

# sightlines

a **GORDIAN**® company

# University of Alabama FY18 Sustainability Solutions

University of the Sciences in Philadelphia  
University of Toledo  
University of Vermont  
University of Washington  
University of West Florida  
University of Wisconsin - Madison  
Vanderbilt University  
Virginia Commonwealth University  
Wake Forest University  
Washburn University  
Washington State University  
Washington State University - Tri-Cities Campus  
Washington State University - Vancouver  
Washington University in St. Louis  
Wayne State University  
Wellesley College  
Wesleyan University  
West Chester University  
West Virginia Health Science Center  
West Virginia University  
Western Oregon University  
Westfield State University  
Widener University  
Williams College  
Worcester Polytechnic Institute  
Worcester State University



# Sightlines Partners With SIMAP

At the end of 2017, Sightlines entered into a partnership with the Sustainability Institute at the University of New Hampshire, ensuring our Sustainability Solutions are always based on the most up-to-date science and methods.

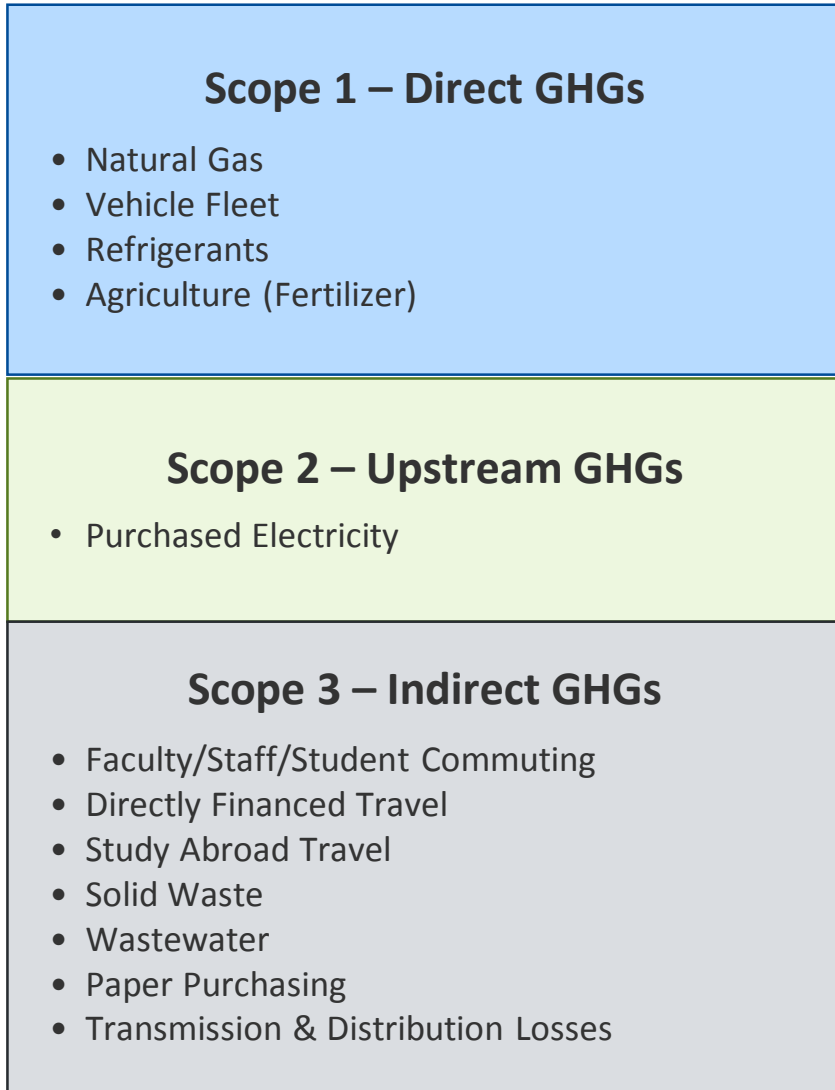
They host *Sustainability Indicator Management & Analysis Platform (SIMAP)*. This is a carbon and nitrogen-accounting platform that tracks and analyzes campus-wide sustainability based on nearly two decades of work supporting campus inventories.



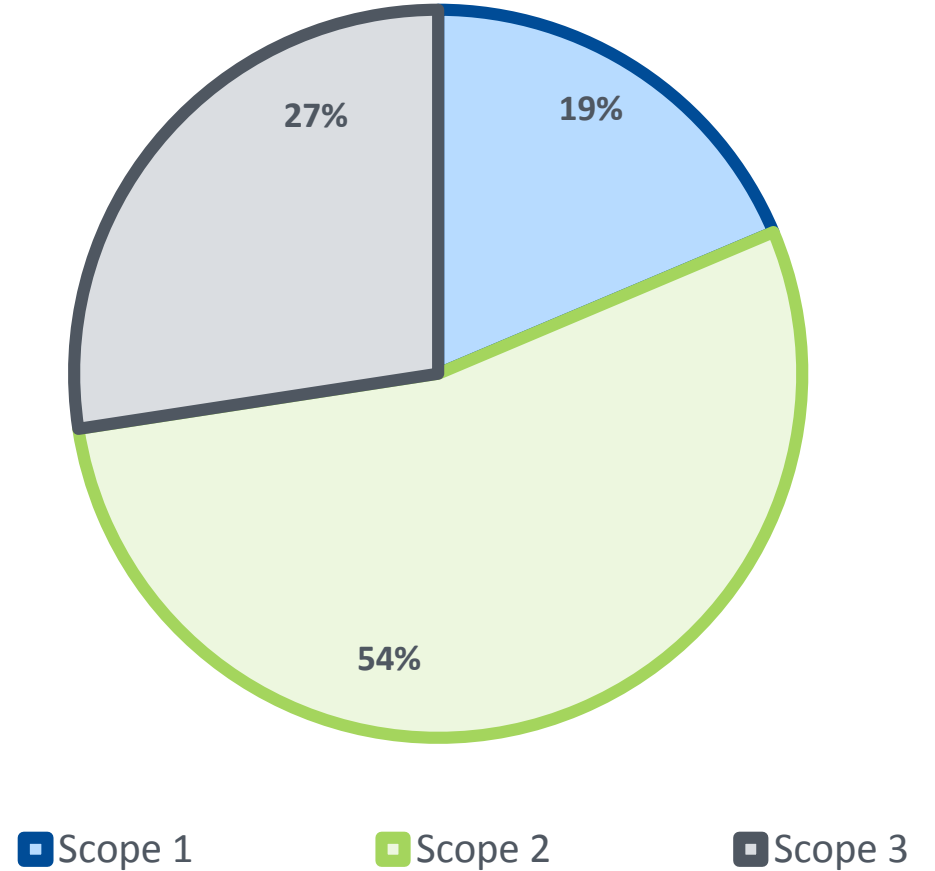
**University of  
New Hampshire**



# Distribution of Emissions by Level of Control



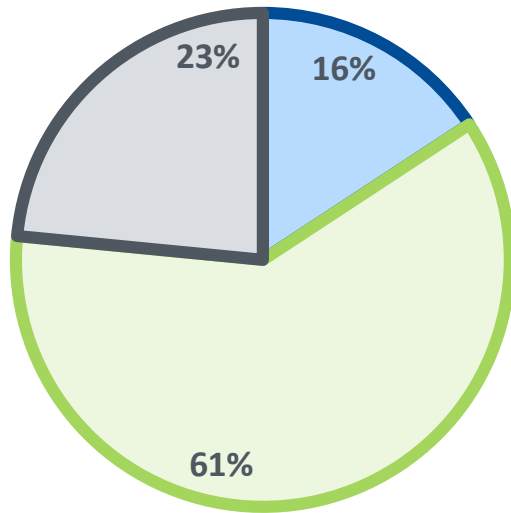
**FY18 Emissions by Scope**



# Changing Distribution of Emissions Over Time

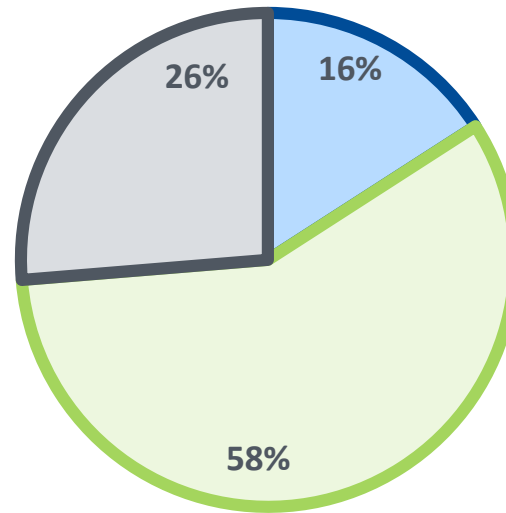
*Increases in Direct and Indirect GHG's since FY16*

FY16 Emissions by Scope



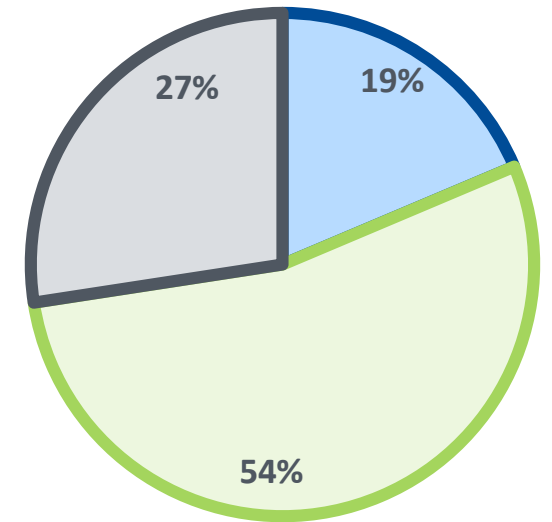
■ Scope 1   ■ Scope 2   ■ Scope 3

FY17 Emissions by Scope



■ Scope 1   ■ Scope 2   ■ Scope 3

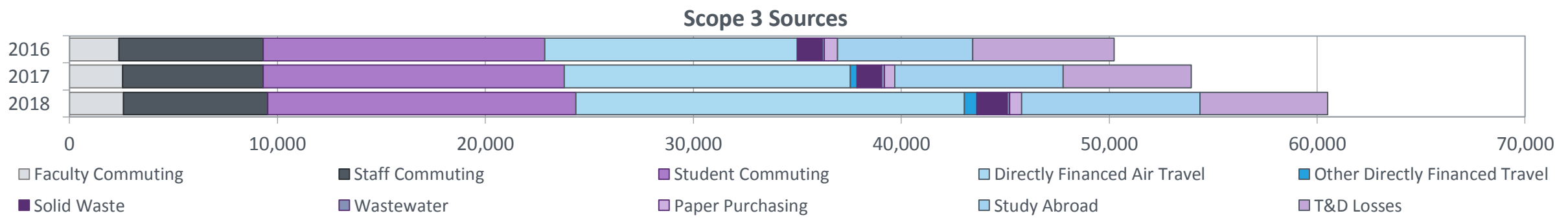
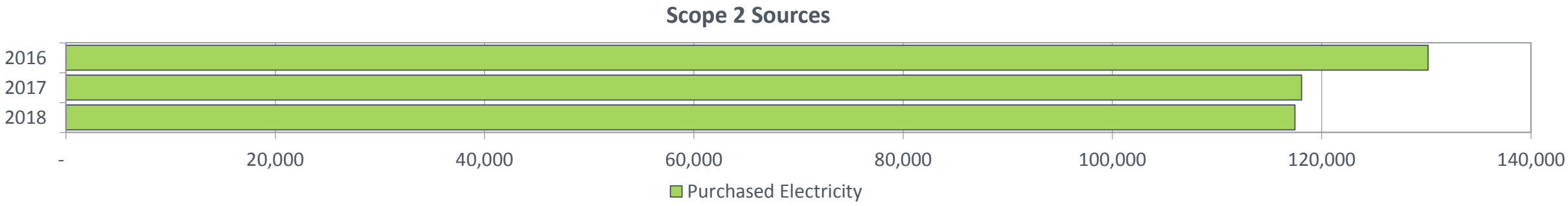
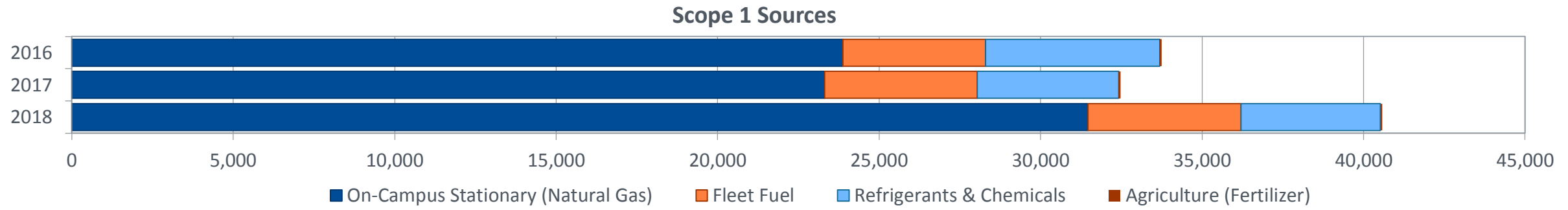
FY18 Emissions by Scope



■ Scope 1   ■ Scope 2   ■ Scope 3

# Segmenting Emissions by Scope

*Increases in natural gas and commuting drive overall emissions increases in FY2018*



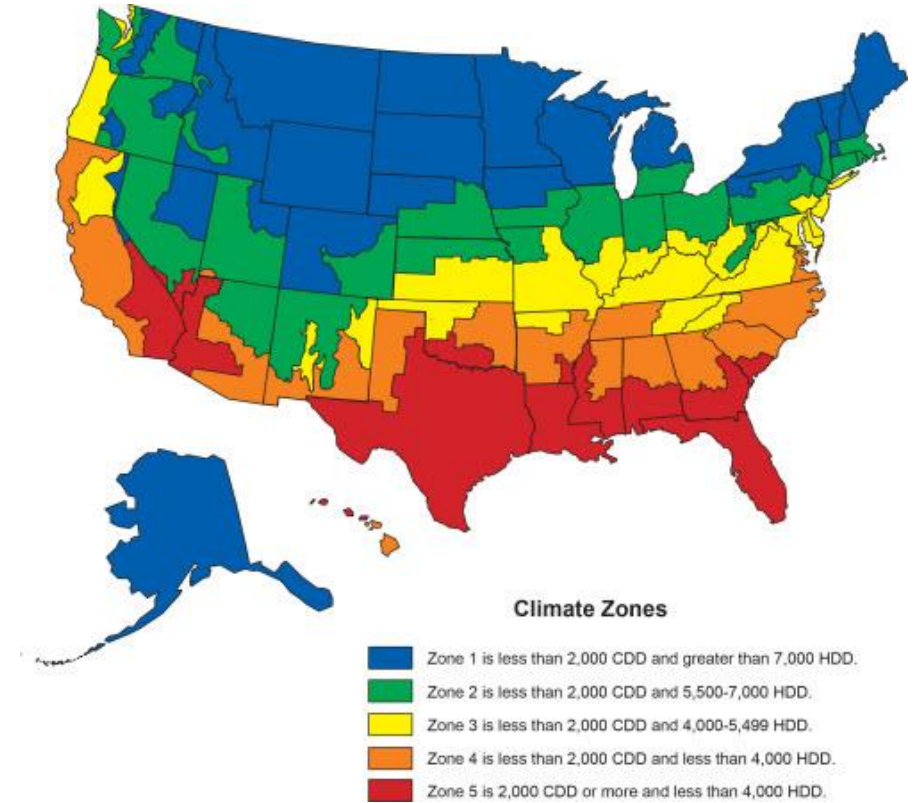
\*Sources measured in MTCDE

# Comparative Peers

*The University of Alabama is located in climate zone 4*

Peer Institutions	Location
Arizona State University	Tempe, AZ
Clemson University	Clemson, SC
George Mason University	Fairfax, VA
Nova Southeastern University*	Fort Lauderdale, FL
Texas A&M University*	College Station, TX
University of Arkansas	Fayetteville, AR
University of Tennessee	Knoxville, TN
Virginia Commonwealth University	Richmond, VA

\*= New Peer in FY18



## Sustainability Solutions Measurement and Analysis Members

- Sightlines has over 50 Sustainability Solutions Members
- Approximately two-thirds are private
- Approximately two-thirds have signed the ACUPCC
- Approximately forty percent are Charter Signatories



# Benchmarking GHG Emissions

*Two ways to normalize: by Campus User & by GSF*



## GHG Emissions per 1,000 EUI Adjusted GSF

$$\frac{\text{Gross GHG Emissions}}{\text{Total EUI Adjusted GSF}} \times 1,000$$

Stresses efficient use of space.

\*EUI Adjusted GSF weighs Science Research and Medical Space more heavily

## GHG Emissions per Weighted User

$$\frac{\text{Gross GHG Emissions}}{\text{Weighted User}}$$

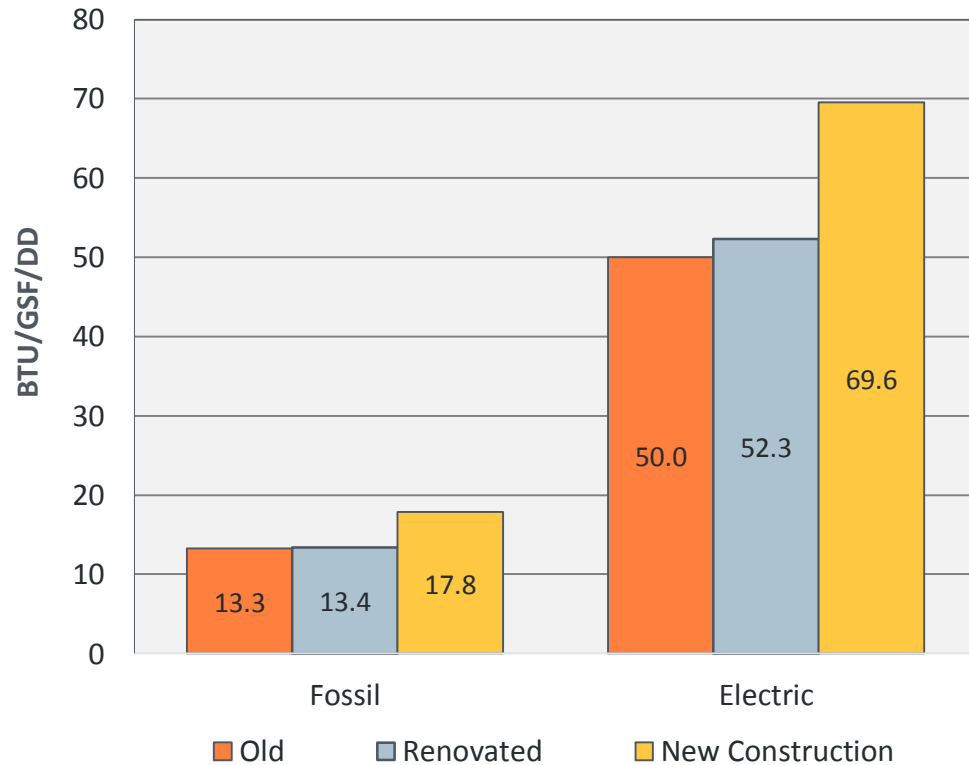
Stresses intensity of operations and commuting.

