sightlines | sustainability solutions

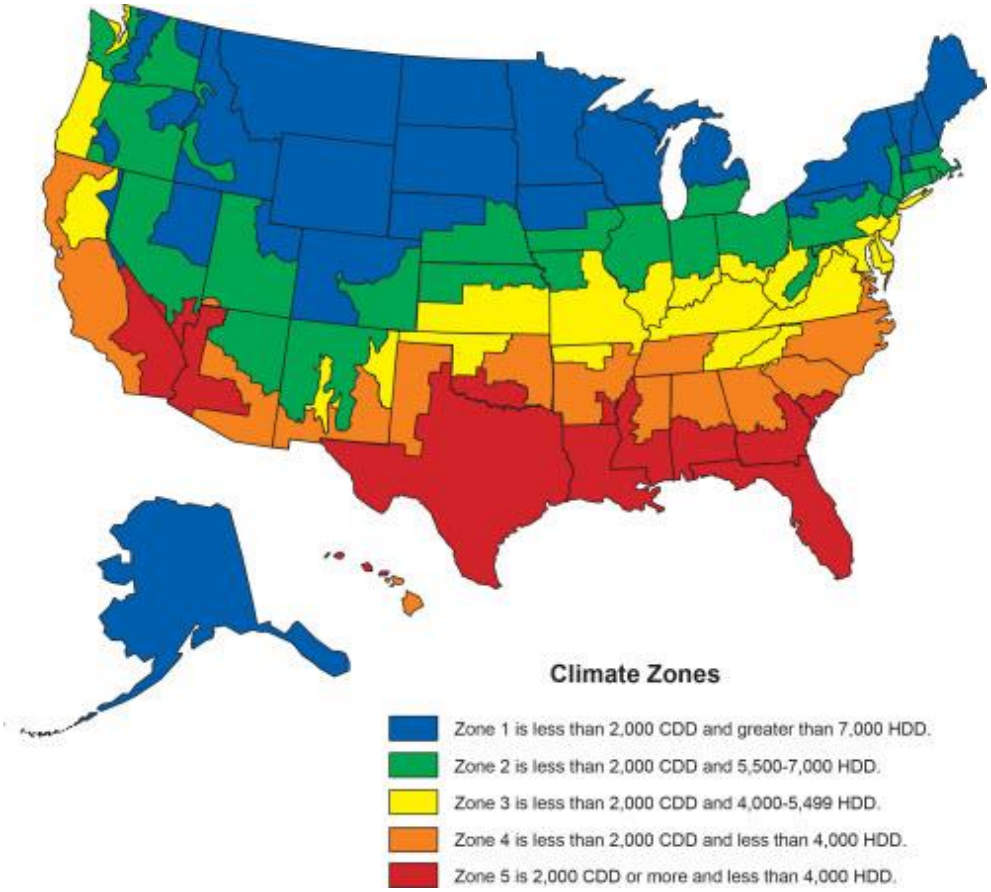
Clemson University

Presenters: Gayle Perez & Matthew Lee

December 2016

Vanderbilt University
Virginia Commonwealth University
Virginia Department of General Services
Wagner College
Wake Forest University
Washburn University
Washington University in St. Louis
Wellesley College
Wesleyan University
West Chester University
West Liberty University
West Virginia Health Science Center
West Virginia Institute of Technology
West Virginia School of Osteopathic Medicine
West Virginia State University
West Virginia University
Western Connecticut State University
Western Oregon University
Westfield State University
Wheaton College
Widener University

Developing a Peer Group for Clemson



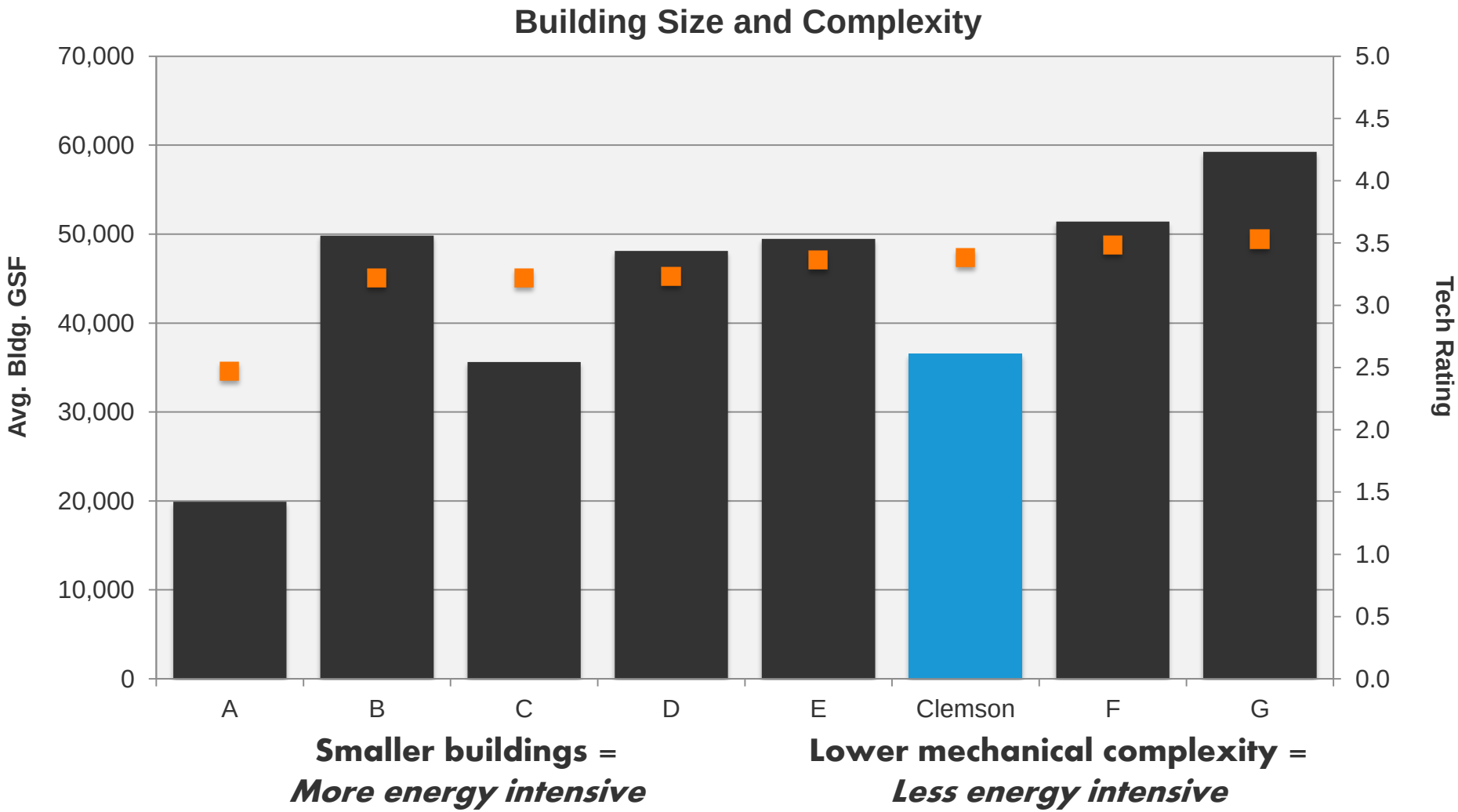
Peer Institutions
George Mason University
Nova Southeastern University
The University of Alabama (Tuscaloosa)
The University of Tennessee - Knoxville
University of Arkansas
University of Vermont
Virginia Commonwealth University

Peer Group Based On:

- Size
- Technical Complexity
- Climate Zone
- Percent of Residential Students

Clemson Operating with Similar Bldg. Complexity

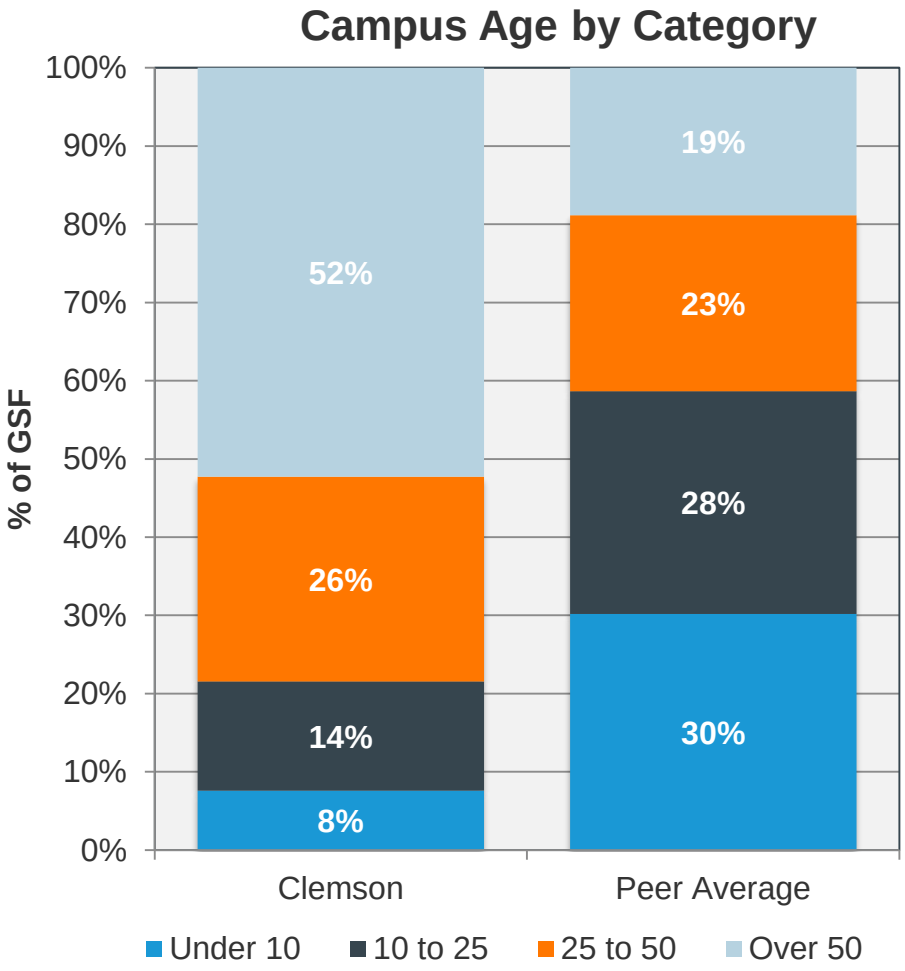
Clemson's average building size aligns with peers

