

Johns Hopkins Sustainability Report

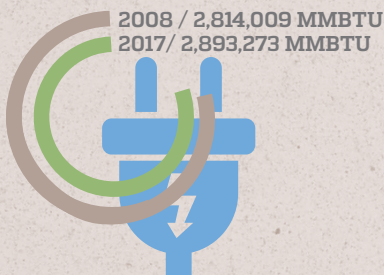
fiscal year 2017

University Perspective

In 2007, Johns Hopkins University committed to reduce its greenhouse gas emissions (GHGs) by 51% by 2025. Fiscal Year 2008 baseline emissions were calculated from electricity, natural gas, heating oil, and gasoline and diesel fuels consumed by university owned properties and vehicles. In addition to carbon dioxide: methane (CH₄), nitrogen dioxide (N₂O), and refrigerants are measured and normalized based on their global warming potentials as metric tons of carbon dioxide equivalent (MTCO₂e).

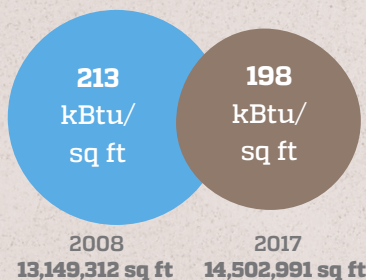
Reaffirming Action

Ten years after Johns Hopkins University made its original pledge to reduce its greenhouse gas emissions, President Ron Daniels confirmed our commitment to sustainability and mitigating the effects of climate change. Alongside 11 peer institutions, JHU pledged to advance the tenets of the Paris Climate Accord. President Daniels said, "Universities have long had a special obligation to advance scientific inquiry and share the benefits of discovery. In fulfilling this obligation, universities have identified the significant threats posed by climate change that require major, lasting changes in human activity at all levels. **For Johns Hopkins, this includes not only further reducing our carbon footprint but also tapping our unique strength as a university** to study and teach the impacts of climate change, and lift up innovative research into practices and technologies with the potential to slow and even reverse those impacts."



Total Energy:

Details to the growth and the increase in energy use are explained by division, but overall the University is moving in the right direction after increasing in energy use from FY08, but dropping then almost 1.4% since last fiscal year.



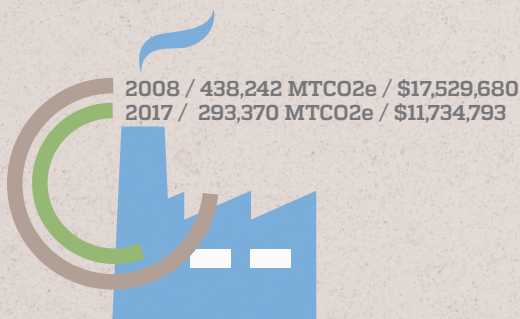
Energy Density:

In the ten years since the original pledge, JHU grew 10%, but the growth is less energy intense than in FY08. The ENERGYSTAR average Energy Density for colleges is 131 kBtu/sq ft.



Water Consumption:

A note on water: Writing the report this year was a reminder that we are privileged to have ready and cheap access to clean water. As such, billing isn't strict and hasn't come for many properties for FY17. We'll publish a water report once data is received.



Greenhouse Gas Emissions:

Even though energy use has increased since FY08, greenhouse gas emissions have decreased 33%. This is back up slightly from last year, factors may include the grid being less clean than in FY16, overall university growth, and energy efficiency and generation not behaving as predicted due to repairs or malfunctions. We explore these factors by division. Also, to highlight is the social cost of emissions as the estimated economic cost of damages caused by climate change. Early estimates from the EPA expect costs at about \$40/MTCO₂e, in 2017 dollars, or nearly \$12 million for FY17 emissions. However, more recent studies, such as by Stanford, value carbon much higher. [Stanford](#) calculated \$220/MTCO₂e. This values our FY17 carbon footprint at \$64,541,359.



Applied Physics Laboratory

Total Energy Consumption

The Applied Physics Laboratory (APL) reached its peak total energy consumption in Fiscal Year 2015, using 443,103 MMBTUs, compared to the 2008 baseline of 409,165 MMBTU. Since FY15, APL reduced energy use by 6.6% through a variety of energy conservation measures. This two year trend results in the lowest energy use since 2008, **414,020 MMBTU in FY17**, only 1.2% above the 2008 baseline. With years of planned growth ahead, APL will be challenged with balancing its increased footprint and the university's emissions reduction goal.

