

2030

ENERGY

REDUCTION

STRATEGY



AUBURN
UNIVERSITY

Facilities Management

Executive Summary

Auburn University is a land, sea and space grant university established in 1856. The university consists of 12,495,125 square feet on 1,840 acres and serves over 30,000 students annually.

The Energy Reduction Strategy was developed in 2012 and revised in 2017 by Auburn University Facilities Management to be proactive in the pursuit of energy reduction while supporting Auburn University's sustainability goals. The (2020) plan established nine goals and expired in 2020. The goals focused on reducing greenhouse gasses and the consumption of natural gas, water, and electricity. The results of the (2020) energy reduction strategy are presented below and the new (2030) energy reduction strategy is introduced after.

From 2010 to 2020 the university added over 2.7 million square feet while the total energy consumption increased by 7,233 MMBtu (less than 1%). Figure 1 below illustrates the total electricity and natural gas purchase since fiscal year 2008 and reflect the efforts to reduce purchased energy while campus continues to grow.

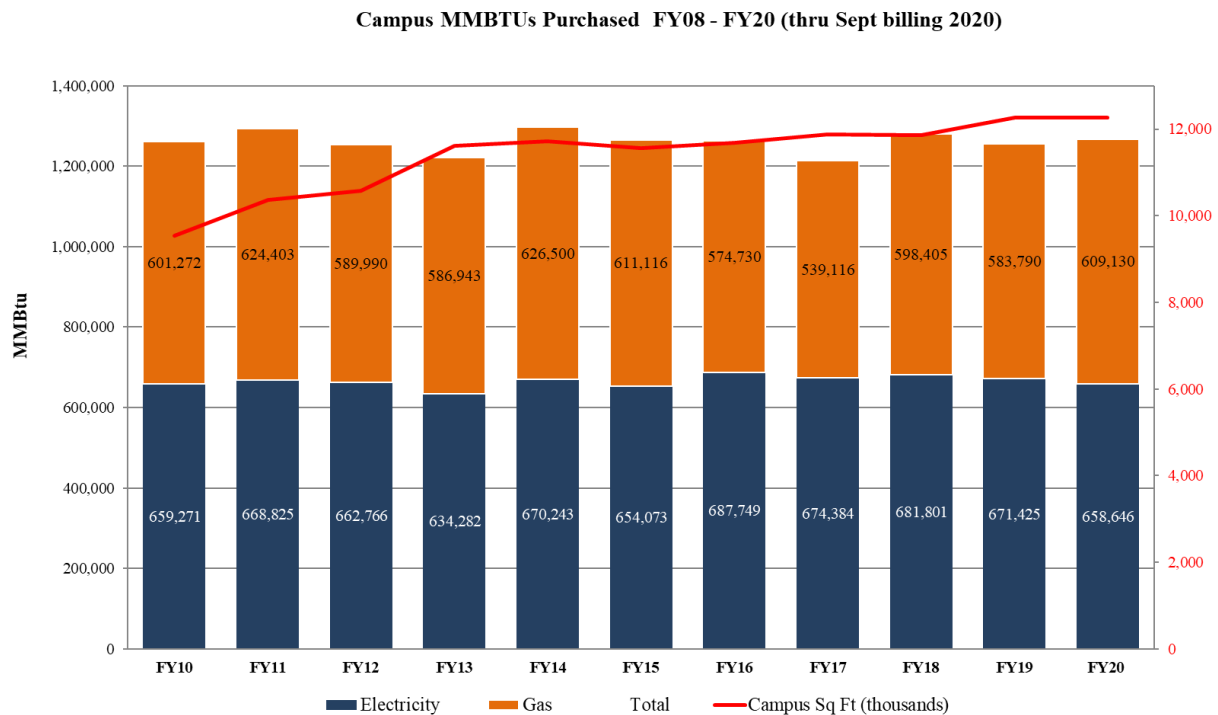


Figure 1: Total MMBtus of Electricity and Natural Gas Purchased

The goals from the 2020 Energy Reduction strategy included consumption goals for electric, natural gas, and water. Our goals remained constant as campus added new buildings. This means that all utility consumption for new buildings had to be saved elsewhere through energy conservation measures. The electric goal was to maintain purchased electric consumption when compared to a 2010 baseline. The natural gas and water goals were to reduce purchased consumption by 5% when compared to a 2010 baseline.

Table 1 below provides the results of our purchased consumption goals at the end of fiscal year 2020.

		Consumption		
		FY20	Target	% Difference from Target
Electricity (kWh)	Sept	182,951,671	186,597,875	-1.95%
Gas (Mcf)	Sept	559,027	547,010	2.20%
Water (kGals)	Sept	334,597	383,822	-12.82%

Table 1: Fiscal Year 2020 Consumption Goal Results

As indicated by Table 1, the electric and water consumption goals were surpassed by 1.95 and 12.8% respectively, while the natural gas goal fell short by 2.2%. These goals were intended to be challenging and the results show tremendous success from Energy Management and Facilities management. The results are especially significant considering that with 2 million square feet of growth, the utility consumptions were maintained or substantially reduced. These are fantastic achievements and illustrate the critical need for an Energy Reduction Strategy.

The COVID-19 pandemic did have an impact on our achievement of the electricity and natural gas consumption goals due to decreased occupation and operational modifications. For nearly 7 months of the fiscal year 2020 the campus operated remotely with skeleton crews keeping equipment online and teaching being preformed via video conferencing solutions. Review of campus consumptions illustrates the modified operations account for some of the reduced electrical consumption and increased natural gas consumption. There was also a substantial decline in water consumption during this time; however, year on year water consumption has been maintained below our FY20 consumption goal.

