



AUBURN UNIVERSITY

FACILITIES MANAGEMENT

# Energy Reduction Strategy Through 2020

Revised: August 2017



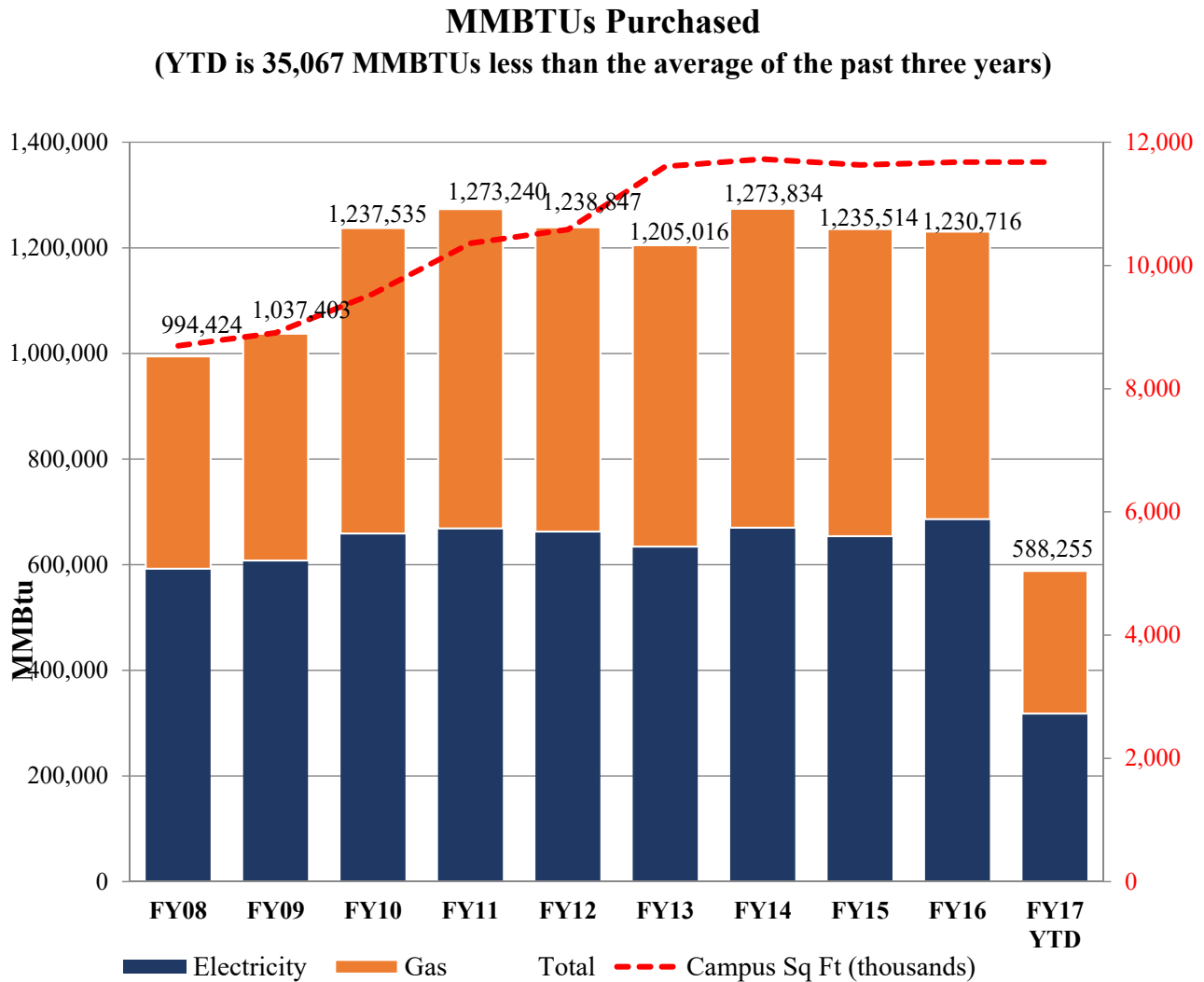
# Auburn Facilities Management Energy Reduction Strategy

## Executive Summary

Auburn University is a land, sea and space grant university established in 1856. The university consists of 11,629,000 square feet on 1,840 acres and serves 25,000 students annually.