Energy Density

Energy density highlights much of APL's successes, with a consistent downward trend from 209 kbtu/sq ft in 2008 to **159 kBTU/sq ft in FY17**. This new low is the result of both energy reductions and

new facilities that have not seen a full year of energy use. This is in line with ENERGYSTAR benchmarking comparisons, which range from office space at 67.3 kbtu/sq ft to physical laboratory facilities at about 300 kbtu/sq ft.

Greenhouse Gas Emissions

APL's **emissions have dropped by 30%** since FY08, from 85,150 MTCO_{2e} to **59,493 MTCO_{2e}**. This is about an 11% reduction from FY15, but up almost 1% from last year, FY16. Much of the emissions are resulting from grid electricity, which has become slightly dirtier this past year. Although energy use dropped, this highlights the uncertain nature of the grid.

Waste Diversion

APL generated nearly double the

amount of waste, trash and recycling, since FY08, up 83% to 2,250 total tons. Waste increased 30%, but the majority collected was recycling, which is 2.5 times its FY08 rate - up to 1,039 tons. APL set its record **diversion rate of 46.2% this year**.

Domestic Water Consumption

Domestic water consumption was approximately **53,979,404 gallons** in FY17. This is up from 21,495,419 gallons in FY08, but down 9% from last year, FY16.

Paper Use

In FY17, APL used 1,899 reams of paper, down from 2,179 used in FY16. Although using 13% less paper, APL went from 47% of orders in FY16 containing recycled content in to only 41% this past fiscal year.

behind the data:

1,434
MWh Savings

1,434 Total MWh Savings were achieved in FY17 through a variety of HVAC projects. With strong growth, APL has been aggressively chasing energy conservation measures. Three projects were completed in FY17, which leveraged \$171,500 in rebate funding from BGE, the local utility.

226 MWh - Building 24 replaced chillers with new, high efficiency units that utilize economizer coils, allowing for both partial and free cooling of chilled water with little to no compressor operation during cooler outside temperatures. This is valuable because data centers require cooling even in the winter due to heat output.

332 MWh - Building 7 replaced mixing boxes with digitally-controlled dual duct variable air boxes. These allow for a duct static pressure control strategy that significantly reduces air supply and return fan power through use of their existing Variable Frequency Drives.

876 MWh - The final project installed Variable Frequency Drives and controls in Building 17, resulting in significant reductions from previous units operating 24/7.

Balancing Growth

APL has seen years of success, which has also meant more square footage of facilities being added to their footprint. Each new facility presents a new challenge to balance this growth with the overall greenhouse gas emissions goal, a 51% reduction from a 2008 baseline. Since 2008, APL has grown by 32%, or more than 600,000 sq ft. The campus acquired four new properties in FY17 - Montpelier Buildings 2, 3, 4, and 5 - for a total of 108,157 sq ft. These have not yet seen a full year of energy use recorded within university metrics, so this impact will be better seen starting in FY18. In addition, two new buildings - Building 201 and Building 14 - are planned for construction, which will mean 473,800 additional sqft by the end of FY20. With a growth rate of 57% in the next three years alone, it will be a challenge to reduce emissions with the 2025 target in mind.

Bloomberg School of Public Health

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Total Energy Consumption



The Bloomberg School of Public Health increased in energy use in FY17 to be above its baseline energy use. BSPH used **273,790 MMBTU in FY17**, an increase of 8% over FY16 and an **increase of 3% over the FY08 baseline** of 265,107 MMBTU. Electric and natural gas consumption continued their gradual decline in FY17. Electricity was down 10% from FY08 and natural gas down 6%. However, heating and cooling demand supplied from steam and chilled water increased by 5% since FY08.

Energy Density

While BSPH's building area

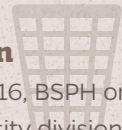
remained constant since FY08, the school increased energy demand. Energy conservation measures curtailed some use, with recent lighting projects, but increased demand for heating and cooling resulted in an energy density of **263 kBTU/sq ft**. As square footage is near constant, this is a 3% increase over the 255 kBTU/sq ft baseline and an 8% increase over FY16. The U.S. national median for colleges and universities is 130.7 kBTU/sq ft and biological and chemical laboratory facilities are typically 375 kBTU/sq ft.

