

# East Carolina University

## Strategic Energy and Water Plan

# 2015



# *Table of Contents*

<b>Executive Summary</b> .....	4
<b>Energy Consumption</b> .....	5
<b>Energy Supply</b> .....	7
Project Spotlight 1 (Lighting Upgrades) .....	8
<b>Energy Demand</b> .....	9
Project Spotlight 2 (Central Chiller Plant Upgrades) .....	11
Project Spotlight 3 (Dedicated Heat Recovery Chiller) .....	12
<b>Awareness and Training</b> .....	13
<b>Water Resources Management</b> .....	15

# *List of Tables*

Table 1: Energy Consumption Summary .....	4
Table 2: Potable Water Usage Summary .....	15

# *List of Figures*

Figure 1: ECU Annual Energy Consumption FY2003–2015 .....	5
Figure 2: ECU Energy Utilization Intensity .....	5
Figure 3: Annual ECU Energy Utilization Intensity FY2003-2015 .....	6
Figure 4: Annual ECU Water Utilization Intensity FY2003-2015 .....	16

# Executive Summary

This year, East Carolina University (ECU) reports an 18.3% overall reduction in energy usage and a 50.2% reduction in potable water usage since the base year, FY2002-03. This reduction represents \$3.8M in avoided energy costs and \$1.5M in avoided water costs over that time period.

ECU is a summer-peaking institution and the two central chiller plants on the main campus were therefore the focus of energy-saving efforts this year. Most of the utility carry-forward funds allowed by the state's HB1292 program were used to make modifications to the controls sequences for the chillers, pumps and cooling tower operations of the chiller plants at the Science & Technology building and Minges Coliseum. A similar project began on the Health Sciences Campus chiller plant near the end of the year that should be completed during FY2015-16.

During this fiscal year, the ECU School of Dental Medicine has continued to expand its network of Community Service Learning Centers (CSLCs) with facilities in operation for most of the past year in Ahoskie, Elizabeth City, Lillington, Lumberton, Spruce Pine and Sylva, North Carolina. The Coastal Studies Institute on Roanoke Island has also been added to the inventory of ECU facilities located outside of the core Greenville campus yet operated and maintained by Campus Operations staff.

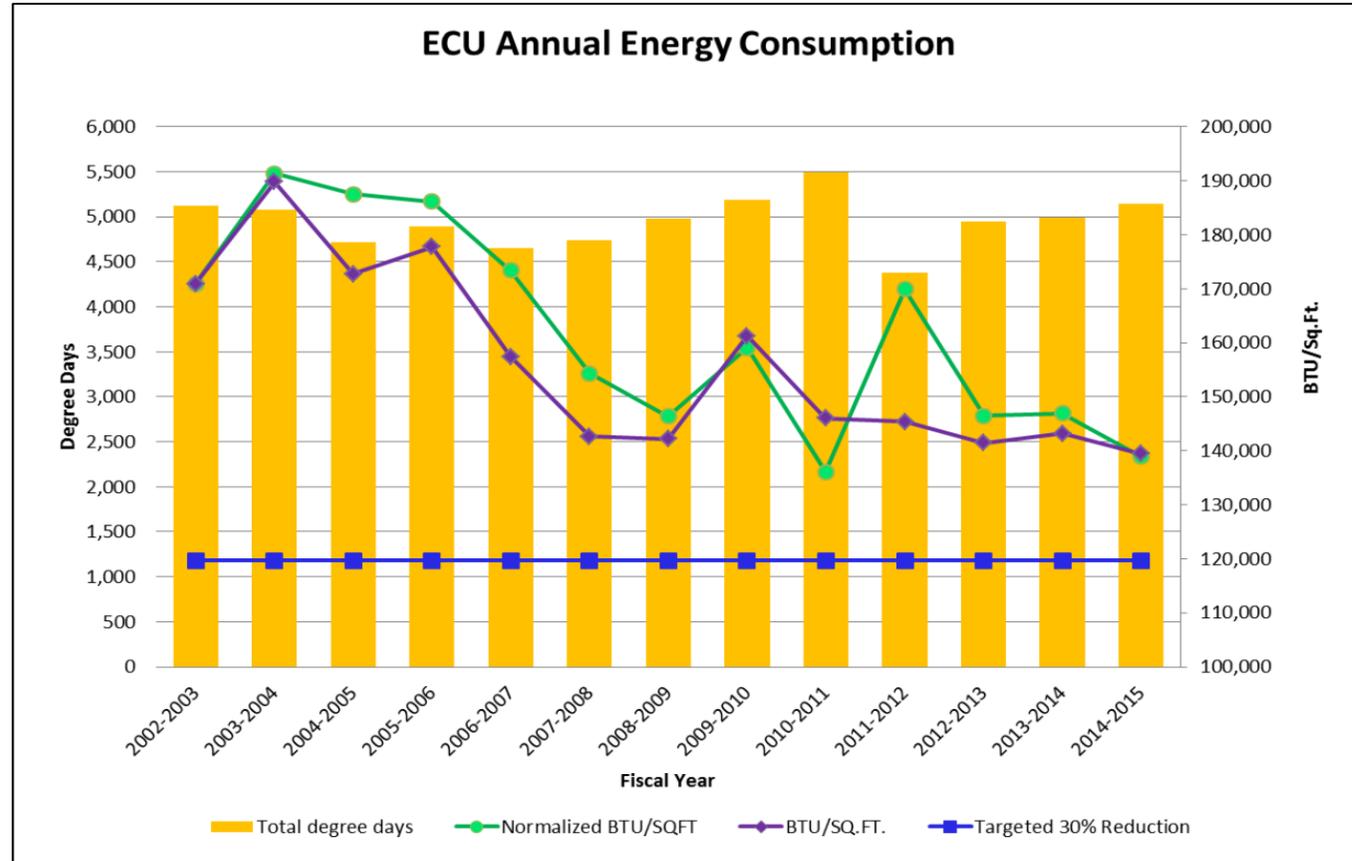
ECU was the largest participant in the ongoing UNC lighting upgrade performance contract. On-campus installation began on October 23, 2014. This project resulted in replacement or upgrades of predominantly fluorescent lighting with LED technology – providing significant energy and maintenance savings in many academic, residence and dining halls. As a result of this project, approximately 30,000 fixtures have been replaced with more efficient technology.

