



sustainability
solutions

Boston College

Presenters: Dan Willman

March 2017

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
Widener University
Williams College
Worcester Polytechnic Institute
Worcester State University
Xavier University
Yale University

Sources of Campus Emissions



Collected carbon emissions at Boston College

Scope 1:

From sources owned or controlled by Boston College

On-Campus Stationary



Vehicle Fleet

Refrigerants



Agriculture

Scope 2:

From the generation of electricity purchased by Boston College



Purchased Electricity

Scope 3:

From sources not directly controlled by Boston College

Directly Financed and Study Abroad Travel



Waste and Wastewater

Student, Faculty, and Staff Commuting



Paper Purchasing
Transmission and Distribution Losses

Updates to the CACP Carbon Calculator – v9



EPA released updated emissions factors for 2012 and onward

Scope 1

- No changes

Scope 2

- Carbon intensity of select electric grids decreased
 - Correlated to coal's carbon intensity change

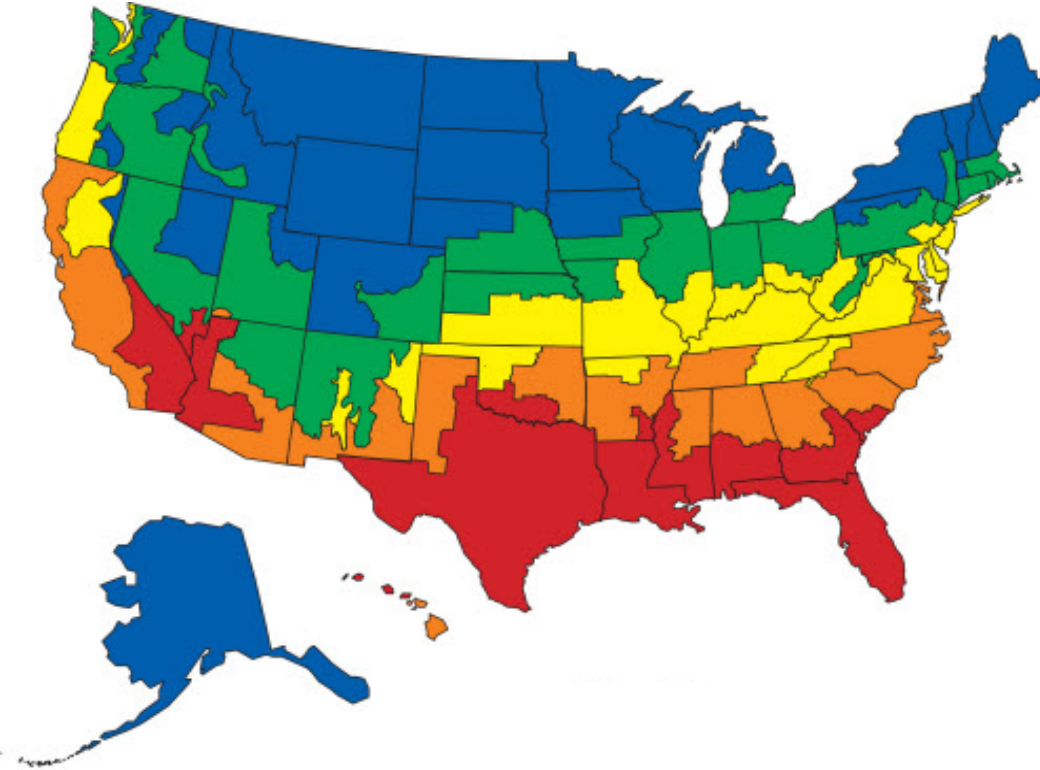
Scope 3

- Carbon intensity of air travel decreased
- Carbon intensity of study abroad decreased
- T&D Loss Factor increased in NEWE grid.

Putting Boston College into Context



Boston College is located in climate zone 2



Institution	Location
American University	Washington, DC
Babson College	Wellesley, MA
Bentley University	Waltham, MA
Emerson College	Boston, MA
Loyola University Maryland	Baltimore, MA
Occidental College	Los Angeles, CA
Rensselaer Polytechnic Institute	Troy, NY
Tufts University	Medford, MA
University of Vermont	Burlington, VT
Wesleyan University	Middletown, CT

Sustainability Solutions Measurement and Analysis Members

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

Peer Group Based On
Size
Technical Complexity
Climate Zone

Core Observations



- Scope 3 emissions has seen an increase in the emissions profile by 4%; scope 3 emissions are traditionally more behavioral in nature.
- Boston College has strived to reduce its reliance on high-intensity fossil fuels, increasing their use of natural gas to 95% of the fuel mix.
- Scope 3 emissions increase due to an increase in student commuting; student commuters increased their trip distance and the mode of travel increased in carbon intensity.
- Overall, Boston College performs below peer levels in gross emissions as they have done historically

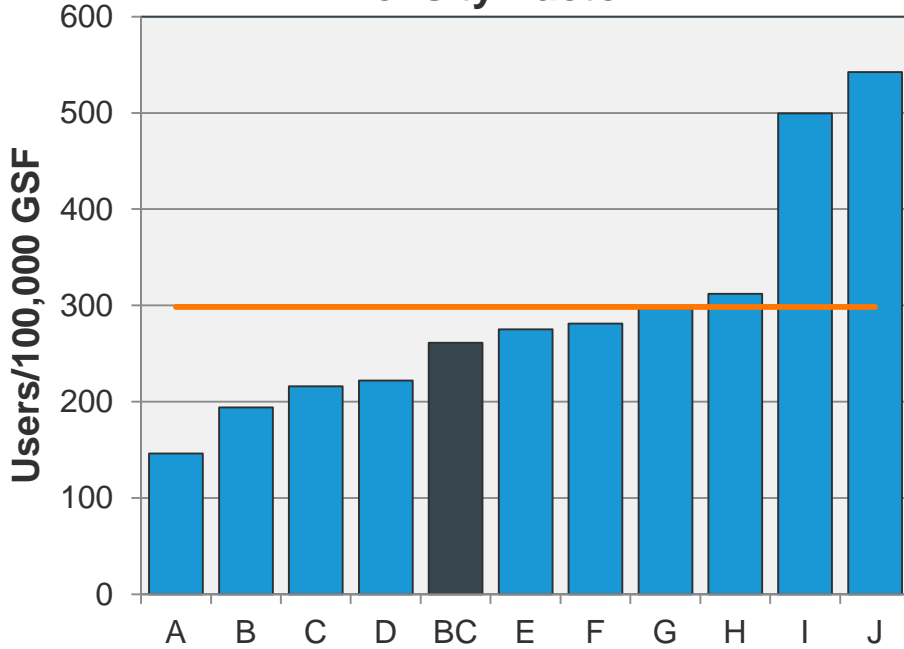
Putting Boston College Into Context

Density & Tech Rating



Lower density and complexity drives emissions

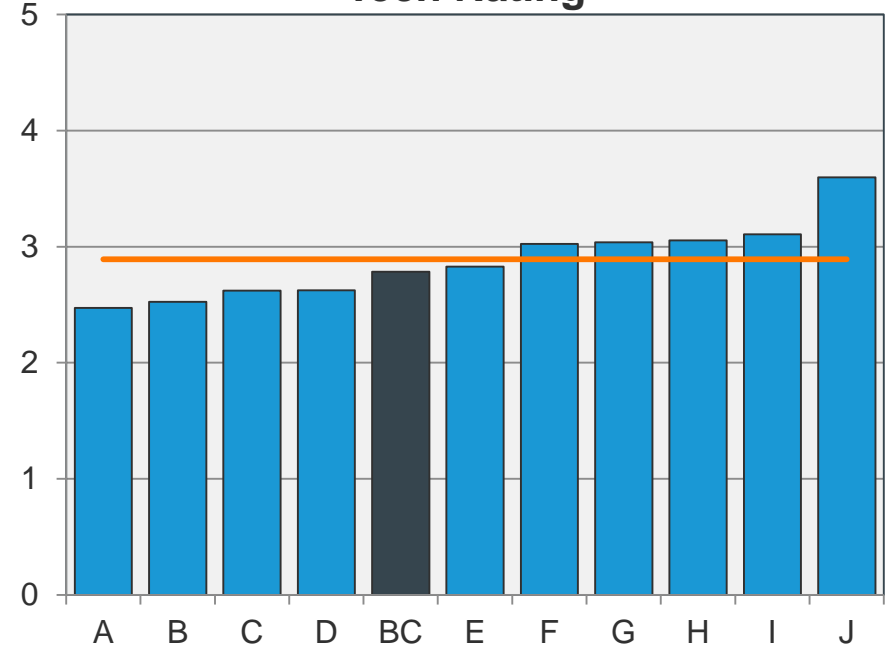
Density Factor



Density Factor Impacts:

- Energy consumption
- Waste output
- Operational demands

Tech Rating



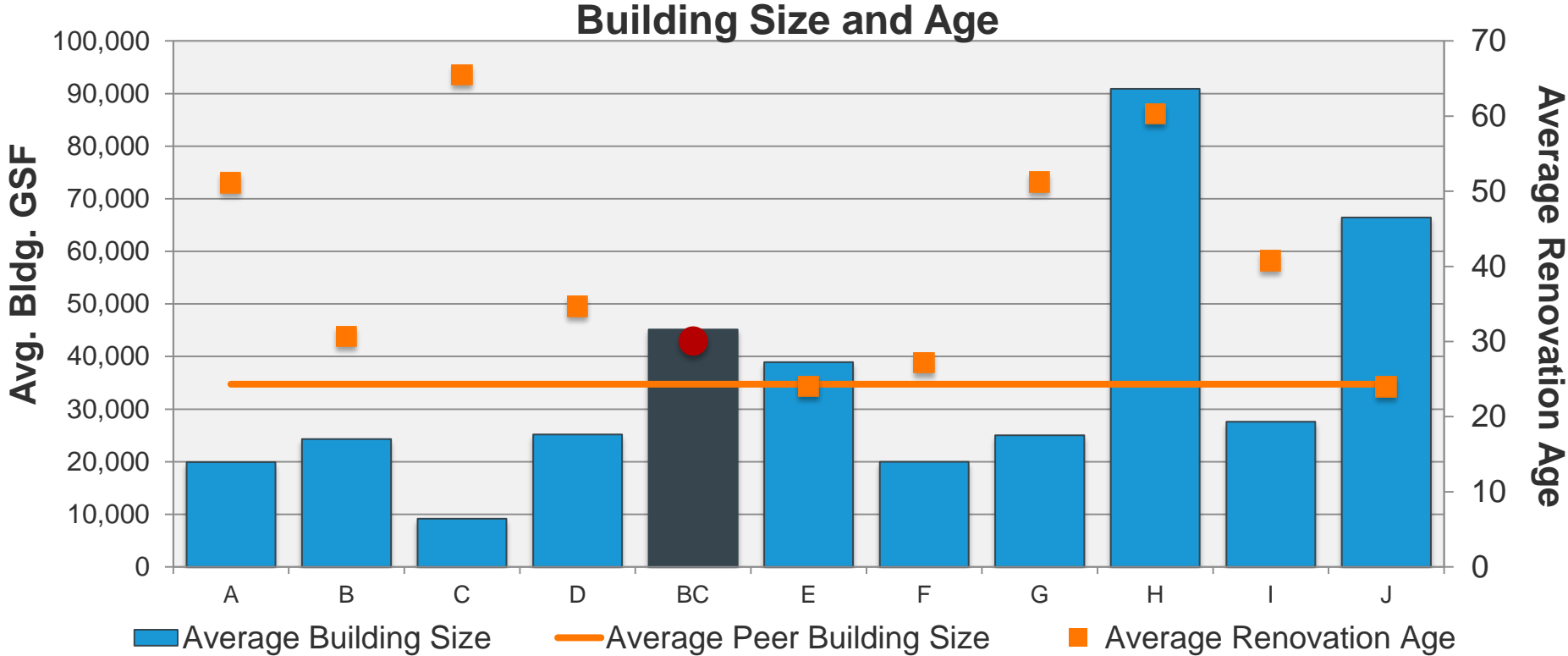
Tech Rating Impacts:

- Energy consumption
- Staffing needs
- Capital demands

Age and Size of Buildings Impact Consumption



Space profile is a significant driver of scope 1 and 2 emissions



Younger Buildings =
Lower Energy Consumption

Larger Buildings =
More Energy Efficient

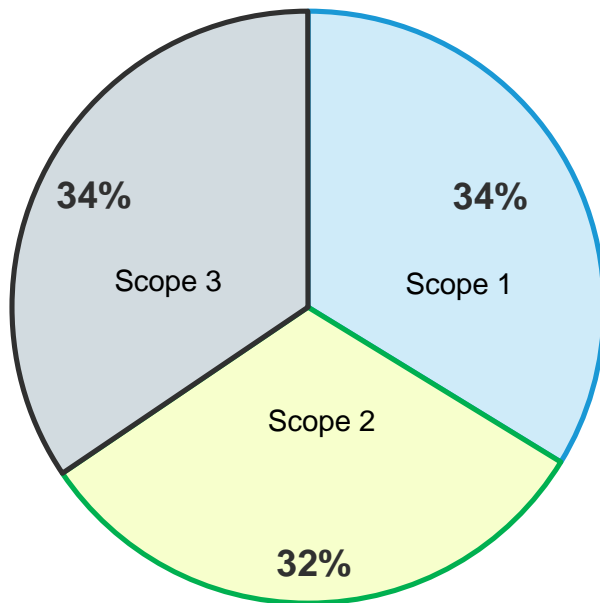
Carbon Emissions Summary

Distribution of Emissions by Level of Control



FY2016 emissions by source and scope

**Emissions
by Scope**



■ Scope 1 ■ Scope 2 ■ Scope 3

Scope 1 – Direct GHGs

- On-Campus Stationary (Natural Gas; Fuel Oil)
- Vehicle Fleet
- Refrigerants
- Agriculture

Scope 2 – Upstream GHGs

- Purchased Electricity

Scope 3 – Indirect GHGs

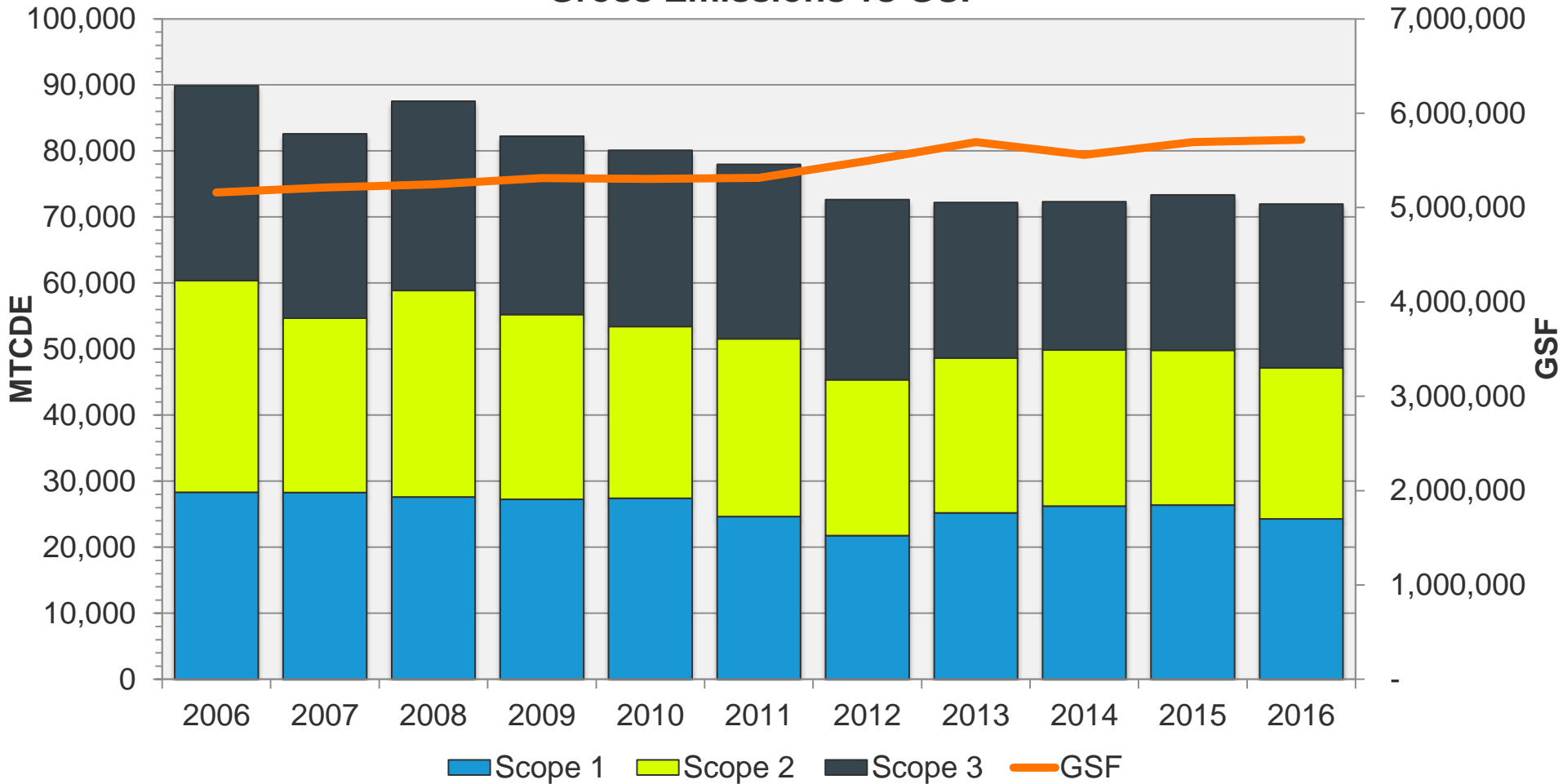
- Faculty/Staff/ Student Commuting
- Directly Financed Travel
- Study Abroad Travel
- Solid Waste
- Wastewater
- Transmission & Distribution Losses