Greenhouse Gas Emissions

BPSH's emissions rose slightly in FY17, up 4.6% from FY16. The **22,531 MTCO2e** emissions are still a **26%**

decrease from the FY08 baseline. BSPH is 7,610MTCO2e reduction away from its goal.

Waste Diversion



Forthcoming: In FY16, BSPH once again led all university divisions with a 60% diversion waste, though this is down from 73% last fiscal year. The average diversion rate for the entire university was 43%.

Paper Use

BSPH is a leader in ordering paper with at least 30% recycled content. In FY17, 93% of orders were recycled content paper, compared to 94% in FY16. More importantly, BSPH reduced their paper orders by 16% since FY16 to 1,247 reams.

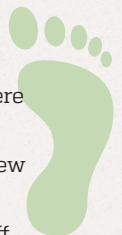
behind the data:

Lighting Retrofits

With lighting accounting for 53% of energy use in BSPH facilities, they've been implementing innovative ways to reduce consumption. In FY17, BSPH installed \$225,000 in high efficiency lighting retrofits in their stairwells and parking garages. Each of these use state of the art controls, turning off in the stairwells during daylight, and when the garages are vacant, alongside the latest LED technology to reduce electric use. The projects have a payback of under 2 years. Additionally, with brighter lights that are occupancy aware, they increase safety and visibility.

Growing Numbers

The Bloomberg School of Public Health has remained fairly constant in physical size, only growing by 12,235 square feet since FY08 to be 1,039,171 total square feet. However, it has grown. The student body grew from 1,599 full time students in FY08 to 2,182 in FY17. Full time employees also rose by 473 to a total of 2,459. This 41% increase in full time students and 25% increase in full time employees means there are 31% more people, using energy and water, requiring fresh air treated to temperature, and generating waste. New research initiatives, partnerships and collaborations between the Office of Sustainability and BSPH students, staff, and faculty are embracing fresh ways of thinking about public health research and practice, by looking to internal operations and opportunities that can explore, model, and inspire sustainable development.



Greater Homewood

Total Energy Consumption

Greater Homewood includes the Homewood campus and adjacent Charles Street properties, Housing & Dining, the School of Education, Eastern, and all Sheridan Library buildings. Energy consumption for these facilities increased from FY08 until FY14, but making a slow decline in recent years. This fiscal year it reached the lowest point since FY10, down to **972,810 MMBTU**, though this is still a 5% increase over the FY08 baseline of 923,157 MMBTU.

Energy Density

Gross floor areas **increased by 178,000 sq ft, or 3.3%** since FY08. Greater Homewood con-

sumed 172 kBtu/sq ft in FY08, and **175 kBtu/sq ft in FY17**. Although an overall increase since baseline, this is moving in the right direction. Baseline was 172 kBTU/sq ft, and the record low was 154 kBTU/sq ft in FY10. FY16 was 182 kBTU/sq ft.

Greenhouse Gas Emissions

Greater Homewood's emissions dropped by 31% since FY08, from 138,641 MTCO_{2e} to **95,348 MTCO_{2e}**. This is a result of on-site power generation, co-generation, efficiency improvements and the PJM grid becoming cleaner. However, this is a 7% increase since FY16, partially the result of cogeneration being offline for 3 months, and the grid improve-

ments stepping back slightly.

Waste Diversion

Greater Homewood waste diversion remained fairly constant the past three years, lowering slightly from 44% to **43% in FY17**. Even with more faculty, staff, students, and facilities, **waste decreased by 32 tons since FY08**, or 1.5%. In FY08 diversion rates were 23%, so total waste is going down while diversion is generally increasing.

Paper Use

Homewood uses about 3,000 reams of paper per year (3,004 in FY17). Homewood is also consistent with ordering paper with 30% or more **recycled content at 75%**. This is up 2% from FY16.

behind the data:

Cogeneration

Cogeneration, often called cogen or combined heat and power (CHP), is the process of burning a fuel in a turbine or engine and creating both heat and electricity. At Homewood, we burn natural gas on-site to create electricity. The byproducts of steam and hot water are then used to heat many of the buildings. This benefits the campus through resiliency and reduced greenhouse emissions. GHG savings are from reducing losses during transmission, making use of the waste heat from the fuel burn, as well as taking advantage of natural gas being a cleaner fuel than the grid average. This was a large strategy in our Climate Action Plan, with one-third of the reductions expected to be achieved through cogeneration. This has been a large success at Homewood, resulting in about 30,000,000 kWh of generation per year, and 190,000 k-lbs of steam or hot water. This reduces Homewood's emissions about 18,000 MTCO_{2e}, annually. In FY17, due to equipment repairs, the cogen system was down for three months, resulting in only 20,000,000 kWh of generation. This means we bought more electricity from the grid, and were responsible for about 6,000 more MTCO_{2e}.