## Energy Consumption Summary

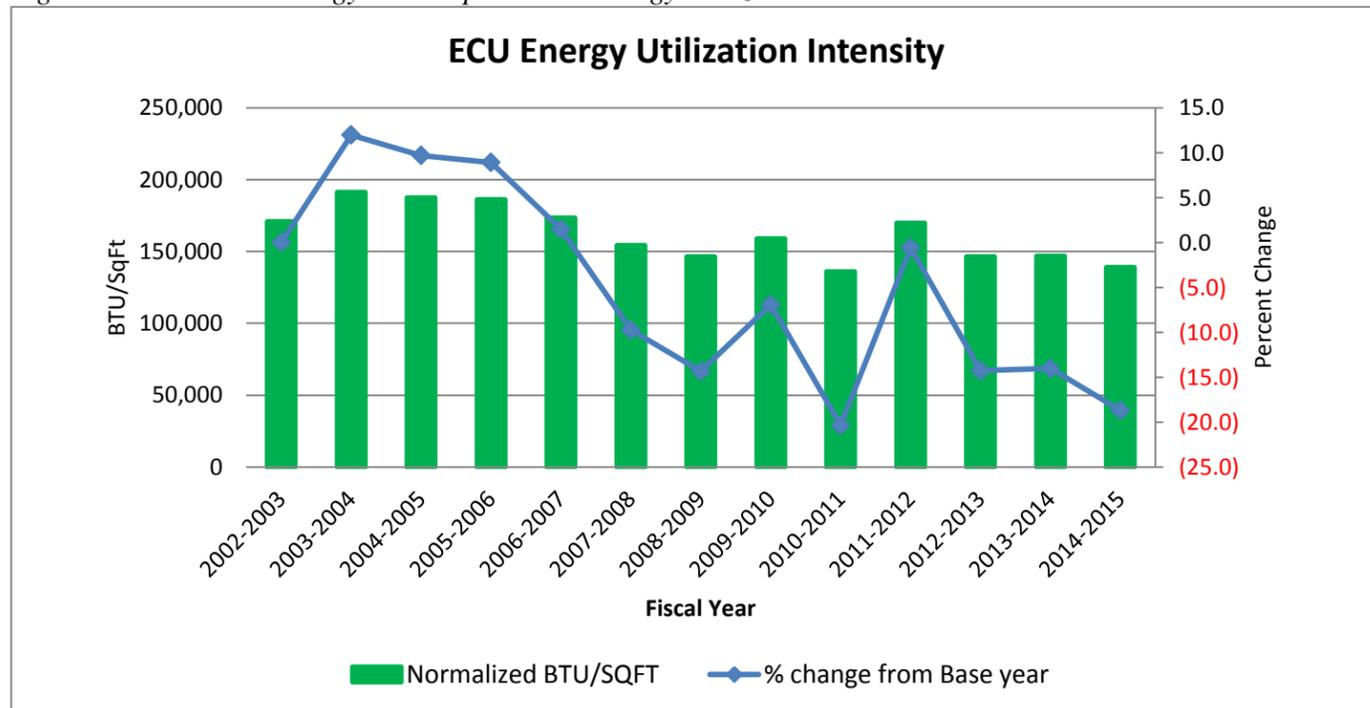
Year	Energy Cost Avoided	Energy Cost (\$ / GSF)	Energy Cost (\$ / MMBtu)	Energy Intensity (Btu / GSF)	Energy Intensity Change
2002-03	-	\$2.13	\$12.50	170,724	-
2003-04	-\$1,130,619	\$2.33	\$12.32	189,287	11%
2004-05	-\$140,266	\$2.47	\$14.29	172,569	1%
2005-06	-\$615,896	\$2.96	\$16.66	177,567	4%
2006-07	\$1,368,244	\$2.56	\$16.30	157,404	-8%
2007-08	\$3,239,093	\$2.44	\$17.14	142,573	-16%
2008-09	\$3,561,260	\$2.72	\$19.16	142,207	-17%
2009-10	\$1,081,982	\$2.86	\$17.71	161,238	-6%
2010-11	\$2,869,386	\$2.61	\$17.84	146,059	-14%
2011-12	\$2,899,179	\$2.56	\$17.58	145,433	-15%
2012-13	\$3,405,994	\$2.42	\$17.15	141,416	-17%
2013-14	\$3,357,400	\$2.43	\$17.13	141,752	-17%
2014-15	\$3,846,835	\$2.51	\$17.97	139,480	-18%