The Energy Reduction Plan was developed in 2012 by Auburn University Facilities Management to be more proactive and intentional in pursuit of energy reduction while supporting Auburn University's sustainability goals. The plan established nine goals and identified baseline years to improve upon while including campus growth. The goals focused on reducing consumption of gas, water, and electricity and reducing greenhouse gas. The original 2012 goals have been revised for this update of the Energy Reduction Strategy.

The strategy includes an assessment of past energy reduction efforts and areas identified with the greatest potential for energy reduction. Figure one provided below illustrates the total electricity and gas purchase since fiscal year 2008 and reflects the efforts to reduce purchased energy while the campus continues to grow.



**Figure 1: Total MMBtus of Electricity and Gas Purchased**

# Auburn Facilities Management Energy Reduction Strategy

Appendix A lists the goals for the Energy Reduction Strategy. The first three goals focus on maintaining purchased electrical consumption and reducing gas and water consumption when compared to a 2010 baseline for all utilities. Purchased utility consumption caps were chosen to drive campus building utility efficiency while pushing toward renewable energy options. The second set of goals (goals 4 to 7) focus on improving the efficiency of utility use within our buildings. Goal number 8 focus on our largest consumer of electricity on campus, the chilled water plants which can move us further towards our electricity goals. Finally we want to ensure we know where all purchased gas and water is being consumed which can be achieved by installing meters at unmetered locations.

Table 1 below provides a status update of our purchased consumption and utility efficiency through fiscal year 2016.

<b>FY16 YTD Consumption Targets (only Master Meters)</b>							
		Consumption			Intensity		
		FY16	Target	% Difference from Target	Baseline*	2015	% Change
<b>Electricity (kWh)</b>	Sept	193,070,691	186,597,875	3.47%	23.72	20.420	-13.91%
<b>Gas (Mcf)</b>	Sept	520,554	558,526	-6.80%	0.0710	0.0586	-17.46%
<b>Water (kGals)</b>	Sept	346,707	391,902	-11.53%	0.0619	0.0400	-35.38%

**Table 1: Fiscal Year 2016 Year to Date Consumption Targets**

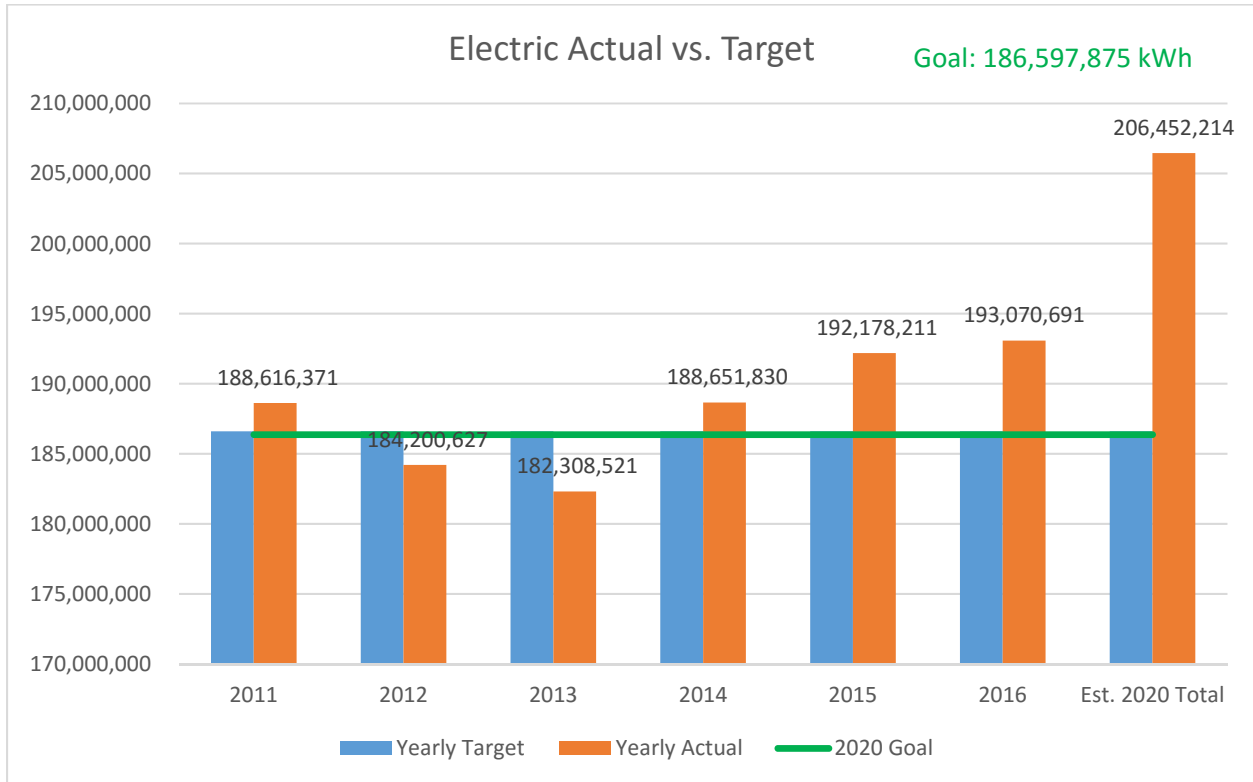
To update the plan we convened a group that included representatives from the Office of Sustainability, University Architect, Facilities Management Maintenance, Energy Management, Campus Services, and the University Engineer. In addition to our diverse group that reviewed the original plan, we also researched energy reduction strategies developed at peer institutions and the Department of Energy.