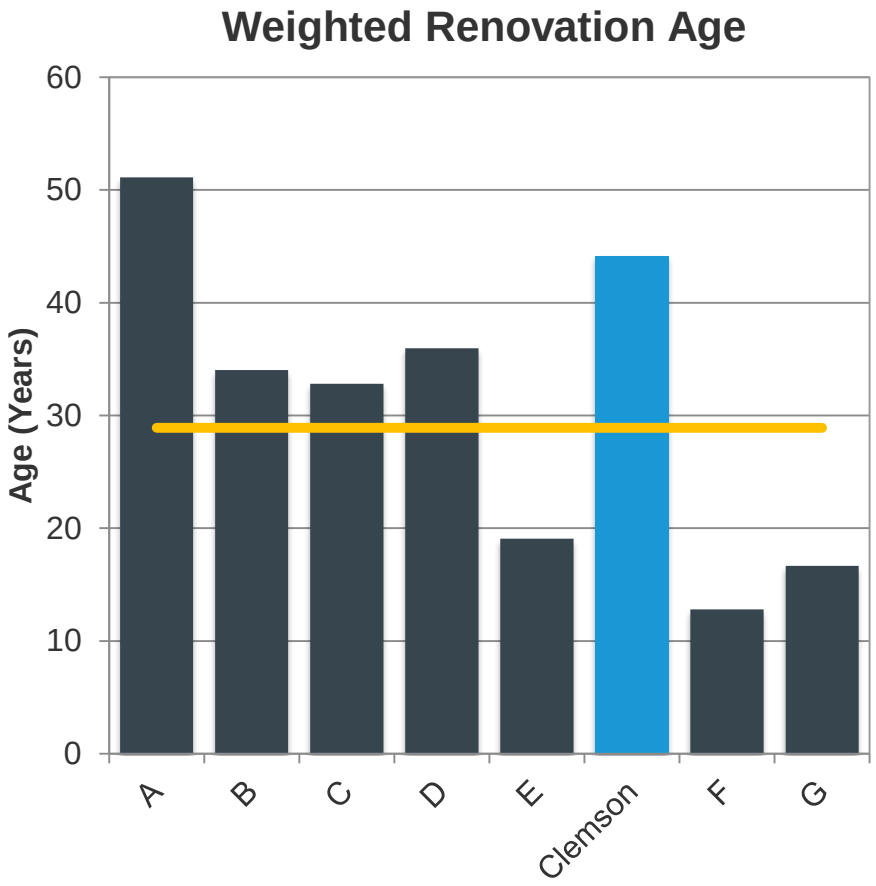


Sorted by Tech Rating

Providing Peer Context

Clemson Operating with space 37% older than peers

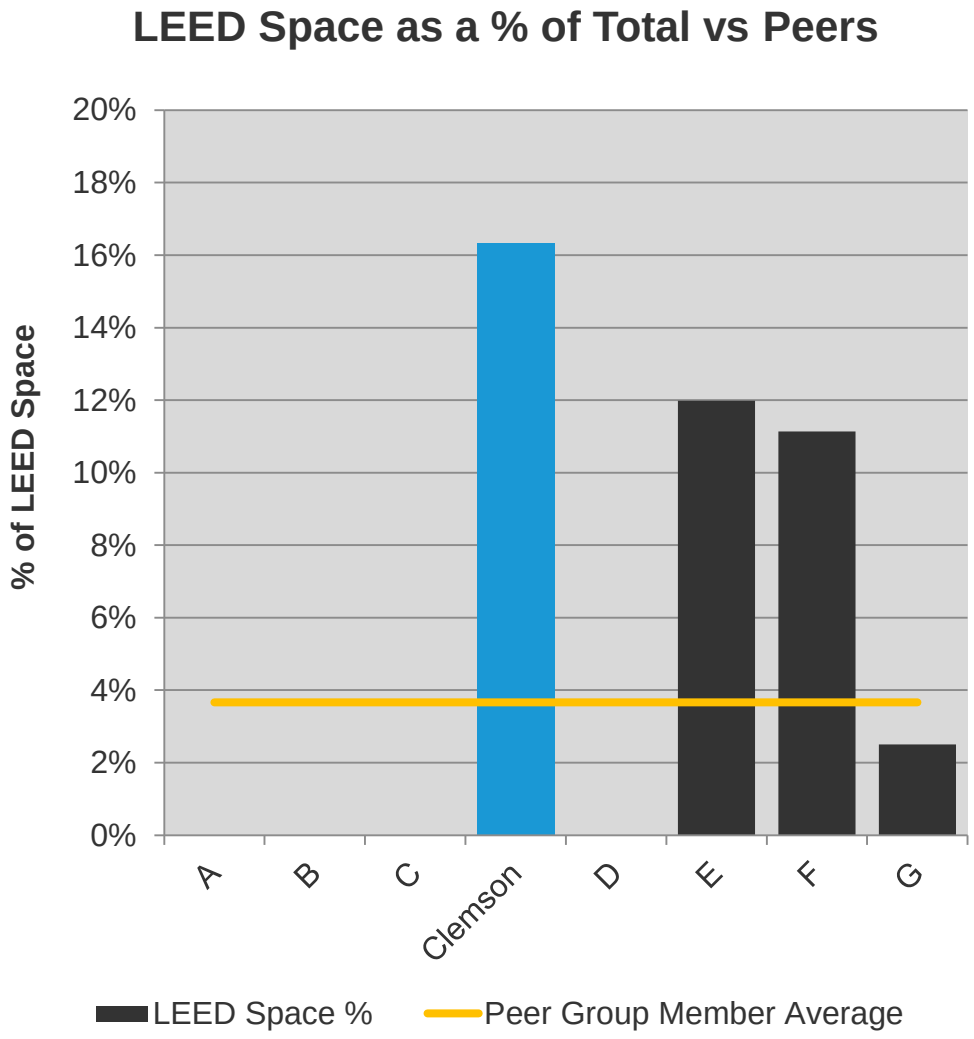




Older buildings =
Higher energy consumption

Progress Toward Goals – LEED Construction

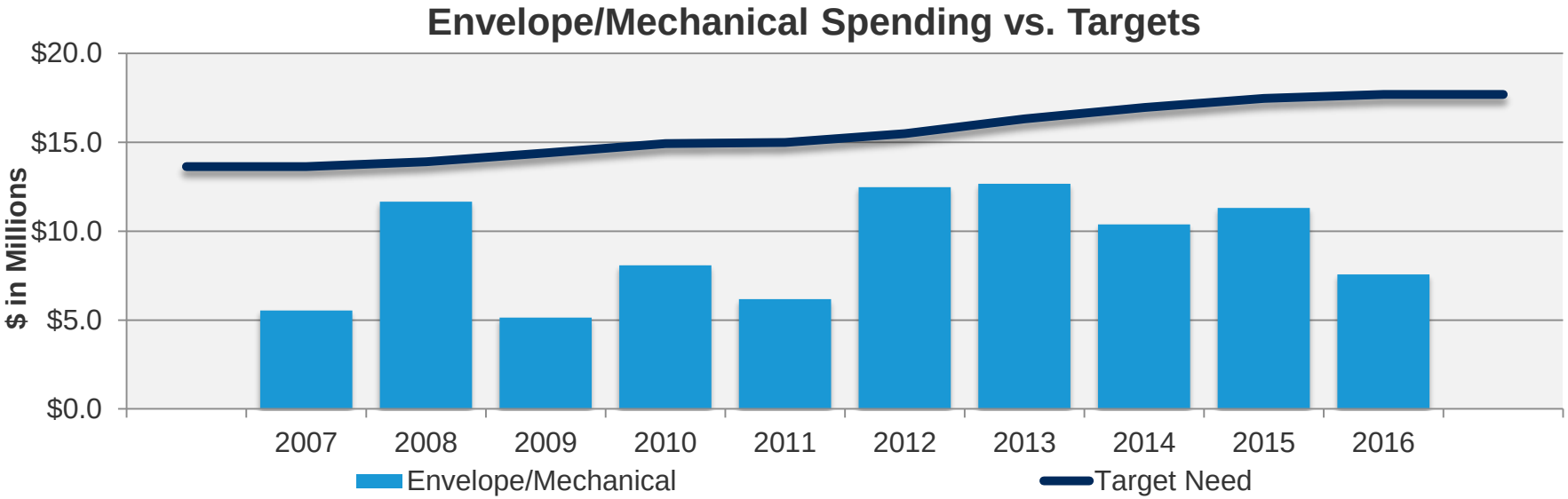
Clemson has built more LEED-certified space than all of its peers

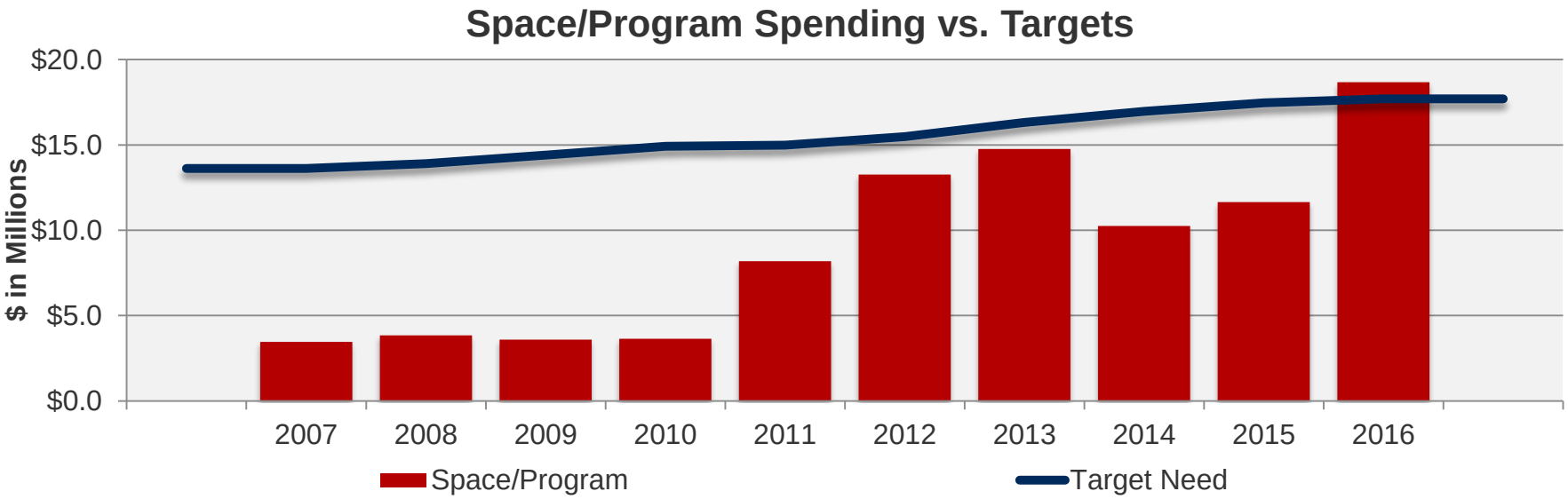


Clemson LEED-Certified Building Examples:

- Rhodes Engineering Addition (Gold)
- Packaging and Design Building (Gold)
- Watts Innovation Family Center (Silver)
- Lee Hall III (Certified)

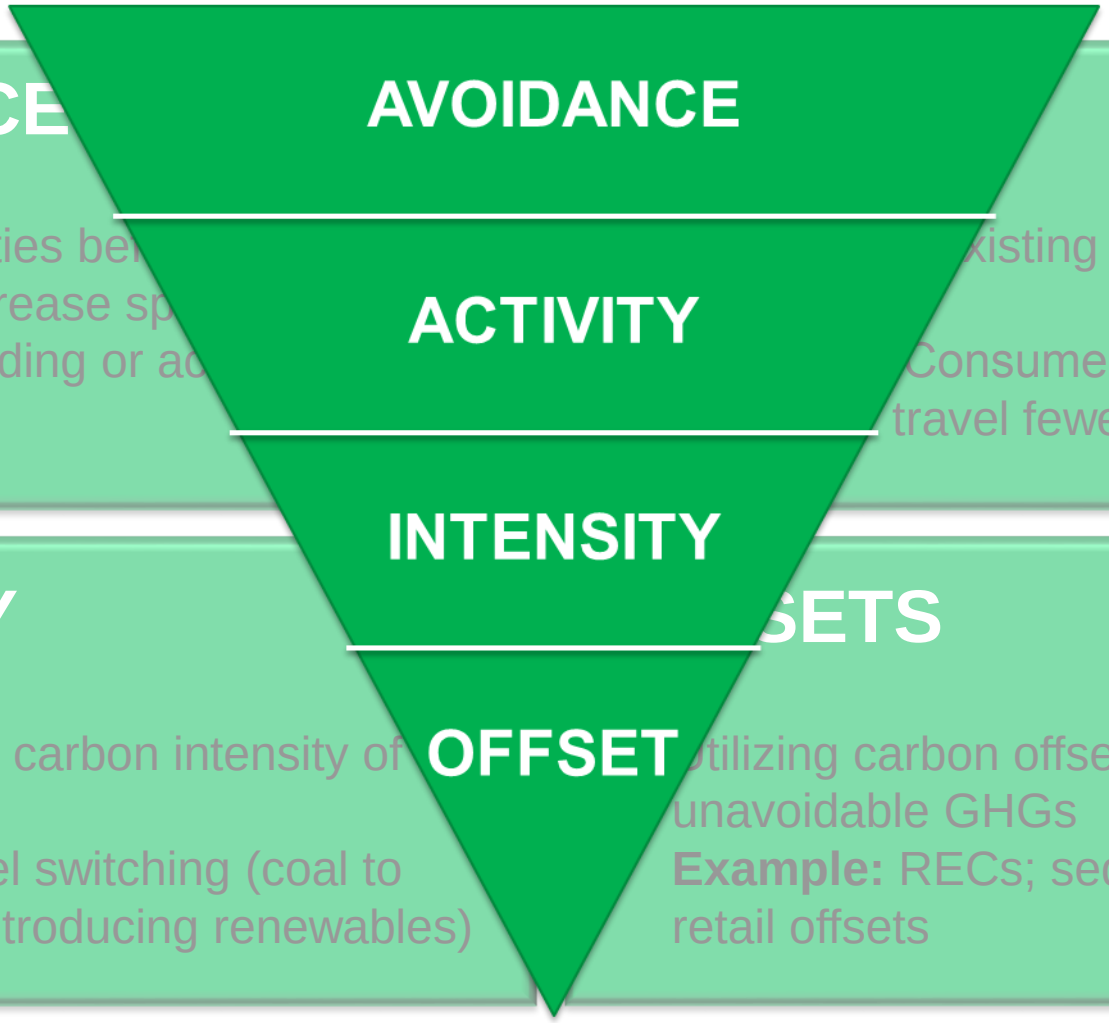
Phases of Funding Distribution





Greenhouse Gas Inventory

Carbon Mitigation Structure



AVOIDANCE

- Prevent activities be
- **Example:** Increase sp
  instead of building or ac
  space

isting level of an

Consumer fewer BTUS' of
travel fewer miles

INTENSITY

- Lessening the carbon intensity of activities
- **Example:** Fuel switching (coal to natural gas; introducing renewables)

SETS

tilizing carbon offsets to neutralize unavoidable GHGs

Example: RECs; sequestration; retail offsets

Simplifying GHG Sources into Scopes

All expressed as metric tons of carbon dioxide equivalent (MTCDE)

Scope 1 – Direct GHGs

- On-Campus Stationary Combustion (Natural Gas)
- Vehicle Fleet
- Agriculture
- Refrigerants

Scope 2 – Upstream GHGs

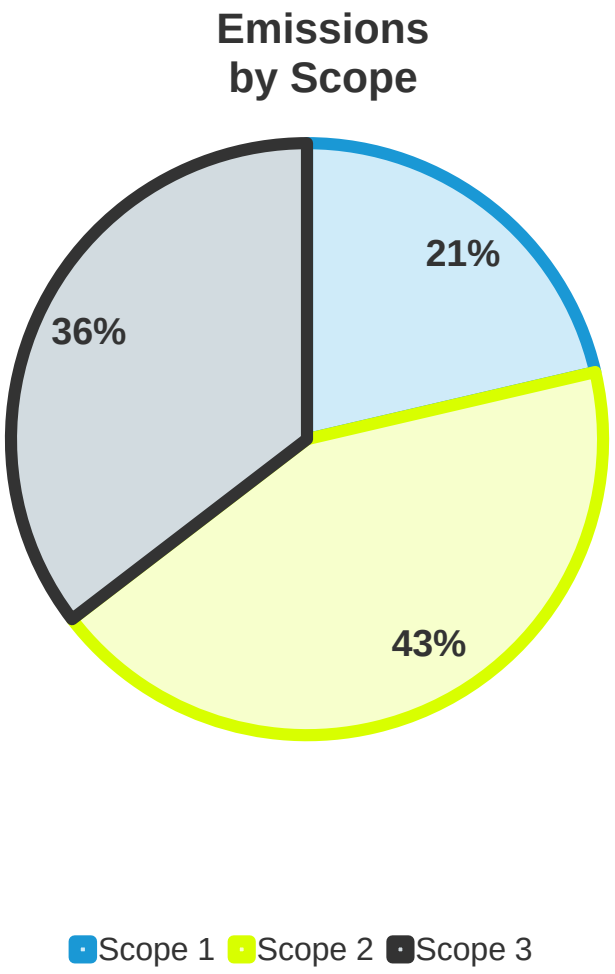
- Purchased Electricity

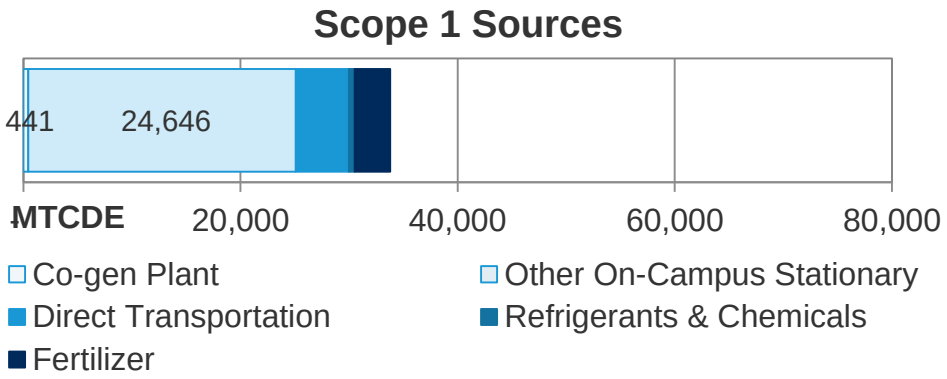
Scope 3 – Indirect GHGs

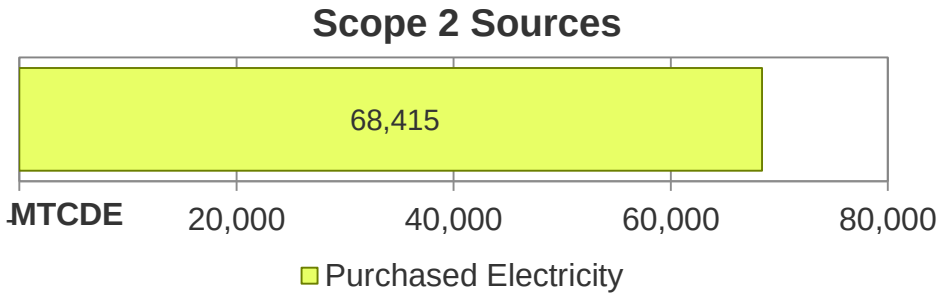
- Employee / Student Commuting
- Employee Air Travel
- Student Study Abroad Travel
- Solid Waste
- Wastewater
- Purchased Paper
- Transmission & Distribution Losses

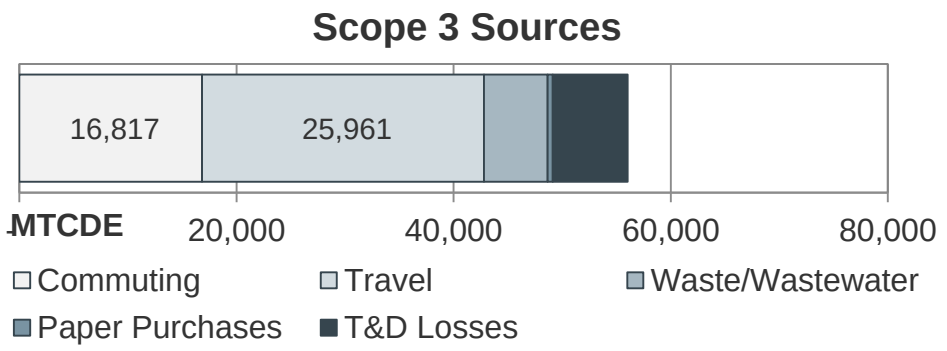
Distribution of Emissions by Level of Control

