

# 2020 Annual Energy and Utilities Report








**EMORY**  
UNIVERSITY



**In 2020**, Emory continued to make progress on its 2025 Sustainability Vision goals to reduce energy use per square foot (EUI) by 50 percent and overall energy consumption by 25 percent by 2025. The COVID-19 pandemic created a unique environment where buildings were set back due to minimal on-campus student and staff presence. From a 2015 baseline, in 2020, Emory achieved an EUI reduction of **16.7%** and a total energy use reduction of **11.5%**. Emory also targets to reduce potable water consumption 50% by 2025 and has made great progress through the first four and a half years operating its WaterHub. Emory is committed to self-generating 10% of energy needed on campus. Emory currently has a steam turbine generator and on-site solar arrays that have a combined capacity of over **1.8 MW**.

**The 2025 total energy use reduction goal of 25%** challenges Emory to reduce energy consumption while also meeting its current building expansion plans. The design and construction standards for new buildings, with a LEED Silver minimum requirement, have contributed to the EUI goal to date. In addition to energy efficiency in new construction, renovations, recommissioning, LED lighting upgrades, Emory’s Sustainability Revolving Loan Fund projects, and participation in the U.S. Department of Energy’s Smart Labs program have all pushed Emory forward toward our ambitious goals.

## 2025 Energy Reduction Goals from a 2015 baseline

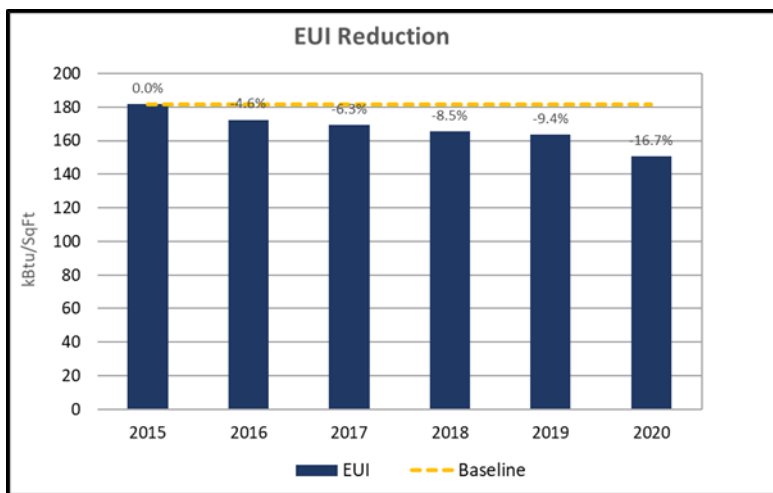
-  25% reduction in Emory University total energy consumption
-  50% reduction in Emory University energy use per square foot (EUI)
-  25% reduction in Emory Healthcare total energy consumption
-  10% self-generation of energy used on campus to replace fossil fuel sources
-  50% reduction in Emory Campus total potable water consumption

# Efforts to Achieve Targeted Energy Reduction

## Energy & Sustainability Initiatives

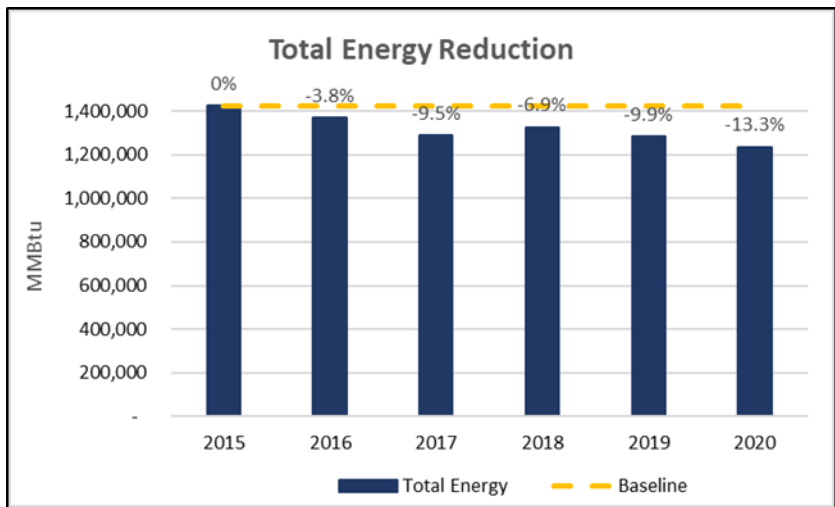
Reaching Emory's ambitious energy reduction goals requires continuous process improvement, innovative energy reduction strategies, and detailed monitoring of building energy performance across campus. A team of Emory University students, faculty, and staff is in place to identify ways to reduce the energy and water needs of Emory University and engage campus in these conservation efforts. This Energy and Water Task Force keeps a running list of potential energy conservation measures that are continuously evaluated for implementation. There are currently 35 projects identified across campus with a payback of 5 years or less. The COVID-19 pandemic has put several projects for 2020 on hold, however a plan has been developed to tackle large energy saving initiatives once those restrictions are lifted.