Four main objectives were identified to categorize types of projects necessary to achieve our goals. The objectives include increasing efficiency of utility plants and University building systems. Increasing the use of renewable energy and operational best practices and implementing behavior change efforts to reduce utility consumptions.

Building energy efficiency has continued to increase year over year resulting in a campus EUI of 17.5%. At the current pace, we should exceed the university EUI goal of 20% by 2020.

# Auburn Facilities Management Energy Reduction Strategy

Based on our status in relation to our goals our greatest area of need is with reducing electrical consumption. While water consumption is currently exceeding our 2020 goal, efforts are still necessary to reduce water consumption in order to achieve our goal. Figure 2 below displays the actual electrical consumption versus our baseline target and shows electrical consumption will miss our goal by more than 10%.



**Figure 2: Actual Electric Consumption vs. Target**

## Ongoing Energy Reduction Strategies

Table 2 below provides an assessment of ongoing and completed energy reduction projects performed recently. The table includes savings achieved and estimated savings.

Project	Savings
Lowder Hall AHU Control Upgrades	\$75,236
Wilmore Labs Mechanical Modifications	\$80,000 (est.)
CWP-2 Optimization	\$116,630 (est.)
Poultry and BERL Exhaust Fan Optimization	\$55,000 (est.)
Parking Deck Lighting Retrofits	\$17,000 (est.)

**Table 2: Energy Reduction Projects**

# **Auburn Facilities Management**

## **Energy Reduction Strategy**

Existing building commissioning is one of our most cost effective approaches for reducing energy and utility consumption in campus buildings. Existing building commissioning includes identifying and repairing systems and equipment that are no longer operating per the original design documents. Additionally we implement optimized sequences of operation that have been successful in other buildings around campus as well as schedules developed with input from building occupants. Existing building commissioning results in a 5 to 15% reduction in total energy use. We need to re-commission buildings every 3 to 5 years in order to maintain energy savings.

Due to the high percentage of buildings that utilize pneumatic controls energy reduction projects begin with upgrading the controls to direct digital controls (DDC) and integration to our campus building automation system. This upgrade improves visibility of the system and improves our ability for scheduling of HVAC systems and equipment when buildings are unoccupied.

Other projects include the installation of variable frequency drives (VFD) on air handling unit fans and pumps.

Installation of LED lights at the Campus Green Parking Deck has resulted in a 40% reduction in electrical consumption since installation in December 2016. Similar projects are an ideal way to contribute to our electricity consumption goal.

