other solutions exist as well. They all require an increase in operating costs and can increase energy consumption. Even before COVID, a significant amount of deferred maintenance existed in State-owned buildings. Those buildings already face operational challenges so additional COVID-related changes will only exasperate the problems they experience. As buildings reopen, facility operators and energy managers should continue to look for ways to make them more efficient and resilient at the same time.

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 2019-20, eleven UNC System schools carried forward over $4 million in savings and reported spending an additional $7.2 million for new energy efficiency projects. In the last five years, UNC System schools have carried forward more than $21 million in savings. These funds are specifically designated for energy efficiency improvements.

In October 2018, Governor Cooper's EO 80 (Section 8) built on the statutory requirements in GS §143-64.12(a) by encouraging cabinet agencies to collectively 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 EO 80 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 EO 80 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 EO 80 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.

Table 3. Roles and Responsibilities of Key Entities

Basis	Responsibility	Reference	Assigned Entity
EO 80	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.	EO 80 Section 1(c) and 8	Cabinet Agencies; DEQ USI
	Designate an Agency Energy Manager that serves as an agency's primary point of contact.	EO 80 Section 8(a)	Cabinet Agencies
	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.	EO 80 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 EO 80 directives.	EO 80 Section 8(c)	Cabinet Agencies
	Develop annual report describing the Comprehensive Program and summarize each cabinet agency's utility consumption, costs, and achieved reductions, completed by December 1st.	EO 80 Section 8(d)	DEQ USI
GS	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 an Agency 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 Facilities Condition and Assessment Program. 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
	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
GS	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

3.2 Comprehensive Program Basis

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. 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."*

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 30% reduction objective. USI has been and will continue to assist them in reaching this goal. Additionally, EO 80 established a new objective for State-owned buildings of a 40% reduction in Btu's per square foot 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. Sometimes this is referred to as a Strategic Energy Plan.

The USI team prepares a biennial Comprehensive Program report that tracks annual utility consumption and measures progress towards EUI reduction goals of the reporting entities. USI performs individual site visits to detail best practices and works to maintain savings already achieved by USI participants. 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 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. This training includes the Energy Management Diploma series (through the NCSU 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

The USI team assists State and local government building owners in developing cost estimates and the prioritization of energy saving projects. Budget line item assessments often include rebates and possible grant funding. USI continuously seeks additional resources to expand energy efficiency programs within State and local government buildings. GESCs may be considered a financial option for projects that meet or exceed utility cost savings beyond the financing mechanism term.

Reporting Requirements

The USI team updates and submits annual reports on the Comprehensive Program, GESC, HB1292 credits, and Utility Management Plans annually to stakeholders to provide an update of the progress accomplished each year.

4.0 Progress Towards EO 80 Goal

Cabinet Agency Overview

As required by January 15, 2019, all the cabinet agencies have appointed an energy manager to oversee the agency efforts in achieving the EO 80 goal. DPS was the only agency that already had a dedicated energy manager; however, all other newly designated energy managers continue to have other full-time jobs/responsibilities that distract from energy management. With the total dollar amount that most State agencies spend on utilities, the lack of a full-time commitment or dedicated staff has proven to be ineffective in moving agencies toward the established reduction goals. The main point is that State agencies spend approximately $100 million dollars per year on utilities which could be reduced with more effective energy management. DPS, DHHS, DOT, DOA, and DNCR are the five largest agencies in the consumption of utilities making up almost 98% of the cabinet agency expenditures for FY 2019-20.

USI requested that the agencies provide an update on energy saving projects that are both funded and non-funded to understand where those projects would move each agency towards achieving the EO 80 goal. While a few provided adequate data, most agencies were not able to list enough projects to make significant energy reductions by 2025. In addition, some agencies did not list energy efficiency projects. USI can only assume that other duties took priority, that no projects were currently on the books, and future funding was inadequate to provide a detailed list. Many of the agencies could benefit from looking at Guaranteed Energy Saving Contracts (GESC) potentially to provide the necessary improvements. There are currently 23 very successful projects within State governmental units. Prioritization and reinforcement are needed from each agency and the Governor's Office for the EO 80 goal to be achieved.

The mission of each agency is critical. Discounted for many years is the substantial amount of deferred maintenance, outdated equipment, antiquated technology, aging infrastructure, limited staff and most importantly, the financial resources required to make major comprehensive energy improvements. Currently, agencies have provided funding requests to address some of these

energy related needs, but more resources must be allocated to address the many years of neglect if the cabinet agencies are to reach the EO 80 goal. Agencies are investing limited resources, as available, to move to LED lighting, provide staff education, and to identify additional low- and no-cost energy conservation measures. The State Energy Office along with the agency energy managers are working together on this effort.

Cabinet Agency EUI Reduction Progress

Table 4 shows the cabinet agency summary. Square footage has increased by 27% while utility costs have increased by 33%. The combined cabinet agency EUI reduction is at -25%. More detailed information about individual agencies may be found in Appendix A.

Figure 2: Cabinet Agency EUI

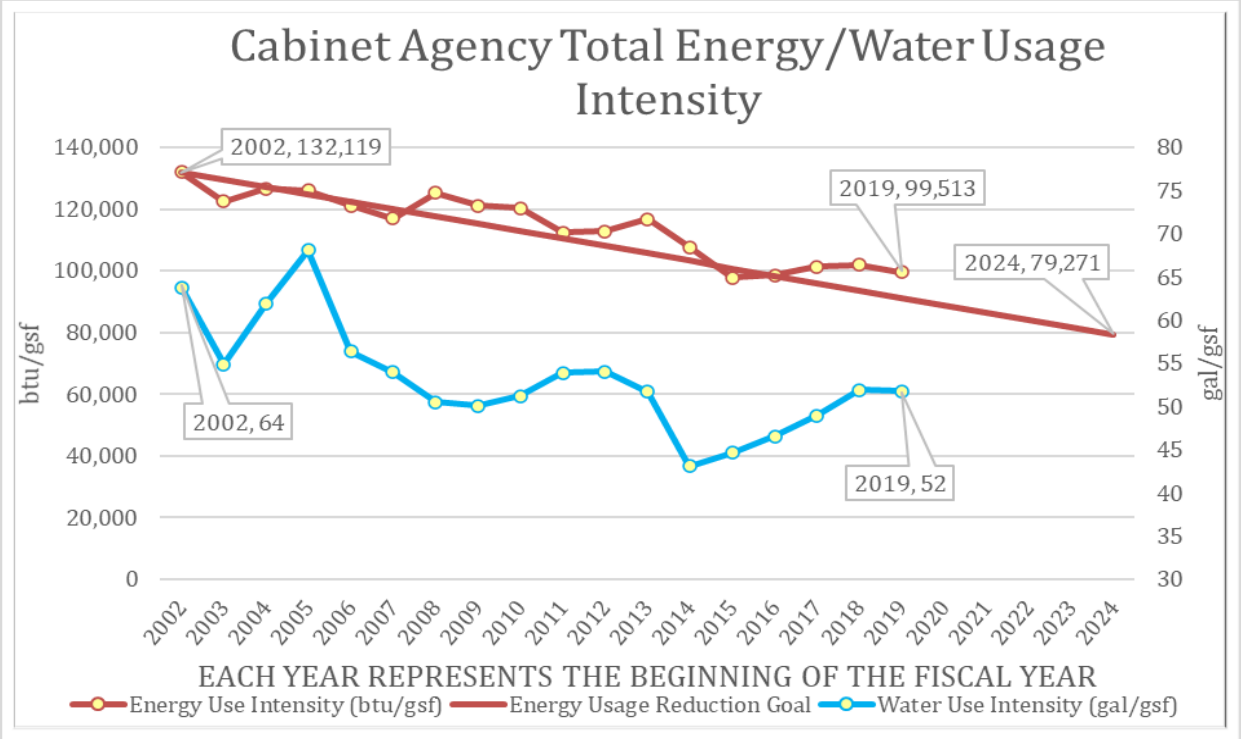


Table 4: Cabinet Agencies Utility Statistics To Date

Metric	Fiscal Year 2002-03 [1]	Fiscal Year 2019-20	% Change
Total Gross Square Feet	34,035,432	43,292,864	+27%
Total Utility Cost	$67,938,824	$90,266,775	+33%
Energy Usage (Btu/gsf)	132,119	99,513	-25%
Energy Cost ($/MMBtu)	$12.23	$14.57	+19%
Water Usage (gal/gsf)	64	52	-19%
Water Cost ($/kgal)	$5.97	$12.26	+105%

1. DEQ and DNCR have 2010-11 as baseline years. See the individual agency summary for rationale.

4.1 EO 80 Agency Projections

The EO 80 goal is required to be met in less than five years. Cabinet Agencies need to be planning now for how they intend to contribute towards achieving that goal. Each agency needs to have a plan of action with specific projects identified along with associated EUI reduction estimates. Without such a plan, the agencies are not likely to contribute proportionately towards the reduction goal because that amount of conservation requires more than implementing "low-hanging fruit". Without specific projects being identified, the agencies will not know how much funding is necessary to accomplish projects aimed at further utility reductions.

During this reporting cycle, USI tasked all the Cabinet Agencies to provide an EO 80 projection worksheet. Table 5 is the result of those efforts. Current energy data is shown for each Cabinet Agency along with the resulting percentage EUI reductions from both funded and unfunded projects. The bottom of the table shows the projected results for all the Cabinet Agencies combined.

DEQ is on track individually to achieve a -40% reduction in EUI by 2025 with fully funded projects. DPS and DOA are projected to achieve and even surpass the EUI reduction by -40% if their identified funded and unfunded (approximately $100 million) projects are implemented by 2025. The remaining agencies have not yet identified energy efficiency projects that substantially improve their EUIs compared to current levels.

Table 5: Projections Based on Funded and Unfunded Energy/Water Efficiency Projects

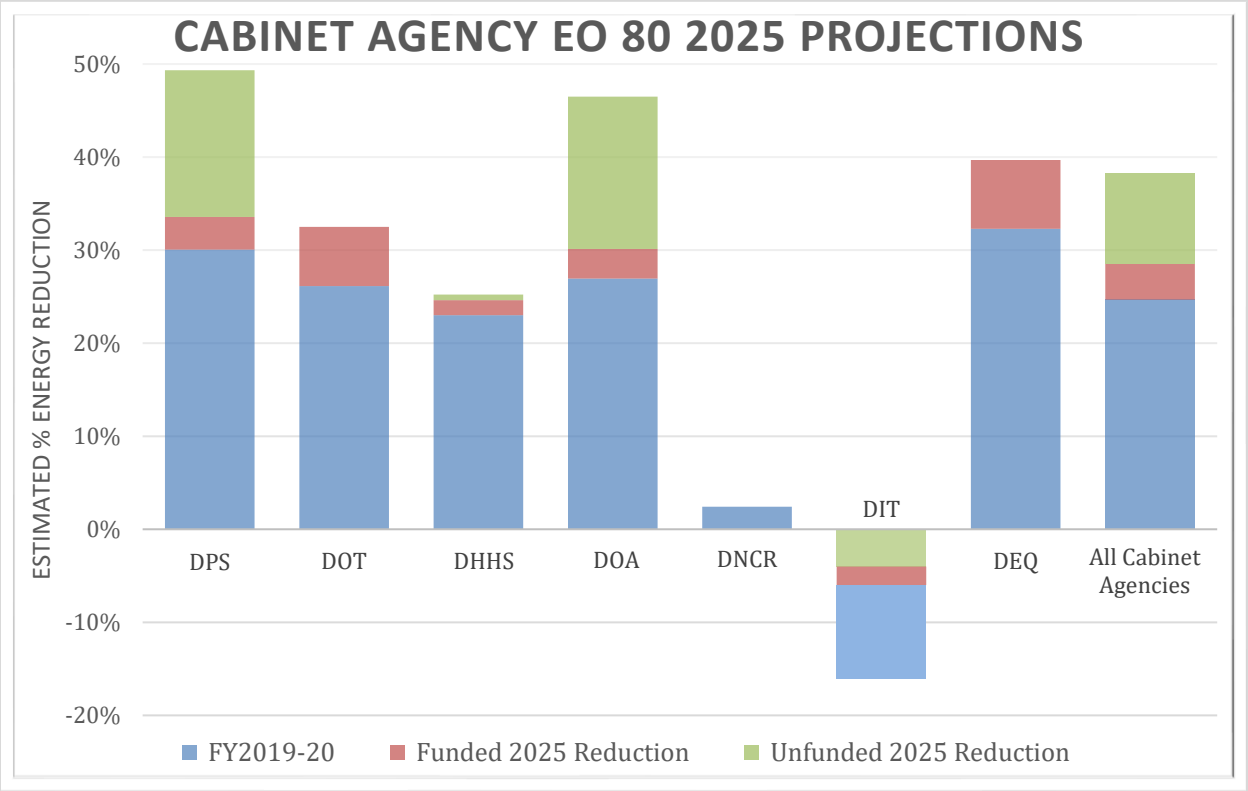
% Impact[1]	Agency	Project Implementation Target Year	MMBTU Usage	Projected MMBTU Reduction	GSF	BTU/ GSF	Estimated % Reduction in EUI
0.3	DEQ	Current 2019/2020	19,992	-	99,335	201,261	-32%
		Funded End of FY2025	17,808	2,185	99,335	179,268	-40%
		Total Funded & Unfunded	17,808	**2,185**	99,335	179,268	**-40%**
23.0	DHHS	Current 2019/2020	1,194,494	-	7,879,494	151,595	-23%
		Funded End of FY2025	1,169,309	25,185	7,879,494	148,399	-25%
		Total Funded & Unfunded	1,160,093	**34,401**	7,879,494	147,229	**-25%**
0.8	DIT	Current 2019/2020	52,141	-	163,866	318,196	+17%
		Funded End of FY2025	50,141	2,000	163,866	305,990	+12%
		Total Funded & Unfunded	49,196	**2,946**	163,866	300,218	**+10%**
6.2	DNCR	Current 2019/2020	205,064	-	3,337,935	61,434	-2%
		Funded End of FY2025	205,064	DNP [2]	3,337,935	61,434	-2%
		Total Funded & Unfunded	205,064	DNP [2]	3,337,935	61,434	**-2%**

% Impact[1]	Agency	Project Implementation Target Year	MMBTU Usage	Projected MMBTU Reduction	GSF	BTU/ GSF	Estimated % Reduction in EUI
9.9	DOA[3]	Current 2019/2020	446,307	-	4,084,314	109,273	-27%
		Funded End of FY2025	426,859	19,448	4,084,314	104,512	-30%
		Total Funded & Unfunded	326,773	**119,534**	4,084,314	80,007	**-47%**
0.6	DOC	Current 2019/2020	25,434	-	261,091	97,414	-8%
		Funded End of FY2025	25,434	DNP [2]	261,091	97,414	-8%
		Total Funded & Unfunded	25,434	DNP [2]	261,091	97,414	**-8%**
15.1	DOT	Current 2019/2020	369,094	-	9,376,737	39,363	-26%
		Funded End of FY2025	337,332	31,762	9,376,737	35,975	-32%
		Total Funded & Unfunded	337,332	**31,762**	9,376,737	35,975	**-32%**
44.1	DPS	Current 2019/2020	1,995,668		18,090,092	110,318	-30%
		Funded End of FY2025	1,895,765	99,903	18,090,092	104,796	-34%
		Total Funded & Unfunded	1,445,881	**549,787**	18,090,092	79,927	**-49%**
All Cabinet Agencies Combined		Current 2019/2020	4,308,192	-	43,292,864	99,513	-25%
		Funded End of FY2025	4,102,277	180,483	43,436,742	94,443	-29%
		Total Funded & Unfunded	3,542,146	**748,984**	43,436,742	81,547	**-38%**

1. Percent impact is a composite number derived from how much each individual agency contributes to the combined total in terms of BTU/GSF
2. DNP = data not provided by agency
3. DOR is included under DOA

Overall, the Cabinet Agencies combined are only projected to achieve a -29% EUI reduction by 2025 through funded projects (see Figure 3). If all the currently identified and reported projects happen to be fully funded at a total cost of $132 million, the cabinet agencies would achieve a -38% EUI reduction and surpass the EO 80 goal when combined with the UNC System's performance. As such, more attention is needed to identify additional energy conservation projects along with creative methods to obtain funding. Otherwise, cabinet agencies will not contribute proportionally towards the reduction goal for State-owned buildings by 2025.

Figure 3: EUI Reduction Projections



4.2 Energy Savings Summary for All Governmental Units

The following tables and figures provide a collective summary of energy and water reductions achieved by State agencies and the UNC System. Similar data for each individual agency is provided in Appendix A.

Energy Consumption and Savings Highlights from Table 6

- EUI (Btu/gsf)
  - The Cabinet Agencies are at a -25% reduction from baseline
  - Other Agencies are at a +7% increase
  - UNC System is at a -48% reduction
  - Total combined State-owned buildings are at a -35% reduction

- Change in Square Footage and Water Usage
  - Total combined State-owned building area has increased by almost +50% compared to baseline
  - Total combined water usage has decreased by -42% from the baseline

Table 6: State Agency & State Institutions of Higher Learning Efficiency Gains

Participant		Cabinet Agencies	Other Agencies	UNC System	State Governmental Units Combined Total
Gross Square Footage	Baseline 2002-03 (Mgsf)	34.0	3.9	55.9	93.8
	Current 2019-20 (Mgsf)	43.3	4.8	89.6	137.6
	% Change	+27%	+22%	+60%	+47%
EUI	Baseline 2002-03 (Btu/gsf) [1]	132,119	52,089	169,521	151,052
	Current 2019-20 (Btu/gsf) [1]	99,513	55,599	88,543	97,964
	% Change	-25%	+7%	-48%	-35%
Water	Baseline 2002-03 (gal/gsf) [1]	64	28	50	53
	Current 2019-20 (gal/gsf) [1]	52	15	23	31
	% Change	-19%	-47%	-54%	-42%

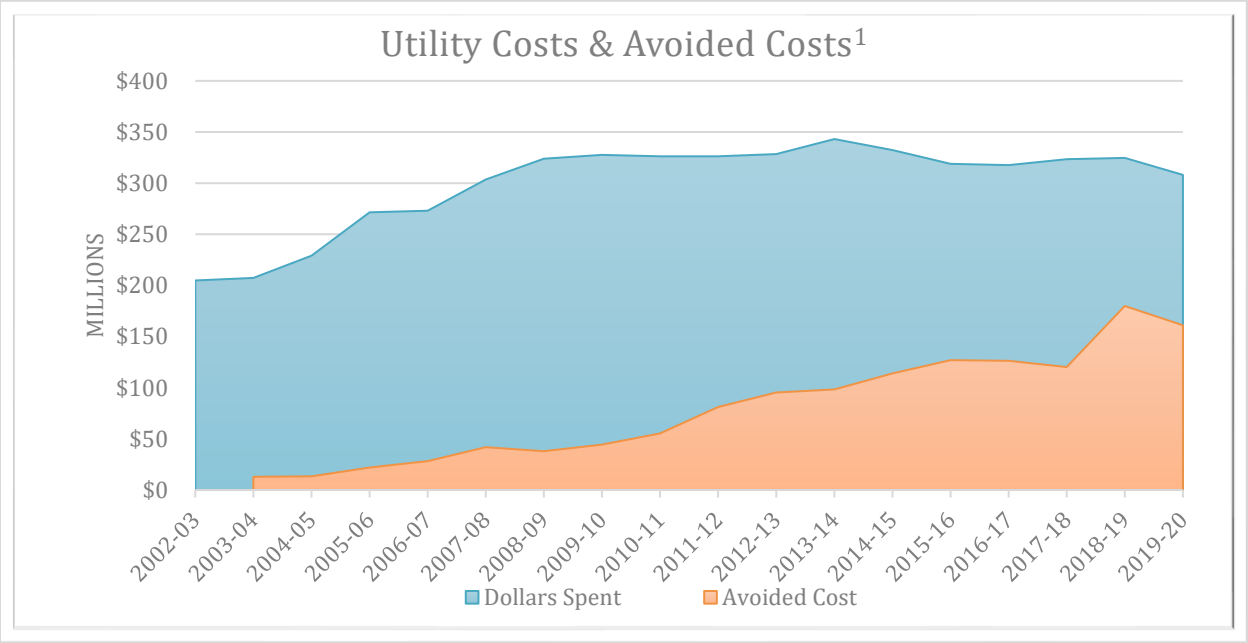
[1] Data is the weighted average of agencies/universities.

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

- Avoided Utility Cost
  - Approximately $175 million per year in avoided utility costs in FY2019-20.
  - Approximately $1.5 billion avoided in utility costs since FY2002-03.

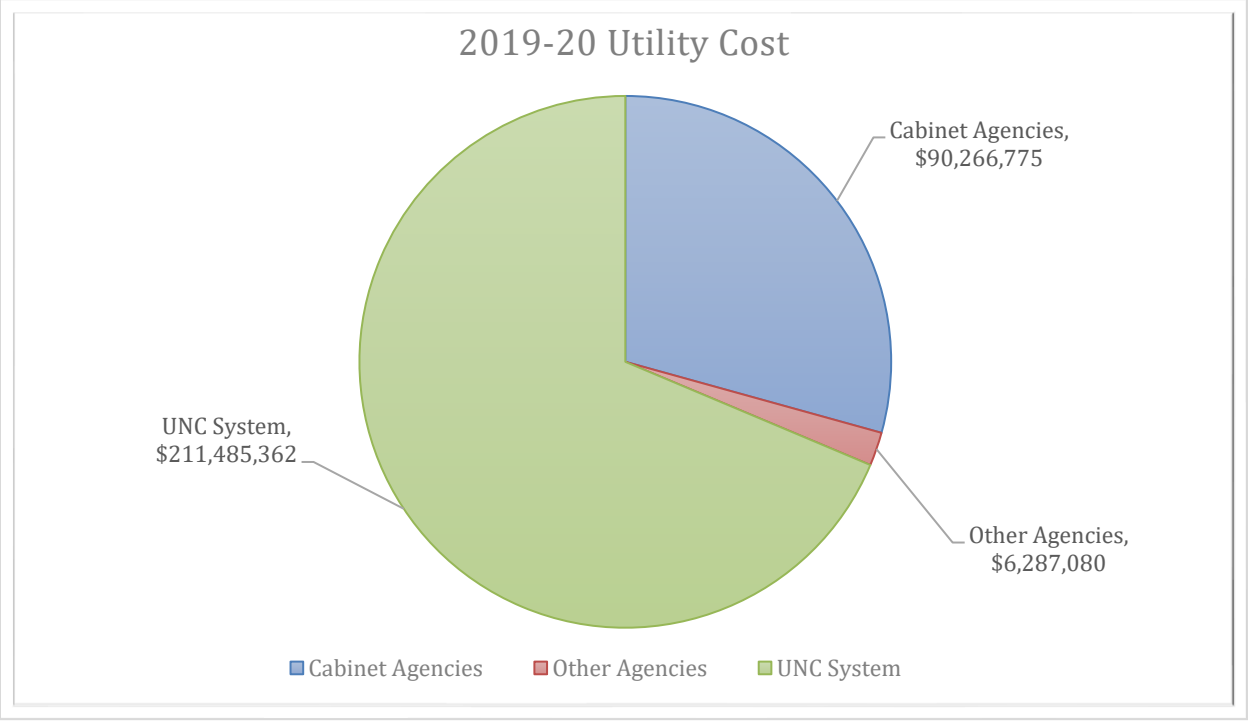
- Expenditures
  - Over $307 million in utility costs (electricity, fuels, and water) for all agencies and the UNC system combined. Approximately two thirds of this amount is paid by the UNC System.
  - Overall spending represents $16.6 million less than during the FY2018-19 fiscal year.

Figure 4: Avoided Utility Cost for State Governmental Units



1. Avoided Utility Cost represents the amount the State agencies and universities would have paid if they had not implemented any energy efficiency retrofits or upgrades based on the current utility rate against the 2002-03 baseline.

Figure 5: Utility Cost Contributions by Participant Type



5.0 Recommendations for State-Owned Buildings to Further Reduce Energy Consumption

In addition to achieving continued reductions in existing buildings' energy and water use, new State-owned buildings must be constructed to energy efficiency standards. As new buildings are constructed, agencies have greater ability to operate and to monitor building performance thereby ensuring energy efficiency goals are met. Agencies that have ageing 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 agencies 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

Assign a Dedicated Energy Manager

Outside of DPS, all the other agencies have selected energy managers in title only. These energy managers had other primary job responsibilities first and were assigned energy management as an additional role. However, energy management is not effective as an additional responsibility if agencies are truly interested in achieving the EO 80 goal. The dollar amount of utility expenditures by individual agencies should dictate the need for oversight and direct control. For any energy management program to be successful, an organization must be willing to provide the necessary resources, tools, and motivation required to meet stated goals. The energy manager must be empowered to direct an organization on what steps need to be taken to achieve the goals and issued the proper tools to accomplish the required tasks or projects.

The Energy Manager must:

1. Have authority to get policies and projects accomplished.
2. Be positioned correctly within the organizational structure to provide input and approval on projects so that energy related measures are made a priority.
3. Receive dedicated funding/budget allocations to ensure energy efficiency projects are completed.
4. Secure leadership support within the organization to prioritize the need for energy efficiency goals to be met.
5. Have direct access to utility data in order to provide proper oversight of utility spending.

The energy manager position involves a multitude of responsibilities along with a full-time commitment by the organization. Anything less becomes a competition in the allocation of time needed to complete assigned tasks properly. Something else always takes precedent or is more important so the energy goals are only discussed and rarely achieved. The energy manager must consistently and repeatedly promote energy conservation and efficiency if EO 80 goals are to be achieved. The bottom line is that to manage and to achieve energy goals within an organization, energy managers must be afforded proper oversight across an organization along with the ability to exercise leadership and to drive change. This is a full-time job when correctly implemented, and almost all energy managers may recover their salary several times over with the energy management measures they implement.

Standardize the Collection of Utility Data

An energy manager can only manage the energy that is measured so without good utility data, establishing or achieving the EO 80 goal is difficult at best. The cabinet agencies currently have thousands of buildings across the State, and those buildings are served by hundreds of different utility providers. While this makes the collection and management of these bills a formidable task, the failure by an agency to use some robust method to collect utility data accurately is not acceptable. One well-known solution would be moving to a third-party service to manage these bills. Third-party services are available to collect, verify, reconcile, record, and possibly even pay a multitude of bills. The service then provides the utility data in an easy-to-use format for an energy manager to extract and to analyze. The data is provided in a timely manner and can be extracted to communicate progress and/or to visualize the results of conservation efforts. Monetary savings is achieved through fewer employees dealing with bill processing, eliminating delinquent payments/late charges, and with streamlining the data collection and entry. The current process in many agencies leaves the majority of utility bill handling to multiple employees with no energy background which impedes the ability to obtain quality data. They often have problems with conversion factors or do not truly understand how to read the bills thereby reporting energy usage incorrectly. Several companies provide bill management services, and their success has been documented within State government.

Effective Utility Data Management

Monthly if not more frequent monitoring of utility data improves facility management of energy and water use. Monitoring utility data less often than monthly does not catch errors, leaks, or equipment problems before they can potentially turn into larger issues. Staying up to date with utility data enables an energy manager to monitor fluctuations in usage or costs and to identify trends that may be venturing in the wrong direction. They have the capability to drill down in specific areas and to catch changes both good and bad. The bottom line is that an energy program cannot improve upon utilities that are not measured and tracked. Each governmental unit must have a robust system for collecting, recording, and monitoring their energy usage. In fact, having utility bill monitoring as a cornerstone to any energy management program also helps with implementing energy efficiency projects. The data is able to help show the results of successful energy projects. All the energy manager has to do is properly collect before and after data to show that actual savings are achieved. Without proper collection and monitoring of data this is not possible, and the savings cannot be used to gain support for future energy conservation projects.

Utilize Metering and Visualization Tools

The use of building level meters or submeters allows for building benchmarking and to identify opportunities for savings. Submeters for new buildings were addressed in SB 668, SL 2007-546, but are not required. The use of building level meters or submeters should be strongly encouraged. The GESC measurement and verification process benefits by installing submeters, and submeters improve the accuracy of the guaranteed savings. A methodology to address buildings that receive district heating and cooling from central boilers and chiller plants without steam or chilled water meters should be determined.

Duke Energy has a new energy management tool termed “OneView” that provides a web-based platform for accessing, tracking, managing, and controlling energy data. This platform provides

alerts, customizable markers, weather condition comparisons, and savings information. These features would greatly assist energy customers in having more control over their energy usage.

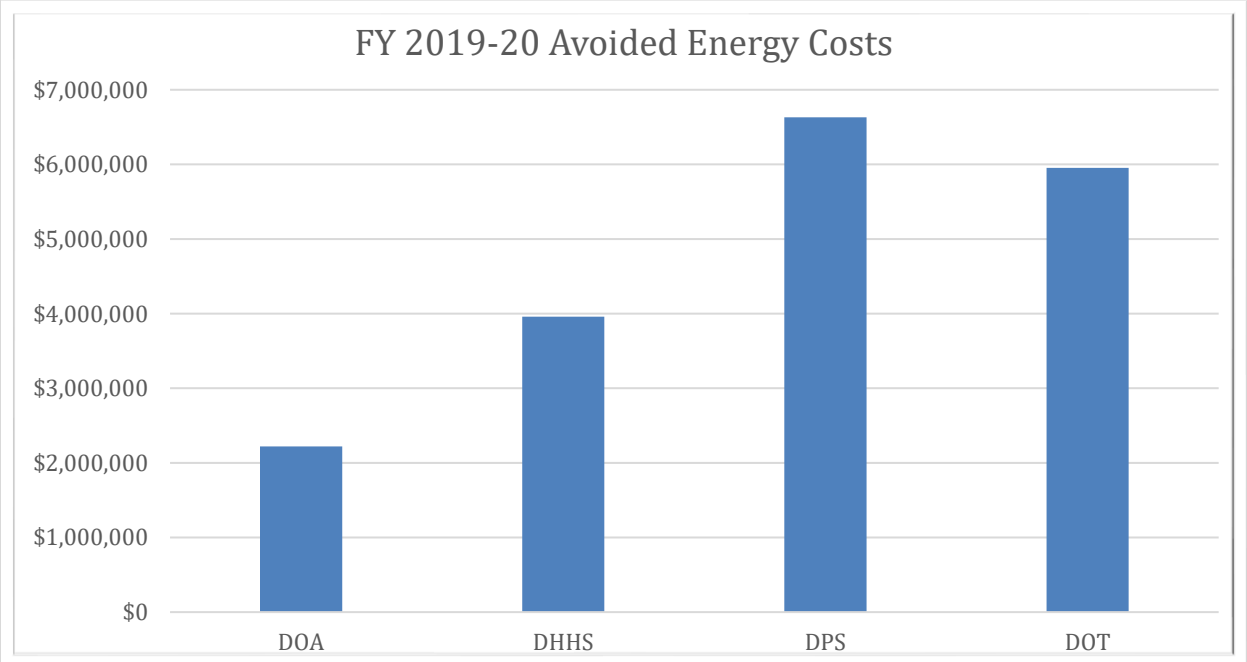
5.2 Funding Methods

Energy Savings Credits

Working with Office of State Budget and Management, State agencies should have a source of energy efficiency funding like that currently available to the UNC System per HB 1292 (SL 2010-196, Sections 1 and 2). HB 1292 allows the UNC System and affiliates to retain funds annually left over in their utility accounts by measuring and verifying energy savings associated with energy saving projects completed during the same fiscal year. These funds are then credited into the next fiscal year's budget, where 60% of those funds must be used for more energy related projects. The UNC System has benefited from taking advantage of the 1292 credits. In 2019, ten UNC schools requested to credit $11.2 million. In 2020, eleven UNC schools requested to credit $15.2 million.

Many State agencies expressed interest in meeting the energy efficiency goals. However, deploying even simple measures has been challenging without increasing annual operating budgets. This issue would largely be resolved with a statutory mechanism like HB1292 which has been extremely successful for the UNC system. The proposed statutory mechanism could also include a requirement to discuss with the Office of State Budget and Management (OSBM) the need for repair and renovation funding, beyond life-safety issues, to maintain existing energy-consuming equipment. Figure 6 shows the estimated avoided energy costs of the top four agencies. If these agencies had a mechanism similar to the HB1292, some of this avoided cost could have been utilized further to fund more energy efficiency projects.

Figure 6: Cabinet Agency Avoided Energy Costs



Guaranteed Energy Savings Contracts

Since 2002, GS §143-64.17 allows for State agencies and the UNC System to utilize the GESC process to implement and 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 State agency or UNC System school 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. Utility budget savings caused by the implementation of the guaranteed ECMs provides repayment of the multi-year loans executed by governmental units to finance the initial energy upgrades. Cabinet agencies are encouraged to utilize the GESC process to fund capital projects that will assist in meeting the EO 80 goal. The USI program's staff are equipped to provide technical assistance and guidance throughout the GESC process.

To date only three cabinet agencies; DOA, DOT, and DPS have used this method of finance for energy efficiency improvements. DOA has seen savings of $1.3 million above the guarantee in two projects combined. In just three years, DOT has accumulated savings of almost $200 thousand dollars above the guarantee, and DPS is meeting the guaranteed savings every year. USI is overseeing another nineteen projects within the UNC System that have an expected guaranteed savings of over $440 million through the life of these contracts. Four years have passed since the last State government RFP was released by DOT. Agencies and the UNC System have proven that GESC works and works well for getting energy projects completed. Using GESC allows a State agency to get large scale improvements done across the State in record time, with a single vendor and with a guaranteed energy savings that is measured, verified and validated by a third-party as required by statute. GESC continues to be a valuable method of funding energy improvement projects and should be utilized quickly if EO 80 agency goals are to be achieved.

Duke Energy's Energy Efficiency Opt-In Program

Duke Energy offers an energy efficiency plan that customers can choose to "opt-in" and take advantage of energy savings programs. The purpose of these programs is to encourage installation of high efficiency equipment. Participants generally pay a little more on 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 a portion of the higher cost of energy efficient installations and maintenance activities. Alternately, customers may elect not to participate in the energy efficiency and/or demand-side management programs and receive a monthly bill credit. Customers could use these monthly savings to fund and implement their own efficiency measures. However, one issue is that a lot of customers who opt out do not really use their savings for energy efficiency as the program was designed. Some State agencies have opted out to utilize the funds for their own energy efficiency projects. DOA is considering opting out and specifically using the funds for third-party utility data management. DPS is using the opt-out savings for staffing to manage energy efficiency projects. Both are good ways to utilize the opt-out savings.

Repair and Renovation

Each agency makes annual requests for repair and renovation budgets. These requests contain capital projects, maintenance issues, aging equipment, and infrastructure necessary to maintain the current use of existing facilities. These funds are justified by references found within the "Faculties Condition Assessment Program" operated by the Office of State Construction. This is a budgetary process that is typically underfunded and continues to increase North Carolina's deferred maintenance issues. While energy efficiency projects may be funded, they must compete against other more critical "life safety" improvements. Designating a percentage of these funds directly for energy efficiency would assist with funding energy savings improvements.

Federal and State Storm Recovery and Resiliency Funding

A. Building Resilient Infrastructure and Communities (BRIC)

On October 5, 2018, the Disaster Regulatory Reform Act was signed into federal law by the President of the United States. Section 1234 of the Act authorized the Federal Emergency Management Agency (FEMA) to annually set aside 6% of expenses from each Presidentially-declared major disaster declaration to create and fund the BRIC grant program. The BRIC program supersedes the Pre-Disaster Mitigation program and is focused on nationwide hazard mitigation projects. For the 2020-2021 grant cycle, FEMA allocated approximately $500 million through the BRIC program to fund projects that reduce risk and damage from future natural hazards, are cost effective, meet the latest two consensus codes, are technically feasible, align with the State or Tribal Mitigation Plan, and meet all environmental and historic preservation requirements. Of that amount, $33.6 million (up to $600,000 per applicant) is designated for all states and territories, $20 million is set aside for tribal governments (up to $600,000 per applicant), and $446.4 million is estimated to remain in the national competition after allocations to states, territories, or tribal governments are made (up to $50,000,000 per sub-applicant). All states and territories that have had at least one Presidentially-declared major disaster declaration within the past seven years are eligible unilaterally apply as "applicants" or on behalf of "sub-applicants". For the purposes of North Carolina, the "applicant" is deemed to be the DPS's Division of Emergency Management Division (NCEM), while "sub-applicants" are deemed to be State agencies, local governments, and federally-recognized tribal governments.

The BRIC program emphasizes that successful projects reduce risks to as many of the seven "community lifelines" as possible and incorporate nature-based solutions. This ensures that projects prepare communities before a disaster and will quickly prevent an unforeseen chain of negative impacts after a disaster. The "community lifelines" are critical services that communities use including: (1) safety and security; (2) food and water; (3) shelter; (4) health and medical; (5) energy (power and fuel); (6) transportation; and (7) hazardous materials. The formation of partnerships with public, private, and non-profit organizations could assist with incorporating several lifelines into project proposals. Projects are graded based on technical (all or nothing for credit) and qualitative criteria (partial credit allowed) per FEMA's project specifications. For FY 2020-21, the cost share of projects is 75% federal and 25% non-federal. FEMA will cover 100% of federal funding for management costs. It is important to note that FEMA will pay up to 90% of costs for small, impoverished communities which is defined as a community of less than 3,000 people that earn less than 80% of the national per-capita income.

State agencies may be eligible to utilize the BRIC funding opportunity to improve the resiliency and energy efficiency of State-owned infrastructure if key project elements are incorporated into North Carolina's Hazard Mitigation Plan (HMP). However, without proactively including key project elements into the HMP, proposals from State agencies may not be eligible to move forward in NCEM's official application to FEMA. The USI program recommends that agencies interested in the BRIC program coordinate with NCEM to identify critical infrastructure or essential functions that may be included in the next HMP update. These efforts will assist with future funding proposals for the BRIC program to enhance the energy-efficiency and resiliency of State-owned buildings.

B. North Carolina Disaster Recovery Framework (NCDRF)

In 2018, the NCEM established twelve "Recovery Support Functions" (RSFs) as part of the NCDRF to address long-term planning, resiliency, and recovery goals in North Carolina[6]. Each RSF consists of several stakeholders from governmental and non-governmental organizations to provide technical subject-matter support, suggest policies, or request legislation to achieve the framework's goals and mission for future events. As such, the USI program recommends that the energy-efficiency and resiliency of State-owned buildings be explored and prioritized in RSF #5 (Transportation & Infrastructure) to align with the key goals of EO 80. These buildings are an area that would greatly benefit from future State-funded opportunities or methodologies to assist with reducing annual energy intensity and costs.

5.3 Utility Management Plans

The Utility Management Plans that were received provide little guidance for agencies to meet the energy efficiency goals. The received plans do not contain clear strategies, objectives, or identification of funding resources to be allocated by the agencies. Plans do not specify dates, responsibilities or assignments for specific individuals/departments to ensure that the tasks are completed and energy efficiency is achieved. These plans do not forecast how energy dollars are to be allocated to efficiency projects or how additional agency funds are to be aligned with agency energy goals. Often these plans are not the collaboration of an interagency group, but the work of specific individuals. Without broader input, the plan becomes narrowly focused and frequently results in increased facilities maintenance workload. There is limited communication of the requirements found within these plans to the whole organization. Acknowledgement and support of energy priorities is not achieved without organizational communication. As such, the result is failure to achieve stated goals.

Plans should allow the agency to identify:

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

[6] *2019 NORTH CAROLINA Disaster Recovery Framework; https://files.nc.gov/ncdps/documents/files/2019-NC-Disaster-Recovery-Framework-FINAL.pdf*

In accordance with GS §143-64.12(a) and EO 80, Section 8, Utility Management Plans are required to be submitted biennially by State agencies in odd-numbered years. The plans should include robust strategies that support statutory requirements and executive initiatives to reduce energy consumption in State-owned buildings. To provide consistency across cabinet and Council of State agencies, the USI program aligned the biennial reporting requirement with EO 80's March 1, 2021 deadline. The table below lists a summary of which agencies have and have not submitted Utility Management Plans as of the date of this document.

Table 7: Utility Management Plans Submitted

Cabinet Agencies	**Submitted Plan Early for Inclusion in this Report?**	
	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	**Submitted Plan Early for Inclusion in this Report?**	
	Yes	**No**
Department of Agriculture and Customer Services	x	
Department of Justice	x	
Department of Public Instruction		x
NC 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)

The following energy conservation measures were most frequently mentioned as those that are being implemented in most facilities:

Light Emitting Diode (LED) Lighting: LED lighting technology is growing exponentially while costs have decreased. LED area lighting improves safety, dramatically reduces maintenance requirements, and costs and has a high return on investment when both are factored into the equation. Maintenance staff are embracing LED lighting because this technology significantly reduces maintenance requirements, with LED fixtures potentially going untouched from 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 heating, ventilation, air conditioning, 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 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.

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.

Employee Engagement: Energy awareness across campuses continues to be highlighted in almost all plans. Energy awareness helps define an agency'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.

State Agencies are contending with competing priorities and other primary responsibilities along with limited resources and staff to identify energy efficiency projects. Requests have been made to expand financial resources so that identified energy projects can be performed. Prioritization and reinforcement are needed from within the agency and the governor's office, and funding from the legislature is needed for the EO 80 goal to be achieved.

The mission of each agency is critical, and what has been discounted for years is the substantial amount of deferred maintenance, outdated equipment, antiquated technology, aging infrastructure, limited staff and most importantly, the financial resources required to make major comprehensive energy improvements. Currently, agencies have provided funding requests to address some of these energy related needs. Agencies are investing their limited resources as available to move to LED lighting, provide more staff education, and the identification of additional low- and no-cost energy conservation measures. The State Energy Office, along with the agency energy managers,

are working together on this effort. Energy savings must be elevated in importance within each agency's day to day responsibilities. Prioritization and reinforcement are needed from within the agency and the Governor's Office for the goal to be achieved.

6.0 Conclusion

Cabinet agencies have an opportunity to contribute towards their share of the reduction goal set by EO 80. Since FY 2015/16, cabinet agencies have stayed around a -25% EUI reduction from the established FY 2002/03 baseline. This reduction is expected to improve slightly (-29%) if certain projects with available funding are implemented. By 2025, the combined State governmental units EUI has the potential to fall short of the EO 80 goal despite the significant reductions achieved by the UNC System. Swift and dedicated action is necessary for State agencies to contribute, and this goal is achievable if the agencies will mirror the efforts of the UNC System.

Approximately $132 million ($26 million funded; and $106 million unfunded) is necessary for identified projects to achieve a -38% EUI reduction. This performance level will provide a proportional response and surpass the EO 80 goal when combined with the UNC System. For all State-owned buildings to achieve the planned EUI reduction goal in 4.5 years, each agency's leadership must make the necessary changes in project priority, energy manager support, and energy program funding.

This report has discussed several hurdles the cabinet agencies face. Cabinet agencies must have a full-time dedicated energy manager with decision-making authority and access to specific funding for energy improvements. Management must empower this energy manager and fully support EUI reduction initiatives both with communicating energy efficiency goals and with providing leadership in making sure these goals are achieved. Agencies need a comprehensive utility data management system, whether performed internally or through a third-party, to ensure accurate data collection to enable energy managers to identify and address areas of improvement.

Appendix A

Agency Summaries, Data, and Graphs

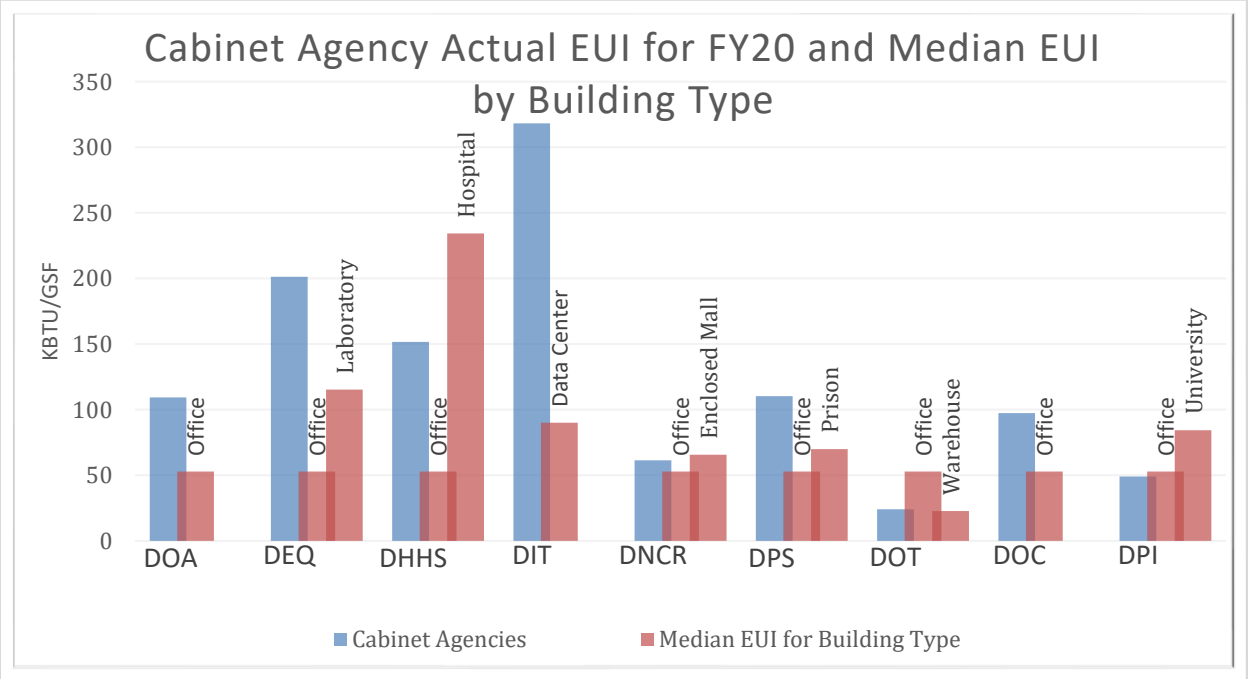
Energy Use Intensity

Energy use intensity (EUI) expresses a building's energy use as a function of the building's size or other characteristics. For most property types, the EUI is expressed as energy per gross square foot per year. EUI is calculated by dividing the total energy consumed by the building(s) in one year (measured in kBtu or Btu) by the total gross floor area of the building. The two types of EUI are source energy and site energy. Source energy represents the total amount of raw fuel that is required to operate a building including transmission, delivery, and production losses. Site energy is the amount of heat and electricity consumed by a building as reflected in the building utility bills. Buildings included in agency site EUI calculation includes all State-owned buildings that have water or electric including parking decks and garages.