Gross Emissions vs Campus GSF



Decrease in FY16 based on decrease in fossil consumption

Gross Emissions vs GSF

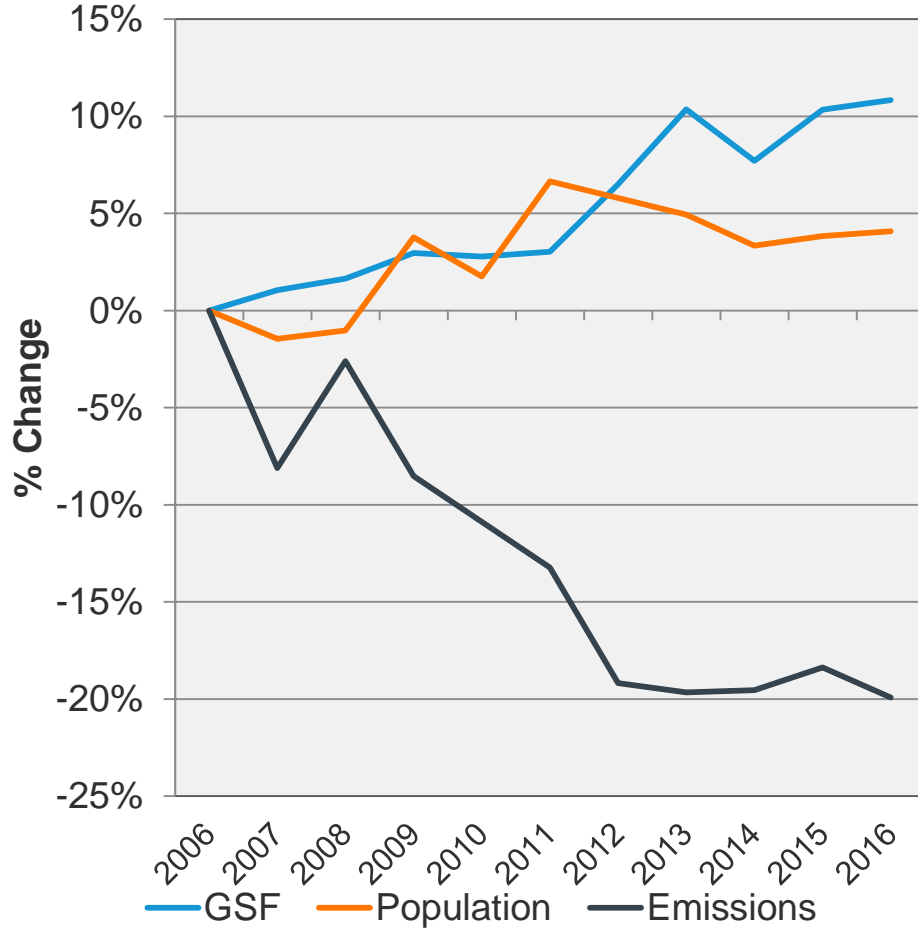


Change in Space vs Change in Emissions

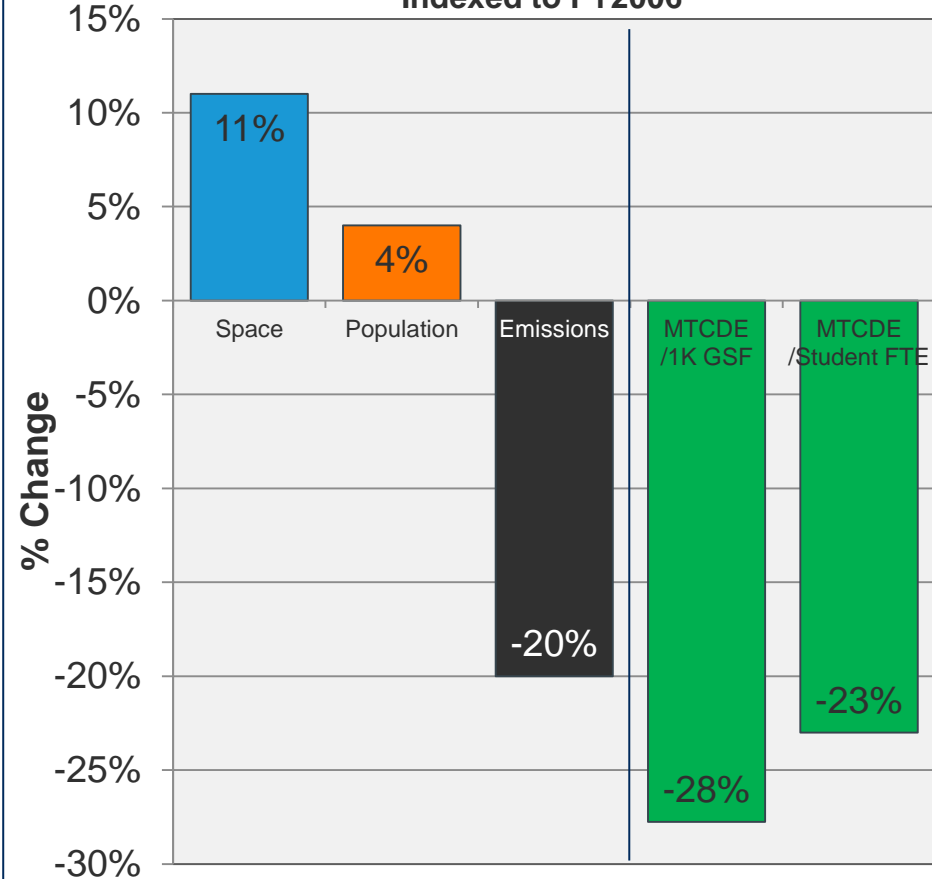


Emissions metrics benefit from emissions decline along with space and population growth