\*Weighted User weighs full-time residential students more heavily

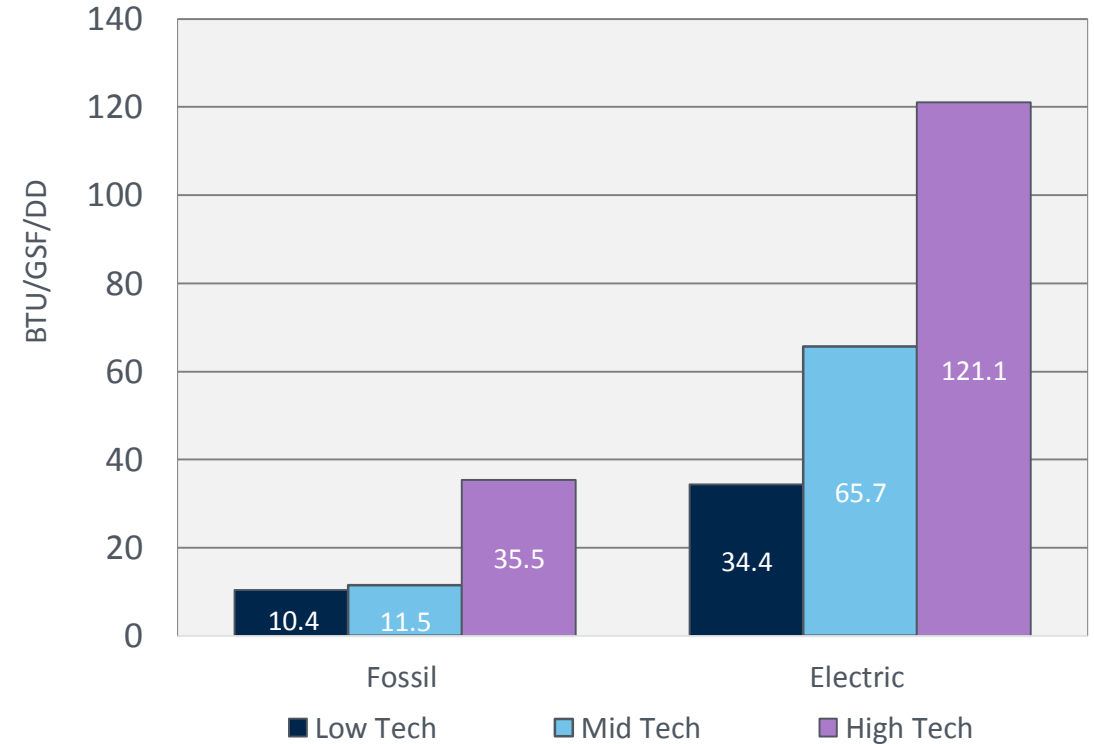
# Campus Space Profile Impacts Sustainability Effort

*Age and technical complexity of buildings on campus impact energy consumption and efficiency*

Energy Consumption by Age



Energy Consumption by Complexity –  
New Construction Only



New construction systems can be more efficient, but high tech complexity increases energy consumption

Technically complex (high tech) systems tend to consume more energy

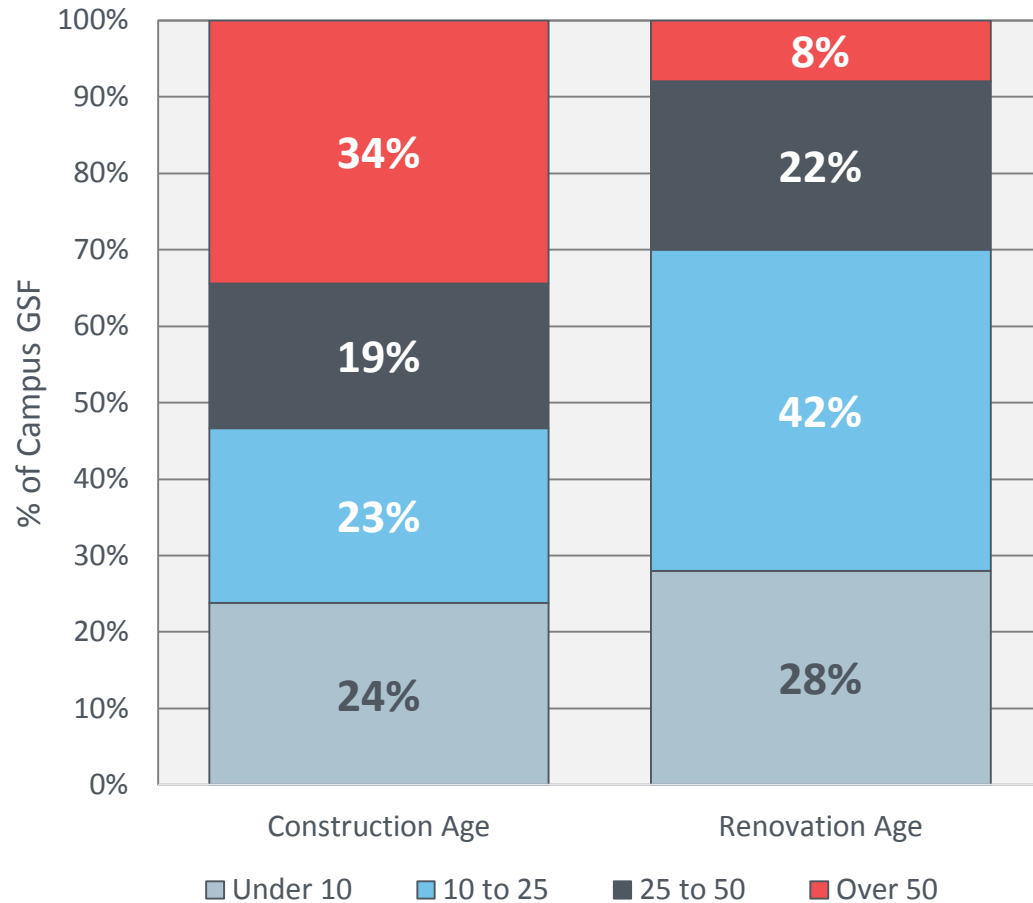
\*Graphs taken from Sightlines State of Sustainability FY17



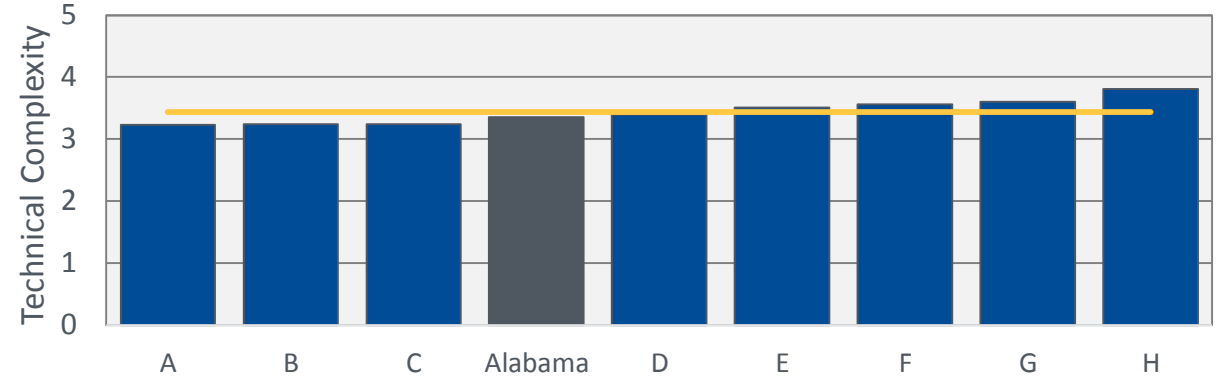
# Age Profile Impacts Energy Consumption

*Reducing campus age through new construction creates potential for higher consumption*

**Campus Age by Category**



**Campus Technical Complexity**



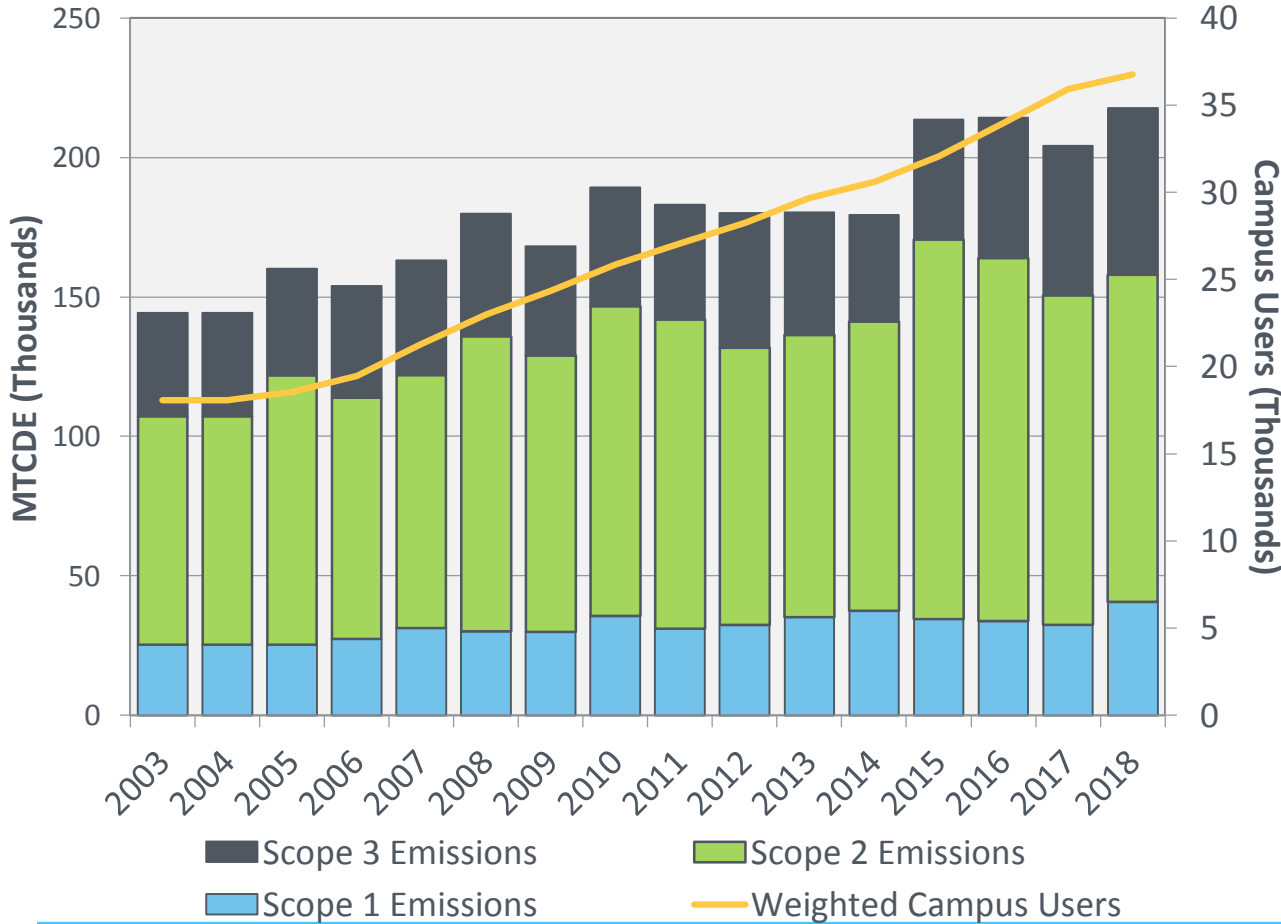
**Questions to think about:**

- What are the sustainability goals for the future of campus?
- How is sustainability considered in planning the construction of a new building or major renovation?

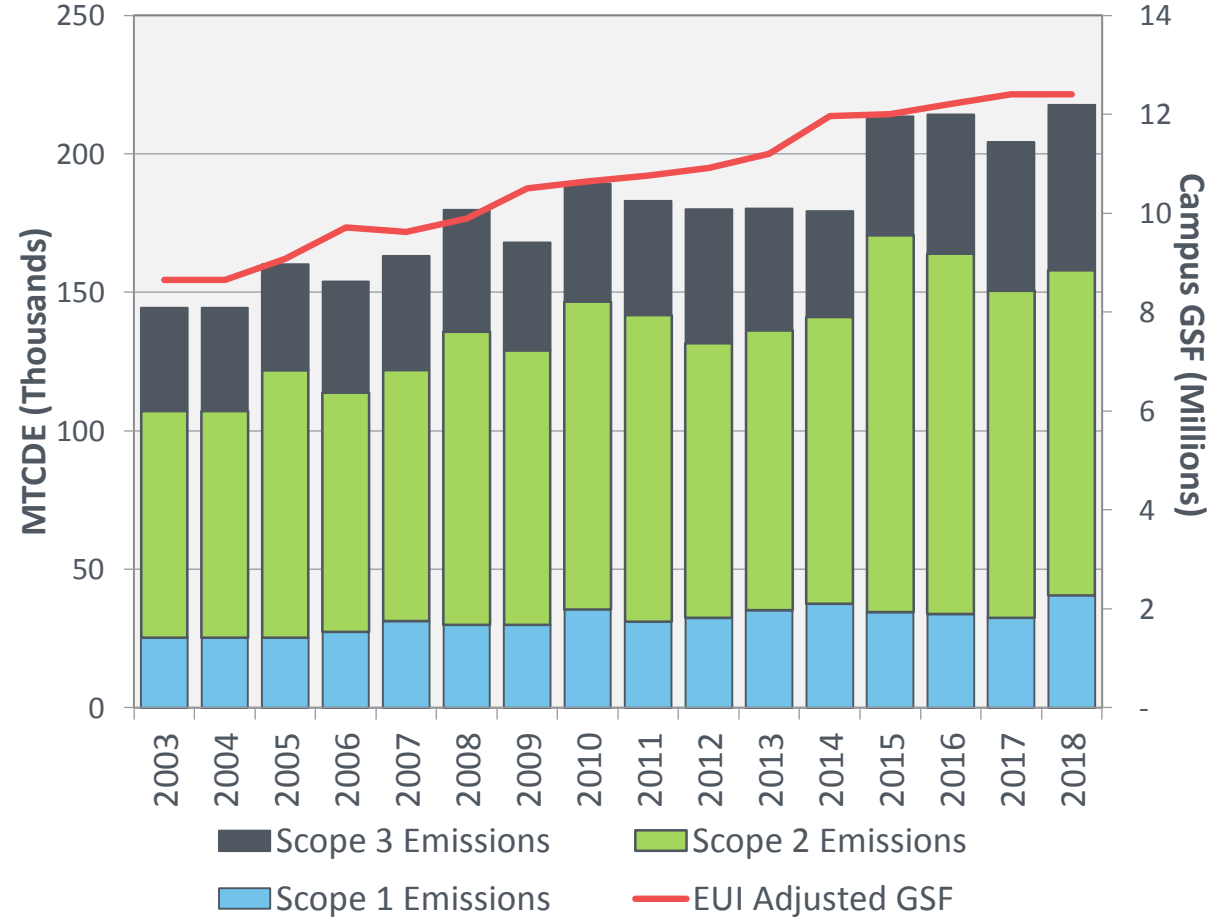
# Longitudinal Tracking of Emissions by Scope

Since 2004, campus users have increased by 103% while emissions have increased by 48%