Appendix A includes narratives on the individual agencies with graphs and tables showing their progress in reaching the -40% EUI reduction.

Figure 1 shows the FY 2019-20 site EUI for each cabinet agency in relation to similar building types. For example, DEQ, which is composed of office and laboratory buildings, is shown next to the median site EUI for offices and laboratories. Laboratories, hospitals, and data centers are building types with high site EUI. Offices and warehouses have lower site EUI.

Figure 1: EUI Comparisons

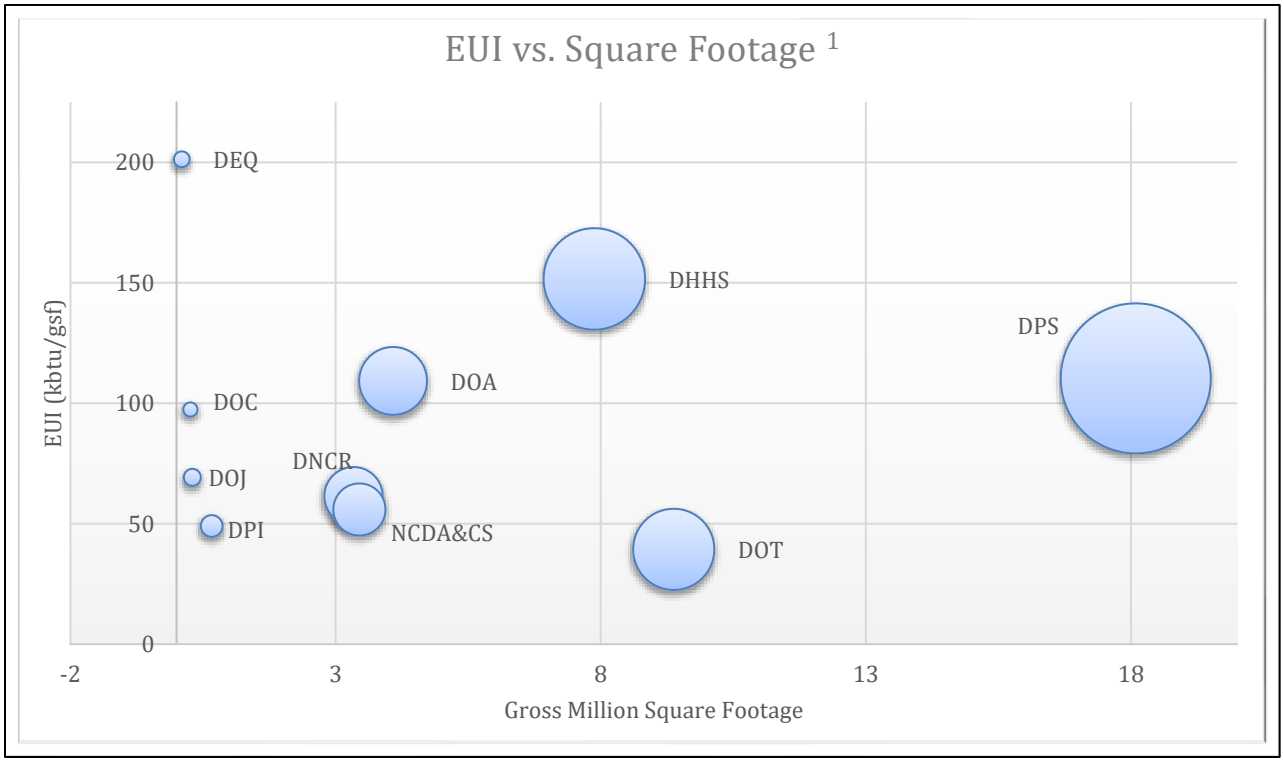


1. Median EUI for building type data from Energy Star and ICF [7]

[7] Darrow, K., & Hedman, B. (2009, March). ICF International / Oak Ridge National Laboratory. Retrieved from Opportunities for Combined Heat and Power in Data Centers: https://www.energy.gov/sites/prod/files/2013/11/f4/chp_data_centers.pdf
Energy Star. (n.d.). What is energy use intensity (EUI)? Retrieved from Energy Star: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager/understand-metrics/what-energy

Figure 2 shows the total energy cost as bubble size. DPS has the most gross square footage and energy costs but has an average EUI. Ideally, bubbles should be located lower on the y-axis to demonstrate most efficient energy usage.

Figure 2: EUI Comparison to Square Footage for FY 2019-2020



1. DIT was not included in this figure because DIT's EUI (318 kBtu/gsf) falls too far to the right to properly show the other agencies.

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. Joe Baden is the energy manager and works in the Facility Condition Assessment Program at the State Construction Office in Raleigh.

DOA is in a unique position within State government to advocate for more energy efficiency. As mentioned above, DOA serves as landlord for many other agencies and oversees the acquisition for leased buildings that all State agencies. Also, within DOA is the State Construction Office that approves construction design for both new and renovated buildings for all State-owned buildings and community colleges. All governmental units look to DOA as a leader, because of DOA's oversight. This is a great responsibility and DOA must step up to the challenge if government entities within North Carolina are to become more energy efficient and reduce the EUI.

DOA is currently at a -27% EUI reduction, which is an additional -2% reduction from the previous fiscal year. The trend shows a general downward slope of consistent energy usage reductions. The EUI for FY 2019-20 is 109,273 Btu/gsf but should be 103,336 Btu/gsf if in line to meet the goal of 89,739 Btu/gsf in FY 2024-25. DOA provided a projection list to USI that included a list of projects totaling more than $38 million dollars which could potentially get DOA to an overall -44% reduction. However, only about $16 million dollars is for funded projects, whereas an additional $22.4 million dollars is needed for unfunded projects.

DOA is currently looking at alternative methods of data collection due to possible inaccuracies with the previously used data collection service. The 2018-2019 data excluded parking decks, which have been added back in for the FY 2019-20 data. USI has been working closely with DOA to provide technical assistance and feedback as DOA looks at 3rd Party software. DOA is considering opting out of the energy efficiency rider with their power company to provide additional funding for a new energy data tool to collect utility data. DOA has lighting upgrade projects planned that will be implemented when the maintenance budget allows. Lighting upgrades and building automation installation would be an ideal project for a GESC.

Figure 3: DOA EUI

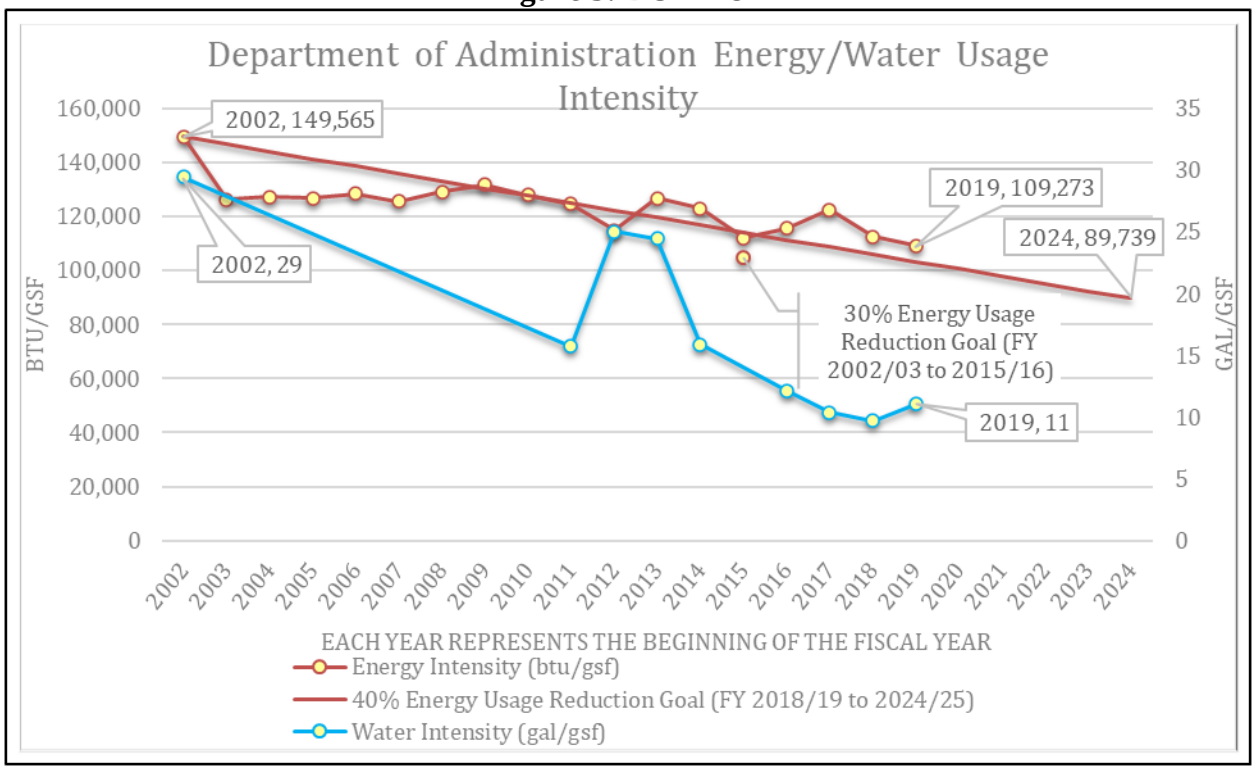


Table 1: DOA Progress

Metric	Fiscal Year 2002-03	Fiscal Year 2019-20	% Change
Total Gross Square Feet	4,659,040	4,084,314	-12%
Total Utility Cost	$8,927,218	$6,553,803	-27%
Energy Usage (Btu/gsf)	149,565	109,273	-27%
Energy Cost ($/MMBtu)	$12.37	$13.50	+9%
Water Usage (gal/gsf)	30	11	-63%
Water Cost ($/kgal)	$2.23	$11.75	+427%

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 EO 80, Section 8.

The DES Central Office is located at 700 Wade Avenue, Raleigh, North Carolina, 27605, and is comprised of 261,091 gross interior square feet. The site's utility plant consists of two 150-horsepower steam boilers and two 350-ton chillers that are designed to exclusively provide comfort heating and cooling. Additionally, the facility houses approximately 400 staff members on State business days between the hours of 6:00 AM and 7:00 PM EST. Joe Katzberg was designated as the energy manager for DES to meet the requirements of EO 80, Section 8(a). However, an important note is that the energy management duties were applied as an additional requirement to his existing scope of work.

The DES was placed in a precarious position with respect to EO 80 when the Central Office was designated as a "surplus" facility by the DOA. As such, the DES planned projects that strive towards the EO 80 goals while remaining fiscally responsible until the building is sold. No major capital improvement projects have been scheduled; however, low- and no-cost conservation strategies were implemented. These included items such as collecting and analyzing monthly energy billing information to identify excessive variations, coordinating with consultants to improve HVAC system controls, retrofitting existing systems with efficient equipment (i.e. LED lighting), conducting preventative maintenance activities, and training maintenance staff. In the past, the DES has utilized surplus administrative grant funding allocations from the Department of Labor to accomplish facility improvements after assessing the cost effectiveness of such items.
Table 2 provides a breakdown of the DOC's progress for six metrics compared to the FY 2002-03 baseline. Notably some of the metrics may appear to be lower than usual in FY 2019-20 due to increased teleworking during the COVID-19 pandemic. As shown, utility costs, Btu per gross square foot, and the total cost per million Btu reduced by -16%, -8%, and -15%, respectively. As of this report, there are not reputable baseline water consumption or cost values for comparison purposes. For many years, the DOC has received abnormal water consumption data since their main water meters malfunctioned. However, the total annual cost of their water bills appeared to be accurate. Therefore, for the purpose of this report, the USI program back calculated the DOC's water usage using the City of Raleigh's 2019-20 fixed and variable water rates for the respective infrastructure sizes compared to the total annual utility bill. The results are contained in Table 2.

Figure 4: DOC EUI

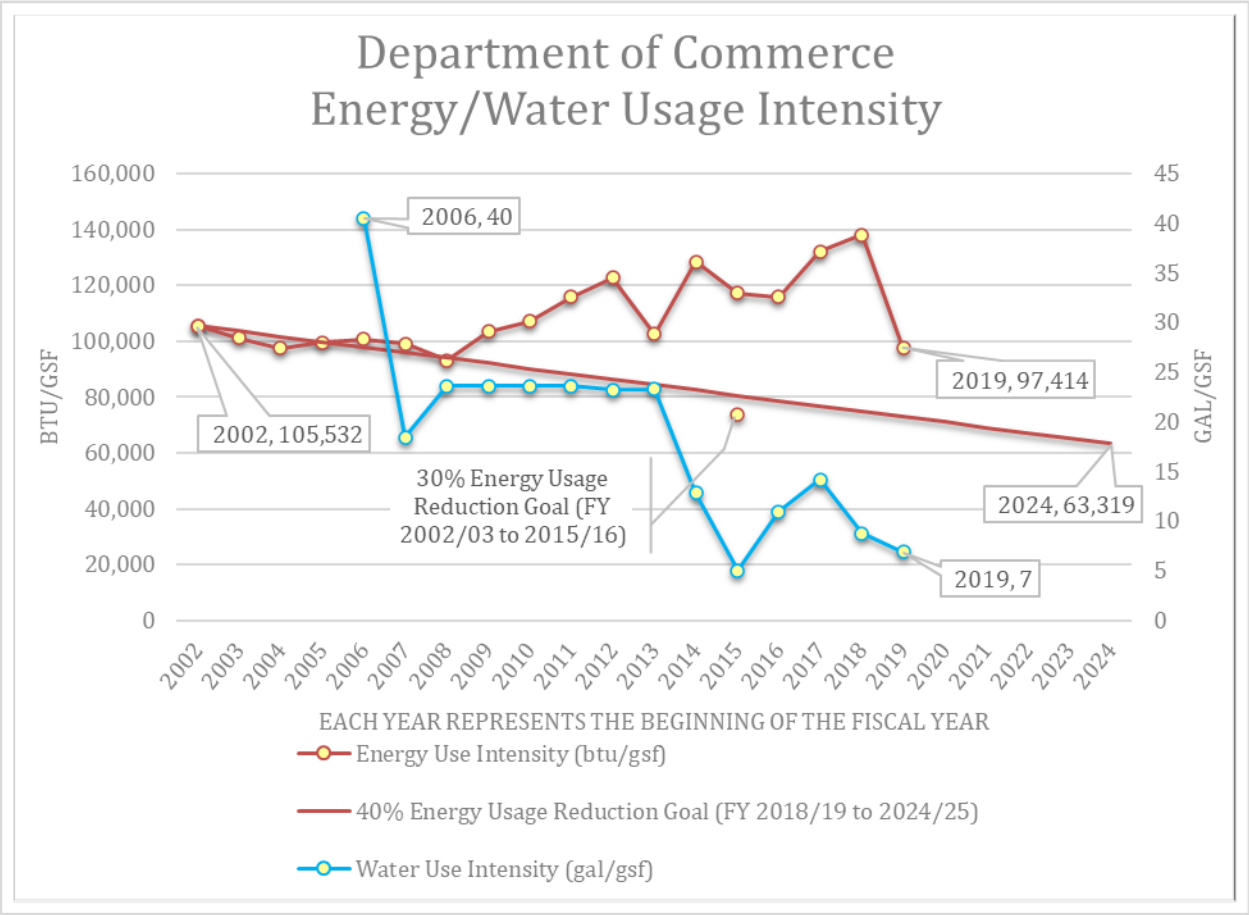


Table 2: DOC Progress

Metric	Fiscal Year 2002-03	Fiscal Year 2019-20	% Change
Total Gross Square Feet	261,091	261,091	0%
Total Utility Cost	$398,568	$334,274	-16%
Energy Usage (Btu/gsf)	105,532	97,414	-8%
Energy Cost ($/MMBtu)	$14.47	$12.36	-15%
Water Usage (gal/gsf)	40[1]	7	-83%
Water Cost ($/kgal)	$5.00[1]	$11.14	+123%

[1] DOC does not have water usage data until 2006. The FY 2006-07 water data is used for the baseline.

Department of Environmental Quality (DEQ)

The Department of Environmental Quality is the lead stewardship agency for the protection of North Carolina's environmental resources. The DEQ reaches far and wide with 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 Department of Administration or in leased buildings which are not included in the utility data of this specific section. Only the State-owned facilities currently managed by DEQ are measured and tracked for the DEQ utility data. These facilities include the Reedy Creek complex located in Raleigh which is primarily occupied by the Divisions of Air Quality and Water Resources along with the Division of Marine Fisheries (DMF) located in Morehead City. The Reedy Creek Laboratory Complex consists of three buildings constructed in 1991 along with two modular buildings with approximately 54,000 sq. ft. of laboratory and office space. The DMF consists of four State owned facilities totaling 45,031 square feet of office space. Mr. Eric Turon based in Raleigh is the DEQ Facilities Engineering Manager who champions all the energy conservation projects for both Reedy Creek and DMF.

Historically, DEQ has been through many changes. They started as the Department of Environment and Natural Resources (DENR) back in FY 2002-03 when an EUI baseline was established for all State agencies. Their gross square footage included museums, the zoo, aquariums, and numerous office buildings. Due to legislative changes over the years, DENR was dismantled and now exists separately as the Department of Natural and Cultural Resources (DNCR) and the DEQ. In order to reflect these changes and restructuring more accurately, an attempt was made to separate utility and square footage data back to the original FY 2002-03 baseline, but lack of data at the division and building level proved to be an overwhelming task. Therefore, both DEQ and DNCR have new baselines established at FY 2010-11. The applicable utility and square footage data were separated and divided between the two agencies according to the relative composition of each agency today. This allows the overall EUI of each agency to be reflected and accounted for against a baseline that more closely resembles how each agency is currently structured. Otherwise, the agencies would be trying to achieve EUI reductions on square footages that no longer exist and are no longer under their control.

Last year, DEQ assumed ownership of the Reedy Creek complex from DOA. Since that time, DEQ has repaired and replaced a lot of equipment that was previously not running. For that reason, their energy usage has increased slightly from FY 2018-19 to FY 2019-20. However, some significant energy conservation projects have taken place and are planned. These include cool, white roofs, building automation systems, new HVAC systems, LED lighting upgrades, and electric vehicle chargers. Although DEQ is currently only showing a -32% EUI reduction from their FY 2010-11 baseline, these projects will enable DEQ to meet the -40% EUI reduction by 2025. Even though DEQ may reflect a relatively small footprint as compared to other cabinet agencies, DEQ is making great strides with energy conservation. The next few years should start to show the results of these improvements.

Figure 5: DEQ EUI

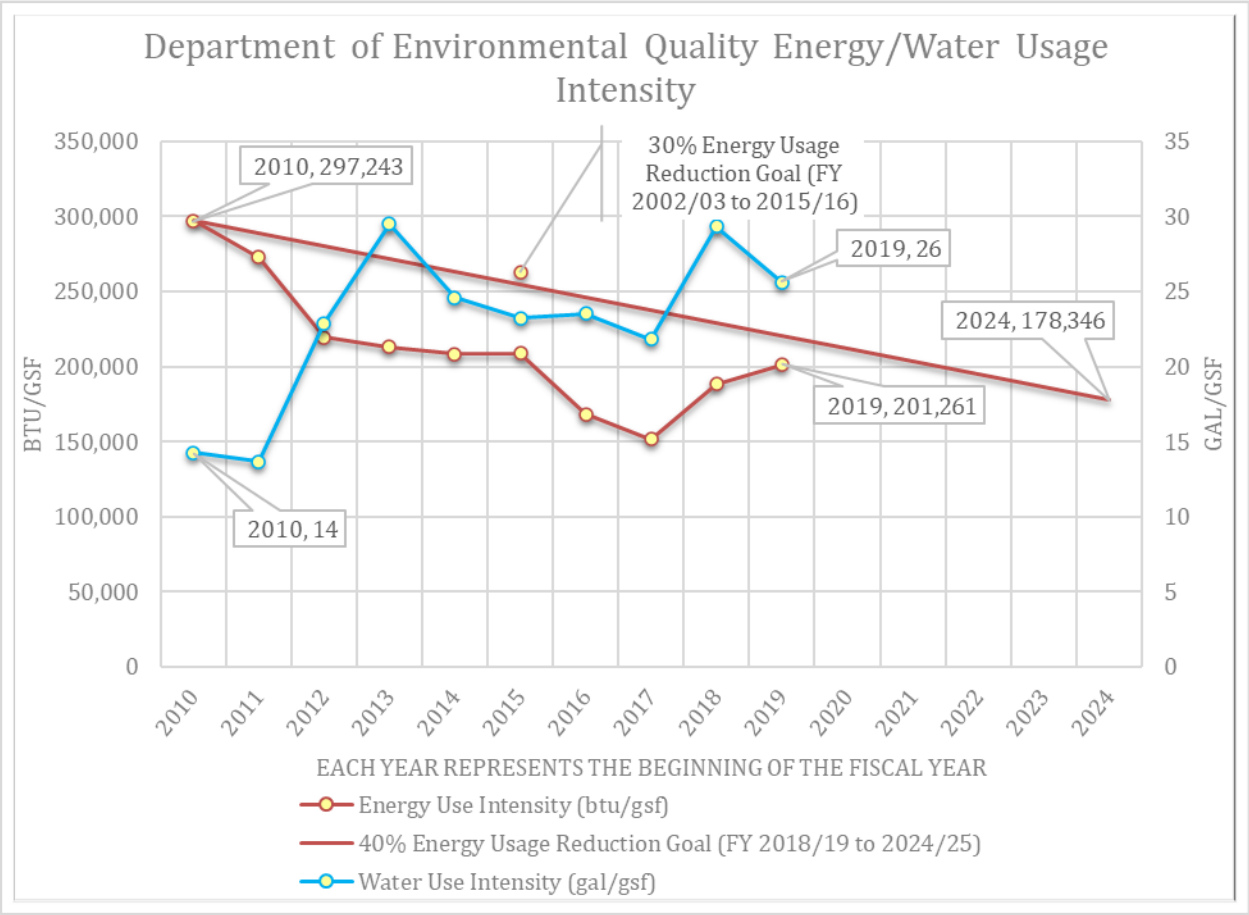


Table 3: DEQ Progress

Metric	Fiscal Year 2010-11[1]	Fiscal Year 2019-20	% Change
Total Gross Square Feet	105,527	99,335	-6%
Total Utility Cost	$572,246	$424,607	-26%
Energy Usage (Btu/gsf)	279,243	201,261	-32%
Energy Cost ($/MMBtu)	$17.56	$19.09	+9%
Water Usage (gal/gsf)	14	26	+80%
Water Cost ($/kgal)	$14.21	$16.84	+18%

[1] DEQ baseline is FY 2010-11.

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 Manager for DHHS is Greg Johnson. Mr. Johnson is housed within the Division of Property and Construction where his primary role is as a Building Systems Engineer.

When EO 80 was introduced, DHHS was the first agency to take steps to ensure that all locations were aware of the responsibilities naming each facility maintenance director at each location as the location's energy manager. DHHS reached out to USI to set up training for all these facilities maintenance managers. In FY 2019-2020, USI went to three different locations to train on the State utility costs, the agency utility costs, and how to be more efficient. Included in the training was a special session on lighting that talked specifically about LEDs. Afterwards, DHHS asked USI to walk a number of campuses to begin to identify energy conservation measures. A total of four facilities reached out for these energy assessments, three have been completed and COVID has hindered the forth from being started.

DHHS wants to continue to consolidate occupants in facilities with a high square foot per person ratio so that buildings may be closed off and HVAC system temperatures set back or turned off completely. Some additional energy conservation measures to be considered would be recommissioning of existing HVAC control systems to optimize energy savings, the verification of proper outdoor air set points on HVAC systems, and the tuning of existing boilers to provide optimal burner efficiency. When HVAC equipment has exceeded useful life, the equipment should be replaced with high efficiency units. When office equipment and appliances are due for replacement, they should be replaced with energy star rated equipment. Each campus should be surveyed for energy savings opportunities. System leaks should be identified and repaired quickly. All existing lighting (incandescent or fluorescent) should be upgraded with LED lighting. Lighting occupancy sensors should be installed in appropriate areas/rooms. Temperature setbacks for non-occupied time periods in non-patient areas should be implemented. Proper deadbands between heating and cooling setpoints in all occupancies should be provided. Personal space heaters and mini refrigerators should be prohibited. Leaks in windows and doors should be repaired and/or caulked while building insulation should be added where needed or where nonexistent.

Overall DHHS wants to Identify and implement renovation projects when required due to the age and condition or change in use of buildings utilizing the requirements of GS §143.135- 25, which mandates minimum energy and water reduction for new construction and major renovation projects. That will ensure improved energy and water use performance. These improvements generally include some or all the following: replacing windows; upgrading building insulation; and replacing HVAC, controls, lighting, and plumbing systems. DHHS further wants to establish policy that requires evaluation of both costs and energy efficiency when selecting equipment to be

purchased and that requires giving preference to Energy Star products when possible. Building assessments will serve as the basis for identifying building needs, developing scope of work for projects, developing estimated project costs, prioritizing project needs, and for requesting and obtaining funding to complete the projects to realize reductions in energy and water consumption. Facility Maintenance staff at each institution will make the effort to identify potential energy and water conservation improvement opportunities by evaluating existing HVAC control systems including considering the following: Time of day/night setback sequences, chilled water and hot water set point optimization, air handling unit (AHU) set point optimization, outdoor air damper operation (closed when building is not occupied), general verification of the operation of the building control system, and the installation of variable speed drives. Potential funding of these projects could be addressed with a GESC.

DHHS is currently only at a -23% EUI reduction. Over the last three years, DHHS has moved the wrong way because in FY 2017-18 DHHS was at the 2015 goal of a 30% reduction. DHHS must step up and address this negative trend. When asked to provide potential projects, DHHS provided USI only with enough information to get them back to -29%. DHHS did not supply any cost estimates or estimated energy savings for funded or unfunded projects. USI does not have the ability to guess at the needs of this agency. Only DHHS can provide those estimates. DHHS will need to commit more resources and do more energy projects to if DHHS is to achieve the 2025 EO 80 goal.

Figure 6: DHHS EUI

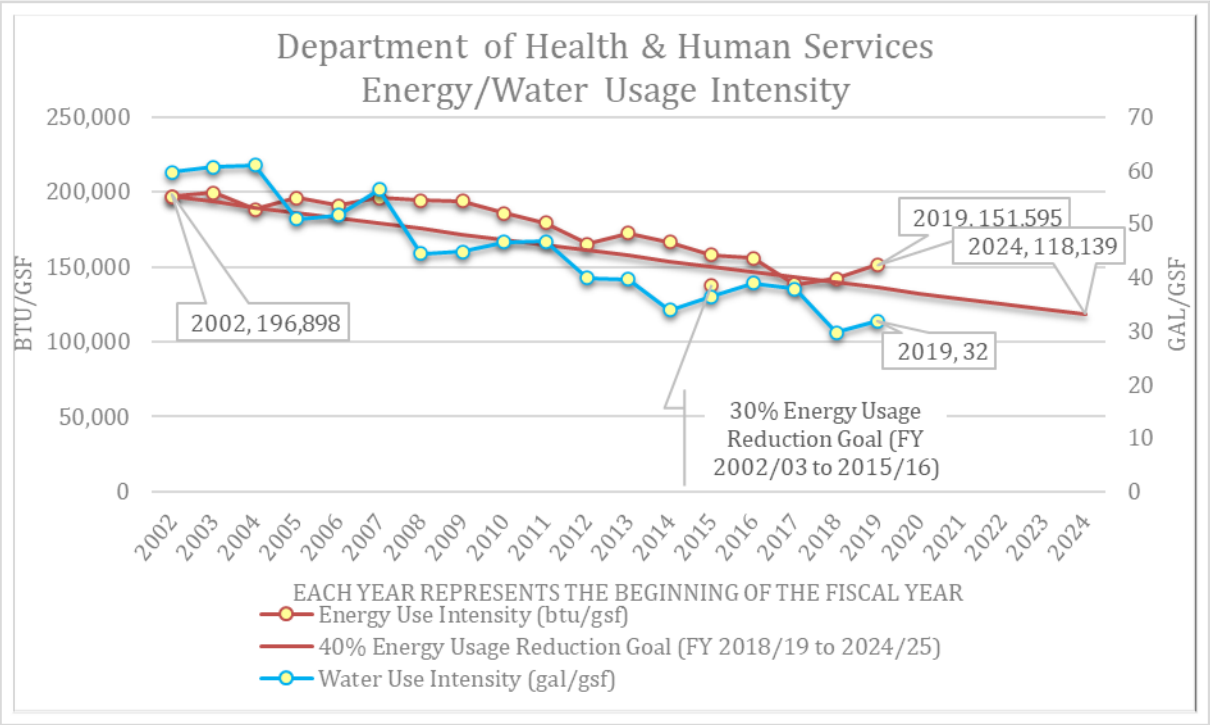


Table 4: DHHS Progress

Metric	Fiscal Year 2002-03	Fiscal Year 2019-20	% Change
Total Gross Square Feet	6,381,007	7,879,494	+23%
Total Utility Cost	$12,834,405	$15,727,859	+23%
Energy Usage (Btu/gsf)	196,898	151,595	-23%
Energy Cost ($/MMBtu)	$9.23	$11.09	+20%
Water Usage (gal/gsf)	60	32	-47%
Water Cost ($/kgal)	$3.25	$9.83	+202%

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.

Energy Consumption based on square footage does not provide an accurate representation of the efficiency of a Data center. The industry standard for Data center efficiency is Power Usage Effectiveness (PUE). That 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 agency's participation in using more DIT services and/or allowing DIT to host more equipment. That said, the more equipment brought in increases energy consumption per square foot. DIT could become vastly more efficient. To get to a point where energy per square foot is somewhat useful both the Eastern and Western Data Centers would need to be full. This would have to occur just to establish a viable energy baseline. Again, since DIT serves other State agencies, they have limited ability to utilize fully all the power and floor space available within their data centers. For example, consider an agency that pays for seven racks of IT space, yet only uses four of them with the remainder held for future growth. Currently, on a floor space basis, the Data center utilization is about 50%.

As part of the EO 80 projections, DIT provided a list of both funded and non-funded projects totaling more than $7.3 million dollars. Of that, only $1.8 was funded, leaving $5.5 unfunded. As mentioned above, DIT is unique among the agencies in that they will not be able to set an actual baseline until all the data centers are at full capacity. Steps taken now to continue for DIT to become more energy efficient are key in the DIT process.

Managing the servers and networks with efficiency in mind must be a priority. When new equipment is purchased, high efficiency must be part of the purchase criteria. Within each data center, DIT provides floor space for hosting other agency equipment (servers) and DIT will need to work with other agencies to ensure energy efficient equipment is installed. With support from upper management and HR, DIT would propose the following improvements and/or projects: create a personal appliance use policy, perform a data analysis of both data centers to identify ways to save energy, start monitoring the PUE of EDC and create a combined PUE chart, investigate water usage at EDC and continue to move to LED.

Figure 7: DIT Progress

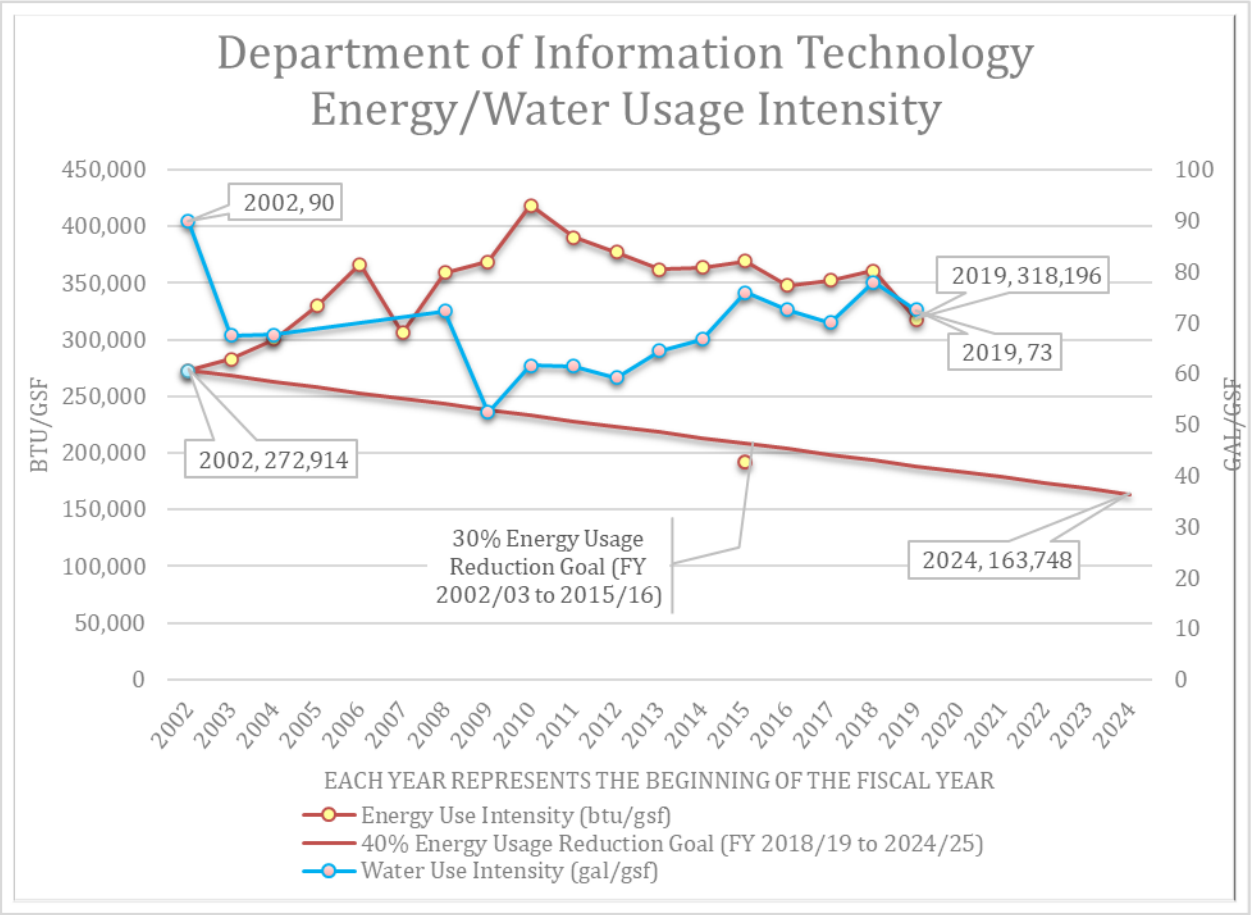


Table 5: DIT Progress

Metric	Fiscal Year 2002-03	Fiscal Year 2019-20	% Change
Total Gross Square Feet	94,343	163,866	+74%
Total Utility Cost	$362,255	$1,204,029	+232%
Energy Usage (Btu/gsf)	272,914	318,196	+17%
Energy Cost ($/MMBtu)	$13.67	$20.62	+51%
Water Usage (gal/gsf)	90	73	-19%
Water Cost ($/kgal)	$1.23	$10.84	+783%

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 dollars annually. The energy manager is Cecil Holt. Mr. Holt is the DMVA Architect, on loan from the State Construction Office.

Over the past year or so, DMVA has used the services of USI and Waste Reduction Partners to perform energy assessments of three facilities across the State. These assessments helped DMVA identify potential low/no cost energy efficiency measures and the identification of larger energy saving projects. Many of these recommendations like moving to LEDs have already been initiated and will continue as funds allow. These assessments highlighted some issues with the geothermal systems and the need to address some problematic piping issues to create a proper 2-pipe system. Once addressed, this will improve the operation of the heating and cooling system and will provide better standards of comfort in at least 3 facilities. With the two new construction projects, DMVA has reached out to Duke Energy to assist with a more energy efficient design, which is provided by Duke at no cost and allows for more potential energy savings to be gained. While DMVA owns these facilities, DMVA has a contract with Pruitt Health to manage and operate these facilities. Under this agreement, Pruitt Health covers all expenses including utilities. Due to this arrangement, DMVA does not submit an annual utility consumption report. Since DMVA does not submit a consumption report, USI does not include a graph. DMVA continues to work with the management companies to ensure energy efficiency goals are met. During the COVID pandemic, DMVA has had to shift responsibilities to ensure the safety of all residents and has adjusted operations to limit the spread of the virus.

Department of Natural and Cultural Resources (DNCR)

The N.C. 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 N.C. Zoo, the N.C. Symphony, the State Library, the State Archives, the N.C. 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 1825 buildings across the State which account for over three million gross square feet of space. The total utility bill for DNCR exceeded $5.25 million for FY 2019-20. Tony Romaine is the energy manager for DNCR, but his primary position is a Facility Construction Engineer with the Capital Projects Unit based out of Raleigh.

DNCR has been undergone significant restructuring over the years since GS §143-64.12 called for the establishment of a FY 2002-03 baseline with annual energy measurements. Due to these significant changes and the lack of historical utility/square footage data at the division and building level, the decision was made to establish a FY 2010-11 baseline. This aligns with the Department of Environmental Quality (DEQ) which was caught in all the restructuring efforts as well. The applicable utility and square footage data was separated and divided between the two agencies according to the relative composition of each agency today. This allows the overall EUI reduction of each agency to be reflected and accounted for against a baseline that more closely resembles how each agency is currently structured. Otherwise, the agencies would be trying to achieve EUI reductions on square footages that no longer exist and is no longer under their control.

Perhaps due to all the restructuring or simply the nature of the DNCR properties, DNCR has currently only achieved a -2% EUI reduction as compared to their FY 2010-11 baseline. DNCR does contain some heavy energy users in the form of the zoo, aquariums, historic structures, and museums. However, no specific energy efficiency projects were submitted for future projections. Without any projects being planned, DNCR does not seem likely to make any further progress in energy reductions. They are shown as remaining stagnant at the current -2% EUI reduction level which falls short of both the overall 15% reduction goal which should have been accomplished by 2015 and the 40% reduction goal by 2025 as mandated by EO 80. Two of the biggest issues DNCR faces with the energy conservation goals is lack of proper oversight and management of utility data along with overall lack of funding for projects. A third-party company would be very beneficial in helping them track and manage utility accounts for almost two thousand buildings, but that requires additional funding as well.

Figure 8: DNCR EUI

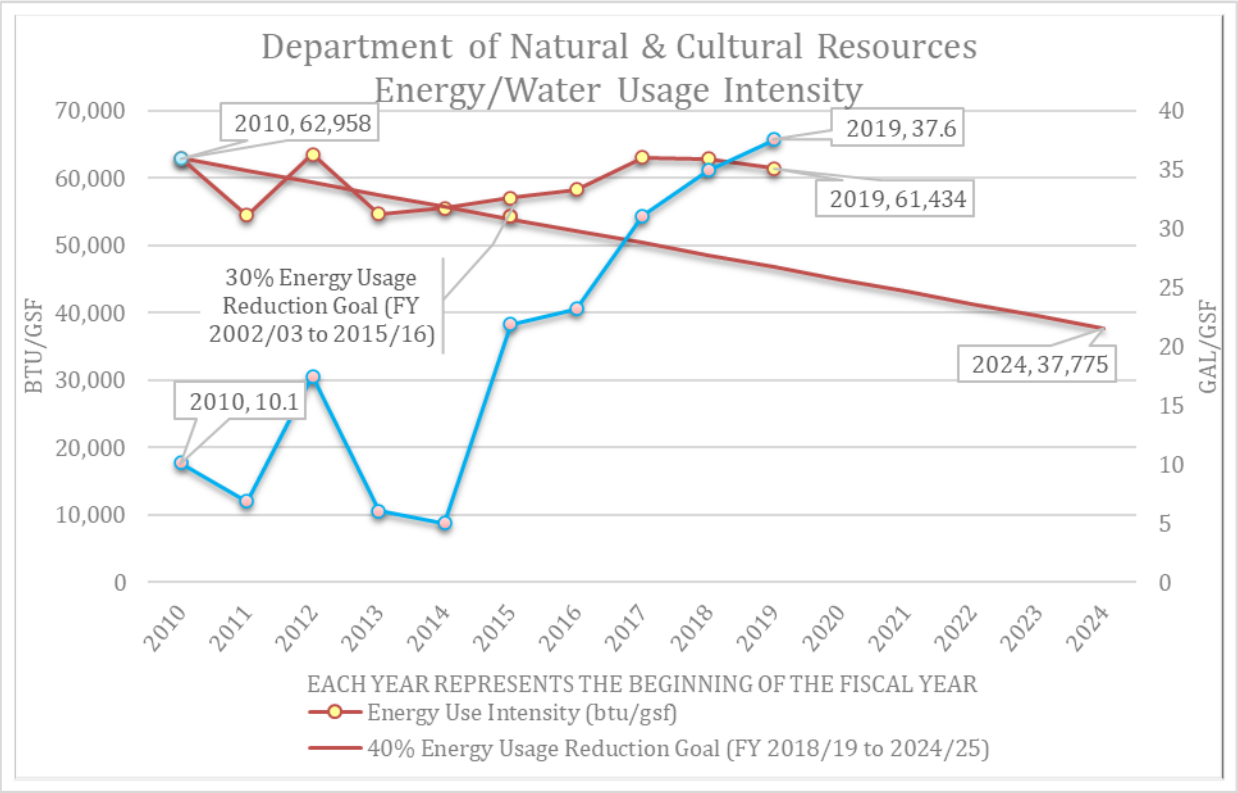


Table 6: DNCR Progress

Metric	Fiscal Year 2010-11[1]	Fiscal Year 2019-20	% Change
Total Gross Square Feet	993,148	3,337,935	+242%
Total Utility Cost	$1,558,130	$5,363,743	+238%
Energy Usage (Btu/gsf)	62,958	61,434	-2%
Energy Cost ($/MMBtu)	$22.37	$21.87	-2%
Water Usage (gal/gsf)	10	38	+270%
Water Cost ($/kgal)	$15.85	$7.02	-56%

[1]DNCR has a FY 2010-11 baseline.

Department of Transportation (DOT)

The N.C. Department of Transportation, DOT, 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 N.C. State Port Authority (NCSPA), N.C. Global TransPark and N.C. Turnpike Authority.

DOT combined with the NCSPA occupies a total of 2382 buildings which amount to 9,376,737 gross square feet spread throughout the State. The annual utility costs for these buildings totaled $10,771,348. DOT and NCSPA have been working diligently to reduce their overall utility consumption. The energy manager for the DOT is Eric Frazier whose primary job title is Energy Management Engineer for the Facilities Management Unit. He works out of the Raleigh DOT headquarters building.

At the end of FY 2019-20, DOT and NCSPA had reduced their energy consumption by -26% from their FY 2002-03 baseline. At the conclusion of FY 2019-20, DOT and NC State Port Authority (NCSPA) energy savings programs have resulted in an energy cost avoidance of $28,269,351 and a water cost avoidance of $13,413,637 totaling $41,682,988 over the last 16 years. By the end of FY 20, those cost savings have reduced energy and water usage per square foot in DOT facilities by -31% and -8% respectively as measured from the baseline fiscal year of 2002-03. NCSPA saw a +22% increase in energy usage, but a reduction in water consumption by -3% per square foot during that same period. Combined DOT and NCSPA energy and water consumption per square foot has decreased by -26% and -7% since FY 2002-03, respectively.

DOT strategy and programs supporting legislative and Executive Order 80 goals include several different projects. Two of the primary projects are both Guaranteed Energy Savings Contracts (GESCs). The first GESC has installed energy efficient HVAC systems, lighting, windows, and water fixtures in six Raleigh area DOT buildings. Building automation systems were also installed in these buildings to improve energy savings and monitor energy usage. The guaranteed cost savings associated with this project is $8,897,860 over 15 years. The second GESC deals with roadway lighting. The project has upgraded light fixtures on State-owned roads and in DOT buildings State-wide to LED-based fixtures. Lighting control systems were also installed to monitor energy usage and to support maintenance of these fixtures. The total guaranteed cost savings over 15 years will be $51,295,813.