In addition to the consumption goals there were also intensity goals for electric, natural gas and water. The electricity goal was to reduce overall average electricity energy intensity (kWh per square foot) by 15% by 2020 when compared to a 2010 baseline. The natural gas and water goals were to reduce overall average natural gas energy intensity (Mcf per square foot) and water use intensity (kGals per square foot) by 20% by 2020 when compared to a 2010 baseline.

Table 2 below provides the results of our intensity goals at the end of fiscal year 2020.

		Intensity		
		FY20	Target	% Change
Electricity (kWh)	Sept	18.6	23.3	-20.16%
Gas (Mcf)	Sept	0.057	0.072	-21.45%
Water (kGals)	Sept	0.037	0.0502	-26.30%

Table 2: Fiscal Year 2020 Intensity Results

As shown by Table 2 the intensity goals for all 3 utilities were successfully achieved and significantly exceeded. The essentially flat consumption for electricity and natural gas consumption can be explained by the exceptional energy use intensity decline. This is a result of many years of successful energy conservation projects.

Water consumption showed a larger decline, however, it should be noted that increased irrigation is not accounted for in this goal only building usage. The results illustrate the continued efforts by Facilities Management to build efficient buildings and to upgrade existing buildings to improve their efficiency.

Similarly, there was a goal to reduce the university's energy use intensity index (energy use per square foot or EUI) by 20% by 2020 from the 2006 baseline. This goal is the total energy usage for electricity and natural gas. In Figure 2 below the results show that the EUI was reduced by 20.8% with a goal of 125 kBtu/sq ft the EUI index was reduced to 123 kBtu/sq ft.

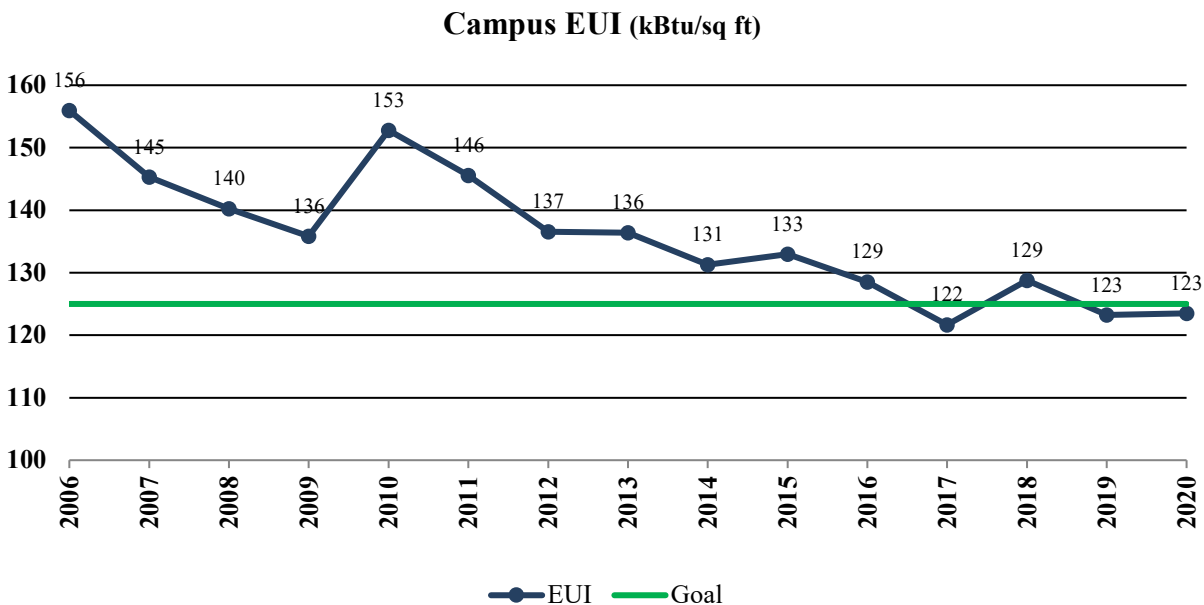


Figure 2: Campus Energy Use Intensity Results

The two remaining goals pertain to campus chilled water plant efficiency and reducing unmetered use and system loss domestic water and natural gas distribution systems. The chilled water efficiency goal was to improve chilled water plant efficiency by 10% by 2020 compared to a 2014 baseline. This goal was achieved with a 10.9% efficiency improvement. The natural gas and water goal was to reduce the unmetered use and system loss by 40% by 2020 based on a 2012 baseline. The water unmetered use and system loss was reduced 69% while the natural gas unmetered use and system loss was reduced 77%.

2030 Energy Reduction Strategy

The results of the previous Energy Reduction Strategy show successful reductions in utility consumption and all-around efficient use of each utility. Tracking and reporting each metric improves accountability and helps drive new efficiency projects. To sustain the accomplishments of the past ten years, a new set of goals for the next energy reduction strategy has been developed and are summarized in Appendix A.

A collaboration between Facilities Management and the Office of Sustainability was convened to develop the new goals, baselines, and end date for the next Energy Reduction strategy. As the new energy reduction strategy was being developed it was agreed that number of goals could

be reduced. For example, there is no longer a natural gas consumption goal and no water use intensity goal. The past electric consumption goal of maintaining a baseline of 2010 including future growth has been retained.

The natural gas, electricity, and the energy use intensity goals are based on an average baseline of FY17, FY18, and FY19 instead of a single baseline year. The water consumption goal is based on the FY19 baseline due to metering errors determined during FY17 and FY18. All goals will be evaluated on a 3-year average to minimize the impact of weather anomalies.⁶⁰

We have continued the main campus chilled water plant efficiency goal and are now including the College of Vet Medicine campus chilled water plant. Additionally, we have added a goal to improve the hot water plant efficiency.