Emissions by Scope Compared to Campus User Growth



Emissions by Scope Compared to Space Growth

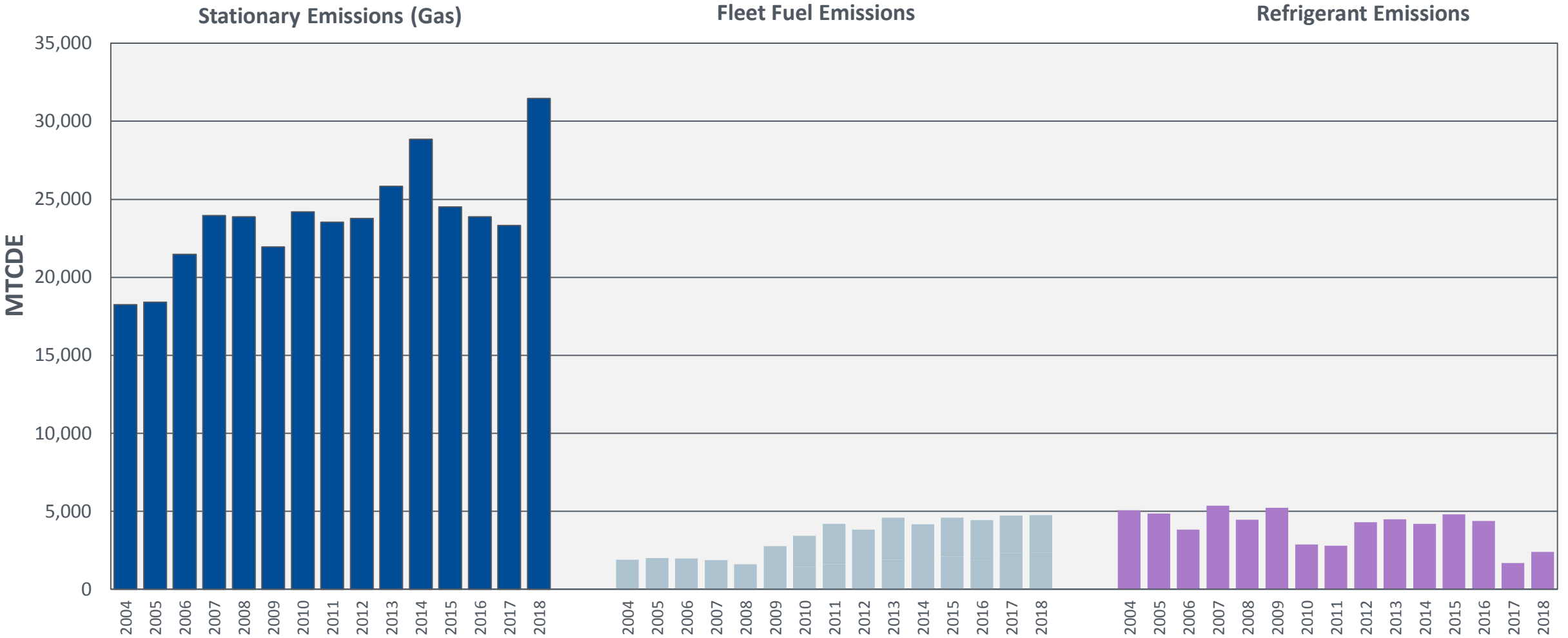


# Scope 1 Emissions: Natural Gas



# Scope 1 Emissions By Source

*Majority of Scope 1 emissions from Natural Gas consumption*

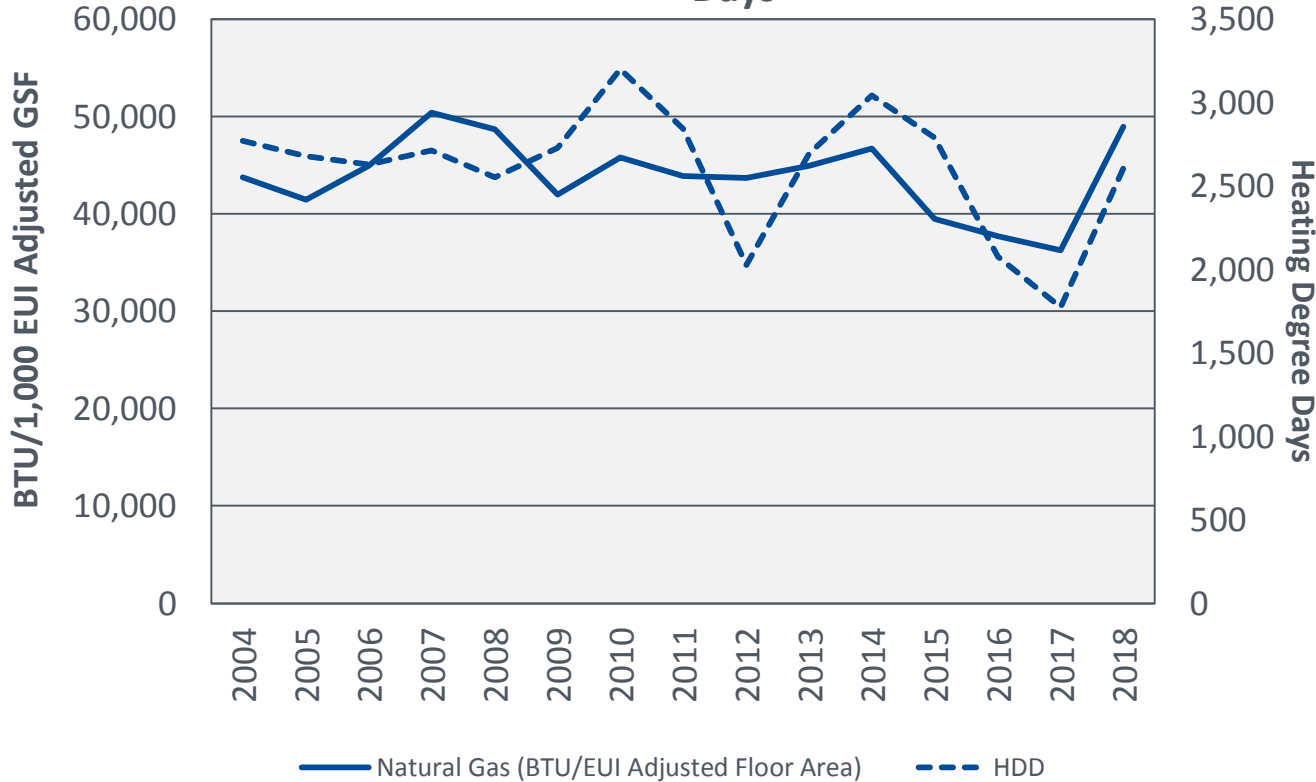


*\*fertilizer left out: insignificant factor for emissions*

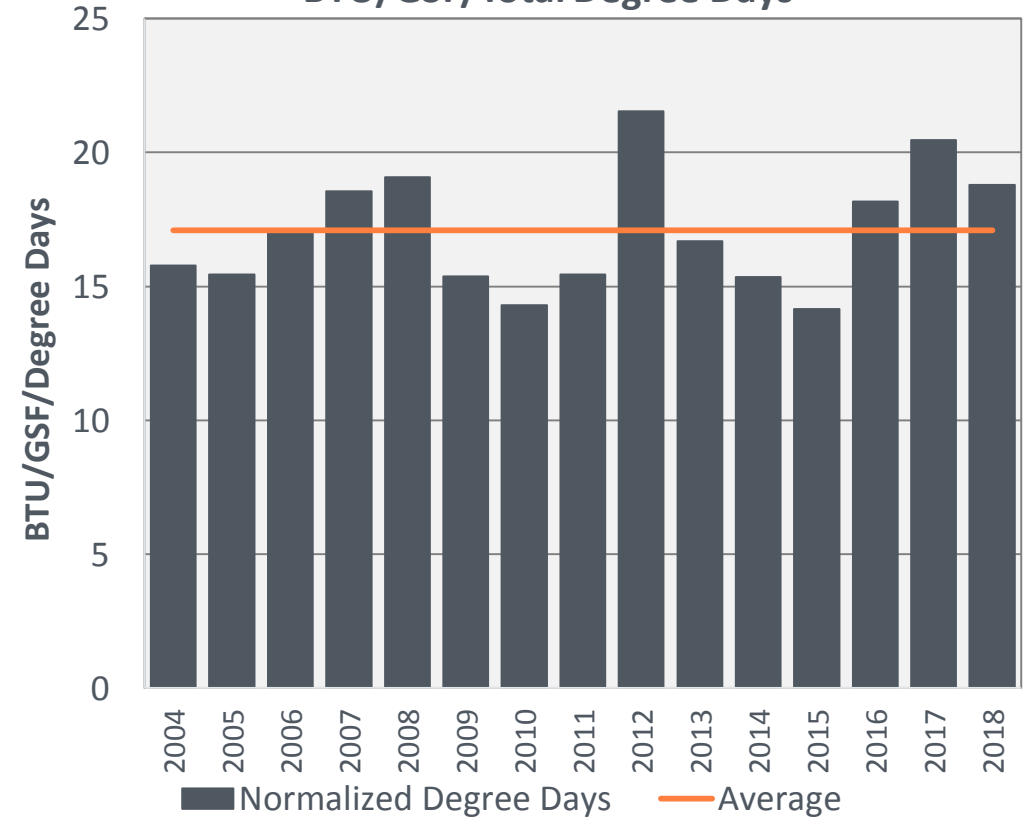
# Impact of Weather on Natural Gas Consumption

*Energy demands similar to degree day trending*

Total Alabama Historic Stationary Consumption with Degree Days



BTU/GSF/Total Degree Days

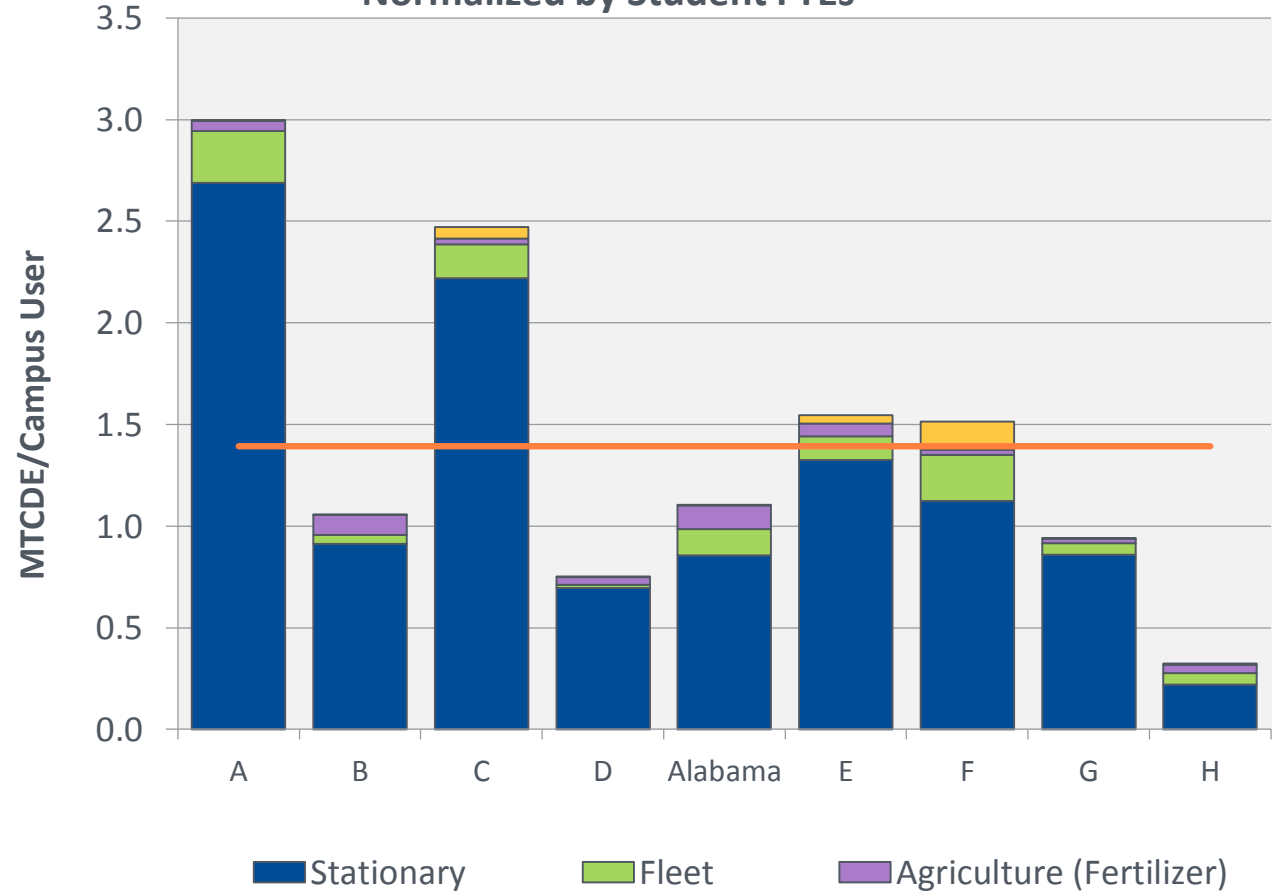


**Heating Degree Day (HDD):** The number of degrees the average temperature in a day is below 65° Fahrenheit (18° Celsius), or the temperature below which buildings are heated.

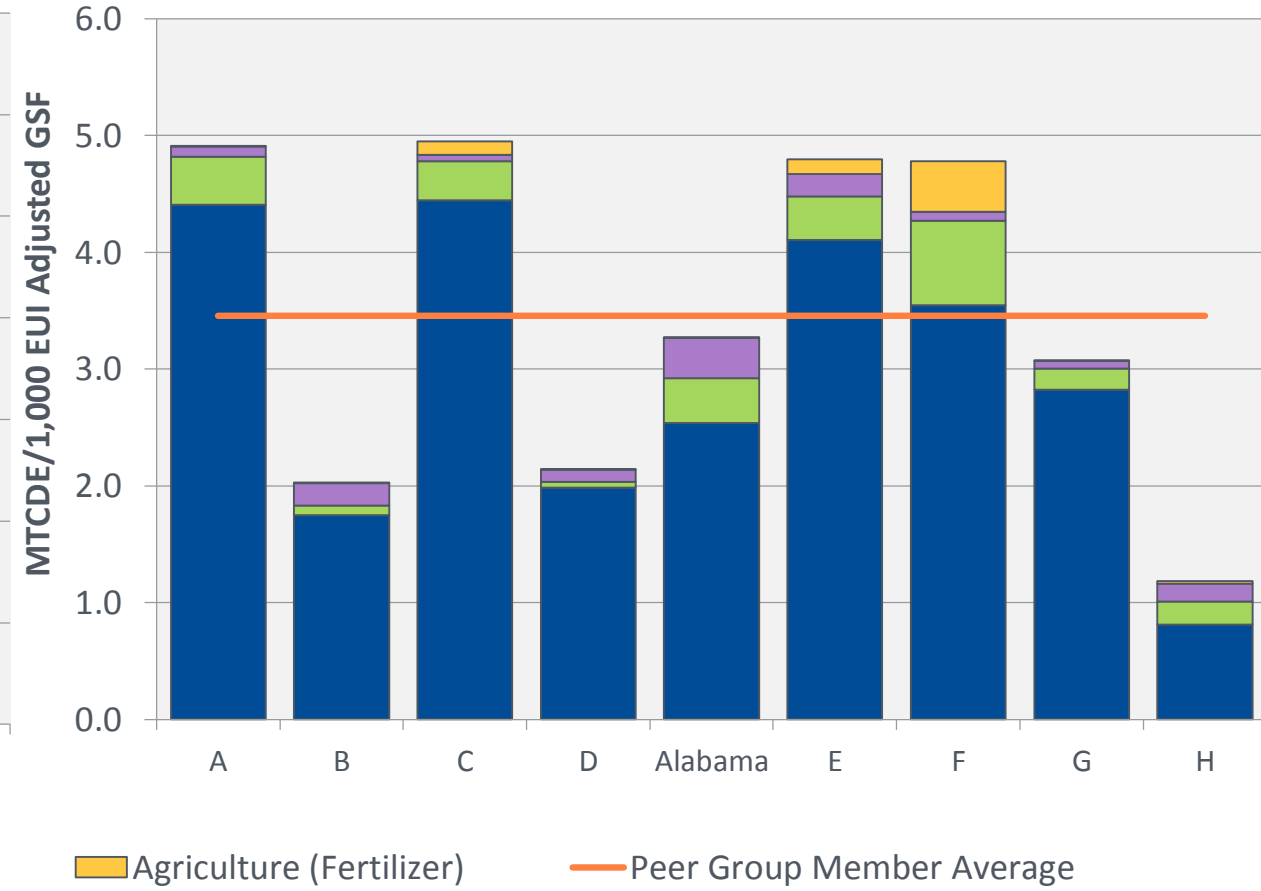
# Scope 1 Emissions by Source, Normalized

*Alabama operating below peer average*

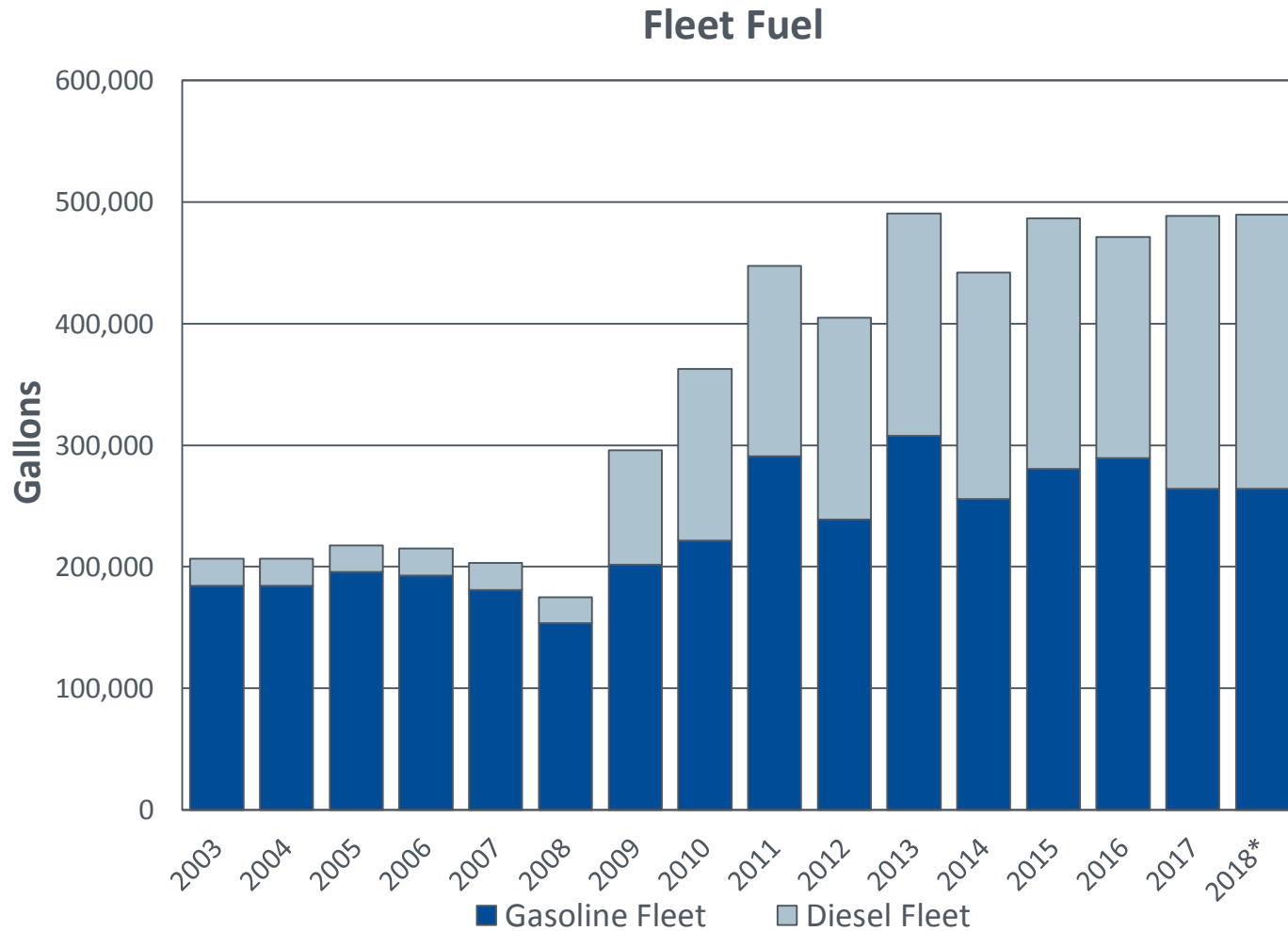
Alabama's Scope 1 Emissions Vs. Peers  
Normalized by Student FTEs



Alabama's Scope 1 Emissions Vs. Peers  
Normalized by 1,000 EUI Adjusted GSF



# Fleet Fuel – Additional Scope 1 Sources



**Themes to consider:**  
*Peer Institutions have taken the initiative to further curb fleet fuel emissions:*

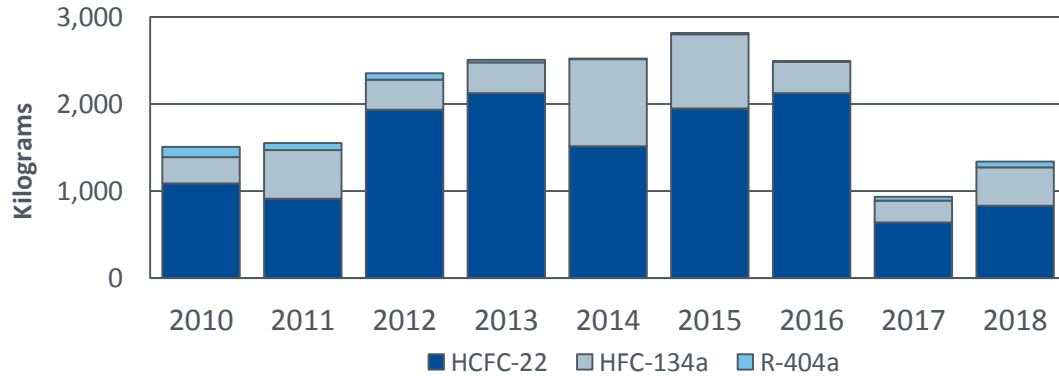
- *Driving more fuel efficient cars*
- *Switching to electric cars*