DOT has identified several other projects that were either not funded or did not have quantified energy savings estimated. A huge start to some of these projects would be DOT's plan to conduct energy audits in DOT buildings 10,000 square foot and larger at the rate of five buildings per year. In conjunction, DOT hopes to partner with utility providers to utilize energy efficiency incentive programs and reduce the cost of DOT projects. DOT further plans to measure and analyze utility bills to identify opportunities to reduce cost and provide data in support of new and ongoing projects. If presented with opportunities to renovate or build new construction, DOT fully expects to comply with the 2012 NC State Energy Code: Energy Conservation Code / GS §143-135.35, Article 8C so that the designs are energy efficient. The new builds or renovations would also implement latest State Property Office workspace standards. These standards reduce the amount

of space/buildings needed in new and renovated buildings thereby minimizing energy consumption and costs. Furthermore, DOT plans to train facility managers / staff to perform preventative maintenance of existing and new systems to ensure energy and water conservation objectives are met and maintained. DOT has no plans to stop there. They additionally plan to work with the Department of Environment Quality (DEQ) / State Energy Office (SEO), and other agencies to participate in existing or planned energy savings programs - particularly those funded / sponsored by those agencies. Lastly, they plan to educate / inform / engage DOT employees regarding State-wide energy conservation project and best practices through meeting presentations, emails, Intranet web sites, etc. Hopefully, these initiatives will be enough to propel DOT to contribute towards the collective reduction goal.

Figure 9: DOT EUI

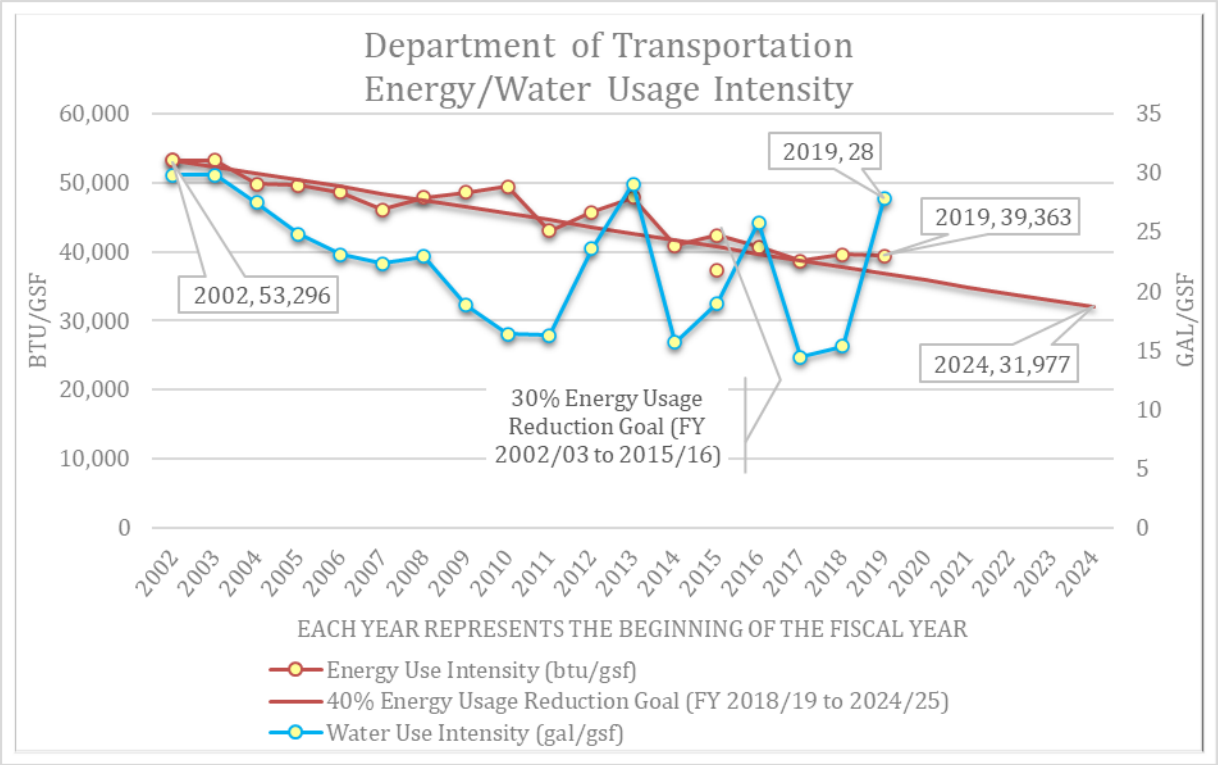


Table 7: DOT Progress

Metric	Fiscal Year 2002-03	Fiscal Year 2019-20	% Change
Total Gross Square Feet	8,767,728	9,376,737	+7%
Total Utility Cost	$9,323,222	$10,771,348	+16%
Energy Usage (Btu/gsf)	53,296	39,363	-26%
Energy Cost ($/MMBtu)	$17.02	$23.17	+36%
Water Usage (gal/gsf)	30	28	-7%
Water Cost ($/kgal)	$5.24	$8.51	+62%

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 owned by the DOA and is located at 501 North Wilmington Street Raleigh, NC, 27604. Construction for the main office began in 1986 and completed in 1992 due to the need for increased space to serve the needs of North Carolina's taxpayers efficiently. The DOR also occupies thirteen remote offices across the State that are housed in leased spaces. Matthew King was designated as the energy manager for DOR to meet the requirements of EO 80, Section 8(a), but these energy management duties were applied as an additional requirement to his existing job responsibilities.

The main DOR office currently reports utilities through the DOA and is the only departmental facility required to report utility consumption in accordance with GS §143-64.12 and EO 80, Section 8. The DOR has expressed interest in independently reporting utility consumption for the main office in future years to highlight energy efficiency improvements and cost savings from the FY 2002-03 baseline. However, their efforts to independently contribute to the statutory and EO 80 goals are somewhat limited since building retrofits and capital projects require DOA's approval. Although the limitations exist, the DOR was proactive in requesting and implementing low-cost energy projects for the main office in FY 2019-20 for items such as HVAC efficiency refinements, LED light retrofits, automatic lighting timers, improved staff teleworking policies, training staff to influence consumption behaviors, and promoting the electronic filing of taxes to reduce scanner operating times. The main office also developed a plan to retire aging capital equipment with energy-efficient hardware that will assist in making progress towards the statutory and EO 80 goals. For example, as part of planned retirements in FY 2019-20, the DOR replaced outdated "computer room air conditioning units" for the main data center. The new units were incorporated as part of a broad digital network that dynamically adjusts the cooling speed, air flow, and operational time to efficiently control the climate for sensitive server equipment.

Discussions with the owners of leased properties were completed in June 2020 to plan for infrastructure improvements. The discussions proposed items such as considering requiring ZEV charging stations for new construction, conducting energy audits, planning for efficiency improvements, and installing motion-activated lighting in individual office spaces. For future leased properties, the DOR continues to work with the State Property Office to update advertisement specifications that will require a minimum baseline of sustainable and energy-efficient features.

Since the DOR reports utilities through the DOA, there are no agency-specific utility tables to include in this update. The USI program anticipates that the DOR will provide agency-specific data for inclusion into the next annual report.

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 for many years that has had 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.

While many agencies see water usage as only a small percentage of overall utility costs, DPS sees water costs that are almost the same as what is paid for electricity. In this year's annual consumption report that difference is about $100,000 for a $50-million-dollar utility budget. For this reason, the DPS focus must be equally shared between energy and water reductions. Over the years DPS has made great strides to reduce energy intensity to their current -30% reduction level from their 2002-03 baseline. DPS can actually boast of over $215 million dollars of avoided costs due to the energy conservation efforts undertaken to date. Moreover, DPS is leading all State agencies and all of the UNC System with the exception of UNC Chapel Hill in avoided costs since the 2002-03 baseline was established. During this same time DPS has added over five million gross- square feet to the portfolio. DPS makes up over 50% of all the State agency utility spend and under Paul's leadership has made DPS a vocal leader with the other agencies.

Over the past year USI was asked to put together projections for all the cabinet agencies to see what each agency needed to do to reach help achieve the EO 80. DPS provided an extensive list of energy projects that if funded would move DPS to contribute towards the collective state buildings goal. The total cost of those potential projects was over $83 million dollars and of that only $6.4 million was actually funded, which leaves over $76 million dollars that DPS needs to get achieve the intended reductions in energy usage. Some of these projects include a continued move to LED for both interior and exterior lighting. While LED lights has energy savings, in the correctional facility environment, safety of the inmates and staff are a bigger concern. Over the years, a number of Building Management Systems (BMS) have been installed and work is underway to upgrade the network backbone of those systems to allow for more integration with newer technology. As mentioned, water is a key cost that can be controlled and so DPS continues to deploy staff to investigate any potential water leak to prevent lost expenses.

The energy management program within DPS is helped by the Capturis data collection system which is a third-party provided service. This Capturis system is able to flag bills which allows DPS to be proactive in addressing billing and consumption issues before the bills are paid. When water costs are half of your annual budget, the importance of catching a water leak early cannot be ignored. DPS is able to use the Capturis system to create charts and graphs that all energy managers need to determine building performance and other key performance indicators. DPS has also used several of Duke Energy's programs to help move forward by utilizing the lighting rebate program in smaller facilities and by opting out in other larger facilities. By opting out, DPS has captured their bill savings and utilized those funds to control the types of energy projects completed annually.

Figure 10: DPS EUI

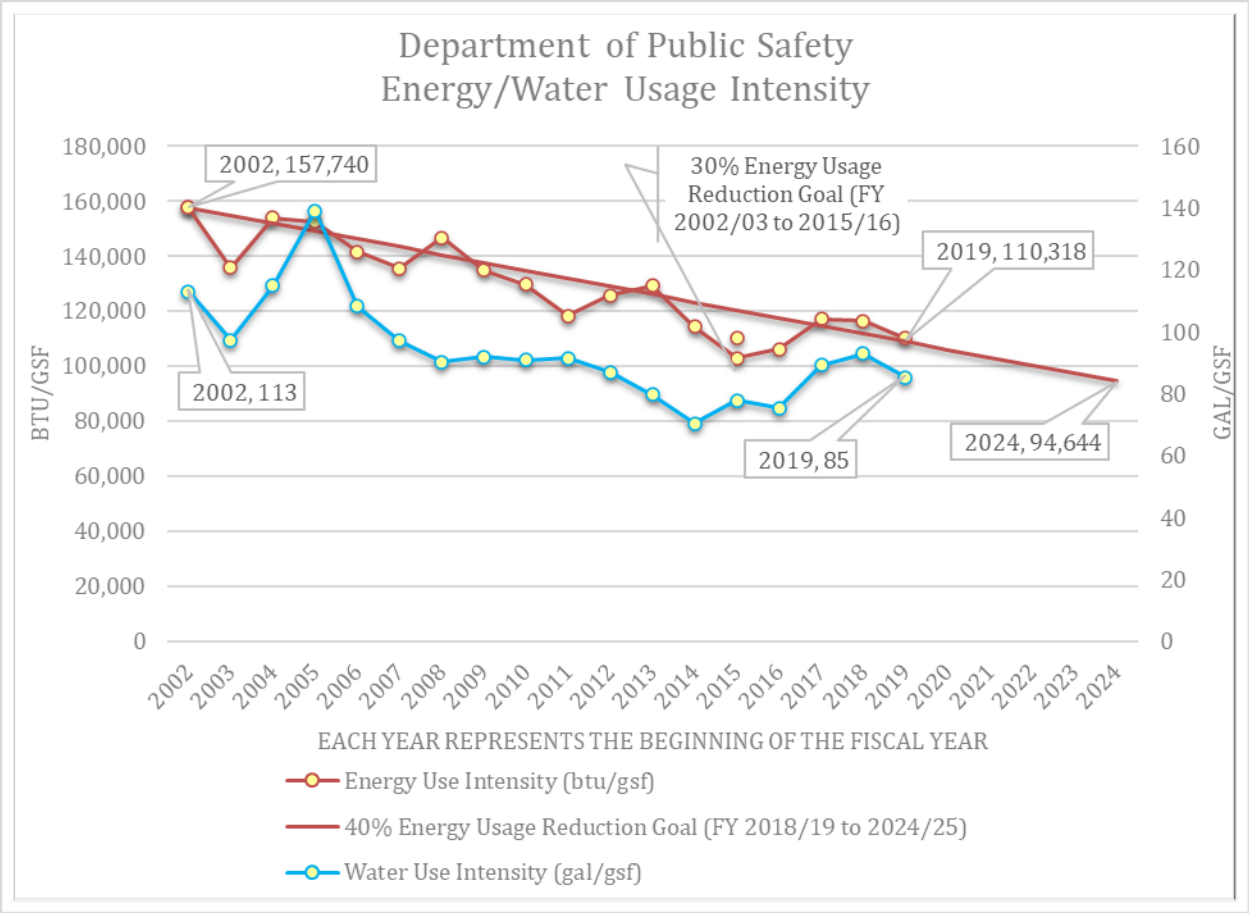


Table 8: DPS Progress

Metric	Fiscal Year 2002-03	Fiscal Year 2019-20	% Change
Total Gross Square Feet	11,581,135	18,090,092	+56%
Total Utility Cost	$32,284,715	$49,887,113	+55%
Energy Usage (Btu/gsf)	157,740	110,318	-30%
Energy Cost ($/MMBtu)	$12.43	$14.37	+16%
Water Usage (gal/gsf)	113	85	-24%
Water Cost ($/kgal)	$7.31	$13.73	+88%

Voluntary EUI Reduction Progress for Council of State Agencies

Per EO 80, 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 the Cabinet Agencies, other Council of State agencies are strongly encouraged to adopt the same goal. These Council of 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. As such, they collectively experienced an unfortunate +7% increase in energy usage since the FY 2002-03 baseline. This equates to an +85% increase in energy costs. Water usage in gallons per gross square feet has improved with a -47% reduction since FY 2002-03 although water costs per thousand gallons have risen +370%.

Table 9: Other Agencies Cost & Consumption Details

Metric	Fiscal Year 2002-03	Fiscal Year 2019-20	% Change
Total Gross Square Feet	3,912,815	4,754,471	+22%
Total Utility Cost	$3,391,431	$6,287,080	+85%
Energy Usage (Btu/gsf)	52,089	55,599	+7%
Energy Cost ($/MMBtu)	$14.75	$19.39	+31%
Water Usage (gal/gsf)	28	15	-47%
Water Cost ($/kgal)	$3.51	$16.49	+370%

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.

NCDA&CS is currently at a -24% energy usage increase from their 2002-03 baseline. That is exactly opposite the EUI reduction mandated by EO 80 and GS §143-64.12. In one year, they are in fact +19% higher than their energy intensity from the previous fiscal year. That is most definitely a trend in the wrong direction and requires immediate attention to get back on a reduction path. Previously, in 2016, the agency switched to a utility collection service and saw a significant decrease in utility consumption from the prior year. The decrease may have been partially due to more accurate data collection, but all that achievement has now been reversed. In fact, the agency is currently at a higher energy usage intensity than ever since establishment of their 2002-03 baseline. Major changes must be taken if this trend is to be stopped.

The Department proposes the following energy/water savings projects for the future: online training for staff and completion of the new Agricultural Science Building (which will replace five separate labs. The new Agricultural Science Building is being constructed to meet the North Carolina Energy Conservation Code, which has more stringent energy efficiency standards than the buildings being replaced.

Figure 11: NCDA&CS EUI

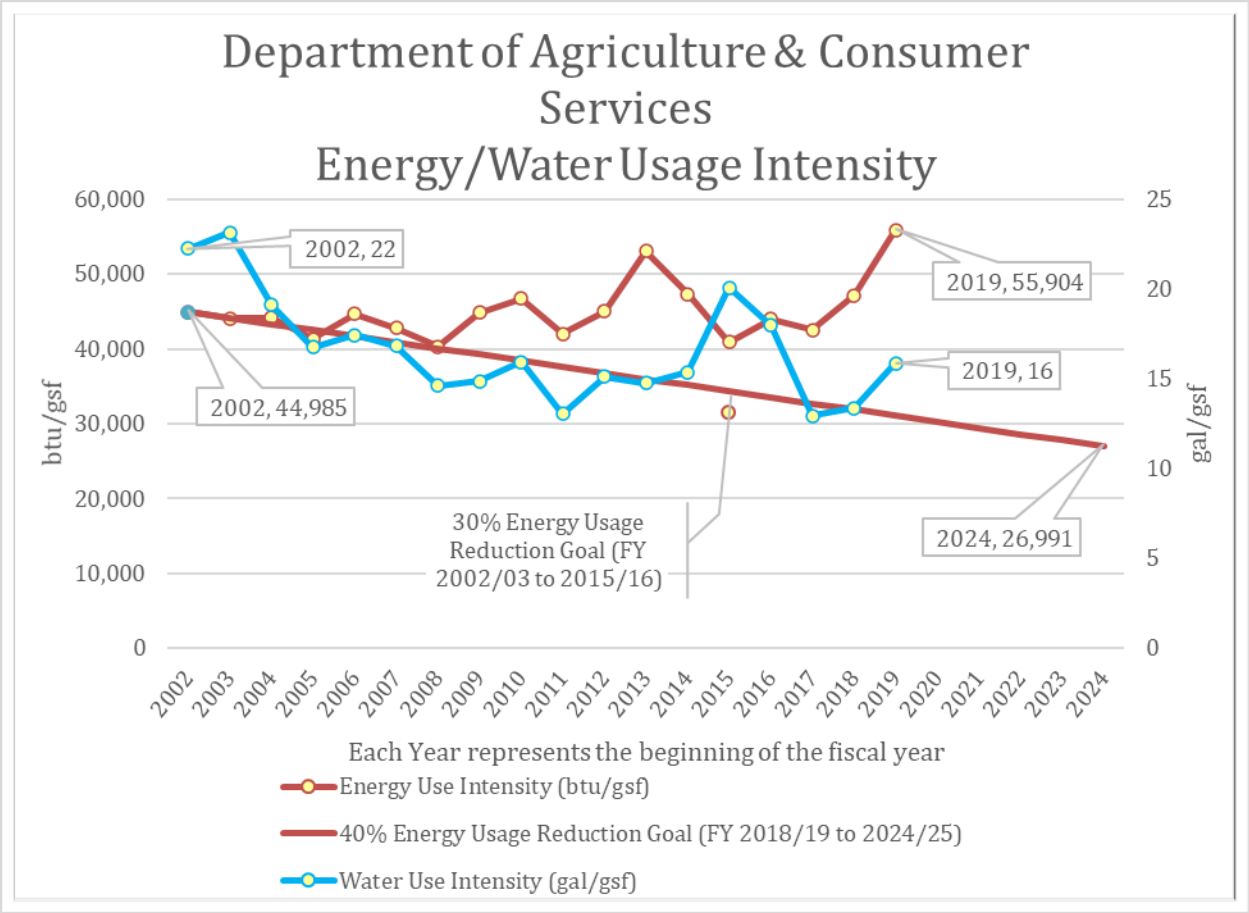


Table 10: NCDA&CS Utility Progress

Metric	Fiscal Year 2002-03	Fiscal Year 2019-20	% Change
Total Gross Square Feet	2,995,262	3,448,451	+15%
Total Utility Cost	$2,374,024	$3,607,887	+94%
Energy Usage (Btu/gsf)	44,985	55,904	+24%
Energy Cost ($/MMBtu)	$15.41	$18.71	+21%
Water Usage (gal/gsf)	22	16	-29%
Water Cost ($/kgal)	$4.47	$18.21	+308%

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 south of Raleigh and Edneyville south of Asheville 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.

With the work that NCJA does at the academies, using the normal BTUs/sqft standard that most State owned facilities use is not valid because this matrix does not provide the necessary feedback needed to assess energy efficiency. These academies are more like hotels where LEOs come to stay for a few hours to a few days to a week for training. By comparing nights stayed to utility costs, provides both academies the ability to see monthly how well energy is being used on campus. In a normal year, there are about 50,000 nights spent on both campuses with an average energy cost of about $10.00 per night per student. The energy manager for NCJA is Gary Royal. Mr. Royal primary role is Director of Operations.

Currently, Justice West has reduced energy intensity by -23%. Justice West was at a -29% reduction prior to the construction of the new Western Crime Lab that began in 2017. The Western Crime Lab created a +20% increase in cost and is an energy intensive building. Since the opening, Maurice Johnson, HVAC Supervisor, has identified and corrected a number of issues that helped decrease costs at the Crime Lab. He is responsible for reductions in propane and electricity costs totaling more than $54,000 in the past couple of years. The Eastern Justice Academy has reduced energy intensity by -25%. During the past year, Justice East has been remodeling of the largest and oldest resident hall on campus Building C. Mr. Royal stated that once this work is completed, he hopes funds are available to being on Building B. Anticipation of significant energy savings after completion of both are expected. USI has provided help with identification and photometrics to enhance the lighting of three firing ranges at Salemburg. NCJA uses automated HVAC controls in most buildings, and all new construction or renovation include controls to improve efficiency. NCJA continues to install new efficient equipment and systems and is committed to identifying and implementing more energy-saving measures.

Figure 12: DOJ EUI

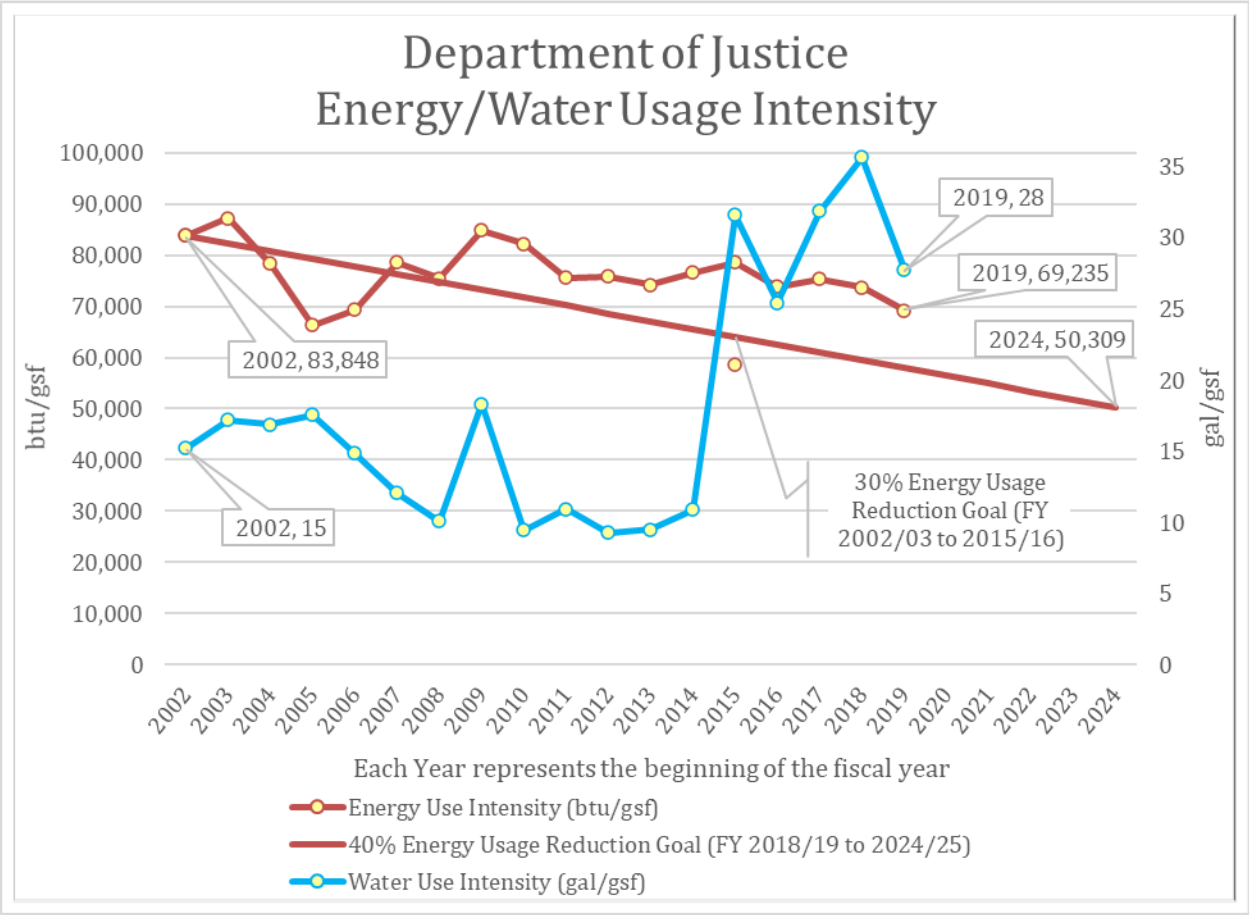


Table 11: DOJ Progress

Metric	Fiscal Year 2002-03	Fiscal Year 2019-20	% Change
Total Gross Square Feet	204,206	298,220	+46%
Total Utility Cost	$269,833	$509,067	+89%
Energy Usage (Btu/gsf)	83,848	69,235	-17%
Energy Cost ($/MMBtu)	$15.09	$21.25	+41%
Water Usage (gal/gsf)	15	28	+83%
Water Cost ($/kgal)	$3.71	$8.49	+129%

Department of Public Instruction (DPI)

The DPI implements the State's laws, 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. Jonathan Jones is assigned as the primary departmental energy manager for the DPI; however, Jonathan Long, Joshua Burris, and William Putman assist in covering the DPI's diverse geographic area. It is important to note that their energy management duties were applied as an additional requirement to their existing job responsibilities.

Except for the Eastern School of the Deaf, Western School of the Deaf, and the NCCAT, all business operations are housed in properties owned by the DOA, DHHS, or are leased. As such, only three DPI-owned facilities are required to report utility consumption in accordance with GS §143-64.12 and EO 80, Section 8. Upon receiving an annual notice of impending reporting deadlines by the USI program, DPI inquired for technical assistance regarding utility consumption data and creating an Agency Utility Management Plan. As a result, the USI program provided an urgent specialized training to update the DPI's staff of the statutory requirements and strongly encouraged meeting the executive directive's goals. The training concluded that DPI needed assistance with creating their first official Agency Utility Management Plan in addition to identifying buildings that should report utility data. Due to time constraints, the USI program was unable to assist with creating an Agency Utility Management Plan for inclusion in this report; however, one will be submitted by September 1, 2021. DPI expressed great interest in complying with the statutory requirements as well as adhering to the executive directive for the next reporting cycle.

FY 2019-20 is the first reporting cycle that the NCCAT provided utility consumption and gross square footage data. As a result, the previously unreported facilities in Cullowhee and Ocracoke Island have no baseline utility data. These facilities increased the overall reported area of the DPI by approximately 106,000 gross square feet. To prevent skewing overall DPI data trends, the USI program utilized the FY 2019-20 NCCAT data as the temporary baseline for the Cullowhee and Ocracoke Island facilities. The NCCAT plans on producing historical NCCAT data in future updates since they obtained the USI training and know what to report. It is important to note that all other DPI-owned facilities have a FY 2002-03 baseline for utilities and gross square footage.

Table 12 provides a breakdown of the DPI's overall progress for six metrics compared to the FY 2002-03 baseline. As shown, gross square footage, Btu per gross square foot, and the total gallons of water per gross square foot decreased by -7%, -33%, and -83%, respectively. These reductions are contrary to the increase in utility costs, cost per million Btu, and the cost of water per thousand gallons by +0.4%, +63%, and +431%, respectively. Both the Eastern and Western Schools for the

Deaf have expressed interest in GESC's as a method to increase energy efficiency, but they have not released a Request for Proposal. The DPI is cognizant of the need to strive for further reductions in Btu's per gross square foot from the FY 2002-03 baseline by 2025. However, due to budgetary constraints, they have only committed to low-cost measures to increase efficiency in future years.

Figure 13: DPI EUI

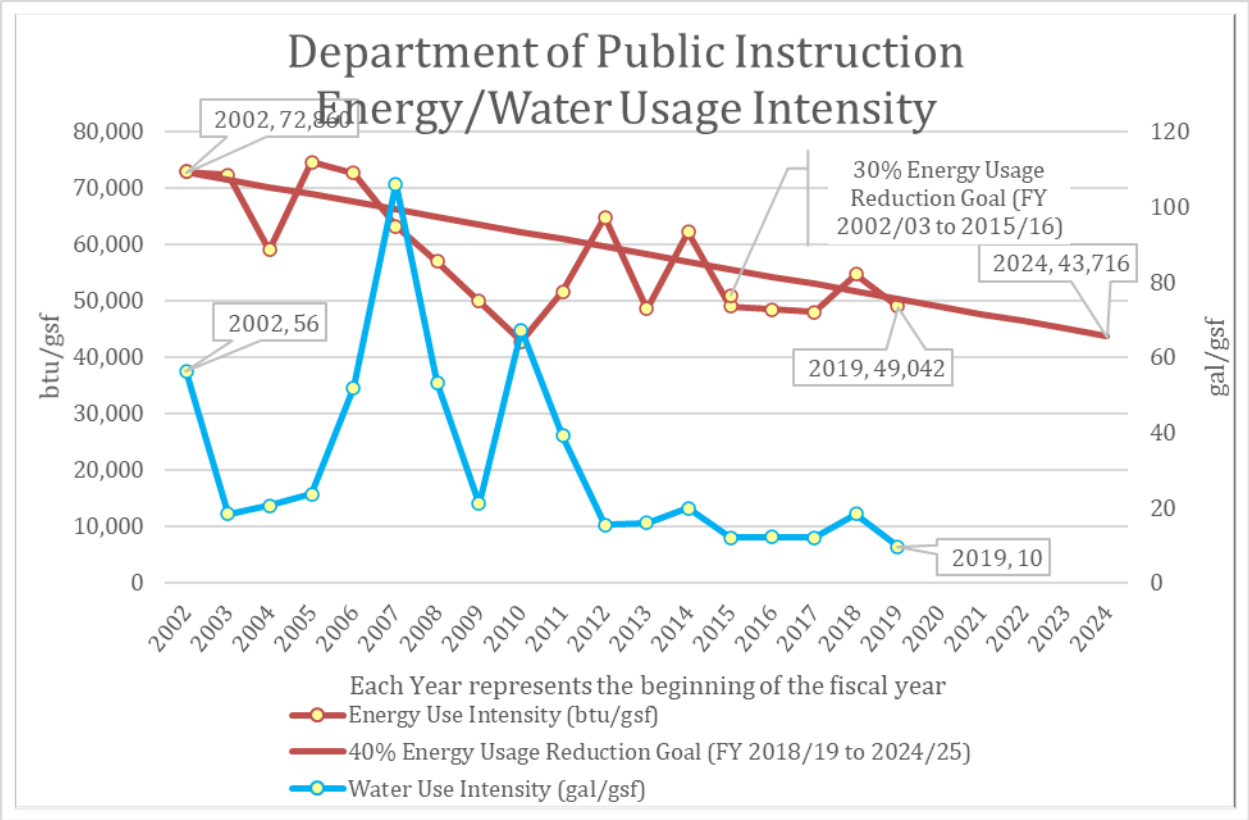


Table 12: DPI Progress

Metric	Fiscal Year 2002-03	Fiscal Year 2019-20	% Change
Total Gross Square Feet	713,347	663,259	-7%
Total Utility Cost	$747,574	$750,228	+0.4%
Energy Usage (Btu/gsf)	72,860	49,042	-33%
Energy Cost ($/MMBtu)	$12.91	$21.10	+63%
Water Usage (gal/gsf)	56	10	-83%
Water Cost ($/kgal)	$1.90	$10.08	+431%

Wildlife Resources Commission (WRC)

The N.C. 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.

WRC has achieved a -21% EUI reduction since FY 2002-03 but has lost gains since last year's -33% EUI reduction. Energy usage trends show a steady increase in energy usage, which should be investigated to determine the cause.

The purpose of the Wildlife Resources Commission Strategic Energy Plan is to make the staff aware that energy is a controllable expense and the need to reduce the EUI. Key elements of the plan include education, utility data measurement, energy audits, and energy/water efficiency projects. Education and engagement of faculty, staff, and students in energy and water conservation are to be accomplished through presentations, emails, handouts, etc. Utility data is quarterly reviewed for trends and costs. Energy audits are regularly conducted to identify opportunities for conservation. By executing physical plant equipment projects, process improvements, and efficient vehicle purchases, the net usage of energy and water should decrease. The plan includes applying sustainable building practices in all major facility construction/renovation projects and operating/maintaining buildings in accordance with the U.S. Green Building/LEED standards to the highest level practical.

WRC has proposed actions to improve energy and water efficiency/usage. Education of staff about the energy efficient designs and features within the Wildlife Headquarters will improve staff behaviors regarding utility usage. Utility bill data will be reviewed to evaluate trends and to ensure the best rates from service providers. Staff will survey depots, hatcheries, and education centers for potential energy savings opportunities. WRC plans to refit some wildlife sites with occupancy sensors, compact fluorescent bulbs, and programmable thermostats.

Figure 14: WRC EUI

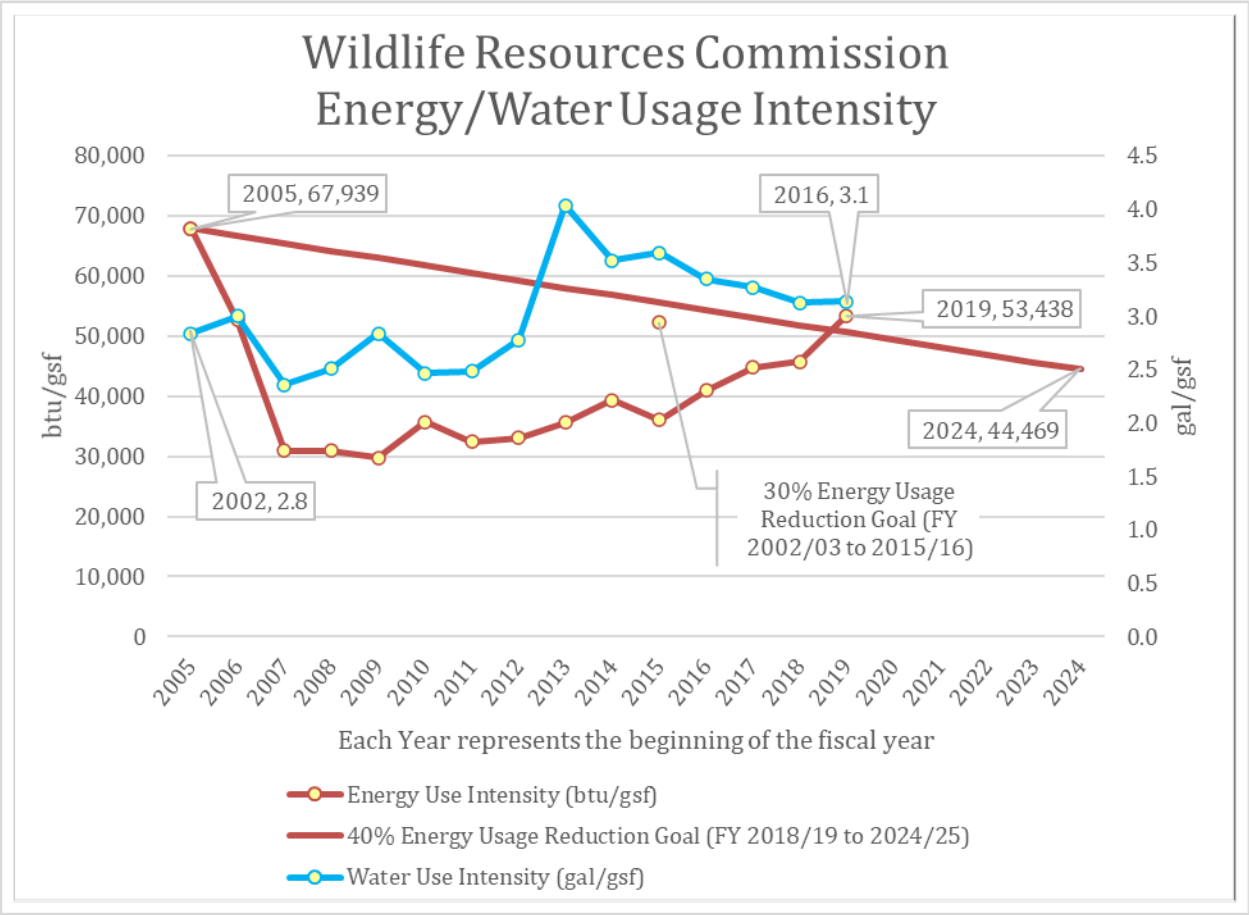


Table 13: WRC Progress

Metric	Fiscal Year 2002-03	Fiscal Year 2019-20	% Change
Total Gross Square Feet	161,093	344,541	+114%
Total Utility Cost	$222,601	$422,585	+90%
Energy Usage (Btu/gsf)	67,939	53,438	-21%
Energy Cost ($/MMBtu)	$20.00	$21.29	+6%
Water Usage (gal/gsf)	2.8	3.1	+10%
Water Cost ($/kgal)	$8 .18	$28.26	+245%

UNC System Universities & Community Colleges Voluntary EUI Reduction Progress

UNC System

In 2011-12, a discussion started at Appalachian State to put together an Energy Summit for UNC System members to talk about EUI reduction 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 and stimulate the NC economy, position our colleagues to be national leaders, and to create a culture of environmental and economic sustainability.

The UNC System and the Affiliates continue to work hard to be at the forefront when the State Energy Office talks about success in energy efficiency. With the encouragement of EO 80, the UNC System has taken on the challenge to reduce BTUs/sqft by 40%. This goal was already being discussed and some of the UNC System were pushing towards this goal without EO 80. While the EO 80 goal is to be achieved by 2025, this year's 2019-20 annual consumption reports for all the UNC System shows that the UNC System has hit the 40% reduction goal a full 5 years ahead of schedule. Simultaneously, the UNC System has reached another goal of over $1.3 billion in avoided costs from 2002-03 to 2019-20. Even more remarkable is the fact that over the last six years the annual spend for utilities has come down while at the same time the UNC System has added over three million additional square feet to campuses across the State and enrollment has increased almost +10%. The UNC System has attained these goals while continuing to add new faculty, staff, students, and facilities. During the 2019-20 fiscal year, the UNC System added more than one million gross square feet of facilities. By the UNC System making energy improvements early on, continuing to make improvements, and building better buildings, they are able to handle events that cause utility bills to fluctuate like changes in weather, occupancy, hours of operation, rate increases and the like. Their energy work has helped the effects of these events become less severe on their overall utility consumption. Most importantly, the UNC System can demonstrate how well their energy program is working as they continue to grow.

Through the Summit, the UNC System has learned that knowledge of energy and how to save energy is to be shared and not held exclusively. They have worked to break down the silos that exist not only on each campus but across the system to communicate and to guide others to be more efficient. USI continues to use the UNC System as the model for energy efficiency. When asked, the UNC System is always ready to educate and help others. USI has provided some technical assistance and collected the data, but these are UNC System accomplishments.

Figure 15: UNC System EUI

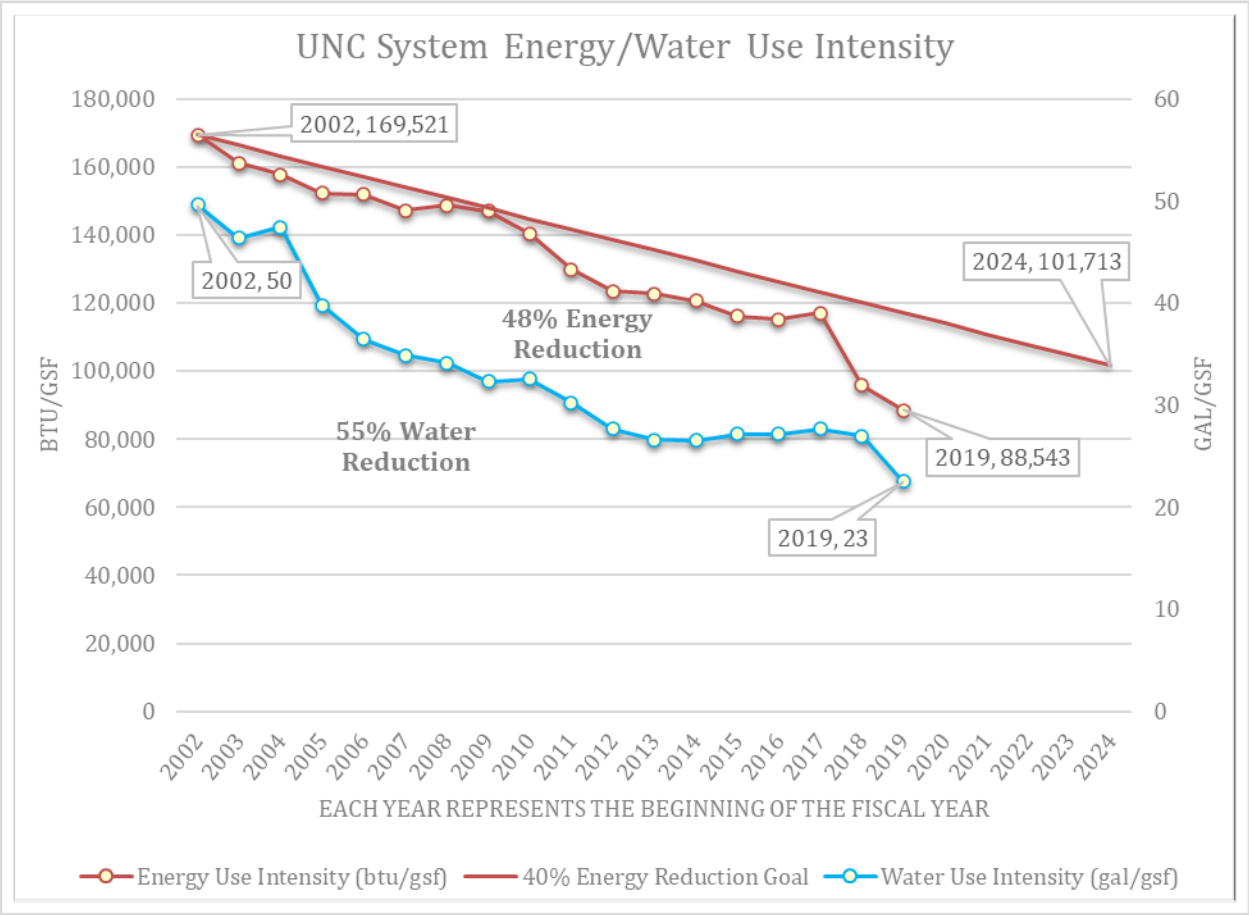
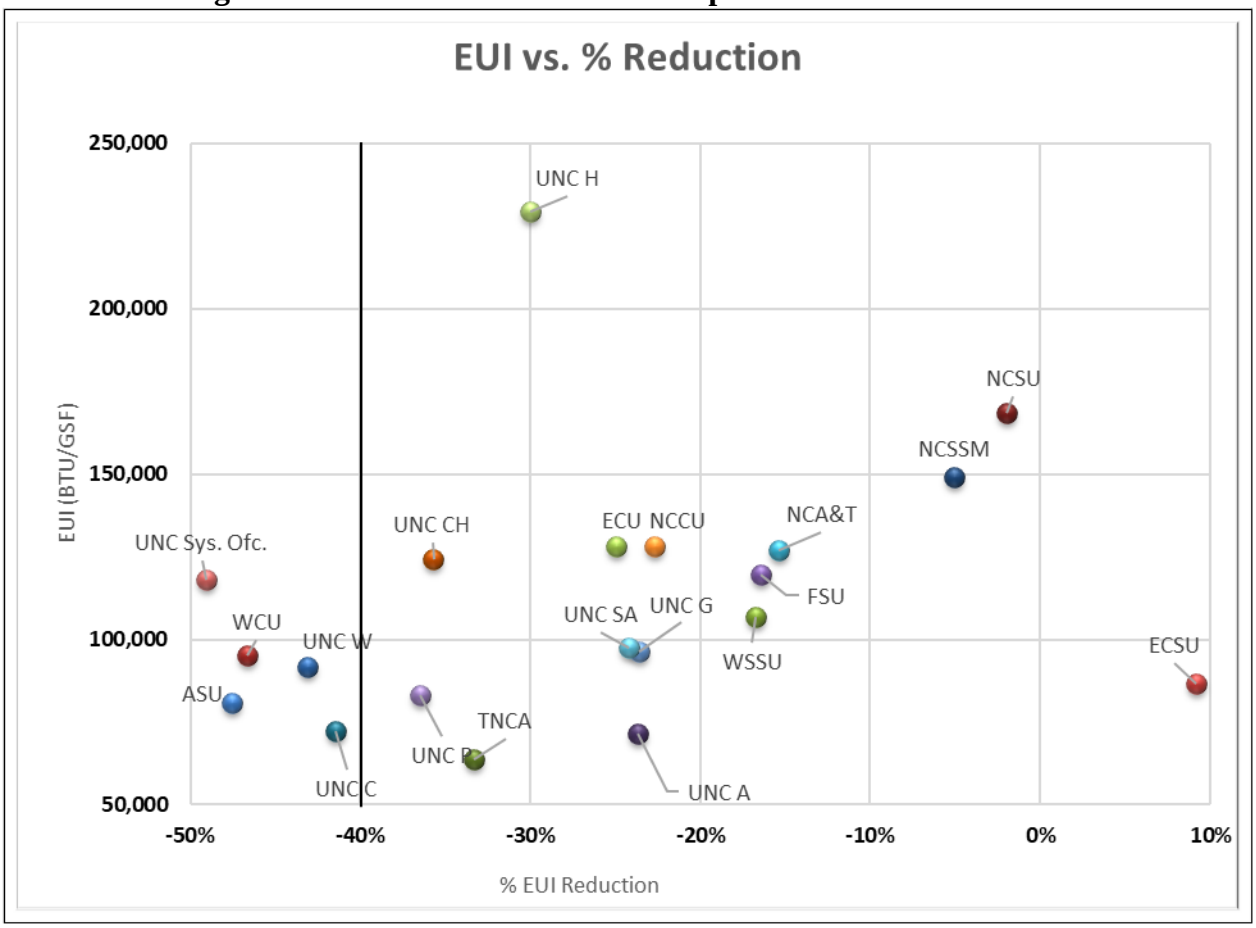


Table 14: UNC System Cost & Consumption Details

Metric	Fiscal Year 2002-03	Fiscal Year 2019-20	% Change
Total Gross Square Feet	55,853,886	89,570,770	+60%
Total Utility Cost	$133,416,627	$211,485,362	+59%
Energy Usage (Btu/gsf)	169,521	88,543	-48%
Energy Cost ($/MMBtu)	$12.98	$23.87	+64%
Water Usage (gal/gsf)	50	23	-55%
Water Cost ($/kgal)	$3.79	$10.98	+189%

Figure 16 provides a graph denoting where each UNC Affiliate is in achieving an individual reduction goal. While the 40% goal is not an EO 80 mandated goal for the UNC System, the goal was created and agreed upon as part of the Appalachian Energy Summit.