177,555 SQ FT
5,319 Students

Greater Homewood's Growth

Since FY08, Greater Homewood grew significantly. The total square footage increased by 3%, while population grew by 5,319 full time students and 1,866 full time employees, a 72% increase and 73% increase, respectively.

Housing & Dining

Total Energy Consumption



Housing and feeding students may not be as energy intense as laboratory space, but still incurs significant consumption. In FY08, H&D consumed 126,649 MMBTU, compared with 97,018 MMBTU in FY16. In **FY17 use is back up to 103,666 MMBTU** - a **28% reduction from FY08** but 4% increase from FY16.

Energy Demand

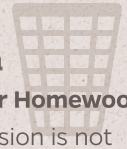
In FY17, approximately **50% of H&D's energy was derived from electricity**, with the remaining 34% from natural gas and 16% from chilled water and steam. Electricity and natural gas each increased slightly, but both decreased overall since FY08, 6% and 19%, respectively. Chilled

water and steam decreased in use, likely from not being supplied by the cogeneration plant during the three months of downtime.

Energy Density

Even while H&D's building area remained the same since FY08, energy density decreased from its 137 kBtu/sq ft baseline. In FY17 Housing and Dining consumed **99 kBtu/sq ft**, up slightly from 92 kBtu/sq ft in FY16. For comparison purposes, ENER-GYSTAR provides benchmarking data for energy density. The U.S. national median for colleges and universities is 130.7 kBtu/sq ft, residence halls/dormitories is 73.9 kBtu/sq ft, and offices is 67.3 kBtu/sq ft.

Waste Diversion



Diversion at Greater Homewood is 43%. Waste diversion is not granular for Housing and Dining in all waste types, but Housing measured trash produced at its facilities since FY15. Housing and Dining produced 633 tons in FY15, compared to 543 tons of refuse in FY17, a **14% reduction**.

Greenhouse Gas Emissions

Excluding the AMRs, as those GHG emissions are included in Homewood's main campus footprint, H&D's emissions were 19,016 MTCO₂e in FY08 and **11,072 MTCO₂e** in FY17, a **42% reduction from baseline**, and a 1% reduction from FY16.

behind the data:

Each year President Daniels calls for everyone across the university to "be a part of the bold thinking and spirit of service that are hallmarks of our institution" in the Idea Lab Challenge. Anyone can create ideas or vote for them to help improve JHU. In FY17, a student from Homewood won the Hopkins Eco-Smart Acorn Grant challenge, one of three in the overall contest. Nemo Keller (BS Biomedical Engineering '17) brought her background in sustainability and her experience working at the Homewood Recycling Office together to look at how to reduce food waste on campus. To help divert leftover food from events, Keller created a free food alert system where users can subscribe to be notified when there is food on campus that needs to be eaten. To expand on this, she submitted the winning idea for a Free Food Fridge - a unit that could store these event leftovers and distribute to the campus community. This idea has since evolved into a food pantry concept that aims to address food insecurity on campus. Keller's work will ensure more of food created by Dining and brought to campus for events doesn't get wasted, and inspires current students to consider the ways food on campus connects with equity, social justice, and climate change.



Keswick & Mt. Washington, Campuses

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Total Energy Consumption



In FY17 **Mt. Washington, consumed 97,582 MMBTU** of total energy, the lowest since its FY08 baseline of 96,219, and a 37% drop of its peak of 154,336 in FY10. Keswick is a more recent addition, being added to the portfolio in 2011. Keswick is still under construction in parts and increasing in occupancy, but is down from its peak in FY15, of 46,024, or 15%. **In FY17 Keswick used 39,064 MMBTU.**

Energy Density

Mt. Washington, has seen its energy use vary year to year, especially given growth in its energy-intensive data center. With lower energy consumption in FY17, **Mt. Washington, saw its energy density improve to 75 kBtu/sq ft** from 87 kBtu/sq ft in FY16. In

FY17, **Keswick consumed 79 kBtu/sq ft**, an improvement from 90 kBtu/sq ft in FY16, but up from 58 kBtu/sq ft in FY11 - likely due to occupancy changes. Mt. Washington's energy density was 74 kBtu/sq ft in FY08. Both are higher than the average of 67.3 for office space.