Emory is currently making progress to reduce building energy use by 50% and total energy by 25%. The graphs below show our progress to date:



Through 2020, Emory has realized an EUI reduction of **16.7%** since 2015

Through 2020, Emory has achieved a total energy reduction of **13.3%** since 2015

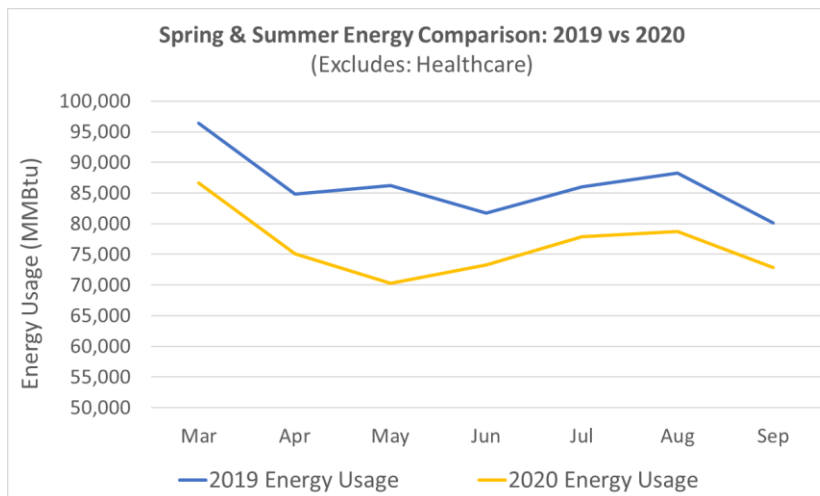


## COVID-19 Impact

The COVID-19 pandemic had substantial and far reaching impacts to Emory's 2020 energy program. In March 2020, Georgia's shelter in place sent students, faculty, and staff home to transition to remote work and learning where possible. The minimal capacity on campus caused our first dip in energy usage as building heating and cooling loads were reduced due to little or no occupancy. The Engineering department then began reviewing setpoints, programs, and energy data across campus to continue turning down buildings and



maximize energy reductions while the campus was empty. We saw record high energy and water reductions due to these efforts made possible by a largely vacant campus. Emory closely followed CDC and ASHRAE guidelines and recommendations for operation during the pandemic, which included switching to maximum outside air circulation in buildings. This change drove



During the pandemic, energy usage dropped by an average of 11% over spring and summer months

energy usage up in the buildings particularly during the summer months. The mechanical systems now had to respond by increasing the amount of heating and or cooling to achieve desired air temperatures and remove high levels of moisture in the air typical for Georgia's climate.