Figure 16: FY 2019-20 UNC EUI Compared to the % Reduction



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.

Figure 17: Community College EUI

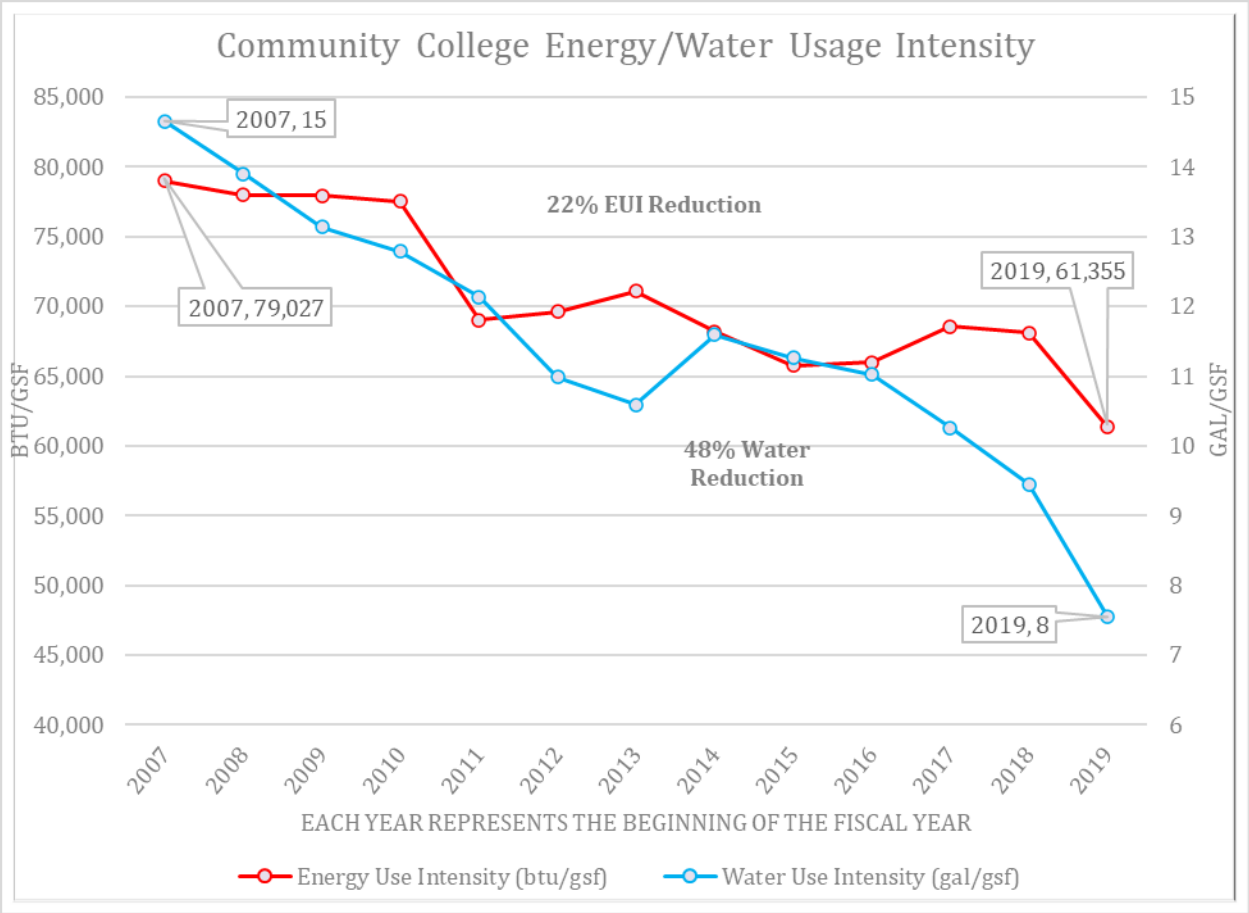


Table 15: Community Colleges Cost and Consumption Details

Metric	Fiscal Year 2007-08	Fiscal Year 2019-20	% Change
Total Gross Square Feet	22,792,520	31,113,588	+37%
Total Utility Cost	$37,189,830	$41,847,502	+13%
Energy Usage (Btu/gsf)	79,027	61,355	-22%
Energy Cost ($/MMBtu)	$19.18	$19.91	+4%
Water Usage (gal/gsf)	15	8	-48%
Water Cost ($/kgal)	$7.93	$16.31	+106%

Appendix B

Agency Utility Management Plans

Table of Contents

NORTH CAROLINA
DEPARTMENT OF ADMINISTRATION
ENERGY USAGE REPORT 2019-20

Prepared By: Design & Consulting Services Section
State Construction Office

PURPOSE

The Department of Administration (DOA) reports energy and water usage annually and includes the figures in the Energy Management Plan. Reporting originally was done annually in accordance with the requirements of GS 143-64.12. It also addresses reporting requirements of EO-80, dated October 29, 2018. The baseline year is FY 2002-03.

OVERVIEW

For last year's report, DOA, in response to requests from DEQ, reviewed and revised the Gross Square Footage (GSF) figures used for energy reporting. DOA is assigned most of the State buildings in the Raleigh Downtown Government Campus and DOA Facility Management is responsible for operating and maintaining these 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. These plants provide chilled water and steam to many of the DOA buildings and a few buildings that are being reported to the Energy Office by other state agencies. This report continues to focus primarily on the Downtown Complex, using the baseline revised for the 2018-19 report.

Revised baseline: Previous reporting included additional buildings. The table below shows the revised baseline. For additional information, refer to notes on DOA energy reporting; parking decks; and, buildings.

FY	Energy + Water Cost ($)	Total Energy Cost ($)	Total Energy Usage (Btu)	Total Water + Sewer Cost ($)	Total water Usage (mgal)	Total Building Area (gsf)	Energy Tracking Measure (Btu/gsf)	Energy Reduction from Baseline (%)
2002-03	$8,621,411	$8,621,411	696,827,809,264	Not Available	Not Available	4,659,040	149,565	NA
Revised 2002-03	$7,894,926	$7,894,926	473,446,975,544	Not Available	Not Available	3,653,063	129,603	NA

CURRENT ENERGY PERFORMANCE

The table below identifies the DOA baseline energy usage of 2002-03 (revised) and the present energy usage for 2018-19, and 2019-20.

FY	Energy + Water Cost ($)	Total Energy Cost ($)	Total Energy Usage (Btu)	Total Water + Sewer Cost ($)	Total water Usage (mgal)	Total Building Area (gsf)	Energy Tracking Measure (Btu/gsf)	Energy Reduction from Baseline (%)
Revised 2002-03	$7,894,926	$7,894,926	473,446,975,544	Not Available	Not Available	3,653,063	129,603	NA
2018-19	$7,559,514	$7,060,624	460,262,263,776	$498,890	39,611	4,084,314	112,718	-13.0%
2019-20	$6,553,802	$6,024,098	446,307,164,846	$529,704	45,140	4,084,314	109,273	-15.7%

Based upon baseline data reported in FY2002-03, DOA is reporting an Energy Reduction of 15.7%. Water reporting has been erratic and as such, the baseline was not reported. DOA did report water usage for FY 2018-19 and FY2019-20.

DOA Energy Reporting:

The Baseline and subsequent reporting of energy data has been dependent in large part on a database and reporting tool that is fraught with errors. The database tool includes report generation that is now known to generate reports that include corrupted data. Some reports drop individual monthly data that is contained in the database. The database was originally designed as a DOS-based system and does not meet the current IT standards. DOA will not renew the contract for this system. A task group is reviewing options for a replacement that meeting IT standards and provides accurate reporting capabilities. This energy usage report is based on energy billing and usage data available, with acknowledgement that it contains incomplete data due to the limitations of the energy database tool in use.

Parking Decks:

In 2018 and 2019, DEQ questioned the square footage reported by DOA. In large part, the question was the inclusion of parking decks in the energy reporting. In 2019, efforts were made to reconcile the square footage and baseline figures. Parking deck square footage is not included in the energy usage reporting.

Parking Deck 65 is attached to five (5) Downtown Government Complex buildings: Archdale Building; Dobbs Building; New Revenue Building; New Education Building; and Legislative Office Building (LOB). Parking Deck 65 does not have its own electrical service or electrical meter. It was built in phases, as the buildings around Halifax Mall were built. There is no practical way to segregate the electrical usage of the parking deck from the surrounding buildings. The parking deck energy usage includes lighting and exhaust fans for ventilation. In addition, automatic roll-up doors add to the electrical load.

Parking Deck 77 was built as part of the Green Square project. The square footage increased with the addition of Nature Resource Center (NRC), DENR/DEQ Office Building, and Parking Deck 77. An effort has been made to be more transparent about the buildings and square footage included in the report.

Parking Deck 17 sits below the Museum of History. Notes on the energy reporting template indicated that Museum of History included 301,000 GSF for parking deck. The Museum of History is being reported as 190,099 GSF, as reflected in the State Property Office (SPO) database. This does not include additional square footage for Parking Deck 17.

The billing and meter data is stored in a database that has a web interface for extracting or reporting data. The software package, Willowtec, was one of the early tools used in State Government for energy reporting. In 2001-02 it was considered by some ahead of its time; however, it falls short of meeting even its initial intent. The constraints associated with the program are clear indications it is not adequate for the energy management needs of DOA. Review of the data in the database reveal that it contains some discrepancies. DOA is researching other options that are better suited to meet its utility metering and billing data management and reporting needs. Available options can help DOA make better use of the data as a management tool, as well as providing a tool for reporting to meet the reporting requirements of EO-80. Available information indicates that DOA is opted-in for the energy efficiency rider charged by the electric utility, without making full use of the energy efficiency resources funded by this rider. DOA is exploring other energy data management tools. Opting out of the energy efficiency rider may provide some funding to go toward the new energy data tool.

Buildings included in the Willowtec database include buildings that are not DOA buildings. Efforts were made to reconcile GSF figures, as well as identify the groups of buildings that are included. The SPO data was used to identify buildings, agency, square footage, and construction year.

Buildings (Background and Notes):

The revised baseline includes only the DOA owned and operated buildings in the Downtown Government Complex.

Legislative Building (LB) and Legislative Office Building (LOB) do not fall under DOA and are not included in the DOA square footage. The steam and chilled water supplied to LB and LOB are included in the energy report. Steam and chilled water supplied by the central plants to LB and LOB have not been separately metered. SPO lists the size of the buildings as 165,786 GSF and 166,144 GSF, respectively.

Highway Building, Former Art Museum, and Olivia Raney Building, all located in downtown Raleigh, are Department of Transportation (DOT) maintained and operated, and are not included in the DOA reporting.

Department of Military and Veteran Affairs (DMVA) is now a separate department. Prior to being named a department, it was a division within DOA. Currently the only building that falls under DOA is the Seaboard Building, owned and operated by DOA, and occupied by DMVA.

Garner Road Complex – Department of Public Safety – State Highway Patrol – Garner Road.

Motor Fleet and Textbook Warehouse are outside of the Downtown Government Complex. These buildings are located on Blue Ridge Road.

Federal Surplus – The Federal Surplus Warehouse is listed by the SPO database as a total of 70,418 GSF. It is not included in the DOA Downtown Government Complex and is not included in the report.

State Surplus Warehouse is listed by the SPO database as 41,164 GSF. It is not included in the DOA Downtown Government Complex and is not included in the report.

North Carolina Museum of Art – Located on Blue Ridge Road and listed by SPO as Department of Natural and Cultural Resources (DNCR).

State Public Health Lab, constructed 2012, is a Department of Health and Human Services (DHHS) building.

State Crime Lab - Listed by SPO as Attorney General-Justice.

For Natural Gas cost and usage, the database does not include complete information. Several of the smaller buildings have cost data, but do not quantify units of natural gas consumption in therms. Estimates were calculated to express energy in therms, so as to be able to report total btus.

Utility Management Plan

FY 2020 – FY 2021

Executive Order No. 80 Update

North Carolina Department of Environmental Quality

NCDEQ, 217 West Jones Street, Raleigh, NC 27603
Phone 877-623-6748; https://deq.nc.gov/

November 2020

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The North Carolina Department of Environmental Quality (DEQ) is the lead stewardship agency for the protection of North Carolina's environmental resources. The DEQ reaches far and wide with 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 Department of Administration or in leased buildings which are not included in the DEQ utility data. Only the State-owned facilities currently managed by DEQ are measured and tracked for the DEQ utility data. These facilities include the Reedy Creek complex located in Raleigh which is primarily occupied by the Divisions of Air Quality and Water Resources along with the Division of Marine Fisheries (DMF) located in Morehead City. Mr. Eric Turon, based in Raleigh, is the DEQ Facilities Engineering Manager who champions all the energy conservation projects for both Reedy Creek and DMF. That encompasses a total of 99,335 gross square feet (GSF) of facilities and amounts to $424,607 total spent on utilities for fiscal year 2019-20.

The DEQ presents this Utility Management Plan in accordance with Article 3B of General Statute 143, “Conservation of Energy, Water, and Other Utilities in Government Facilities,” which authorizes DEQ to develop a comprehensive program to manage energy, water and other utility use for state government. Each agency is to develop and implement a management plan including strategies to support stated energy reduction goals, and update plans biennially. The first plan was issued Mar. 1, 2019 as mandated by Governor Cooper’s Executive Order No. 80 (EO80), North Carolina’s Commitment to Address Climate Change and Transition to a Clean Energy Economy dated October 29, 2018. This document will serve as the March 1, 2021 update. EO80 Section 8 requires Cabinet agencies to implement strategies to support a new energy consumption reduction goal of 40% by 2025. This goal surpasses the previous goal to reduce energy consumption in state government buildings 30% by 2015 as measured from a fiscal year (FY) 2002-03 baseline.

This updated utility management plan presents the recorded utility data along with strategies to achieve continued success in energy and water management for DEQ state-owned facilities both at Reedy Creek in Raleigh, and the Division of Marine Fisheries in Morehead City. Many DEQ employees work in buildings owned by the Department of Administration, or in leased buildings, which are not included in the utilities scope of this management plan. However, DEQ occupants which are considered tenants in buildings owned or leased by the state can make significant contributions to energy and water savings efforts through awareness and behavior, contributing toward the goals in EO80.

Last year, DEQ assumed responsibilities of the Maintenance Operations for the Reedy Creek complex from DOA. Since that time, DEQ has repaired and replaced a significant amount of equipment that was previously not running nor operable. For that reason, their energy usage has increased slightly from FY 2018-19 to FY 2019-20. However, some significant energy conservation projects have taken place and are planned. These include cool, white roofs, building automation systems, new HVAC systems, LED lighting upgrades, and electric vehicle chargers. Although DEQ is currently only showing a 32% energy reduction from their FY 2010-11 baseline, these projects will enable DEQ to meet the 40% energy reduction by 2025 as required with EO 80. Even though DEQ may reflect a relatively

small footprint as compared to other cabinet agencies, DEQ is making great strides with energy conservation. The next few years should start to show the results of these improvements.

BACKGROUND

Efforts to measure and track energy use and cost in state buildings was highlighted in 2002 with the launch of the state's comprehensive program, the Utility Savings Initiative, pursuant to N.C.G.S. 143-64.10-12. At that time DEQ was known as the Department of Environment and Natural Resources (DENR.) DENR owned a few large buildings and a multitude of small buildings widely distributed across the state and across several divisions, including the NC Zoo, Parks and Recreation, and the NC Aquariums. Due to legislative changes in 2015, DENR was dismantled and now exists separately as the Department of Natural and Cultural Resources (DNCR) and the DEQ. That change effectively reduced DEQ's stock of buildings down to only two facilities. These two current DEQ facilities include the Reedy Creek complex located in Raleigh which is primarily occupied by the Divisions of Air Quality and Water Resources along with the Division of Marine Fisheries (DMF) located in Morehead City. The Reedy Creek Laboratory Complex consists of three buildings constructed in 1991 along with two modular buildings with 54,304 sq. ft. of laboratory and office space. The DMF consists of four State owned facilities totaling 45,031 square feet of office space. The overall total area DEQ comprises is 99,335 gross square feet.

In order to reflect the gross square footage changes and restructuring more accurately, an attempt was made to separate utility and square footage data back to the original FY 2002-03 baseline, but lack of data at the division and building level proved to be an overwhelming task. Therefore, new baselines of FY 2010-11 were established for both DEQ and DNCR. The applicable utility and square footage data were separated and divided between the two agencies according to the relative composition of each agency today. This allows the overall energy reduction of each agency to be reflected and accounted for against a baseline that more closely resembles how each agency is currently structured. Otherwise, the agencies would be trying to achieve energy reductions on square footages that no longer exist and are no longer under their control. All the utility data and calculations within this report reflect the new FY2010-11 baseline.

The DEQ Reedy Creek and DMF facilities are managed by designated "site" energy managers, also serving as Capital Projects Coordinators, who are instrumental in achieving savings through capital improvement and repair projects and maintaining savings in energy and water. These sites report usage and cost annually and update management plans biennially as contributors to this DEQ management plan.

Many DEQ employees work in buildings owned by the Department of Administration or in leased buildings, which are not included in the utility scope of this management plan. However, DEQ occupants who are tenants in buildings owned or leased by the state can still make significant contributions to energy and water savings efforts through awareness and behavior. All DEQ employees can be a part of the statewide effort to save energy and water and to address climate change. Reducing energy consumption translates to a reduction in fossil fuels burned and a decrease in air pollution emitted. Water conservation is also becoming an increasingly important issue particularly during drought conditions.

UTILITY PERFORMANCE

The following tables present the energy, water, and performance data of the current DEQ facilities per GSF of building space for the Reedy Creek and Marine Fisheries locations combined using a baseline year of FY 2010-11. Table 1 shows the total amount spent on each utility along with the utility and energy cost per square feet. Utility costs include water and sewer whereas energy costs only include electricity and fuels. Per this data, electric is by far the major consumer followed by natural gas and water/sewer. Overall spending is reduced from the baseline but has increased over the past couple of years. This can be attributed to the work Reedy Creek has done to reinstate and replace a significant amount of non-operational equipment over the past couple of years.

Table 2 shows the DEQ energy reduction performance annually from the FY10-11 baseline. The EO80 goal is a 40% reduction, and DEQ currently stands at a 32% reduction. Although energy usage has increased over the past couple of years as Reedy Creek has improved and replaced inoperable equipment, the projects currently being installed and proposed should help them to attain the overall 40% reduction by 2025. Also of note is that approximately half of the DEQ space is used for laboratories which normally have a high energy use per square foot of space compared to a typical office. More detailed tables are available in the Appendix.

Table 1: DEQ Utility Cost Details

Fiscal year	Total Utility $	Total Energy $	Electric kwh $	Nat Gas $	Propane $	Water-sewer $	Total Utility $/GSF	Total Energy $/GSF	GSF
10-11	$572,246	$550,833	$428,428	$118,893	$ 3,512	$21,413	$5.42	$5.22	105,527
11-12	$502,132	$480,275	$372,292	$107,974	$ 8	$21,857	$4.76	$4.55	105,527
12-13	$444,867	$419,839	$363,472	$ 54,739	$ 1,628	$25,029	$4.22	$3.98	105,527
13-14	$485,174	$456,367	$384,948	$ 69,258	$ 2,161	$28,808	$4.60	$4.32	105,527
14-15	$470,151	$437,491	$370,135	$ 64,109	$ 3,247	$32,600	$4.46	$4.15	105,527
15-16	$393,311	$359,980	$302,288	$ 56,711	$ 981	$33,331	$3.73	$3.41	105,527
16-17	$373,231	$335,429	$277,124	$ 55,860	$ 2,445	$37,802	$3.54	$3.18	105,527
17-18	$341,919	$303,618	$236,851	$ 65,822	$ 945	$38,301	$2.82	$2.50	121,397
18-19	$378,914	$338,345	$280,824	$ 56,109	$ 1,411	$40,569	$3.81	$3.41	99,335
19-20	$424,607	$381,711	$283,710	$ 97,180	$ 822	$42,896	$4.27	$3.84	99,335

Table 2: DEQ Energy Reduction Performance

Fiscal year	Total energy Btu	GSF	Energy per GSF Btu/gsf	% Change Energy per GSF
2010-11	31,367,728,948	105,527	297,248	----
2011-12	28,777,710,158	105,527	272,705	-8%
2012-13	23,186,771,944	105,527	219,724	-26%
2013-14	22,477,883,549	105,527	213,006	-28%
2014-15	21,990,790,966	105,527	208,390	-30%
2015-16	22,049,504,628	105,527	208,947	-30%
2016-17	17,766,979,928	105,527	168,364	-43%
2017-18	18,432,835,063	121,397	151,839	-49%
2018-19	18,721,241,491	99,335	188,466	-37%
2019-20	19,992,304,434	99,335	201,261	-32%

DIVISION OF MARINE FISHERIES

The Department of Environmental Quality (DEQ), Division of Marine Fisheries (DMF) consists of four state owned facilities totaling 45,031 square feet located in Carteret County, North Carolina with the main headquarters in Morehead City. DMF shares space with other state agencies at six other locations that are leased facilities throughout the eastern region of the state. None of the leased facilities are included in the utility scope of this management plan. DMF spent a total of $155,532 on utilities for the FY19-20 year.

DMF works closely with DEQ to comply with the overall department Strategic Energy Plan (SEP) and supports the initiative to reduce energy consumption by 40 percent by 2025 as directed by the Governor's Executive Order No. 80. Currently, DMF is trending in the right direction to accomplish the goal but, much depends on whether sufficient Repair and Renovation (R&R) funding is received. The replacing of equipment with more efficient types and renovating with energy conservation measures are a high priority. Educating employees to be more aware of energy savings initiatives is also vital to accomplish our goals. DMF is working with DEQ to secure grants to change out LED lights and to install EV chargers. DMF is currently at an 18% energy reduction from their FY10-11 baseline as shown in Table 3 below.

Table 3: DMF Energy Reduction Performance

Fiscal year	Total energy Btu	GSF	Energy per GSF Btu/gsf	% Change Energy per GSF
2010-11	7,827,451,270	45,031	173,824	----
2011-12	9,210,378,678	45,031	204,534	18%
2012-13	7,997,642,651	45,031	177,603	2%
2013-14	8,442,216,980	45,031	187,476	8%
2014-15	8,269,790,588	45,031	183,647	6%
2015-16	9,674,385,185	45,031	214,838	24%
2016-17	7,772,732,988	45,031	172,608	-1%
2017-18	8,057,443,355	45,031	178,931	3%
2018-19	7,683,608,235	45,031	170,629	-2%
2019-20	6,432,374,826	45,031	142,843	-18%

NC Division of Marine Fisheries Energy Related Projects

DMF Noteworthy Energy Related Projects Already Completed

Project Description	Cost	Funding	Estimated Savings	Completion
HVAC Chiller & Replacement	$ 161,000	R&R	$ 9,500	2014
Elevator Modernization	$ 172,000	R&R	undetermined	2015
Maintenance Building Restrooms Renovation (Emergency Project)	$ 202,596	Special Funds	undetermined	2018
Maintenance Building Roof Replacement	$ 209,000	R&R	undetermined	2019
HVAC Controls System Upgrade and Standby Generator	$ 417,000	R&R	undetermined	2019
Main Building Complex Roof Replacement	$ 463,000	R&R	undetermined	2020

DMF Proposed Energy Related Projects

Project Description	Cost	Funding	Estimated Savings	Completion
Campus LED Lighting Conversion	100000	TBD	undetermined	TBD
Installation of Electric Vehicle Chargers	30000	TBD	undetermined	TBD

Plan of Action

DMF has submitted 10 projects in the six-year plan for 2019-2025 Reserve for Repairs and Renovations (R&R) and 40 percent of those projects will have an impact on energy efficiency. DMF will continue to strive to meet energy reduction goals, but funding for R&R projects is imperative to achieve DMF's goals.

DIVISIONS OF WATER RESOURCES AND AIR QUALITY AT REEDY CREEK LABORATORY

The Reedy Creek Laboratory Complex brings together the analytical capabilities of the Division of Water Resources and the Division of Air Quality. These capabilities include chemical analysis and biological assessment for determinations of environmental quality. The Complex consists of three buildings constructed in 1991 along with two modular buildings with 54,304 sq. ft. of laboratory and office space. These structures experienced numerous problems early on with the roofs of all three buildings requiring replacement within the first ten years. Partly due to the nature of the buildings being laboratories, numerous other problems emerged as the buildings aged. The Chemistry Laboratory was plagued by serious problems with air balance within the building. Energy consumption, particularly natural gas usage, seemed to be high for the size of the buildings. Comfort of the occupants and reliable conditions within the analytical instrument requirements were inferior to what would be expected for a building this age.

A study was done in 2007 to identify the problems and to recommend steps necessary to remedy the situation. Those recommendations were translated into requests for Repair and Renovation (R&R) funding and numerous projects have been taken to improve the occupant comfort, the environment for the analytical instruments, and energy conservation measures for the complex.

In 2012, the HVAC system in the Chemistry Laboratory was renovated, a new chiller was installed serving the whole complex and numerous other measures were taken to improve safety, comfort and energy conservation. The result is a building that can be relied upon to better serve staff and to save energy.

In 2016, the boiler serving the complex was replaced as well as air handling units in the other two buildings. The HVAC controls were not replaced but are part of an additional project that is about to commence. The buildings have reliable heat and cooling, but the coordination of the controls is lacking and extremely important. In May of 2020 DEQ Facilities Services installed analytics software on the existing HVAC system controls to help troubleshoot daily operational issues as well as track energy usage.

In December 2019 DEQ created and staffed a Facilities Services Department to support fully the Lab campus 24/7. Day to day maintenance responsibilities were transferred from DOA Facilities Services (who were service fee based) over to DEQ Facilities Services. All critical infrastructure equipment was put onto a Preventative Maintenance System. Additionally, an electronic asset inventory system was implemented with all equipment assets in the process of being asset tagged and logged into the system. Since December 2019 DEQ Facilities Services has spent over $550,000 on critical infrastructure and equipment repairs to ensure lab operations experience minimal interruption of services. Some of those repairs include:

- Installation of 80 Uninterrupted Power Supplies and Surge Protection Devices on all electronic pieces of lab equipment.
- Replacement of the broken gas main and meter.
- Infra-Red and Arc Flash Analysis on all campus electrical supply system, repairs made as identified in analysis.
- Repairs to campus generator, installation of remote monitoring system.
- Several HVAC repairs.
- Analytic Software installed on HVAC controls system.
- Convert 16 broken parking lot pole lights to LED.
- Replace burned out exterior lighting to LED.

The staff at the Reedy Creek complex is committed to, and takes pride in, working with the DEQ to comply and to exceed the energy reduction goal set out by the Governor in Executive Order No. 80. We are an environmental agency and committed to reduce the environmental impact of our operations as we carry out the mission of the Department. Reedy Creek is currently at a 36% energy reduction from their FY10-11 baseline as shown in Table 4 below. Their total utility spending was $269,074 for FY19-20.

Table 4: Reedy Creek Energy Reduction Performance

Fiscal year	Total energy Btu	GSF	Energy per GSF Btu/gsf	% Change Energy per GSF
2010-11	23,540,277,678	60,496	389,121	----
2011-12	19,567,331,480	60,496	323,448	-17%
2012-13	15,189,129,293	60,496	251,077	-35%
2013-14	14,035,666,569	60,496	232,010	-40%
2014-15	13,721,000,378	60,496	226,808	-42%
2015-16	12,375,119,444	60,496	204,561	-47%
2016-17	9,994,246,940	60,496	165,205	-58%
2017-18	10,375,391,708	76,366	135,864	-65%
2018-19	11,037,633,256	54,304	203,256	-48%
2019-20	13,559,929,608	54,304	249,704	-36%

NC Division of Water Resources and Air Quality-Reedy Creek Labs Projects

Reedy Creek Noteworthy Energy Related Projects Already Completed or In Progress

Project Description	Cost	Funding	Estimated Savings	Completion
HVAC Chiller Replacement & Chemistry Lab Renovations	$ 1,205,973 $ 982,000	ARRA R&R	$ 57,000	2012
Boiler & Air Handler Replacement in DAQ & DWQ Buildings	$ 632,846	R&R	undetermined	2020
HVAC Renovations & DDC Controls - DAQ & DWQ Labs	$ 265,000	R&R	undetermined	Jun-21
HVAC Ductwork & VAV Box Replacements - DAQ & DWQ	$ 496,000	R&R	undetermined	Jun-21
Cooling Tower Replacement & Evaporation Credit Meter	$ 159,000	R&R	undetermined	Dec-21
Glycol Energy Loop Refurbishment - DWQ Building	$ 35,000	R&R	undetermined	2020
Campus Lighting Retrofit from T12 to LED	$ 114,000 $ 46,000	DOE Grant Duke Rebates	$ 20,000	2020
Cool Roof Replacements for buildings 4401 and 4403	$ 567,000	R&R	$ 6,440	Jun-21
Reflective window blinds for entire campus	$ 14,000	Gen. Fund	undetermined	Dec-20

Reedy Creek Proposed Energy Related Projects

Project Description	Cost	Funding	Estimated Savings	Completion
Installation of Electric Vehicle Chargers	$ 30,000	TBD	undetermined	TBD

Plan of Action

The Reedy Creek Lab Complex will continue the efforts already underway to improve the energy efficiency of the buildings in the complex. We will continue to seek new ways to save energy through improvements to the buildings, their operations and their maintenance. The support provided by the Department of Environmental Quality has been and will continue to be critical for the complex to carry out its mission and set an example for environmental stewardship.

DECLARATION OF SUPPORT FOR DEPARTMENT OF ENVIRONMENTAL QUALITY UTILITY MANAGEMENT PLAN

We recognize that:

- Energy and water consumption can be managed to the benefit of our agency.
- Energy and water management is a responsibility of the staff at each facility.

This Agency will implement a Utility Management Plan. Eric Turon, Facilities Engineering Manager, is responsible for the implementation of the Program at this agency.

The attached plan outlines the activities and expenditures required to reduce energy and water consumption to achieve the goals of the program.

The Division staff will review progress and results quarterly and will support staff attendance at training in energy and water management.

Utility Management Plan Mandate- Goals

Agency will reduce annual Total Energy Use Btu per Square Foot by a minimum of 40% by fiscal year 2024-2025 from a baseline fiscal year 2002-2003. We will also continue to track and manage water consumption.

Utility Management Plan Mandate- Measures

Our tracking measures will be the following State Key Performance Indicators (KPI):

- *Total Energy Use Btu per Square Foot*
- *Total Utilities Cost per Square Foot*
- *Total Energy Cost per Square Foot*

I have read and will support the Utility Management Plan for my Organization.

Implemented this 16 day of December, 2020

DocuSigned by:
John A. Nicholson
E784124E10E244F...
Chief Deputy Secretary

DocuSigned by:
Kimberly L. Van Metre
28637E8036744BF...
Chief Financial Officer

DocuSigned by:
Eric Turon
0FF66BADA1A04B9...
Facilities Engineering Manager

Submitted by:

Julie Pfeiffer
Utility Savings Initiative

Appendix of Tables for NCDEQ Utility Management Plan

FY 2020 – FY 2021 Executive Order No. 80 Update

Appendix Table 1: DEQ Buildings Energy Performance All Fuels by Fiscal Year

Fiscal year	Energy Cost per GSF $/gsf	Cost per million Btu of Energy $/mmbtu	% Change Cost per million Btu of Energy	Energy per GSF Btu/gsf	% Change Energy per GSF
2010-11	$ 5.22	$ 17.56		297,243	
2011-12	$ 4.55	$ 16.69	-5%	272,705	-8%
2012-13	$ 3.98	$ 18.11	3%	219,721	-26%
2013-14	$ 4.32	$ 20.30	16%	213,004	-28%
2014-15	$ 4.15	$ 19.89	13%	208,387	-30%
2015-16	$ 3.41	$ 16.33	-7%	208,946	-30%
2016-17	$ 3.18	$ 18.88	8%	168,362	-43%
2017-18	$ 2.50	$ 16.47	-6%	151,839	-49%
2018-19	$ 3.41	$ 18.07	3%	188,464	-37%
2019-20	$ 3.84	$ 19.09	9%	201,261	-32%

This table shows data for DEQ combined sites which includes Reedy Creek and DMF. Energy costs have risen slightly during the last fiscal year which puts the total energy reduction for DEQ at 32% less than their 2010-11 baseline. The EO80 goal is a 40% energy reduction from the baseline.

Appendix Table 2: DEQ Buildings Energy Cost & Usage by Fuel Type

Fiscal year	Total Energy $	Total energy million Btu	Electric kwh	Electric $	Natural Gas therms	Natural Gas $	Propane gals	Propane $
10-11	$550,833	31,367	4,968,293	$ 428,428	142,512	$118,893	1792	$ 3,512
11-12	$480,275	28,778	4,305,027	$ 372,292	140,885	$107,974	5	$ 8
12-13	$419,839	23,187	4,660,789	$ 363,472	72,022	$ 54,739	891	$ 1,628
13-14	$456,367	22,478	4,149,933	$ 384,948	82,629	$ 69,258	603	$ 2,161
14-15	$437,491	21,991	3,945,660	$ 370,135	84,412	$ 64,109	947	$ 3,247
15-16	$359,980	22,049	3,402,930	$ 302,288	104,136	$ 56,711	273	$ 981
16-17	$335,429	17,767	3,184,744	$ 277,124	68,325	$ 55,860	741	$ 2,445

17-18	$303,618	18,433	3,040,599	$ 236,851	80,339	$ 65,822	265	$ 945
18-19	$338,345	18,721	3,418,012	$ 280,824	70,161	$ 56,109	466	$ 1,411
19-20	$381,711	19,992	3,224,230	$ 283,710	89,659	$ 97,180	276	$ 822

This table shows data for DEQ combined sites which includes Reedy Creek and DMF. Energy costs have risen slightly during the last fiscal year with most of that increase occurring in the cost of Natural gas. Actual therms used only rose slightly, but the cost almost doubled.

Appendix Table 3: DEQ Buildings Energy & Water Cost and Indexed by GSF

Fiscal year	Total Utility $	Total Energy $	Water-Sewer $	Total Utility $/GSF	Energy $/GSF	Water $/GSF	GSF
2010-11	$ 572,246	$ 550,833	$ 21,413	$ 5.42	$ 5.22	$ 0.20	105527
2011-12	$ 502,132	$ 480,275	$ 21,857	$ 4.76	$ 4.55	$ 0.21	105527
2012-13	$ 444,867	$ 419,839	$ 25,029	$ 4.22	$ 3.98	$ 0.24	105527
2013-14	$ 485,174	$ 456,367	$ 28,808	$ 4.60	$ 4.32	$ 0.27	105527
2014-15	$ 470,151	$ 437,491	$ 32,660	$ 4.46	$ 4.15	$ 0.31	105527
2015-16	$ 393,311	$ 359,980	$ 33,331	$ 3.73	$ 3.41	$ 0.32	105527
2016-17	$ 373,231	$ 335,429	$ 37,802	$ 3.54	$ 3.18	$ 0.36	105527
2017-18	$ 341,919	$ 303,618	$ 38,301	$ 2.82	$ 2.50	$ 0.32	121,397
2018-19	$ 378,914	$ 338,345	$ 40,569	$ 3.81	$ 3.41	$ 0.41	99,335
2019-20	$ 424,607	$ 381,711	$ 42,896	$ 4.27	$ 3.84	$ 0.43	99,335

This table shows data for DEQ combined sites which includes Reedy Creek and DMF. Energy costs have risen slightly during the last fiscal year, but this shows the increase was not due to significant increases in water/sewer.

Appendix Table 4: DEQ Water Data Cost and Usage

Fiscal year	Water & Sewer Cost $	Total Usage in 1,000 gal (kgal)	Cost per 1,000 gal $/kgal	% Change $/kgal	gal/sf	% Change gal/sf	Water-sewer $/gsf	gsf
2010-11	$ 21,413.00	1,507	$ 14.21		14.28		$ 0.20	105,527
2011-12	$ 21,857.00	1,442	$ 15.16	7%	13.66	-4%	$ 0.21	105,527
2012-13	$ 25,029.00	2,417	$ 10.36	-27%	22.90	60%	$ 0.24	105,527

2013-14	$ 28,808.00	3,114	$ 9.25	-35%	29.51	107%	$ 0.27	105,527
2014-15	$ 32,600.00	2,597	$ 12.58	-11%	24.61	72%	$ 0.31	105,527
2015-16	$ 33,331.00	2,450	$ 13.60	-4%	23.22	63%	$ 0.32	105,527
2016-17	$ 37,802.00	2,482	$ 15.23	7%	23.52	65%	$ 0.36	105,527
2017-18	$ 38,301.00	2,652	$ 14.44	2%	21.85	53%	$ 0.32	121,397
2018-19	$ 40,569.37	2,915	$ 13.92	-2%	29.34	105%	$ 0.41	99,335
2019-20	$ 42,895.84	2,547	$ 16.84	18%	25.65	80%	$ 0.43	99,335

This table shows data for DEQ combined sites which includes Reedy Creek and DMF. Water and sewer costs have risen slightly during the last fiscal year, but usage has decreased. Water and sewer costs have risen significantly.

Appendix Table 5: DEQ Fuel Cost Comparison

Fiscal year	$/kwh	$/therm	Propane $/gal	Electric $/therm	Nat Gas $/therm	Propane $/therm
2010-11	$ 0.086	$ 0.834	$ 1.96	$ 2.53	$ 0.83	$ 2.13
2011-12	$ 0.086	$ 0.766	$ 1.67	$ 2.53	$ 0.77	$ 1.81
2012-13	$ 0.078	$ 0.760	$ 1.83	$ 2.29	$ 0.76	$ 1.99
2013-14	$ 0.093	$ 0.838	$ 3.58	$ 2.72	$ 0.84	$ 3.90
2014-15	$ 0.094	$ 0.759	$ 3.43	$ 2.75	$ 0.76	$ 3.73
2015-16	$ 0.089	$ 0.545	$ 3.59	$ 2.60	$ 0.54	$ 3.91
2016-17	$ 0.087	$ 0.818	$ 3.30	$ 2.55	$ 0.82	$ 3.59
2017-18	$ 0.078	$ 0.819	$ 3.57	$ 2.28	$ 0.82	$ 3.87
2018-19	$ 0.082	$ 0.800	$ 3.03	$ 2.41	$ 0.80	$ 3.29
2019-20	$ 0.088	$ 1.084	$ 2.98	$ 2.58	$ 1.08	$ 3.24

This table shows data for DEQ combined sites which includes Reedy Creek and DMF. Costs for electricity and natural gas have increased while propane cost has decreased slightly.

Appendix Table 6: Reedy Creek Energy Performance All Fuels by Fiscal Year

Fiscal year	Energy Cost per GSF $/gsf	Cost per million Btu of Energy $/mmbtu	% Change Cost per million Btu of Energy	Energy per GSF Btu/gsf	% Change Energy per GSF
2010-11	$ 6.49	$ 16.68		389,121	
2011-12	$ 5.25	$ 16.22	-3%	323,448	-17%
2012-13	$ 4.55	$ 18.11	9%	251,077	-35%
2013-14	$ 4.98	$ 21.45	29%	232,010	-40%
2014-15	$ 4.88	$ 21.53	29%	226,808	-42%
2015-16	$ 3.99	$ 19.51	17%	204,561	-47%
2016-17	$ 3.45	$ 20.89	25%	165,205	-58%
2017-18	$ 2.23	$ 16.40	-2%	135,864	-65%
2018-19	$ 3.48	$ 17.10	2%	203,256	-48%
2019-20	$ 4.40	$ 17.62	6%	249,704	-36%

This table shows data for Reedy Creek alone. Energy costs have risen slightly during the last fiscal year which puts the total energy reduction for Reedy Creek at 36% less than their 2010-11 baseline. The EO80 goal is a 40% energy reduction from the baseline.

Appendix Table 7: Reedy Creek Energy Cost & Usage by Fuel Type

Fiscal year	Total Energy $	Total energy million Btu	Electric kwh	Electric $	Natural Gas therms	Natural Gas $
10-11	$392,738	23,540	3,489,360	$ 297,218	115,097	$ 92,821
11-12	$317,336	19,567	2,798,368	$ 248,462	100,193	$ 68,874
12-13	$275,076	15,189	3,319,440	$ 248,771	38,632	$ 26,305
13-14	$301,077	14,036	2,794,363	$ 266,575	45,013	$ 34,502
14-15	$295,430	13,721	2,726,751	$ 262,718	44,173	$ 32,712
15-16	$241,420	12,375	2,327,250	$ 212,295	44,345	$ 29,126
16-17	$208,790	9,994	2,081,784	$ 186,380	28,912	$ 22,410
17-18	$170,121	10,375	1,909,259	$ 144,950	38,610	$ 25,171
18-19	$188,736	11,038	2,040,338	$ 161,018	40,760	$ 27,719
19-20	$238,864	13,560	2,107,834	$ 162,015	63,680	$ 76,848

This table shows data for Reedy Creek alone. Energy costs have risen slightly during the last fiscal year with most of that increase occurring in the cost of Natural gas. Actual therms used has increased by about 50%, but the cost almost tripled. Most of the increased usage can be attributed to the significant amount of equipment that was restored to working order over the past couple of years.

Appendix Table 8: Reedy Creek Energy & Water Cost and Indexed by GSF

Fiscal year	Total Utility $	Total Energy $	Water-Sewer $	Total Utility $/GSF	Energy $/GSF	Water $/GSF	GSF
2010-11	$ 404,801	$ 392,738	$ 12,063	$ 3.84	$ 3.72	$ 0.11	105527
2011-12	$ 332,094	$ 317,336	$ 14,757	$ 3.15	$ 3.01	$ 0.14	105527
2012-13	$ 292,121	$ 275,076	$ 17,045	$ 2.77	$ 2.61	$ 0.16	105527
2013-14	$ 323,020	$ 301,077	$ 21,943	$ 3.06	$ 2.85	$ 0.21	105527
2014-15	$ 318,127	$ 295,430	$ 22,698	$ 3.01	$ 2.80	$ 0.22	105527
2015-16	$ 264,120	$ 241,420	$ 22,700	$ 2.50	$ 2.29	$ 0.22	105527
2016-17	$ 236,511	$ 208,790	$ 27,721	$ 2.24	$ 1.98	$ 0.26	105527
2017-18	$ 197,546	$ 170,121	$ 27,425	$ 1.63	$ 1.40	$ 0.23	121,397
2018-19	$ 219,331	$ 188,736	$ 30,595	$ 2.21	$ 1.90	$ 0.31	99,335
2019-20	$ 269,074	$ 238,864	$ 30,211	$ 2.71	$ 2.40	$ 0.30	99,335

This table shows data for Reedy Creek alone. Energy costs have risen slightly during the last fiscal year, but this shows the increase was not due to significant increases in water/sewer.

Appendix Table 9: Reedy Creek Water Data Cost and Usage

Fiscal year	Water & Sewer Cost $	Total Usage in 1,000 gal (kgal)	Cost per 1,000 gal $/kgal	% Change $/kgal	gal/sf	% Change gal/sf	Water-sewer $/gsf	gsf
2010-11	$ 12,063.47	966	$ 12.49		15.97		$ 0.11	105,527
2011-12	$ 14,757.38	792	$ 18.63	49%	13.09	-18%	$ 0.14	105,527
2012-13	$ 17,044.63	1,797	$ 9.49	-24%	29.70	86%	$ 0.16	105,527
2013-14	$ 21,943.31	2,617	$ 8.38	-33%	43.26	171%	$ 0.21	105,527
2014-15	$ 22,697.54	1,930	$ 11.76	-6%	31.90	100%	$ 0.22	105,527
2015-16	$ 22,699.65	1,826	$ 12.43	0%	30.18	89%	$ 0.22	105,527
2016-17	$ 27,720.90	1,902	$ 14.57	17%	31.44	97%	$ 0.26	105,527

2017-18	$ 27,425.15	2,059	$ 13.32	7%	26.96	69%	$ 0.23	121,397
2018-19	$ 30,594.76	2,300	$ 13.30	7%	42.35	165%	$ 0.31	99,335
2019-20	$ 30,210.80	2,233	$ 13.53	8%	41.11	157%	$ 0.30	99,335

This table shows data for Reedy Creek alone. Water and sewer costs have remained relatively stable during the last fiscal year.