### **Areas of Greatest Potential**

The largest consumer of electricity on campus is our chilled water plants as this is where nearly all cooling is generated for main campus and the vet school campus. Replacement of equipment that has reached end of life will increase chilled water plant efficiency. In addition, new control strategies coupled with upgraded variable speed equipment will maximize chilled water plant efficiencies. Further improvement of the chilled water plant performance can be made by maximizing building chilled water return temperature. The chilled water plants are also our largest consumer of water. This could be mitigated with the development of projects for the use of reclaimed water for cooling tower makeup water.

After chilled water, plants the largest consumers of energy on campus are laboratory buildings. Upgrading constant volume laboratories to variable volume will result in reduced energy consumption and improved laboratory airflow controls.

Other options include repair and replace inefficient HVAC equipment in campus buildings, including repair and replacement of insulation, ductwork and other related equipment. Increase the use of low flow plumbing fixtures and water closets in existing campus restrooms.

As our campus continues to grow, we will need to invest in renewable energy production such as photovoltaic solar panels in order to achieve our purchased electricity goals.

# **Auburn Facilities Management Energy Reduction Strategy**

## **Appendix A: Energy Reduction Objectives and Goals**

# **Auburn Facilities Management**

## **Energy Reduction Strategy**

**Objectives:** Auburn University Facilities Management will work to reduce energy use, utility consumption, energy costs, and the university's carbon footprint by utilizing the following strategies to:

1. Increase efficiency of utility production and distribution systems.
2. Improve performance and efficiency of University building systems.
3. Increase use of energy saving, energy efficient, renewable energy technologies and operational best practices.
4. Increase energy awareness and energy conservation efforts by all AU students, faculty and staff.

### **Auburn Facilities Management Energy Goals:**

1. To maintain the overall consumption of purchased electricity (kWh) for main campus through 2020 at the same level as the 2010 baseline. This consumption will include future growth of the campus.
2. To reduce the overall consumption of purchased gas (MMBtu) for main campus a minimum of 5% by 2020 when compared to a 2010 baseline. This consumption will include future growth of the campus.
3. To reduce the overall consumption of purchased water (kGals) for the university a minimum of 5% by 2020 when compared to a 2010 baseline. This consumption will include future growth of the campus.
4. Reduce the university's energy intensity index (energy use per square foot) by 20% by 2020 from the 2006 baseline.
5. To reduce the overall average electricity energy intensity (kWh per square foot) of Auburn University facilities 15% by 2020 when compared to a 2010 baseline.
6. To reduce the overall average gas energy intensity (Mcf per square foot) of Auburn University facilities 20% by 2020 when compared to a 2010 baseline.
7. To reduce the overall average water use intensity (kGals per square foot) of Auburn University facilities 20% by 2020 when compared to a 2010 baseline.
8. To improve total chilled water plants efficiency 10% by 2020 when compared to a 2014 baseline.
9. To reduce unmetered use and system loss by 40% for domestic water and natural gas distribution systems by 2020 based on a 2012 baseline.

# **Auburn Facilities Management Energy Reduction Strategy**

## **Appendix B: Energy Reduction Strategy Projects**



# **Auburn Facilities Management**

## **Energy Reduction Strategy**

### **Objective 1: Increased Efficiency of Utility Production and Distribution Systems**

- 1.1. Develop and implement chilled water plant optimization projects. Projects include:
  - Expand chilled water plant optimization programming to increase efficiencies.
  - Installation of chilled water heat exchanger for free cooling.
  - Convert chilled water plants to variable primary plants.
  - Replace inefficient equipment at end of life with new more efficient equipment.
  
- 1.2. Develop and implement hot water plant optimization projects. Projects include:
  - Improvement of boiler operations and staging to increase efficiencies.
  - Continue to connect campus buildings to the central hot water system.
  - Convert central steam system buildings to connect to central hot water system.
  
- 1.3. Reduce chilled water and hot water system leaks by continuing to identify and repair leaks in systems.
  
- 1.4. Focus on increasing chilled water return temperature in poor performing buildings. Develop list of poor performing buildings and investigate possible solutions to improve performance of those buildings.
  
- 1.5. Investigate projects and develop standards for new buildings for the installation and use of reclaim water systems. Reclaim water systems to include grey water systems, rainwater capture systems, condensate capture systems and waste water treatment systems to produce reclaimed water.
  
- 1.6. Develop plan and schedule for the replacement of Chilled Water Plant 1 with a new more efficient chilled water plant.
  