Potential project ideas are broken into four categories and are summarized in Appendix B. These categories indicate the types of projects that will be pursued in the future or included in new buildings. In addition, Appendix C contains a list of projects that have been recently completed or will be executed in the next 5 years.

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 campus energy use, utility consumption, energy costs, and the 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 2030 at or below the 2010 baseline. This consumption will include future growth of the campus. (2019 Baseline = 186,370,589 kWh) Electric Consumption Goal
2. To reduce the overall consumption of purchased water (kGals) for the university a minimum of 2.5% of a 3-year average by 2030 when compared to a 2019 baseline. This consumption will include future growth of the campus. (2019 Baseline = 378,837 kgals) Water Consumption Goal
3. Reduce the university's energy use intensity index (energy use per square foot) by 5% of 3-year average by 2030 when compared to a 3-year average baseline of FY17, FY18, and FY19. (EUI goal = 118 kBtu / sq ft) Campus Energy Use Intensity Goal
4. To reduce the overall average electricity energy intensity (kBtu per square foot) of Auburn University facilities by 5% of a 3-year average by 2030 when compared to a 3-year average baseline of FY17, FY18, and FY19. (3-year Average Baseline = 19.24 kBtu / sq ft) Electric Intensity Goal
5. To reduce the overall average natural gas energy intensity (Mcf per square foot) of Auburn University facilities by 5% of a 3-year average by 2030 when compared to a 3-year average baseline of FY17, FY18, and FY19. (3-year Average Baseline = 0.054 Mcf / sq ft) Gas Intensity Goal
6. To improve main campus chilled water plants efficiency 10% and College of Vet Medicine campus chilled plant efficiency 36% by 2030 when compared to a 2020 baseline. Goal is to achieve a 0.66 kW/ton operational efficiency for main campus and College of Vet Medicine campus. Chilled Water Plant Efficiency Goal
7. To improve hot water plant efficiency by 10% by 2030 when compared to a FY21 baseline.(Achieve 80% efficiency) Hot Water Plant Efficiency Goal

Auburn Facilities Management Energy Reduction Strategy

Appendix B: Energy Reduction Strategy Project Ideas

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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. Leaks cost \$79 per thousand gallons for hot water and \$217.50 per thousand gallons for chilled water.

- 1.4. Focus on increasing chilled water return temperature in buildings connected to central chilled water system. Buildings are actively monitored and identified using building automation system chilled water excessive pumping (CWEP) programming.

- 1.5. Focus on decreasing hot water return temperature in in buildings connected to central hot water system. Buildings are actively monitored and identified using building automation system hot water excessive pumping (HWEP) programming

- 1.6. 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.

- 1.7. 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 (e.g. 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. Develop a plan for the conversion of interior lighting to LED and the addition of lighting controls for major areas that show benefit. Implement standards for improved lighting design to increase the use of energy savings technologies like LED and daylighting.
- 2.4. Develop landscaping standards and plans with plantings that require little water and improve the operation of the building systems.
- 2.5. Create a 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.
- 2.6. Develop new standards (with support from OIT) for IT rooms. Standards should address requirements for power, back up, equipment and HVAC.
- 2.7. Develop comprehensive lab improvement plan. Plan to address existing lab needs for improvement in safety and energy consumption.
- 2.8. Develop projects to evaluate and improve building envelopes. Investigate the use of drone mounted infrared cameras to determine building envelope integrity.
- 2.9. 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.

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Energy Reduction Strategy

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

- 3.1. Continue upgrading exterior lighting to LED for campus.
- 3.2. Schedule regular thermal imaging of central plant distribution systems and roofs to identify issues.
- 3.3. Continue training for technicians and campus users in the use of the building automation systems (Metasys).
- 3.4. Develop standards for new buildings and renovation projects to incorporate renewable energy technologies
- 3.5. Invest in large scale renewable energy technologies on campus and off campus.

Auburn Facilities Management

Energy Reduction Strategy

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

- 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.

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Auburn Facilities Management

Energy Reduction Strategy

Appendix C: Energy Reduction Strategy Projects Recently Completed and Queued for Execution Within 5 Years