Appendix Table 10: Reedy Creek Fuel Cost Comparison

Fiscal year	$/kwh	$/therm	Electric $/therm	Nat Gas $/therm
2010-11	$ 0.085	$ 0.806	$ 2.50	$ 0.81
2011-12	$ 0.089	$ 0.687	$ 2.60	$ 0.69
2012-13	$ 0.075	$ 0.681	$ 2.20	$ 0.68
2013-14	$ 0.095	$ 0.766	$ 2.80	$ 0.77
2014-15	$ 0.096	$ 0.741	$ 2.82	$ 0.74
2015-16	$ 0.091	$ 0.657	$ 2.67	$ 0.66
2016-17	$ 0.090	$ 0.775	$ 2.62	$ 0.78
2017-18	$ 0.076	$ 0.652	$ 2.23	$ 0.65
2018-19	$ 0.079	$ 0.680	$ 2.31	$ 0.68
2019-20	$ 0.077	$ 1.207	$ 2.25	$ 1.21

This table shows data for Reedy Creek alone. The cost for natural gas has almost doubled while electricity has decreased very slightly.

Appendix Table 11: DMF Energy Performance All Fuels by Fiscal Year

Fiscal year	Energy Cost per GSF $/gsf	Cost per million Btu of Energy $/mmbtu	% Change Cost per million Btu of Energy	Energy per GSF Btu/gsf	% Change Energy per GSF
2010-11	$ 3.51	$ 20.20		173,824	
2011-12	$ 3.62	$ 17.69	-12%	204,534	18%
2012-13	$ 3.21	$ 18.10	-10%	177,603	2%
2013-14	$ 3.45	$ 18.39	-9%	187,476	8%
2014-15	$ 3.15	$ 17.18	-15%	183,647	6%

2015-16	$ 2.63	$ 12.26	-39%	214,838	24%
2016-17	$ 2.81	$ 16.29	-19%	172,608	-1%
2017-18	$ 2.96	$ 16.57	-18%	178,931	3%
2018-19	$ 3.32	$ 19.47	-4%	170,629	-2%
2019-20	$ 3.17	$ 22.21	10%	142,843	-18%

This table shows data for DMF alone. Energy used per gross square foot has decreased slightly during the last fiscal year which puts the total energy reduction for DMF at 18% less than their 2010-11 baseline. The EO80 goal is a 40% energy reduction from the baseline. DMF still has significant work to do before achieving a 40% energy reduction goal.

Appendix Table 12: DMF Energy Cost & Usage by Fuel Type

Fiscal year	Total Energy $	Total energy million Btu	Electric kwh	Electric $	Natural Gas therms	Natural Gas $	Propane gals	Propane $
10-11	$158,095	7,827	1,478,933	$ 131,211	27,415	$ 26,072	433	$ 812
11-12	$162,939	9,210	1,506,659	$ 123,830	40,692	$ 39,101	5	$ 8
12-13	$144,762	7,998	1,341,349	$ 114,700	33,390	$ 28,434	891	$ 1,628
13-14	$155,290	8,442	1,355,570	$ 118,373	37,616	$ 34,756	603	$ 2,161
14-15	$142,061	8,270	1,218,909	$ 107,417	40,238	$ 31,397	947	$ 3,247
15-16	$118,560	9,674	1,075,680	$ 89,993	59,791	$ 27,586	273	$ 981
16-17	$126,639	7,773	1,102,960	$ 90,744	39,413	$ 33,450	741	$ 2,445
17-18	$133,498	8,057	1,131,340	$ 91,900	41,729	$ 40,652	265	$ 945
18-19	$149,608	7,684	1,377,674	$ 119,806	29,401	$ 28,391	466	$ 1,411
19-20	$142,847	6,432	1,116,396	$ 121,694	25,979	$ 20,332	276	$ 822

This table shows data for DMF alone. Energy costs except for electricity have decreased slightly during the last fiscal year.

Appendix Table 13: DMF Energy & Water Cost and Indexed by GSF

Fiscal year	Total Utility $	Total Energy $	Water-Sewer $	Total Utility $/GSF	Energy $/GSF	Water $/GSF	GSF
2010-11	$ 167,445	$ 158,095	$ 9,350	$ 1.59	$ 1.50	$ 0.09	105527
2011-12	$ 170,038	$ 162,939	$ 7,100	$ 1.61	$ 1.54	$ 0.07	105527
2012-13	$ 152,746	$ 144,762	$ 7,984	$ 1.45	$ 1.37	$ 0.08	105527
2013-14	$ 162,155	$ 155,290	$ 6,865	$ 1.54	$ 1.47	$ 0.07	105527
2014-15	$ 152,024	$ 142,061	$ 9,962	$ 1.44	$ 1.35	$ 0.09	105527
2015-16	$ 129,191	$ 118,560	$ 10,631	$ 1.22	$ 1.12	$ 0.10	105527
2016-17	$ 136,720	$ 126,639	$ 10,081	$ 1.30	$ 1.20	$ 0.10	105527
2017-18	$ 144,373	$ 133,498	$ 10,876	$ 1.19	$ 1.10	$ 0.09	121,397
2018-19	$ 159,583	$ 149,608	$ 9,975	$ 1.61	$ 1.51	$ 0.10	99,335
2019-20	$ 155,532	$ 142,847	$ 12,685	$ 1.57	$ 1.44	$ 0.13	99,335

This table shows data for DMF alone. Energy costs have decreased slightly during the last fiscal year, but water and sewer costs have increased a small amount.

Appendix Table 14: DMF Water Data Cost and Usage

Fiscal year	Water & Sewer Cost $	Total Usage in 1,000 gal (kgal)	Cost per 1,000 gal $/kgal	% Change $/kgal	gal/sf	% Change gal/sf	Water-sewer $/gsf	gsf
2010-11	$ 9,350	541	$ 17.28		12.01		$ 0.09	105,527
2011-12	$ 7,100	650	$ 10.93	-37%	14.42	20%	$ 0.07	105,527
2012-13	$ 7,984	619	$ 12.89	-25%	13.76	15%	$ 0.08	105,527
2013-14	$ 6,865	497	$ 13.82	-20%	11.03	-8%	$ 0.07	105,527
2014-15	$ 9,962	667	$ 14.93	-14%	14.82	23%	$ 0.09	105,527
2015-16	$ 10,631	624	$ 17.04	-1%	13.85	15%	$ 0.10	105,527
2016-17	$ 10,081	580	$ 17.38	1%	12.88	7%	$ 0.10	105,527
2017-18	$ 10,876	593	$ 18.33	6%	13.18	10%	$ 0.09	121,397
2018-19	$ 9,975	615	$ 16.21	-6%	13.66	14%	$ 0.10	99,335
2019-20	$ 12,685	315	$ 40.30	133%	6.99	-42%	$ 0.13	99,335

This table shows data for DMF alone. Water and sewer costs have risen sharply during the last fiscal year, but usage has almost halved. The drastic change in this data could possibly be traced to a reporting error.

Appendix Table 15: DMF Fuel Cost Comparison

Fiscal year	$/kwh	$/therm	Propane $/gal	Electric $/therm	Nat Gas $/therm	Propane $/therm
2010-11	$ 0.089	$ 0.951	$ 1.87	$ 2.60	$ 0.95	$ 2.04
2011-12	$ 0.082	$ 0.961	$ 1.60	$ 2.41	$ 0.96	$ 1.74
2012-13	$ 0.086	$ 0.852	$ 1.83	$ 2.51	$ 0.85	$ 1.99
2013-14	$ 0.087	$ 0.924	$ 3.59	$ 2.56	$ 0.92	$ 3.90
2014-15	$ 0.088	$ 0.780	$ 3.43	$ 2.58	$ 0.78	$ 3.73
2015-16	$ 0.084	$ 0.461	$ 3.60	$ 2.45	$ 0.46	$ 3.91
2016-17	$ 0.082	$ 0.849	$ 3.30	$ 2.41	$ 0.85	$ 3.59
2017-18	$ 0.081	$ 0.974	$ 3.56	$ 2.38	$ 0.97	$ 3.87
2018-19	$ 0.087	$ 0.966	$ 3.03	$ 2.55	$ 0.97	$ 3.29
2019-20	$ 0.109	$ 0.783	$ 2.98	$ 3.19	$ 0.78	$ 3.24

This table shows data for DMF alone. Costs for electricity has increased while natural gas and propane costs have decreased slightly.

Strategic Energy and Water Plan

North Carolina Department of Health and Human Services

August 28, 2020

Prepared By:

Division of Property & Construction

3026 Mail Service Center

Raleigh, NC 27699-3026

Executive Summary

The North Carolina Department of Health and Human Services (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.

DHHS is committed to improving building energy performance and water consumption at these institutions to reduce costs and the potential for any negative impact to the environment.

DHHS will reduce energy and water usage by identifying and implementing projects to improve the efficiency of utility systems. DHHS has utilized various funding sources including American Recovery and Reinvestment Act (ARRA) and repair and renovation funds to complete energy conservation projects.

General Items for the DHHS Strategic Energy and Water Plan include the following:

1. Consolidating building occupants in buildings with a high square foot per person so that buildings may be closed off and HVAC system temperatures set back or turned off completely.

2. Recommissioning existing HVAC control systems in order to optimize energy savings. Verification of proper outdoor air set points on HVAC systems.

3. Tuning up of existing boilers to provide optimal burner efficiency.

4. When HVAC equipment is due for replacement, replace this equipment with high efficiency replacements. When office equipment and appliances are due for replacement, replace with energy star rated equipment.

5. Survey each campus for energy savings opportunities. Identify system leaks and repair them.

6. Replace existing lighting (incandescent or fluorescent) with LED lighting.

7. Install lighting occupancy sensors in appropriate areas/rooms.

8. Implement temperature setbacks for non-occupied time periods for non-patient areas. Provide proper deadband between heating and cooling setpoints in all occupancies.

9. Prohibit personal space heaters and mini refrigerators.

10. Repair and caulk leaks in windows and doors. Add building insulation where needed or where it does not exist.

Current elements of the DHHS Strategic Energy and Water Plan include the following:

1. Identifying and implementing renovation projects when required due to the age and condition or change in use of buildings. The requirements of General Statute 143.135-25 which mandates minimum energy and water reduction for new construction and major renovation projects will ensure improved energy and water use performance.

These improvements generally include some or all the following: replacing windows; upgrading building insulation; and replacing HVAC, controls, lighting, and plumbing systems.

1. Lighting replacement with LED fixtures at multiple facilities.

2. At J. Iverson Riddle Developmental Center, replace the domestic water heater at the Mulberry Building.

3. At J. Iverson Riddle Developmental Center, replace aging domestic water and sewer piping.

4. At John Umstead Campus, upgrade the HVAC system at Building 27A.

5. At Julian Keith ADATC, upgrade Dorms 1 & 2.

6. At Julian F. Keith ADATC, replace the aging condensing unit at the Activities/Gym Building.

7. At O'Berry NMTC, upgrade the HVAC system at the Administration Building.

8. At O'Berry NMTC, replace the windows at ELC-2.

9. Completing various selected smaller projects in buildings to address specific needs and to reduce energy and water usage including replacing existing inefficient HVAC equipment with modern and energy efficient equipment.

An Energy Manager (Maintenance Director) is assigned at each institution to ensure that energy conservation projects are completed in a timely manner.

The main Key Performance Indicators (KPIs) consist of British thermal units per gross square foot (btu/gsf) for energy use and gallons/gsf for water use. Due to the expense of metering each building, utility invoices will be utilized to monitor and report overall energy and water usage for each facility.

Organizational Support for Energy Culture Change

1. Educate staff through presentations, emails, handouts, subcommittees, and other effective forms of communication about energy and water conservation practices they can implement daily.

2. Incorporate energy and water conservation discussions and presentations as appropriate into institutional and departmental meetings.

3. Encourage staff to identify and attend energy and water conservation training.

4. Establish policy that requires evaluation of both costs and energy efficiency when selecting equipment to be purchased and that requires giving preference to Energy Star products when possible.

Organizational Culture Change Projects

Past 12 months Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				
Continuation of existing activities							Facility Maintenance and Division of Property & Construction	GF

Next 12 months Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				
Educate staff regarding NC energy legislation, State Energy Office policies and resources, and Strategic Energy Planning techniques.							Facility Maintenance and Division of Property & Construction	GF
Encourage staff to identify and attend energy and water conservation training.							Facility Maintenance and Division of Property & Construction	GF
Establish policy that requires evaluation of both costs and energy efficiency when selecting equipment to be purchased and that requires giving preference to Energy Star products when possible.							Facility Maintenance and Division of Property & Construction	GF

1. Supply Side

a. Review all accounts with utility providers to ensure lowest cost Rate Schedule is in effect for each facility.

b. Identify locations, meter ID, and account numbers for all existing primary meters installed by utility providers. Request utility providers to install new digital meters to replace any analog meters. Request new digital meters to be remote reading type compatible with existing Building Management System (BMS) software whenever possible.

Past 12 months Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				
Continuation of existing activities							Facility Energy Manager and Division of Property & Construction	GF

Next 12 months Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				
Contact Duke Progress and the local utility provider to review all electrical rates							Facility Energy Manager	GF
Contact Piedmont Natural Gas to review all gas rates							Facility Energy Manager	GF
Contact local water service providers to review water rates							Facility Energy Manager	GF

2. Demand Side

a. Building assessments will be completed at each DHHS institution to identify the condition of buildings including the age, type, and condition of the building equipment and lighting. These building assessments will serve as the basis for identifying building needs, developing scope of work for projects, developing estimated project costs, prioritizing project needs, and for requesting and obtaining funding to complete the projects and realize reductions in energy and water consumption.

b. Facility Maintenance staff at each institution will make the effort to identify potential energy and water conservation improvement opportunities by evaluating the existing HVAC control system including considering the following:

i. Time of day/night setback sequences.
ii. Chilled water and hot water set point optimization.
iii. Air handling unit (AHU) set point optimization.
iv. Outdoor air damper operation (closed when building is not occupied)
v. General verification of the operation of the building control system.
vi. Installation of variable speed drives.

Past 12 Months Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				
Broughton Hospital – Gym Upgrades					$945,000		Division of Property & Construction	RR
Caswell Center – Boiler Addition at Parrott & Byrum Buildings					$1,000,000		Division of Property & Construction	RR
Caswell Center - Cooling Tower Replacement					$460,000		Division of Property & Construction	RR
Dorothea Dix Campus – Cooling Tower Repairs					$67,000		Division of Property & Construction	RR
J. Iverson Riddle Developmental Center – Replace chiller serving Spruce Building					$140,000		Division of Property & Construction	RR

Murdoch Developmental Center – Infirmary, Medical Clinic & Dental Clinic HVAC Upgrades					$3,617,000		Division of Property & Construction	RR
O'Berry Neuro Medical Treatment Center – HVAC Upgrades					$1,838,000		Division of Property & Construction	RR
O'Berry Neuro-Medical Treatment Center – ELC-1 Building Alterations					$6,923,000		Division of Property & Construction	RR
R.J Blackley: Building 24A Chiller Replacement					$369,000		Division of Property & Construction	RR
Walter B. Jones ADATC – Units 4, 5, & 6 Heat Pump Replacement					$189,000		Division of Property & Construction	RR
WorkSource West – HVAC Upgrades to Old Farm Colony Building					$376,000		Division of Property & Construction	RR

Next 12 Months Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				
Lighting replacement with LED fixtures – Multiple facilities.					$250,000		Division of Property & Construction	2020 R&R
J. Iverson Riddle Developmental Center – Mulberry Building Domestic Water Heater Replacement					$74,000		Division of Property & Construction	2020 R&R

J. Iverson Riddle Developmental Center – Willow Cottage Replace Domestic Water & Sewer Piping					$210,000		Division of Property & Construction	2020 R&R
John Umstead Campus – Building 27A – HVAC Upgrades					$236,000		Division of Property & Construction	2020 R&R
Julian F. Keith ADATC – Dorms 1 & 2 Building Upgrades					$2,000,000		Division of Property & Construction	2020 R&R
Julian F.Keith ADATC – Activities/ Gym Building A/C Unit Replacement					$75,000		Division of Property & Construction	2020 R&R
O'Berry NMTC – Administration Building HVAC Upgrades					$355,000		Division of Property & Construction	2020 R&R
O'Berry NMTC – Window Replacement at ELC-2					$457,000		Division of Property & Construction	2020 R&R

The DHHS Utility Report showing energy and water usage and associated costs is included as a separate attachment. Note the following regarding the DHHS Utility Report:

1. The Special Care Center is Longleaf Neuro-Medical Treatment Center located at 4761 Ward Boulevard, Wilson, NC 27893.
2. The John Umstead Hospital data includes the R.J. Blackley Alcohol and Drug Abuse Treatment Center (ADATC) located at 1003 12th Street, Butner, NC 27509.
3. The Central Regional Hospital data includes the John Umstead Hospital (and R.J. Blackley ADATC) data starting in 2010-11.
4. The Dorothea Dix Hospital includes the Governor Morehead School starting in 2007-08.
5. The Vocational Rehabilitation combines both Work Source East located at 902 Corporate Drive, Goldsboro, NC 27534 and Work Source West located at 200 Enola Road, Morganton, NC 28655.

Confirmation:

This Strategic Energy and Water Plan is approved for the NC Department of Health and Human Services by its authorized representative, Luke O. Hoff, PE, Director of the Division of Property and Construction.

Approved: DocuSigned by: Luke Hoff 33CA902BBA3D4A1... Date: 8/28/2020

North Carolina Department of Information Technology (DIT)

Strategic Energy Management Plan

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

NCDIT-DSC-IOEDC / WDC – 0070

Version 0.1

July 2, 2020

Prepared for

NC Department of Information Technology

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

Prepared by

Department of Information Technology Infrastructure Operations

Western Data Center

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

Executive Summary

The DIT Eastern Data Center facility located at 3700 Wake Forest Rd, in Raleigh, NC, is nearly 40 years old and has housed the State's primary data center for about 29 years. The DIT Western Data Center is 13 years old and has taken on an increasing server load as it has transitioned away from being primarily backup and recovery. It is now a big part of agency consolidation efforts.

Both locations are open 24 hours per day, 365 days per year. At the EDC there typically are about 400 employees working from 8 am till 6 pm Monday through Friday, 30 employees on second shift Monday through Friday, and 20 employees third shift Monday through Friday. Approximately 10 employees are on site for 24 hours per day on the weekends and holidays. At the WDC there are about 34 total employees counting security and janitorial. There are typically about 12-13 employees onsite between 8am and 5pm with the rest covering the other shifts and weekends.

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 types of Information Technology equipment currently in use. DIT offers numerous IT services supported by the Data centers to the other State Agencies. Much of the IT equipment which is used by these services are in the Data centers. Floor hosted options are also offered to the agencies where they utilize a spot on the Data floor with a DIT supplied rack, power, and cooling. Customers can also supply their own racks/cabinets if desired. The agencies need's change over time and is generally an upward trend from a power consumption view.

Energy Consumption based on square footage 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). That 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 DIT 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 sq foot.

To get to a point where energy per sq foot is somewhat useful both the Eastern and Western Data Centers would need to be full. This would have to happen to even get a viable baseline. Again, since 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 others held for future growth. On a floor space basis, the Data center utilization is about 50%.

Energy and Water Data Management: WDC Facilities 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. The EDC has been reporting to the energy office since it was required. There will be a renewed focus on monitoring energy consumption going forward. From the meter all the way down to equipment level at both data centers. This will allow us to find the areas we need to concentrate on. We hope to get a combined PUE chart for both data centers in the coming year.

Energy and Water Supply Management: Electric, Water and Fuel bills are reviewed monthly and abnormal usage is investigated. The Facility Manager's meet with Duke Energy representative's at least once a year to review rates and anything that may affect each Data Center.

Equipment and Building Efficiency: Regular documented equipment maintenance enables the equipment to run as efficiently as possible. Walls and windows are resealed as needed.

Existing Conditions: The EDC is a 94,343 with about 15,000 sq ft. of data floor with the rest being office space, warehouse, and shipping. Two Carrier Air Handlers. We have three Trane Chillers (each at 500 tons), 1 Rheem Round 120 Gallon Tank and Rheem Round 50 Gallon Tank for the building HOT water.

Novar Controls-for all HVAC points. Three 2500kw Caterpillar generators.

The WDC is a 53,000 sq ft. Data Center with two 500-ton and one 50-ton Trane Chillers, three 2500kw Caterpillar generators, and three 750kw Emerson UPS. The building is designed to support the IT operations of the 15,000 sq ft. data floor, office space, small warehouse and receiving.

The Department of Information Technology will strive to meet the goals set forth in EO 80. We will work toward conservation of energy and water resources at all our locations by creating, implementing, and following an effective Energy and Water Management Plan. The objective of the 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.

FY 2019/20 Usage

Factors

Several unusual factors came into play in 2020. The Covid-19 Pandemic has greatly reduced onsite work at the EDC with hundred employees working from home. IT personnel at the WDC are also working predominantly from home, however at the WDC this is offset by multiple vendor personnel being onsite with the fiber project.

The WDC Fiber project required 3-4 weeks of intense under the floor work in the Data room. During this time, large number of tiles were removed to perform the work. Our fan gallery fans were running at full capacity 8-9 hours a day during this time. A 40-50% increase over normal.

The WDC Building Management System was upgraded over three phases starting in February. During this time, the main controller and software, AHU 1-2 controllers and the Chiller Plant controllers were replaced. Over the course of the upgrade, both 500-ton chillers were run at the same time multiple times for several hours for testing. Other Air handlers and equipment were run more than usual as well. Spring is the time of year we would typically see a reduction in power consumption.

Due to these factors the WDC saw a very slight increase in electrical consumption this year. The EDC saw a decrease in electrical consumption at least partially due to the pandemic. Both data centers saw a large decrease in Diesel fuel consumption. Primarily due to better weather conditions over the previous year and reduced run times at the WDC. We also went to a once a

month schedule for several months due to the pandemic. Winter weather and Hurricanes can greatly increase the amount of run time needed.

BTU's per square foot were down significantly this year. 318,196 vs 360,839.

Metric	Baseline 2002-03	Current 2019-20	% Change
Gross Square feet	94,343	163866	74%
Utility cost	$362,255	$1,204,029	232%
Btu per square foot per year	272,914	318,196	17%
Cost per million Btu	$13.67	$20.62	51%
Water gallons per square foot	90	72.51	-19%
Water cost per thousand gal	$1.23	$10.64	765%

2019/20 updates

- We are now running three mechanical cooling units in the UPS room at the WDC rather than four. Cooling is still maintained within recommended temperature and humidity for the UPS.
- The Bi-weekly generator test runtime was reduced by 20 minutes at the WDC and has contributed to lower fuel consumption this year.
- Water heater for eyewash station shut off. Not needed to maintain water within OSHA specifications.
- 1000 LED plug and play Philips bulbs were purchased for installation in the Data room during the 20-21 year. Installation is underway.
- All the lighting at the EDC was replaced with LED and completed during the 19-20 year.
- Computer room air conditioners were replaced at the EDC during the 19-20 year with new more efficient units.

- Lag Chiller setting at the WDC was reduced from 1 hour to 30 minutes. Lag chiller typically runs 3-4 times per year during testing and sometimes due to power outages. The reduction is the amount of time it will run after temps are normal.
- During the WDC BMS upgrades it was found that we can run the AHU chilled water loop at a higher pressure and lower gallons per minute with greater cooling efficiency.

Goals for 2020-21

Focus Areas

78% of the WDC's building load is the Chillers and UPS server and network load. The remaining 22% is Pumps, Air Handling, heating, and lighting load. 50% of the load is the servers and networks. Managing the servers and networks with efficiency in mind must be a priority. When new equipment is purchased, high efficiency must be part of the purchase criteria. Agency hosting customers must be part of the process as well.

We need a renewed focus and buy in from upper management and HR to reduce energy usage by adopting a personal appliance use policy. Space heaters in particular are inefficient and can be a fire hazard. Reduction in energy usage by implementing computer power management for all ITS personal computers (where applicable). Purchasing energy efficient computer equipment, Servers, storage units, tape drives, where applicable. We need continued analysis of both Data Centers to potentially lower energy usage by increased efficiencies.

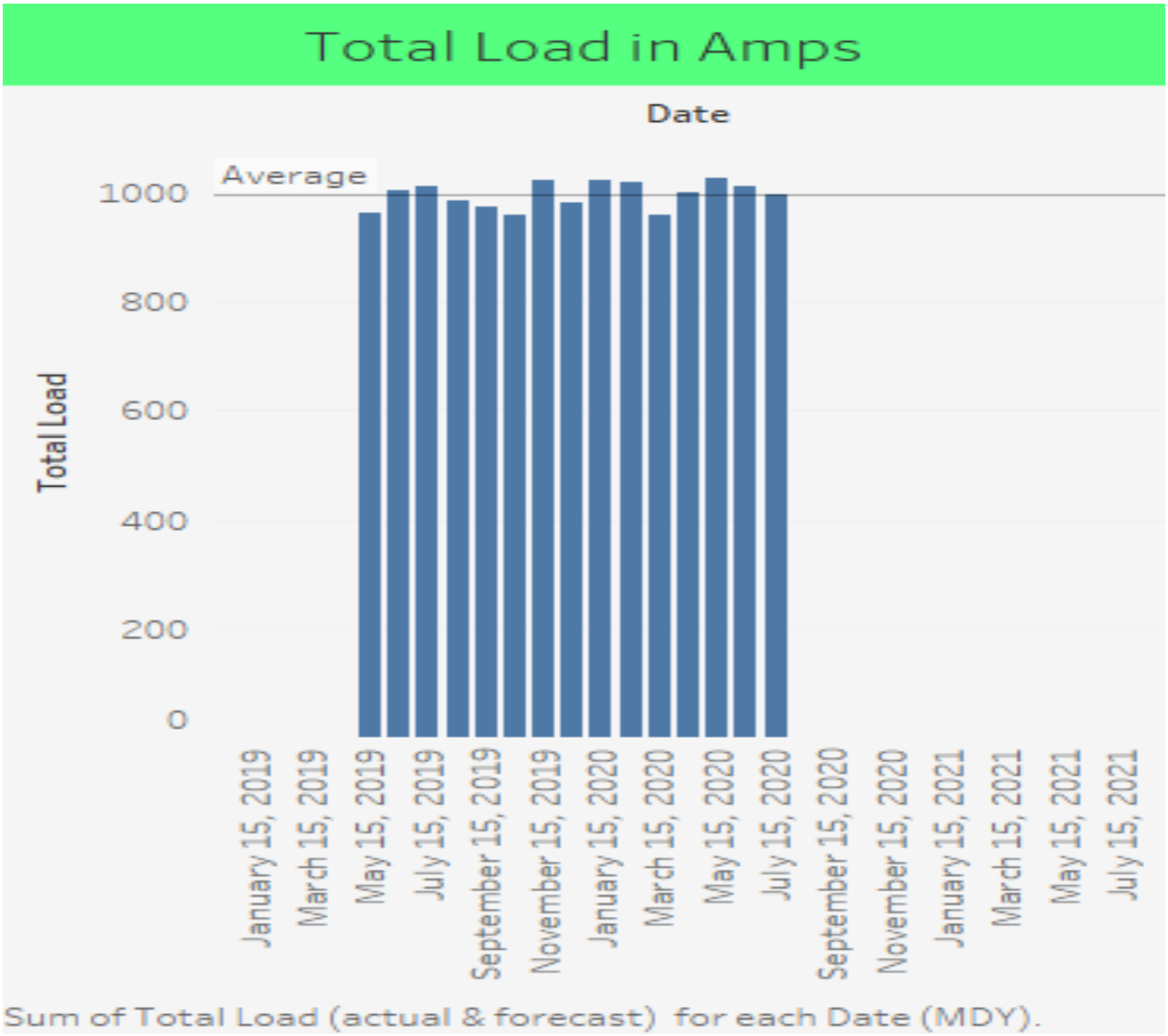
- Continue with energy efficiency training opportunities.
- EDC to have the electrical distribution project engineering study done this year. Though it is not specifically an energy reduction project, when the project is completed, we expect greater electrical monitoring capabilities, higher efficiency equipment and reliability.
- Complete the Data room LED installation at the WDC.
- Continue installing LED's in the rest of the WDC as the fluorescents fail.

- Start monitoring the PUE of the EDC like is being done at the WDC. With the current setup at the EDC it will be cumbersome to start, but after the electrical upgrades are done it should be much easier.
- Create a combined Data center PUE chart.
- Sixteen new server cabinets installed in June 2020, were equipped with smart power bars that will allow control and monitoring down to the outlet level. Upgrades in the future for all the existing cabinets is in the planning stages. (funding dependent)
- Continue monitoring both water and electrical metering to ensure it is correct and meet with Duke energy representative twice per year to stay abreast of anything that may affect our rates or service.
- Investigate water consumption at the EDC. It is still substantially higher than the EDC even with most of the IT staff working from home.

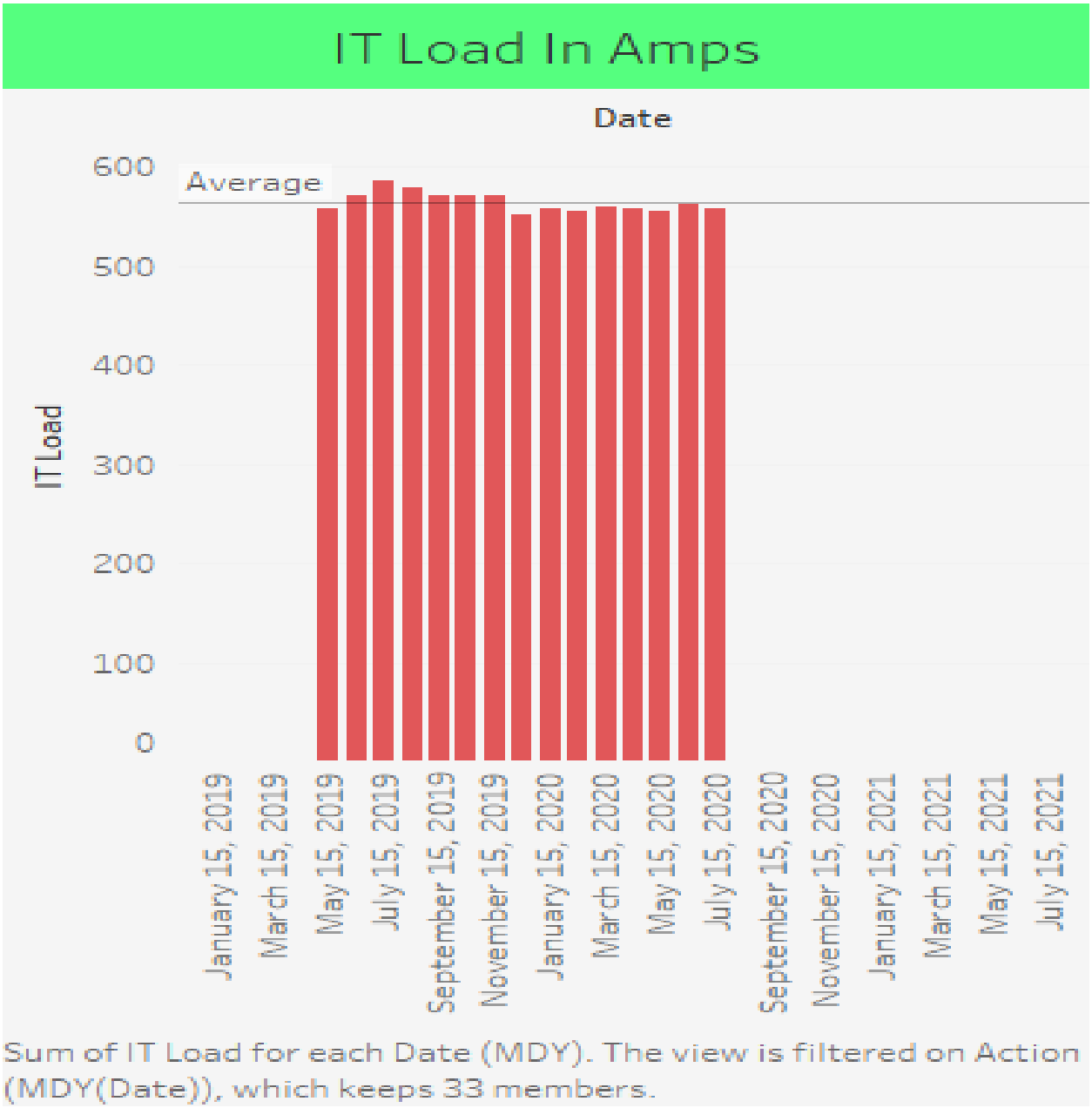
Future projects

- Work on potential funding for a more efficient third chiller at the WDC.
- Scheduled replacement of the existing UPS units at the WDC with more efficient units. 85% vs 93-97%. Two to three years out.
- EDC to complete the electrical distribution project. Funded.
- Enclosed cold aisles at the WDC. Not funded. Need to work up potential savings.

Graphical Representation of the WDC Electrical loads

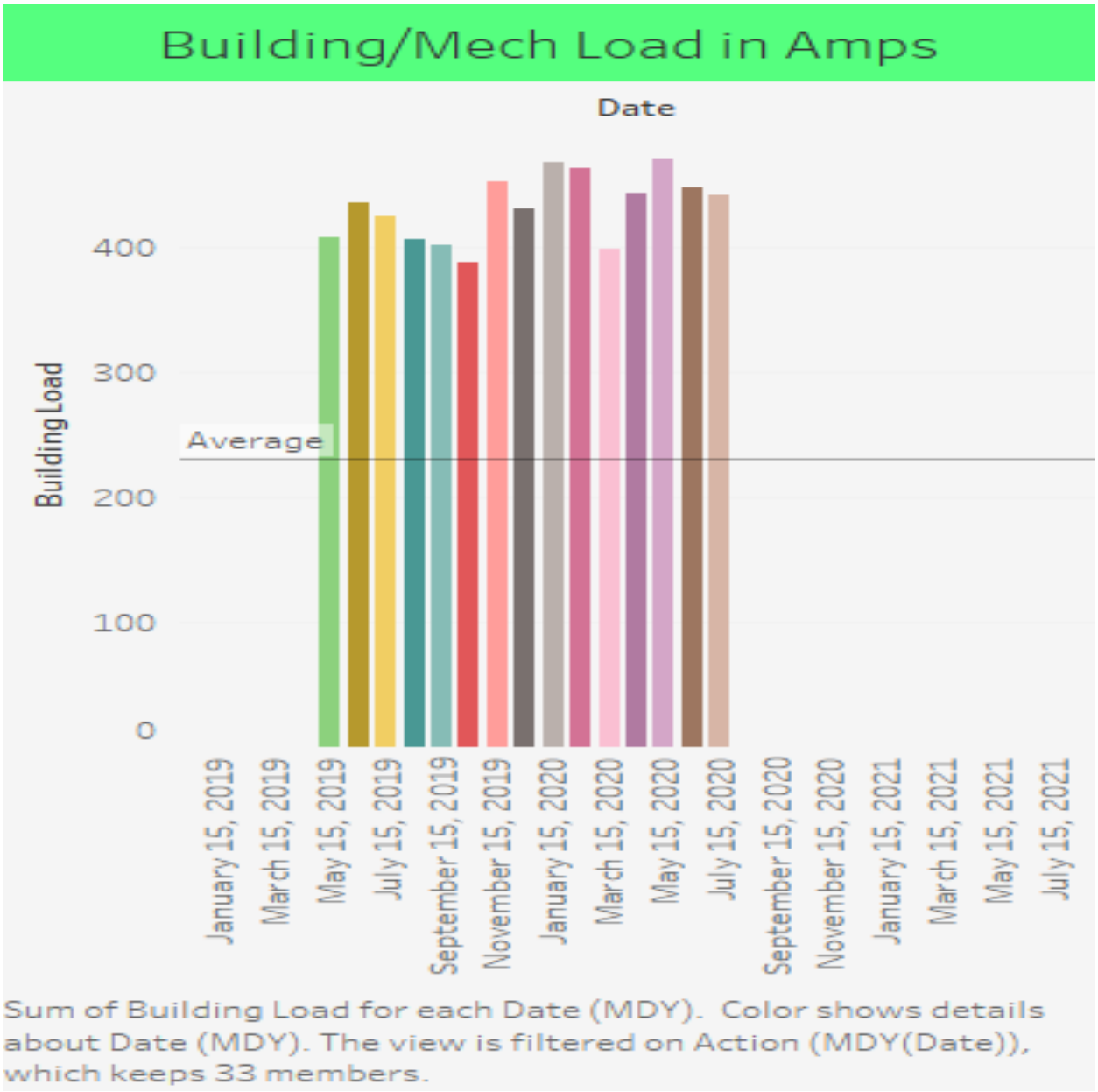


This May and June year over year were likely higher due to the fiber and building management system projects and upgrades.

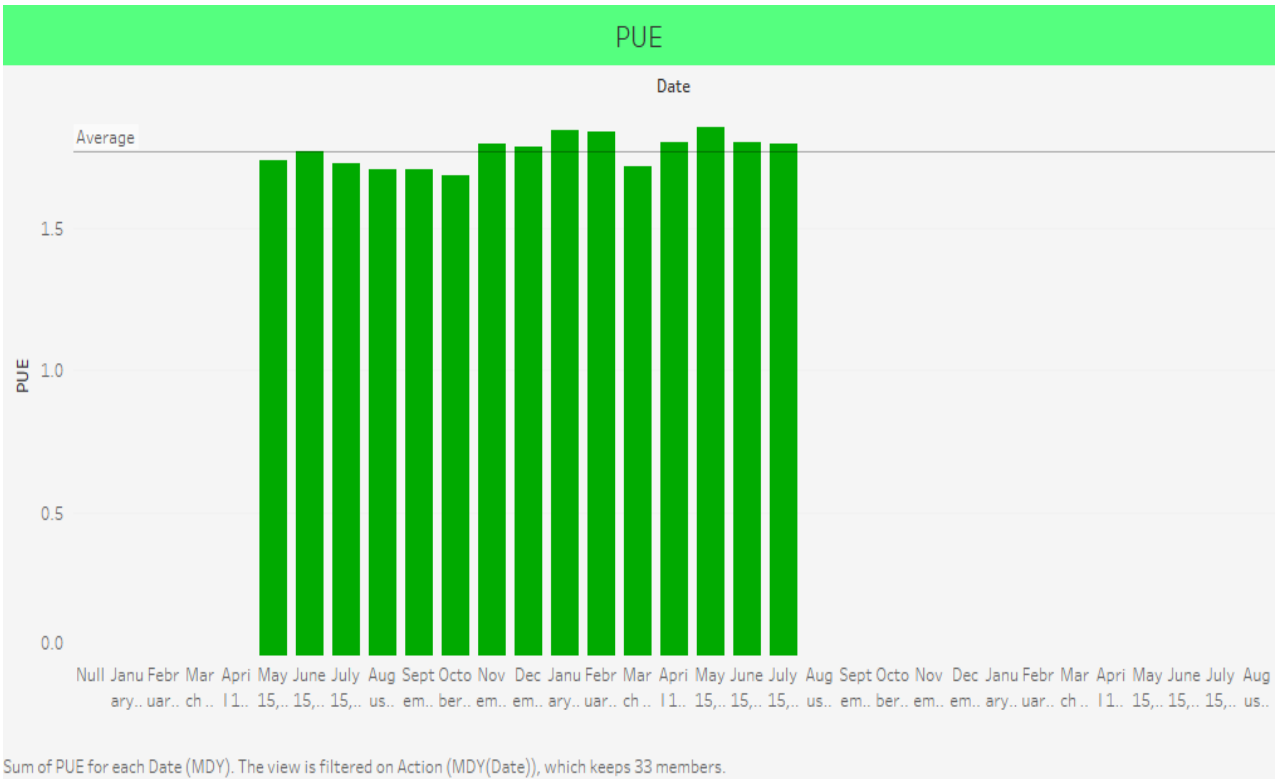


IT load has trended downward due to changes in the amount of equipment in the Data room.

Refreshes and virtualization account for the trend.



Mechanical Cooling loads trended up during the spring and summer due to the Fiber and BMS projects.



Power usage effectiveness (PUE) is the industry standard for Data Center efficiency monitoring. It is the Total building energy/Total IT loads. The idea is that the IT load should be the predominant consumer with the rest of the building loads as low as possible. IT loads that come into DIT's data centers can be handled more efficiently and helps the other state agencies lower their energy consumption.

The WDC PUE has been as low as 1.68 to a high of 1.85 this past year and has trended upward in recent months due to the lower IT load and the spring/summer projects.

Progress

Consumption has dropped to 17% over 02/03 btu/sf levels. This is the best we have been since 05/06. Note: In the early 2000's DIT was a much smaller agency that did not house the number of servers and IT equipment that we do today. That fact greatly contributes to the difficulty in achieving EO80 requirements, however that in no way prevents us from working to reduce 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
02/03		$3.73	$13.67		272,914			$1.90		58.03	
03/04	-$13,911	$4.17	$14.72	8%	282,930	4%	-$1,504	$1.69	-11%	67.46	16%
04/05	-$36,880	$4.30	$14.31	5%	300,237	10%	-$1,551	$1.71	-10%	67.63	17%
05/06	-$83,065	$5.09	$15.44	13%	329,943	21%	$85,297	$15.63	722%	0.17	-100%
06/07	-$146,910	$6.09	$16.60	21%	366,747	34%	$53,728	$9.88	420%	0.37	-99%
07/08	-$123,483	$5.58	$17.37	27%	321,172	18%	$94,500	$12.58	562%	7.03	-88%
08/09	-$285,594	$6.74	$17.92	31%	375,794	38%	-$11,655	$5.46	187%	71.82	24%
09/10	-$336,266	$7.03	$18.24	33%	385,416	41%	$8,572	$7.43	291%	50.99	-12%
10/11	-$439,696	$7.72	$18.45	35%	418,371	53%	-$4,351	$7.54	297%	61.56	6%
11/12	-$368,901	$7.48	$19.15	40%	390,467	43%	-$4,246	$8.18	331%	61.20	5%
12/13	-$336,030	$7.40	$19.59	43%	377,583	38%	-$1,587	$8.21	332%	59.21	2%
13/14	-$298,519	$7.41	$20.48	50%	361,852	33%	-$9,858	$9.39	394%	64.44	11%
14/15	-$283,613	$6.93	$19.04	39%	363,819	33%	-$13,509	$9.44	397%	66.77	15%
15/16	-$338,243	$7.91	$21.42	57%	369,266	35%	-$29,807	$10.18	436%	75.90	31%
16/17	-$252,457	$7.16	$20.59	51%	347,729	27%	-$24,755	$10.42	448%	72.53	25%
17/18	-$254,542	$6.87	$19.49	43%	352,622	29%	-$20,913	$10.64	460%	70.03	21%
18/19	-$294,877	$7.39	$20.47	50%	360,839	32%	-$37,215	$11.39	499%	77.97	34%
19/20	-$153,011	$6.56	$20.62	51%	318,196	17%	-$25,726	$10.84	471%	72.51	25%

NC DIT Western Data Center
Energy and Water Management Plan Mandate

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

Our 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

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. The attached plan outlines the activities and expenditures required to reduce energy and water consumption to achieve the goals of the program.

Strategic Energy Management Plan Mandate- Commitment

I have read and support the Strategic Energy Plan for my Organization Implemented this __ day of ____

Facilities Manager DocuSigned by: Tony Brackett 064DCE1867E9474... Date 8/26/2020 | 1:26 PM

Operations Director DocuSigned by: Henry Taylor BB7BB0435C254C8... Date 8/26/2020 | 2:06 PM

Chief DSCIO DocuSigned by: Susan Kellogg EE3E24D45A644DE... Date 8/28/2020 | 8:07 AM

North Carolina Department of Military and Veterans Affairs

Agency Utility Management Plan

2019-2021

Prepared by Cecil Holt, DMVA Energy Manager
8-29-2020
With Military Installation Information provided by:
Paul Berry **Robert Johnson**
SgtMaj, USMC (Retired) SgtMaj., USMC (Retired)
Program Development Installation Coordinators
NC Department of Military and Veterans Affairs

Purpose

To provide Secretary Hall of the North Carolina Department of Military and Veterans Affairs & Department of Environmental Quality information on Executive Order No. 80.

"The North Carolina Department of Military and Veteran Affairs is the newest state government agency and we are dedicated to helping our veterans and active duty men and women access the programs, benefits and resources that they earned when they took the oath and answered the call to service. Our staff is committed to providing the highest level of service, responsiveness and integrity in keeping with the principles and values of this state and nation that our military and their families deserve. "

Larry D. Hall, Secretary of Department of Military and Veteran Affairs

Overview

- DMVA is a State agency that assists with the management of 4 military Skill Care Nursing Homes housing 449 veterans and are currently in the construction phase of 1 - 120 Bed Home & plans to build a 6th Home to provide additional housing for veterans in the state.
- North Carolina has one of the largest military footprints of any state in the country, representing three out of the four branches of service and totaling 129, 049 in 2016. Military and defense industries are the second largest employers in our state, and the military has an economic impact of $66 billion annually. The military bases located in North Carolina are major drivers in our communities, allowing families and business to thrive through the synergy and partnerships that have developed between local and state government, military and defense sectors, and local businesses throughout our history.

Utility Management Plan Goals

Department Veterans Affairs Nursing Homes

Salisbury State Veteran Home

- Replacement of T12 Bulbs to T8 Bulbs to capitalize on potential energy savings. Seek funding to replace existing T12 Fluorescent Fixtures to T8 LED fixtures.
- Investigate feasibility of Solar Powered Water Heater System
- Add Light Diming functions to Resident Rooms.
- Investigate how to monitor utility consumption on site

- Will request Design Proposal to add Isolation Wing in response to COVID Pandemic, with Negative Pressure Equipment Features to Home in effective yet energy efficient manner.
- Educate and engage employees in energy conservation best practices through meeting presentations, emails, Intranet web sites, etc.