Table 1: \$21M in cost avoidance since FY2002-03 and 18% reduction in energy intensity.

# Energy Consumption



Figures 1 & 2: Annual Energy Consumptions and Energy Utilization Indices



# Energy Consumption

While ECU made a significant 18.3% reduction (18.7%, weather normalized) in energy intensity from the base fiscal year of 2002-2003, the university continues towards the goal of a 30% reduction. During the past year, more than 30,000 lighting fixtures were replaced with more efficient LED or fluorescent lighting as the largest campus participating in the UNC Lighting Upgrade performance contract was also the first on which the replacements began in October 2014.

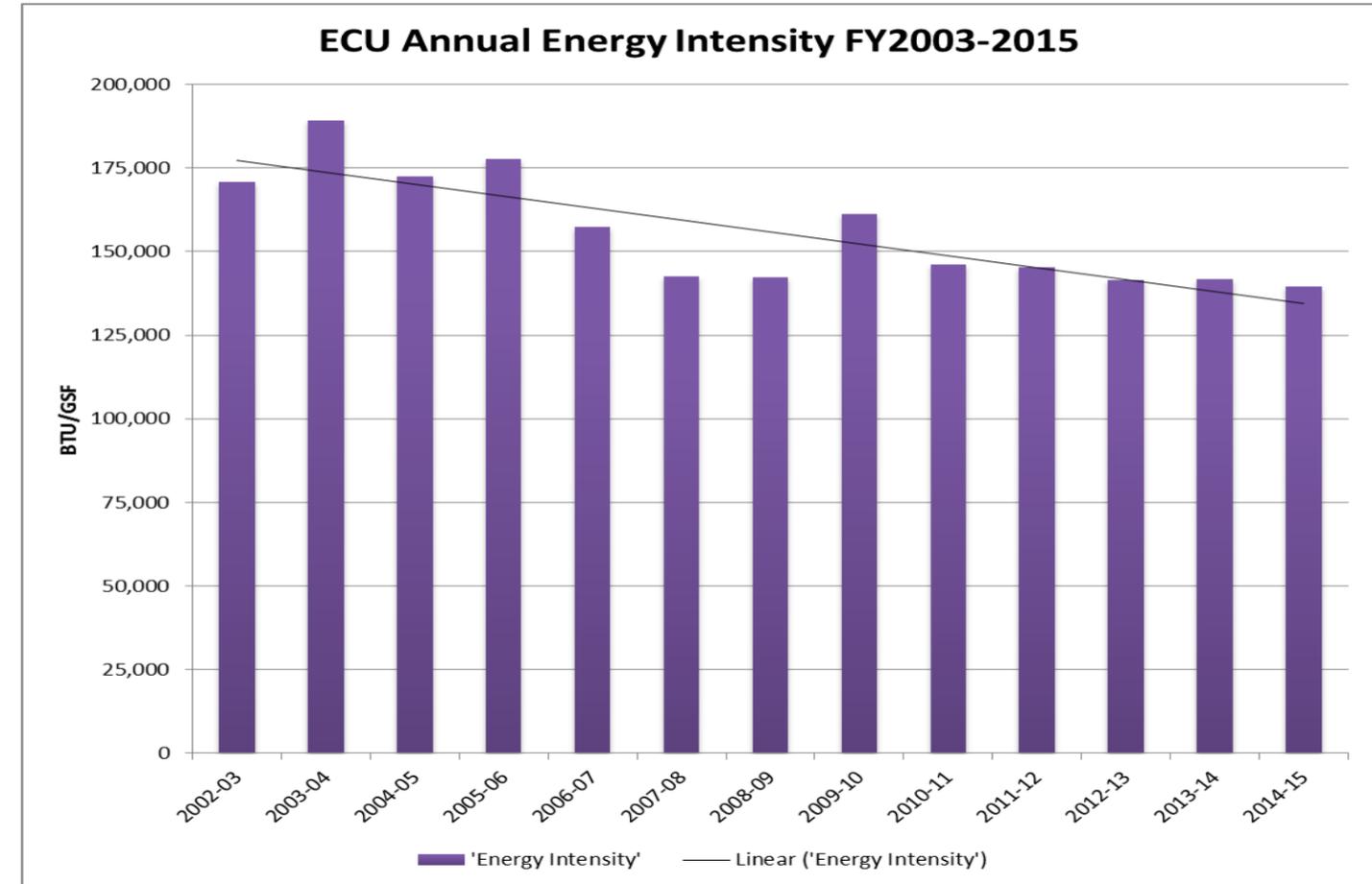


Figure 3: Annual Energy Consumption reduced by 18% to 139.4 kBtu/GSF

In addition, since ECU is a summer-peaking institution electrically, efforts were undertaken this year to more efficiently operate the two central chiller plants on the main campus. These projects were funded using HB1292 energy carry forward monies and promise to produce electrical energy consumption savings (kilowatt-hours) as well as a reduction in kilowatt demand charges. Electrical demand reduction has become more important with the recent change in the Greenville Utilities Commission (GUC) rate schedule under which ECU's main points-of-delivery are billed. Although the kilowatt-hour rate was reduced, the peak demand charge was increased by more than 50%.

*"I don't give up on commitments until what I've been asked to do is clearly finished."  