Auburn Facilities Management

Energy Reduction Strategy

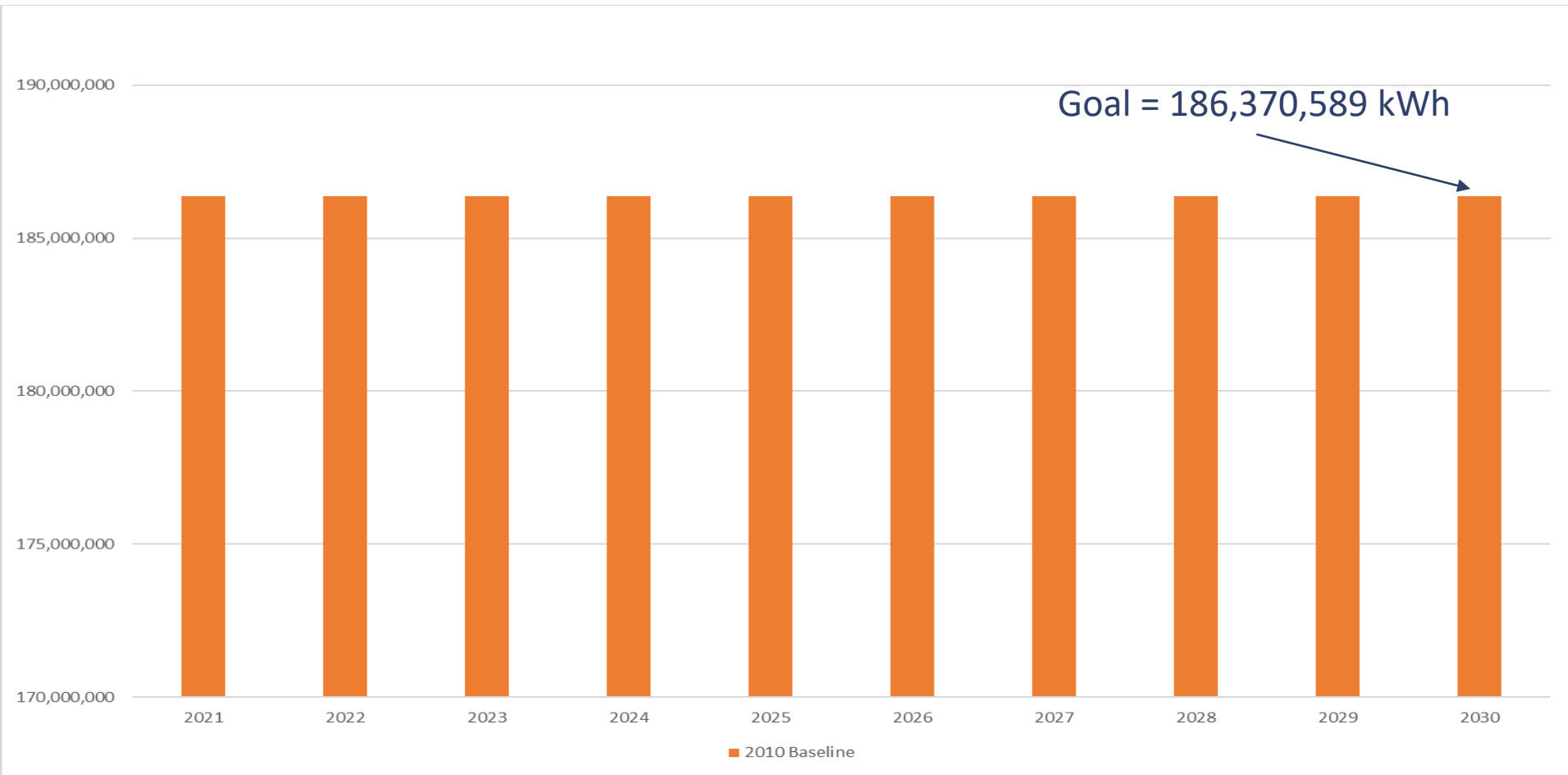
- The 25,000 gallon rain water capture tank installed at the ACLC and Central dining projects could save over 500,000 gallons of water for irrigation. This is equal to an estimated annual savings of \$2,250. This will contribute to a 5% annual reduction in water consumption.
- Renovation of Quad dorms should include conversion of all toilets to low flow flush valves. Renovations are expected to be performed over the next 5 to 7 years. There are over 240 toilets that would result in an estimated annual reduction of domestic water of 3.9 million gallons an estimated annual savings of \$37,000.
- Implement chilled water optimization strategies at Chilled Water Plant 2 and District Energy Plant. Project costs are estimated at \$900,000 to \$1.2 million with estimated annual savings of \$325,000 to \$373,000.
- Replace end of life chillers and pumps at Chilled Water Plant 3 serving the College of Vet Medicine. Will result in a 35% improvement in chiller plant efficiency.