Greenhouse Gas Emissions

Keswick and Mt. Washington, had stable greenhouse gas emissions since FY16. And, despite the addition of the Keswick facility in FY11, GHG emissions decreased between the pair since FY08, currently down 9%. Mt. Washington, alone emitted 21,778 MTCO_{2e} in FY08, while both contributed a combined **19,020 MTCO_{2e} in FY17.**

Waste Diversion

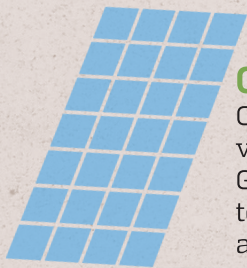


Mt. Washington and Keswick, together, generated 462 tons of recycling and waste in FY17. This is a **12% drop from FY16.** The majority of this decrease comes from Mt. Washington decrease waste generation by one-third, or 80 tons. This decrease in waste resulting in Mt. Washington seeing a record high diversion rate of 52.6%. Keswick only diverted 36.9%.

Paper Use

Together, Mt. Washington, and Keswick used 951 reams of paper in FY17. Of this, 54% of orders were of 30% of more recycled content paper. This is down slightly from 62% in FY16. Overall paper orders decreased by 228 reams, down from 1179 reams in FY16, or by 19%.

behind the data:



On-site Solar

Often unseen, Both Keswick and Mt. Washington, are home to two of JHU's large photovoltaic solar arrays. The arrays are at the Keswick Garage, and the Davis Building and Garage at Mt. Washington. Combined they have 6,519 panels that create enough energy to power 240 single family homes annually. In FY17, Mt. Washington received 1,208 MWh and Keswick received 1,293 MWh of clean electricity. The installations are part of a second round of on-site solar that helps reduce our greenhouse gas emissions. Generating 2,600 MWh of electricity, these reduce emissions and help drive the clean energy economy. The generation is purchased through a Power Purchase Agreement (PPA), but the Solar Renewable Energy Credits (SRECs) are kept by the provider and sold to another party. SRECs are meant to be a regulation based financing tool to help solar be more cost effective by creating minimum SREC requirements for some entities (a market for their purchase). The market is designed to create the value differential between solar and another type of electricity per kWh. In JHU's original Climate Action Plan, SRECs are not outlined as a mechanism to be utilized for emissions reductions. As markets, technology, and accounting have evolved, it's sensible for JHU to revisit this position and approach.

Montgomery County Campus

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Total Energy Consumption

The Montgomery County Campus continues to reduce their total energy use, with an overall downward trend from FY08 to FY17. In FY17 MCC used **15,718 MMBTU**. The modest annual reductions have achieved an 8% decrease from the baseline, and a 1% decrease from FY16.

Energy Density

MCC's building area remained the same, but its energy consumption decreased, which led to further improvement in energy use per square foot. In FY17, MCC consumed **147 kBtu/sq ft** in its owned facilities, down from 160 kBtu/sq ft in FY08 and 156 in FY16. For comparison purposes, ENERGYSTAR provides benchmarking data for energy density. The U.S. national median

for colleges and universities is 130.7 kBtu/sq ft and for offices is 67.3 kBtu/sq ft.

Greenhouse Gas Emissions

MCC reduced emissions by 38% since FY08, from 3,213 MTCO_{2e} to **1,977 MTCO_{2e}**. By achieving both energy and greenhouse gas reductions, MCC is only 402 MTCO_{2e} away from the 51% reduction on that campus.

Waste Diversion

MCC is a small campus - only 106,570 sq ft - and generates little refuse. Because of this, they only receive estimates for trash and recycling generation that don't change each year. There is no composting on-site. In recent years the estimate

is a **diversion rate of 17% and 43 total tons** of waste and recycling produced per year.

Domestic Water Consumption

In FY17 MCC reduced their water consumption significantly - by 30% compared to FY16's peak consumption. In FY16 MCC used 1,115,888 gallons, reduced to **777,892 gallons in FY17**. MCC's average is 965,681 gallons.