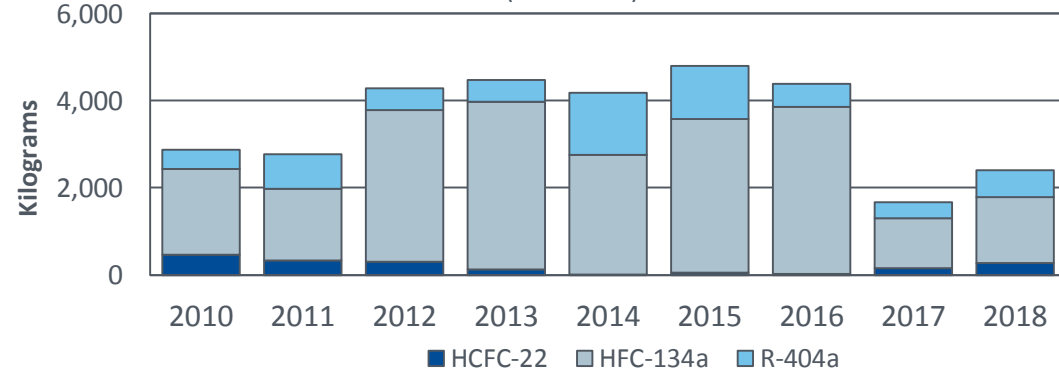
# Refrigerant & their Emissions Factors

*Alabama uses HCFC-22, HFC-134a, and R-404a on campus*

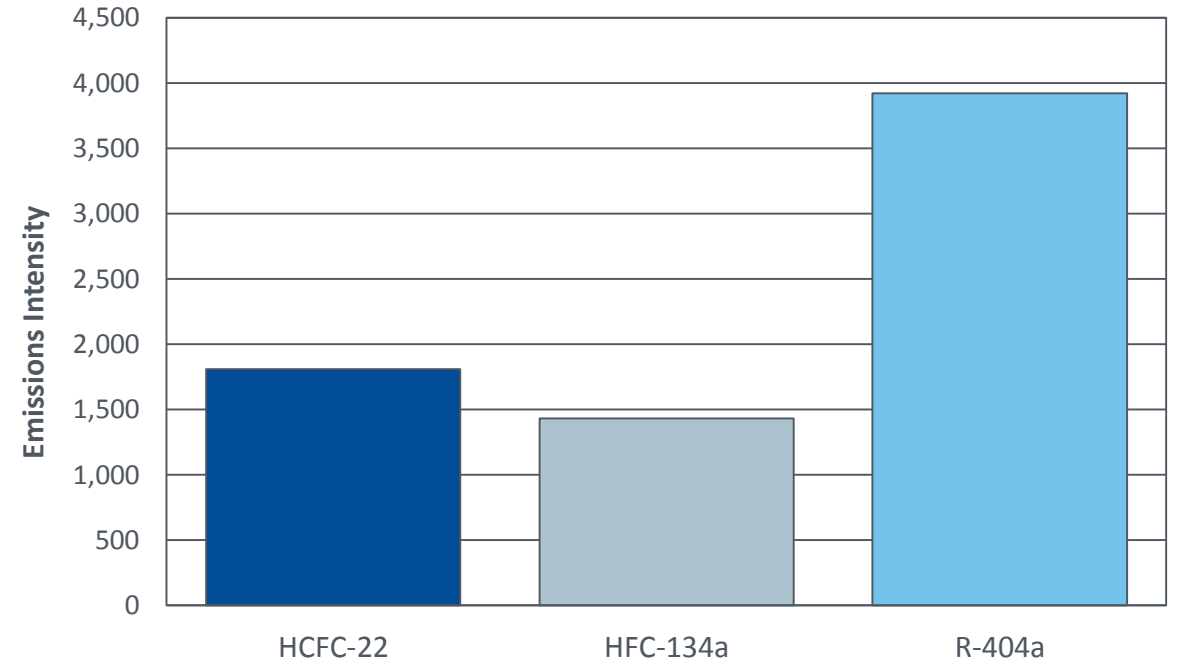
**Refrigerants & Chemicals**  
(Purchased)



**Refrigerants & Chemicals**  
(Emissions)



**Emissions Intensity of Each Refrigerant Type**



**Questions to think about:**

*Is there a strategy around refrigerants currently used on campus or for future use?*

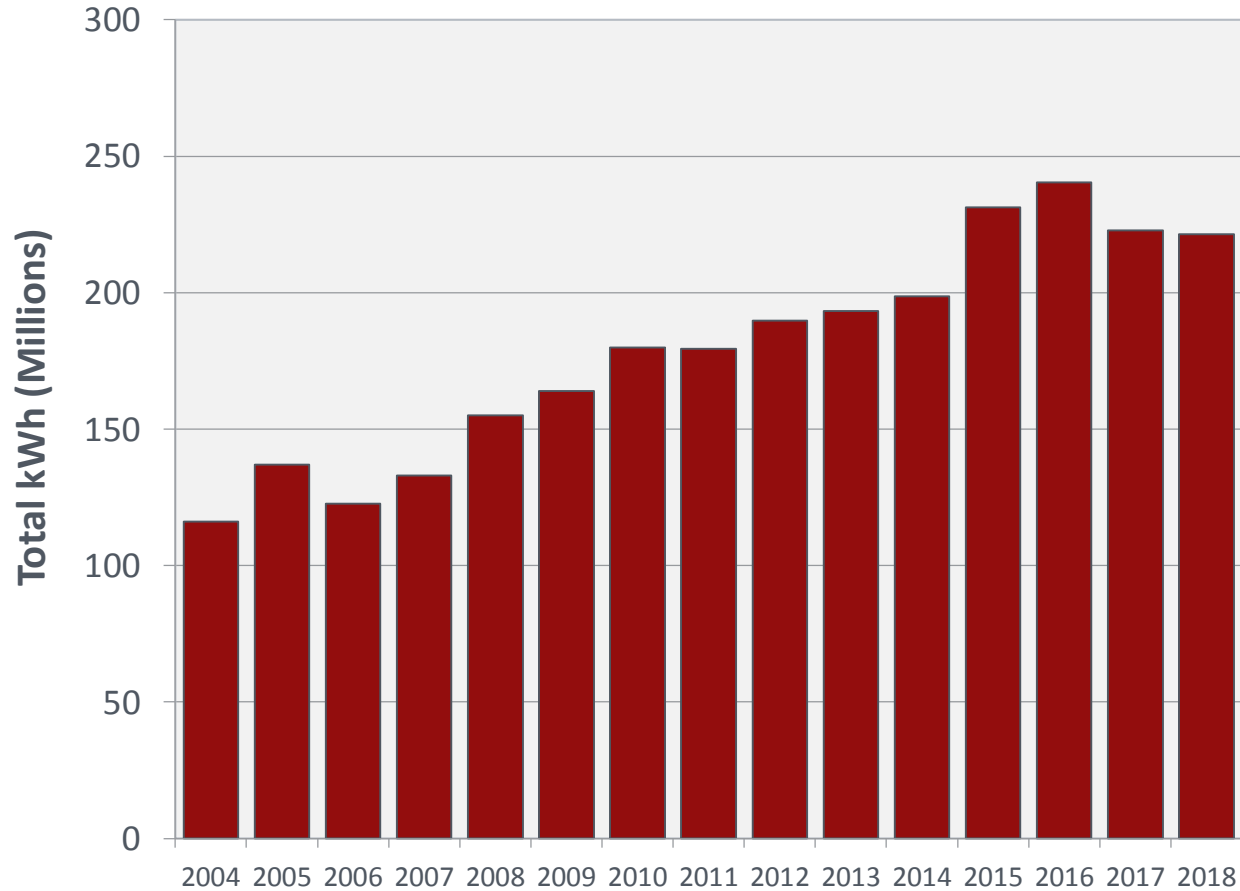
# Scope 2 Emissions: Purchased Electricity



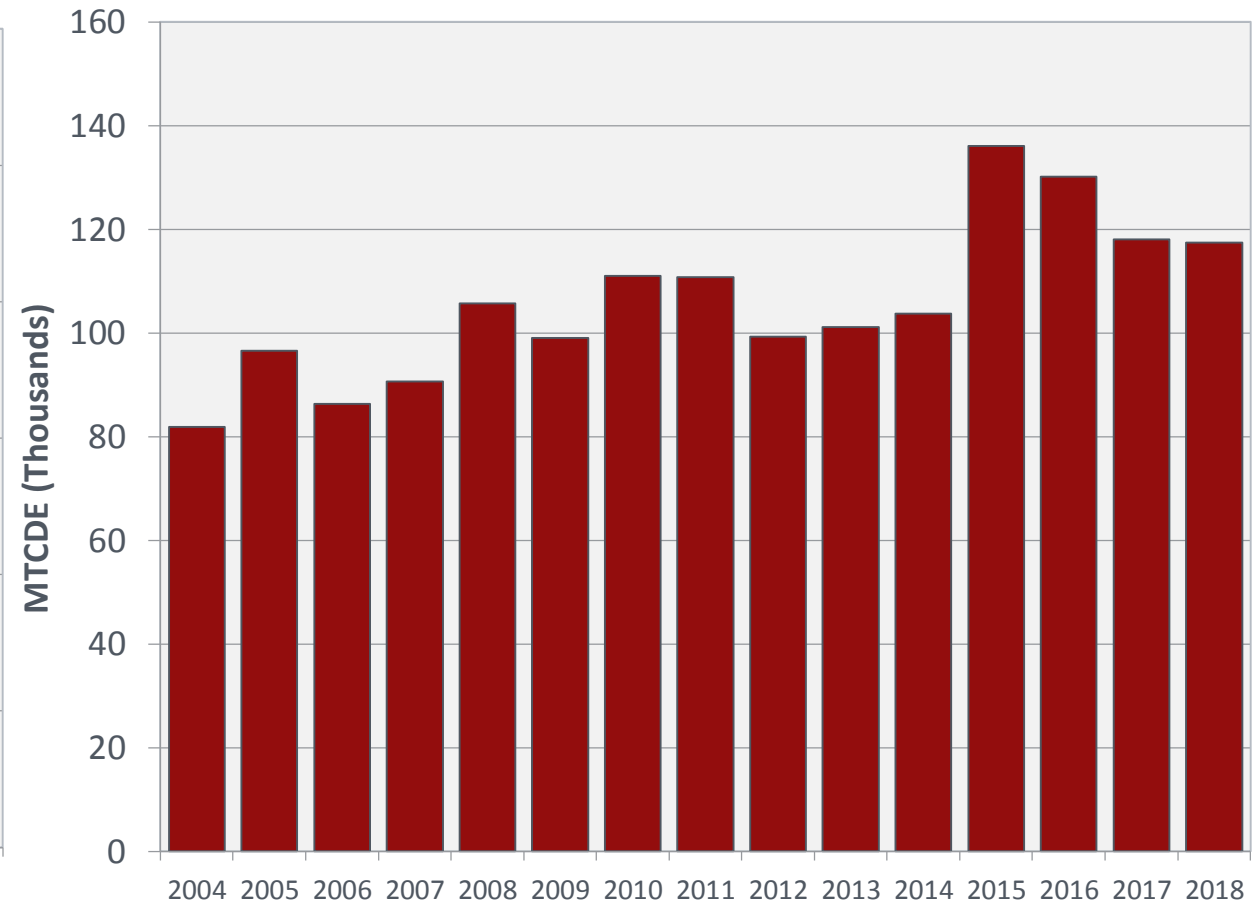
# Scope 2: Electricity Consumption vs Emissions

*Consumption has decreased by 7% while emissions have decreased 10% since 2016*

Historical Energy Consumption

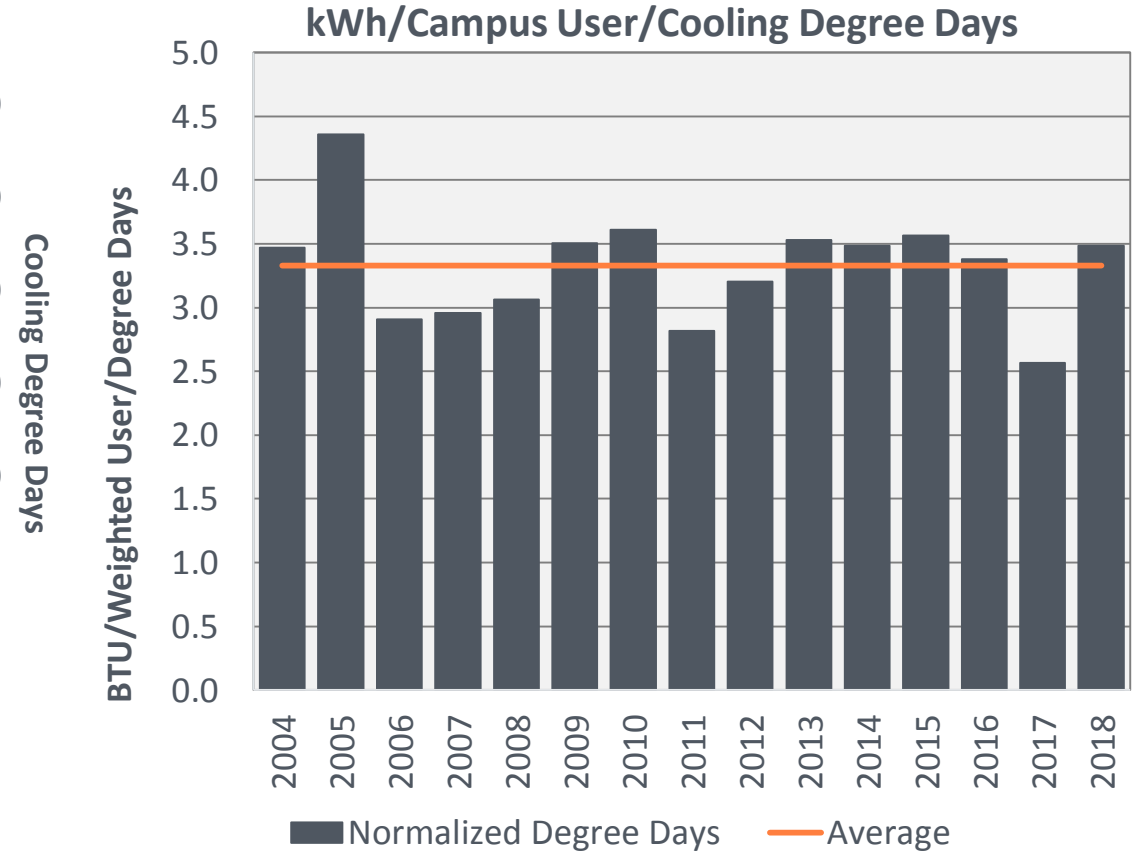
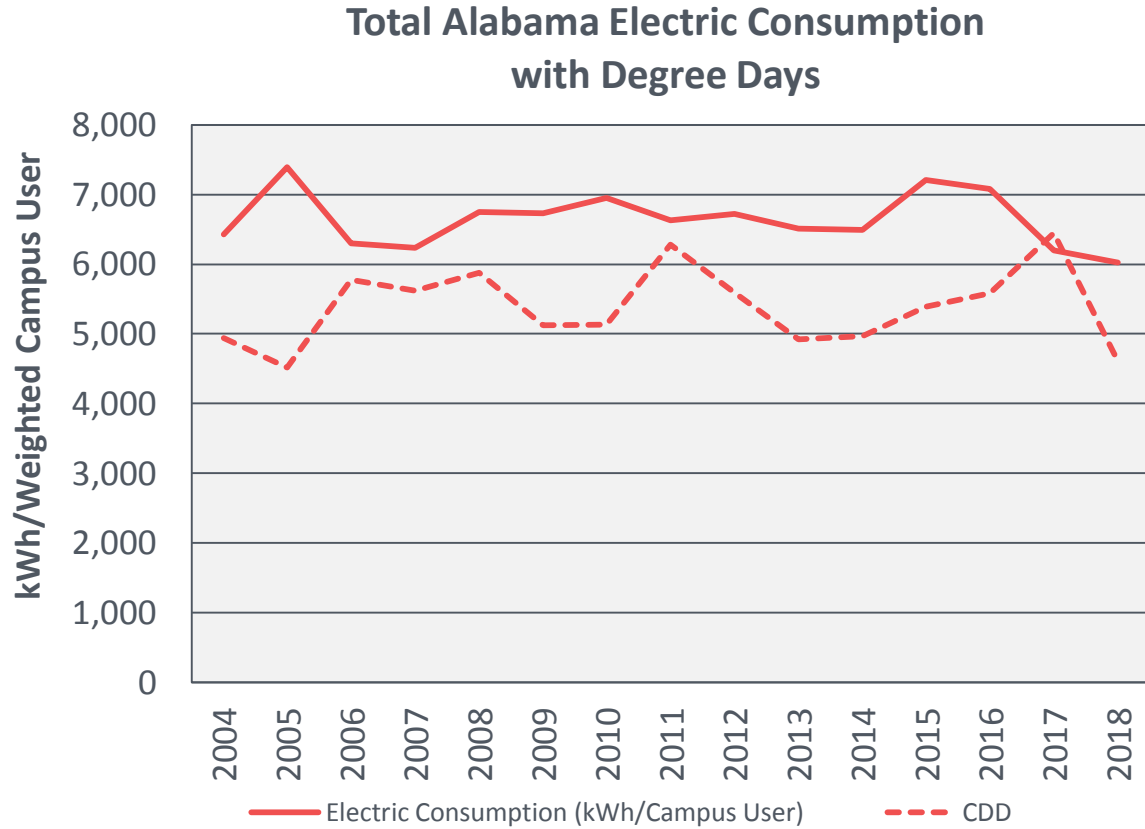


Historical Energy Emissions



# Impacts of Weather on Energy Consumption

*Normalizing by weather trends shows increase in electricity consumption in FY18*