Auburn Facilities Management

Energy Reduction Strategy

- **Appendix D: Charts**

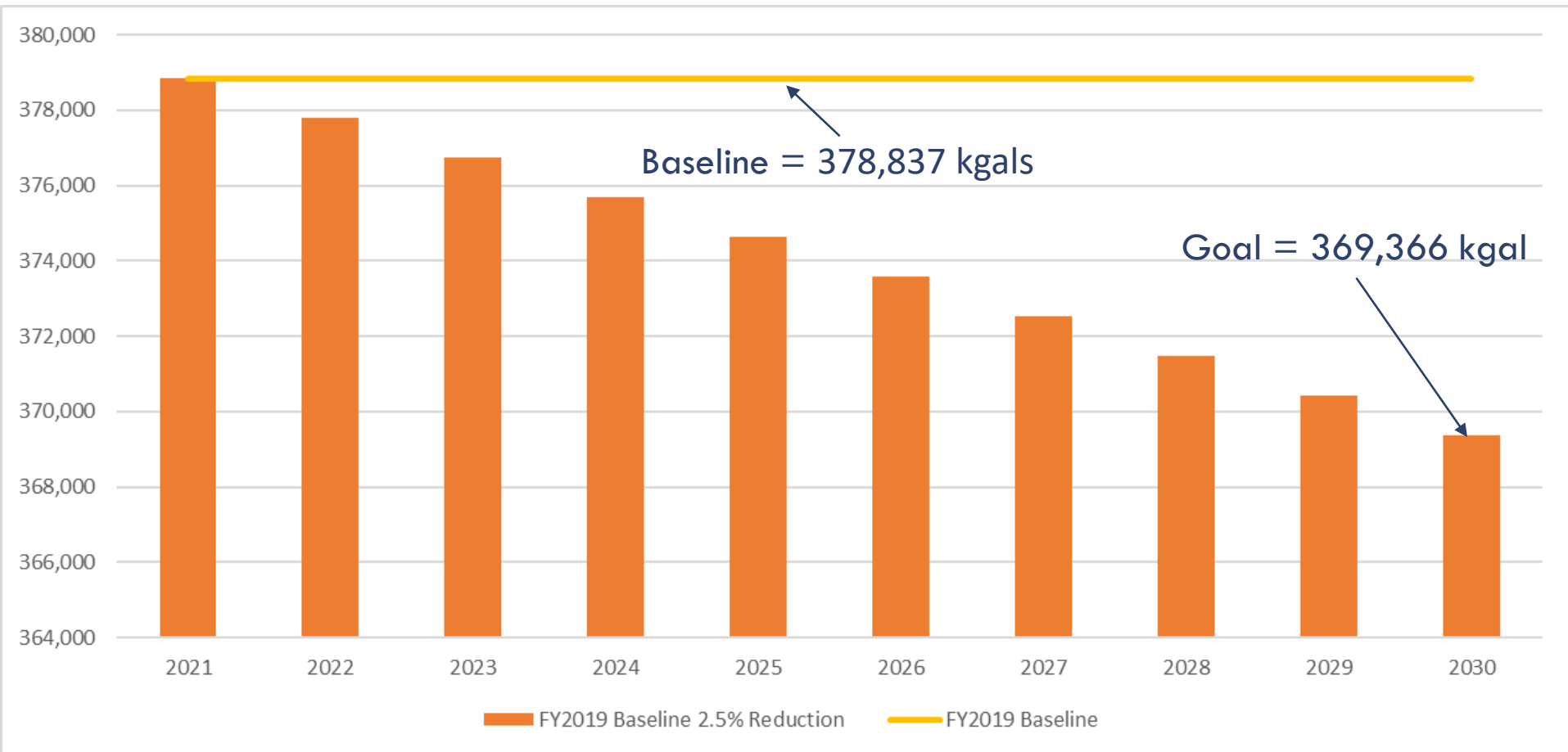
Electric Consumption Goal



To maintain the overall consumption of purchased electricity (kWh) for main campus through 2030 at or below the 2010 baseline. This consumption will include future growth of the campus.



Water Consumption Goal

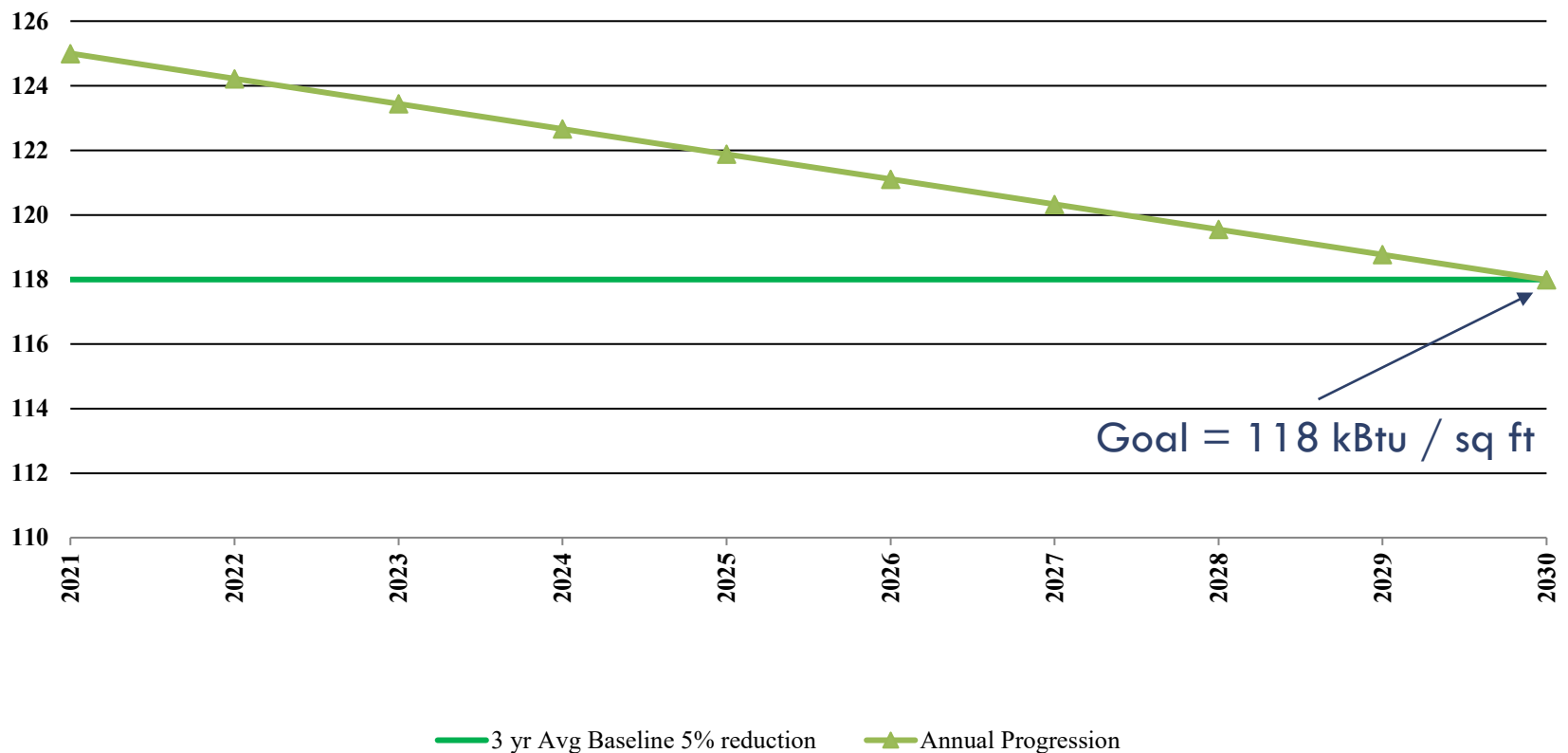


To reduce the overall consumption of purchased water (kGals) for the university a minimum of 2.5% of a 3-year average by 2030 when compared to a 2019 baseline. This consumption will include future growth of the campus.