Change in Emissions vs Institution Metrics Indexed to FY2006



Change in Space, Population, and Emissions Indexed to FY2006

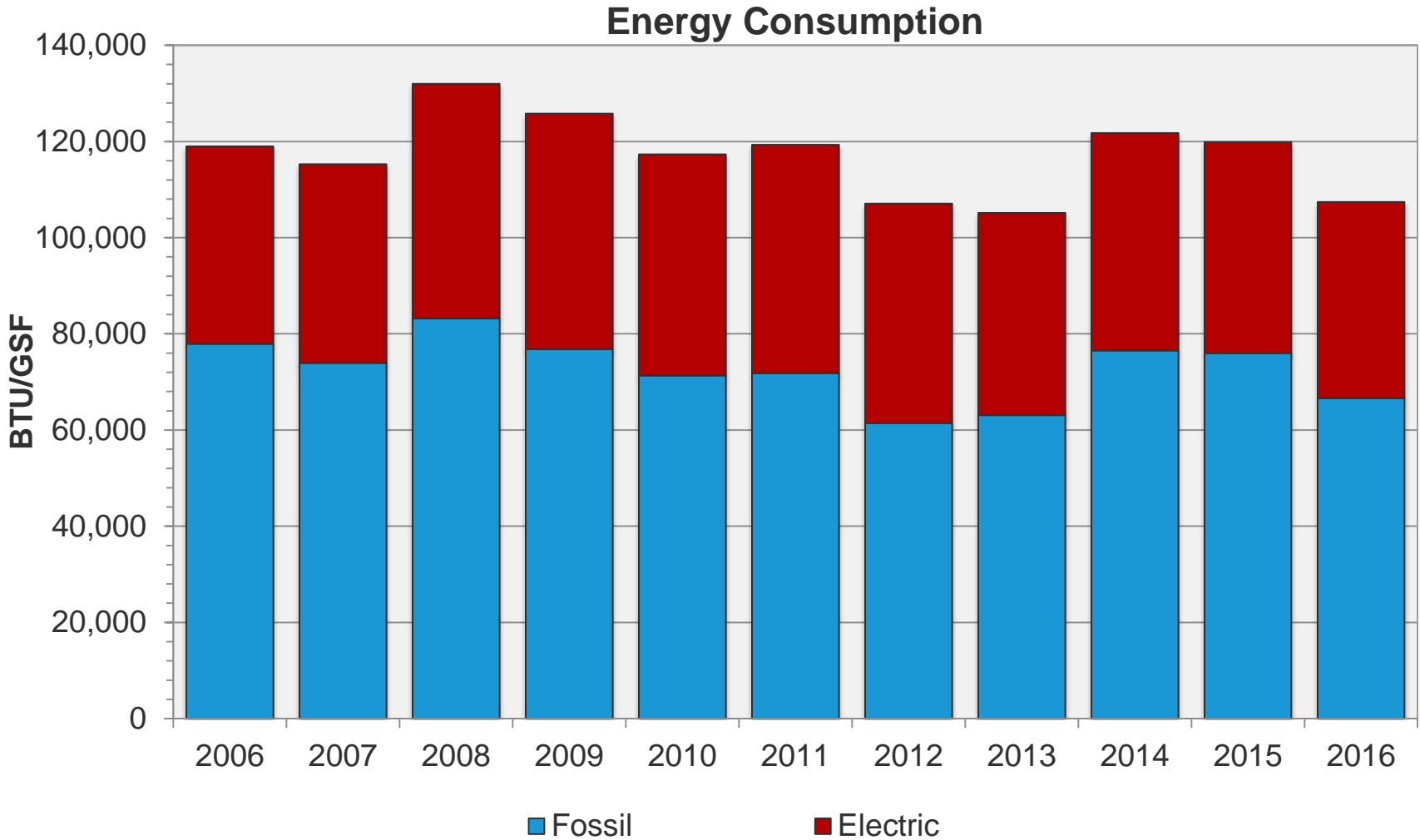


Utility Emissions Profile

Fossil Consumption Trends With Degree Days



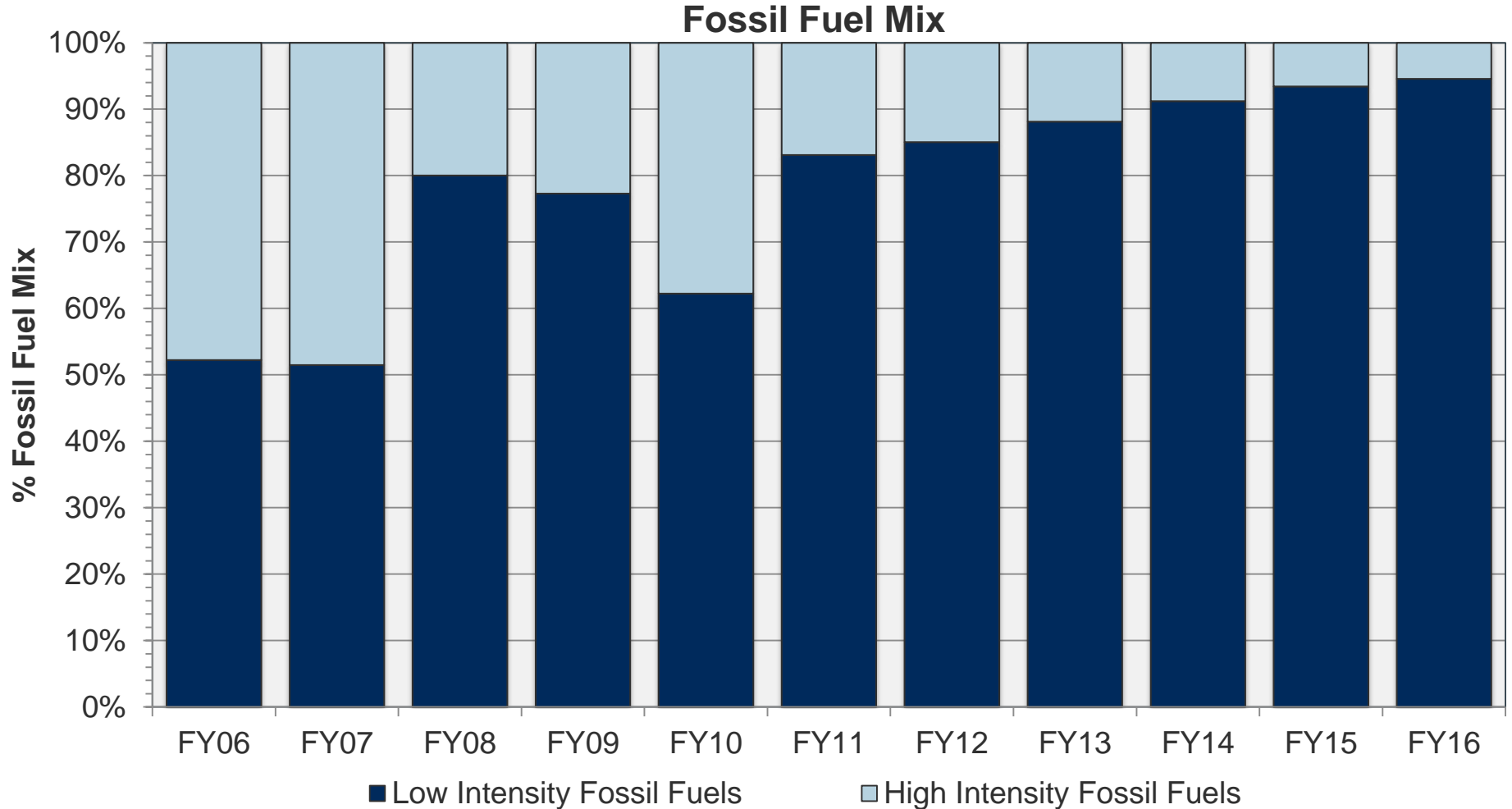
Electric consumption has remained consistent through scope of analysis



Boston College Shifting from Carbon Intense Fossil Fuels



5% of high intensity fossil fuels still utilized at Boston College



*High intensity fuels include oil #2, oil #4, and oil #6

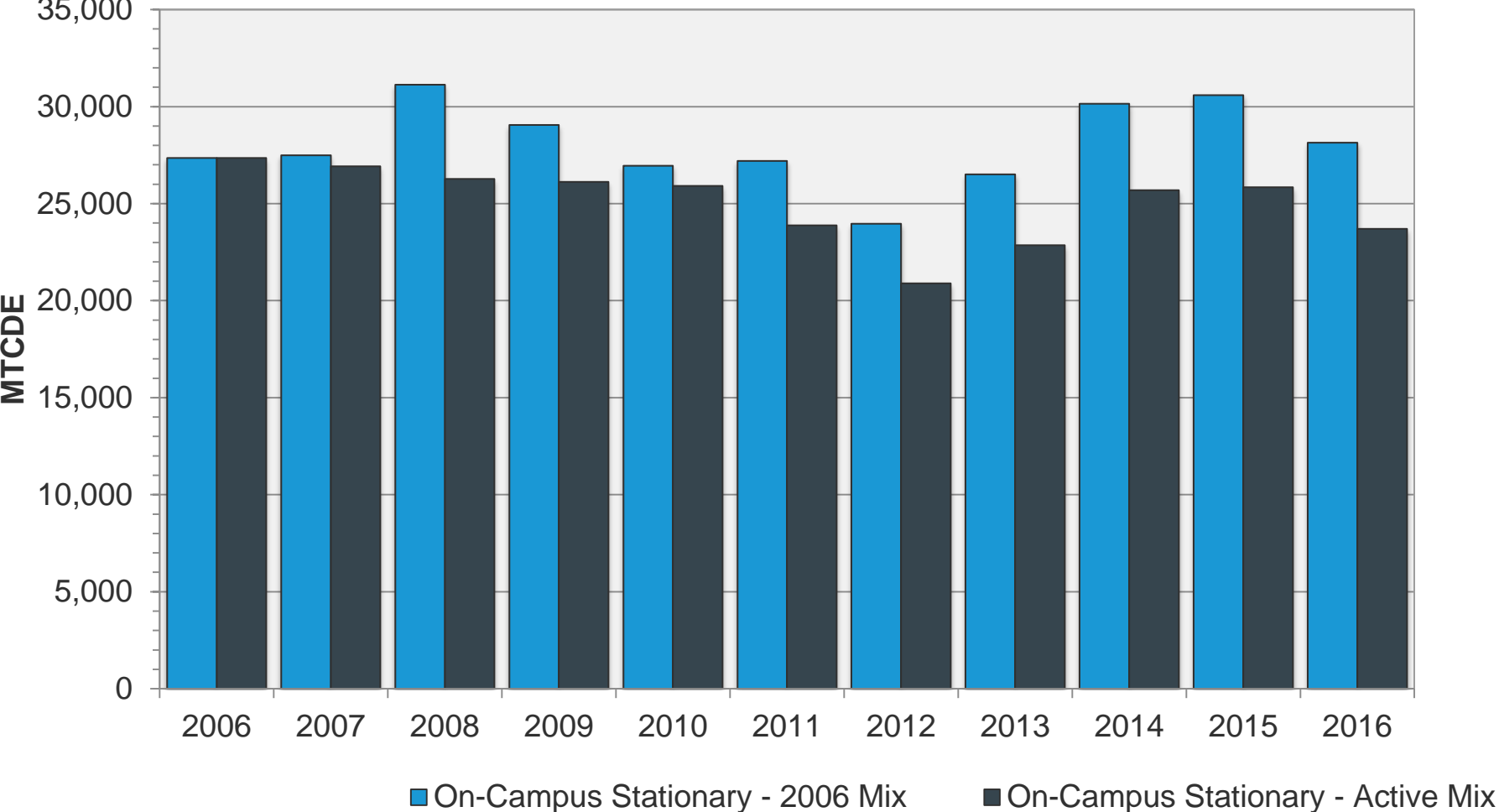
**Low intensity fuels include natural gas and propane