Fayetteville State Veteran Home

- Replacement of T12 Bulbs to T8 Bulbs to capitalize on potential energy savings. Seek funding to replace existing T12 Fluorescent Fixtures to T8 LED fixtures.
- Investigate feasibility of Solar Powered Water Heater System
- Investigate Heating Ventilation & Air Conditioning System replacement with an Energy Conservation System.
- Investigate feasibility of Power Company LED/ Solar Light Pole Leasing Program.
- Investigate how to monitor utility consumption on site
- Site walkthrough with State Energy Office to look for additional low/no cost projects
- Educate and engage employees in energy conservation best practices through meeting presentations, emails, Intranet web sites, etc.
- Will request Design Proposal to add Isolation Wing in response to COVID Pandemic, with Negative Pressure Equipment Features to Home in effective yet energy efficient manner.

Black Mountain State Veteran Home

- Replacement of T12 Bulbs to T8 Bulbs to capitalize on potential energy savings. Seek funding to replace existing T12 Fluorescent Fixtures to T8 LED fixtures.
- Investigate feasibility of Solar Powered Water Heater System
- Investigate Heating Ventilation & Air Conditioning System replacement with an Energy Conservation System.
- Investigate feasibility of Power Company LED/ Solar Light Pole Leasing Program.
- Investigate how to monitor utility consumption on site
- Site walkthrough with State Energy Office to look for additional low/no cost projects
- Educate and engage employees in energy conservation best practices through meeting presentations, emails, Intranet web sites, etc.
- Will request proposal to add Isolation Wing in response to COVID Pandemic, Negative Pressure Equipment Features to Home in effective yet energy efficient manner.

Kinston State Veteran Home

- Replacement of T12 Bulbs to T8 Bulbs to capitalize on potential energy savings. Seek funding to replace existing T12 Fluorescent Fixtures to T8 LED fixtures.
- Investigate feasibility of Solar Powered Water Heater System

- Investigate Heating Ventilation & Air Conditioning System replacement with an Energy Conservation System.
- Existing Shingle Roof Replacement will be with Metal
- Investigate how to monitor utility consumption on site
- Site walkthrough with State Energy Office to look for additional low/no cost projects
- Educate and engage employees in energy conservation best practices through meeting presentations, emails, Intranet web sites, etc.
- Will request proposal to add Isolation Wing in response to COVID Pandemic, Negative Pressure Equipment Features to Home in effective yet energy efficient manner.

Kernersville State Veteran Home (Construction Phase)

- In response to COVID Pandemic, a Change Order will was approved to add Isolation Wing with Negative Pressure Equipment features to Home in effective yet energy efficient Specification and Design.
- Being built to current Energy Codes.
- DMVA did participate in the Duke Energy New Construction Energy Efficiency Design Assistance Program provided by the Weidt Group.
- Investigate how to monitor utility consumption on site

Raleigh State Veteran Home (Proposed)

- If funding is approved the intent is to have a Solar System as a Base Bid program item.
- Investigate Green Roof System as a alternate program item.
- Will be designed & built to current Energy Codes.
- Will participate in the Duke Energy New Construction Energy Efficiency Design Assistance Program provided by the Weidt Group.
- Investigate how to monitor utility consumption on site

Department of Military & Veterans Affairs Cemeteries

Western Carolina State Veterans Cemetery

- Seek funding to install an energy efficient irrigation system in place of staff manual watering system.
- Research funding and options to retrofit lighting to LED fixtures.

Coastal Carolina State Veterans Cemetery

- Seek funding to replace existing irrigation System with an energy efficient system.
- Research funding and options to retrofit lighting to LED fixtures.

Sandhills State Veterans Cemetery

- Seek funding to install an energy efficient Irrigation system in place of staff manual watering system.

- Research funding and options to retrofit lighting to LED fixtures.

Military Installations in NC

"The chief priority of the Department of Defense (DoD) energy policy is to ensure the mission readiness of the armed forces by pursuing energy security and energy resilience. In today's technology-dependent environment, energy is inextricably combined with the Department's missions, from the directly employed weapons systems to the installations and systems that support missions around the globe. In this environment, energy resilience, which enables the capabilities of weapons platforms, facilities, and equipment, is a critical investment that must be part of the Department's research, acquisition, operations, and sustainment conversations."

Camp Lejeune

- Site visits or teleconferences to connect with the energy manager on site
- Determine installations strategy energy security and sustainability goals
- Collaborate to share best practices and knowledge gained from energy and water initiatives

Coast Guard's Base Support

- Site visits or teleconferences to connect with the energy manager on site
- Determine installations strategy energy security and sustainability goals
- Collaborate to share best practices and knowledge gained from energy and water initiatives

Fort Bragg

- Site visits or teleconferences to connect with the energy manager on site
- Determine installations strategy energy security and sustainability goals
- Collaborate to share best practices and knowledge gained from energy and water initiatives

Seymour Johnson Air Force

- Site visits or teleconferences to connect with the energy manager on site to determine installations strategy energy security and sustainability goals.
- Collaborate to share best practices and knowledge gained from energy and water initiatives

The attached following documents display the efforts the installations are taking in regards to Energy and Energy Resilience Plans. Provided by

a. Department of Defense Operational Energy Strategy Implementation Plan. This document provides the overarching guidance to the uniformed service components. Each uniformed service component then builds their own Energy Plan/Strategy.
b. Depart of the Navy (DoN) Installation Energy Resilience Strategy. This document provides guidance and direction to the Navy and Marine Corps on how to develop each installation energy plan. This strategy provides further guidance

and direction on the proper use of energy when the uniformed are training and during combat operations. The Army, Air Force, and Coast Guard have very similar plans.

c. Marine Corps Installations East (MCIE) Energy Plan. This is a great example of a local plan here in NC. Camp Lejeune and Marine Corps Air Station Cherry Point both recently converted from coal fired hot water plants to natural gas. Every Battalion and Squadron level command has an Energy Manager. Their duties direct them to monitor the energy consumption both in garrison and during field training environments. Social media is used heavily to educate all personnel on how to properly use and conserve energy. An example if when there is a major holiday assigned personnel ensure all lights and office equipment are tuned off. These efforts have proven to be big cost savers over time. Military Ocean Terminal Sunny Point (MOTSU), NC is energy independent. They have a state of the are solar farm that provides most of their energy. I have requested details from them about this project and I will share it with you.
d. MCIE Energy and Water Strategy. I was at this command when this strategy was written. This is an example of a well written plan that is easy to implement and monitor.
e. Joint Land Uses Study Seymour Johnson Air Force Base and Dare County Range. These studies have also taken place around Camp Lejeune, Cherry Point, Ft. Bragg, and MOTSU. One of the outcomes of protecting land around military installations is Energy Development.

A Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis is currently taking place with the NC Military Installations.

Attached are the following documents that best display the efforts the installations are taking in regards to their Energy and Energy Resilience Plans.

a. Department of Defense Operational Energy Strategy Implementation Plan. This document provides the overarching guidance to the uniformed service components. Each uniformed service component then builds their own Energy Plan/Strategy.
b. Depart of the Navy (DoN) Installation Energy Resilience Strategy. This document provides guidance and direction to the Navy and Marine Corps on how to develop each installation energy plan. This strategy provides further guidance and direction on the proper use of energy when the uniformed are training and during combat operations. The Army, Air Force, and Coast Guard have very similar plans.
c. Marine Corps Installations East (MCIE) Energy Plan. This is a great example of a local plan here in NC. Camp Lejeune and Marine Corps Air Station Cherry Point both recently converted from coal fired hot water plants to natural gas. Every Battalion and Squadron level command has an Energy Manager. Their duties direct them to monitor the energy consumption both in garrison and during field training environments. Social media is used heavily to

educate all personnel on how to properly use and conserve energy. An example if when there is a major holiday assigned personnel ensure all lights and office equipment are tuned off. These efforts have proven to be big cost savers over time. Military Ocean Terminal Sunny Point (MOTSU), NC is energy independent. They have a state of the are solar farm that provides most of their energy. I have requested details from them about this project and I will share it with you.

d. MCIE Energy and Water Strategy. I was at this command when this strategy was written. This is an example of a well written plan that is easy to implement and monitor.
e. Joint Land Uses Study Seymour Johnson Air Force Base and Dare County Range. These studies have also taken place around Camp Lejeune, Cherry Point, Ft. Bragg, and MOTSU. One of the outcomes of protecting land around military installations is Energy Development.

A Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis is currently taking place with the NC Military Installations. This will be after your 1 September deadline but will be shared for situational awareness.

NC Department of Military & Veterans Affairs
Agency Utility Management Plan

- The NC Department of Military & Veterans Affairs recognizes that energy and water consumption can be managed for the benefit of our agency. Energy and Water management is the responsibility of the staff at each facility, which will be guided and supported by the Energy Manager Designee for NC DMVA.
- The Department of Military & Veterans Affairs has implemented an Agency Utility Management Plan.
- The attached plan outlines the activities and expenditures required to reduce energy and water consumption to achieve the goals of the program.
- The Department Secretary's staff will review progress and results and will support staff attendance at training in energy and water management.

Agency Utility Management Plan Goals

- As required in Executive Order 80, NC DMVA will support efforts to reduce by 2025 total 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 Military and Veterans Affairs. The plan, as presented, supports the reduction goals in Executive Order 80. Implemented this 1st day of September 2020

Energy Manager

Larry D. Hall, Sec.
Department Secretary

Appendix A

Sample Utility Management Plan

2019-20

Comprehensive Plan	
Strategy 1.	Designate Energy Manager as the point of contact for SEO
Strategy 2.	Edit or create a plan to reflect EE strategy toward 40% reduction in Btu/gsf.
Strategy 3.	Contact the SEO to assist with review of strategy, budget, training, and timeline.
Strategy 4.	Develop internal stakeholders to develop behavioral programming and internal team building toward goals
Strategy 5.	Implement Plan

2019-2020 Planned Activities	**Expected Measurement**	**Assigned To**	**Occurrence**
Meet with SEO to develop ideas for plan	Discuss training schedule available, current Utility Management Plan and future Management Plan	Energy Manager and SEO staff	Quarterly
Research facilities for potential energy savings projects	Create a list to use for potential projects to be implemented in the Utility Management Plan	Energy Manager and Agency Staff	Monthly
Create a Utility Management Plan	Complete timeline and approvals from agency and submit plan to SEO	Energy Manager and staff	Due March 1, 2019, thereafter October 1st each year
Attend SEO or other energy conservation training sessions	Discuss lessons learned with staff and how that can enhance your strategy	Agency staff	(add dates of training)
Develop internal stakeholders and internal teams to implement plan	Designate a person or team to implement portions on the plan	Energy Manager and staff	May, 2019
Develop internal marketing and awards/rewards program	Designate person to develop programming and implement program	Energy Manager and staff	May, 2019
Review Utility Management Plan progress	Tweak plan if it is not realizing expected savings	Energy Manager	Quarterly

2019-2020 Planned Activities	Expected Measurement	Assigned To	Occurrence
Track utility data	Record monthly utility data for annual utility report to submit to SEO and trend to catch anomalies early on	Energy Manager	Monthly, September 1st each year

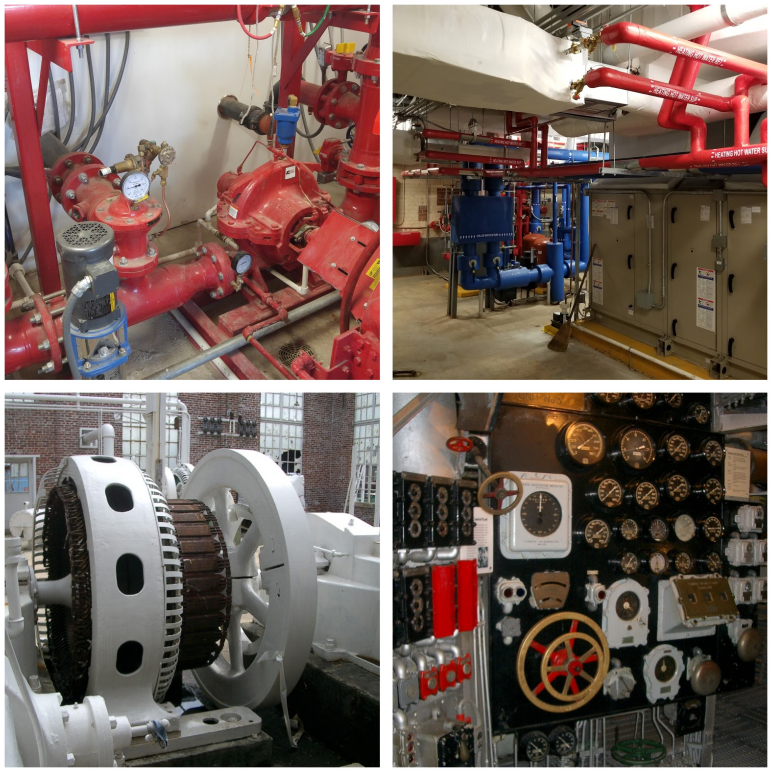
2019-20

Projects to Implement	
Strategy 1.	Review projects with staff to determine high priority projects to implement
Strategy 2.	Work with staff to determine the best timeframe to implement projects
Strategy 3.	Create a schedule for projects to be implement during the fiscal year
Strategy 4.	Communicate projects to staff
Strategy 5.	Implement projects

Planned Activities	**Expected Measurement**	**Assigned To**	**Occurrence**
Research lighting retrofit or replacement opportunities in Retirement Homes	Replacement of T12 Bulbs to T8 Bulbs to capitalize on potential energy savings. Seek funding to replace existing T12 Fluorescent Fixtures to T8 LED fixtures.	Energy Manager	Ongoing
Investigate feasibility of Solar Powered Water Heater System	Determine if installation of solar powered water heating system feasible.	Energy Manager and Agency Staff	Ongoing
Investigate feasibility of Power Company LED/ Solar Light Pole Leasing Program.	Determine if lighting can be upgraded on pole lighting by utility company	Energy Manager and Agency Staff	Ongoing
Investigate Heating Ventilation & Air Conditioning System replacement with an Energy Conservation System	Determine which units can be retrofitted or upgraded to more energy efficient units	Energy Manager	Ongoing
Investigate how to monitor utility consumption on site	Determine the best method to track utility data	Energy Manager	Ongoing
Site walkthrough with State Energy Office	Look for additional low/no cost projects	Energy Manager and staff	Ongoing

Educate and engage employees in best practices	Educate and engage employees in energy conservation best practices through meeting presentations, emails, Intranet web sites, etc.	Energy Manager and staff	Ongoing
Building New Retirement Homes to current Energy Codes.	Design and build new facilities to be energy efficient.	Energy Manager and staff	Ongoing
Participate in Duke Energy New Construction Energy Efficiency Design Assistance Program	Participate in the program provided by the Weidt Group.	Energy Manager and staff	Ongoing
Lighting retrofits at cemetery.	Research funding and options to retrofit lighting to LED fixtures.	Energy Manager and staff	Ongoing

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



Prepared by:

NC-DNCR Energy Management Team
109 East Jones Street
Raleigh, North Carolina 27601
August 2020

PURPOSE

The Department of Natural & Cultural Resources 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 the Department'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 senate bill 668 and Executive Order No. 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.

OVERVIEW

The Department of Natural & Cultural Resources spent $6,200,000 in FY 2017-18 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.

The Department is responsible for the operation and maintenance of approximately 1,825 buildings per State Property Office. The Department's building inventory includes historic structures (primarily houses), museums, amphitheaters, administrative offices, support & maintenance buildings, the North Carolina Zoo, State Park facilities, Aquariums and the USS North Carolina Battleship. 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 identification of major energy and water consumers, which will most likely be existing major facilities (20,000 square feet or larger) with older less efficient systems. The Department 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 will be implemented as soon as possible at all facilities. A comprehensive energy & water efficiency awareness & training program will be established for employees. The Department will seek to train facility maintenance personnel on innovative and low-cost techniques to lower energy and water consumption for their specific site.

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 2020-2021 GOALS

- Reduce energy consumption per square foot towards the goal of a 40% decrease in comparison to FY 2002-2003 levels, consistent with Executive Order No. 80.
- Conduct informal energy audits on highest energy consuming facilities in the Department to identify energy cost saving measures to reduce consumption by FY 2020-21.
- Continual annual self-audit procedure and checklist for Departmental facilities to identify low or no cost energy saving initiatives to reduce consumption in FY 2020-21.
- Establish annual energy and water usage reporting form to more accurately collect data and determine seasonal trends. Conduct assessment and evaluation of individual sites and energy billing rate schedules.

DATA MANAGEMENT

Current base year for Department data is FY 2010-11. Goals for energy reduction are based on comparison to 2005 levels.

- Merge additional data for former Natural Resource sites (State Parks, Zoo, etc.) for the years before 2010-11.
- Project Cultural Resource sites for the years before 2010-11.
- Research data management options, such as bill paying services to ensure more accurate utility data.

NEW CONSTRUCTION AND RENOVATIONS

New construction of facilities, even at current minimum standards will perform at better btu/ft² levels than existing buildings in the department's portfolio.

- New Visitor Center and Museum at Fort Fisher State Historic Site (in design)
- New Underwater Archeology Building at Kure Beach (in design)
- New Addition to the Museum of History in downtown Raleigh (in design)
- New HVAC system at the Tryon Palace Main Building (completed 2018)
- South Mountains State Park Visitor Center, R-22 substitute refrigerant study
- Various Connect NC bond projects with State Parks
- Roof repair projects will include increased insulation value where applicable
- A third-party firm is conducting a study of the Department's largest energy users to investigate the feasibility of combining multiple sites into a Performance Contract.

OUTREACH AND SUSTAINABILITY

Energy Management will continue to focus on demand-side management by implementing low/no-cost conservation and energy efficiency measures first.

- Adopt best-practice strategies to reduce energy usage at NC-DNCR sites throughout the State
- Develop sustainability policies that emphasize reuse and reduction of consumables
- Support sustainability initiatives through electronic materials and signage at waste stations
- The DNCR Environmental and Energy Performance Committee meets monthly including members from each division in the Department.

ENERGY MANAGEMENT PLAN BUY-IN

GOAL to accomplish the following by the year 2025:
Reduce annual Total Energy Consumption by a minimum of 40% from a baseline established in fiscal year of 2002-03, consistent with Executive Order No. 80.

MEASURES
Our tracking measures will be: Total Energy Use in Btu per Square Foot per Year

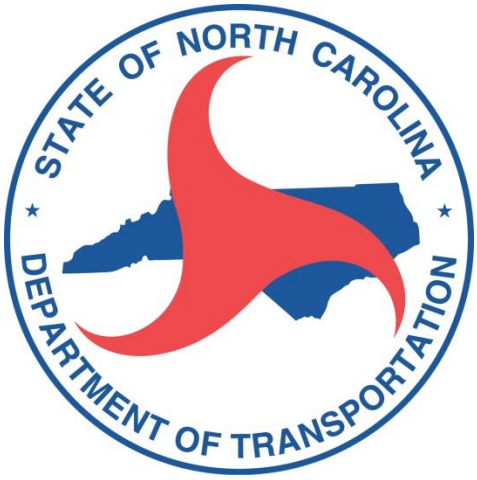
COMMITMENT

- 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 Utility Manager and Utility Savings Initiative (USI) Liaison.
- The attached plan outlines the activities and expenditures 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 Transportation

Agency Utility Management Plan

Fiscal Years 2020-22



2020 Agency Utility Management Plan

North Carolina Department of Transportation

Table of Contents

Executive Summary

This NCDOT Agency Utility Management Plan (AUMP) has been developed in accordance with N.C. Gen. Stat. 143-64/12(a), and has been updated to support the achievement of goals outlined in Sections 1 and 8 of Executive Order 80 - NORTH CAROLINA'S COMMITMENT TO ADDRESS CLIMATE CHANGE AND TRANSITION TO A CLEAN ENERGY ECONOMY. The intent of this plan is to support environmental stewardship and reduce the impact of utility usage in NCDOT-owned buildings upon the climate through the responsible use of utilities. This Plan reports FY 2017-2018 utility usage and trends, and summarizes NCDOT strategy and programs supporting legislative and Executive Order 80 goals for fiscal years 2019 - 2021.

This report is updated biennially, and outlines ongoing energy savings programs that will reduce NCDOT energy consumption per square foot in DOT buildings by 40% from fiscal year 2002-2003 levels; support specified goals to preserve and enhance the State's natural resources, and reduce the economic impact of operating a vast transportation network. It will also help the Department to compete for additional funding available through the DEQ / State Energy Office and the Federal Government to fund energy saving programs. Energy and cost saving results to-date from current programs are summarized in the Energy and Usage Data section beginning on page 9.

Since 2003, NCDOT has implemented and tracked energy savings programs that reduce the financial burden and environmental impact of utility usage. At the conclusion of Fiscal Year 2020, DOT and NC State Port Authority (NCSPA) energy savings programs have resulted in an **energy cost avoidance of $28,338,381** and **a water cost avoidance of $16,910,482 totaling $45,244,863** over the last 16 years. By the end of FY 20, those cost savings have **reduced energy and water costs per square foot by 31% and 8% in DOT facilities respectively** measured from the baseline fiscal year of 2004-2005. NCSPA saw a **22%** increase in energy usage, but a reduction in water consumption by **3%** per square foot during that same period. **Combined DOT and NCSPA energy and water consumption per square foot has decreased by 27% and 7% respectively since fiscal 2003-04**.

Due to the type of buildings used by NCSPA, the success of efforts to reduce energy costs in buildings is not evident by measuring energy use per square foot. A more informative metric for measuring energy usage in NCSPA buildings is energy cost per ton of cargo transported through port terminals. In FY 20 there was a **31% increase in energy usage of per ton of cargo and a 4% increase in water usage by per ton** compared to usage during the baseline fiscal year of 2003-04.

At the conclusion of fiscal year 20, NCDOT (DOT and NCSPA) employees occupied at total of 2,382 buildings, totaling 9,376,748 square feet, and building utility costs totaled $10,771,348.

FY 20 - 22 strategies, programs, roles and deadlines are summarized in Appendix A on page 14, and energy and cost reductions achieved through FY 20 are illustrated in the following tables and graphs.

Table 1 – Total Energy Usage for DOT and NCSPA during FY 20

Agency	Building Square Fee	Total Building Utility Expense
DOT	6,552,374	$9,184,593
NCSPA	2,824,363	$1,586,755

Figure 1 – Total Avoided Cost for DOT and NCSPA combined

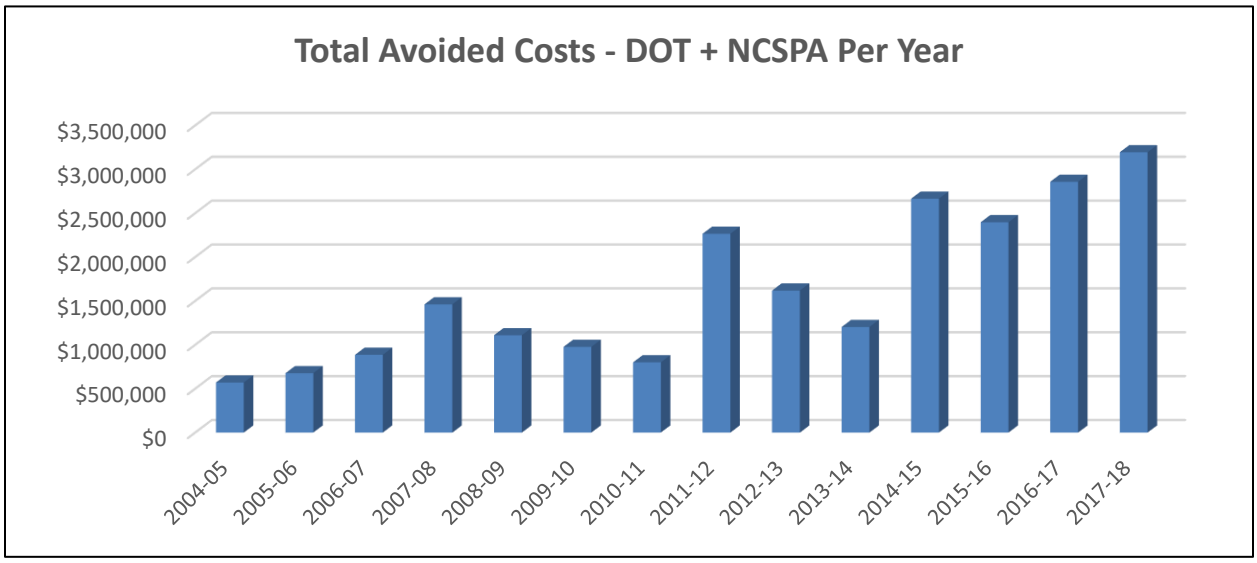


Figure 2 – Energy in BTUs per square foot for DOT

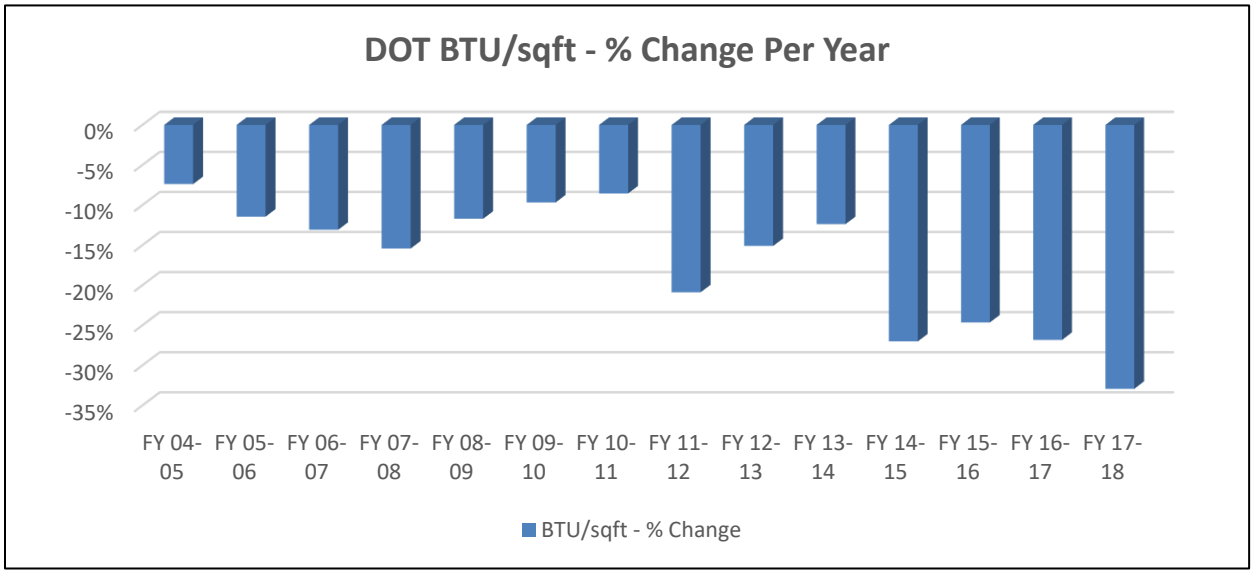


Figure 3 – Energy Usage in BTUs per square foot for NCSPA

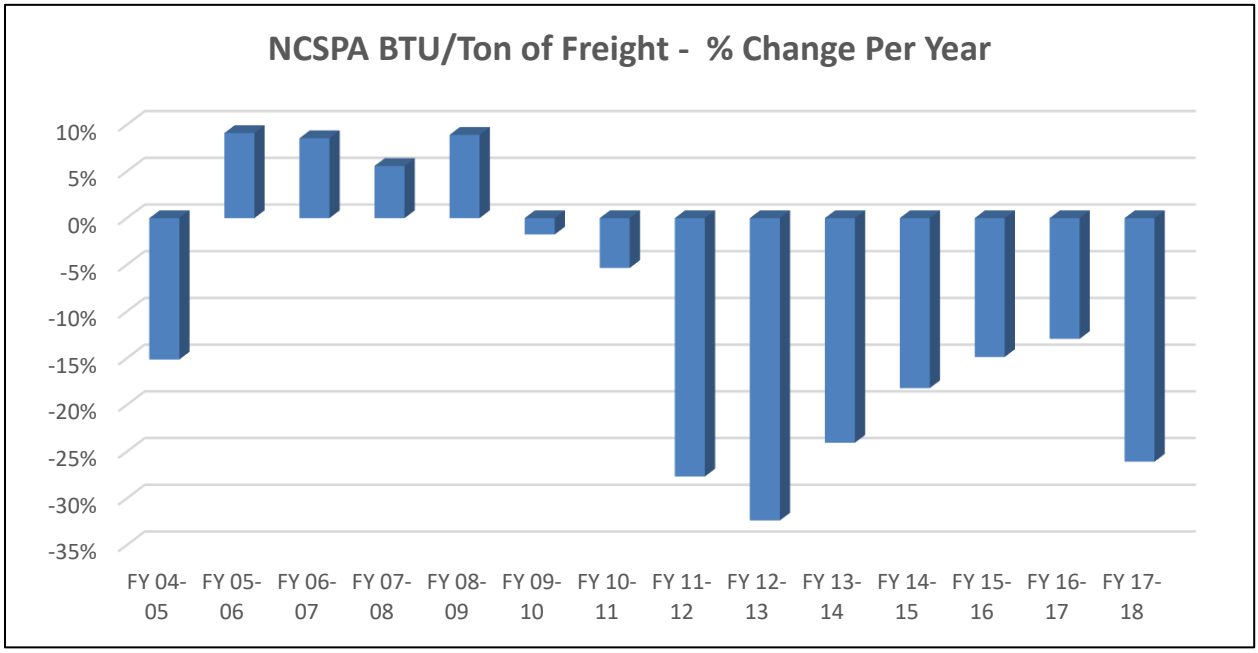
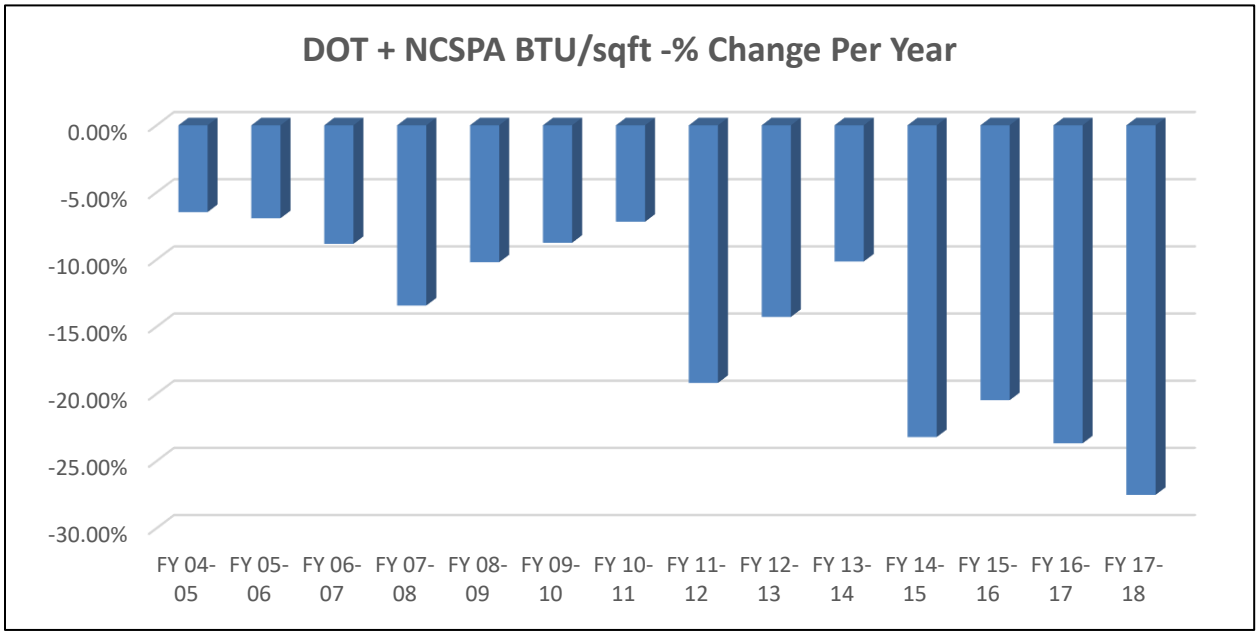


Figure 4 – Total Energy Usage in BTUs per square foot of DOT and NCSPA



The following is a summary of the legislative and executive basis for this report and NCDOT programs in place followed by additional figures and tables showing results to-date.

Basis for NCDOT Agency Utility Management Plan

The Agency Utility Management Plan (AUMP) for NCDOT was developed in accordance with General Statute 143-64.10-12, *Energy Conservation in Public Facilities*, which mandates a comprehensive energy management program for State government, and Section 8 of Executive Order 80 (EO-80), NORTH CAROLINA'S COMMITMENT TO ADDRESS CLIMATE CHANGE AND TRANSITION TO A CLEAN ENERGY ECONOMY. This AUMP also meets the objectives of the State Utility Savings Initiative as managed by DEQ.

NCDOT Energy Conservation Programs

The primary NCDOT programs to achieve Executive Order 80 and legislative energy conservation goals are:

- Guaranteed Energy Savings Contract (GESC)
    - Use GESC as approved for state buildings or utility systems under General Statute 143-64.17, as a vehicle to fund and implement energy-related improvements.

    - *Building GESC*
        - Installed Energy Conservation Measures (ECMs) in 6 buildings in Raleigh
        - Installed more energy efficient HVAC system, lighting, windows and water fixtures.
        - Installed a building automation system to improve energy savings and monitor energy usage.
            - This system can be expanded to monitor and control HVAC systems in other DOT facilities.
        - Guaranteed cost savings over 15 years: **$8,897,860**
        - Status: Ongoing – energy savings period

    - *Roadway Lighting GESC*
        - Upgrading roadway light fixtures on state-owned roads and in NCDOT buildings state-wide to LED-based fixtures.
        - Upgraded **10,689 roadway light fixtures** to LED-based fixtures.
        - Upgraded **14,981 interior and exterior light fixtures** in **805 DOT buildings** to LED-based fixtures.
        - Installed lighting control system to monitoring energy usage and support maintenance of fixtures.
        - Cost of installation and maintenance over 15 years to be paid from energy and operational savings.
        - Guaranteed cost savings over 15 years: **$51,295,813**
        - As of 11/11/2018 this is the only roadway lighting project in the US where project savings are used to:
            - Upgrade all state-owned roadway lighting
            - Install a lighting control system
            - Maintain & repair installed roadway lighting systems
        - Status: In construction – construction completion date is 3/31/2019.

- Energy Efficiency Incentives
  - Partnering with utility providers to utilize energy efficiency incentive programs to reduce the cost of NCDOT projects - both vertical and horizontal.
  - Utilities provide a rebate for the installation of approved energy efficient hardware as well as funding approved measures / projects that will save energy.
  - Projected energy incentives from utility companies to reduce the cost of the *Roadway Lighting GESC* project by over **$1,500,000**.
  - Incentives totaling **$338,000** were received by NCDOT for the *Building GESC* project.
  - Status: Ongoing

- Analysis of Utility Accounts and Billing
  - Measuring and analyzing utility bills to identify opportunities to reduce cost and provide data in support of new and ongoing projects.
  - As of 02/15/2019, NCDOT pays the cost of 15,025 utility (electricity, water, gas, fuel oil, etc.) accounts.
  - Verify billing using appropriate rates.
  - Consolidate accounts to take advantage of lower rates.
  - Identifying excessive energy usage to identify and take corrective action.
  - Status: Ongoing.

- Building Energy Efficiency Design Standards
  - Ensure compliance with 2012 NC State Energy Code: Energy Conservation Code / NCGS 143-135.35, Article 8C so that new and renovated building designs are energy efficient.
  - Implement additional energy efficiency / sustainability design standards and other best practices for new and renovated buildings.
  - Status: Ongoing.

- Energy Audits
  - Perform energy audits of facilities to identify opportunities for energy and water conservation, and perform cost/benefit analysis for the proposed measures.
  - Plan and implement appropriate energy conservation projects funding permitting.
  - Status: Ongoing.

- NC Workspace Standards
  - Implementing latest State Property Office workspace standards in new and renovated buildings.
  - Reduces space / buildings needed in new and renovated buildings, energy consumption, and costs.
  - Status: Ongoing

- Training
  - Train facility managers / staff to perform preventative maintenance of existing and new systems to ensure energy and water conservation objectives are met and maintained.
  - Ensure adequate training is included in the scope of work for building projects.
  - Status: Ongoing

- Partner with Other Agencies on Energy Savings Programs
  - Work with the Department of Environment Quality (DEQ) / State Energy Office (SEO), and other agencies to participate in existing or planned energy savings programs - particularly those funded / sponsored by those agencies.
  - Energy audits paid with funding from other agencies.
    - Usually coordinated by DEQ / SEO
  - Status: Ongoing

- Education
  - Educate / inform / engage NCDOT employees regarding state-wide energy conservation project and best practices through meeting presentations, emails, Intranet web sites, etc.
  - Status: Ongoing

Energy and Utility Usage Data

The following tables and graphs list and illustrate utility usage and costs in NCDOT owned facilities from the baseline year of FY 2003-04 to-date as well as progress toward achieving energy conservation and other goals specified in EO-80 and legislation.

Figure 5 – DOT Utility Costs for FY 2017-18

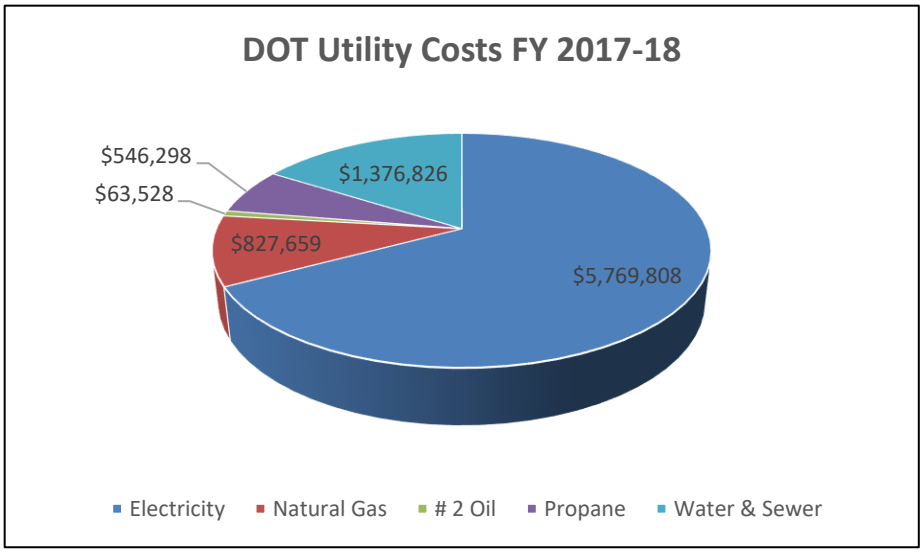


Figure 6 – DOT Utility Costs Per Year

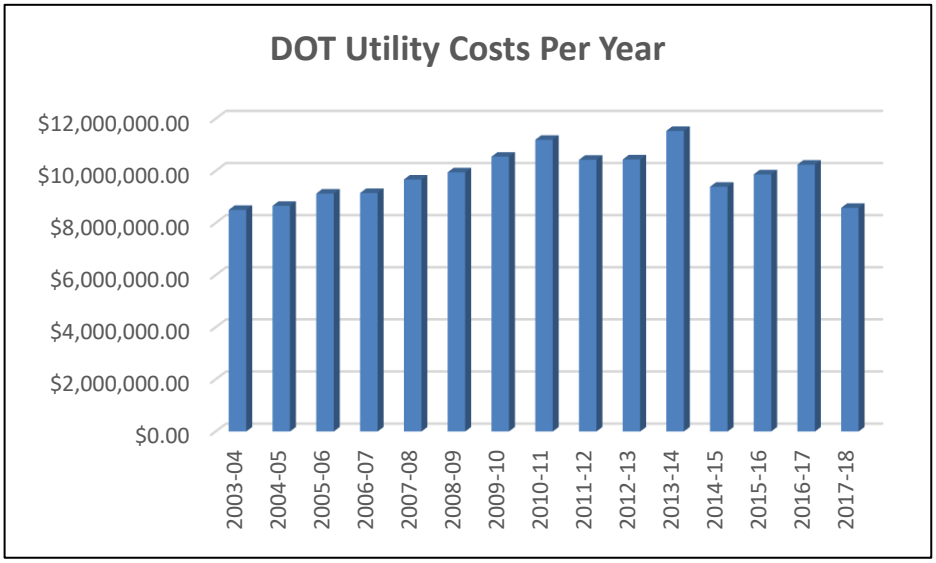


Figure 7 – NCSPA Utility Costs for FY 2017-18

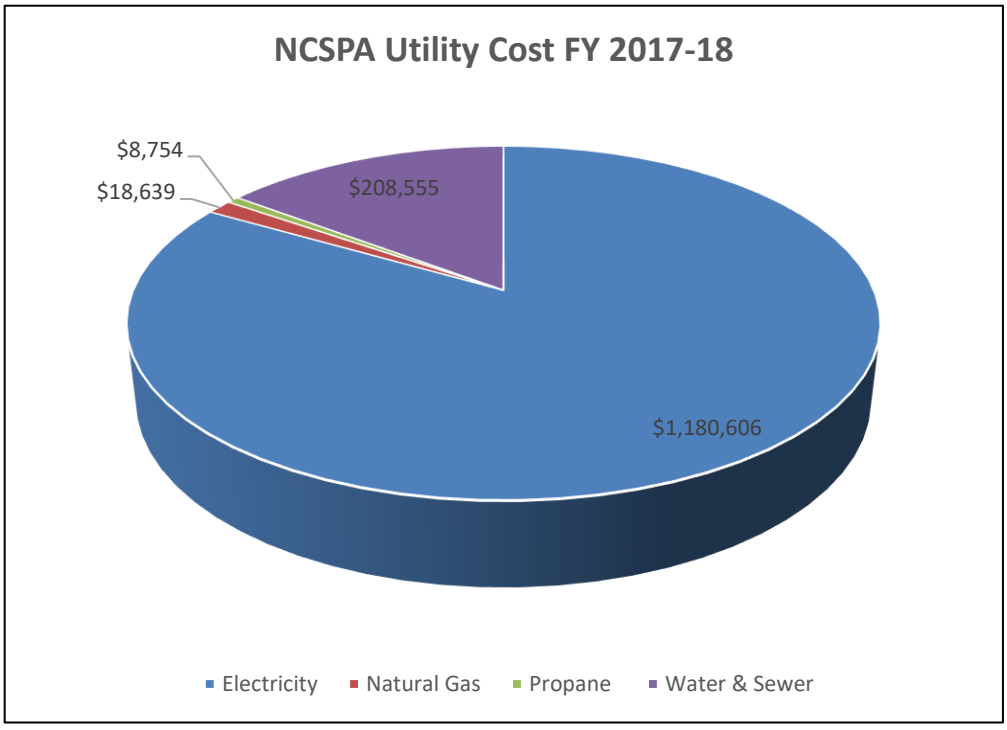


Figure 8 – NCSPA Utility Costs Per Year

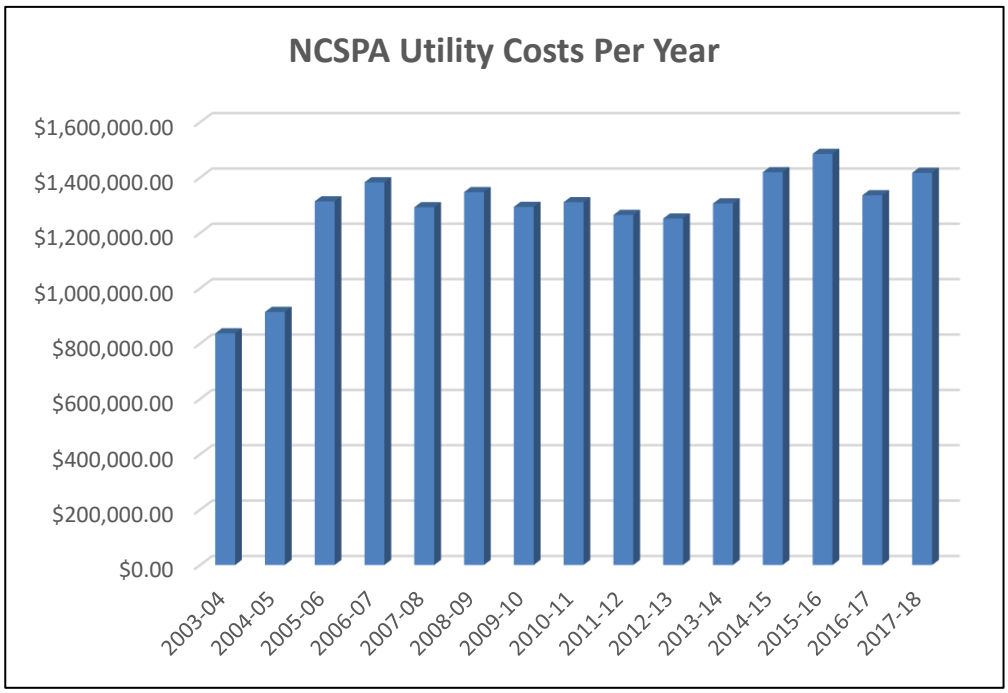


Figure 9 – DOT + NCSPA Utility Costs for FY 2017-18

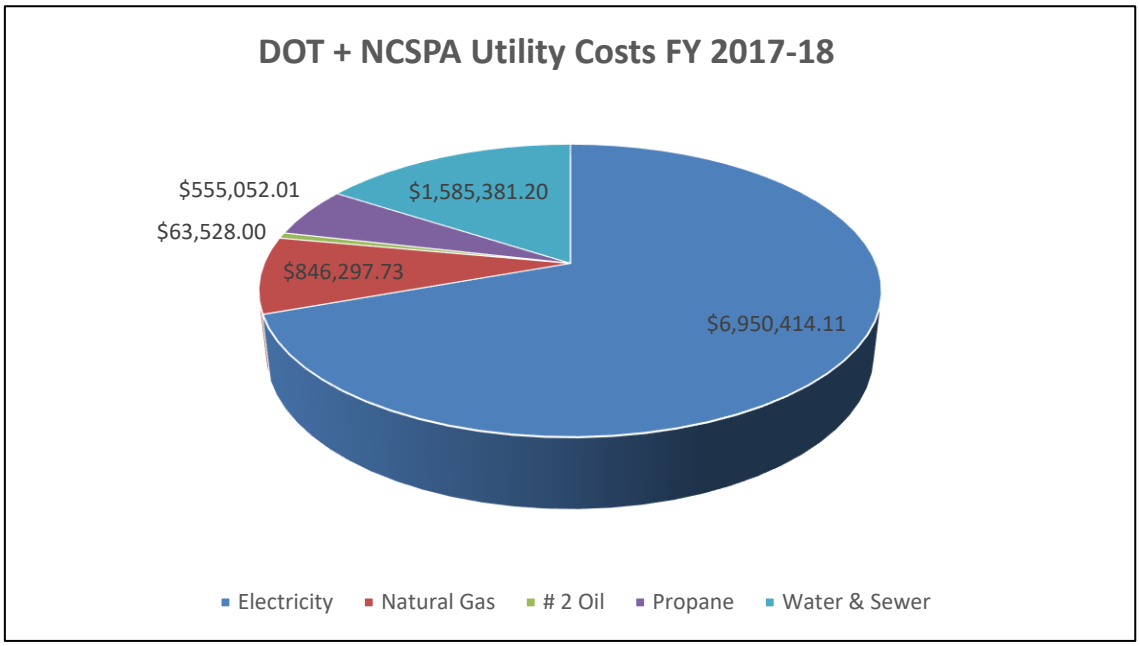


Figure 10 – DOT + NCSPA Utility Costs Per Year

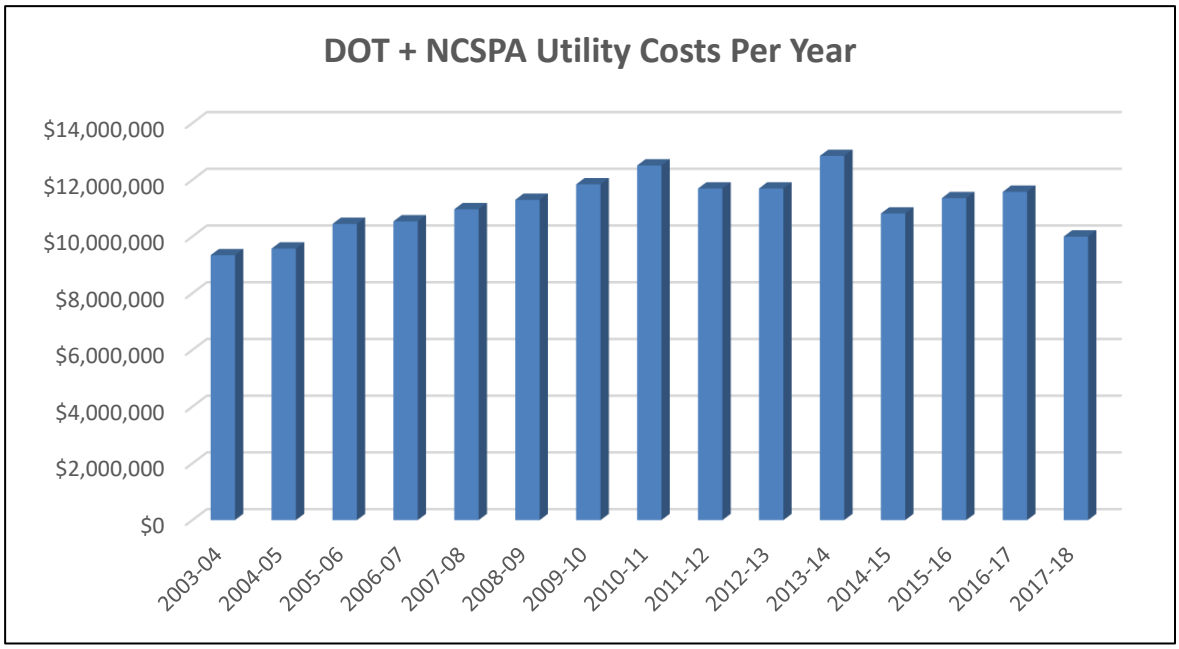


Table 2 – DOT + NCSPA Total Utility Costs and Savings Per Year

Fiscal Year	Total Utility Cost	Total Energy Cost	Total BTU	Total Savings / Cost Avoidance
2003-04	$9,341,426	$7,968,465	468,194,525,603	$0
2004-05	$9,575,686	$8,252,231	440,432,559,838	$681,870
2005-06	$10,445,101	$9,102,939	442,095,953,042	$948,020
2006-07	$10,534,967	$9,151,251	435,071,335,280	$1,289,426
2007-08	$10,962,336	$9,426,863	421,516,401,078	$1,975,965
2008-09	$11,293,419	$9,773,003	441,776,595,730	$1,567,344
2009-10	$11,841,312	$10,197,596	451,010,172,592	$1,939,150
2010-11	$12,505,316	$10,349,287	463,559,419,547	$2,572,585
2011-12	$11,693,641	$9,543,376	406,075,671,419	$4,065,367
2012-13	$11,693,575	$9,725,755	422,504,327,079	$2,139,048
2013-14	$12,842,594	$10,663,448	454,034,725,899	$1,258,751
2014-15	$10,811,735	$8,815,598	388,128,689,644	$4,470,425
2015-16	$11,354,444	$9,316,551	405,665,608,567	$3,567,365
2016-17	$11,576,783	$9,213,902	394,589,016,967	$3,227,339
2017-18	$10,000,673	$8,415,292	378,824,523,811	$4,888,300
2018-19	$11,056,122	$9,447,950	385,933,161,556	$3,027,378
2019-20	$10,771,348	$8,552,775	369,093,657,350	$3,188,775