- 1.7. Increase the metering of utility systems and campus buildings. Develop a long range plan to increase the metering of utility systems and buildings to provide increased capability to monitor utility/energy usage.

# **Auburn Facilities Management**

## **Energy Reduction Strategy**

### **Objective 2: Improved Performance and Efficiency of University Building Systems**

- 2.1. Develop projects for the repair and replacement of inefficient HVAC equipment in campus buildings. Projects to repair/replace insulation, ductwork and other related equipment and complete air handling systems replacements. Projects to include control retrofits and upgrades (i.e. pneumatic controls).
- 2.2. Increase the use of low flow plumbing fixtures by developing a list of buildings to target that need to be retrofitted with low flow plumbing fixtures to meet the current campus standards.
- 2.3. Expand current HVAC scheduling program across campus. Updated list of buildings that are scheduled is needed and then plan developed to install schedules in buildings not currently scheduled. The plan will include buildings that are not digitally controlled.
- 2.4. Expand lighting improvements in buildings which include controls, delamping and conversion to LED. Develop a plan for the conversion of interior lighting to LED and the addition of lighting controls for major areas that show benefit. Develop standards for improved lighting design to increase the use of energy savings technologies like LED and daylighting.
- 2.5. Develop landscaping standards and plans with plantings that require little water and improve the operation of building systems.
- 2.6. Implement projects to improve the operation of the Coliseum.
- 2.7. Expand the existing building commissioning program to increase the number of buildings commissioned or recommissioned each year.
- 2.8. Conduct steam trap surveys in buildings and central systems to identify needed repairs. Develop plans and schedules for the repair or replacement of identified steam traps.
- 2.9. Identify list of air compressors used across campus. Develop plan and projects to improve the operation, upgrade or removal of air compressors across campus. Develop standards for the purchase of new air compressors on campus.
- 2.10. Develop new standards with support from OIT for IT rooms. Standards should address requirements for power, back up, equipment and HVAC.
- 2.11. Develop comprehensive lab improvement plan. Plan to address existing lab needs for improvement in safety and energy consumption.

# **Auburn Facilities Management**

## **Energy Reduction Strategy**

### **Objective 2: Improved Performance and Efficiency of University Building Systems**

- 2.12. Review and update design standards to ensure energy efficient designs of new and renovated buildings. Standards should address the use of life cycle cost analysis, energy models, new building commissioning and equipment efficiency standards.
- 2.13. Conduct energy audit of campus greenhouses to identify potential energy savings.
- 2.14. Develop projects to evaluate and improve building envelopes.
- 2.15. Improve the Preventive Maintenance Program for the AHUs, distributed chillers, coils, heat exchangers, pumps, boilers, and other equipment to improve equipment performance, efficiency and reliability. Increase the use of industry best practices and the use of predictive maintenance practices. Train Maintenance staff personnel as needed to achieve this goal.

# **Auburn Facilities Management**

## **Energy Reduction Strategy**

### **Objective 3: Increased Use of Energy Saving or Energy Efficient Technologies**

- 3.1. Develop exterior lighting LED retrofit plan for campus.
- 3.2. Schedule regular thermal imaging of central plant distribution systems and roofs to identify issues.
- 3.3. Identify and install energy management analysis software to track energy usage and help identify potential energy reduction projects.
- 3.4. Develop training for technicians and campus users in the use of the building automation systems (Metasys).
- 3.5. Develop standards for new buildings and renovation projects to incorporate renewable energy technologies.

# **Auburn Facilities Management**

## **Energy Reduction Strategy**

### **Objective 4: Increase energy awareness and energy conservation efforts by all Faculty, Students and Staff.** **AU**

- 4.1. Develop website to communicate campus and building energy usage to faculty, staff and students across campus.
- 4.2. Develop energy reduction competitions between different buildings, departments, dorms or schools/colleges to promote energy reductions.
- 4.3. Develop training/education topics for students, faculty and staff on energy management and reduction.
- 4.4. Develop standards for new building training to improve the level of training received by building occupants and building technicians.
- 4.5. Develop campus purchasing policy for “Manage Print” and a purchasing policy on purchasing energy star and EPEAT certified equipment.