- Carly Fiorina*

# Energy Supply

**Strategies:**

ECU continues to implement programs, initiatives, equipment and renovations to make University buildings more efficient.

**Tactics:**

Past 12 Months' activities	Measurement		Savings		Cost	Jobs	Project Champion	Funding Source
	Expected	Actual	Expected Actual	Actual				
Install sub-meters to monitor energy & water usage	Additional meters installed	Meters installed at new Gateway dorm	N/A	N/A	N/A	0	Gina Shoemaker	Campus Living
		Meters installed at Davidson SLC	N/A	N/A	N/A	0	Bobby Paige, Kevin Dorsey	HSC Facilities Operating
Revise construction standards to include specs for metering & networking	Construction standards revised		N/A	N/A	\$20,000	0	Construction Standards Committee	Campus Operations Operating
Upgrade Schneider Power Monitoring Expert Server	New server installed	New server installed; awaiting software upgrade	N/A	N/A	\$15,000	0	Les Hewlett	Capital & Operating
Configure PME Server to monitor all currently installed compatible meters	All current compatible meters communicating with PME Server	Added Aycock, Ficklen North, Ficklen Scoreboard, Greenville Center, Bldg 43, West End Dining meters to EMS	N/A	N/A	\$0	0	Les Hewlett	N/A

*“You can observe a lot by just watching.”  
- Yogi Berra*

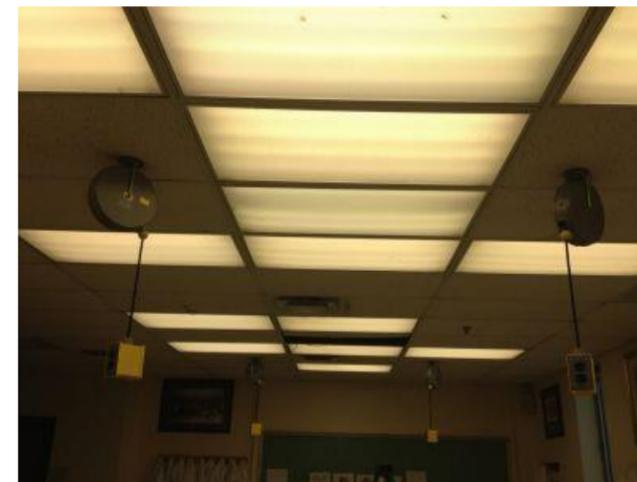
# Energy Supply

**Strategies:**

ECU continues to implement programs, initiatives, equipment and renovations to make University buildings more efficient.