Majority of emissions result from purchased electricity



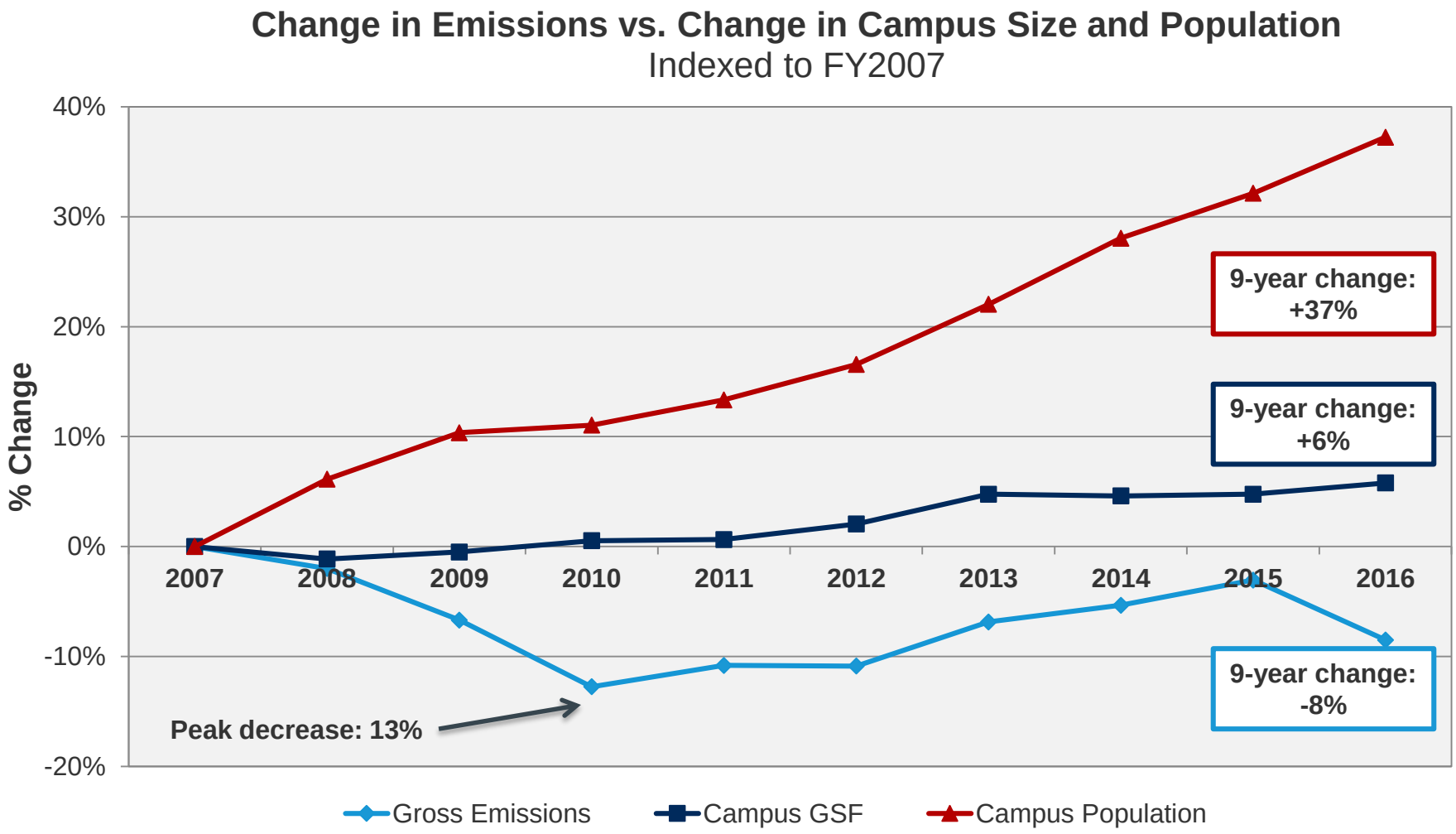






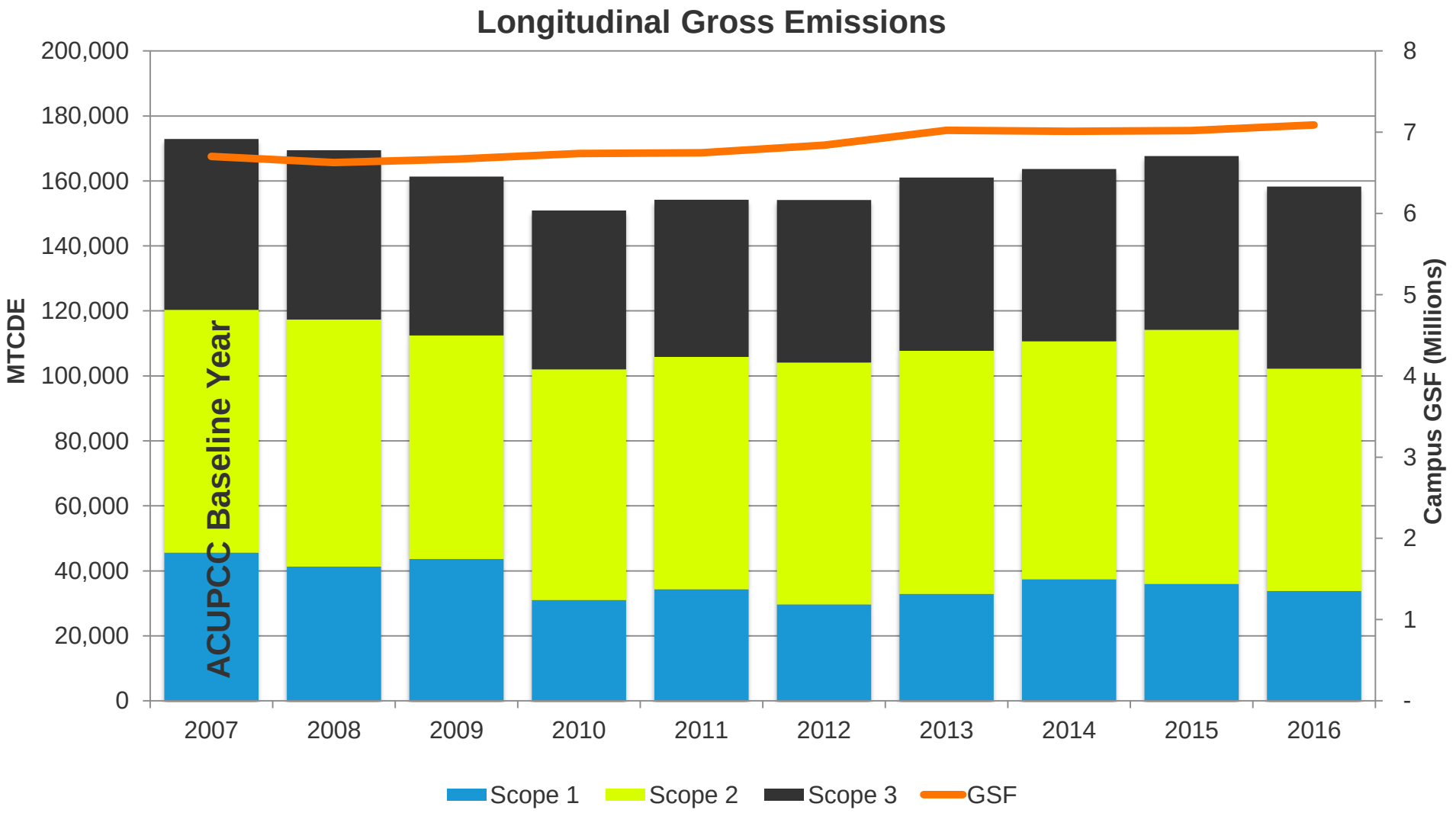
Gross Emissions Decreased Against 2007 Baseline

Despite increase in population, Clemson successful in continuous emissions decrease



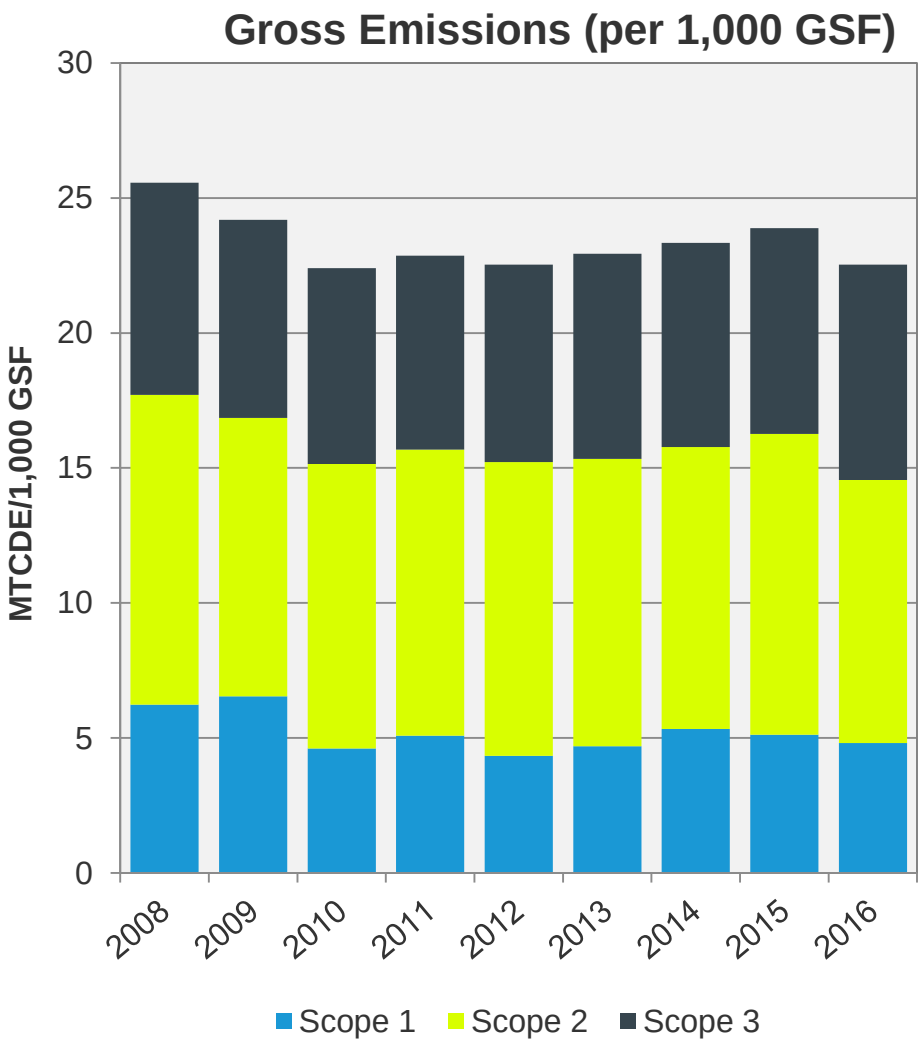
Total Gross Emissions

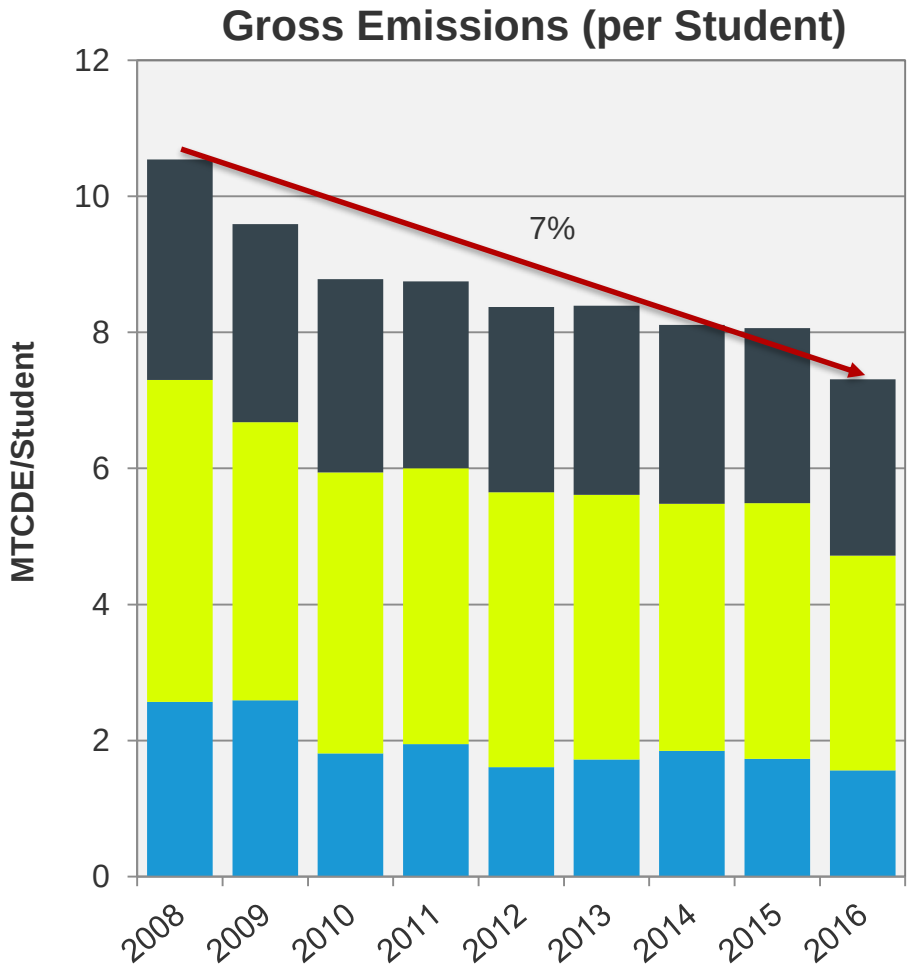
Decrease in overall emissions, despite growth in space



Normalized Gross Emissions

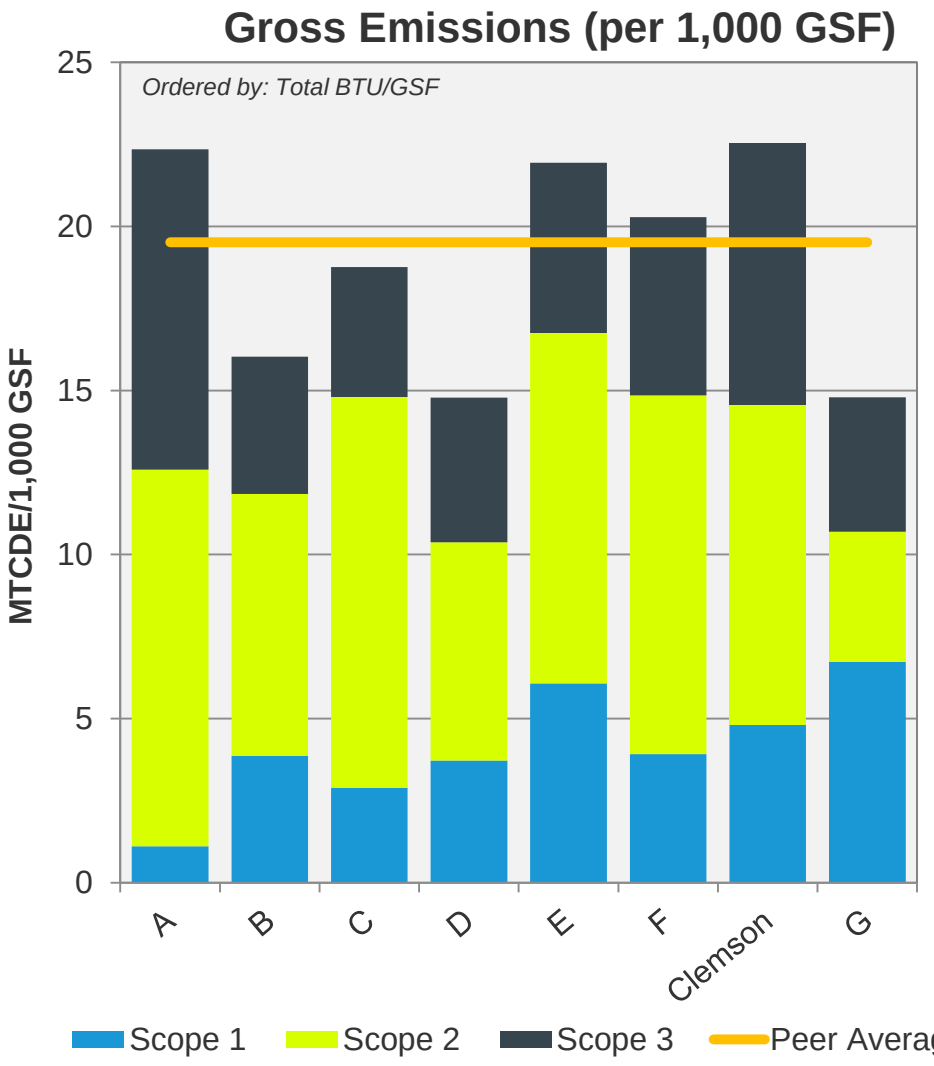
Clemson's gross emissions have decreased since FY2008