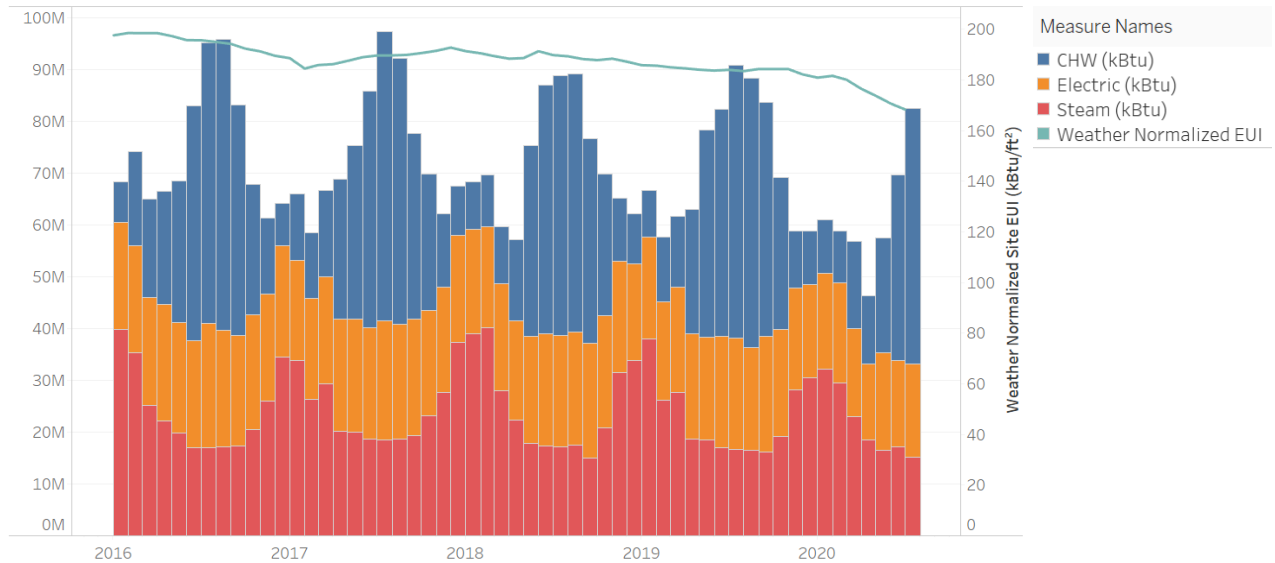
## Recommissioning

Emory continues to support in-house commissioning of campus projects, as well as recommissioning of existing buildings. Recommissioning is a strategic process that optimizes existing building systems to return them to their originally commissioned state where possible. Recommissioning is the major driver to the EUI reductions for the University. Emory is using Fault Detection and Diagnostics (FDD) to identify anomalies in equipment and system operation that in most cases can be corrected remotely through the building controls system or in some cases results in required field corrections.

## Sustainable Performance Program (SPP)

The SPP is a continuous commissioning program that strives to keep building HVAC systems optimized and prevent performance degradation.

Total Energy vs. Weather Normalized EUI for SPP Buildings



First, buildings are recommissioned to ensure they are operating optimally. At that point they can be added to the SPP program with the goal of maintaining that optimal performance over time. FDD software is crucial in identifying issues that arise to maintain that high performance level. In 2020, the Oxford Road Building and Woodruff Health Science Administration were added to the SPP program, bringing the total to 31 participating buildings. In 2020, the Engineering department completed large standardization initiatives within the SPP buildings using FDD software to help find and resolve issues faster. They established standards for lab alarms, terminal unit evaluations, and air handler resets. In total, 2020 saw 740 issues identified and 525 were fixed. These issues can range from programming changes implemented remotely to physical repairs and replacement of mechanical equipment. The chart above is used to monitor the SPP program building's energy usage in Tableau. The Weather Normalized EUI trend line (teal) shows that overall SPP buildings have trended down in energy, exceeding the goal of maintaining a constant energy use profile.

## Lighting

Emory has continued to install LED lighting throughout the campus. 2020 saw multiple LED retrofits as stand-alone projects or incorporated into larger renovation projects.



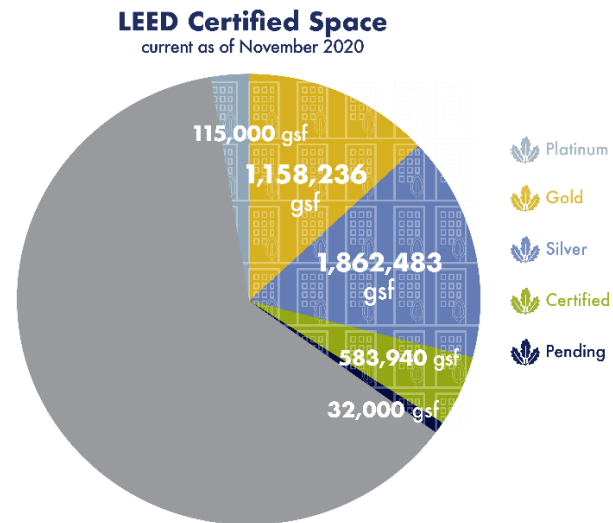
LED Exit signs installed in Emory University Hospitals