Campus Energy Use Intensity Goal

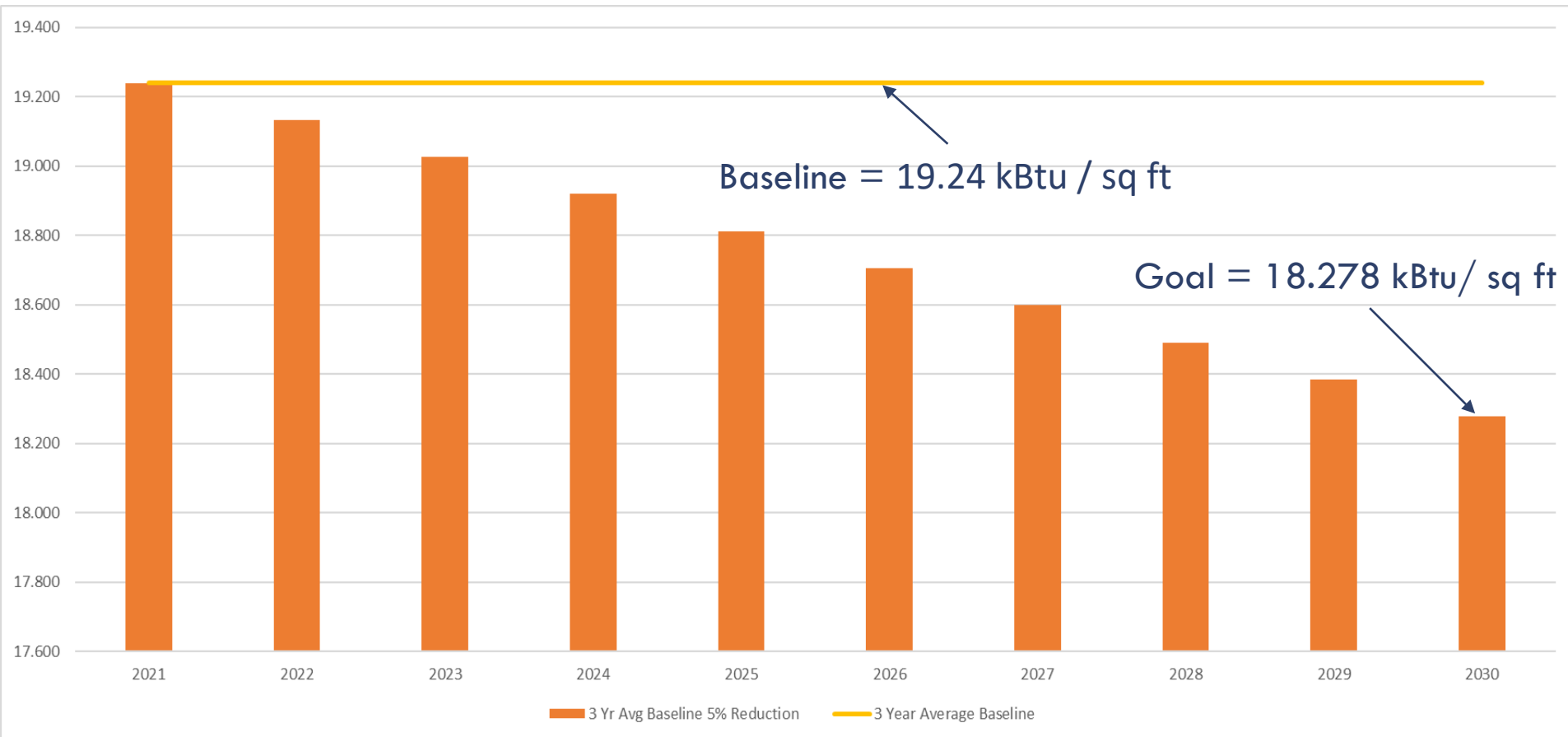
Campus EUI (kBtu/sq ft)



Reduce the university's energy use intensity index (energy use per square foot) by 5% of 3-year average by 2030 when compared to a 3-year average baseline of FY17, FY18, and FY19.