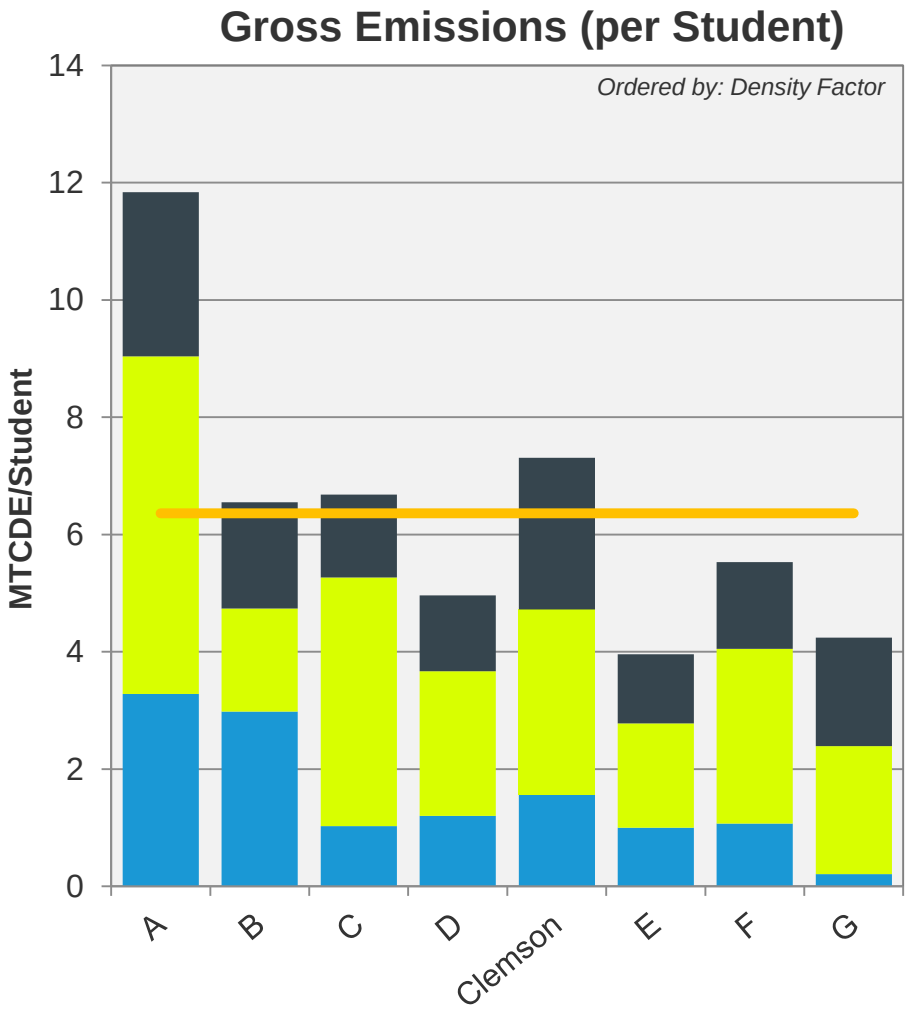




Gross Emissions Compared to Peers

Clemson has higher gross emissions than peer average





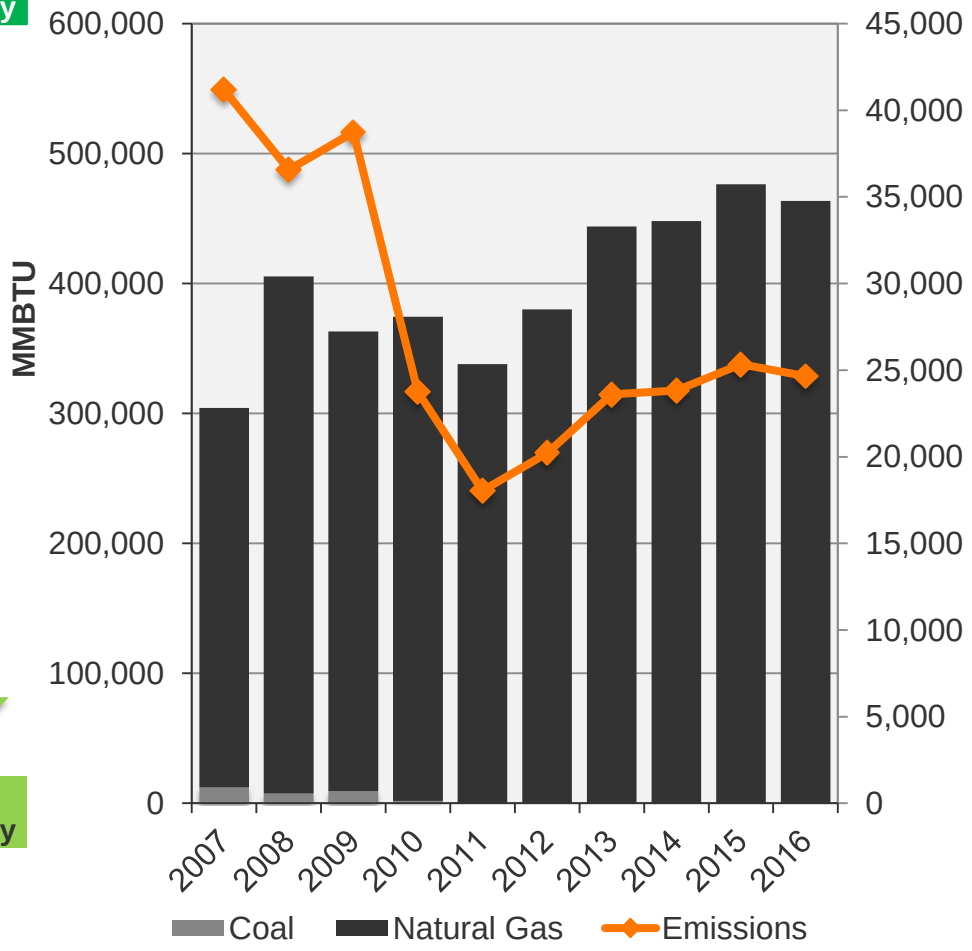
Scope 1

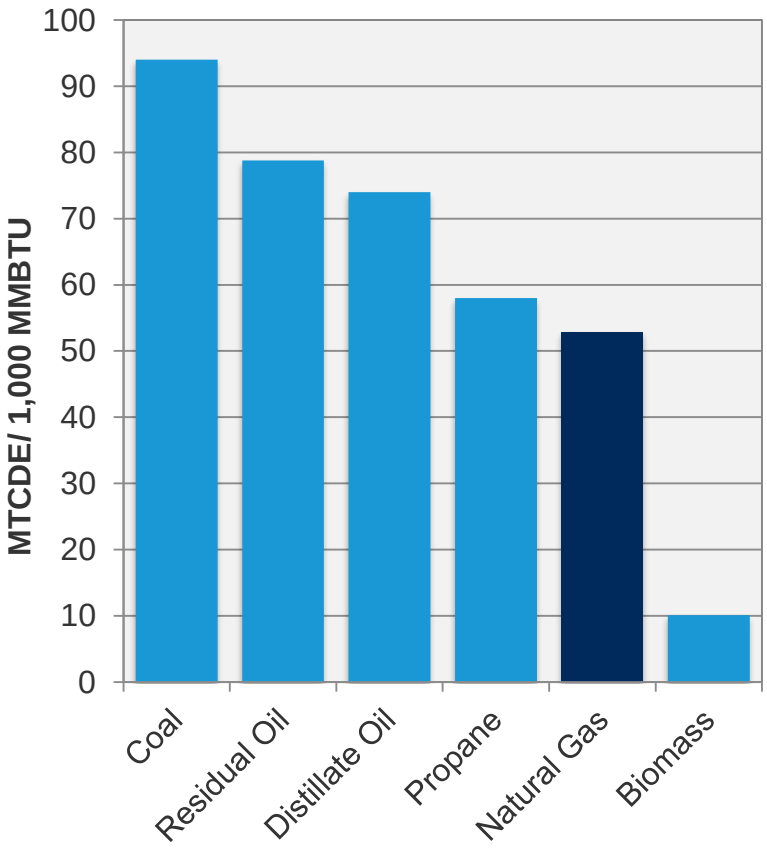
Scope 1 Stationary Emissions

Clemson has lower Carbon Intensity after switching to 100% Natural Gas

More Activity

Less Activity

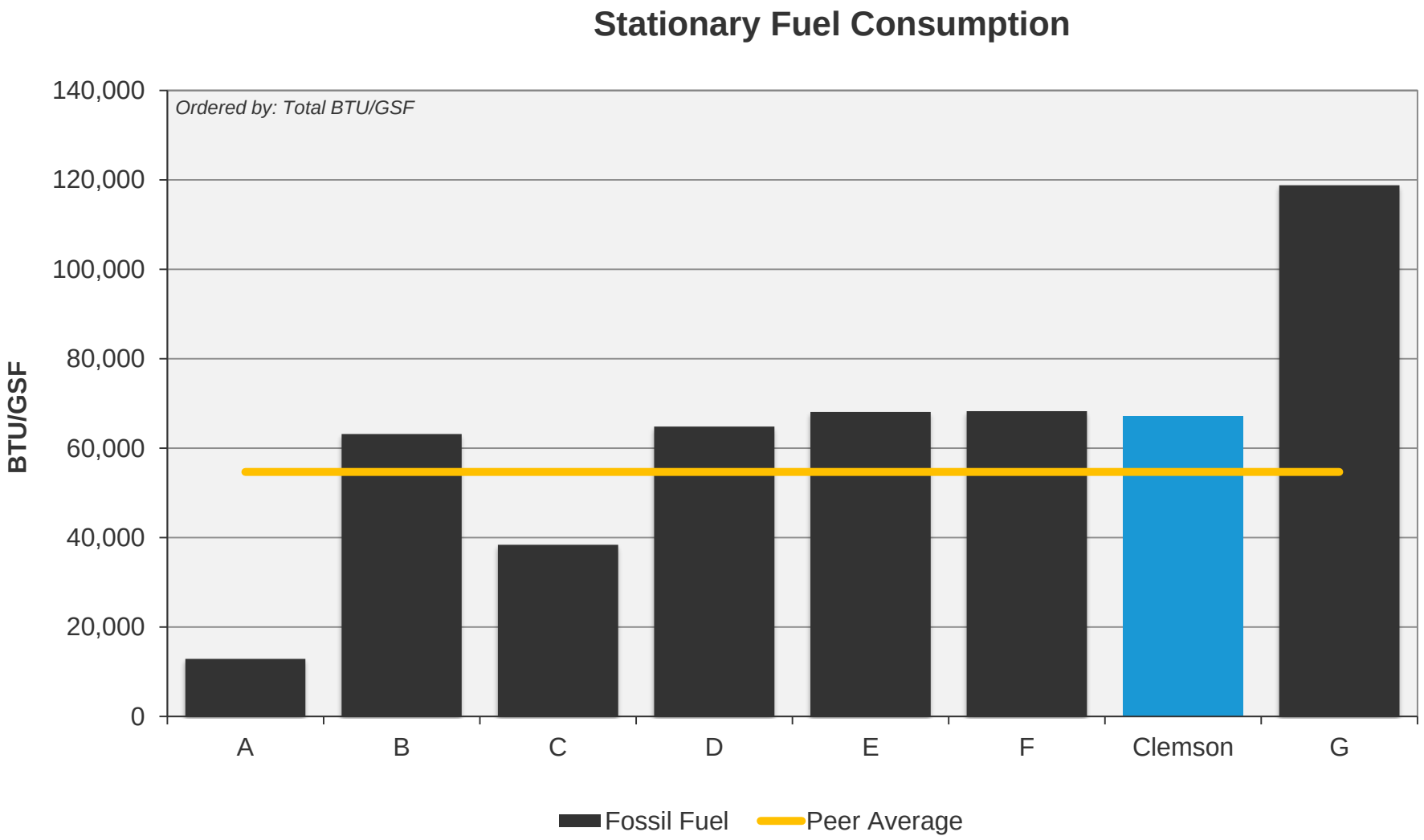




More Intensity → Less Intensity

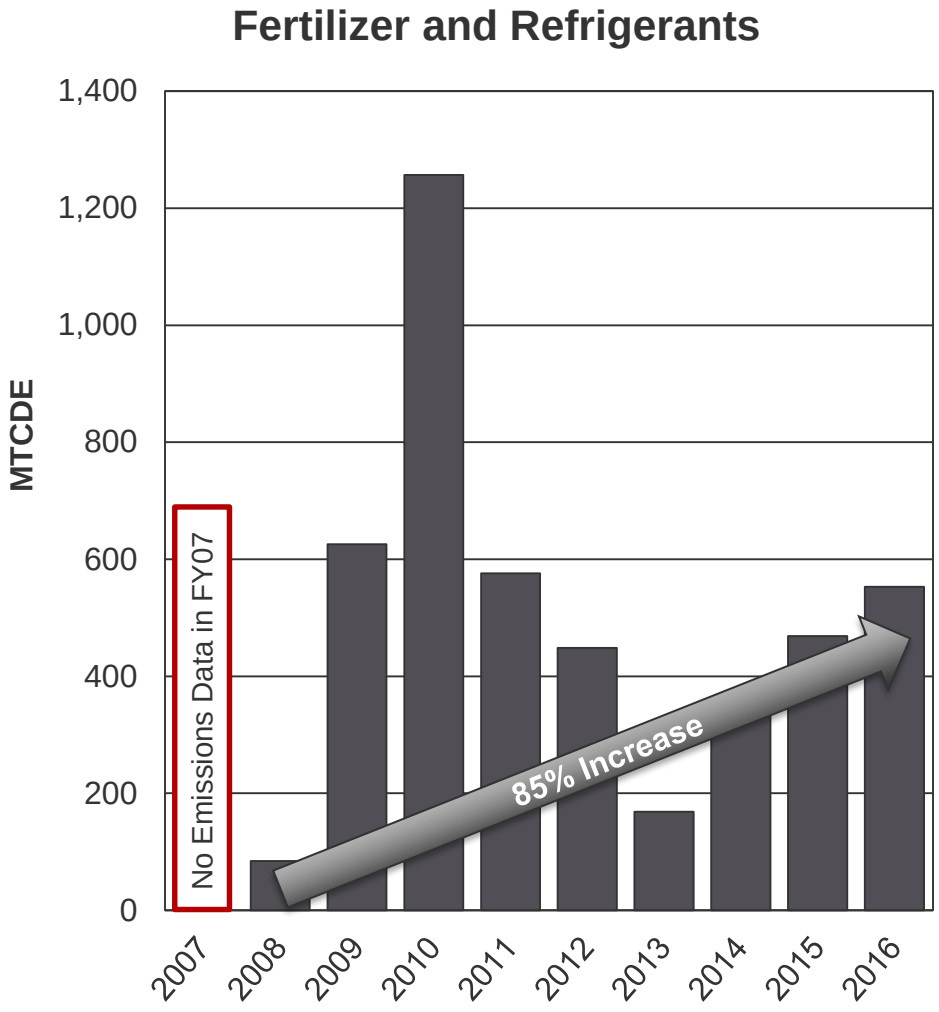
Total Stationary Fuel Consumption

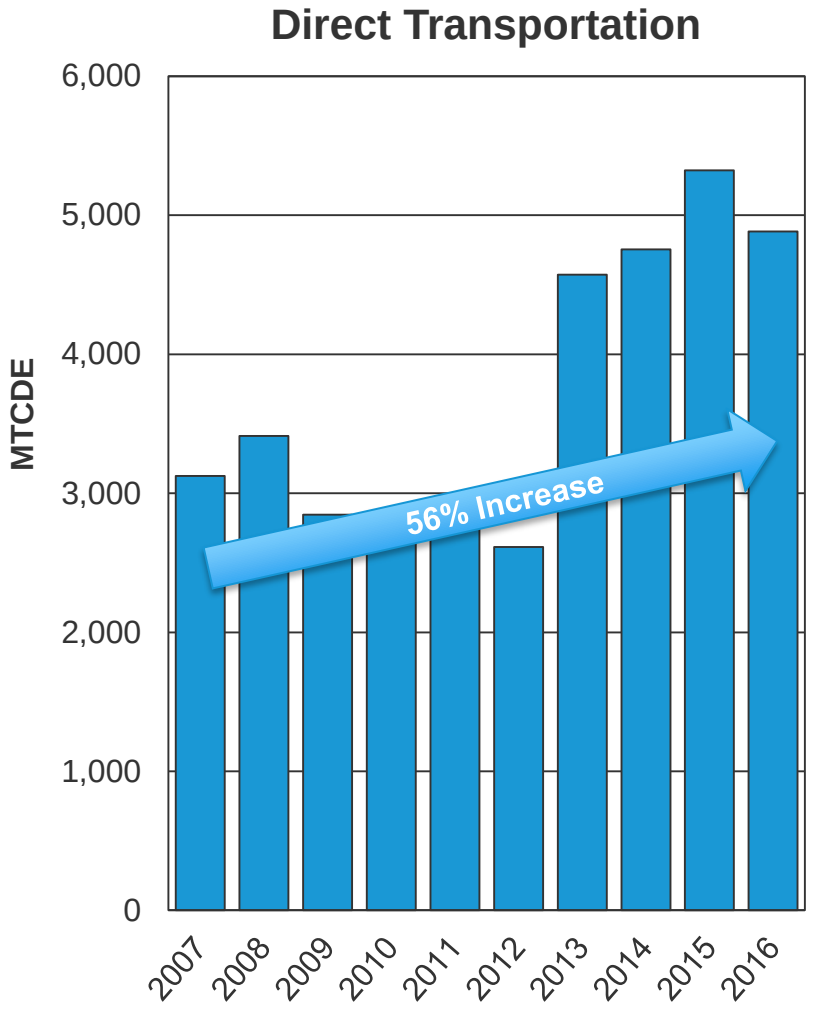
Clemson above peer average in Stationary Fuel Consumption