Paper Use

MCC maintains both consistently low paper orders, as well as consistently ordering almost 100% paper with at least 30% recycled content. In both FY16 and FY17, MCC ordered only two reams of non-recycled content paper, with **96% of their orders with recycled content**. Similar to FY16, In FY17 MCC ordered 50 total reams.

behind the data:

Calculating Emissions

The Montgomery County Campus is about 40 miles Southeast of Johns Hopkins Homewood, but greenhouse gases are calculated using the same coefficient for electricity from the grid. Whether grid electricity is going to a light bulb in Homewood, Montgomery County, or anywhere in the PJM region (from Maryland to New York to beyond Ohio) emissions are calculated the same. That coefficient is the value of carbon dioxide and nitrous oxide emitted based on the generation in the PJM region. Generation in the region is made up from natural gas, coal, nuclear, wind, solar, and less common sources, such as biomass. In FY17 our coefficient was 0.0006 metric tons of carbon dioxide equivalent per each kWh used. That coefficient also includes methane, but PJM doesn't publish methane data. To be sure we're capturing all greenhouse gases, we quantify methane using e-grid, a federal estimate of methane per kWh produced. PJM coefficients are updated annually. A substitute is data purely from e-grid, which has smaller regions, MCC is in a region comprise of only Maryland and Virginia. E-grid only updates data less often, and electrons end up traveling much farther on the grid than their region size, based on where power is produced. If we were to use the e-grid values for nitrous oxides and carbon dioxide, our FY17 coefficient would have been 0.004, including methane. This would result in an overall smaller GHG footprint for MCC and the university.



Peabody Institute

Total Energy Consumption

Peabody remains steady in energy use through the years, increasing and decreasing, rarely more than 5% either way. In FY17 Peabody increased by 2% above the baseline to **46,836 MMBTU**. This was a nearly 8% increase above FY16, a relatively low energy use year.

Energy Density

Peabody's building area is the same since FY08, though its energy consumption changes. Peabody's energy density varies accordingly between 95 and 113 kBTU/sq ft. In **FY17 Peabody used 102 kBTU/sq ft**, moving in the right direction overall. In FY16, the

energy density was 95 kBTU/sq ft. For comparison purposes, ENERGYSTAR provides benchmarking data for energy density. The U.S. national median for colleges and universities is 130.7 kBTU/sq ft

Greenhouse Gas Emissions

In total MMBTU, Peabody is fairly consistent in energy use. Although increase in natural gas use, Peabody reduced their electricity use by 8%. With electricity being more greenhouse gas intense than natural gas, this helped Peabody cutback emissions by 31%. **In FY17 Peabody emitted 4,703 MTCO₂e**, which is 4% higher than in FY16.

Waste Diversion

For smaller campuses such as Peabody, vendors only provide estimates for some refuse services. Peabody only receives estimates for recycling and compost at 18.71 tons. Waste is variable - 104 tons in FY17 - a **70 ton decrease** from when first measured in FY10.

Paper Use

FY16 was the first year Peabody stopped giving a paper course catalogue to all students, and greatly reducing paper consumption. In FY17, **paper consumption dropped another 30%**, to only 133 reams, **74% of which** were 30% or more recycled content.

behind the data:

Climate Change Through Music

In FY17, Andrew Posner, a recent Peabody graduate, wrote a symphony to try to make climate change tangible. Putting rising seas to notes, listeners can feel it happening. Partnering with the ensemble, Symphony Number One, his piece, [The Promised Burning](#), was performed around Baltimore and recorded. Posner turned to the symphonic medium to try to help people, especially those in Baltimore, feel the effects of climate change. He wrote it with the belief: "Grieving a place is not like grieving a person. This kind of grief does not heal with time. It is an emotion most of us have never truly experienced and from which no one in future generations will be spared." He tries to give the audience that experience of anguish and heartache, not portrayed through the traditional somber melodies and key changes, rather ritualistic and brutal rhythms with quick notes, creating agitation against stillness. The rhythm carries a clash of strings and brass through tension and turmoil. This is to leave the listener thinking about war and civilization's encroachment on and violence towards the natural world. Posner's work to create that emotion, helps this data, and the reality of climate change come alive, and be felt, and hopefully inspiring the understanding and action to protect and preserve our planet.