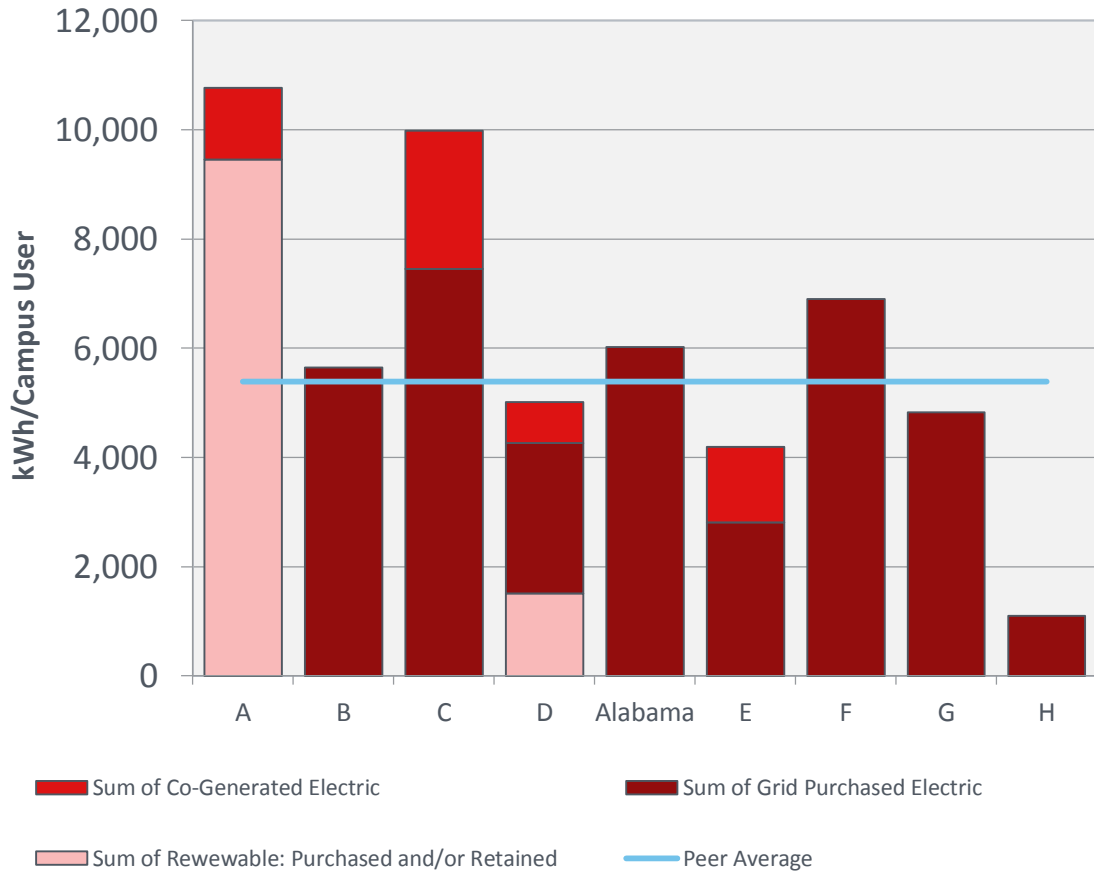


**Cooling Degree Days (CDD):** The number of degrees the average temperature in a day is above 65° Fahrenheit (18° Celsius), or the temperature above which buildings are heated.

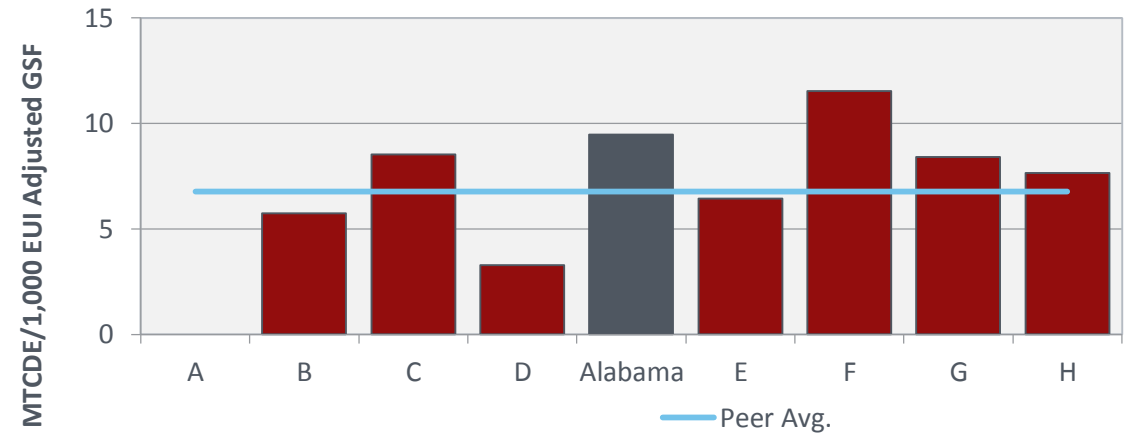
# Comparing Emissions from Electricity

*Type of electricity consumed impacts emissions*

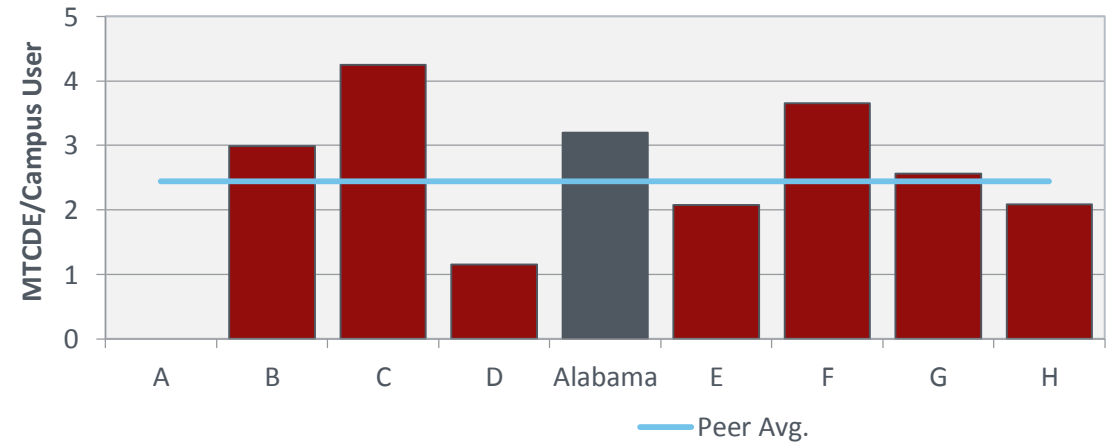
**Purchased Electricity Consumption**



**Purchased Electricity Emissions (per GSF)**



**Purchased Electricity Emissions (per User)**



\* Co-Generated Electricity and Renewable Energy do not contribute to emissions

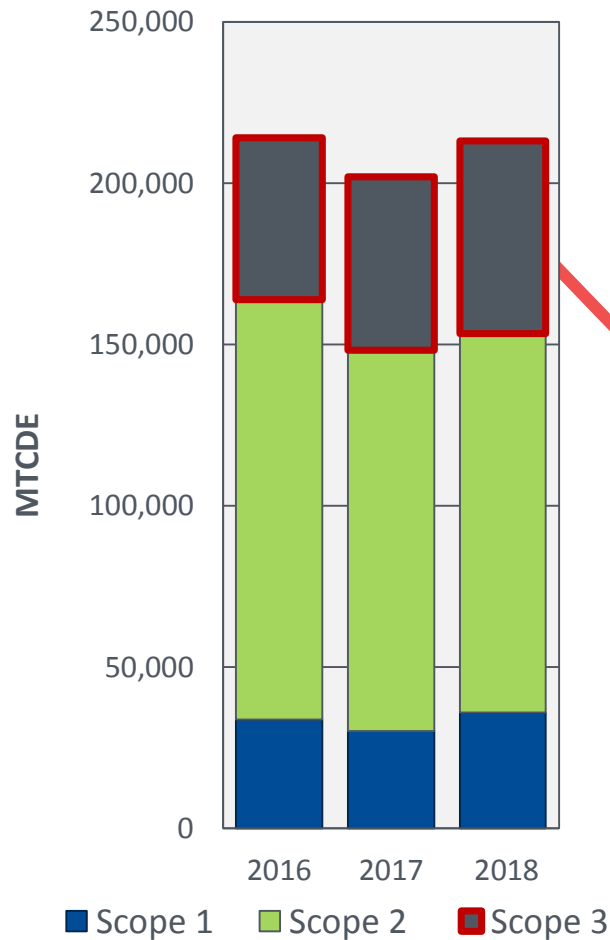
# Scope 3 Emissions



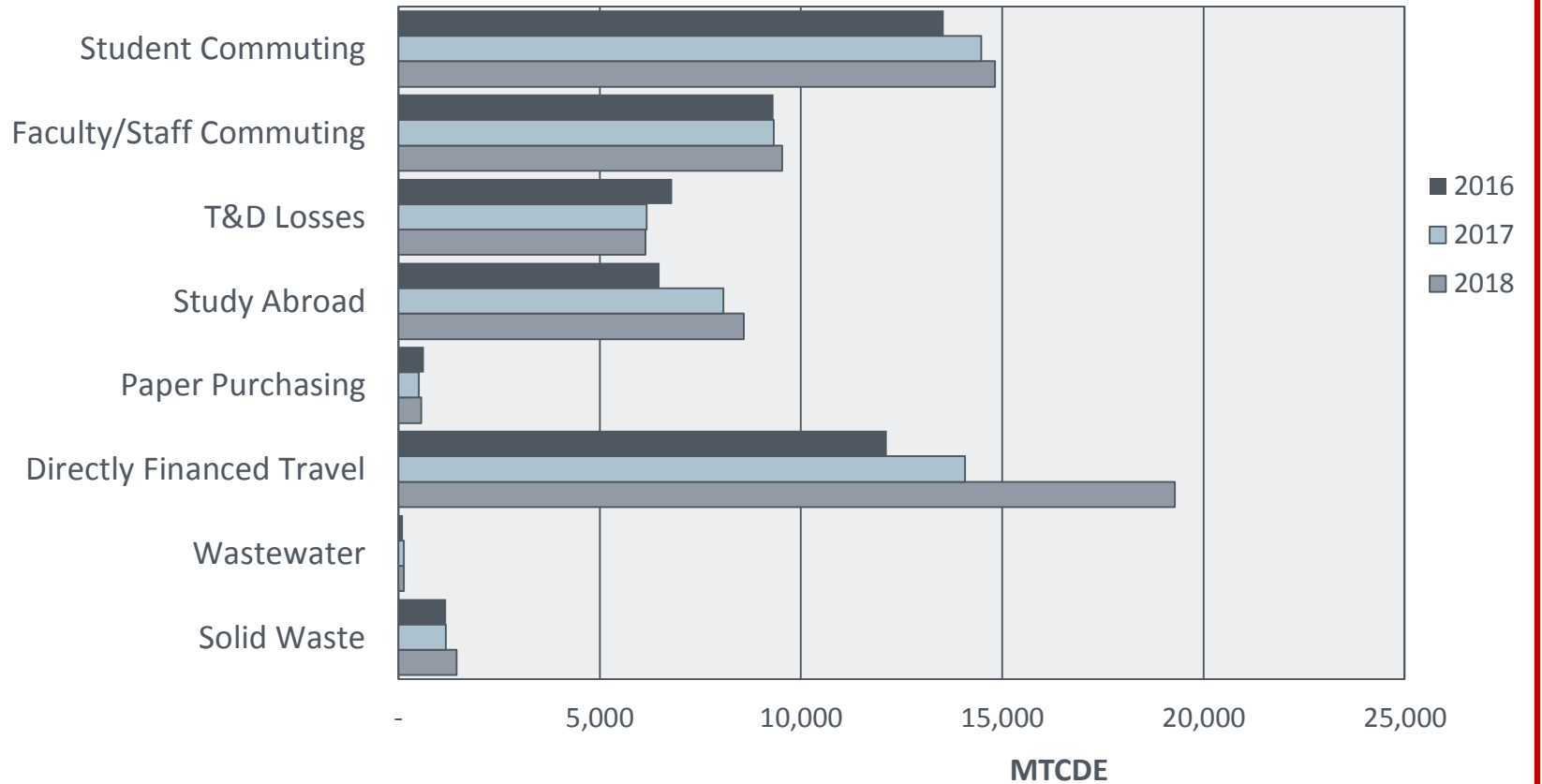
# Scope 3 Distribution by Source

*Increase in FY18 a result of increased directly financed travel*

**Total Emissions**



**Scope 3 Sources**

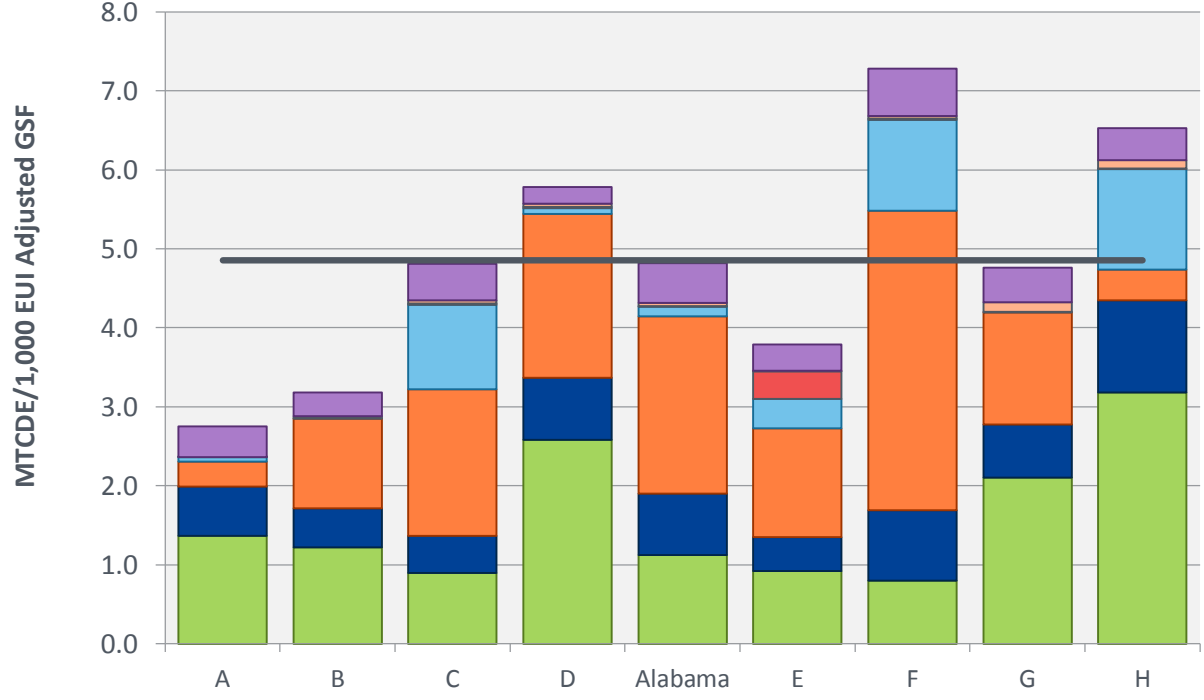




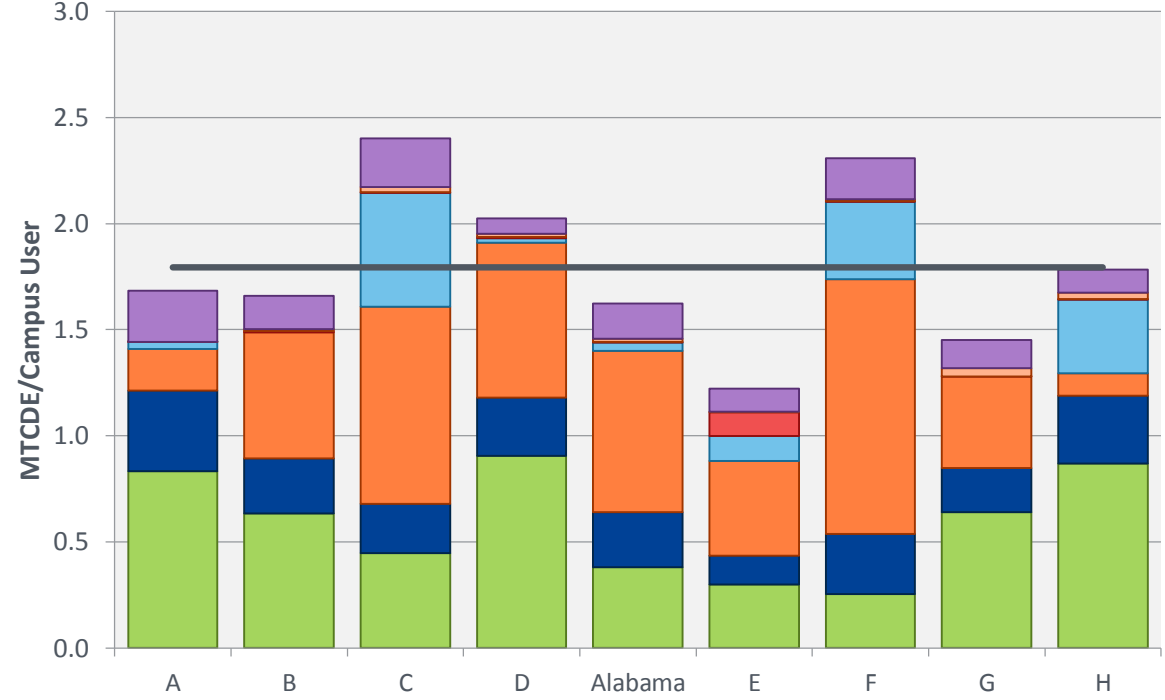
# Scope 3 – Emissions by Source

*Scope 3 at Alabama driven by travel*

Scope 3 Emissions Vs. Peers  
Normalized by EUI Adjusted GSF



Scope 3 Emissions Vs. Peers  
Normalized by Weighted Campus User

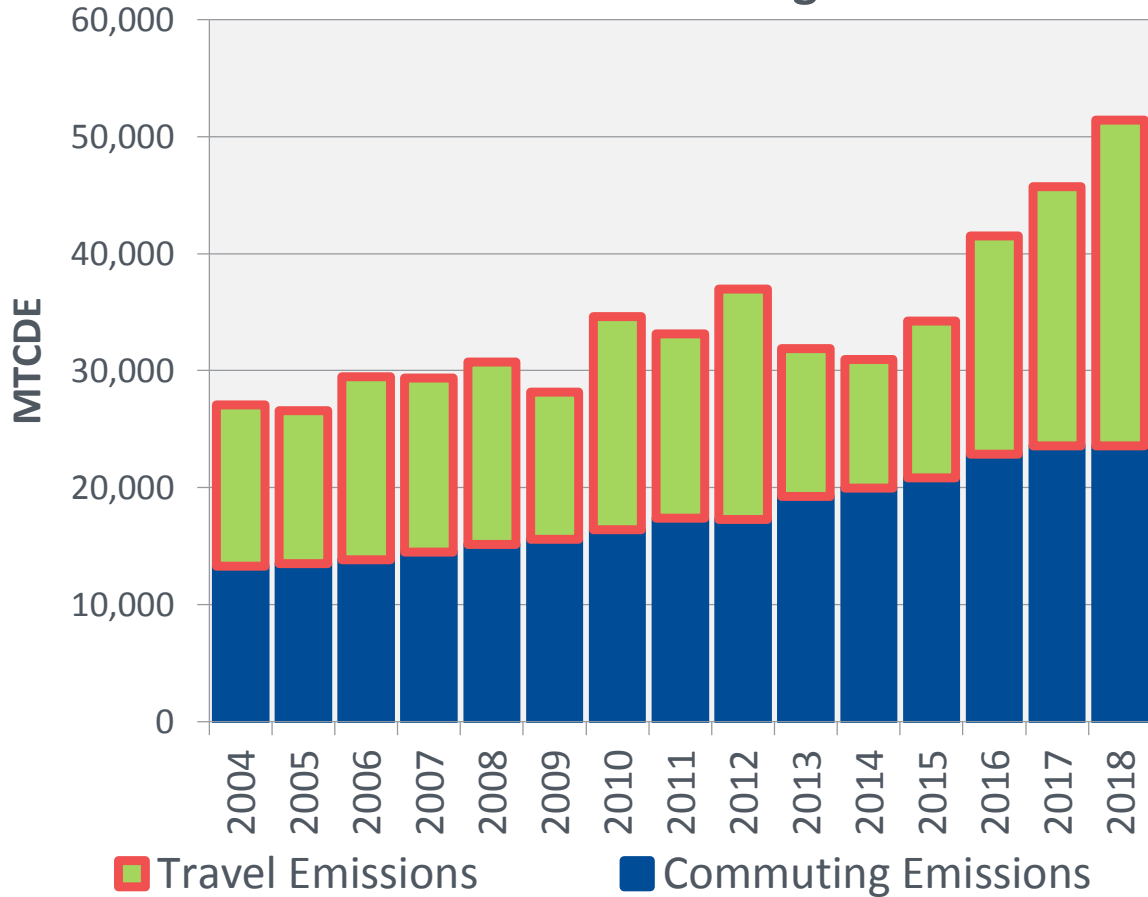


- Student Commuting
- Employee Commuting
- Other Travel Emissions
- Waste Emissions
- Wastewater Emissions
- Paper Emissions
- T&D Losses
- Peer Average