The Michael Street Chiller Plant received roughly 56 high bay LED fixtures that will better illuminate the space, reduce energy consumption at the fixtures, and reduce heat given off by the lighting in a space with high heat radiating off mechanical equipment. Many renovations in sections of buildings had LEDs installed as part of the scope such as 4th floor of O. Wayne Rollins, various rooms in

Goizueta Business School, Callaway, Clifton Road office spaces, and many others. Emory approved plans to upgrade 160 pedestrian light poles and 7 streetlight poles with LED technology, which is projected to reduce the energy used by these lights by **77%**. This project is still moving forward despite several delays but will have a substantial impact in exterior lighting energy reduction. Transportation & Parking Services completed their parking deck LED retrofit in 2019 and has continued to reap the energy saving benefits. To date, the cumulative savings for **8** parking decks lighting retrofits is over **\$853,000** and **12,400,000 kWh**.

## 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, however for most new buildings Emory strives to achieve Gold. In 2019, the Emory Student Center officially opened its doors boasting a LEED Platinum certification that includes several innovative energy saving technologies such as geothermal heating and cooling, solar thermal hot water heating, and chilled beams to reduce forced air energy.



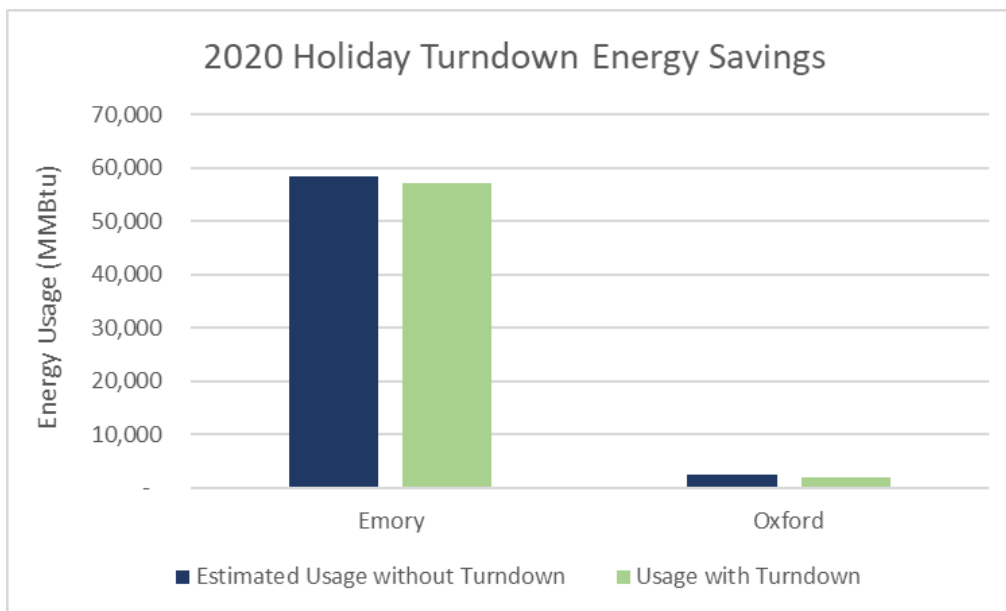
**3,719,659** gross square feet of LEED certified building space to date out of 14,107,297 total gsf on campus (total gsf on campus 4-year update)

## Sustainability Revolving 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 reduce energy and water consumption at Emory. Each project is selected with the criteria that it is financially viable, has environmental and or energy benefits, and improves the student experience. Currently Emory is investigating 8 separate projects with a payback period of 3 years or better that can potentially be funded through the revolving fund in 2022. These projects range from HVAC optimization by reducing air flows during unoccupied times to improving plug load management.

## 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.



The COVID-19 pandemic reduced the potential impact of the holiday turndown since buildings were already operating at a minimum or near minimum capacity. That being said, Emory made a special effort to review the building setbacks and find additional reductions where possible. This effort resulted in additional savings over the 2020 holiday period. Emory's Atlanta campus saw a **2.2%** reduction after reviewing setbacks at 51 buildings. Oxford campus saw an additional **0.8%** reduction from adjusting setpoints down at 4 buildings. The holiday turndown still managed so save **\$13,000** in utility costs over a 3 week period.