Other Scope 1 Emissions

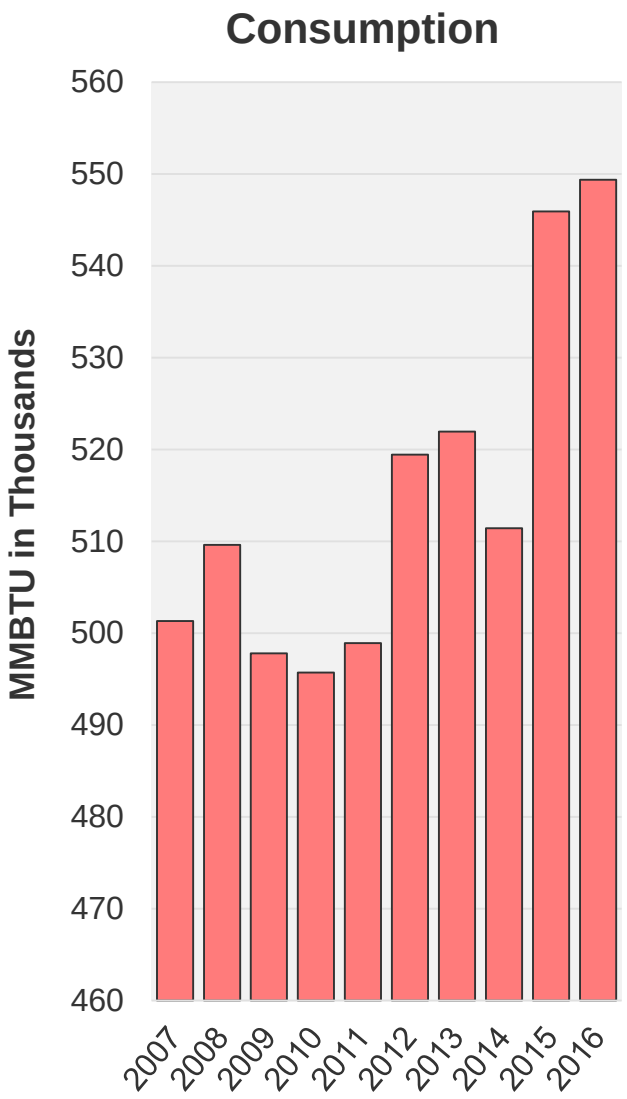
Options for future fuel switching are limited

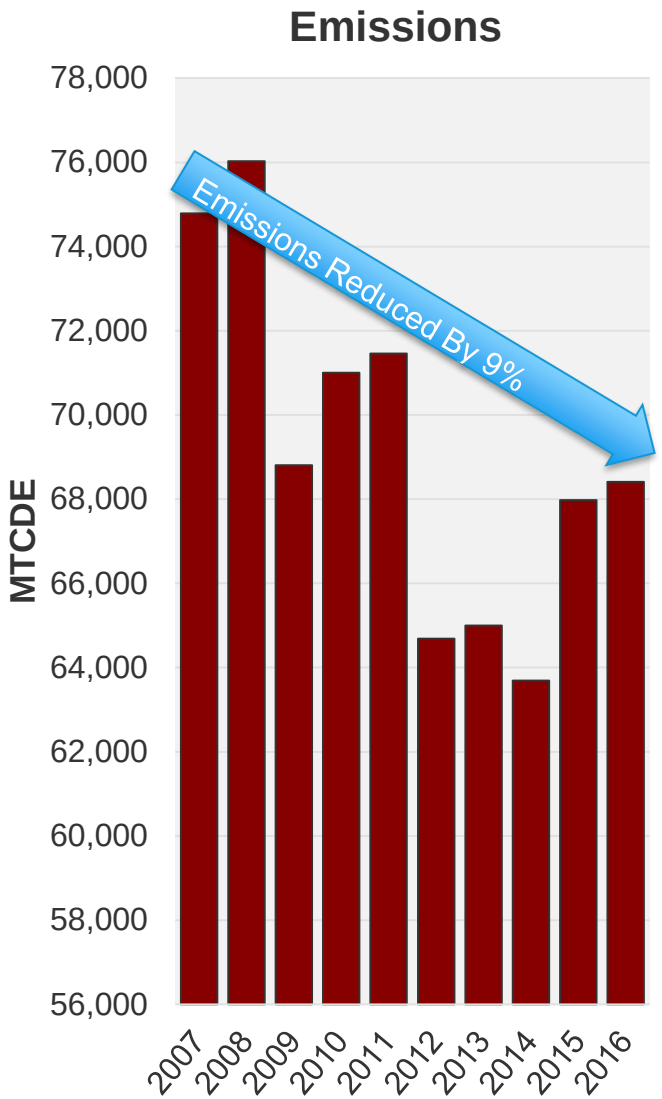


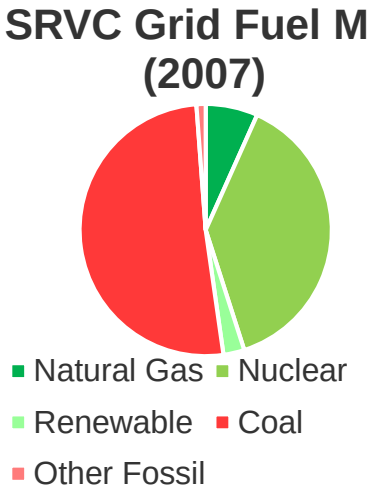


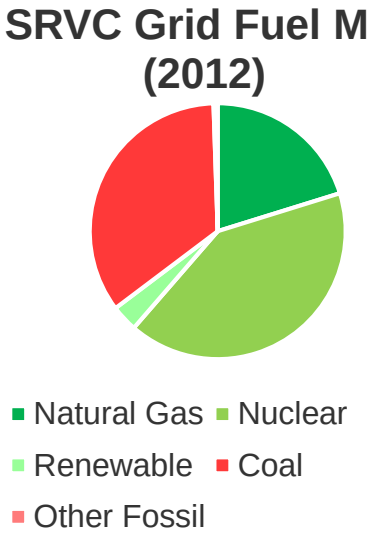
Scope 2

Little Progress Reducing Scope 2 Emissions



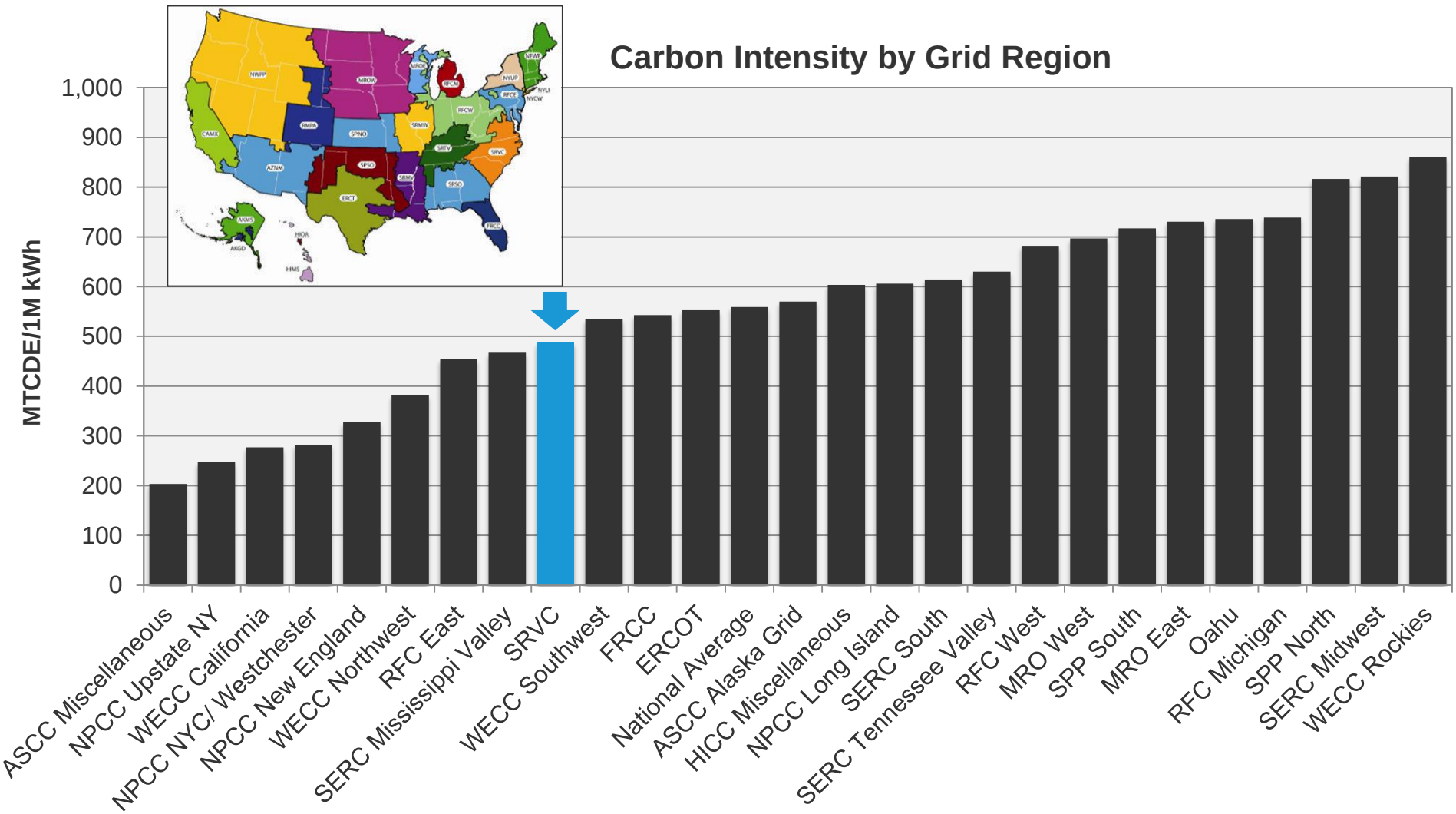






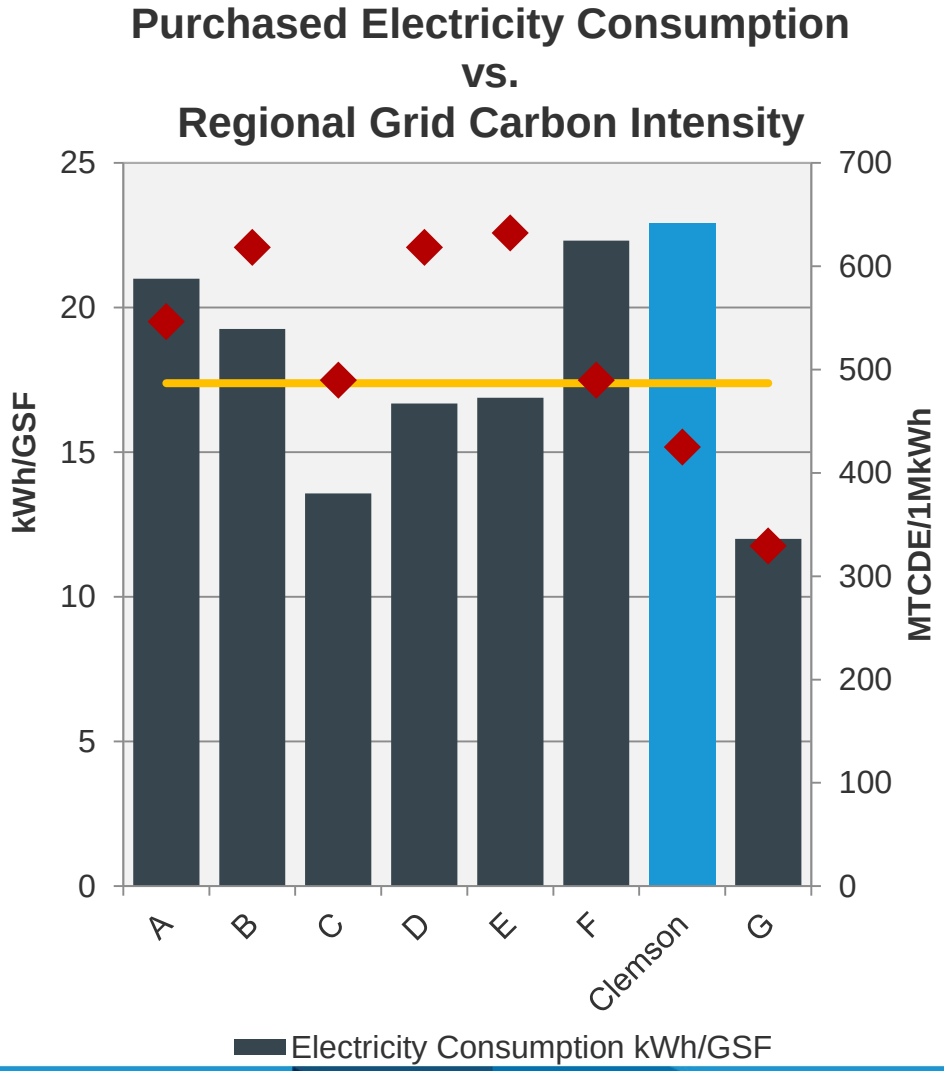
Intensity: Scope 2 Already Low

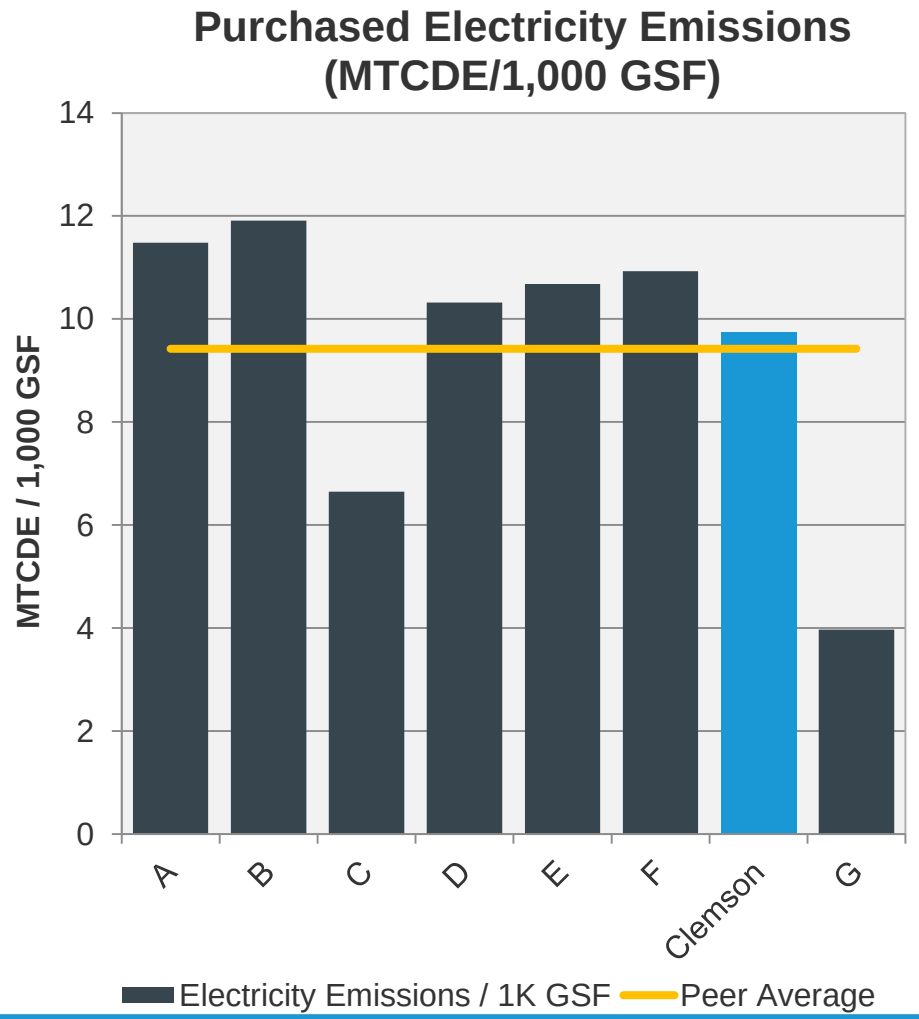
SRVC is less carbon intense compared to other regions