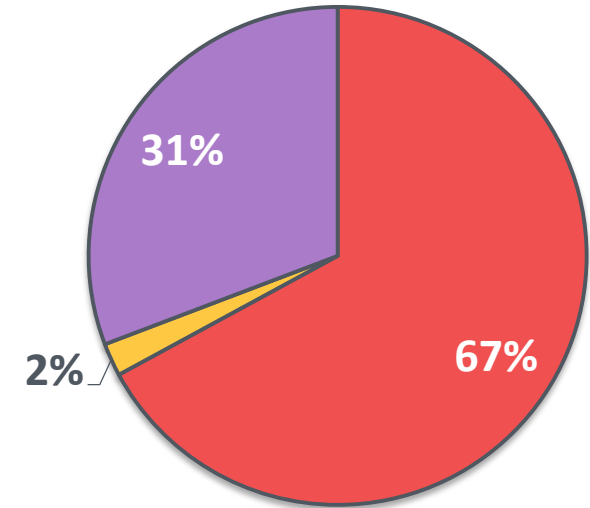
# Emissions Increasing Over Time

Travel emissions have increased 54% since FY16 due to the 50% increase in air travel

Travel Trending

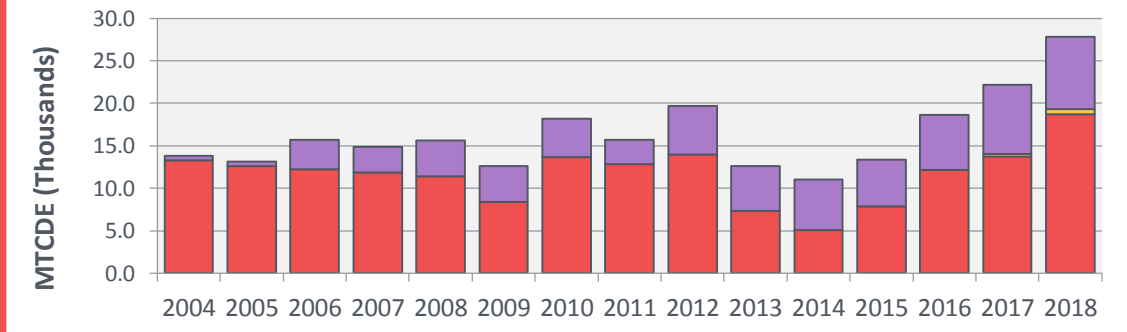


FY18 Travel Emissions



■ Air Travel ■ Personal Mileage Reimbursement ■ Study Abroad

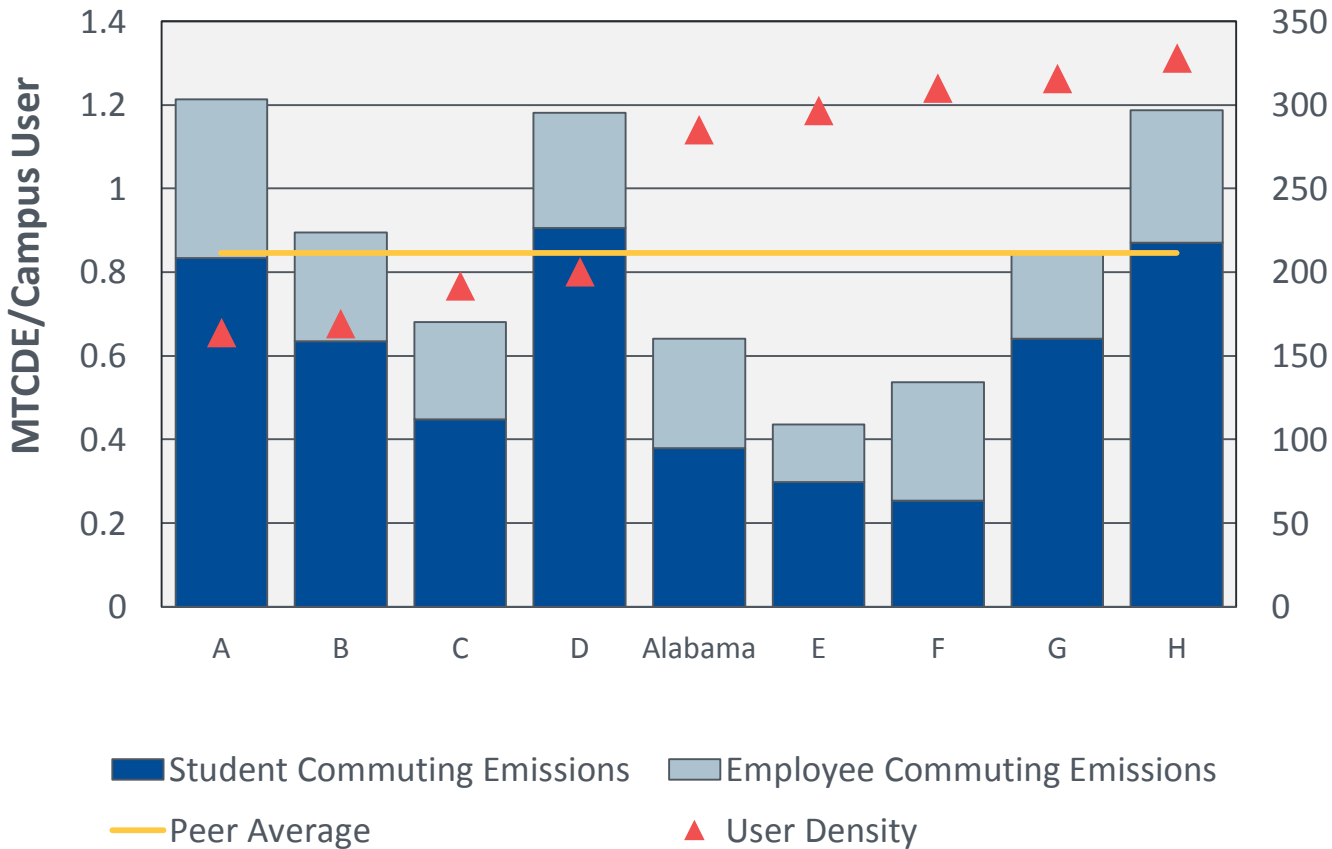
Travel Trending



# Scope 3 - Commuting

*Alabama commuting emissions are below peer average, driven by independent car travel*

Commuting Emissions vs. Peers

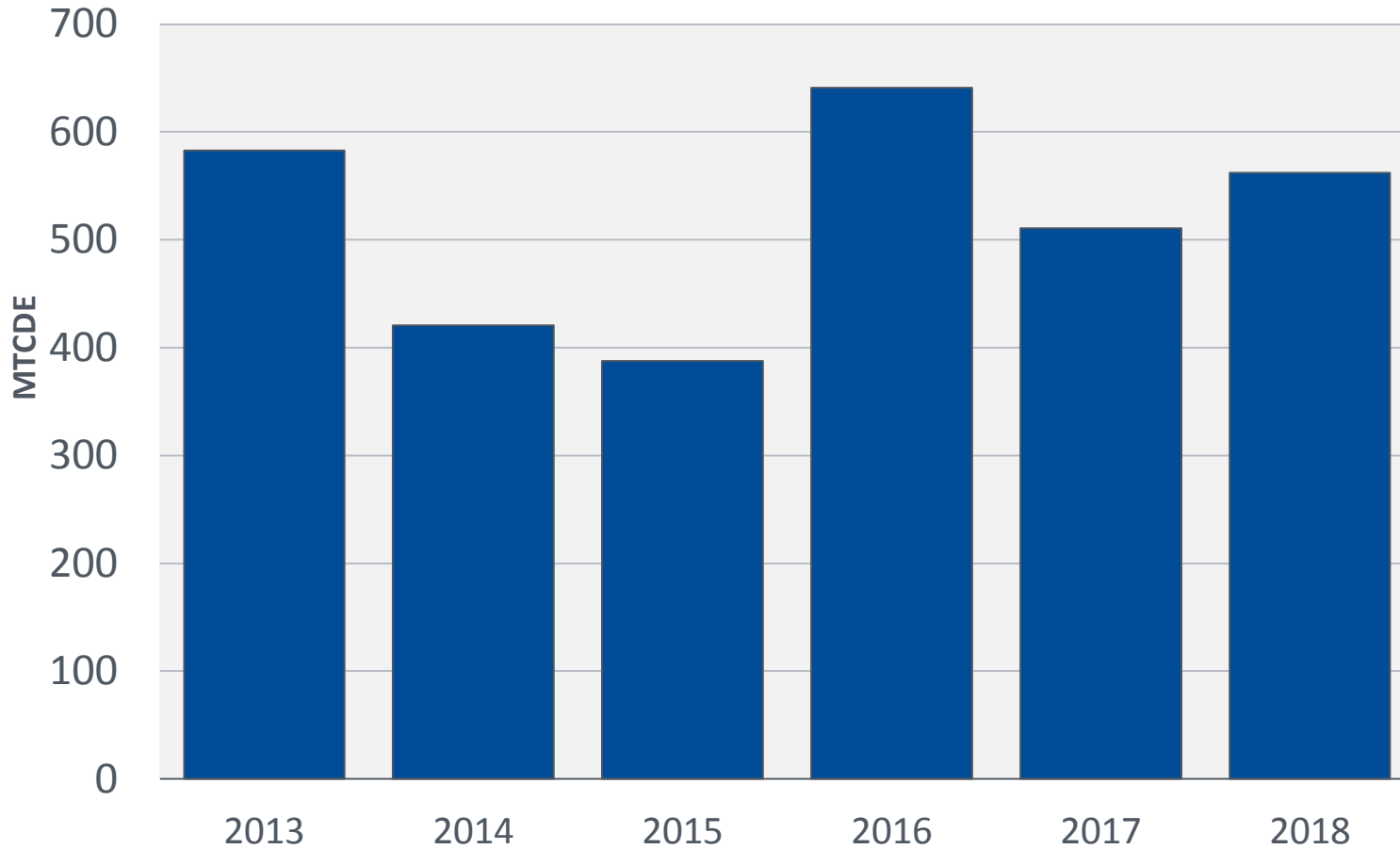


**Questions for Discussion:**  
*What are you doing on campus to curb commuting emissions?  
 Are additional plans/strategies in the works?*

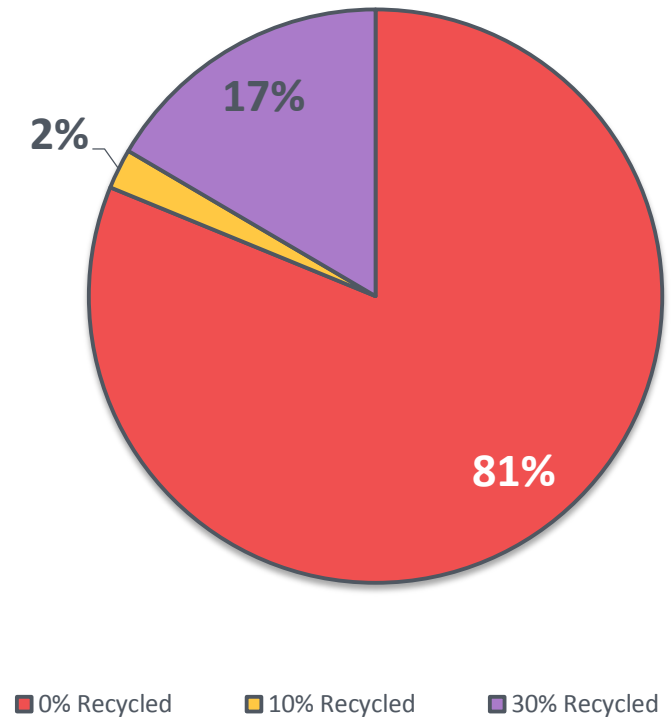
# Paper Purchasing and Emissions

*Majority of paper purchased in FY2018 had 0% recycled content*

Paper Emissions Trending



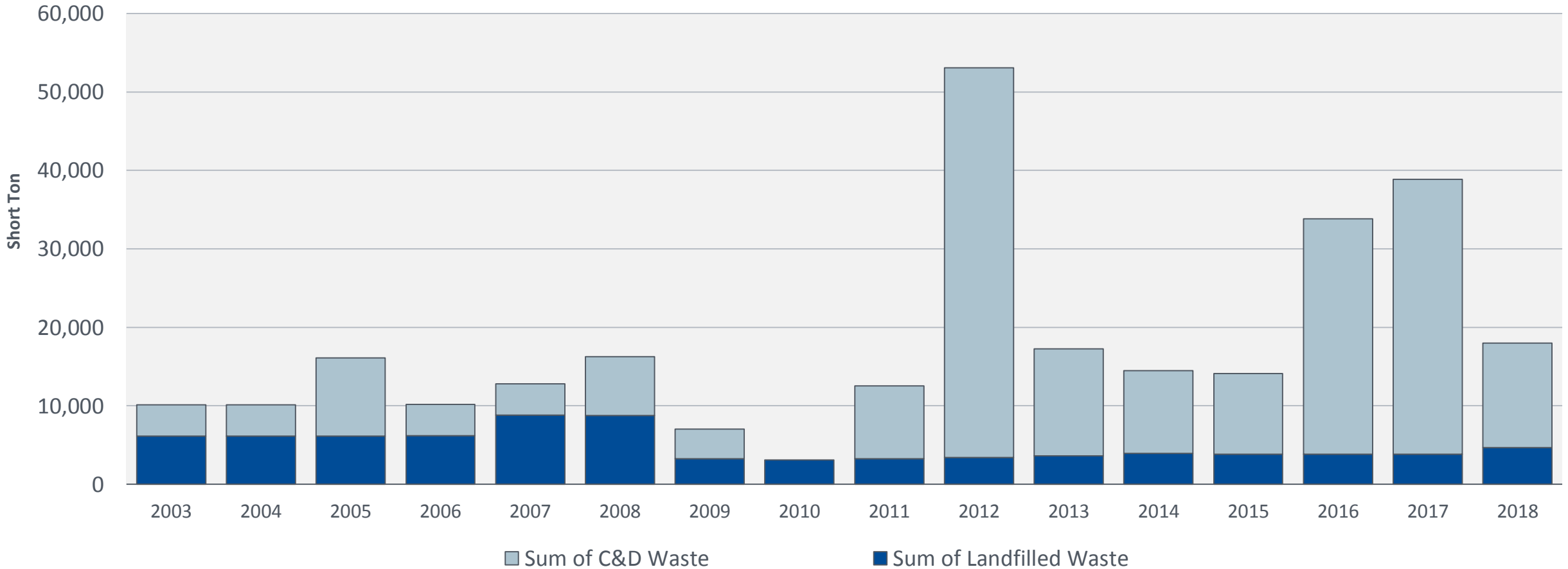
FY18 Paper Purchase Breakout



# Measuring Campus Waste

*Less C&D Waste in FY2018 means less waste on campus*

Historic Waste Trending



# Overview of Recycling at The University of Alabama



Modified Cardboard Collection Containers



Bale Cardboard, Sorted Office Paper (SOP) and Mixed Paper to Receive High Side of 'Over the Board Pricing'