## Utility Overview – Atlanta Campus

### Steam

Emory operates five 100,000 lb/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. One of the newly installed boilers operates at 250psi and then drops the pressure through a 1MW steam turbine generator to distribution pressure of 115psi. 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

Three main chilled water plants provide cold water for space cooling to numerous buildings through underground distribution systems. There are additional plants in building mechanical spaces that supply chilled water directly to a specific building. The plants provide annually about 50,000,000 ton-hours of cooling by supplying 42° F water used to cool and dehumidify air entering and circulating in the buildings. Chilled water consumption is metered at each building on the distribution system. In 2020, Emory's North Decatur Building received substantial upgrades to the chiller equipment to boost overall efficiency of the plant (pictured above).



## Electricity

In 2020, Georgia Power provided over 250 million kilowatt hours of electricity to the central campus facilities with a peak summer electric demand of about 42 megawatts. Electric power is primarily fed by Georgia Power through two substations and then delivered by the Emory 20kV distribution system. Buildings not connected to Emory's distribution system receive electricity directly from Georgia Power. Electricity consumption is metered either by Georgia Power directly or by Emory meters at every building.



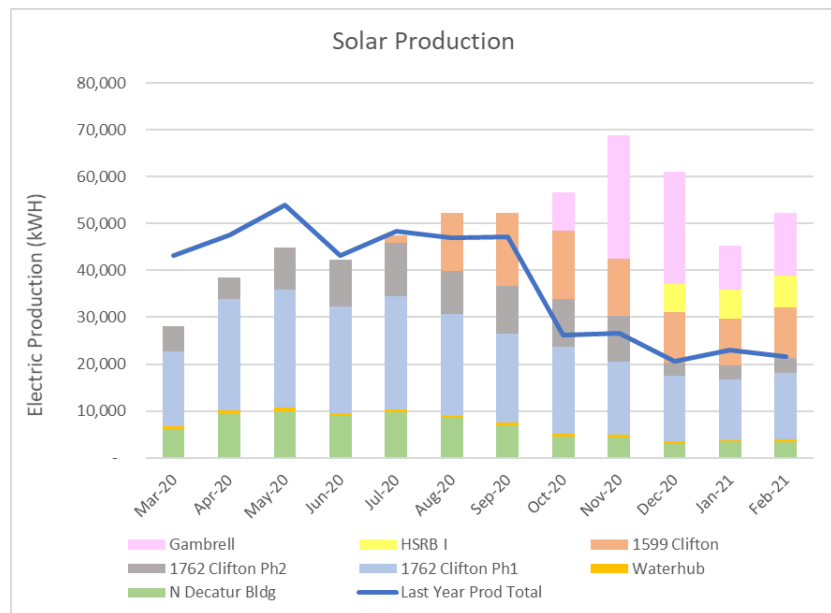
Emory Atlanta campus Oxford Rd Electric Substation

# Efforts to Achieve Targeted Self-Generation

Emory's 2025 Sustainability Vision commits the institution to self-generate 10% of energy used on campus to replace fossil fuel sources and increase campus resiliency. In 2020, Emory generated **3,136 MWh** of electricity from steam and solar production. Additionally, Emory approved a **2.5 MW** microgrid for the new Health Science Research Building II and is currently under construction. Emory is also investigating a 10MW microgrid that would serve several critical buildings with a possible expansion to the Center for Disease Control.

