2018 Annual Energy and Utilities Report
In 2018, Emory has continued its dedication to reduce energy use per square foot (EUI) by 50 percent in 10 years, and overall by 25% as part of the 2015 Sustainability Vision and Strategic Plan. To date, Emory has achieved an overall EUI reduction of **10.2%** since 2015 and an overall total energy reduction of **3.1%**. Emory also targets to reduce potable water consumption 50% by 2025 and has made great progress through the first two and a half years operating its WaterHub. Emory is committed to self-generate 10% of campus electric use, and currently has installed over **1.36MW** made up of solar and co-generation with a steam turbine.

The **2025 total energy use reduction goal of 25%** challenges Emory to reduce energy consumption while also meeting its current building expansion plans. The new design and construction standards, with a minimum LEED Silver requirement, have been a large contributor to the energy reduction goals to date. In addition to energy reductions, renovations, recommissioning, LED lighting upgrades, and the Smart Labs program have all continued to push Emory forward towards our ambitious goals.

### 2025 Reduction Goals:

- 25% reduction in Emory Campus total energy consumption
- 50% reduction in Emory Campus energy use per square foot (EUI)
- 25% reduction in Emory Healthcare total energy consumption
- 10% self-generation of energy used on Emory Campus
- 50% reduction in Emory Campus total water consumption

...So how do we get there?
Efforts to Achieve Targeted Energy Reduction

Energy Initiatives

Reaching Emory’s ambitious energy reduction goals will take continuous process improvement, innovative energy reduction strategies, and detailed monitoring of building energy performance across campus. Emory has outlined its strategy down this challenging yet exciting path.

Emory is currently making progress to reduce EUI (kBtu/SqFt) by 50% and total energy by 25%. The graph to the right shows how we are currently doing. Emory has a current reduction of **10.2%** from our 2015 baseline. We are looking forward to a strong 2019 with new programs starting up such as Smart Labs.
Smart Labs Accelerator

In an effort to continue reducing energy within current buildings across campus, Emory has joined the Department of Energy’s Smart Lab Accelerator program. Emory will work directly with the DOE and other participating groups to advance strategies that rapidly improve energy efficiency in laboratory buildings. As a part of this challenge, Emory will share our strategies and successes while having access to the strategies and results of other participating groups, collectively helping everyone be successful in the program.

As part of this program, Emory will focus on targeting HVAC optimization by using technology such as variable frequency drives where applicable. There will also be a careful evaluation of unoccupied spaces within these lab buildings to implement smart controls to cut back HVAC use and reduce or cut off lighting. Campus Services and the Emory Health and Safety Office have identified 7 lab buildings (shown below) with the highest opportunities to save energy while maintaining a safe and productive workspace. Emory is projecting to save an average of 22.2% across these 7 buildings.

- Heath Science and Research Building
- Emory Children’s Center
- Whitehead Memorial Research
- Claudia Nance Rollins
- O. Wayne Rollins Research
- Emerson
- Atwood

Emory has joined the DOE led Smart Labs initiative alongside 7 other universities nationwide.
Recommissioning

Recommissioning is an ongoing strategic process, which optimizes existing building systems by identifying controls, schedules, faulty equipment or installations and setting the building back on course for energy efficiency. Beginning with the 2017 fiscal year, all new project commissioning has been done in-house. Not only does this save money but it also keeps project knowledge in-house, allowing Emory to train and support its operating staff more effectively.

Sustainable Performance Program (SPP)

The SPP is a continuous commissioning program that strives to keep the building HVAC systems optimized and prevent performance degradation. Prior to 2018, there were 25 buildings in the program. Three additional buildings were added in 2018.

- Atwood Chemistry
- Woodruff PE Center
- HSRB

SPP Buildings have saved over $1.9M in avoided energy costs since 2015.
Lighting

Parking & Transportation Services continued its LED lighting conversion with 2 more parking decks completed in 2018. To date, the now-7 deck total savings is over 9,000,000 kWh and $600,000. Emory has currently approved a LED retrofit project to upgrade 160 pedestrian poles and 7 street light poles with LED technology to begin in 2019. This project will reduce the energy used by these lights currently by 77%.

LEED Construction

In order to meet Emory’s long-term energy reduction goals, special attention must be paid to the removal, addition, and renovation of buildings on campus. The minimum design and construction standard for Emory is LEED Silver.

Renovations

Emory has completed numerous renovation projects that have reduced demand and improved occupant satisfaction. Some of those renovations occurred at Pierce Hall, Haygood Hall (West Wing), Phi Gamma Hall at Oxford campus. Woodruff Library and Woodruff Memorial Research Building have also received renovations in parts of the building that will continue in 2019.
**Sustainability Initiatives**

**Revolving Loan Fund**

Emory’s Sustainability Revolving Fund, initially established in 2017 with seed capital from the Kendeda Fund, will continue providing funding for approved projects that help reduce Emory’s energy and water usage. Each project is selected with the expressed criteria that it is financially viable, has environmental and or energy benefits, and improves the student experience. This fund has already approved 4 projects that will improve Emory’s infrastructure while reducing energy. This year, the fund approved an investment of just over $245,000 with an average payback of 6.5 years.

**Energy and Water Task Force**

A team of Emory University students, faculty and staff was created to identify ways to reduce the energy and water needs of Emory University and engage campus in these conservation efforts. This group keeps a running list of potential energy conservation measures that get evaluated. There are currently 38 projects identified across campus with a payback of 5 years or less.