**Tactics:**

Next 12 Months' Activities	Measurement		Savings		Cost	Jobs	Project Champion	Funding Source
	Expected	Actual	Expected Actual	Actual				
Install sub-meters to monitor energy & water usage	Meters installed at Brunswick SLC		N/A	N/A		0	Bobby Paige, Kevin Dorsey	
Obtain BTU and water consumption data at Aux Gym	Connect PME server to domestic and heating hot water meters		N/A	N/A	\$4,991	0	Tony Yamada	TBD
Improve monitoring capability at Warren Life and Health Science Buildings	Old GE meters replaced with Schneider		N/A	N/A	\$25,000	0	Bobby Paige	HSC Facilities Operating



*Brody School of Medicine Gross Anatomy Lab (before and after LED replacements installed).*

**Project Spotlight 1  
Lighting Upgrades**

In October 2014, replacement of approximately 30,000 lighting fixtures in 21 academic buildings, 8 residence halls and 2 dining halls began as ECU became the first UNC-system campus to participate in the state-wide performance contract. This project provides the university with a guaranteed energy savings of \$6.7M over the seven year term of the contract. Most of the replacements are from fluorescent to LED lighting that provides additional savings in maintenance with the much longer lifetime promised by LEDs – meaning support staff will spend less time replacing tubes and ballasts.

New construction and major facility renovations will also call for LED lighting further reducing electrical consumption. However, lighting quality also results from the switch from fluorescent. The dramatic improvement in lighting can be seen in the before and after photos above that were taken in the Brody School of Medicine’s Gross Anatomy lab.

# Energy Demand

## Strategies:

ECU continues to implement programs, initiatives, equipment and renovations to make University buildings more efficient.

## Tactics:

Past 12 Months' activities	Measurement		Savings		Cost	Jobs	Project Champion	Funding Source
	Expected	Actual	Expected	Actual				
CCP #2 Upgrades, Improvements & Optimizations	CCP #2 upgraded, re-sequenced	Completed	\$25,673	M&V Underway	\$335,056	0	Ray Schmit	2014 HB1292 Funds
Replace CCP #1 automation system & Cooling Tower Upgrade	CCP #1 automation system replaced inc/new sequencing	Completed	\$22,480	M&V Underway	\$279,362	0	Ray Schmit	2014 HB1292 Funds
Minges AHU control modifications & new energy valves	Upgrades & Installations completed	Completed	\$15,621	M&V Underway	\$140,662	0	Ray Schmit	2014 HB1292 Funds
Health Sciences Campus – Steam Line Replacement – Phase 2	Replace steam line and condensate return piping	On Hold	TBD	TBD	\$600,000	0	Robert Still	R & R
Initiated pilot data analytics project on Health Sciences Building BAS – Phase I	Phase I complete	Completed	TBD	TBD	\$27,500	0	Ken Yarnell	
Replaced 155 ton chiller at Mendenhall with more efficient model	Replace chiller	Completed				0	Tony Yamada	
Replace Steam & Condensate line to Rawl & Austin	Replace line	In close-out			\$1,205,400	0	Robert Still	R&R
Replace Steam & Condensate line to Mendenhall – Phase I	Replace line	In close-out			\$190,000	0	Robert Still	R&R
Replace 100 ton chiller at Whichard with more efficient model	Replace chiller	Completed	\$4,563	TBD	\$102,373	0	Tony Yamada	
Inspection, repair, calibration and optimizing HVAC field devices in 8 campus facilities	Project completed	Completed	\$33,516	TBD	\$50,000	0	Ray Schmit	
Lighting upgrades in multiple buildings	Project completed	Interior lights 100% complete	\$168,751	M&V Underway	\$3,065,581	0	Les Hewlett	UNC Performance Contract
Economizer setup/implementation	Project completed	Project completed	\$18,608	TBD	\$15,000	0	Ray Schmit	2014 HB1292 Funds
West Research chiller replaced w/heat recovery capability	Project completed	Project completed	\$16,000	TBD	\$161,000	0	Ken Yarnell	
Additional lighting upgrades to directories, Warehouse B214F, Ward and Belk stairs	Project completed	Project completed	\$212	TBD	\$23,143	0	Tony Yamada	

# Energy Demand

## Strategies:

ECU continues to implement programs, initiatives, equipment and renovations to make University buildings more efficient.