School of Medicine

Total Energy Consumption

The School of Medicine had a quick start at reducing its energy use. Total energy dropped from the FY08 baseline of 1,000,929 MMBTU by 17% in FY09. However, faced with years of growth, it peaked energy use at 1,064,225 MMBTU in FY11. After decreasing 5% below FY11 in both FY15 and FY16, energy use increased once again to **992,069 MMBTU in FY17**, which is 1% below the FY08 baseline.

Energy Density

In FY16, SoM consumed 363 kBtu/sq ft, improved from 380 kBtu/sq ft in FY08 and 384 in FY15. AS with energy consump-

tion, **Energy Density increased in FY17 to 370 kBtu/sq ft.** For comparison purposes, ENERGYSTAR and the International Institute for Sustainable Laboratories provide benchmarking data for annual energy density. The U.S. national median for colleges and universities is 130.7 kBtu/sq ft and biological and chemical laboratory facilities are typically about 375 kBtu/sq ft.

Greenhouse Gas Emissions

In FY17, greenhouse gas emissions increased slightly above FY16, by 1%, to **86,015 MTCO₂e**. This is still a 33% decrease from the baseline. The School of Medicine will need to reduce their footprint by an additional 22,860 MTCO₂e by 2025 to meet the current state target.

Waste Diversion

Due to composting regulation changes, the diversion rate for the School of Medicine has dropped from its peak in FY14 of 69.9%, to just **41% in FY17**, also down from 48% in FY16. However, the School of Medicine has achieved a decrease in total waste generation, **dropping by more than 500 tons**, or 20%, from FY14.

Paper Use

In FY17, the School of Medicine used **2,683 reams of paper**, 57% of which were 30% or more recycled content. This is an improvement both in percent recycled, by 1%, and by reducing total paper orders by 364 reams, or 12% compared to FY16.

behind the data:

693,577
MMBTU

Heating and Cooling Energy Generation received from the Johns Hopkins Hospital System Central Plant

Similar to Homewood, the School of Medicine receives energy from a central cogeneration plant. The School of Medicine receives electricity and hot water/steam generated from natural gas to help reduce their emissions.

177 MWh

177,921 kWh of Solar PV

was generated at the School of Medicine in FY17, reducing their demand on the grid and greenhouse gas emissions.

Waste Diversion and Air Quality

Each semester the Leadership Initiative for the Environment (LIFE), a joint student group between the Bloomberg School of Public Health, the School of Medicine, and the School of Nursing, collects waste that students, faculty, and staff would otherwise throw in the trash. During Earth Week in FY17, LIFE collected 1,450 lbs of electronics, 78 lbs of batteries, and 72 lbs of styrofoam, a high volume of low weight material. Styrofoam is a common packing supply for lab materials and fills many lab rooms. LIFE helps collect this so it can be recycled properly, rather than going to the waste-to-energy incinerator with the rest of our trash supply. Styrofoam is one of the worst air pollutants when burnt. Keeping this material out of the incinerator waste stream keeps Baltimore cleaner, by reducing air pollution in a city and neighborhood with high rates of respiratory disease.

School of Nursing

Total Energy Consumption



After three years of relatively consistent energy consumption, the School of Nursing lowered their use in FY17, which was 4% lower than the FY08 baseline, and 14% lower than peak consumption in FY16. **FY17 consumption was 23,580 MMBTU.** This was mostly due to a 17% decrease in chilled water and steam demand.

Energy Density

In FY16, SoN consumed **206 kBtu/sq ft**, down from their highest energy density of 263 kBtu/sq ft in FY08, and the lowest since FY12.

Greenhouse Gas Emissions



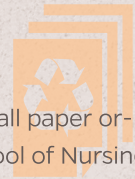
SoN's emissions have dropped by 33% since FY08, from 3,008 MTCO₂e to 2,008 MTCO₂e. Even with grid energy having greater emissions than FY16, the School of Nursing achieved an 11% decrease. The SoN is 534 MTCO₂e away from their goal.