**Freezer Challenge**

A group of Emory staff and students started the Freezer Challenge to encourage best practices to reduce CO₂ emissions produced at the Chemistry department. 5 labs from Emory’s Department of Chemistry participated in the challenge. Through these efforts, the Department of Chemistry was able to save 103 lbs CO₂ emissions. They are looking to expand the challenge for greater impact.

**Holiday Turndown**

During official University winter holidays, the heating systems in buildings across Emory’s campus are programmed to maintain a 55° F minimum set point which helps save energy. In 2018, 23 buildings had their HVAC systems turned back which resulted in a 66.4% reduction in HVAC use over the 10 day period. The University 3 day holiday recess for staff and employees even further boosted these savings by adding an additional 40% energy reduction on top.
Utility Overview

Steam

Emory operates five 100,000lb/hr. steam boilers that consume natural gas and fuel oil when the natural gas supply is interrupted. The boiler plant annually consumes about 786 million cubic feet of natural gas to produce about 693 million lbs. of steam. The steam is distributed underground to 59 buildings on the central campus for space heating, water heating, humidification, and process loads. Steam consumption is metered at every building. Looking ahead, additional alarms and sensors will be added to more quickly detect and address operational issues.

Natural Gas

Southern Company Gas annually delivers approximately 830 million cubic feet of natural gas, purchased through marketers, to the central steam plant as well as directly to some facilities. Emory purchases mostly interruptible gas for the steam plant, but has a base load volume of firm gas to provide reliability during high volume days.

Chilled Water

Two older centrifugal chillers located in the WMRB Chiller Plant were replaced in 2018. One of the chillers had failed and needed extensive repairs and both chillers suffered from degradation. These chillers were replaced, one with a Trane chiller with a variable speed drive. This chiller offered outstanding full load efficiency and was 28% more efficient than the chiller it replaced. The other chiller was replaced with a York magnetic bearing chiller with a variable speed drive. This chiller offered outstanding part load efficiency and was 32% more efficient than the chiller it replaced. Both of these chillers will be used extensively in the WMRB Chiller Plant so as to increase the overall chilled water plant efficiency.
Electricity

Georgia Power provides over 270 million kilowatt hours of electricity annually to the central campus facilities with a peak summer electric demand of about 45 megawatts. Electric power is primarily fed by Georgia Power through two substations and then delivered by the Emory 20kV distribution system. Electricity consumption is metered either by Georgia Power directly or by Emory meters at every building.

Emory Campus Oxford Rd Electric Substation

Rebates

Emory has continued to work diligently with Georgia Power to obtain rebate incentives to install energy efficiency equipment. In 2018 Emory received $107,812 in rebate incentives for different projects such as LED lighting in the Peavine and Gambrell parking decks, Variable Frequency Drives in the Woodruff Memorial Research Building, and Geothermal wells under in the Emory Student Center to name a few.
As part of the 2025 goals, Emory is committed to self-generate 10% of energy used on campus to replace fossil fuel sources. For steam and solar combined, Emory has witnessed an 80% increase in self-generation from 2017 for a total production of 3,409 MWh.

Solar Produced Electricity

Currently, Emory has installed four solar projects with a combined capacity of 1.36 MW. In 2018, Emory’s solar projects produced over 413 MWh of electricity. Emory is currently evaluating the potential for a solar expansion across campus in stages. This large endeavor entails adding solar arrays to a few select buildings and most of the parking decks, and would help Emory meet its on-site generation goal. Emory is also investigating adding a 3.5 MW microgrid system that would also significantly boost Emory’s on-site generation capabilities.

Combined Heat and Power

In 2017, Emory commissioned a steam turbine generator (STG) that was added into the steam plant for electric generation. This steam turbine uses higher pressure steam to produce electricity. 2018 saw our first full year of steam power generation totaling 2,996 MWh.

Boiler 10 which supplies the STG was out of service for a total of 17 days in Nov & Dec due to maintenance. This reduced the total energy output by 28% in those months.
The WaterHub at Emory

Launched in 2015, Emory’s WaterHub is an on-site water reclamation system which utilizes eco-engineering processes to clean waste water primarily for utility water make-up. This water reclamation facility is the first of its kind in the United States. In 2018, Emory’s WaterHub displaced nearly 59 million gallons of city potable water to Emory’s major utility plants, providing 98% of total make-up to cooling towers around campus. Since operations began, the WaterHub used over 27,000 kWh of solar energy produced from its panels (approximately 7,100 kWh in 2018).

Irrigation

Emory has employed smart irrigation technology known as UgMO (Underground monitoring). UgMO uses specialized sensors buried in the soil to detect moisture levels. The system then uses algorithms to determine how much irrigation water is needed to maintain a healthy landscape while minimizing water waste. In addition to smart irrigation, Emory also uses underground cisterns to capture and store rainwater. That rainwater is then repurposed and used to flush toilets and run irrigation, thus reducing our reliance on water from the utility system.

Emory has a current water reduction of 5.8% from our 2015 baseline.
Awards

IDEA Innovation Award

Emory University received the 2018 IDEA Innovation Award for its wastewater reclamation and reuse system, “WaterHub”, in collaboration with IDEA member Sustainable Water. Joan Kowal, Senior Director of Energy and Utilities (pictured 3rd from left) accepted the award on behalf of Emory University at the 109th Annual IDEA Conference and Trade Show in Vancouver, BC.

Campus Sustainability Achievement Award

Emory University received a Campus Sustainability Achievement Award from the Association for the Advancement of Sustainability in Higher Education (AASHE). Emory was recognized for its innovative teaching and student docent programs related to the WaterHub. Members of Sustainable Water and Emory’s Office of Sustainability Initiatives accepted the award at the 2018 AASHE annual conference in Pittsburgh, PA.

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