## Tactics:

Next 12 Months' Activities	Measurement		Savings		Cost	Jobs	Project Champion	Funding Source
	Expected	Actual	Expected	Actual				
Complete chiller plant upgrade on HSC	Chiller plant controls upgraded		\$66,413		\$100,930	0	Ken Yarnell	2015 HB1292 Funds
Replace fan canvas & motors in Brody	Motors and fan canvas replaced		\$24,000		\$35,000	0	Ken Yarnell	2015 HB1292 Funds
Upgrade S&T MUA controls	Controls upgraded		\$96,813		\$164,582	0	Tony Yamada	2015 HB1292 Funds
Install wireless controls on 50 water coolers	Pilot project completed		\$2,500		\$4,950	0	Les Hewlett	2015 HB1292 Funds
Upgrade lighting in Rivers Building	Lighting upgraded		\$48,311		\$216,000	0	Tony Yamada	2015 HB1292 Funds
Install Niagara control of VAV in 8 academic buildings	Niagara installed		\$26,932		\$147,967	0	Tony Yamada	2015 HB1292 Funds
Upgrade lighting in Ward Sports Medicine Building	Lighting upgraded		\$40,055		\$248,000	0	Tony Yamada	2015 HB1292 Funds
Upgrade lighting in Speight Building	Lighting upgraded		\$26,953		\$200,000	0	Tony Yamada	2015 HB1292 Funds
Wireless thermostat control of 3 building with Trane Tracer EC	Control implemented		\$4,931		\$41,683	0	Tony Yamada	2015 HB1292 Funds
Complete lighting upgrades in Bate Building	Lighting upgraded		\$14,609		\$157,000	0	Tony Yamada	2015 HB1292 Funds
Complete lighting upgrades in Brody Building	Lighting upgraded		TBD		TBD	0	Mike Rowe	2015 HB1292 Funds
Replace 80 ton chiller at Graham with more efficient model	Chiller replaced		TBD		TBD	0	Tony Yamada	
Extend central chilled water & replace steam lines to Speight Building	In planning		TBD		\$700,000	0	Robert Still	
Changing Constant Air Volume to VAV in ECHI	Complete		TBD	TBD	\$0	0	Gray Hamill	N/A
Health Sciences Building Analytics Phase II	Complete		\$0		\$18,500	0	Les Hewlett	

**Project Spotlight 2**  
Central Chiller Plant Upgrades

Many of ECU’s largest facilities on the main campus are cooled by two centralized chiller plants. One of these is located at the Science & Tech building and the other at Minges Coliseum. During the past fiscal year, HB1292 carry forward funds were utilized to improve the operation and efficiency of both.



Sports Medicine portions of the complex.

During the warranty period of the upgrades, both plants will be monitored remotely by the vendor to ensure operations of the two facilities are at optimal performance.

*“Everything should be made as simple as possible ... but not simpler”.*  
- Albert Einstein

Chiller plants’ sequence of operations were revised using recommended best practice methods to stage chillers and cooling tower fans to operate most efficiently. Trane’s Chiller Plant Manager software (see dashboard in inset) is in place to ensure the optimum combination of chillers and fans is in service at all times based upon climatic conditions and building heat load. Analytics software is also in place providing a constant “look-out” for operational anomalies.

Some hardware improvements were also made including installation of a dedicated 25 horsepower filter pump motor (to minimize operational use of an existing 200 horsepower motor for filtration), replacement of motors with more efficient motors controlled by variable frequency drives, and replacement of three-way valves with new “smart” energy valves on air handlers in the Minges Pool and Ward

*“Every day we are paying more for energy than we should due to poor insulation, inefficient lights, appliances, and heating and cooling equipment - money we could save by investing in energy efficiency.”*  
- Bernie Sanders

**Project Spotlight 3**  
Dedicated Heat Recovery Chiller

Even during the summer months, many buildings require simultaneous heating & cooling for proper humidity control, potable hot water, and potentially other hot water applications. Heat recovery utilizes this waste heat and turns it into usable energy, thus reducing the building’s carbon footprint and improving overall building and campus efficiency. Previously, the chilled water and hot water systems in the West Academic Building did not reclaim waste heat from its old chilled water system and therefore used fresh electrical and propane energy to perform their heating and cooling functions.

The building’s existing chillers were approaching their end-of-life. Since both chilled water and hot water are often needed simultaneously, a dedicated heat recovery chiller (DHRC) was installed as a replacement and to recover heat from the chilled water return system for use in the reheat system. As a result, the building now benefits from both reduced hot water (propane) and chilled water (electricity) from the existing boiler and chiller systems.

When a DHRC is applied as a supplement to a building system, it can contribute to the cooling process during the spring, summer and fall, while supplying hot water for the building for free.