Scope 2 eGrid Emissions

Clemson within the second least carbon intense region

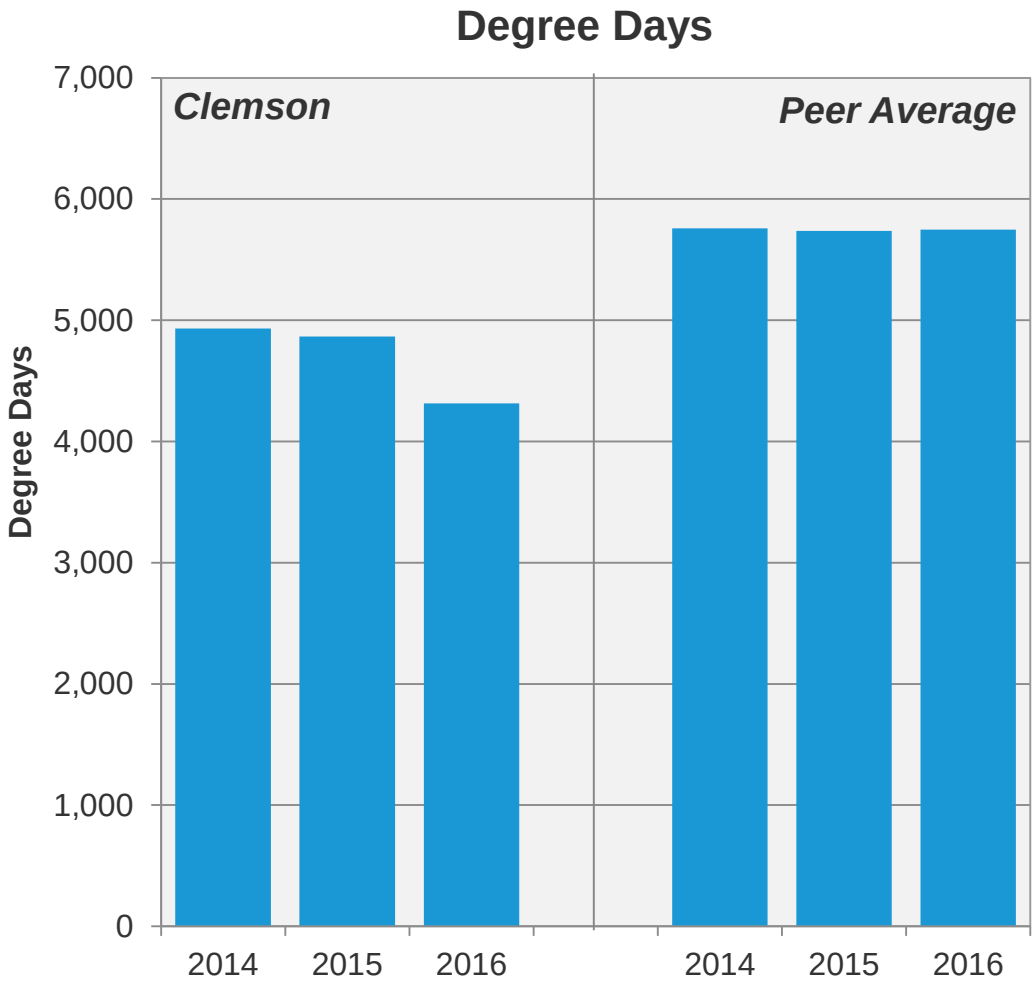


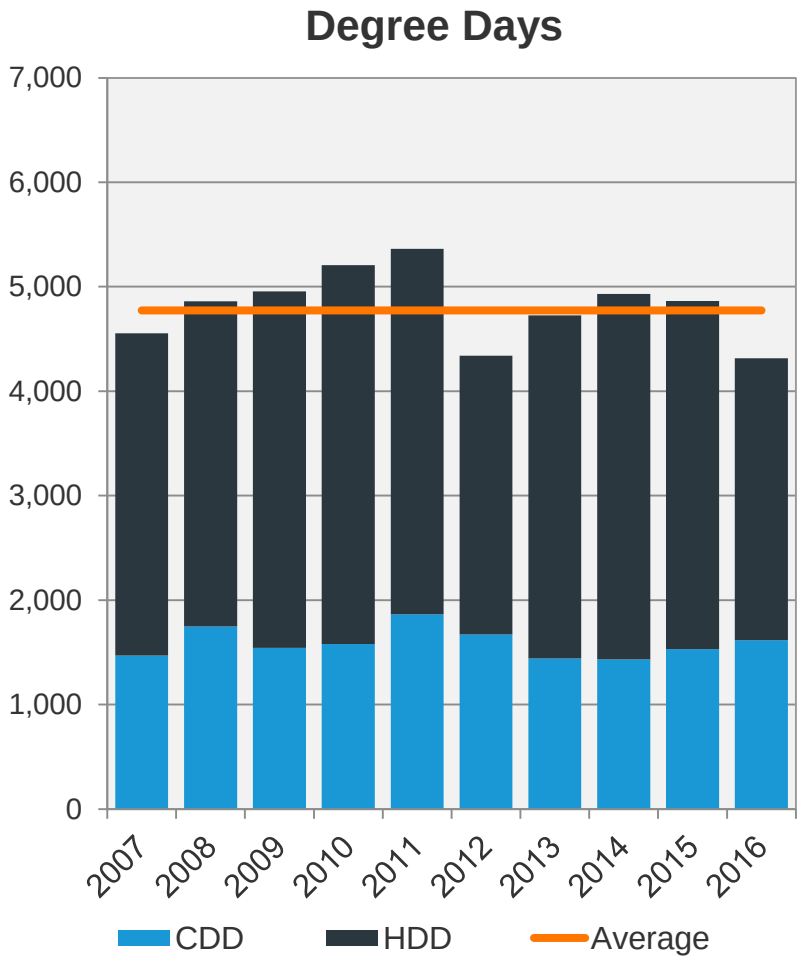


Ordered by: Regional Grid Carbon Intensity

Degree Days Context

Downward degree day trending as peer institutions stay consistent

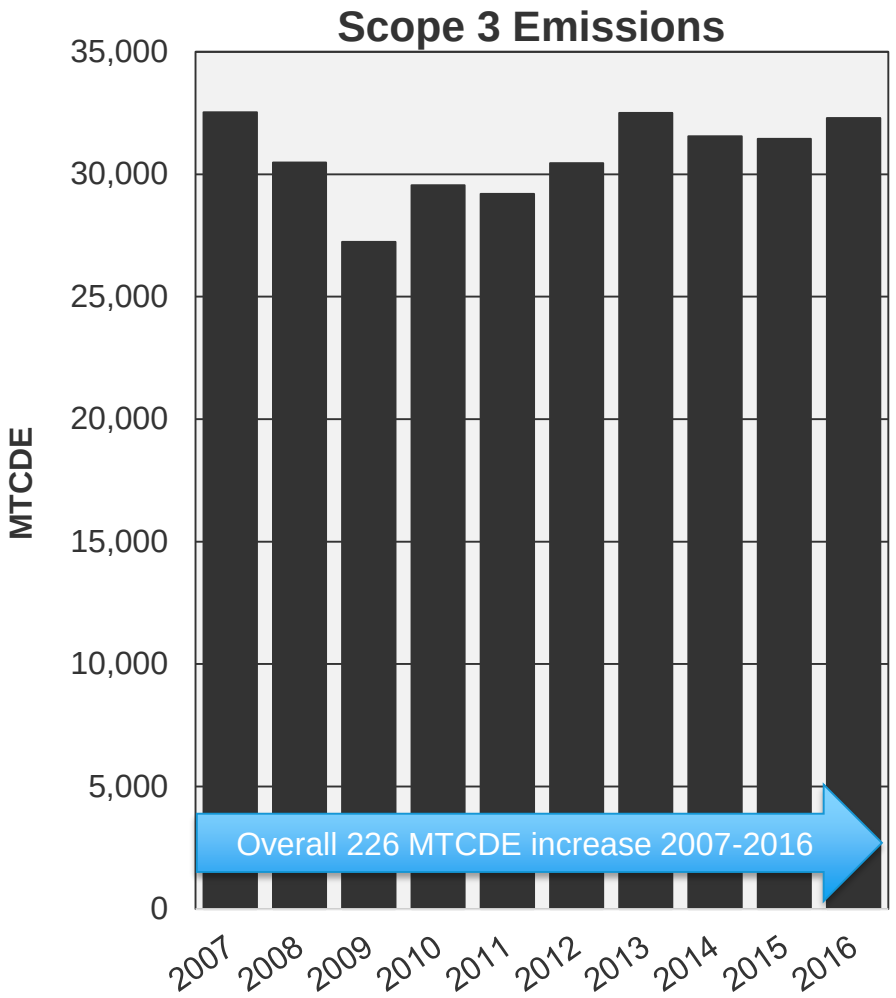


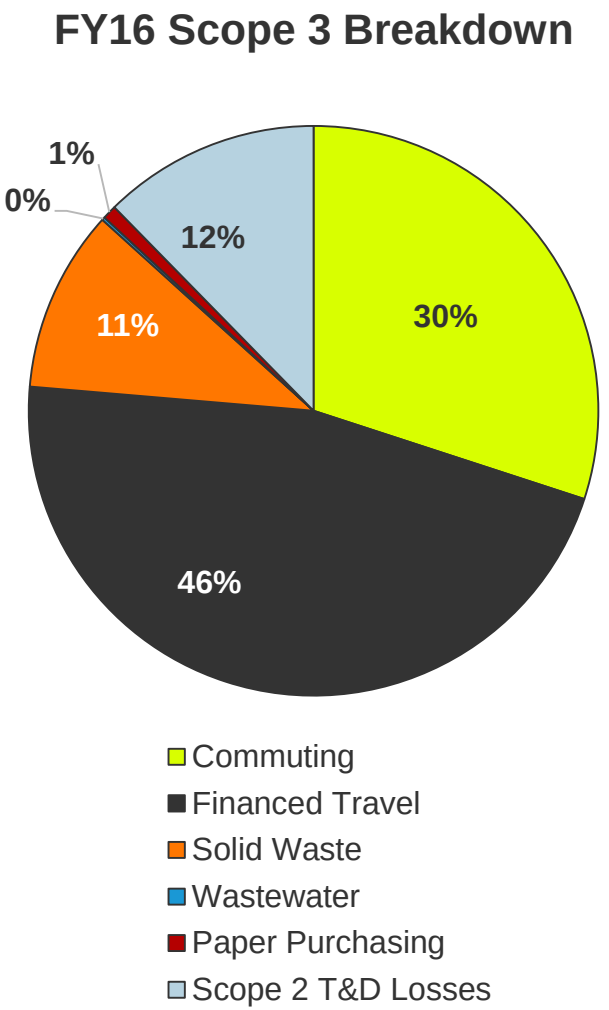


Scope 3

Minimal Changes in Scope 3 Emissions

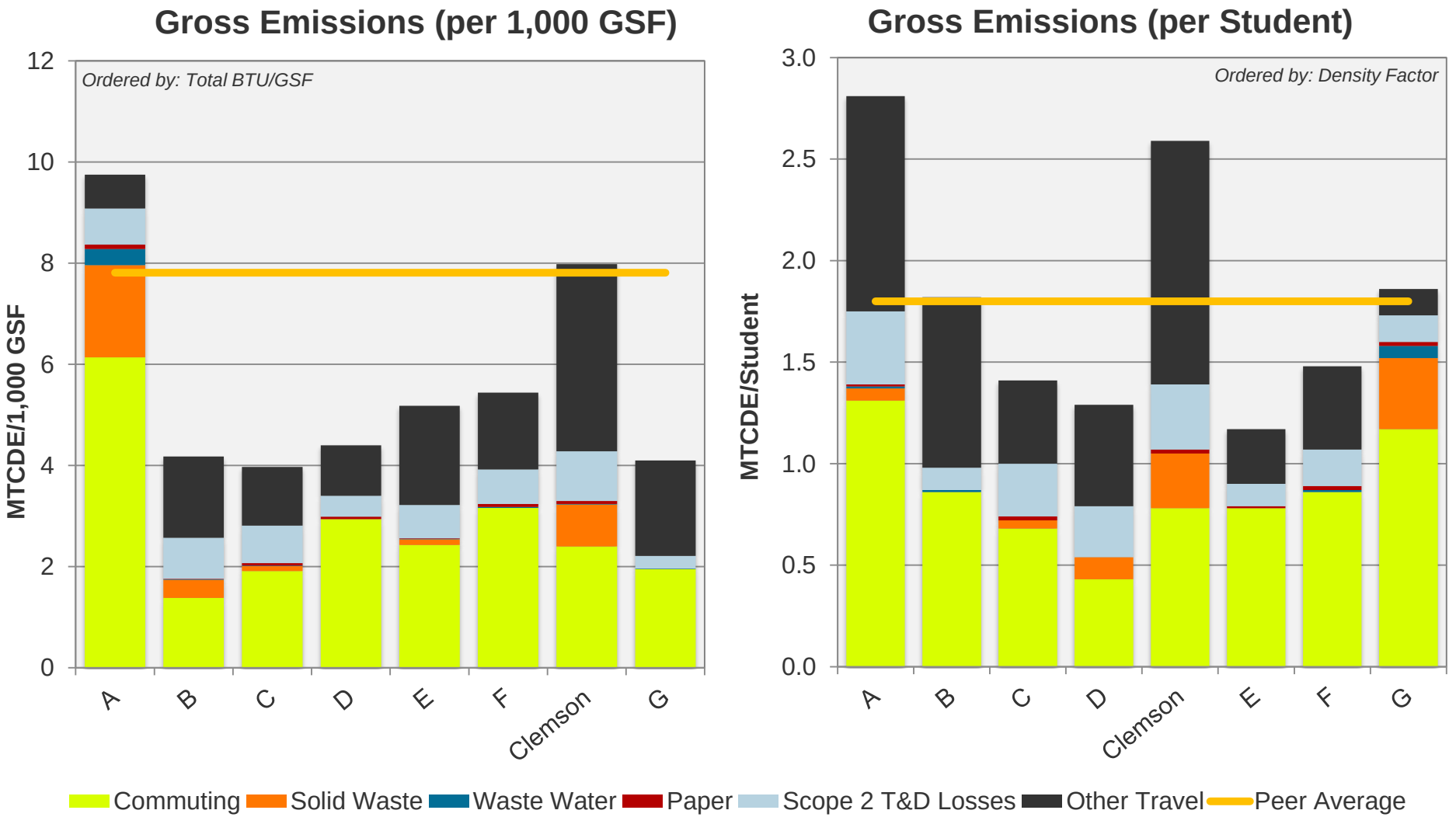
Commuting and travel are largest contributing sources in Scope 3