Uniform Pallet Purchasing to Sell Used Pallets to Vendor



Educational and Process Related Information Available on UA's Recycling Website



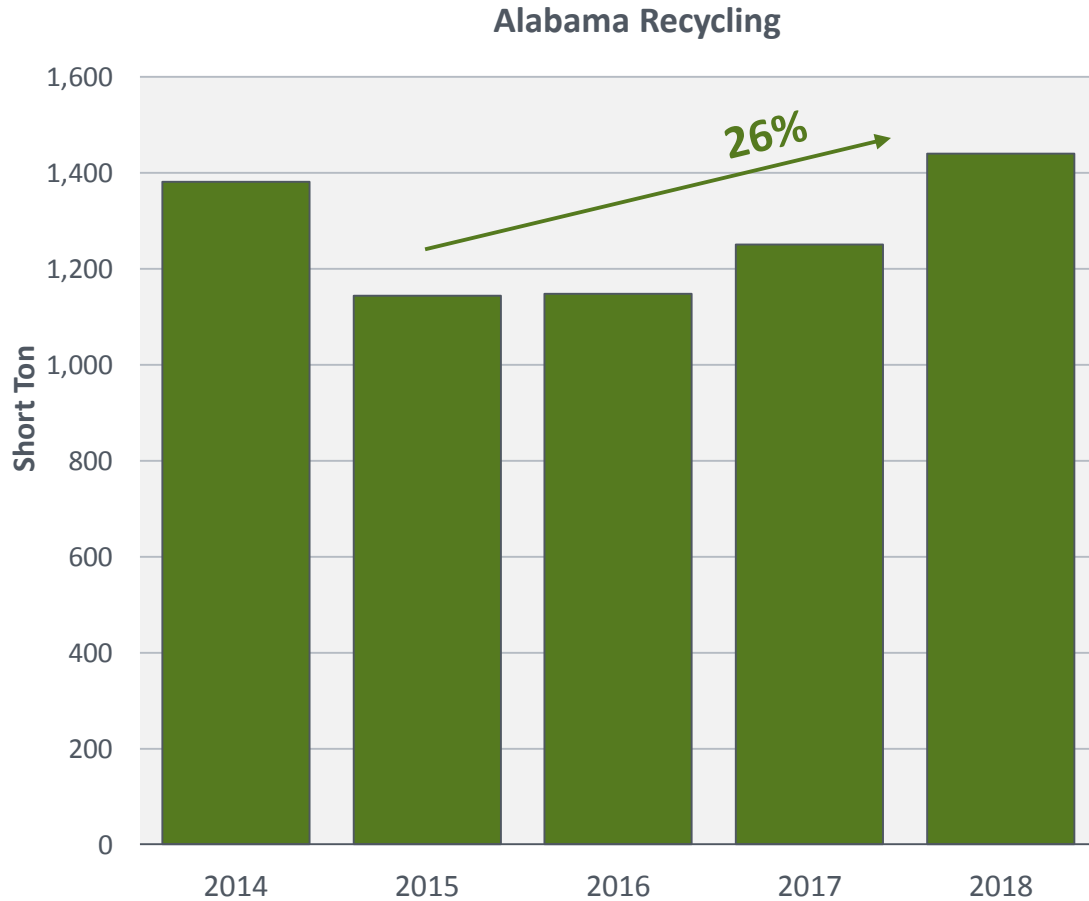
\$290K+ in Grant Funds Past 5 Years



Positive University Press

# Campus Recycling Efforts on the Rise

26% increase in tons recycled since 2015



## FY18 Recycling Facts

- Landfill Cost per Ton: \$28
- Recycling Revenue per Ton: \$201

- **1,439 Tons Recycled**



- \$40,314 in Tipping Fees Saved
- \$184,287 Generated via Sale of Recycled Materials



# Generating Revenue, But Not Self Supporting

## Cost for in-house Recycling

✓ Salaries/Benefits:	\$416,158
✓ <u>Operating Expenses:</u>	\$ 94,650
Total Cost of Recycling Operation:	\$510,808

✓ Revenue from Sale of Recycled Materials:	\$184,287
✓ Tipping Fee Generated Savings:	\$ 40,314
✓ <u>Shredding Cost Avoidance:</u>	\$ 65,553
Total Revue, Savings & Cost Avoidance:	\$290,154

\$510,808 - \$290,154 = \$220,654 Unfunded

# Target Amount: \$220,654\*

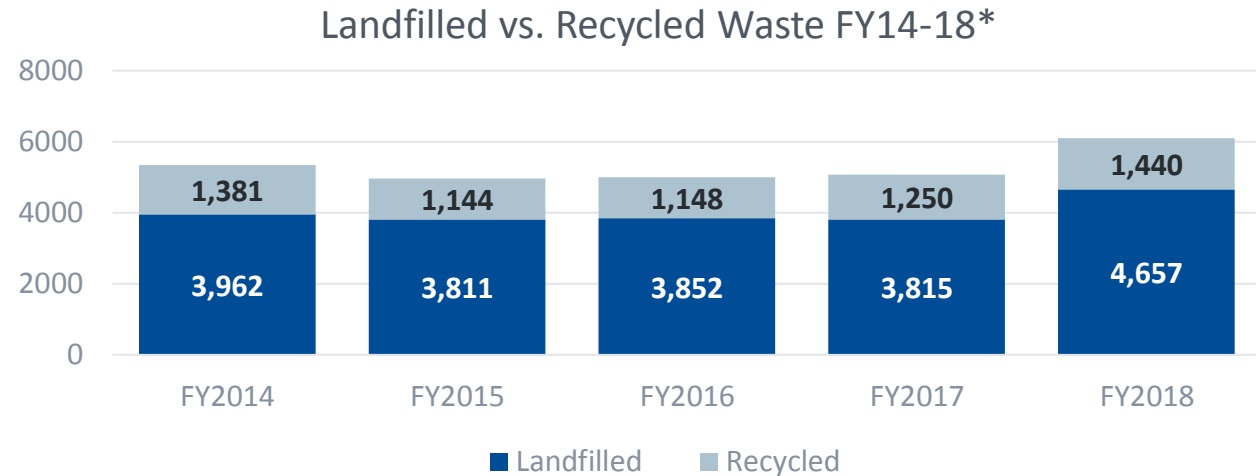
\*Additional operational expenses may be required due to increased tonnage

To generate an additional **\$220,654\*** in revenue/cost savings/cost avoidance via the recycling operation an additional **961 tons\*** would need to be diverted from the landfill. For reference 659.6 tons is the equivalent of:



3 Empty 12 oz.  
Aluminum Cans per  
Student **per Week**  
**(61.5 Tons)**

2 Empty 11.50" X 8.75"  
X 7.25" Amazon Boxes  
per Student **per Week**  
**(598.1 Tons)**



**Questions for Discussion:**

*Is diverting an extra 80.5 tons a week feasible?  
What materials are the biggest 'culprits'?*

# What Additional Opportunities Exist?

## Questions for Discussion



*Are there enough recycling bins easily accessible around campus?*



*Are students/staff aware of what they can recycle or what should be thrown out? Is there an opportunity to improve this communication with pictures?*



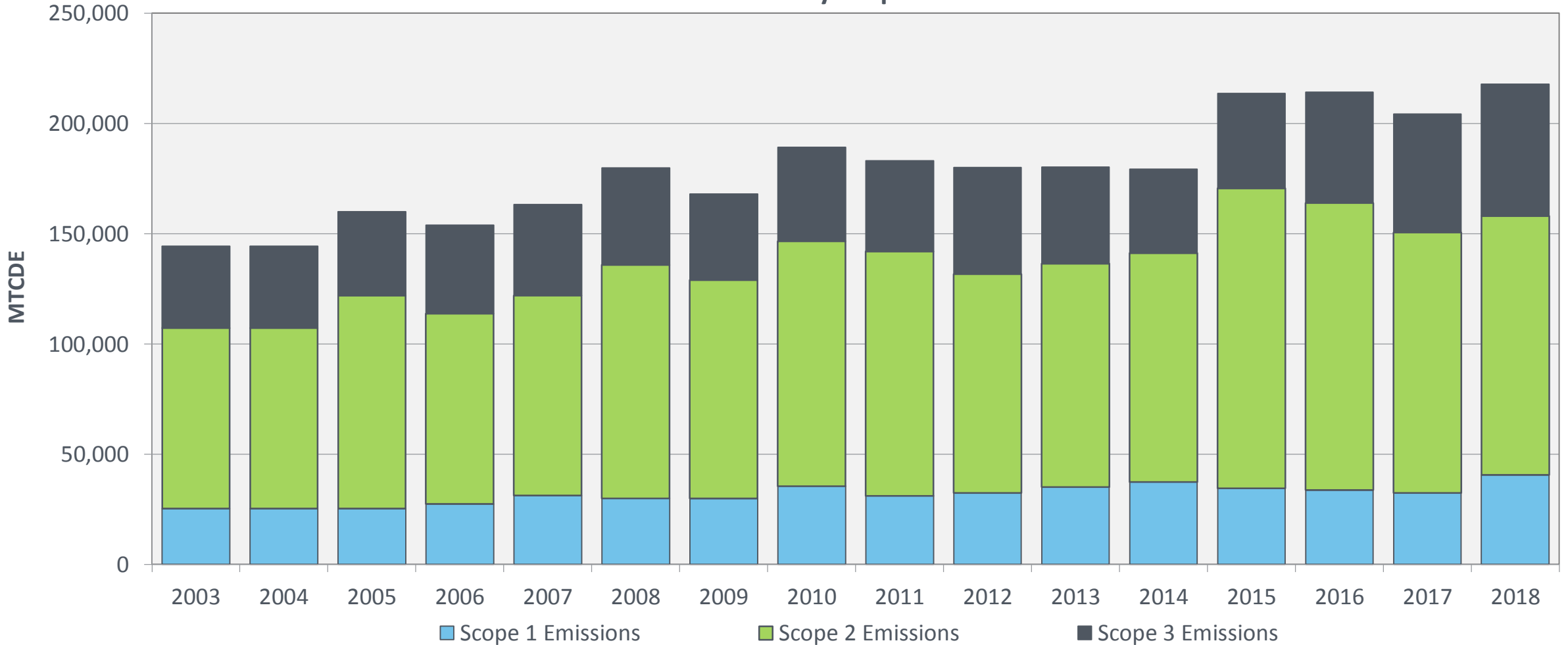
# Total Emissions Profile



# Longitudinal Tracking of Emissions by Scope

*FY18 saw an increase in Scopes 1 and 3, reduction in Scope 2 compared to historical trending*

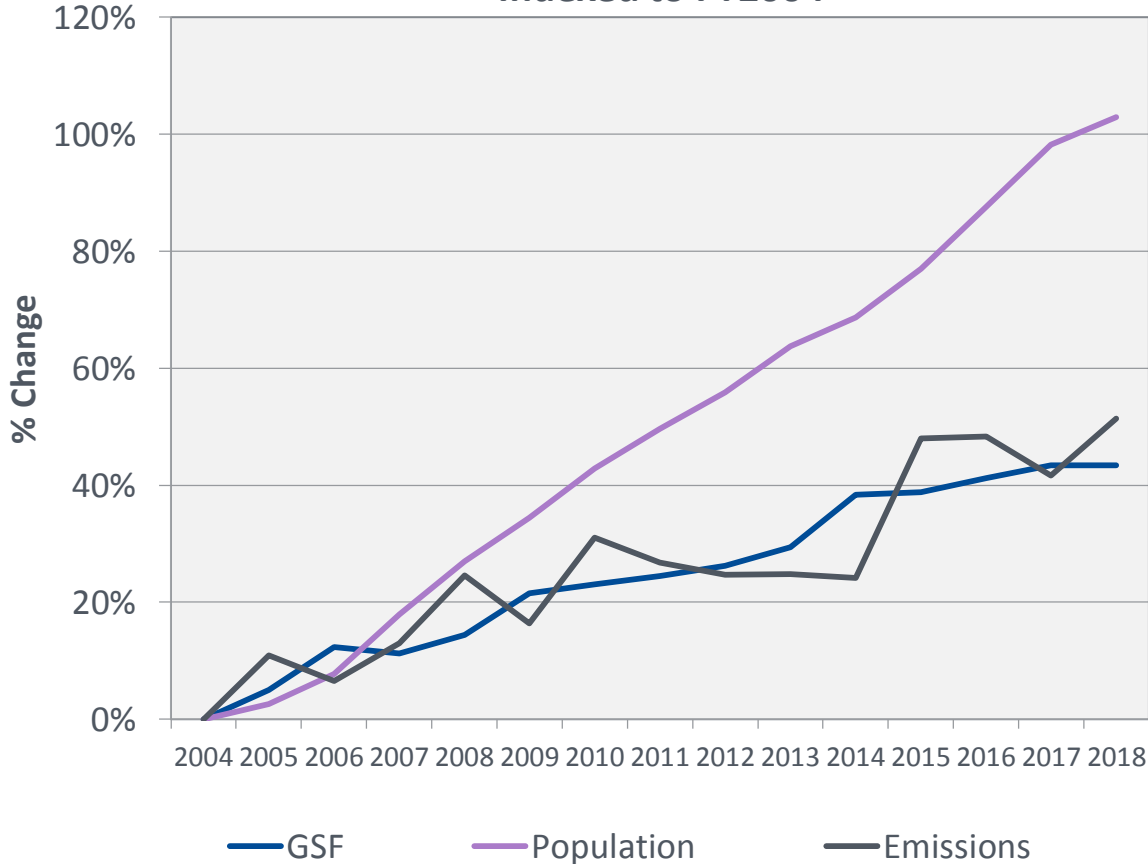
Emissions by Scope



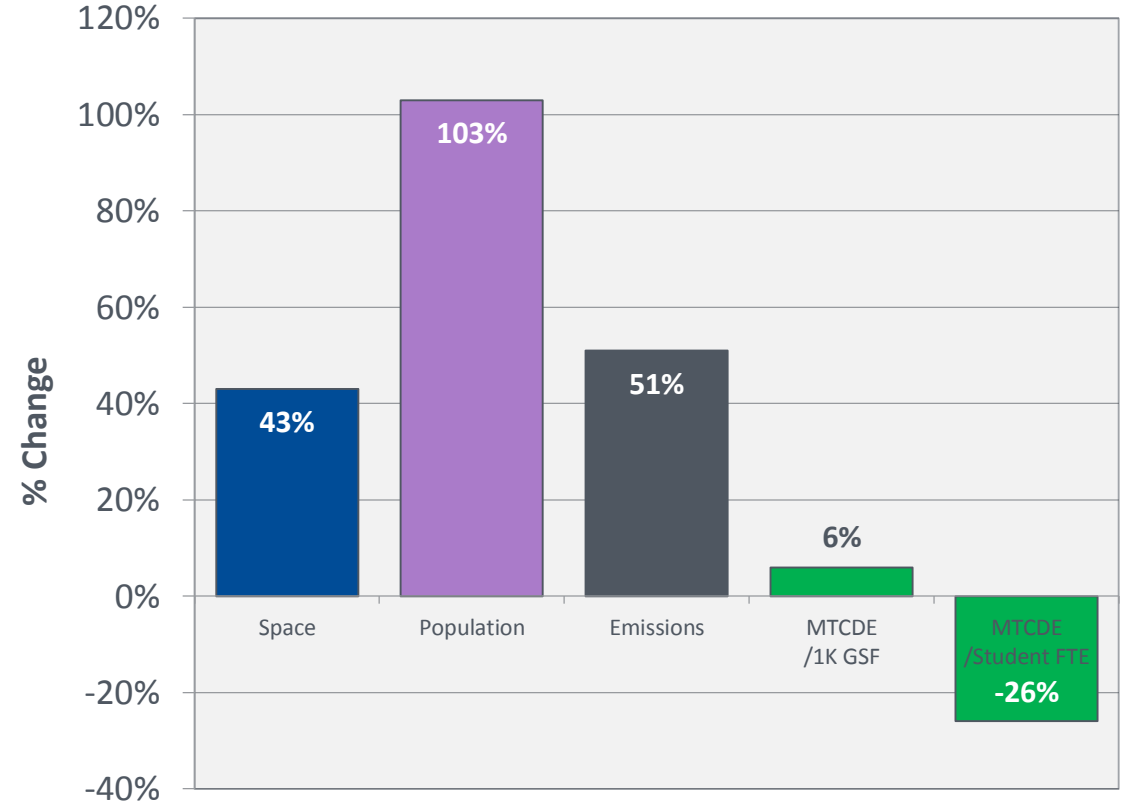
# Stagnant/Decreasing (Normalized) Emissions

Despite rapid, significant campus growth, emissions (when normalized) have decreased