# Awareness and Training

**Strategies:**

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

Past 12 Months' Activities	Measurement		Savings		Cost	Jobs	Project Champion	Funding Source
	Expected	Actual	Expected	Actual				
Create fulltime Sustainability Manager position and fill	Position filled	Position approved, posted, resumes reviewed	N/A	N/A	N/A	1	Griffin Avin	Campus Operations
University – Hold Sustainability Fair to publicize sustainability initiative, opportunities and involvement	Sustainability Fair held	Fair held as part of Earth Day 2015	N/A	N/A	N/A	0	ECU Sustainability Committee – Environmentally Preferred Purchasing Subcommittee	N/A
Implement Climate Action Plan to target carbon neutrality by 2050	Upgraded Greenhouse Gas Emissions Plan		N/A	N/A	\$0	0	Paul Carlson	N/A
University – Participate in the Sustainability Alliance meeting	Attend Alliance Summit	Participating in Alliance functions	N/A	N/A	N/A	0	Griffin Avin	N/A
University – Participate in the Appalachian Energy Summit	Attend Energy Summit	Attended by faculty, students & staff in July 2014	N/A	N/A	N/A	0	Griffin Avin	N/A
University – Participate in the Mid-Year Energy Summit	Attend Energy Summit	Attended in February 2015	N/A	N/A	N/A	0	Griffin Avin	N/A
University – Added dorm electrical meters to energy dashboard	Completed	Completed	\$0	\$0		0	Aaron Lucier	Campus Living

# Awareness and Training

**Strategies:**

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

Next 12 Months' Activities	Measurement		Savings		Cost	Jobs	Project Champion	Funding Source
	Expected	Actual	Expected	Actual				
Create fulltime Sustainability Manager position and fill	Position filled	Position approved, posted, resumes reviewed	N/A	N/A	N/A	1	Griffin Avin	Campus Operations
University – Hold Sustainability Fair to publicize sustainability initiative, opportunities and involvement	Sustainability Fair held		N/A	N/A	N/A	0	ECU Sustainability Committee – Environmentally Preferred Purchasing Subcommittee	N/A
Implement Climate Action Plan to target carbon neutrality by 2050			N/A	N/A	\$0	0	Paul Carlson	N/A
University – Participate in the Sustainability Alliance meeting	Attend Alliance Summit	Participating in Alliance functions	N/A	N/A	N/A	0	Griffin Avin	N/A
University – Participate in the Appalachian Energy Summit	Attend Energy Summit	Attended by faculty, students & staff in July 2015	N/A	N/A	N/A	0	Griffin Avin	N/A
University – Participate in the Mid-Year Energy Summit	Attend Energy Summit		N/A	N/A	N/A	0	Griffin Avin	N/A

*“Starbucks is not an advertiser; people think we are a great marketing company, but in fact we spend very little money on marketing and more money on training our people than advertising.”*  
- Howard Schultz

# Water Resources Management

## Summary

ECU's potable water usage has dropped to slightly more than half against the baseline year, FY2002-03. This reflects East Carolina University's commitment to creating a sustainable environment by reducing negative environmental impacts and utility costs.

### Potable Water Consumption Summary

Year	Water Cost Avoided	Square Foot Cost (\$ / kGal)	Water Intensity (Gal/GSF)	Water Intensity Change
2002-03	-	\$5.12	47.12	-
2003-04	\$1,790	\$4.87	47.04	0%
2004-05	\$258,795	\$5.66	38.52	-18%
2005-06	\$239,129	\$5.44	38.99	-17%
2006-07	\$555,511	\$5.67	31.57	-33%
2007-08	\$649,600	\$5.74	30.25	-36%
2008-09	\$816,313	\$6.45	27.70	-41%
2009-10	\$746,882	\$6.64	29.64	-37%
2010-11	\$771,136	\$7.07	30.39	-35%
2011-12	\$994,505	\$8.05	28.18	-40%
2012-13	\$1,109,705	\$8.20	27.14	-42%
2013-14	\$1,158,509	\$8.20	26.25	-44%
2014-15	\$1,468,629	\$9.05	23.45	-50%

Table 2: \$8.8M in cost avoidance since FY2002-03 and 50% reduction in water intensity.