Increase of Natural Gas Causes 16% Decrease



If BC was consuming at the 2006 fuel mix, they would increase emissions by 4k

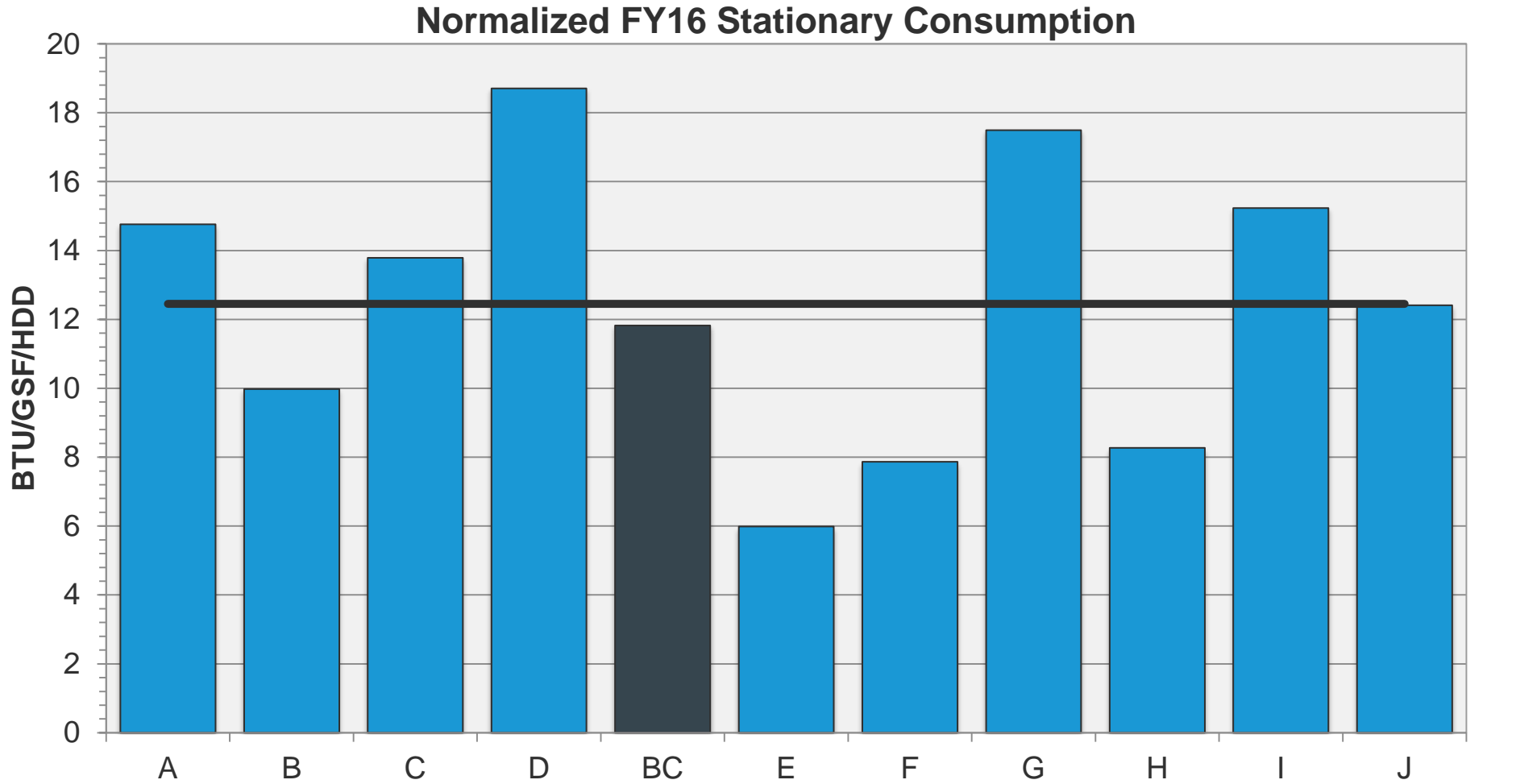
Fossil Emissions – 2006 Fuel Mix vs Real Fuel Mix