Table 3 – DOT + NCSPA Utility Usage Per Year

Fiscal Year	Elect - kWh	NG - therms	#2 oil - gals	Propane - gals	Water - kgal
2003-04	86,652,990	1,111,591	10,081	533,782	261,994
2004-05	85,256,357	885,493	12,200	561,665	242,988
2005-06	89,688,007	835,562	4,802	491,151	221,089
2006-07	89,396,867	772,125	3,275	475,535	206,793
2007-08	85,876,819	821,193	37,180	449,864	204,064
2008-09	86,587,839	907,786	58,725	517,370	211,582
2009-10	85,337,729	993,424	59,069	570,699	174,478
2010-11	89,730,765	999,185	70,528	520,451	153,404
2011-12	89,022,044	684,572	25,353	331,259	153,048
2012-13	82,430,157	970,481	25,358	443,958	218,086
2013-14	87,254,878	1,082,185	42,896	459,951	275,758
2014-15	75,191,176	842,193	31,990	468,320	148,538
2015-16	79,198,293	774,510	29,863	587,559	181,319
2016-17	76,128,423	764,352	26,747	596,787	250,203
2017-18	68,714,683	1,040,101	30,436	394,323	141,420
2018-19	75,545,860	933,992	12,389	360,656	150,182
2019-20	73,012,385	924,707	2910	295,710	260,682

Table 4 – Roadway Lighting Energy Savings Performance Contract Project - Costs and Energy Savings

				Schedule N						
				Guaranteed Cash Flow Analysis						
Total Financed Costs:	$ 33,454,594				Escalation Rate by Utility/Fuel*					
Finance Term Years:	15				Electric:	0%				
Annual Interest Rate:	2.75%				Natural Gas:	0%				
Construction Months:	16				Steam:					
First Year Payment:	$ 2,793,285				Water:	0%				
Principal	$ 34,596,945	including construction period interest			Other (specify):					
Interest	$ 7,725,119				Escalation Rate for Annual Fees (Avg):	2.38%				

Yr.	Guaranteed Electric Dollar Savings	Guaranteed Electrical Dollar Savings from Control System	Other Guaranteed purchased Fuel Dollar Savings	Guaranteed Water Dollar Savings	-	Guaranteed Operational Dollar Savings	Total Guaranteed Dollar Savings (a)	Annual Service Fees (b)	Financing Cost (P&I) (c)	Net Savings (= a-b-c)
0	$ -	$ -	$ -	$ -		$ -	$ -	$ -	$ -	$ -
1	$ 1,202,563	$ 156,718	$ -	$ -	$ -	$ 1,824,648	$ 3,183,929	$ 390,644	$ 2,793,285	$ -
2	$ 1,202,563	$ 142,297	$ -	$ -	$ -	$ 1,864,243	$ 3,209,104	$ 455,354	$ 2,753,750	$ -
3	$ 1,202,563	$ 130,047	$ -	$ -	$ -	$ 1,899,065	$ 3,231,675	$ 465,740	$ 2,765,935	$ -
4	$ 1,202,563	$ 118,913	$ -	$ -	$ -	$ 1,934,595	$ 3,256,071	$ 476,465	$ 2,779,606	$ -
5	$ 1,202,563	$ 108,492	$ -	$ -	$ -	$ 1,970,846	$ 3,281,902	$ 487,541	$ 2,794,361	$ -
6	$ 1,202,563	$ 98,576	$ -	$ -	$ -	$ 2,009,372	$ 3,310,511	$ 514,365	$ 2,796,146	$ -
7	$ 1,202,563	$ 89,043	$ -	$ -	$ -	$ 2,046,039	$ 3,337,645	$ 526,489	$ 2,811,156	$ -
8	$ 1,202,563	$ 79,815	$ -	$ -	$ -	$ 2,084,555	$ 3,366,933	$ 539,009	$ 2,827,923	$ -
9	$ 1,202,563	$ 70,837	$ -	$ -	$ -	$ 2,122,225	$ 3,395,624	$ 535,614	$ 2,860,010	$ -
10	$ 1,202,563	$ 62,068	$ -	$ -	$ -	$ 2,162,292	$ 3,426,923	$ 548,642	$ 2,878,281	$ -
11	$ 1,202,563	$ 53,481	$ -	$ -	$ -	$ 2,210,637	$ 3,466,680	$ 636,702	$ 2,829,978	$ -
12	$ 1,202,563	$ 45,051	$ -	$ -	$ -	$ 2,250,095	$ 3,497,709	$ 652,104	$ 2,845,605	$ -
13	$ 1,202,563	$ 36,760	$ -	$ -	$ -	$ 2,292,095	$ 3,531,418	$ 685,670	$ 2,845,748	$ -
14	$ 1,202,563	$ 28,596	$ -	$ -	$ -	$ 2,333,153	$ 3,564,312	$ 702,431	$ 2,861,881	$ -
15	$ 1,202,563	$ 20,545	$ -	$ -	$ -	$ 2,375,019	$ 3,598,127	$ 719,728	$ 2,878,399	$ -
Total	**$ 18,038,442**	**$ 1,241,240**	**$ -**	**$ -**	**$ -**	**$ 31,378,878**	**$ 50,658,561**	**$ 8,336,497**	**$ 42,322,064**	**$ -**

NOTES:
1) Annual Net Savings must never be negative.
2) A surplus in one year cannot be carried forward to create positive cash flow in a subsequent year.
3) "Annual Service Fees (b)" includes Owner 3rd party review fee of + ESCO M&V + Service fees
4) Guaranteed savings values will be verified per calculation methods in Schedule F.
5) Interest rate as provided by ISSUER to ESCO. Payments are calculated monthly in arrears.
6) Electric and Operating savings will all be combinned and guaranteed annually as a total savings amount and not individually.
7) Construction Period Interest is capitalized for calculation of Financing Costs (P&I)

Table 5 – Building Energy Savings Performance Contract – Costs and Energy Savings

Yr.	Guaranteed Electric Dollar Savings	Guaranteed Natural Gas Dollar Savings	Guaranteed DOA Steam and Chilled Water Dollar Savings	Guaranteed Water Dollar Savings	Other Please Specify	Guaranteed Operational Dollar Savings	Guaranteed Dollar Savings (a)	Annual Service Fees (b)	**Financing Cost (P&L) (c)	**Net Savings = a-b-c
0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
1	$ 308,979	$ (48,616)	$ 175,485	$ -	$ -	$162,321	$ 598,169	$ 27,760	$ 570,408	$ 1
2	$ 308,979	$ (48,616)	$ 175,485	$ -	$ -	$161,670	$ 597,518	$ 28,315	$ 569,200	$ 3
3	$ 308,979	$ (48,616)	$ 175,485	$ -	$ -	$161,005	$ 596,854	$ 28,882	$ 567,972	$ 0
4	$ 308,979	$ (48,616)	$ 175,485	$ -	$ -	$160,328	$ 596,176	$ 29,459	$ 566,716	$ 1
5	$ 308,979	$ (48,616)	$ 175,485	$ -	$ -	$159,637	$ 595,485	$ 30,048	$ 565,436	$ 1
6	$ 308,979	$ (48,616)	$ 175,485	$ -	$ -	$158,932	$ 594,780	$ 30,649	$ 564,128	$ 3
7	$ 308,979	$ (48,616)	$ 175,485	$ -	$ -	$158,213	$ 594,061	$ 31,262	$ 562,796	$ 3
8	$ 308,979	$ (48,616)	$ 175,485	$ -	$ -	$157,479	$ 593,328	$ 31,888	$ 561,440	$ 0
9	$ 308,979	$ (48,616)	$ 175,485	$ -	$ -	$156,731	$ 592,580	$ 32,525	$ 560,052	$ 2
10	$ 308,979	$ (48,616)	$ 175,485	$ -	$ -	$155,968	$ 591,817	$ 33,176	$ 558,640	$ 1
11	$ 308,979	$ (48,616)	$ 175,485	$ -	$ -	$155,190	$ 591,038	$ 33,839	$ 557,196	$ 3
12	$ 308,979	$ (48,616)	$ 175,485	$ -	$ -	$154,396	$ 590,244	$ 34,516	$ 555,728	$ 0
13	$ 308,979	$ (48,616)	$ 175,485	$ -	$ -	$153,586	$ 589,435	$ 35,206	$ 554,228	$ 0
14	$ 308,979	$ (48,616)	$ 175,485	$ -	$ -	$152,760	$ 588,609	$ 35,911	$ 552,696	$ 2
15	$ 308,979	$ (48,616)	$ 175,485	$ -	$ -	$151,918	$ 587,766	$ 36,629	$ 524,581	$ 26,556
Total	**$ 4,634,691**	**$ (729,240)**	**$ 2,632,275**	**$ -**	**$ -**	**$ 2,360,134**	**$ 8,897,860**	**$ 480,065**	**$ 8,391,217**	**$ 26,578**

Appendix A

NCDOT Agency Utility Management Plan

2019-21

Focus Area 1: Comprehensive Plan	
Strategy 1.	Designate Energy Manager as the point of contact for SEO
Strategy 2.	Edit or create a plan to reflect energy efficiency strategy toward 40% reduction in Btu/gsf and EO-80 goals.
Strategy 3.	Contact the SEO to assist with review of strategy, budget, training, and timeline.
Strategy 4.	Develop internal stakeholders to develop behavioral programming and internal team building toward goals
Strategy 5.	Implement Plan

2019-2021 Planned Activities	**Expected Measurement**	**Assigned To**	**Occurrence**
Meet with SEO to develop ideas for plan	Discuss training schedule available, current Utility Management Plan and future Management Plan	Energy Manager and SEO staff	Quarterly
Research facilities for potential energy savings projects	Create a list to use for potential projects to be implemented in the Utility Management Plan	Energy Manager and Agency Staff	Quarterly
Create a Utility Management Plan	Complete timeline and approvals from agency and submit plan to SEO	Energy Manager, Agency Staff, and NCDOT Climate Change Workgroup	Due March 1, 2019, thereafter October 1st each year
Attend SEO or other energy conservation training sessions	Discuss lessons learned with staff and how that can enhance your strategy	Agency staff	As available
Develop internal stakeholders and internal teams to implement plan	Designate a person or team to implement portions on the plan	Energy Manager, Agency staff, and NCDOT Climate Change Workgroup	May, 2019

2019-2021 Planned Activities	Expected Measurement	Assigned To	Occurrence
Develop internal marketing and awards/rewards program	Designate person to develop programming and implement program	Energy Manager, Agency Staff, and NCDOT Climate Change Workgroup	May, 2019
Review Utility Management Plan progress	Tweak plan if it is not realizing expected savings	Energy Manager, and NCDOT Climate Change Workgroup	Quarterly
Track and analyze utility data	Record monthly utility data for annual utility report to submit to SEO and trend to catch anomalies early on	Energy Manager	Monthly, September 1st each year
Performance Contracts	Verifying guaranteed energy savings are achieved, and execute contractual requirements	Energy Manager and Agency Staff	Monthly monitoring and annual energy savings verification.
Energy Efficiency Incentives	Partner with utility providers to utilize energy efficiency incentive programs to reduce the cost of NCDOT projects - both vertical and horizontal.	Energy Manager and Agency Staff	Evaluate by project.
Building Energy Efficiency Design and Workspace Standards	Implement most recent NC State Energy Code and additional energy efficiency / sustainability design standards, SPO workspace standards, and other best practices for new and renovated buildings.	Energy Manager and Agency Staff	Update quarterly.
Partner with DEQ / State Energy Office and other agencies on energy savings projects	Coordinated with DEQ and other agencies.	Energy Manager and Agency Staff	As available
Training	To promote preventative maintenance of new and existing systems to maintain expected energy savings.	Energy Manager and Agency Staff	As contractually required.
Education	To inform and promote energy savings	Energy Manager and Agency Staff	TBD

2019-2021

Focus Area 2: Projects to Implement	
Strategy 1.	Review projects with staff to determine high priority projects to implement
Strategy 2.	Work with staff to determine the best timeframe to implement projects
Strategy 3.	Create a schedule for projects to be implement during the fiscal year
Strategy 4.	Communicate projects to staff
Strategy 5.	Implement projects

Planned Activities	Expected Measurement	Assigned To	Occurrence
Building Energy Performance Contract	Annual energy savings	Energy Manager and Agency Staff	Ongoing
Roadway Lighting Energy Performance Contract	Completion of construction work by 3/31, annual energy savings, and compliance with contractual maintenance requirements.	Energy Manager and Agency Staff	Ongoing
Energy Efficiency Incentives	Funds received per project	Energy Manager and Agency Staff	Ongoing
Analyze and track uility accounts to reduce costs and identify problems to correct	Funds saved	Energy Manage and Agency Staff	Ongoing
Investigate options for tracking utility data	Determine the best method to track utility data	Energy Manager and Agency Staff	February 3, 2020
Energy Audits and Corrective Measures	Identification of buildings that show excessive energy usage; determine cause and implement corrective actions.	Energy Manager, DEQ, and Agency Staff	TBD
Building energy efficiency design and SPO workplace standard	Update annually	Energy Manager and Agency Staff	Annually
Develop priority list of projects for 2020-21	Develop list of projects and start to schedule implementation for next fiscal year	Energy Manager and staff	June 30, 2020

NC Department of Transportation

Agency Utility Management Plan Declaration

- The NC Department of Transportation recognizes that energy and water consumption can be managed for the benefit of our agency. Energy and Water management is the responsibility of the staff at each facility, guided and supported by the NCDOT Energy Management Engineer.
- The Department of Transportation has implemented an Agency Utility Management Plan for NCDOT-owned facilities. The Director of Facilities Management Division is responsible for the success of the program in NCDOT facilities.
- The attached plan outlines the activities and expenditures required to reduce energy and water consumption in NCDOT-owned facilities to achieve the goals of the program.
- The Department Secretary's staff will review progress and results, and will support staff attendance at training in energy and water management**.**

Agency Utility Management Plan Goals

As required in Executive Order 80, NCDOT will support efforts to reduce by 2025 total energy consumption per square foot in state owned buildings by at least 40% below fiscal year 2002-2003 levels, and implement energy efficiency best practices and programs in support of these goals.

Agency Utility Management Plan – Measures

Our tracking measures will be the following Key Performance Indicators:

Total Energy Use per Square Foot
Total Energy Cost per Square Foot
Total Water Use per Square Foot
Total Water Cost per Square Foot

Strategic Energy and Water Plan Mandate – Commitment

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

Implemented this __th day of September 2020

_____	_____	_____
Energy Management Engineer	Director, Facilities Management Division	Department Secretary

NC Department of Revenue

Agency Utility Management Plan

Fiscal Years 2019-2021

Prepared by Business Services and Support
11-24-2020

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 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.

Utility Management Plan
2019 - 2021

Focus Area 1: Comprehensive Plan	
Strategy 1.	Designate Energy Manager as the point of contact for DOR
Strategy 2.	Create a plan 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.	Develop internal education and marketing plan to support the strategy
Strategy 5.	Implement Plan

2019-2021 Planned Activities	**Expected Measurement**	**Assigned To**	**Occurrence**
Meet with SEO to develop ideas for the plan	Discuss the Utility Management Plan content and focus areas	Agency Designee, Energy Manager and SEO staff	Complete
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	Complete
Create a Utility Management Plan	Complete the plan and timeline for the agency and submit plan to SEO	Agency Designee, Energy Manager and staff	Due March 1, 2019, thereafter October 1st each year
Attend SEO or other energy conservation training sessions	Completion of training and identification of revisions to plan as needed	Agency staff	No dates at this point
Identify 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	Complete
Develop marketing and communication program	Designate a team to develop and implement program	Agency Designee, Energy Manager and staff	Complete
Review Utility Management Plan progress	Review plan and revise and adjust initiatives and timelines as needed	Agency Designee, Energy Manager and staff	Quarterly
Review utility data	Work with DOA to review the utility data baseline and ongoing data tracking	Energy Manager and DOA	Included with DOA data for the Downtown Complex

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 initiatives to implement during the fiscal year
Strategy 4.	Communicate initiatives to staff
Strategy 5.	Implement initiatives

2019-2021 Planned Activities	Expected Measurement	Assigned To	Occurrence
HVAC improvements	Implement HVAC improvements	Energy Manager and DOA	December, 2019
LED Light replacement – rotunda areas	Replace obsolete lighting in multi-floor rotunda areas	Energy Manager and DOA	December, 2019 Complete
Evaluate aging equipment in various areas and develop a master plan for replacement	Replacement of aging equipment (PDUs and CRAC Units Replaced in Data Center)	Energy Manager, DOA and staff	September, 2021 Ongoing
Review leased space specifications and preferences for addition of energy efficient features for new 2019 advertisements	Updated and approved specifications for future leased space advertisements	Agency Designee, staff and SPO	December, 2019 Complete
Discuss energy efficient features and future initiatives with leased property owners	Document existing features and planned improvements for leased space	Energy Manager and staff	June, 2020 Complete
Evaluate adding energy efficient and environmentally safe language to solicitations for goods and services	Standard language drafted for inclusion in solicitations Language identified and to be added to solicitations as appropriate.	Agency Designee and staff	December, 2019 Complete
Review agency telework policy	Updated telework policy	Agency Designee and staff	December, 2019 Complete
Evaluate potential use of ZEVs	Review use of long term lease and motor fleet vehicles	Agency Designee and staff	June, 2021 Complete
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

2019-2021 Planned Activities	Expected Measurement	Assigned To	Occurrence
Create internal employee education campaign	Employee awareness of Executive Order 80 and opportunities to support energy efficiency	Agency staff	December, 2019 Complete
Update marketing plan for electronic filing	Identification of action items to support increased electronic filing	Agency staff	Annually

Agency Accomplishments since March, 1 2019

- In 2019, the Department of Revenue supported the Department of Administration (DOA) in making HVAC upgrades to the main DOR building. The project included replacement of the outdated controls tied to the HVAC system. This project supports the Executive order by making the HVAC system more energy efficient as well as make it easier to regulate temperature throughout the facility.
- The Department of Revenue funded and upgraded lighting in several locations throughout the main facility. These changes included moving from high energy use lighting to LED lighting in the rotunda areas on each floor and the secretary's conference room. 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 funded and upgraded the outdated Power Distribution Units (PDU) throughout the main facility. This equipment was outdated and nearing the end of life. With the assistance of DOA, the agency has a better utilized power distribution system, one less PDU, and a better source of redundant power to critical equipment.
- The Department of Revenue funded the replacement of outdated computer room air conditioning (CRAC) units located inside the main data center. With the assistance of DOA, one CRAC unit inside the Data Center was downsized resulting in better utilization and efficiency of air flow. The new CRAC units work together with 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 data center.

Newly installed equipment inside of our Data Center

- 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 created an internal employee education program about Executive Order 80 to include posters throughout all facilities as well as Intranet postings. The Digital Communication Division maintains an Electronic Filing Marketing Plan with the objective of increasing electronic filing for individual and business taxes. For tax year 2019, electronic filing increased by 3% for Individual Income Tax, 6% for Corporate Tax, and 9% for Partnership Tax. Increased electronic filing results in lower power consumption by the high speed scanning equipment.

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 Business Services and Support 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.
- The Department will review progress and results and will support staff in attendance at training in energy and water management**.**

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

EXECUTIVE ORDER 80 ENERGY & WATER MANAGEMENT PLAN

Revision 1

SEPTEMBER 16, 2020

CENTRAL ENGINEERING
2020 Yonkers Road, Raleigh, NC 27699

Executive Summary:

GS 143-64 requires all agencies reduce energy and water *intensity* by 30%[1] by 2025. Governor Cooper's Executive Order 80 increases this requirement to 40%[2] by FY 2025-2026. NCDPS is struggling to attain these targets (see **Graph 1A** and **1B**) even though efforts have intensified substantially since FY 2017-2018 (**Appendix A**). NCDPS currently stands at an 19 % energy and 12 % water reduction compared to FY 2002-2003[3]. By comparison, the department *peaked at a 22% and a 23% reduction respectively in FY 2016-2017. The department's annual* water & sewer expenditure is about the same as electricity - and even higher for correctional facilities*. For this reason, the focus must be equally on energy and water reductions in intensity. A challenge to reducing intensities is that ~40% of correctional spaces are not air conditioned and lack sufficient security lighting; moreover, when NCDPS begins addressing these basic operational shortfalls, it will only serve to delay achievement of the targets.*

Attaining these targets requires aggressive action:

- Saving approximately 87 MMBTU every year for the next six years based on current usage intensity.
- This translates to investing approximately *$13.5M* a year in water and energy efficiency projects[4], or $81M over the next 6 years. Projects both funded and unfunded needed to attain these targets are provided in **Appendix B**. *Aggressive leak detection and repair could noticeably reduce overall project funding needs.*
- Hiring additional staff to manage these projects and properly maintain facility systems.
- Leadership buy-in and promotion of commission-based maintenance over break-fix.

Legislation like HB 1292[5] for cabinet agencies would accelerate these efforts. Several universities have taken advantage of this bill and have surpassed the desired 40% reduction in water & energy intensity.

Attaining these targets have tremendous tangential benefits:

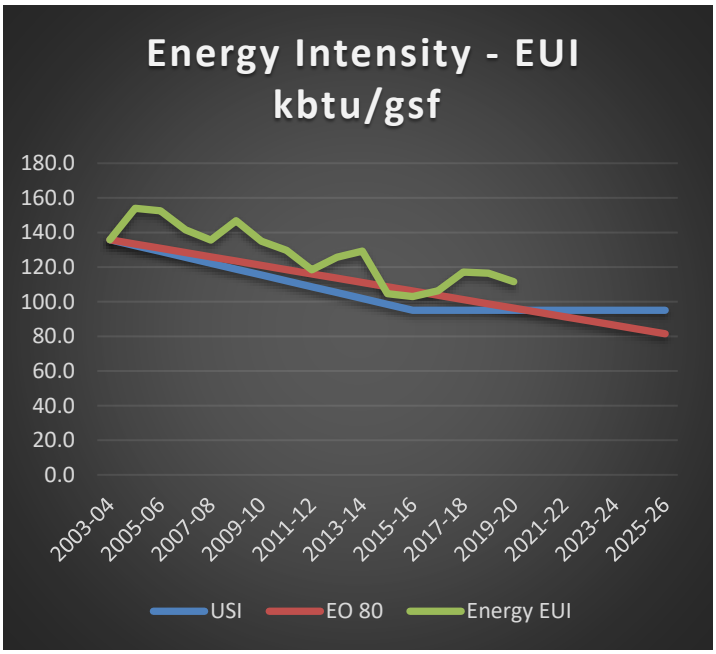
- Improved security and safety of our Adult Correctional and Juvenile Justice officers and staff, and adult and youth offenders.
- Reduced deferred maintenance.
- Reduced maintenance requirements.
- Improved occupancy comfort (temperature and visual),
- Prolonged equipment life.
- 15% or better ROIs. *How many departments can pay for their salaries through their savings?*

Attaining these target reductions are challenging for several reasons:

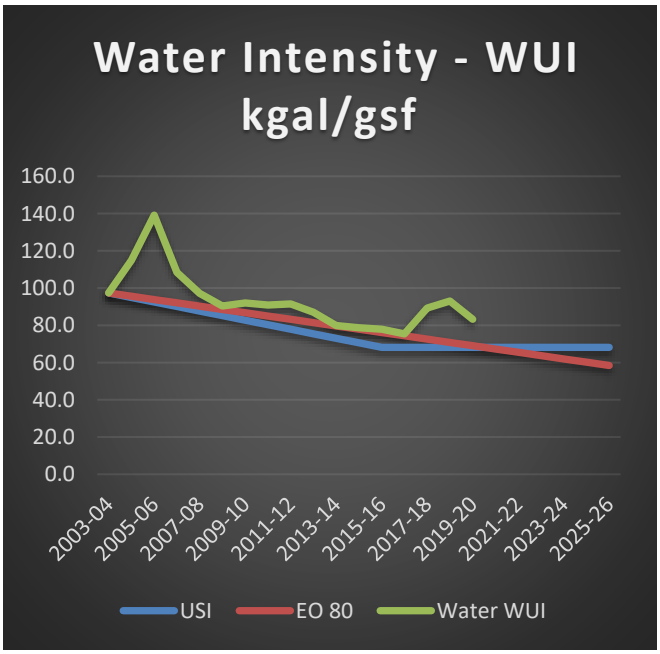
- Insufficient energy management and maintenance staffing.
- Insufficient funding with energy and water efficiency projects competing with other Repair and Renovation needs such as leaking roofs, failing infrastructure and mechanical & electrical systems.

[1] Session Law 2008-203/Senate Bill 1946: Intensity is the energy and water use per square foot.
[2] Compared to our energy/water intensity (usage per gross square foot) in FY 2002-2003. See also Footnote 3.
[3] There is insufficient data to establish a FY 2002-2003 baseline. So, FY 2003-2004 is being used. See also Footnote 2.
[4] This is an "order of magnitude" estimate. Our current level of project investment is $1M a year, or around 10% of what is required.
[5] HB 1292 allows universities -but not other state agencies - to use energy efficiency savings from completed projects for new energy efficiency projects. Utility budgets are maintained at "pre-energy efficiency project" funding levels.

- No building management system (BMS) standards and insufficiently trained staff to proper manage these systems.



Graph 1A



Graph 1B

Accomplishments FY 2019-2020:

Funding:

Opt-Out funding peaked this year at close to $1.2 M. *This will decrease over time due to site closings and reduced energy usage.* From the inception of our program to present over $2.4M in credits have been received.

Analyses:

- NCDPS' utilities database, Capturis, issues "fatal exceptions" whenever usage increases by 50% as compared to the same month in the past year. Emails are faithfully sent to these facilities staff at these sites requesting investigation of these issues. Otherwise, uncovering excessive (outlier) energy/water outlier usage is like looking for a needle in a haystack. The latest (August 2020) version Energy/Water Analytics Dashboard now pinpoints sites trending in the wrong (or right) direction at-a-glance.
- Oil and Propane are commodities – not utilities. This data must be carefully extracted from the NCAS system. As of FY 19-20 propane bills are now entered into Capturis partially simplifying the task. Fuel Oil bills still require careful review.

Finally, rate analyses (electric and third-party natural gas) are now on an annual review to always ensure the most cost competitive rates are used.

Staffing: Energy Management: The team has increased in size from 1 full time equivalent employees (FTE[6]) to 2.75 FTE with the hiring of a project manager for exterior lighting projects and a ¾ time college intern. These positions are temporary employees funded through Opt-Out credits and subject to disruptions created by frequent turnover. Adult Corrections (AC) is in the final stages of hiring an Energy & Sustainability Manager for the Department of Prisons. These hires will accelerate our interior lighting projects, allow us to formally develop a water leak detection, and, maintenance-based commissioning (MBC) program.

- Project Management: Additional support is provided on a 'when available' basis from the Central Engineering project management team. Over the past 12 months, four Small Business Projects have been completed by a project manager, yielding the equivalent of a ¼ FTE for the Energy Program.

[6] We cannot hire full time staff. Opt-Out funds are being used to hire additional staff from Temporary Solutions to develop sufficient bandwidth to execute more projects. However, temporary employees have little incentive to remain in temporary positions.

Projects:

Exterior Lighting: Since FY 2017-2018 over $1.9M has been spent and over 1,180 perimeter and 725 wall pack LED fixtures installed at our Correctional and Juvenile Justice facilities. 23 sites have been improved by these projects and of these 6 sites are completely retrofitted with LED exterior lights.

Interior Lighting: Since FY 2017-2018 over $506k has been spent on interior LED lighting retrofits for 21 sites.

Four sites have had comprehensive audits and retrofits under Duke Energy's Small Business Energy Savers (SBES) program. NCDPS spent $190k to receive a matching $285k in rebates as Duke covers 60% of the retrofit cost under this program.

Building Management Systems (BMS): Phase I of the BMS Design Guidelines is complete and being implemented on current and new projects. The design for upfitting Nash CI's BMS in accordance with the new BMS design guidelines is complete.

Water Leaks: The average age of our facilities is over 50 years and water leaks are a major issue. In FY 2018-2019 over $600k in water and energy savings occurred at Nash CI once leaks were repaired. Another major water leak at NCCIW is under investigation with repairs anticipated by November 2020.

Programs: All lighting purchases must now be approved by Central Engineering. This ensures we only order LED lamps. LED lamps are more expensive than conventional lamps (fluorescent and otherwise). Energy Management is matching funds to ensure energy efficient LED lamps are ordered.

Goals FY 2020-2021:

Funding:

As noted earlier Opt-Out credits have peaked due to operational consolidations and reduced energy usage. NCDPS is aggressively taking advantage of every funding option available by:

- Opting-Out of Renewable Energy Portfolio (REP) duplicate credits which will result in about $20,000 in additional credits. The overall impact of total credits received this year should be neutral.
- Taking advantage of Duke Energy's SBES Program which offers aggressive rebates up to 70% for turnkey energy efficiency projects (energy audit, cost estimate, purchase and retrofit) for small sites.
- Pursuing sewer credits for water leaks to reimburse the costs of these investigations and repairs.
- Developing a performance contract for Adult Corrections by FEB 2021 for leadership review. It will include completion of exterior lighting retrofits, select sites for interior lighting retrofits, and water management systems. As noted previously, about $11M in yearly funding is needed for energy and water efficiency projects to meet our targets; thus, performance contracting (PC) is the only solution at this time unless a bill is passed similar to HB 1292. PC is an appropriate vehicle for funding projects that emphasize quick paybacks and are narrowly focused in scope and scale.
- Introducing a matching fund program for lighting retrofits with maintenance personnel. Opt-Out funds are being used to split the cost for every light fixture/lamp that is purchased by a local unit. This ensures local units retrofit fixtures/ lamps using high efficiency LEDs rather than conventional fluorescent or high pressure sodium.
- Continuing to rally support for legislation equal or better than HB 1292.

$250k in R&R funds is being requested this fiscal year to support measures that cannot be funded from Opt-Out. If approved, projects are slated for lighting and BMS upfits for our smaller divisions (Juvenile Justice, State Highway Patrol and SBI), and, funds for water leak detection and repairs for our Adult Correction facilities. This presents a continued challenge pitting energy/water efficiency measures against life-safety and security R&R needs.

Analyses:

- The Energy & Water Dashboard will be used to pinpoint and further investigate the top five sites with the best and worst energy intensities since FY 2016-2017 to determine the cause for the decreases/increases. Best practices will be developed from the lessons learned.
- The last of the transportation rate natural gas accounts will be transitioned back to utility purchased gas. Estimated savings will be $100k per year.

Staffing:

- Energy Management: If approved, another ¾ time energy intern (Opt-Out funded) and an assistant energy manager by Fall 2020 will be hired. Central Engineering will assist DOP with onboarding the new AC Energy & Sustainability Manager.
- Maintenance: High performance maintenance can result in energy savings of over 15%. The existing energy management team will strategize with the new AC Energy Manager on how to overcome current personnel shortages and alternative means of addressing this aspect of energy efficiency. An option is to hire centrally

based teams dedicated to Maintenance Based Commissioning (MBC) that focus on water leak detection, and high-performance maintenance.

Projects:

Exterior Lighting: Purchase and install $500k in exterior LED light fixtures this fiscal year. Fixture solutions for the remaining sites (approximately 31) will be completed by July 2021. *If this pace of funding continues, another five years of funding is required to fully convert all our sites to exterior LED light fixtures.* At least three sites will be assisted in having their utility owned exterior lighting converted to LED.

Interior Lighting: Make Foothills CI the first facility with 100% LED lighting for both interior and exterior lighting applications. Fund $145k in interior lighting LED retrofits including SBES projects. Target 15 additional sites for SBES audits. Complete photometric analyses and fixture selections for all interior lighting inmate individual cells and dormitory rooms.

Building Management Systems (BMS): Upgrade the network backbone of the BMS systems at our NORESCO sites (Harnett CI, NCCIW and Nash CI). Begin upfitting Nash CI's BMS in accordance with the new NCDPS BMS design guidelines. Fund an additional $40k for the installation of variable frequency drives. Complete Phase II of the BMS Design Guidelines by focusing on specification performance standards, the layout of the point property pages, summary diagnostic tables, data analytics, and name tagging.

Thermostats: Investigate and deploy where feasible Duke Powe's free programmable thermostat for small businesses throughout the Duke Energy territories.

Water Leaks: Complete major water leak repairs at NCCIW by November 2020 and investigate one other site. Attempt repairs if leaks found. Investigate the use of foot pedals in our kitchens to reduce water usage in these areas.

Programs: Initiate a boiler tune-up and training program.

Challenges

Funding: The Energy Team has the talent and drive to attain these targets but does not have the funds and staff to do so. Compared to other institutions of similar scale, an additional seven staff members are needed. 15%+ ROIs can occur while *reducing deferred maintenance, prolonging equipment life, improving maintainability, and, correctional officer and staff safety.*

Maintenance: Maintenance staffing is down by 18 % and over 88 positions because qualified candidates cannot be hired quickly and paid sufficiently. 15%+ energy savings are possible when maintenance teams are properly staffed and high-performance maintenance occurs. A possible and highly viable solution is for the new AC Energy Manager to create a team dedicated to energy management and Maintenance Based Commissioning (MBC). This would also result in *reduced deferred maintenance, prolonged equipment life, improved maintainability, and, correctional officer and staff safety.*

COVID-19: *The COVID-19 pandemic possibly resulted in a reduction in energy and water usage for all divisions except Adult Corrections. Adult Corrections experienced increases that are possibly due to our clients and their proximity to each other. A deeper dive into each division and each site is required to determine the short- and long-term impact of this pandemic, and how we can still effectively address energy and water efficiency opportunities while doing so.*

Opportunities:

Duke Power Programs: Duke has several programs that may benefit NCDPS in the future. One is a Shared Savings Program which is similar to performance contracting in that there are no up-front costs - just payments from the savings. Duke Power is also upgrading to continuous logging meters which can be viewed via a program they called One View. These opportunities require further evaluation.

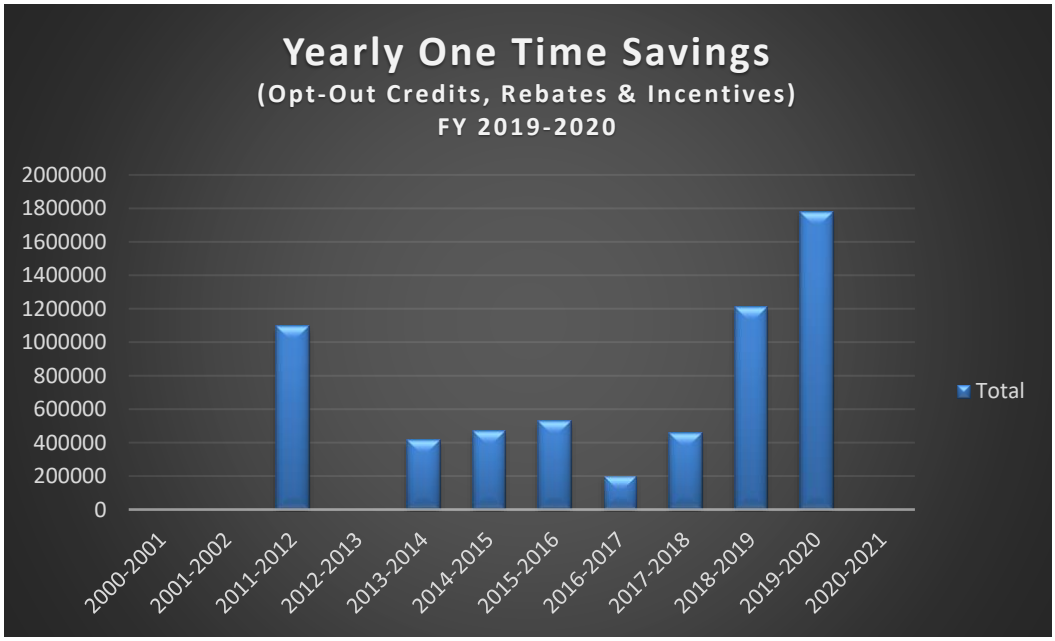
Sustainability: Sustainability can be defined as a means of preserving and enhancing the environment and human quality of life while remaining economically viable. For this reason, sustainability compliments the roles of energy and water managers. The NCDPS program already focuses on human quality of life, security, and economic viability through ROI and reducing maintenance requirements and other opportunities abound. A good start is recycling with a focus on cardboard. Other opportunities are provided in **Appendix C.**

Resiliency, Potential Site Consolidations & Energy/Water Efficiency Impacts: Resiliency can be defined as the ability of NCDPS, its divisions, facilities and staff to proactively face and address more frequent and intense storms, flooding, drought, and, increasing day and night-time temperatures. This includes logistical issues related to relocation of inmates, goods, and services. Many factors impact energy & water efficiency as well as resiliency that should be taken into consideration if further site consolidations are considered. Questions that should be asked include:

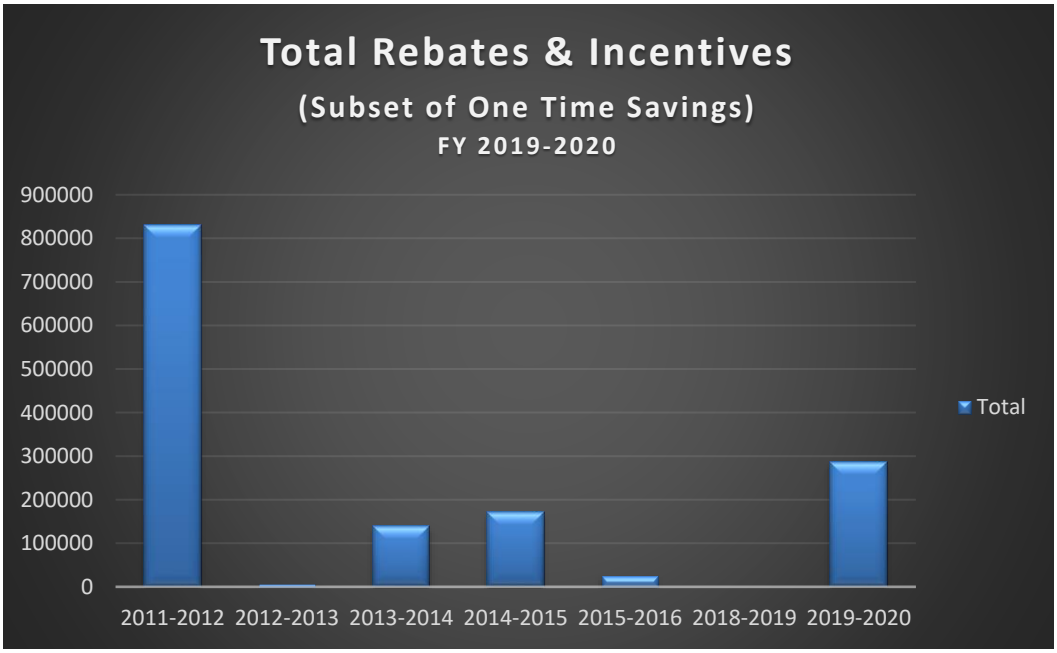
- What sites have the most unairconditioned bed count? (and will require future cooling and energy use)
- What sites have the highest water/sewer, and, electrical costs per unit? (Electric Coops generally have higher rates. Water/sewer rates are generally higher when we are the primary or only industrial/commercial water customer of a water service provider)
- What sites have the oldest facilities and need the most R&R work? (Possible indicator of higher water and energy costs, more poorly insulated buildings, etc.)
- What sites have the most failing roofs? (Can result in poorer indoor air quality due to potential mold issues and reduced energy efficiency due to wet insulation)
- What sites have the oldest, failing infrastructure (electrical and water distribution systems)? (Possible indicator of higher water and sewer costs due to leakage, and cost to upgrade electrical systems)
- What sites have the highest Energy Use Index (EUI - energy use per square foot) and/or Water Use Index (WUI - water use per square foot)? (Relocating to other sites could improve our overall EUI/WUIs and bring us closer to our 40% reduction targets)
- What sites are least conducive to ease of temporary inmate/staff/goods/services relocation? (Higher energy transportation costs and pollution)
- What sites are most prone to excessive and frequency of flooding conditions?