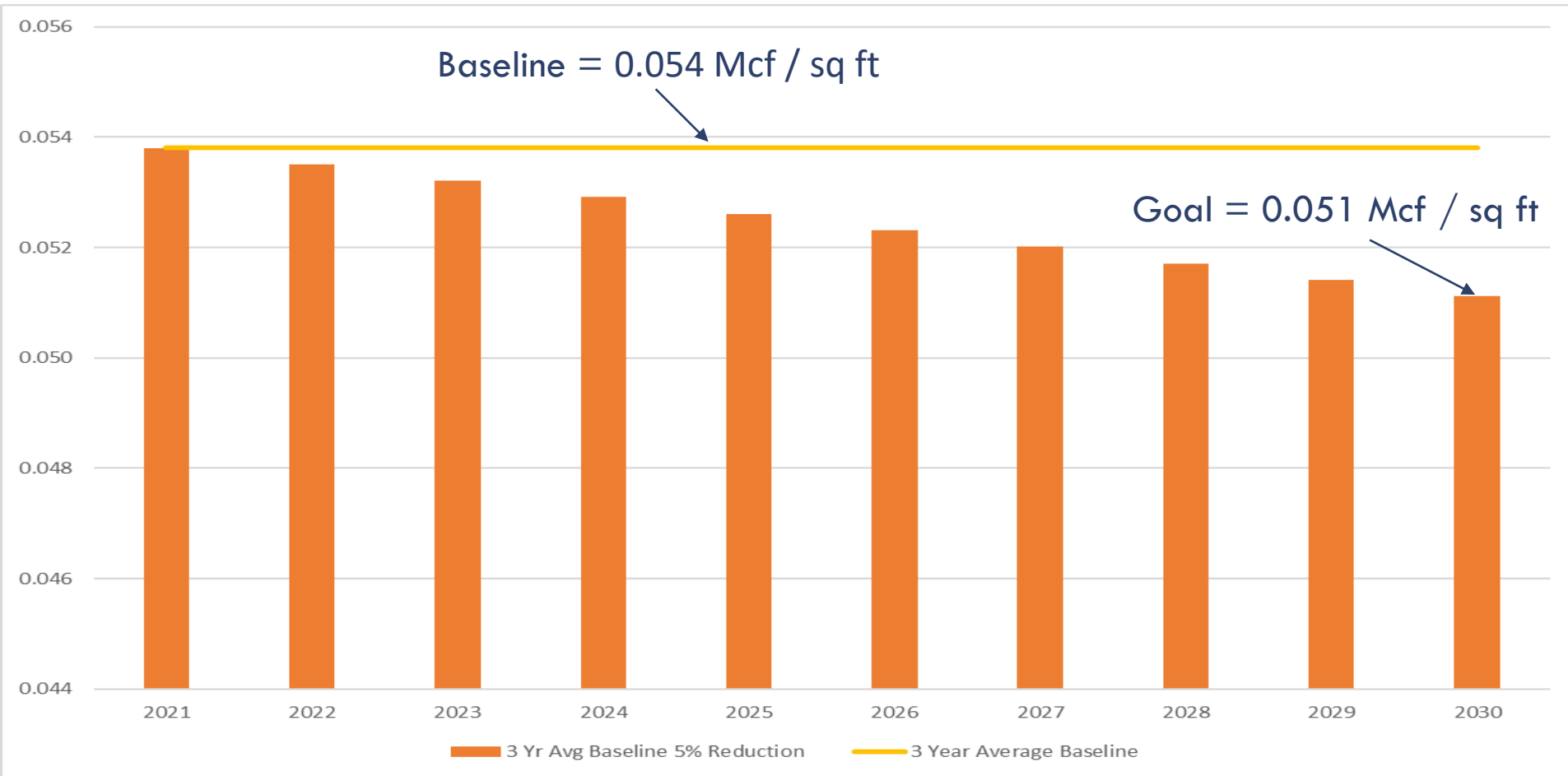
Electric Intensity Goal



To reduce the overall average electricity energy intensity (kBtu per square foot) of Auburn University facilities by 5% of a 3-year average by 2030 when compared to a 3-year average baseline of FY17, FY18, and FY19.