Change in Emissions vs Institution Metrics  
Indexed to FY2004

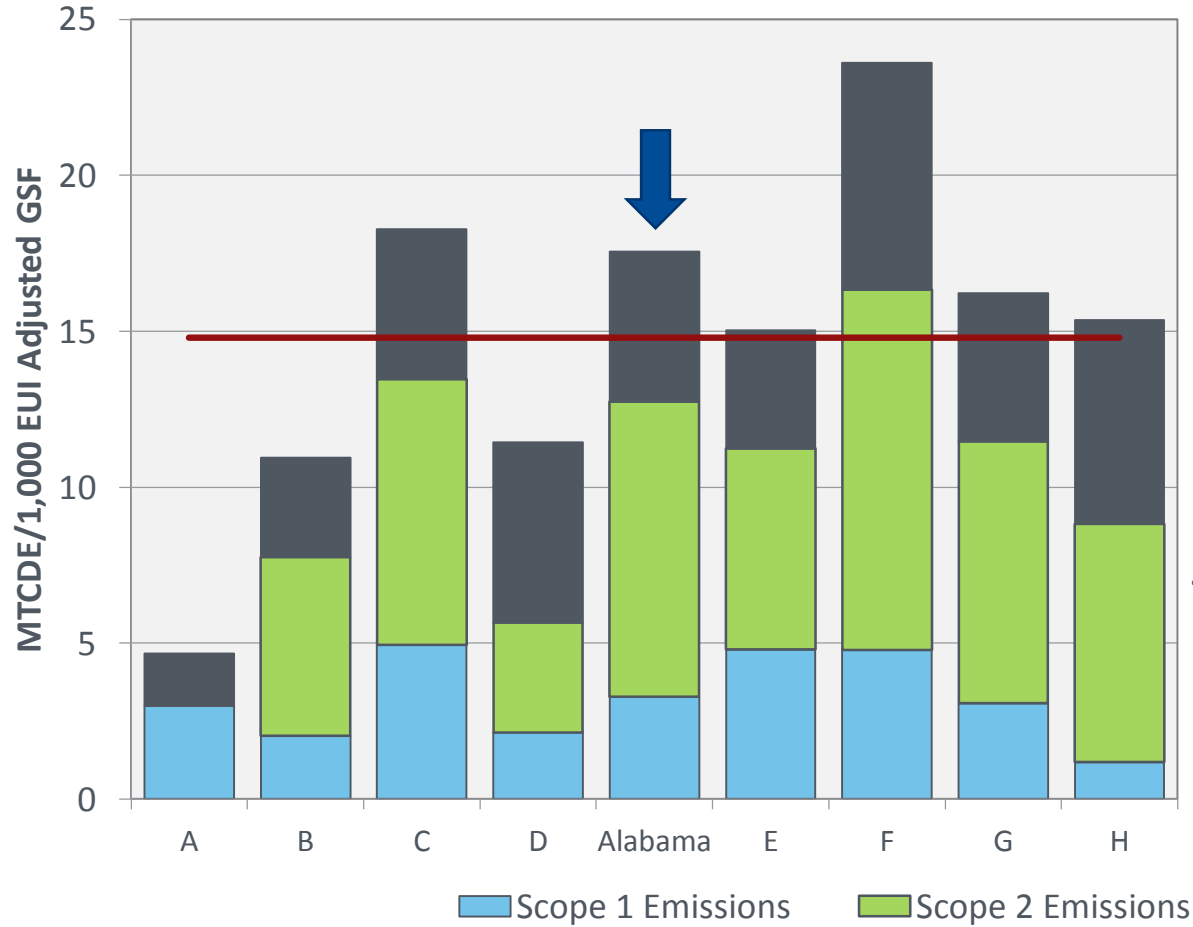


Change in Space, Population, and Emissions  
Indexed to FY2004

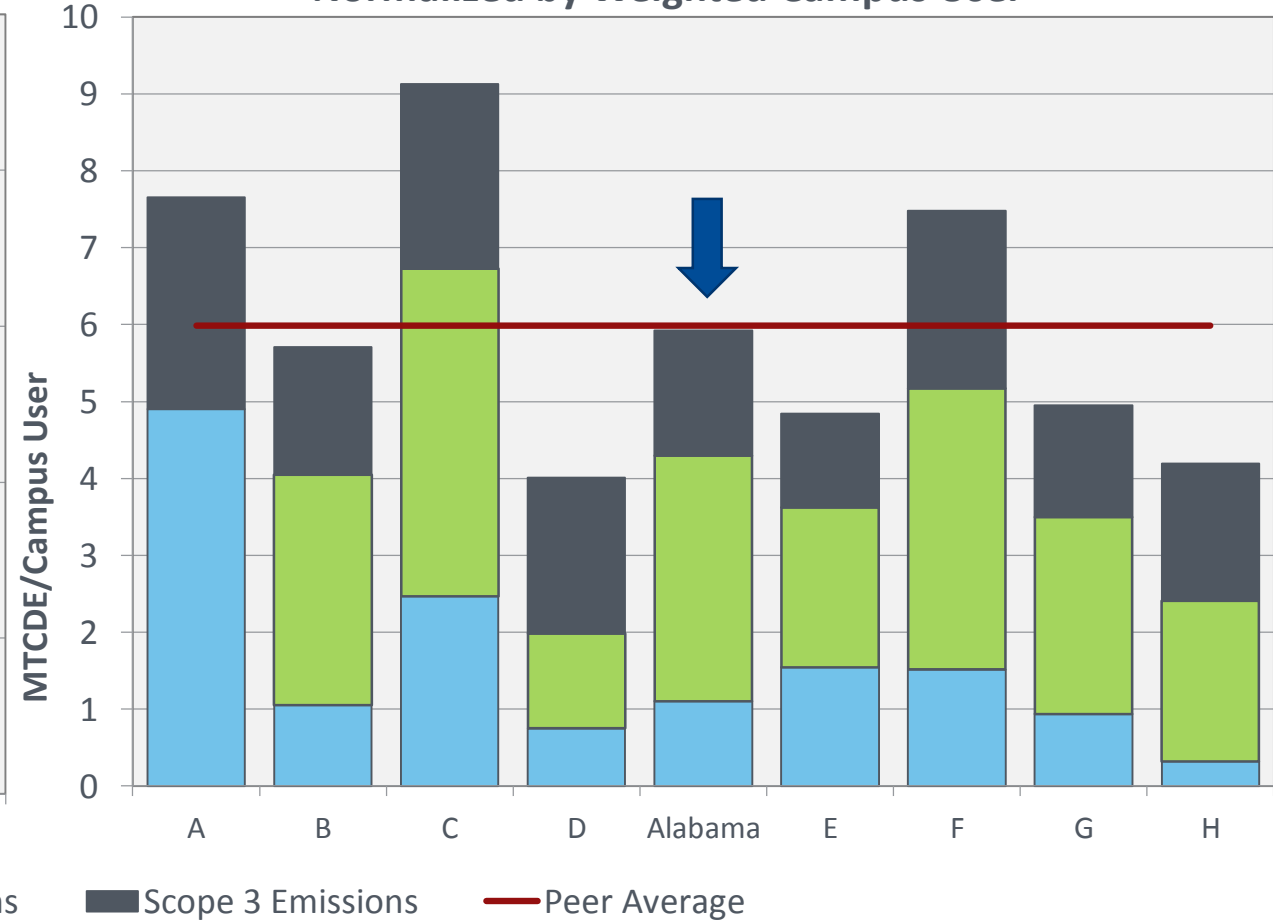


# Tracking Alabama's Total Carbon Footprint

Total Emissions vs. Sustainability Peers  
Normalized by EUI Adjusted GSF

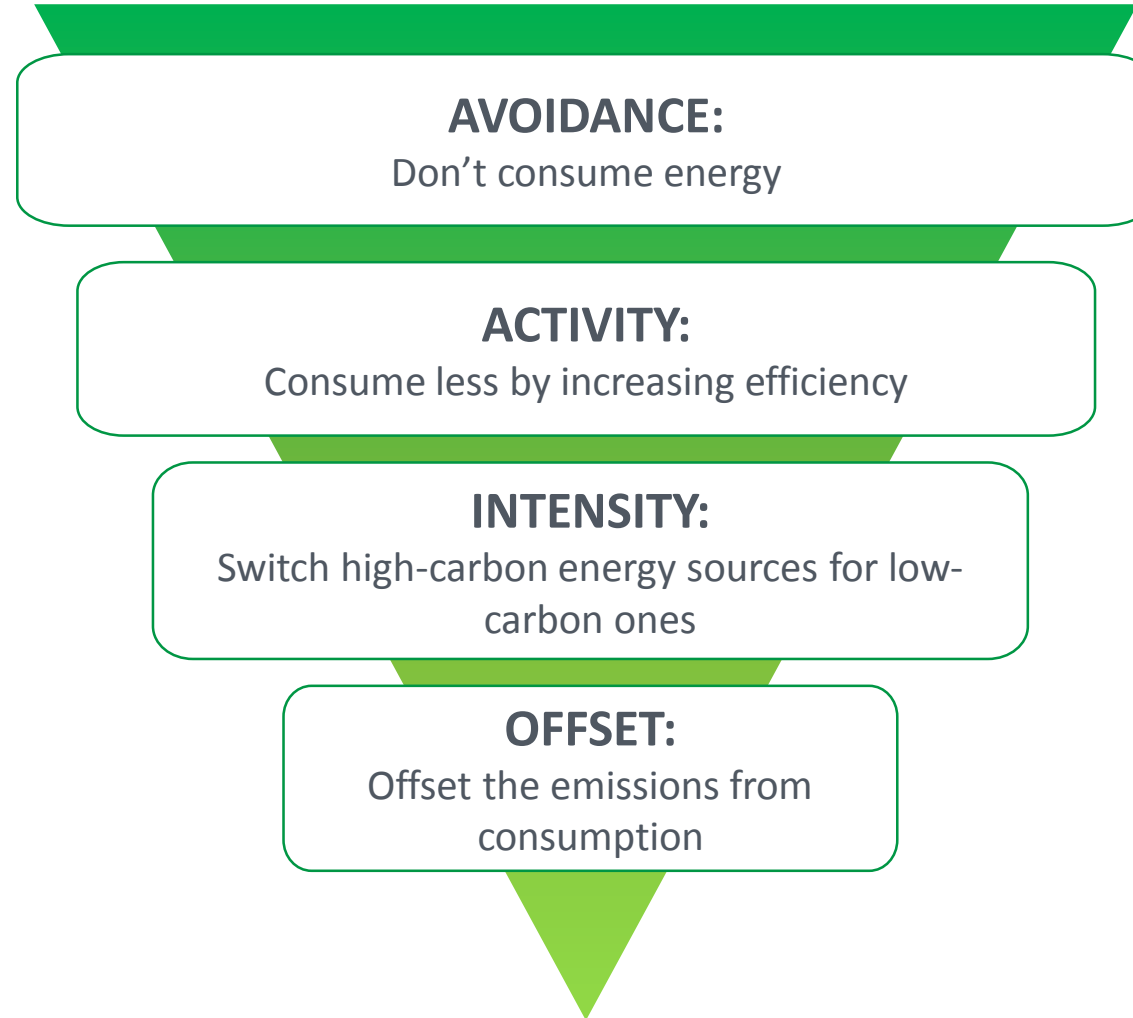


Total Emissions vs. Sustainability Peers  
Normalized by Weighted Campus User



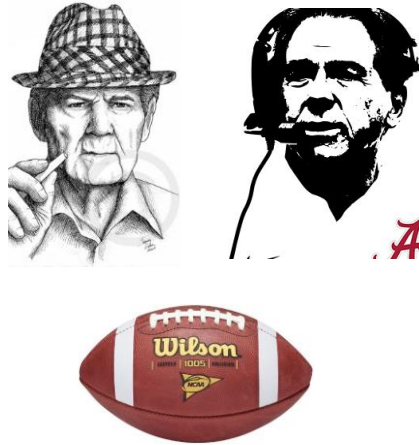
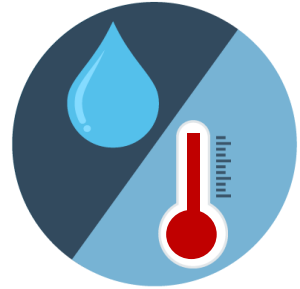


# Carbon Management for Energy



# Perception vs. Performance

## The University of Alabama



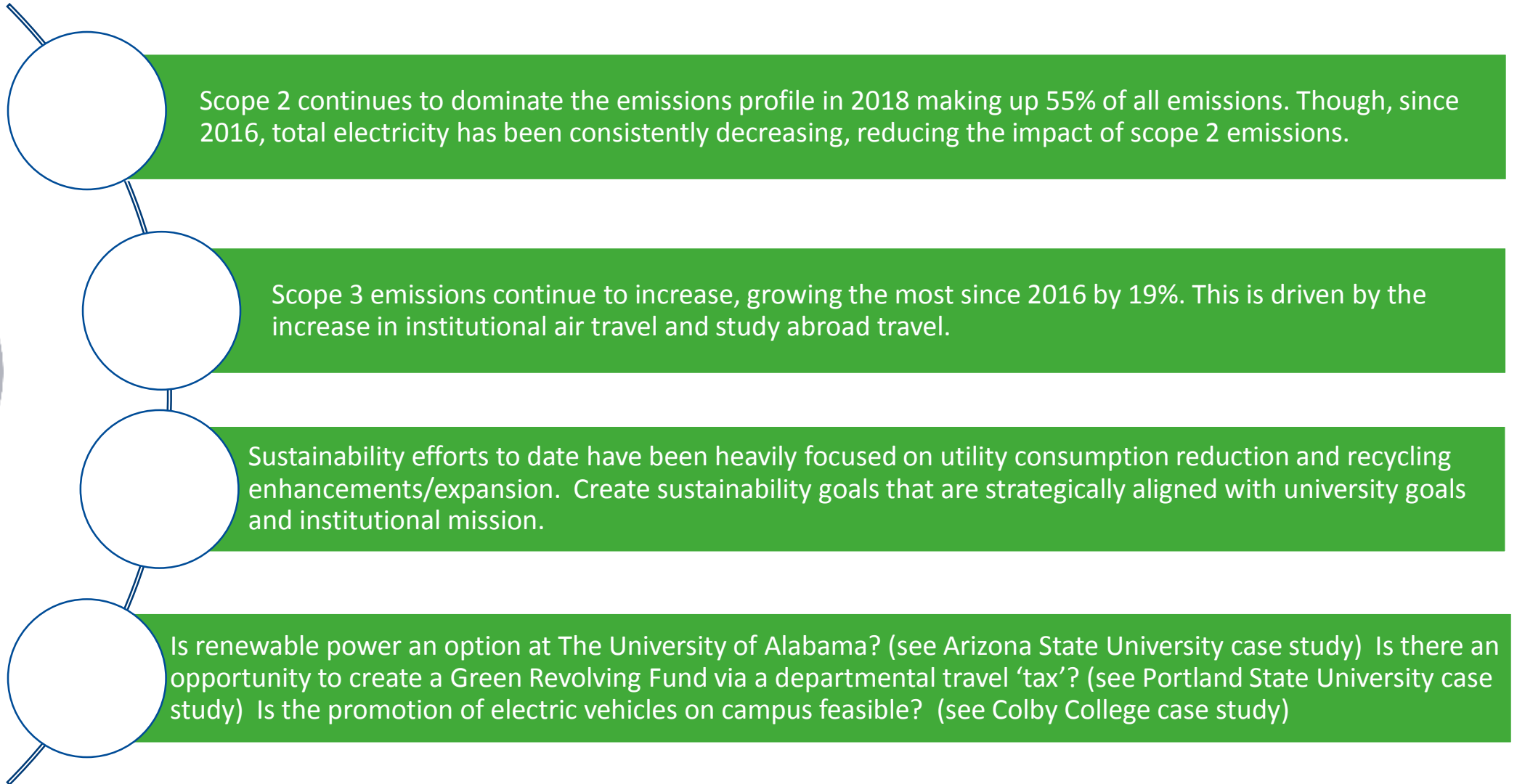
## “Green” Schools

- American University
- Arizona State University
- Babson College
- Emerson College
- George Mason University
- Texas A&M University
- University of San Diego
- University of Vermont



	Alabama	“Green” Schools Avg.	% Difference
BTU/GSF	109,452	101,448	7%
GHG(MTCDE)/GSF(1,000)	17.62	11.76	33%
GHG(MTCDE)/Student	5.94	4.62	22%
Waste Pounds/Student	978*	319	67%
Gallons of Water/Student	6,670	7,688	-10%

# Observations, Recommendations & Considerations





Questions & Discussion

# Appendix I: Selected Case Studies



## *ASU partners with PayPal to purchase power from the 40 megawatt Red Rock Power Plant*

- Power from the plant won't go directly to ASU and PayPal, but the power they purchase from the facility is meant to compensate for traditional utility-grid power used at their facilities.
- The Red Rock Power Plant is on 400 acres of land near the Saguaro natural-gas fired power plant. The location allows the solar facility to take advantage of existing transmission lines and utility infrastructure.
- The plant has solar panels on tracking devices to follow the sun from east to west across the sky. Its 40-megawatt capacity is enough electricity to power about 10,000 homes at once, when sun is shining on the panels.



<https://www.azcentral.com/story/money/business/energy/2017/01/11/aps-dedicates-solar-plant-near-tucson-power-paypal-arizona-state-university/96449650/>



*Over 50 MW equivalent solar generating capacity development from both on-site and off-site components.*

- **On-site Program Milestones as of June 30, 2018**

- **Solar Generation Capacity:** 24.1 MW equivalent
- **Solar kWh Equivalent FY 2018:** 39,616,262
- **Solar Systems:** 89
- **PV Panels Installed:** 82,456
- **CPV Modules Installed:** 8,652
- **Solar Collectors Installed:** 7,840
- **Shaded Parking Spaces:** 5,952
- **Shaded Stadium Seats:** 828

- **Off-site Program Milestones as of June 30, 2018**

- The ASU Red Rock Solar Project is a collaboration between ASU and APS in which APS constructed and operates a solar energy generating facility at Red Rock, Arizona. Beginning January 2017, ASU has committed to purchase 65,000 MWh per year of solar-generated electricity from APS.
- **Solar Generation Capacity:** 28.8 MW
- **Solar kWh FY2018:** 65,000,004
- **PV Panels Installed:** 91,440

- Travel Offset Program: program designed to mitigate university business travel
  - Voluntary program that charges participating departments a fee of 2% of their total travel expenses. The funds are then allocated to the Green Revolving Fund for efficiency upgrades on campus
- Green Revolving Fund: supports energy reduction and climate action goals while further advancing PSU's leadership in sustainable practices.
  - The fund is used to implement efficiency projects and is reimbursed through savings in the campus utilities budget.
  - The fund was set up in 2013 with \$500,000 using funds allocated by the State of Oregon to PSU for capital improvements. An additional \$489,000 was added in 2014, and \$517,729 in 2015, with savings from the university's utility budget.
  - As of June 2015, \$45,000 have been added from Energy Incentive Rebates (\$44,900) through the Energy Trust of Oregon, and a voluntary travel offset program (\$150) for PSU departments.
  - In total, \$1,551,779 as been allocated to the fund so far.
- Climate Champions: is designed to promote and recognize resource conservation and stewardship within PSU departments, as well as to support the goals of our Climate Action Plan. The program includes an assessment that departments use to track their progress on sustainable best practices for the workplace.





# Colby College – Sustainable Transportation

- 6 Electric vehicle (EV) stations located around campus
- Reserved parking spots throughout campus for low emissions vehicles (LEVs)
- Colby Shuttle: provides service between downtown Waterville and the campus on Mayflower Hill
- Jitney: free student driven taxi provides daily service to anywhere in Waterville
- ZipCar: Colby owns 3 ZipCars. Can be used by both students and employees. Online signup and hourly fee to use ZipCar which includes gas
- iBike: Began in 2008, program offers free bike loans to students and employees. Bikes come with helmet and lock and may be checked out for up to 24 hours at a time.
- Rideboard: Students can post asking for and offering rides to help promote carpooling and assist students without cars get to where they need to go
- Weekend Shuttle
- Airport Shuttle





- Installed rainwater harvesting system to capture and use rainwater for indoor use
- The system stores and cleans rainfall that falls on two of the school's residence halls
- The purpose of the system is to use the water for washing machines, toilet flushing, and landscape irrigation.
- One tank of rainfall provides enough water for 2,991 loads of laundry, 27,343 toilet flushes, or 31 days of irrigation.

# Appendix II: Glossary of Terms



# Glossary of Terms

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- **Scope 1 (direct)** – Emissions from the power sources owned or controlled by the institution, including on-campus stationary fossil fuel sources; mobile sources, such as the vehicle fleet; and fugitive sources, such as refrigerants and fertilizer
- **Scope 2 (indirect)** – Indirect emissions from sources that are neither owned nor operated by your institution but whose products are directly linked to on campus energy consumption. This includes purchased energy: electricity, steam, and chilled water.
- **Scope 3 (indirect)** – Any other indirect emissions, including commuting by faculty, staff and students, air travel by faculty, paper, solid waste, wastewater, research animals and scope two transmission and distribution losses
- **Global Warming Potential (GWP)**- a relative measure of how much heat a greenhouse gas traps in the atmosphere. It compares the amount of heat trapped by a certain mass of the gas in question to the amount of heat trapped by a similar mass of carbon dioxide.
- **MTCDEs (Metric Tons of Carbon Dioxide Equivalent)**- The carbon footprint is reported in metric tons of carbon dioxide equivalents (CO<sub>2</sub>e)<sup>5</sup>. This measure includes all six greenhouse gases, which are converted to CO<sub>2</sub>e based on their 100-year global warming potential
- **Density Factor**- A measure of the amount use the campus buildings receive on a daily basis/The number of campus users per 100,000 GSF
- **Technical Complexity**- the relative mechanical complexity of the campus on a scale of 1-5