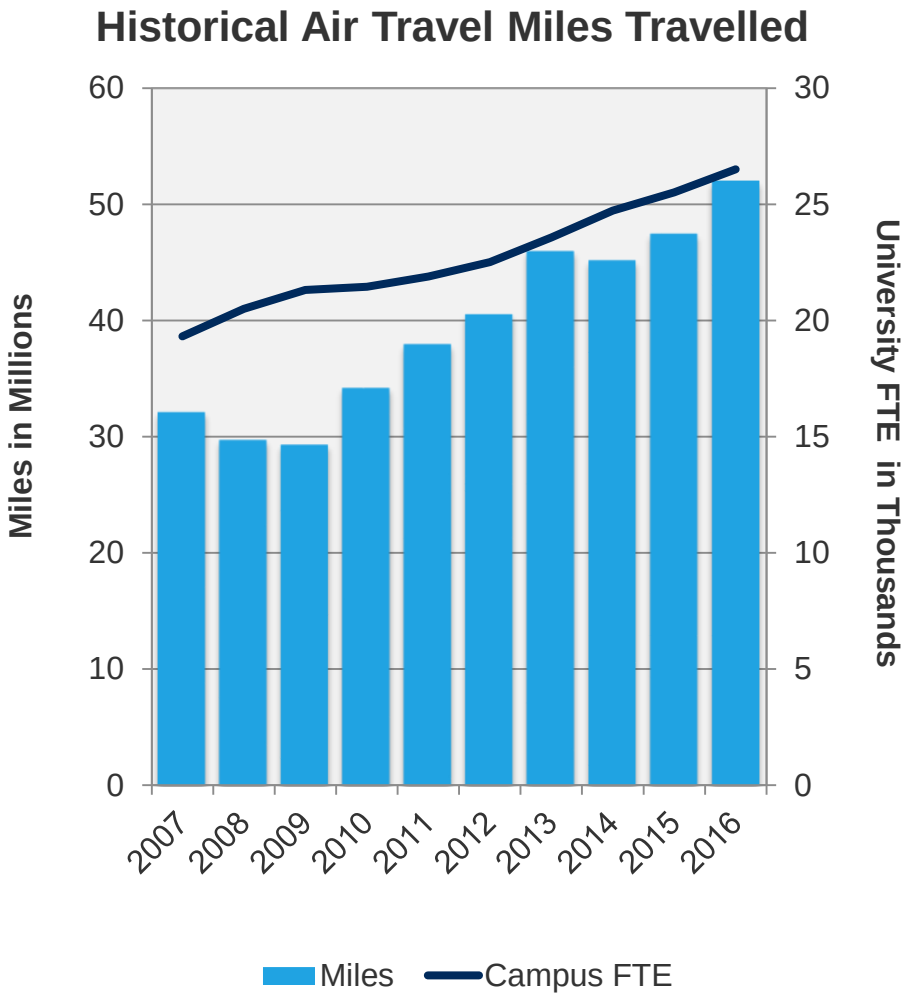
Scope 3 Source Distribution

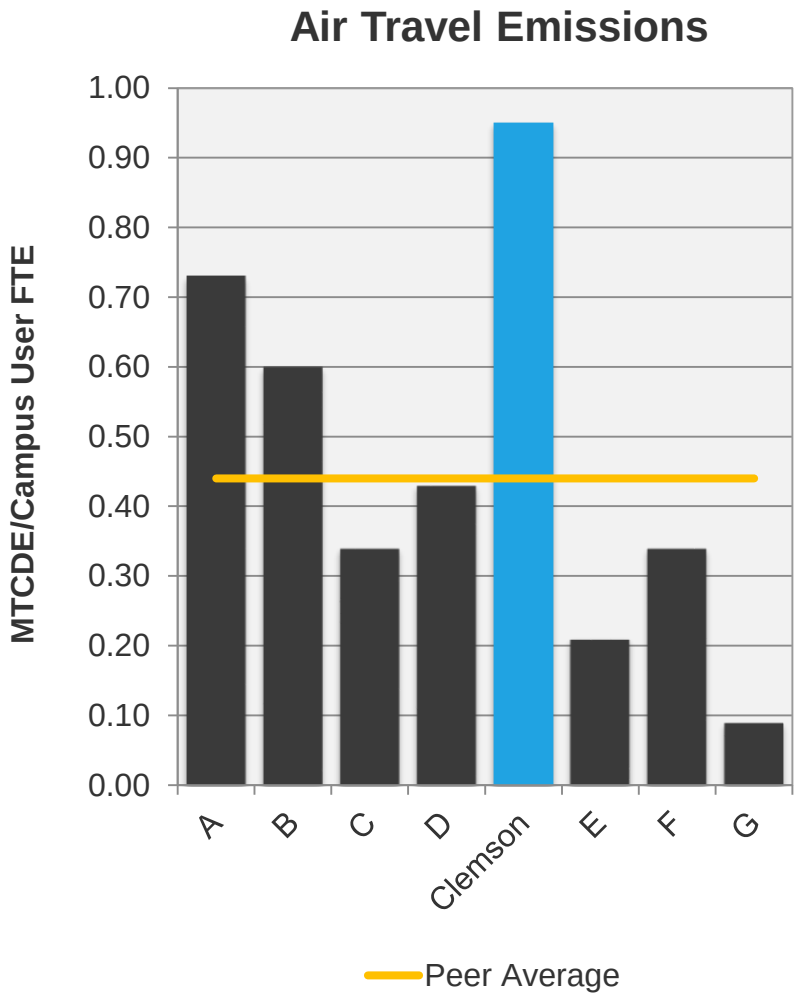
Air Travel, Commuting and Solid Waste drive up Clemson's emissions over peer average