Gas Intensity Goal

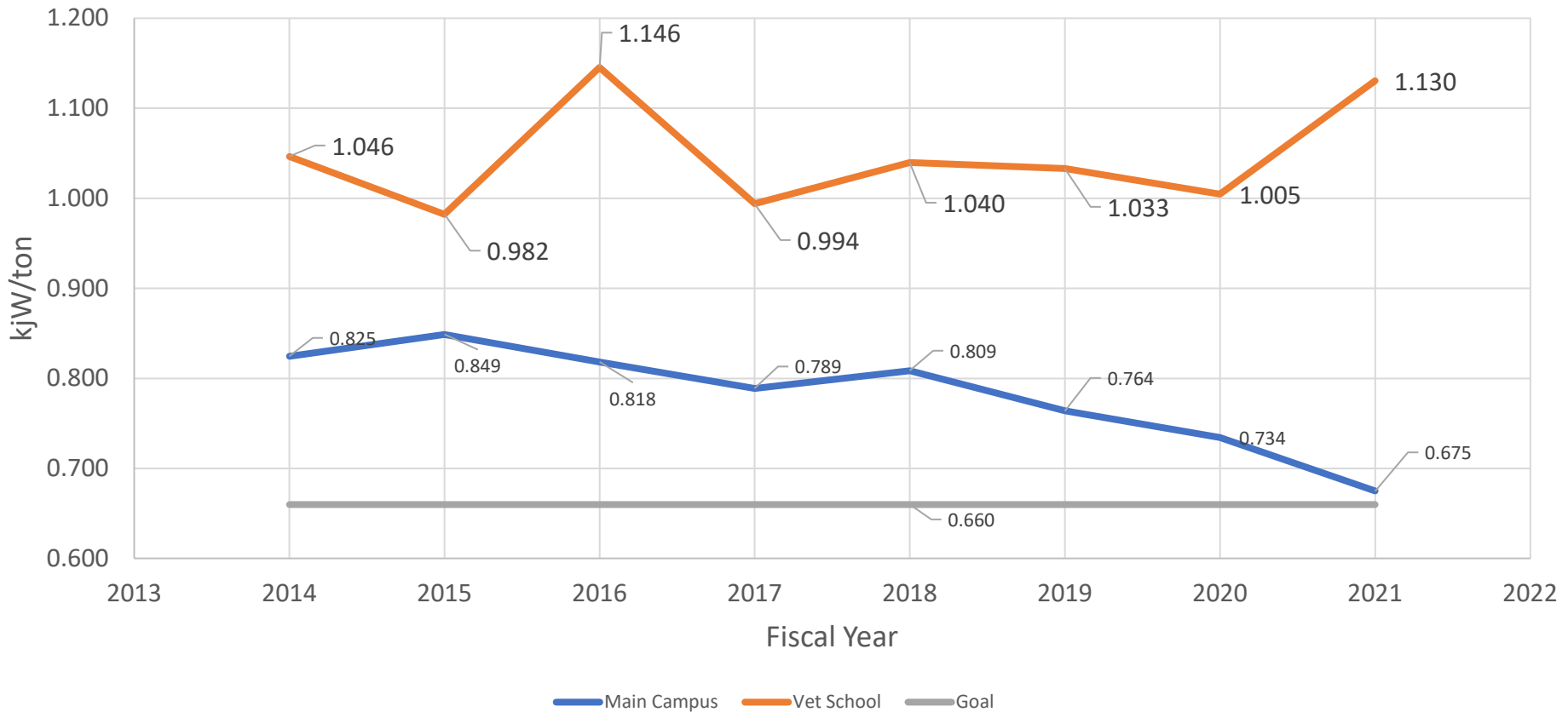


To reduce the overall average natural gas energy intensity (Mcf per square foot) of Auburn University facilities by 5% of a 3-year average by 2030 when compared to a 3-year average baseline of FY17, FY18, and FY19.



Chilled Water Plant Efficiency Goal

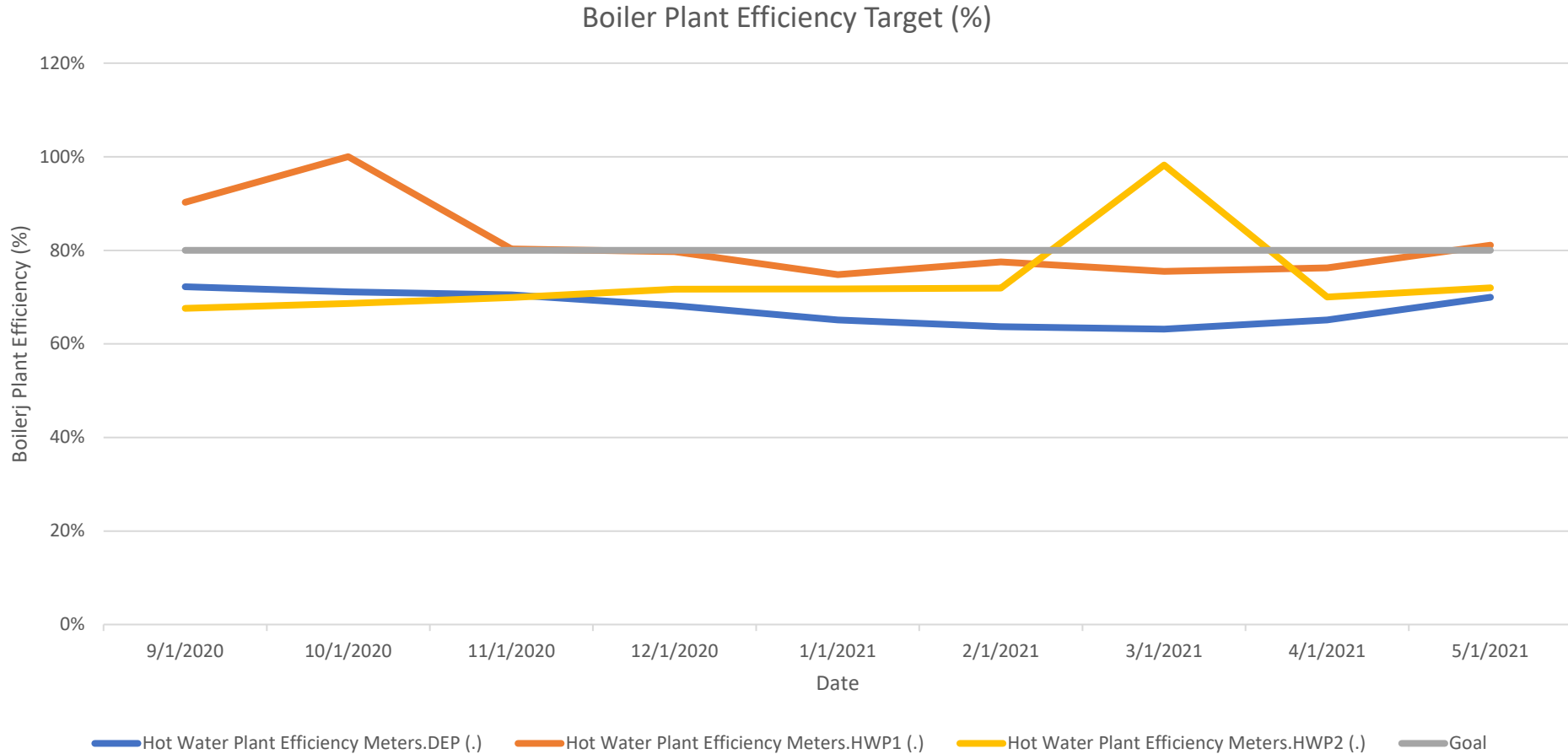
Main Campus & Vet School (kW/ton)



To improve main campus chilled water plants efficiency 10% and College of Vet Medicine campus chilled plant efficiency 36% by 2030 when compared to a 2020 baseline. Goal is to achieve a 0.66 kW/ton operational efficiency for main campus and College of Vet Medicine campus.



Hot Water Plant Goal



To improve hot water plant efficiency by 10% by 2030 when compared to a FY21 baseline.(Achieve 80% efficiency)