Stationary Consumption Normalized by Degree Days



Consumption is below average when heating demands are incorporated



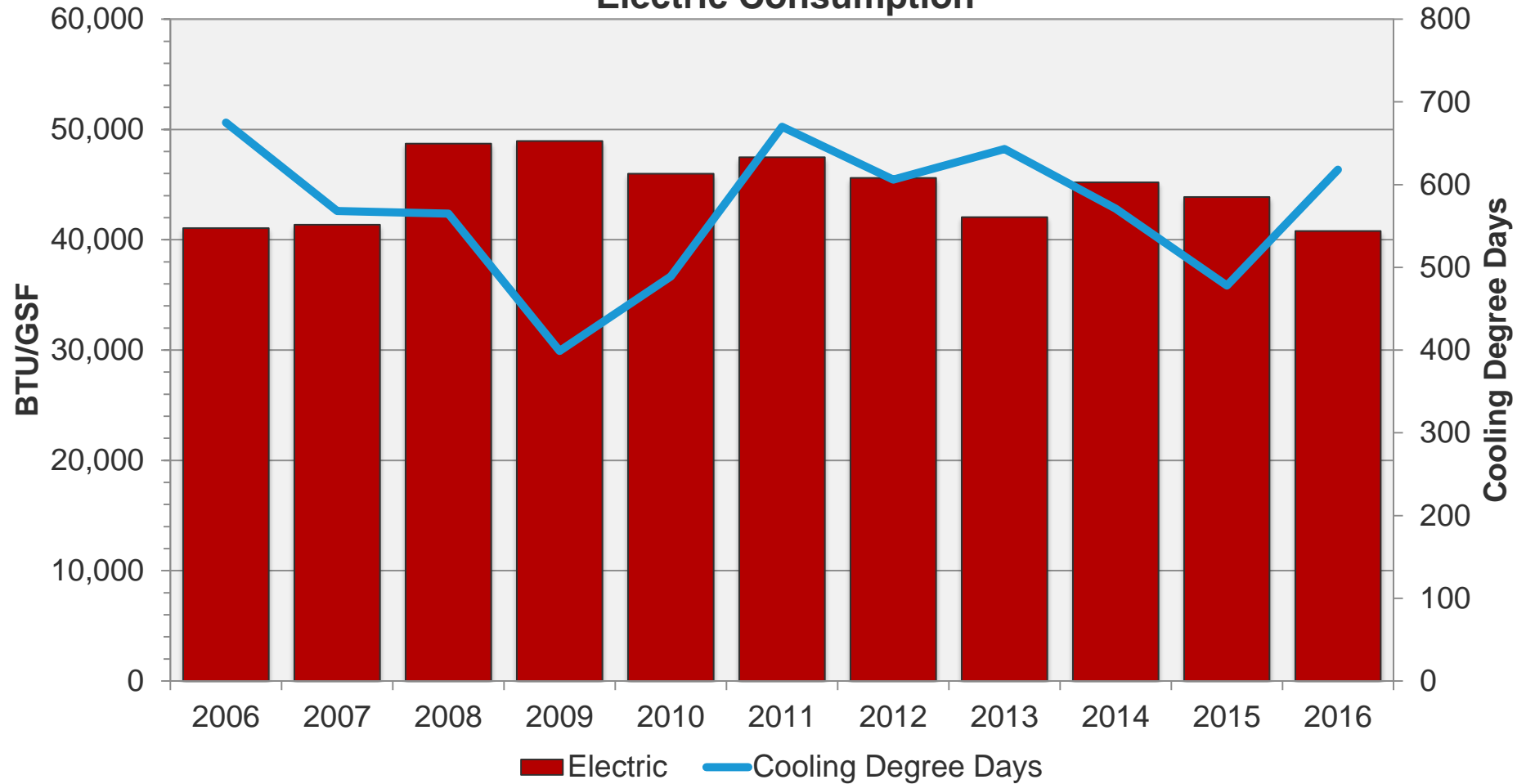
**Ordered by tech rating*

Electric Consumption Independent from Degree Days



Fluctuations in cooling degree days has no correlation to electric consumption

Electric Consumption

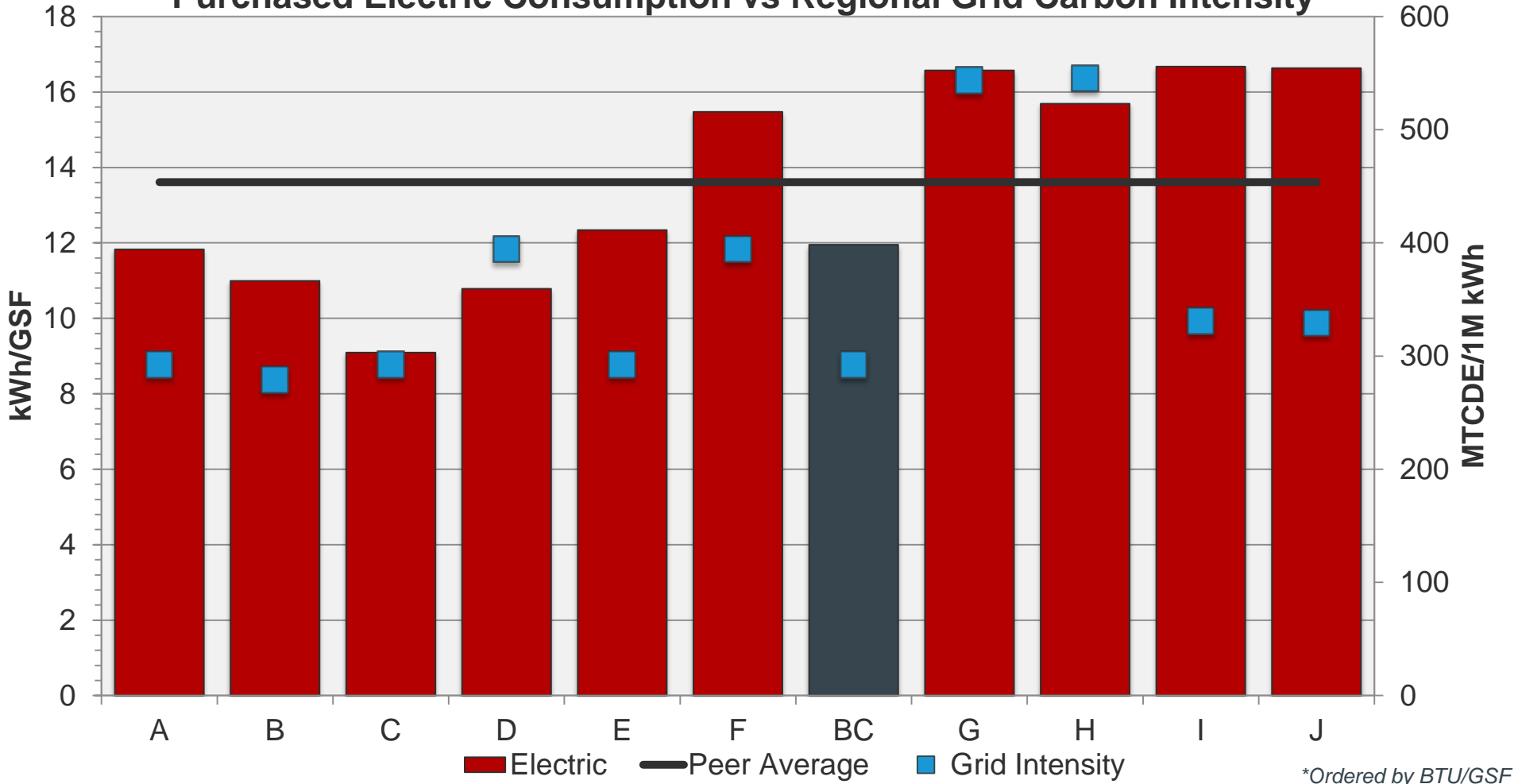


Purchased Electric Consumption & Carbon Intensity



Boston College benefits from a cleaner grid

Purchased Electric Consumption vs Regional Grid Carbon Intensity

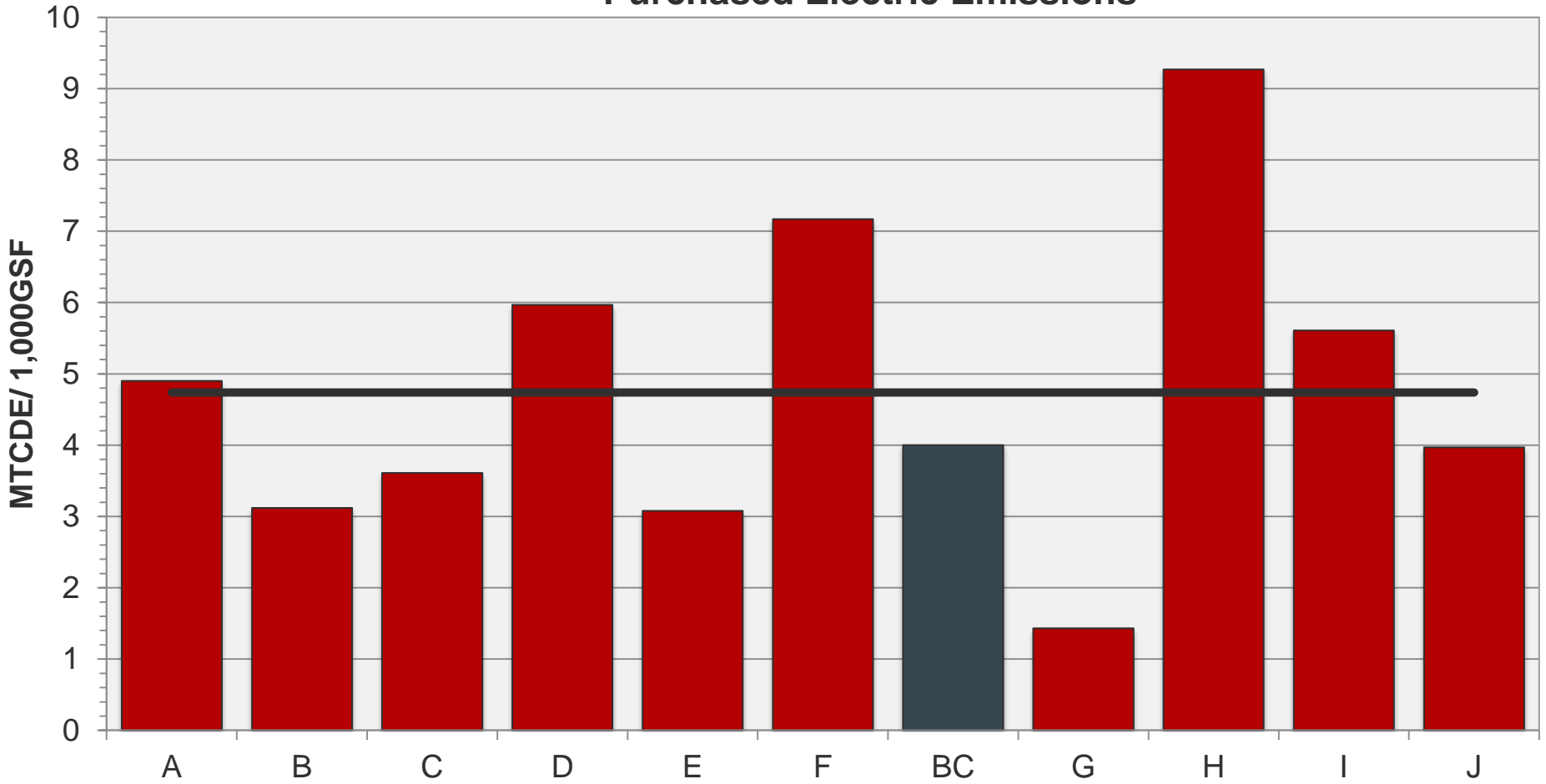


Electric Emissions vs. Peers