# Water Resources Management

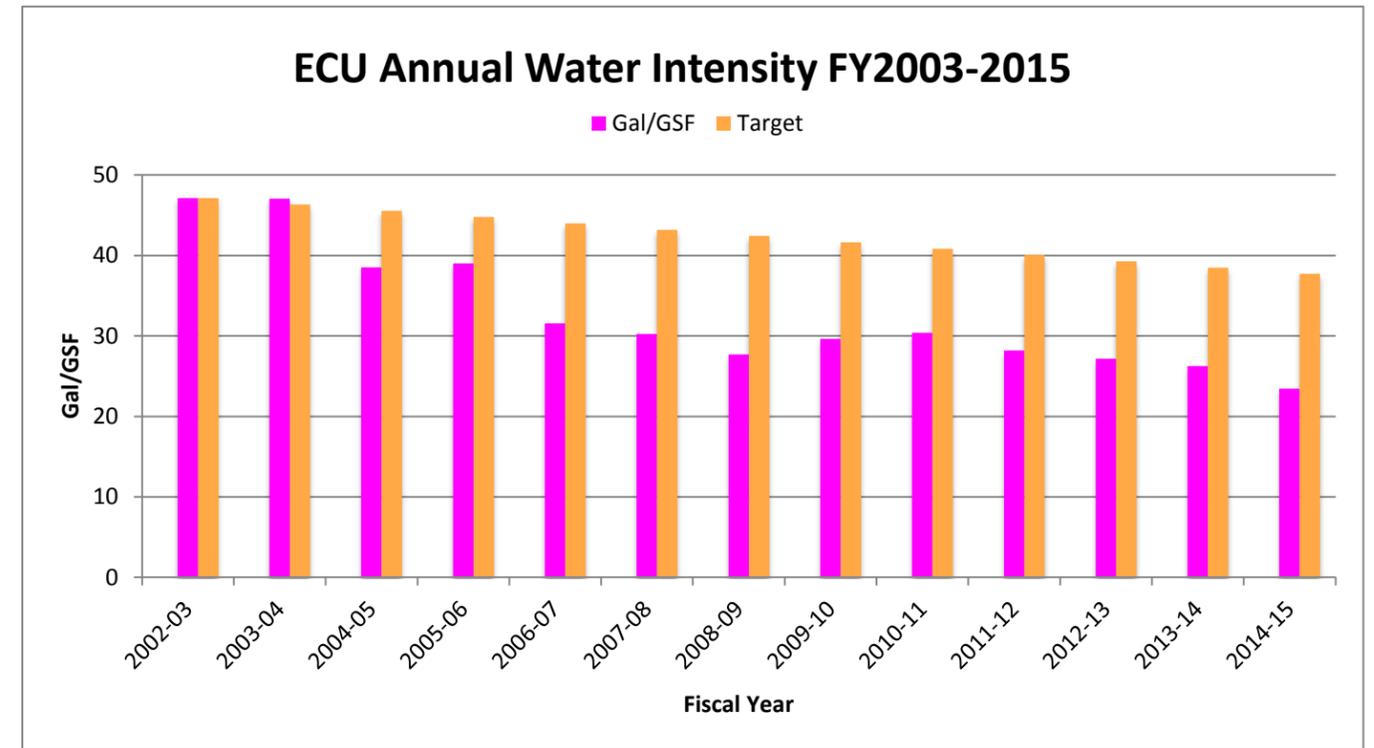


Figure 4: Annual potable water consumption reduced by 50% to 23 gallons/GSF exceeding the 20% reduction target established by NC Senate Bill 668

*“Our livelihood is intimately tied to the food we eat, water we drink and places where we recreate. That's why we have to promote responsibility and conservation when it comes to our natural resources.”*

- Mark Udall

# Water Resources Management

**Strategies:**  
Continue to implement programs, initiatives, and equipment that conserve water resources.

**Tactics:**

Past 12 Months' Activities	Measurement		Savings		Cost	Jobs	Project Champion	Funding Source
	Expected	Actual	Expected	Actual				
Repurpose and remodel Woodworks building as a Dance Studio	Upgrade plumbing	Project cancelled	N/A	N/A	N/A	0	Robert Brown	N/A
Replace condensate line at Greenmill Run	Line replaced		N/A	N/A	N/A	0	Robert Still	R&R
Replace standard toilet valves with two-flush type as pilot project	Three valves replaced in Central Utility Plant	Completed	N/A	N/A	\$633	0	Kevin Dorsey	Facilities Services

# Water Resources Management

**Strategies:**  
Continue to implement programs, initiatives, and equipment that conserve water resources.

**Tactics:**

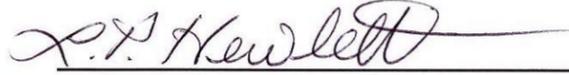
Next 12 Months' Activities	Measurement		Savings		Cost	Jobs	Project Champion	Funding Source
	Expected	Actual	Expected	Actual				
Replace 137 standard toilet valves with two-flush type in Health Sciences Building	Project completed		TBD	TBD	\$28,900	0	Kevin Dorsey	TBD



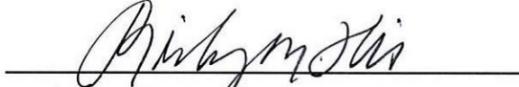
# Energy Mandate

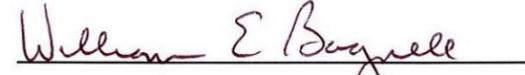
I have read the strategic Energy and Water Plan for my organization. The plan, as presented, supports the reductions required in Session Law 546.

Implemented this 29<sup>th</sup> day of September 2015

  
Les Hewlett, CEM  
Energy Manager

  
Griffin Avin  
Director, Facilities Services – HSC

  
Ricky Hill  
Interim Director, Facilities Services - East

  
William E. Bagnell  
Associate Vice Chancellor, Campus Operations