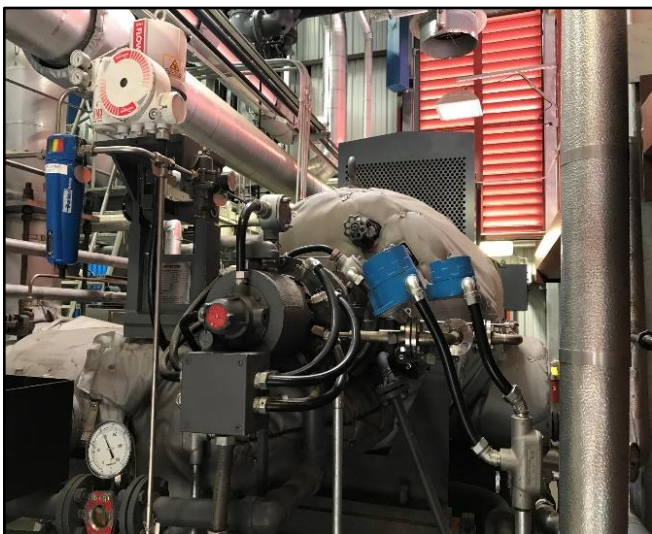
## Solar Produced Electricity

To date, Emory has installed seven solar projects with a combined capacity of **1.8 MW**. In 2020, Emory's solar projects produced over **532 MWh** of electricity. Emory is currently under construction with additional on campus arrays that will bring Emory's total solar capacity to **5.5 MW** by 2022.



## Steam Electric Production

In 2016, Emory commissioned a steam turbine generator that was added into the steam plant for electricity generation. This 1 MW steam turbine uses higher pressure steam to rotate a generator that produces electricity.



In 2020, Emory generated **2,603 MWh** of power from the steam turbine generator (pictured left) which equates to approximately 1.3% of energy used on campus.

# Efforts to Achieve Targeted Water Reduction



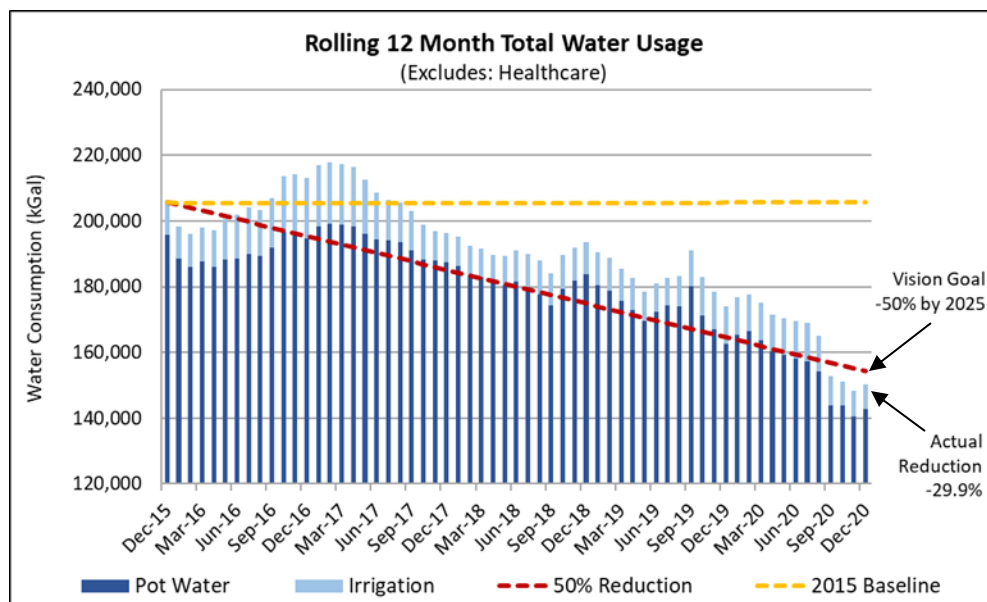
## The WaterHub at Emory

Launched in 2015, Emory's WaterHub is an on-site water reclamation system which utilizes eco-engineering processes to clean wastewater for non-potable use on campus, primarily for utility water make-up, irrigation, and toilet flushing. This water reclamation facility is the first of its kind in the United States. In 2020, Emory's WaterHub displaced nearly **51 million** gallons of city potable water to Emory's major utility plants, a decrease from last year largely due to COVID-19 reductions. The facility provides **75%** of total make-up water to cooling towers around campus. Since operations began, the WaterHub has used over 42,600 kWh of solar energy produced from its panels (approximately 7,600 kWh in 2020).

## Water Reduction

Emory has a current water reduction of **29.9%** from our 2015 baseline. The COVID-19 pandemic has resulted in having a largely vacant campus which contributed to a drastically lower demand for water used on campus daily.

Emory continued the use of 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.



**For questions or additional information  
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