Boston College benefits from a cleaner grid

Purchased Electric Emissions

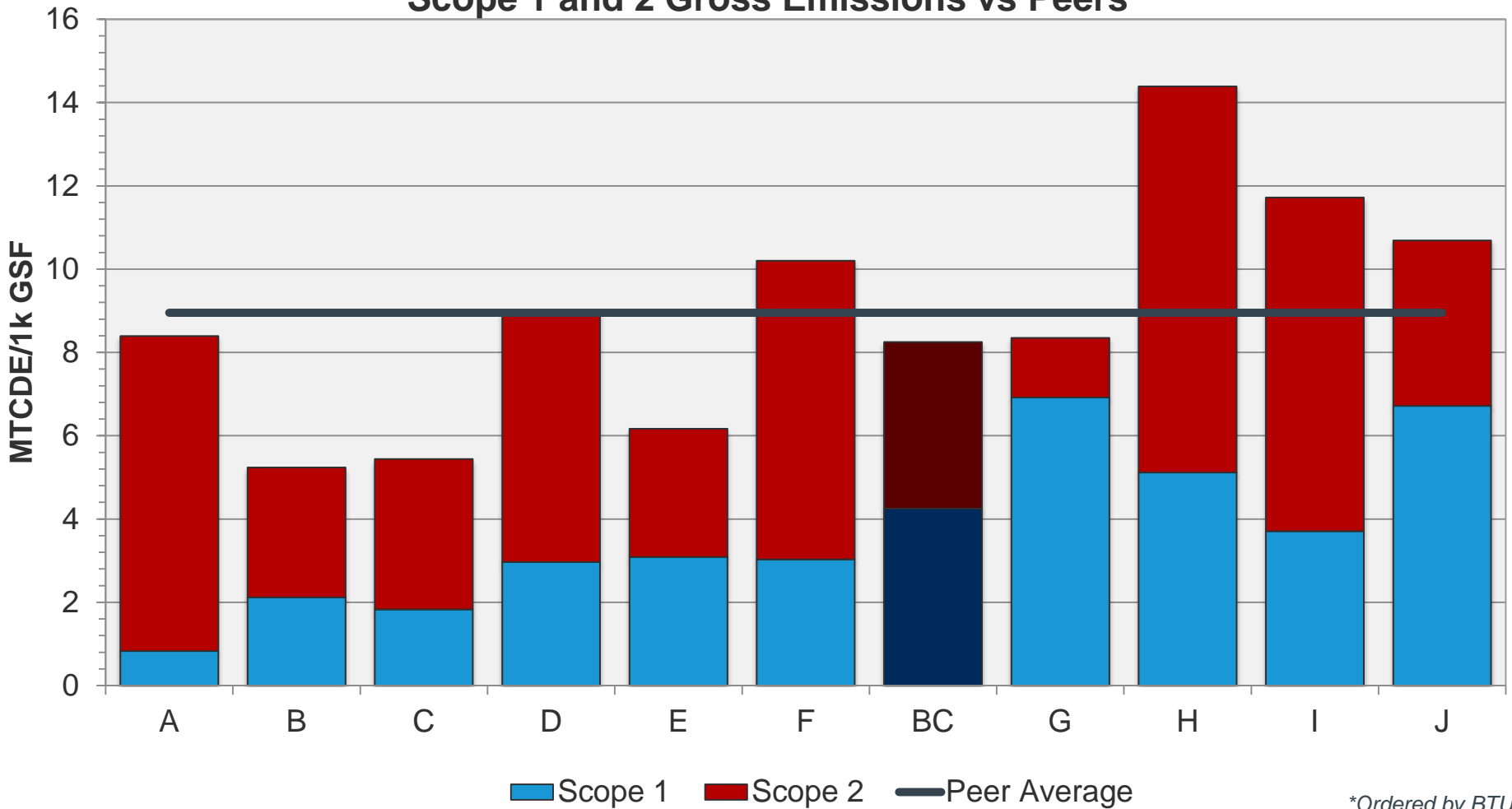


*Ordered by BTU/GSF

BC outperforms peers in Utility Emissions



Scope 1 and 2 Gross Emissions vs Peers



*Ordered by BTU/GSF

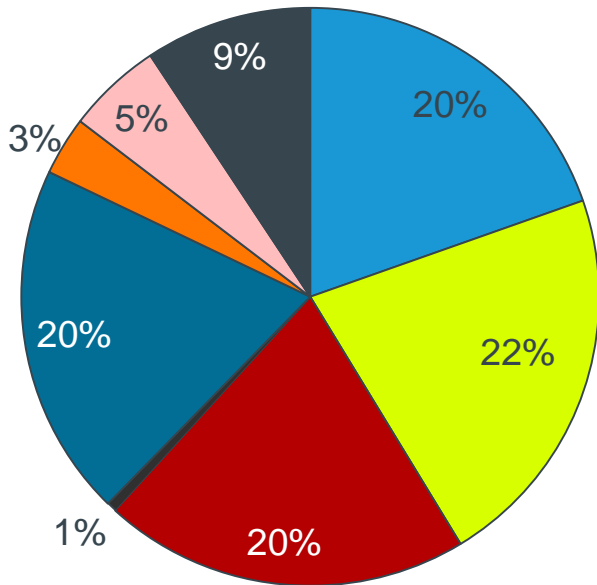
Scope 3 Emissions Profile



Scope 3 Summary

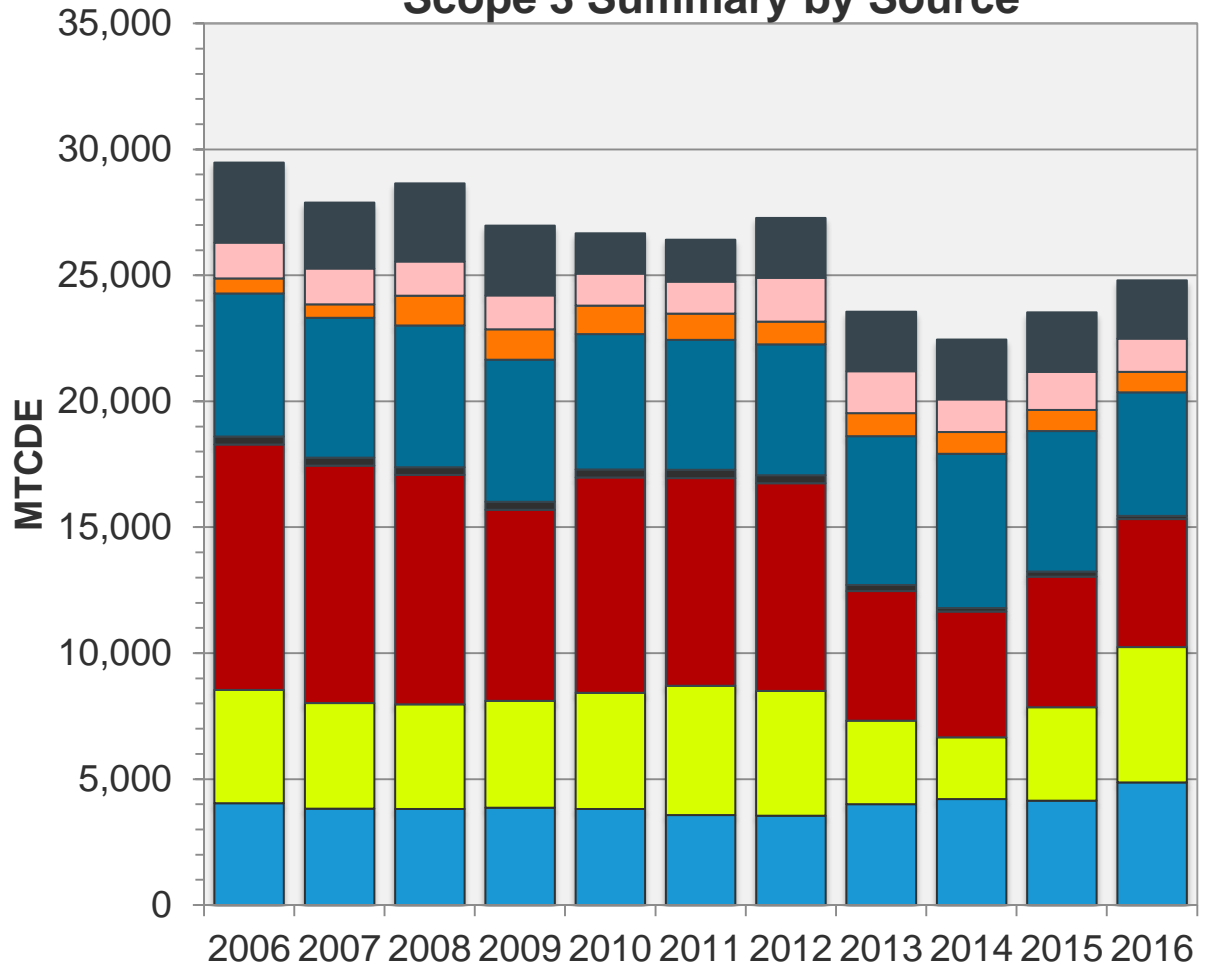
Student commuting driving increase in emissions in FY16

FY16 Scope 3 Summary



- Faculty/Staff Commuting
- Student Commuting
- Directly Financed Air Travel
- Other Directly Financed Travel
- Study Abroad Travel
- Solid Waste
- Wastewater
- Scope 2 T&D Losses