Waste Diversion

Because of the School of Nursing's small size, trash generation is estimated and hasn't changed from 76.8 tons per year. Recycling and composting does vary, and decreased slightly last year

over the prior two years, by about 3 tons. Based on this, they've maintained a consistent **44% diversion rate.**

Paper Use



In prior years, not all paper orders from the School of Nursing were going through the typical purchasing process, so not all reams were accurately accounted for. This resulted in both low total order counts and a low percent consisting of 30% or more recycled content. This was rectified in FY17 to show SoN ordered 252 reams of paper, 94% of which were with recycled content.

behind the data:

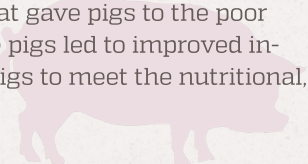


17,656 kWh

17,656 kWh of Solar PV generated electricity at School of Nursing in FY17, reducing their demand on the grid and greenhouse gas emissions.

Sustainability and Women's Health

The School of Nursing hosted the International Council on Women's Health Issues (ICOWHI) Conference, in Baltimore, in November 2016. This conference brought together the world's leading researchers, clinicians, educators, and community advocates to address women's health issues across the globe, under a new objective - Scale and Sustainability: Moving Women's Health Forward. Using the United Nations Sustainable Development goals as a lens for their talks. ICOWHI led the discussion of connecting women's health and sustainability for the first time in this context. The [UN Sustainable Development goals](#) were designed in Rio to help policy makers and researchers design "the future we want" through education, employment, energy, transportation, chemical use, water, and other central themes. Experts came from across the world to discuss disaster preparedness among elderly women, or research on the value of investing in women in sub-Saharan Africa. A local, School of Nursing professor and Director of the Center for Global Health, Nancy Glass, presented "Pigs for Peace," her project that gave pigs to the poor women of the Democratic Republic of Congo, which found the pigs led to improved income and health, both physical and mental. Women use the pigs to meet the nutritional, educational, and economic needs of their families.



JHU in Washington, D.C.

Total Energy Consumption



JHU in Washington, D.C. completed a variety of energy conservation measures in FY17, and plans to complete more in FY18. These helped them reduce energy consumption by 32% compared to the baseline and 3% compared to last fiscal year. **In FY17 JHU in Washington, D.C. only consumed 17,804 MMBTU.** The one note of variance over last year was slightly increased electric consumption (1.4%) with a more significant decrease in natural gas consumption (9%). Although overall energy use is down, this effected greenhouse gas emissions.

Energy Density

In FY17, JHU in Washington, D.C. reached an **all-time low for energy density at 65 kBtu/sq ft.** That is 32% lower than in FY08, an all-time high, of 96 kBtu/sq ft. ENERGYSTAR provides energy density benchmarking data for U.S. facilities. The annual median for colleges and universities is 130.7 kBtu/sq ft, and for offices is 67.3 kBtu/sq ft.

Greenhouse Gas Emissions

JHU in Washington, D.C.'s **emissions have dropped by 48%** since FY08, from 4,411 MTCO₂e to 2,274 MTCO₂e in FY17. The School of Advanced International Studies and D.C. Campus leads the university in percentage emissions reduction, and is hovering around the target goal. With aggressive plans for FY18 energy conser-

vation measures, it should be within reach.

Waste Diversion

JHU in Washington, D.C. had an estimated **diversion rate of 21.5%** in FY17, excluding any compost collection. This was similar to prior years, except total recycling and trash generation increased significantly, from 35 tons in prior years, up to 67 tons for commingled recycling, and from 181 tons up to 244 tons for trash.

Paper Use

In FY17, JHU in Washington, D.C. remained consistent in using about 400 reams of paper per year. Roughly, **93% of paper in FY17** was 30% or more recycled content, up 2% from FY16.

behind the data:

\$87K

JHU in Washington, D.C. invested \$86,567 into a Chiller Overhaul and the addition of controls in the Nitze Building. This full tune-up should help the chiller reach designed efficiency, and the controls will reduce run-time and overall energy use.

4 tons

Composting with Fat Worm
JHU in Washington, D.C. restarted their composting program with Fat Worm, and expect to compost 4 tons of organic material per year.



Lighting Retrofits

In FY17, JHU in Washington, D.C. completed four lighting retrofits. The lighting retrofits focused on replacing less efficient lighting with the latest in LED technology in those locations where lights are on constantly. In the Rome building, all exit signs were replaced with LEDs, and Nitze replaced all exterior lights and elevator lights. The largest project was the Bernstein-Of-fit Building Parking Garage. This project, which cost \$22,648, replaced nearly 100 lights to LEDs with integrated occupancy controls. The new lights are expected to save 23,926 kWh annual, a 67% reduction from the existing fixtures, and have a simple payback of 4.0 years.