-End-

Relevant Charts

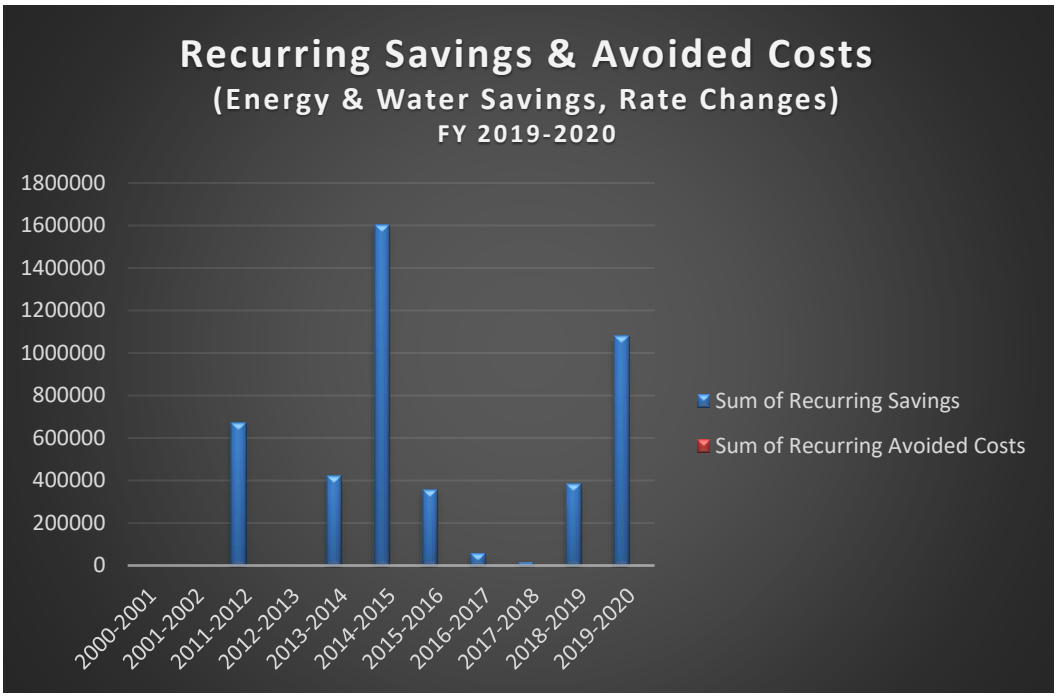


Note increase in Opt-Out credits as the program matured, and rebates/incentives received from Small Business Energy Savers incentives this past fiscal year.

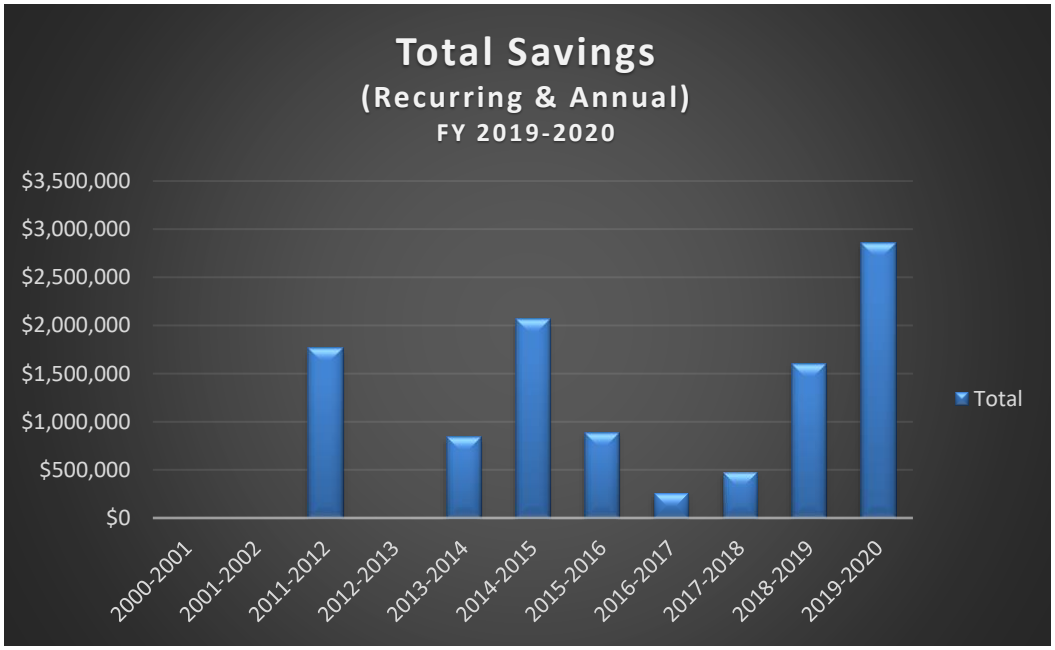


Rebates/Incentives are a sub-set of Yearly One Time Savings. Small Business Energy Savers Program are primarily responsible for FY 2019-2020 increase, though a $32k rebate was received for LED lighting retrofits at Alexander CI.

Relevant Charts

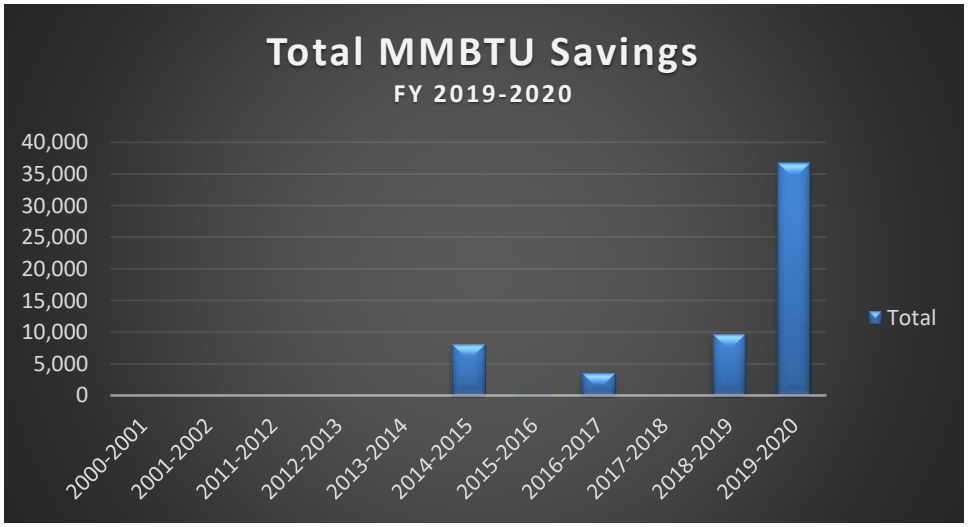


Note increase in recurring savings due to energy/water efficiency. Peaks in 2011-2012 and 2014-2015 reflect the America Recovery & reinvestment Act (ARRA) funded projects and NORESCO projects respectively.



Note increase in yearly savings over the past three years.

Relevant Charts



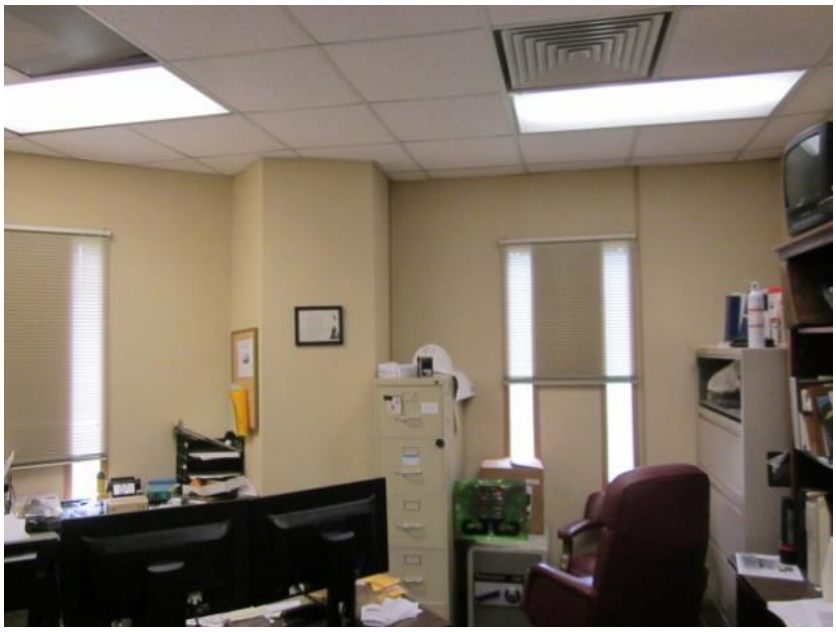
Note increase in energy savings. Savings not available for most projects prior to FY 2017-2018.

Interior Lighting Retrofit Example:

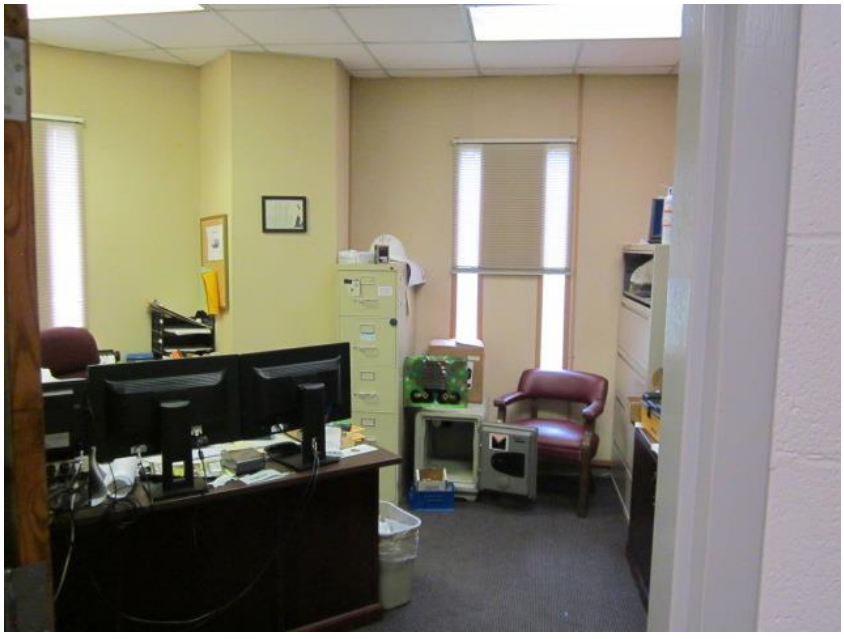
Southern CI (Special Thanks to Jere Spaun and team for his efforts)

Initial light level:	**46 fc**
Final Light Level	**53.5 fc**
Energy Reduction:	**64%**

Before LED Retrofit



After LED Retrofit



Project improved visual acuity and dramatically reduced the exterior lighting maintenance

Thousand Cell Exterior Lighting Retrofits

Before… **After…**

85% Reduction in Energy Use

Project improved visual acuity, enhanced site safety, and dramatically reduced the exterior lighting maintenance

Special thanks for all the site and regional maintenance team members responsible for installing these light fixtures

Thousand Cell Exterior Lighting Retrofits

Before…

After…

After…

Thousand Cell Exterior LED Lighting

82% Power Reduction

Project improved visual acuity, enhanced site safety, and dramatically reduced the exterior lighting maintenance

Appendix A

Historic Efforts to Attain Energy & Water Reduction Targets

FY	Category	Success
2017-2018	Funding	Opt-Out program started resulting in credits of over $300k
	Staffing	4 Summer Interns hired to expedite projects and analyses.
	Exterior Lighting	$250k in exterior LED lighting purchased.
	Interior Lighting	$18 k in interior LED lighting installed. Additional $12 k in LED lighting purchased.
	Building Management Systems (BMS)	Design Guidelines for building management systems started.
	Water Efficiency	DOP Bus Terminal toilets replaced, meter size reduced: ~$7k yrly savings.
	Analysis	~$100k savings by converting two natural gas accounts back to more cost effective rates. Water & electric meters removed and LED lights installed at Umstead CC ~$23k/yr. ~$6k yearly billing error corrected (Capturis billing),

2018-2019	Funding	Opt-Out program credits surpasses $890 k. ~45k rebate for Nash CI Demand Response Agreement.
	Staffing	4 Summer Interns hired to expedite projects and analyses. Several retained throughout fiscal year.
	Exterior Lighting	~$180k yrly cost savings, Exterior Lighting LED Retrofit replacement program begun.
	Interior Lighting	
	Building Management Systems (BMS)	
	Water Efficiency	
	Analysis	~101k Natural Gas tax fee recovery (Teresa Murphy). Phase I of Utility Analytics Dashboard begun. ~315k yrly savings Natural Gas rate changes.

2019-2020	Funding	Our Opt-Out program resulted in credits of over $1.2 M in FY 19-20
	Staffing	Temporary staffing increased by 2 FTE[7]. One student intern hired for the summer. Central Engineering supplemented our project management staff by approximately .25 FTE
	Exterior Lighting	~212k yearly energy savings and over $1M in exterior lights purchased.
	Interior Lighting	~$184k in yearly energy savings and ~$278k in interior lighting projects including Small Business Energy Savings Program (5 sites) and Led lamp retrofits.
	Building Management Systems (BMS)	BMS Design Guidelines I complete.
	Water Efficiency	~$590k savings from Nash CI water leak.
	Analyses	~85k yearly savings electric rate changes, Phase I Energy & Water Data Analytics dashboard completed.

Appendix B:

Projects Anticipated To Be Funded (Through Opt-Out Credits) and Unfunded Projects Needed to Attain Our Target Reductions.

Project Summary: Funded and Unfunded				
Project Summary	**Project Costs:**	**Recurring Savings:**	**Kgal Reduction**	**Sum of Total Energy MMBTU**
2020-2021				
Interior LED Lighting Lamp Replacements	$226,000	$125,508		6,548
LED Exterior Lighting Retrofit	$597,070	$127,426		5,996
Stormwater Fee Elimination	$1	$29,880		0
2021-2022				
Exterior LED Lighting Lamp Replacements	$500,000	$115,696		5,179
Interior LED Lighting Lamp Replacements	$226,000	$125,508		6,548
Rockingham Duke energy analyses and savings	$239,042			1,416
Rockingham Duke rebate				0
2022-2023				
Exterior LED Lighting Lamp Replacements	$500,000	$115,696		5,179
Interior LED Lighting Lamp Replacements	$226,000	$125,508		6,548
2023-2024				
Exterior LED Lighting Lamp Replacements	$500,000	$115,696		5,179
Interior LED Lighting Lamp Replacements	$226,000	$125,508		6,548
2024-2025				
Exterior LED Lighting Lamp Replacements	$500,000	$115,696		5,179
Interior LED Lighting Lamp Replacements	$226,000	$125,508		6,548
Interior LED Lighting Retrofits	$9,061,169	$5,923,363		264,083
Water Management System = to ICON	$17,065,142	$2,059,024	173,200	0
2025-2026				
Exterior LED Lighting Lamp Replacements	$500,000	$115,696		5,179
Interior LED Lighting Lamp Replacements	$226,000	$125,508		6,548
Water Management System = to ICON	$31,008,198	$3,741,347	314,713	0
Additional HVAC Projects to Attain Goal: Energy	$19,605,668	$4,155,986		185,800
Grand Total	**$81,432,290**	**$17,368,554**	**487,913**	**522,476**

These projects are anticipated to be funded through Opt-Out Funds

These are unfunded projects needed to attain our 40% reductions.

Appendix C: Sustainability Opportunities

Category	Description	Priority	ROI
Land	Native Plantings/Grass		Low
Land	Reforestation		Low
Land	Drought resistant grass		Medium
Land	Xeriscaping, Native plantings, perenials		Medium
Land	Reduce Impervious Areas		Low
Land	Stormwater retention		Low
Farm	No till operations		High
Farm	Reduced chemical Usage		High
Farm	Rainwater capture		Medium
Water Efficiency	BOD Reductions		Medium
Water Efficiency	Water Management Systems		High
Water Efficiency	Low flow aerators		High
Water Efficiency	Low flow flushmeters		High
Water Efficiency	Low flow toilets		High
Water Efficiency	Pressure reducing stations		Medium
Water Efficiency	Leak Detection (including metering) & repair		High
Water Efficiency	(Rain) water reuse		Medium
Energy/Atmosphere	LED Interior Lighting		High
Energy/Atmosphere	LED Exterior Lighting		High
Energy/Atmosphere	Photovoltaics -Leased		Medium
Energy/Atmosphere	Photovoltaics - Owned		Low
Energy/Atmosphere	ZEV/low emission vehicles		Medium
Energy/Atmosphere	ZEV/low emission equipment (lawn care, etc.)		Medium
Materials & Resources:	Local Materials		Low
Materials & Resources:	Lamp Recycling: Bulb crusher		High
Materials & Resources:	Cardboard recycling		High
Materials & Resources:	White paper recycling		Low
Materials & Resources:	Large toilet rolls & dispensers		Medium
Materials & Resources:	Foam Soap Dispensers		Medium
Materials & Resources:	Filter manometers		High
IAQ	IAQ Management & filtration systems		High
IAQ:	Daylight & Views		Low
IAQ:	Green Cleaning - microfiber products		Medium

IAQ:	Green Cleaning - Foam soap, non-antibacterial		Medium
IAQ:	Green Cleaning - products		Medium
IAQ:	Humidity Control		High
IAQ:	Pollution Source Control & Management		Low
IAQ:	Mold reduction		Low
IAQ:	Lead reduction		Low
IAQ:	Asbestos reduction		Low

--End--

STRATEGIC ENERGY MANAGEMENT PLAN

for

NC DEPARTMENT OF AGRICULTURE

&

CONSUMER SERVICES

Prepared By:

Property & Construction Division

1001 Main Service Center

Raleigh, NC 27699-1001

SEPTEMBER 2020

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 206 locations across the state with a total of approximately 1200 state-owned buildings with a total gross square footage of 3,840,010. The range in size of the facilities vary from 1 office building to a 400-acre research station with 87 buildings or 33,000-acre state forest with 40 buildings to the NC State Fairgrounds with previously (before COVID 19) 500 events year round. 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. NCDA & CS has buildings whether State Owned or leased in 99 counties across NC Statewide. The diversity of sites from size, use, number and type of building, present a challenge in monitoring utilities and identifying energy savings initiatives.

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 was a significant decrease from the prior years. In 2019-2020 there was also a decrease in energy consumption; however , with COVID19 and less people in the workplace, this is an extremely difficult year to assess.

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.

FOCUS AREAS

Focus #1 – Data Management

2017 – 18 Planned Activities
Overview: In November of 2016, NCDA&CS transitioned to a 3rd party utility billing system. The new system will provide consistency in collection and reporting of key elements from each invoice. Accounting Staff will monitor the system for expenditures, changes in service and late fees.
Responsible Groups: Accounting Clerk
Funding Source: General Operations and Salary
Metric: Notification of late fees, recording of necessary data; fewer disruptions in service

2017-18 Planned Activities
Overview: Using the 3rd party utility billing system identify a revised baseline and benchmark for assessing energy and water usage by Division down to site level.
Responsible Groups: Division staff – positions to be determined
Funding Source: Salaries
Metrics: Benchmarks established for each Division

Future Planned Activities

- Identify baseline data and benchmarks for each location with an emphasis on large energy consumers such as labs, greenhouses and animal facilities

Focus #2 – Facility Management

2016-17 Past Activity
Overview: Upgrading of lighting at NCDA&CS facilities through Duke Energy Incentives. Initiate upgrades at the Farmers Markets & Agriculture Event Centers
Responsible Groups: Property & Construction Division staff & site managers
Funding Source: General Appropriations & Receipts
Metric: Reduction in energy usage tracked through Capturis.

2017-18 Past Activities
Overview: In 2016, NCDA&CS initiated a project to identify all state-owned buildings. The project has been useful in verify building existence, utilization, and square footage. The project is scheduled to be completed no later than June 30, 2018.
Responsible Groups: Property & Construction Division staff
Funding Source: General Appropriations and Salaries
Metric: Accurate & Up-to-date building inventory.

Focus #2 – Facility Management

2017-18 Past Activities
Overview: Assessment of energy and water usage for each NCDA&CS managed site using the reports and graphs from the 3rd party billing system.
Responsible Group: Site Managers
Funding Source: Salaries
Metric: List of energy savings projected by site

Future Planned Activities

- Identify low or no cost initiatives
- Evaluate energy savings from lighting upgrade project at Farmer's Markets and Ag Center, 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 #3 – Organizational Communication and Outreach

2017-18 Past Activities
Overview: Notify all site managers and administrative staff of the 3rd party utility billing system; provide access information; identify training opportunities
Responsible Groups: Accounts Payable staff
Funding Source: General Appropriations and Salaries
Metric: Site staff accessing the system and running reports to track energy and water usage

Focus for Future 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 todays standards in construction.

Strategic Energy Plan
North Carolina Justice Academy
Salemburg, NC

Summary

The North Carolina Justice Academy, in Salemburg, provides training to law enforcement personnel. We currently have over 200,000 square feet of facilities that offer housing, classrooms, and support facilities for this training. We will continue to focus on five key areas, in addition to staff awareness.

- *Energy Data Management*- NCJA has developed a system that records and analyzes monthly usages. This information is useful to identify potential problems and to locate where savings can be found.

- *Rate Management*- NCJA works with Duke Progress Energy and Energy Professionals to ensure we are at best possible rate. The NCJA will also follow suggestions and guidelines established by the State of North Carolina. We invite assistance from the State Energy Office to review our rates.

- *Building Energy Usages*- Each building is unique, and opportunities for savings may differ from building to building. We have seen reductions in buildings that have recently been renovated in specific areas. The NCJA received appropriations to renovate two (2) residence halls. Residence Hall C started in late 2019 and B will begin early 2021. We anticipate significant energy savings after completion of both.

- *Efficient Equipment*- When the opportunity presents itself, we replace equipment with high efficiency or low-consumption equipment. We use automated HVAC controls in 7 buildings, and all new construction or renovation will include controls to improve efficiency. As mentioned above, we will install new efficient equipment and systems as part of our upcoming renovations.

- *Staff Awareness*- The Academy will provide information to all staff, urging their cooperation for energy savings.

Baseline

We are using data from past fiscal years to showing savings and trends

Year	Water	Sewage	Gas	Electric
2001-02	$4,491	$7,327	$44,588	$181,224
2002-03	$4,305	$7,214	$68,905	$189,409
2003-04	$4,650	$8,031	$89,178	$196,854
2004-05	$5,110	$10,433	$88,948	$192,367
2005-06	$5,122	$10,979	$92,078	$196,257
2006-07	$8,216	$9,823	$73,516	$205,188
2007-08	$7,865	$10,783	$68,746	$225,232
2008-09	$6,847	$10,179	$70,976	$227,611
2009-10	$7,330	$12,612	$77,237	$255,373
2010-11	$7,146	$12,687	$65,562	$261,630
2011-12	$7,704	$14,219	$45,489	$254,882
2012-13	$7,743	$13,570	$49,965	$250,678
2013-14	$8,148	$13,295	$47,614	$253,044
2014-15	$9,145	$14,700	$45,737	$265,284
2015-16	$9,328	$16,570	$45,723	$274,607
2016-17	$11,989	$16,490	$49,215	$245,883
2017-18	$10,440	$16,409	$55,341	$247,745
2018-19	$10,108	$14,962	$46,409	$262,115
2019-20	**$9,909**	**$12,972**	**$39,079**	**$232,824**

- *Cost per square foot*

Year	Square Footage	Utility Cost	Average per Sq. Ft.
2001-02	204,206	$237,630	$1.16
2002-03	204,206	$269,833	$1.32
2003-04	204,206	$298,713	$1.46
2004-05	204,206	$296,858	$1.45
2005-06	204,206	$304,426	$1.49
2006-07	204,206	$296,743	$1.45
2007-08	204,206	$312,626	$1.53
2008-09	204,206	$315,613	$1.55
2009-10	204,206	$352,552	$1.73

2010-11	204,206	$347,025	$1.70
2011-12	204,206	$322,294	$1.58
2012-13	204,206	$321,956	$1.58
2013-14	204,206	$322,101	$1.58
2014-15	204,206	$334,866	$1.64
2015-16	204,206	$346,228	$1.70
2016-17	204,206	$323,577	$1.58
2017-18	204,206	$329,935	$1.62
2018-19	204,206	$333,594	$1.63
2019-20	**204,206**	**$294,784**	**$1.44**

- *Cost per night spent on campus*

Year	**Nights Spent**	**Utility Cost**	**Average per Night**
2001-02	32,601	$237,630	$7.30
2002-03	33,365	$269,833	$8.09
2003-04	39,912	$298,713	$7.48
2004-05	39,971	$296,858	$7.43
2005-06	31,622	$304,426	$9.63
2006-07	26,675	$296,743	$11.12
2007-08	27,899	$312,626	$11.21
2008-09	24,748	$315,613	$12.75
2009-10	31,815	$352,552	$11.08
2010-11	32,873	$347,025	$10.56
2011-12	33,688	$322,294	$9.57
2012-13	35,506	$321,956	$9.07
2013-14	36,226	$322,101	$8.89
2014-15	36,226	$334,866	$9.24
2015-16	44,991	$346,228	$7.70
2016-17	43,597	$323,577	$7.42
2017-18	39,223	$329,935	$8.42
2018-19	30,702	$333,594	$10.87
2019-20	**15,024**	**$294,784**	**$19.62**

- *Consumption of Utilities*

Year	Gallons of Water	Therms	KWH
2001-02	3,130,000	56,500	2,494,377
2002-03	3,107,000	81,395	2,632,712
2003-04	3,512,000	83,432	2,774,597
2004-05	3,452,000	73,088	2,545,930
2005-06	3,589,000	60,928	2,186,008
2006-07	3,033,000	56,999	2,475,527
2007-08	2,826,000	49,877	2,591,612
2008-09	2,228,000	53,896	2,461,583
2009-10	2,492,000	66,635	2,831,877
2010-11	2,223,000	67,550	3,035,041
2011-12	2,538,000	50,792	2,920,931
2012-13	2,110,000	56,735	2,820,249
2013-14	2,059,000	52,204	2,788,825
2014-15	2,567,000	57,390	2,924,905
2015-16	2,570,000	59,262	3,039,455
2016-17	3,269,000	53,948	2,739,709
2017-18	3,192,000	50,689	2,705,972
2018-19	2,118,000	50,231	2,645,405
2019-20	**1,818,000**	**48,471**	**2,366,941**

Results: *The NCJA suspended in-person training on March 16, 2020, until the end of the fiscal year.*

As a result of renovations and the suspension of in-person training due to Covid-19, our overall consumption has been impacted. We are pleased to see the reduction in costs of $38,810; however, it is a result of the cancelation of in-person training.

Conclusion:

The NCJA East Campus is committed to identifying and implementing energy-saving measures. In the fall of 2019, the NCJA started a significant renovation of Residence Hall C. We plan to begin a renovation of Residence Hall B in 2021. As part of both renovations, the NCJA is installing higher efficiency equipment throughout the buildings. We will continue to explore energy savings opportunities and welcome suggestions from the State Energy Office.

Strategic Energy Plan
North Carolina Wildlife Resources Commission
2020-2021

Executive Summary:

North Carolina Wildlife Resources Commission is dedicated to reducing its impact on the environment. The agency's missions include habitat conservation, watershed enhancement, and non-game and endangered species protection. The agency is dedicated to lowering its carbon footprint and thus its total energy and water consumption. The purpose of this Strategic Energy Plan is to make the staff aware the energy is a controllable expense and to reduce the total amount of energy consumed by NCWRC.

Key elements of the plan include:

- Educating and engaging faculty, staff, and students in energy and water conservation through presentations, emails, handouts, and other effective forms of communication that help the understanding that effective energy conservation supports the primary mission of The CC by using less funding for operating expenses which may provide more funds for curriculum purposes.
- Accurate measurement and analysis of electricity, fossil-based fuels, and water usage, including a quarterly review of trends and costs.
- Conducting energy audits to identify opportunities for conservation. Developing cost/benefit estimates for opportunities and appropriately prioritizing projects based on probable benefit and available resources.
- Executing approved physical plant equipment projects, process improvements, and vehicle purchases that reduce the net consumption of fossil based fuels and increase the creation and use of sustainable energy sources.
- Annual review of utility Billing Rates with suppliers.
- Applying sustainable building practices in all major facility construction/renovation projects, and in operating and maintenance of buildings in accordance with US Green Building Council / LEED standards to the highest level practical.

1. North Carolina Legislative basis for the Plan:

a. *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 Agency to update its management plan annually and include strategies for supporting consumption reduction requirements. Each State Agency shall submit to the State Energy Office an annual written report of utility consumption and costs.

b. *Session Law 2008-203 / Senate Bill 1946* - Energy Efficiency Improvement: 30% for major construction projects, 20% for major renovation projects based on 2004 codes. Water Use: for major construction or renovation projects 20% less indoor potable water use, and sum of outdoor potable water use and harvested storm water use at least 50% less based on 2006 NC Building Code.

2. Organizational Support for Energy Culture Change

- Attempt to educate people of the public as well as state employees within Wildlife about the energy efficient designs and features within the Wildlife Headquarters building in Raleigh.
- Attempt to educate managerial staff on the benefits of using LED & CFL lamps, programmable thermostats, and occupancy sensors.
- Continue the process of having employees who code utility invoices keeping electronic files of energy consumption and bill amount

Past 12 months Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				
Tours of Green Building for students, public, and state employees	3	2	n/a	n/a	Salary		Jeff Cole	O&M
Educate hatchery and depot managers about the benefits of LEDs, programmable thermostats, and solar panels.	2	2	n/a	n/a	Salary		Jeff Cole	O&M

Next 12 months Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				
Tours of Green Building for Students, Public, and State Employees	3		n/a		Salary		Jeff Cole	O&M
Educate hatchery and depot managers about the benefits of LEDs, programmable thermostats and solar panels.	2		n/a		Salary		Jeff Cole	O&M

3. Supply Side

- Review Energy rates with service providers
- Note and investigate changing trends

Past 12 months Activities	Measurement Expected	Measurement Actual	Savings Expected	Savings Actual	Cost	Jobs	Assigned to	Funding Source
Reviewed Energy Rates with other Electric Companies	5	5	n/a	n/a	Salary		Jeff Cole	O&M
Review Rates with water providers	4	4	n/a	n/a	Salary		Jeff Cole	O&M

Next 12 months Activities	Measurement Expected	Measurement Actual	Savings Expected	Savings Actual	Cost	Jobs	Assigned to	Funding Source
Review Rates with other Electric Companies	5		n/a		Salary		Jeff Cole	O&M
Review Rates with water providers	4		n/a		Salary		Jeff Cole	O&M

Demand Side

- Take part in surveying depots, hatcheries, and education centers for potential energy savings opportunities.
- Initiate project to refit different wildlife sites with occupancy sensors, compact florescent bulbs, and programmable thermostats.

Past 12 months Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				
Upgrade HVAC software controls package at HQ Building	1	1	15%	TBD	Salary		Jeff Cole	O&M
Replace HVAC units at Pisgah Education Center	1	1	15%	TBD	Salary		Jeff Cole	O&M

Next 12 months Activities	Measurement		Savings		Cost	Jobs	Assigned to	Funding Source
	Expected	Actual	Expected	Actual				
Replace Boiler system at HQ Building	2		TBD		Salary		Jeff Cole	O&M

I have read the Strategic Energy and Water Plan for my Organization. The plan, as presented, supports the reductions required in Senate Bill 668.

Implemented this _3rd__ day of _September 2020.

Facilities Mechanical Engineer
Jeff Cole

Engineering Section Chief
Gary Gardner

Appendix C

Annual Trends in Weather and Utility Rates

Annual Trends in Weather and Utility Rates

North Carolina annual temperatures are trending to milder winters and warmers summers. These changes affect energy usage by decreasing the amount of heating needed while increasing the need for cooling. Figure 1 below shows the average annual number of heating and cooling degree days. Degree days are measurements of how cold or warm a location is. A degree day compares the mean (average of the high and low) temperatures to 65˚F. The more extreme the outside temperature, the higher the number of degree days. A high number of degree days generally results in higher energy use for heating or cooling.

Figure 1: Annual Temperature Trends

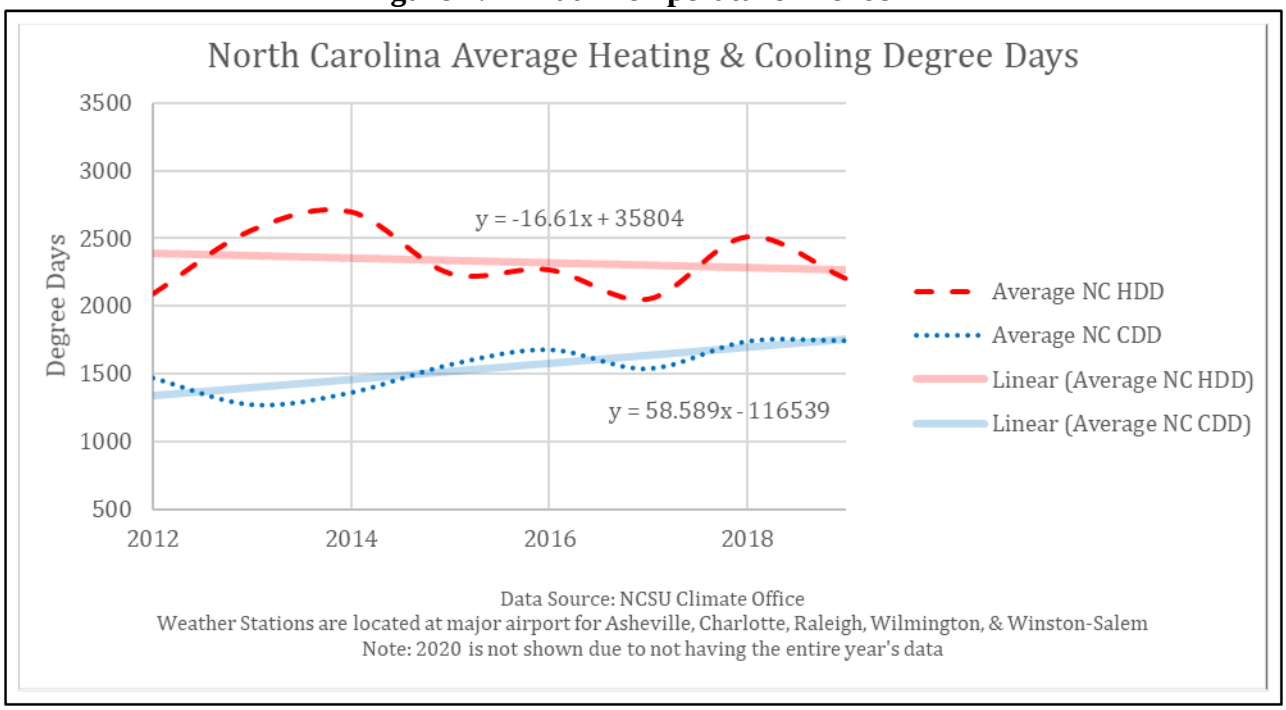
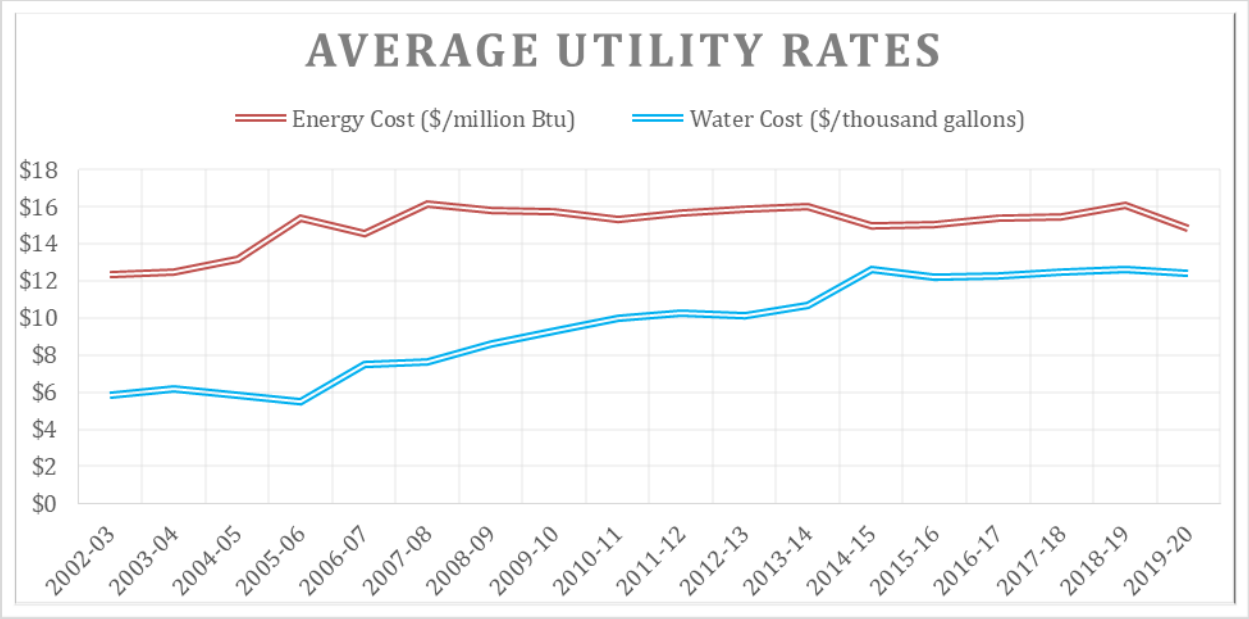


Figure 2 shows trends in electricity and water rates. Energy rates have increased an average of 1% each year since 2002-03. Water rates on the other hand have increased an average of 4% each year since 2002-03. While averaging only about 10% of overall total utility spending, water is the fastest rising utility cost component.

Figure 2: North Carolina Utility Rates



Water is the fastest rising cost for reporting entities in the state. In order to understand the relationship between energy and water, the entire life cycle cost (LCC) of water must be looked at closely. Energy and water systems are not interdependent because a great deal of energy is required to extract, treat, store, and distribute water. These become part of the LCC of water before reaching any facility or home. Once on-site, water is often heated or cooled to provide comfort for indoor spaces. Water is also boiled and frozen in kitchens to prepare meals. There are many ways water is used throughout a facility, but almost all require the use of electricity or fuel. Water and energy conservation can help offset stress on already limited water or energy supplies. By optimizing chillers, boilers, and other water-using facilities, water efficiency projects can reduce both water and energy usage.

Appendix D

Sources and Assumptions Used to Calculate Greenhouse Gas Offsets

Sources and Assumptions Used to Calculate Greenhouse Gas Offsets

Table 1: Cumulative Avoided GHG Totals from FY2002-03 through FY2019-20

Fuel Source	Cabinet Agencies ($MTCO_{2e}$)	State Agency Total ($MTCO_{2e}$)	UNC System ($MTCO_{2e}$)	All State Government Units ($MTCO_{2e}$)
Electricity Usage	760,878	753,424	1,919,507	**2,672,931**
Nat Gas Usage	-88,435	-71,535	-251,727	**-323,262**
Fuel Oil Usage	548,113	549,211	1,368,465	**1,917,676**
Propane Usage	62,599	64,862	4,290	**69,152**
Total	**1,283,156**	**1,295,962**	**3,040,536**	**4,336,497**

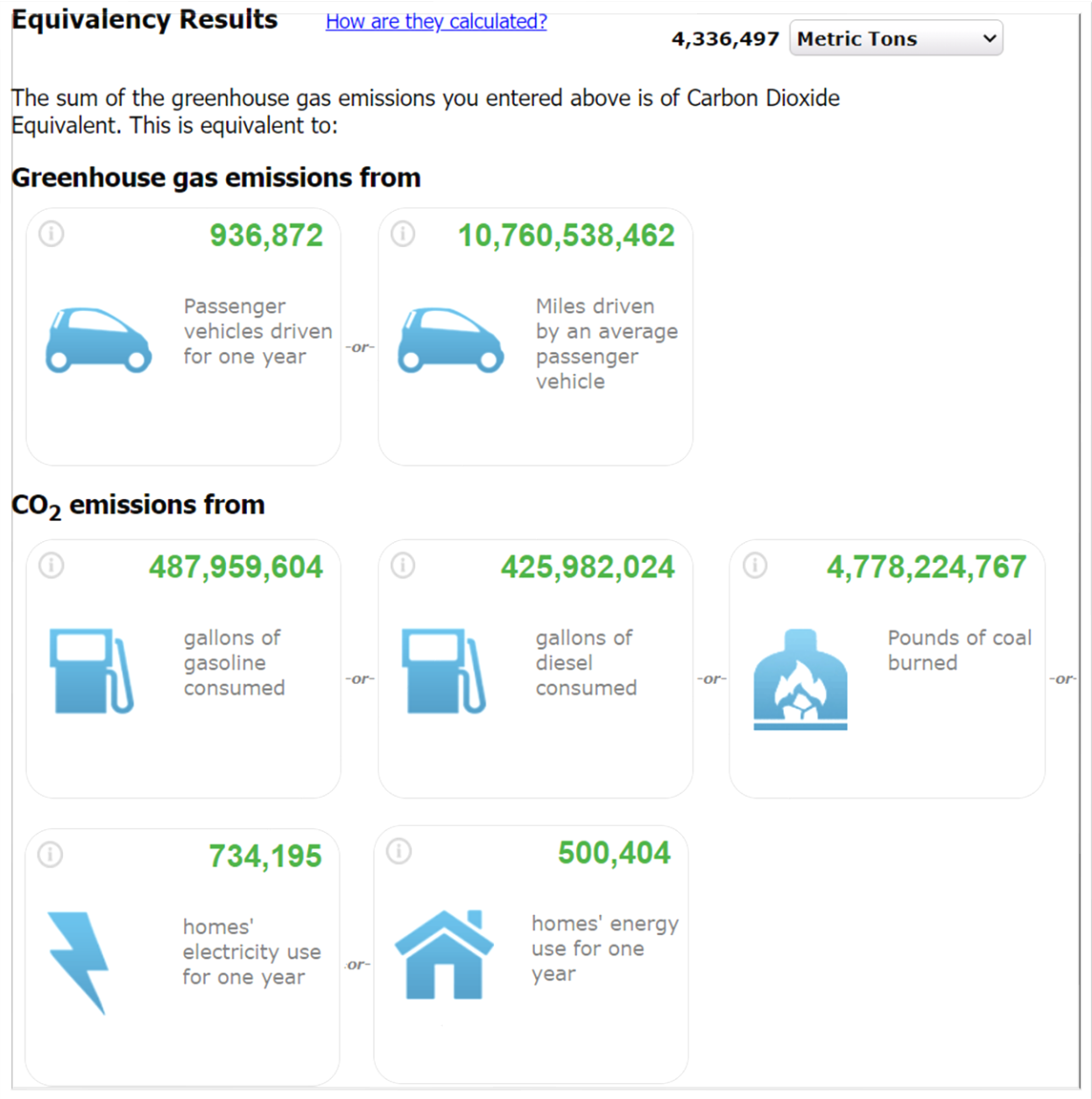
Table 2: FY19-20 Avoided GHG Totals

Fuel Source	Cabinet Agencies ($MTCO_{2e}$)	State Agency Total ($MTCO_{2e}$)	UNC System ($MTCO_{2e}$)	All State Government Units ($MTCO_{2e}$)
Electricity Usage	71,161	66,301	260,908	**327,209**
Nat Gas Usage	853	1,390	-19,746	**-18,356**
Fuel Oil Usage	46,124	45,675	95,821	**141,496**
Propane Usage	9,631	9,665	656	**10,321**
Total	**127,769**	**123,030**	**337,639**	**460,670**

Table 3: Emission Calculation Conversion Factors

Emission Source	Multiplier for $MTCO_{2e}$	Units
Electricity Purchase	0.0004491	$MTCO_{2e}$/kWh
Natural Gas Combustion	0.0053188	$MTCO_{2e}$/therm
No. 2 Fuel Oil	0.0104146	$MTCO_{2e}$/gal
No. 6 Fuel Oil	0.0115642	$MTCO_{2e}$/gal
Propane	0.0057033	$MTCO_{2e}$/gal

Figure 3: EPA GHG Calculator[6]



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

Appendix E

Executive Order No. 80

(This page intentionally left blank)

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 F

General Statute Chapter 143-64.12, *Authority and Duties of the Department; State Agencies and State Institutions of Higher Learning*

(This page intentionally left blank)

§ 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).)