Air Travel a Highlight on Campus

Clemson's air travel emissions double peer average

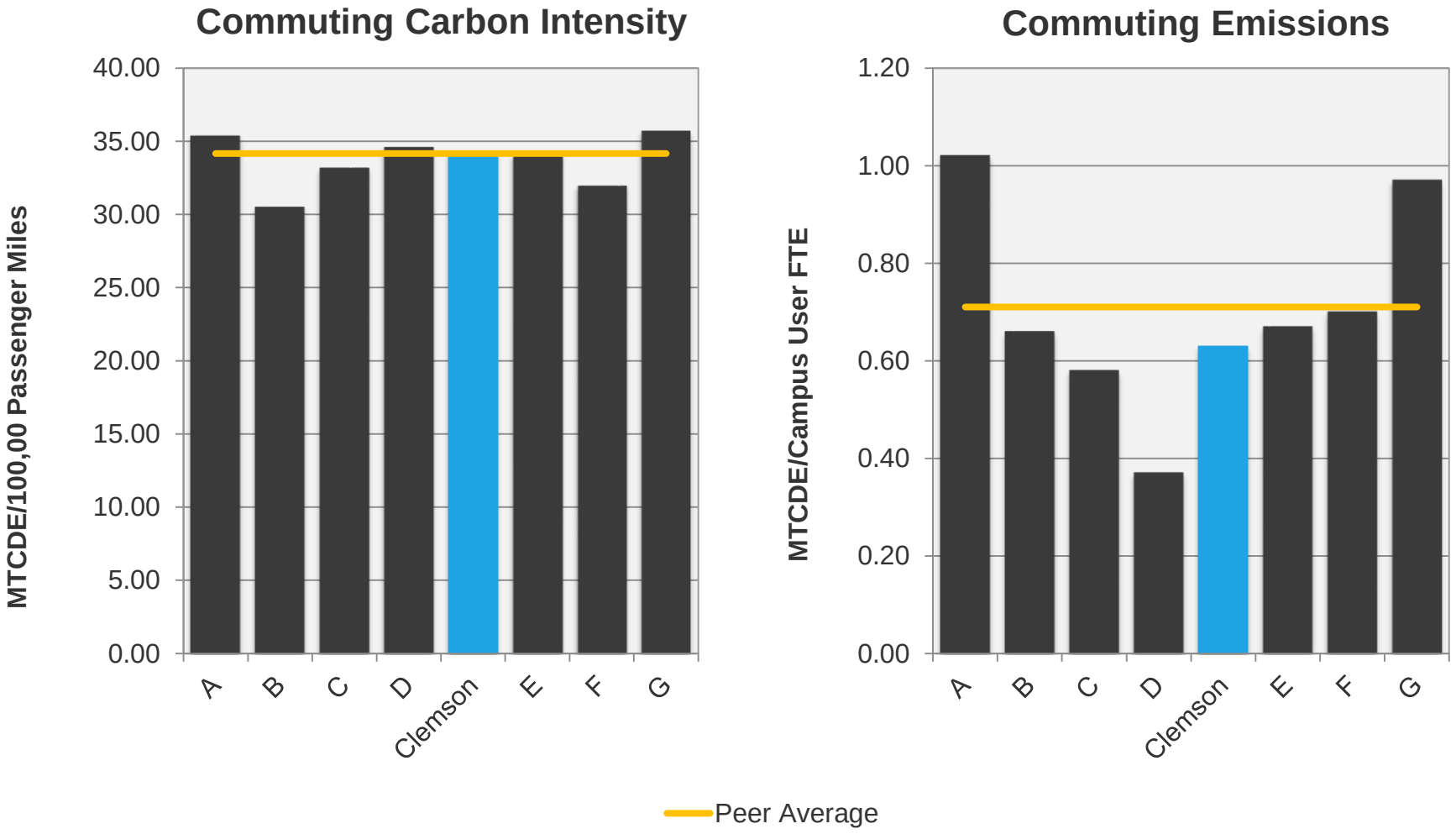




Ordered by: Density Factor

Commuting is Second Highest Scope 3 Contributor

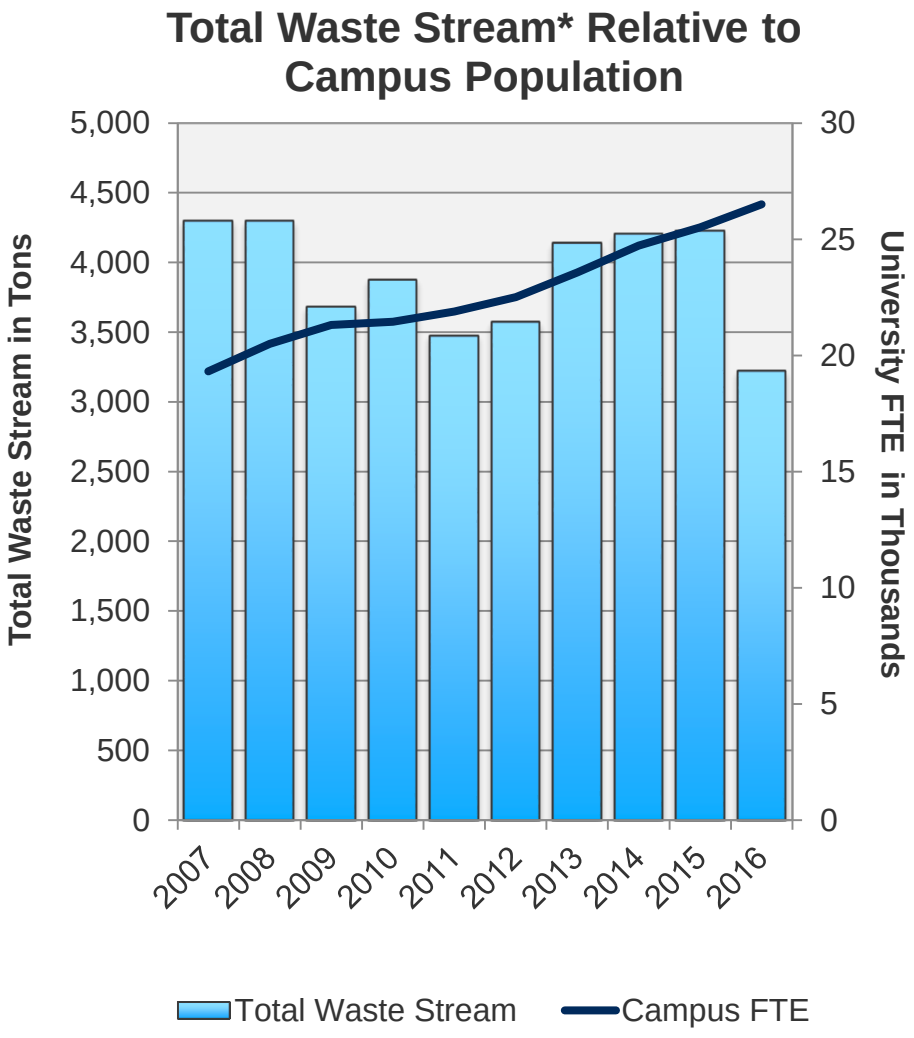
Commuting data pulled forward from FY15

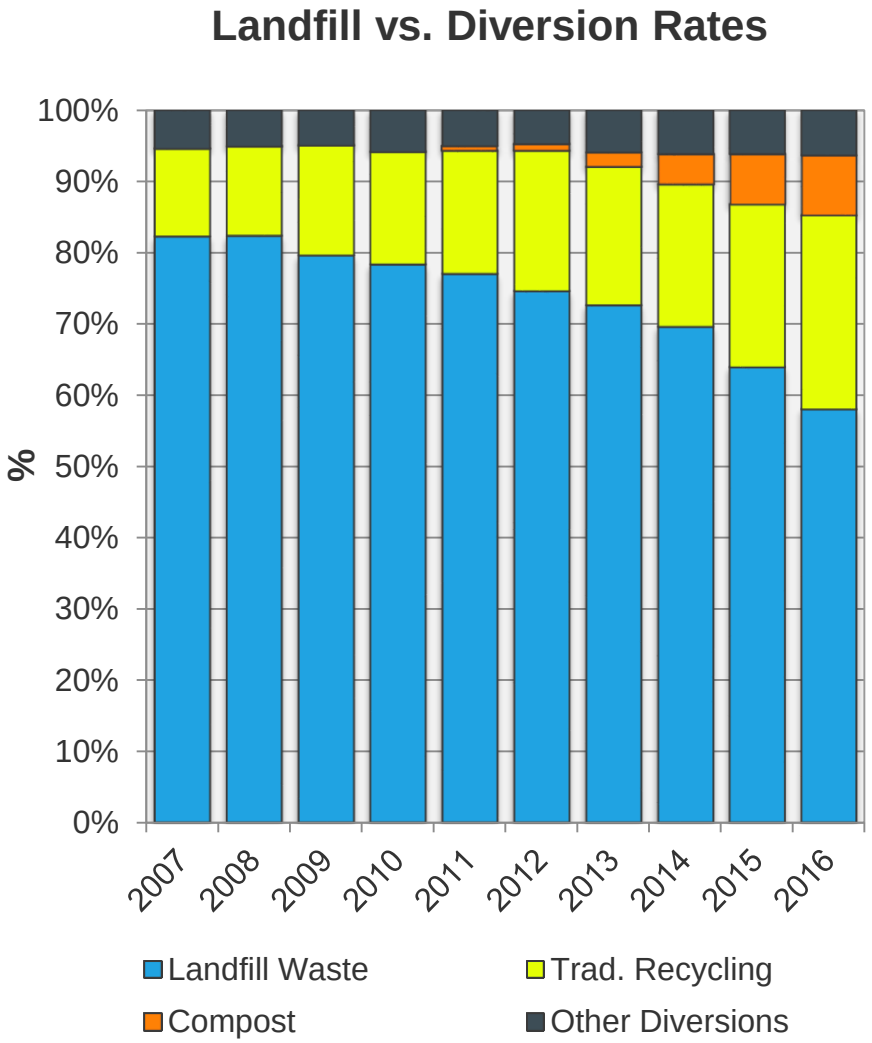


Ordered by: Density Factor

Total Waste Stream and Recycling Rates

Despite increase in enrollment Total Waste Stream decreases in FY16

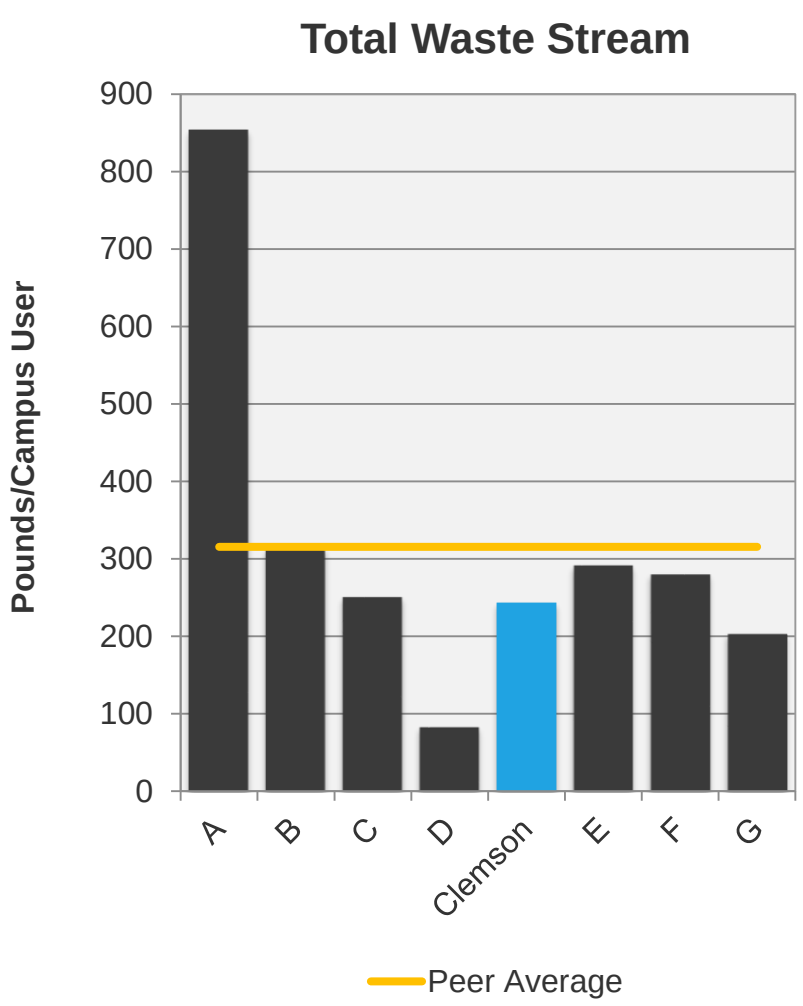


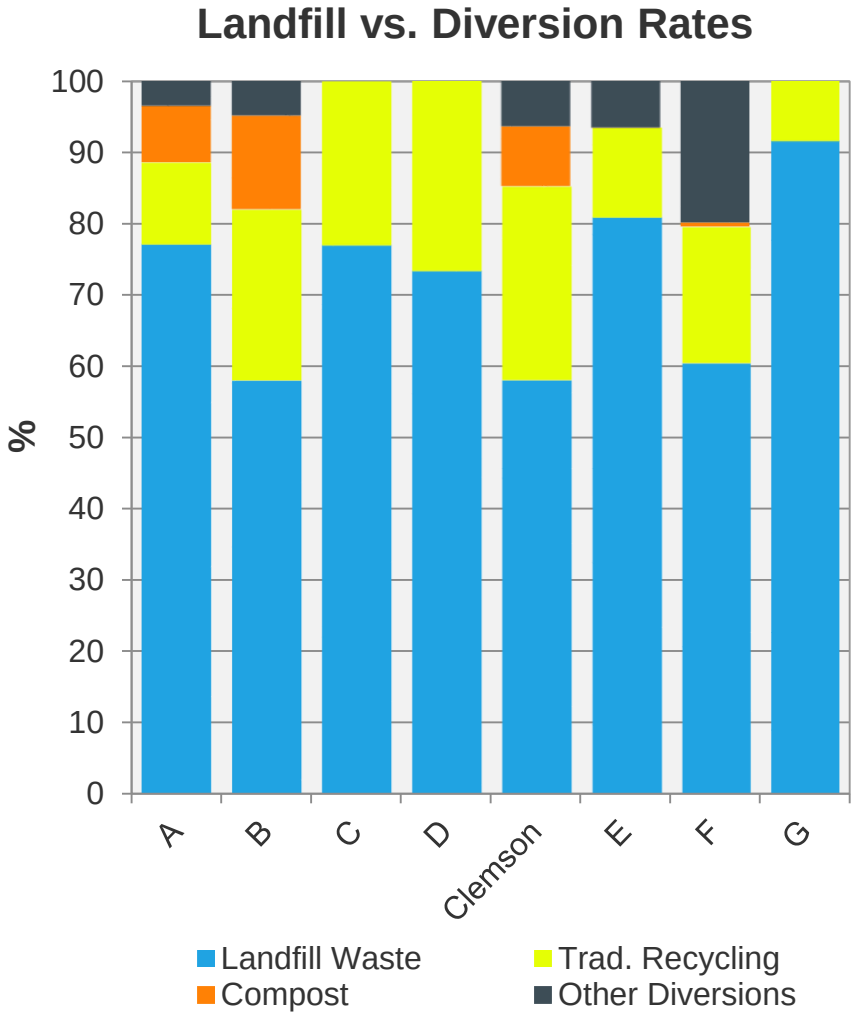


*C&D waste excluded from totals

Waste Stream Compared to Peers

Decrease in FY16 Total Waste Stream brings Clemson below peer average



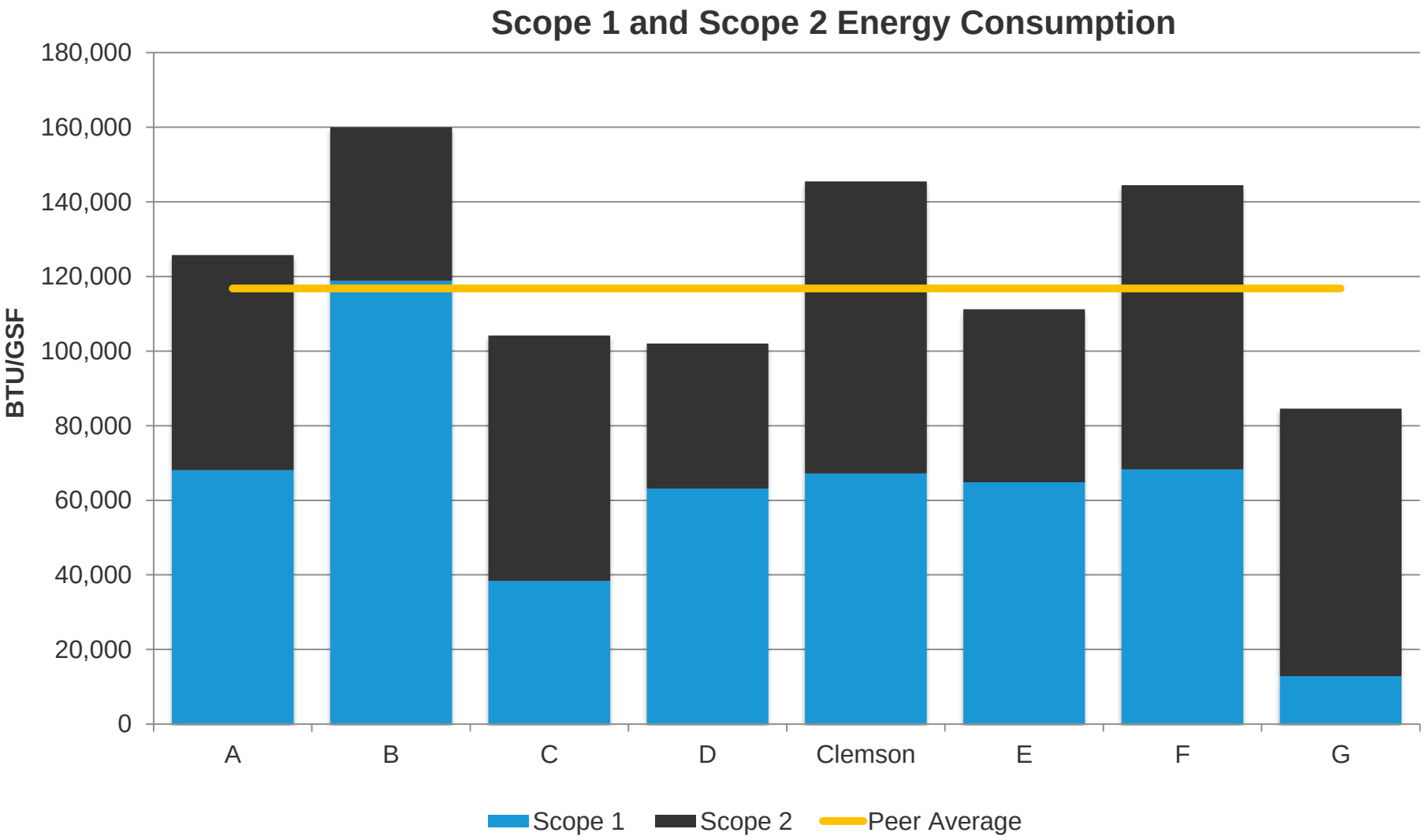


*C&D waste excluded from totals

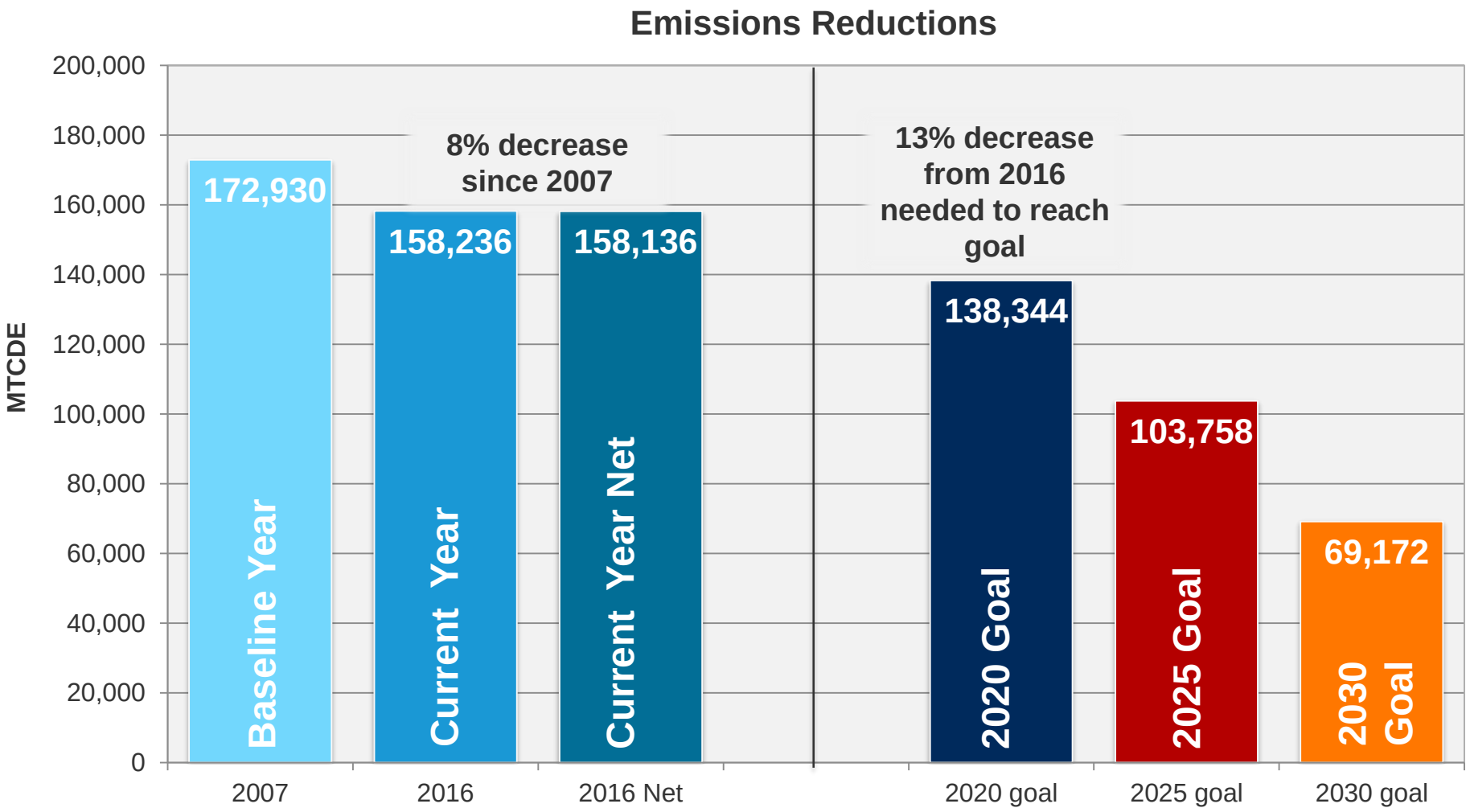
Summary

Total Energy Consumption

Decrease in FY16 emissions, but consumption higher than peers



Progress Towards Emissions Reduction Goal

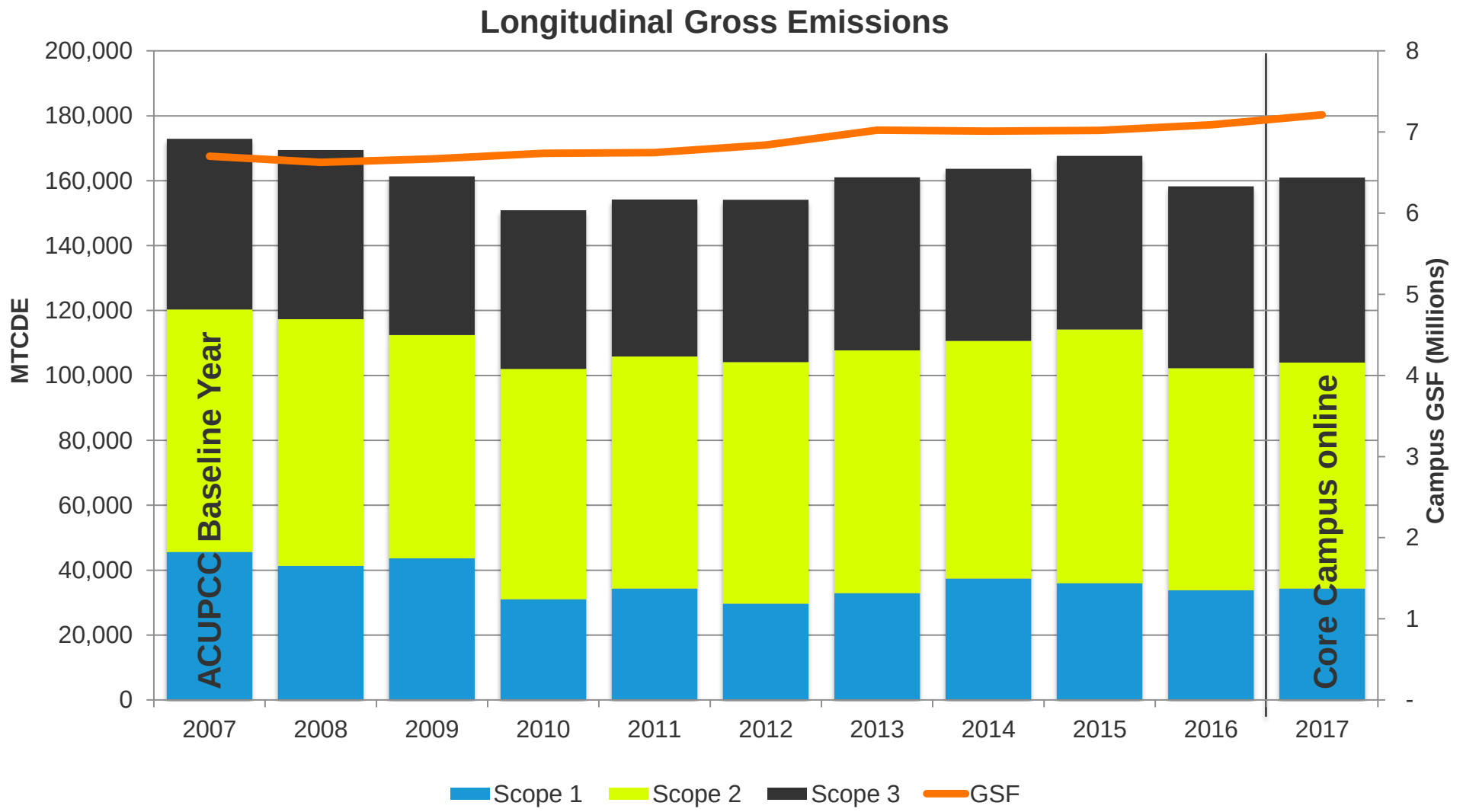


Gross emissions, does not include emissions reductions associated with the purchase of offsets

Net emissions, takes into consideration the purchase of offsets

Total Gross Emissions Projections

With additional GSF coming online, gross emissions will increase



Concluding Comments

- Compared to Peer Institutions, Clemson has both an older space profile and smaller, more energy intensive buildings.
- From the Baseline year we have seen a decrease of total energy emissions, despite a total FTE population increase of 37% since 2007.
- Envelope and mechanical investment has fallen short of target for the last four years. Address envelope and mechanical needs on buildings in order to maintain the momentum of emissions reductions through project selection that Clemson can control.
- With a significant amount of new space coming online, Clemson University must continue to increase intensity measures on campus to move closer to its emissions reduction goals.

Questions & Discussion