Scope 3 Summary by Source

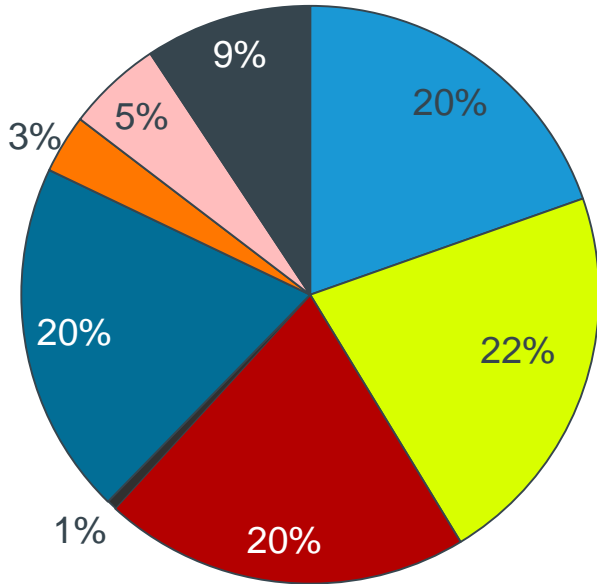




Scope 3 Summary

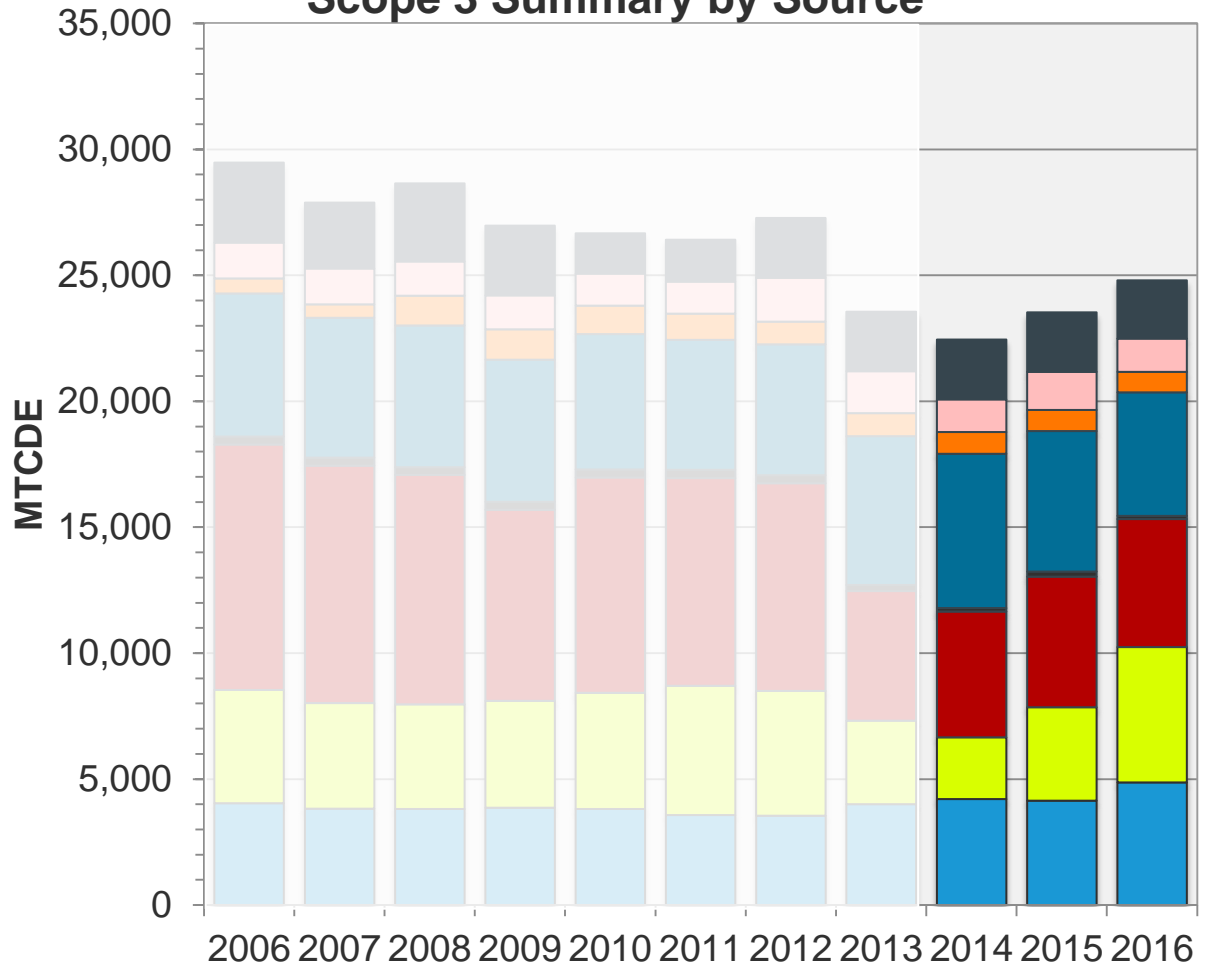
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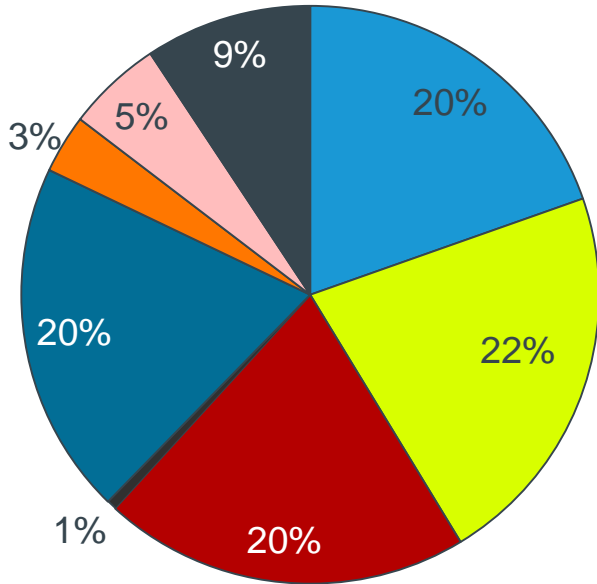


Scope 3 Summary



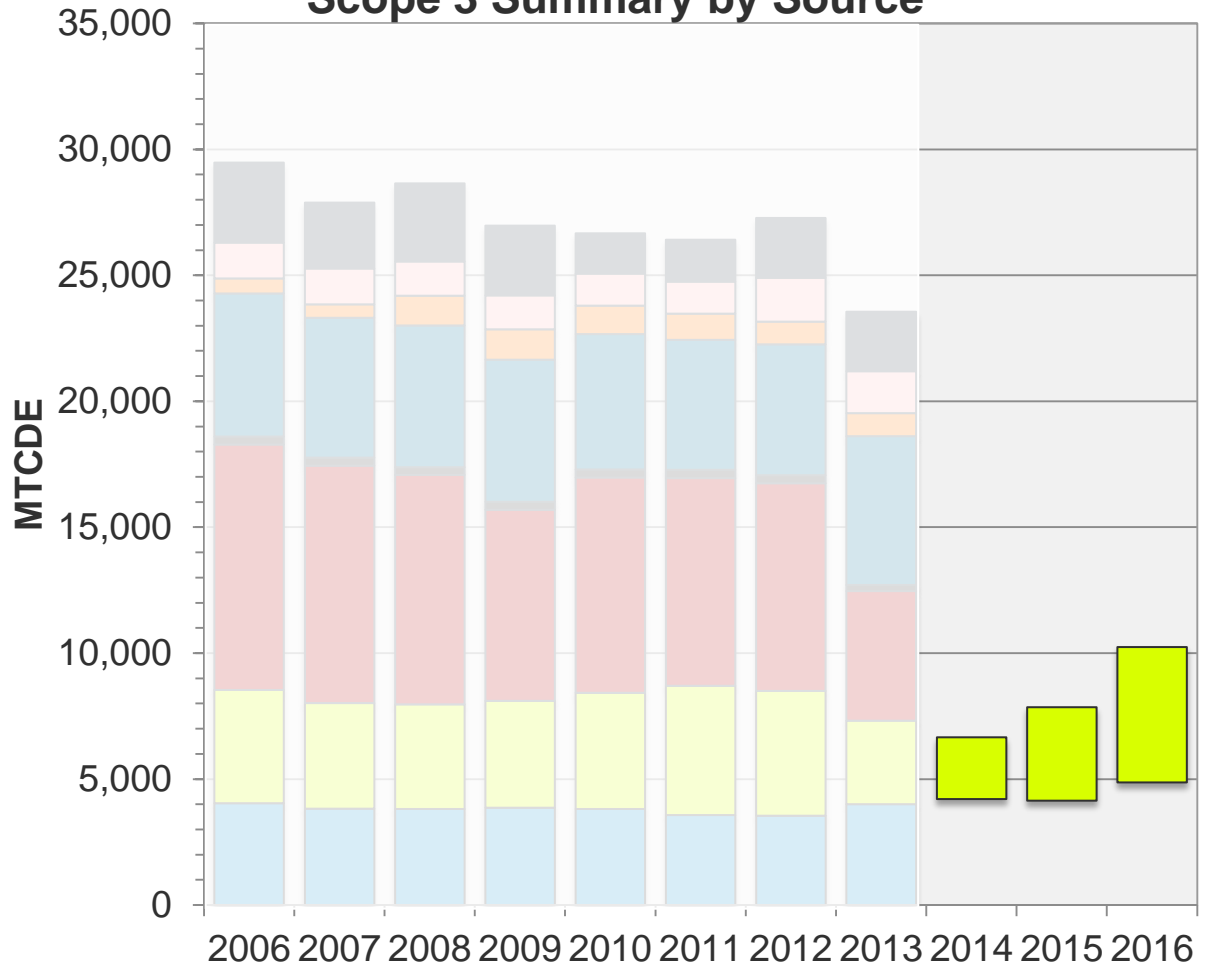
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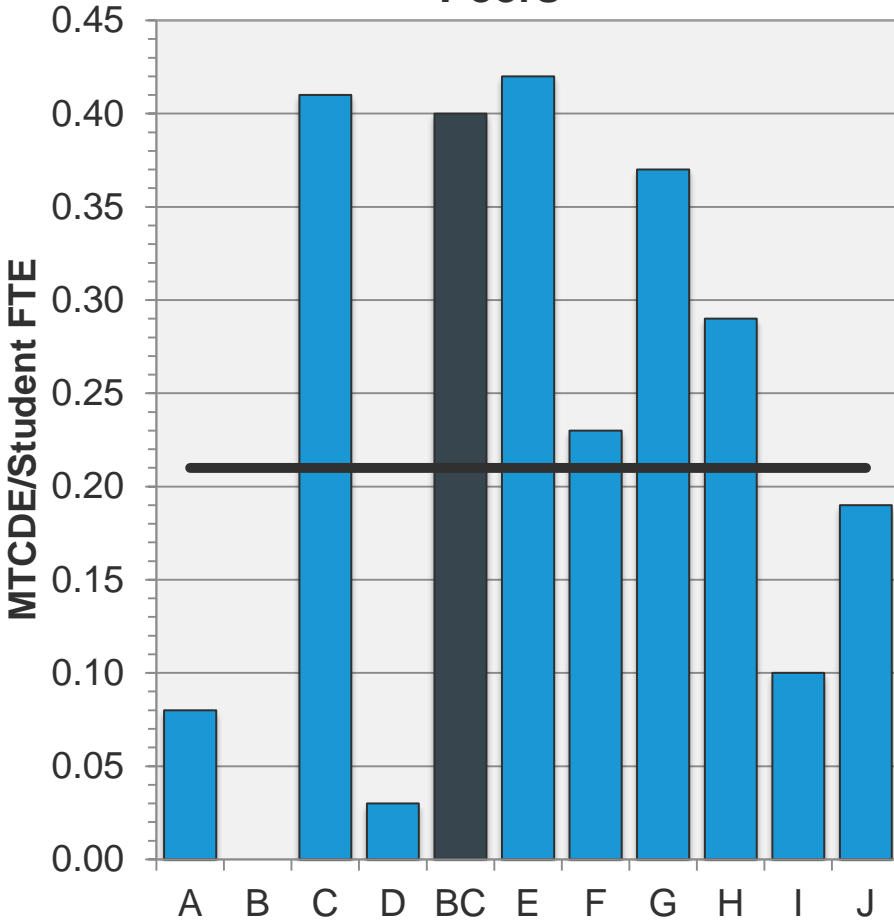




Students Commuting Emissions Double Peer Levels

All facets of student commuting influencing the increase in emissions

Student Commuting Emissions vs Peers



Students Commuting	
Boston College	Peers
45%	38%



Average Trip Distance	
Boston College	Peers
9.8	8.2



Commuters Traveling Alone	
Boston College	Peers
56%	41%



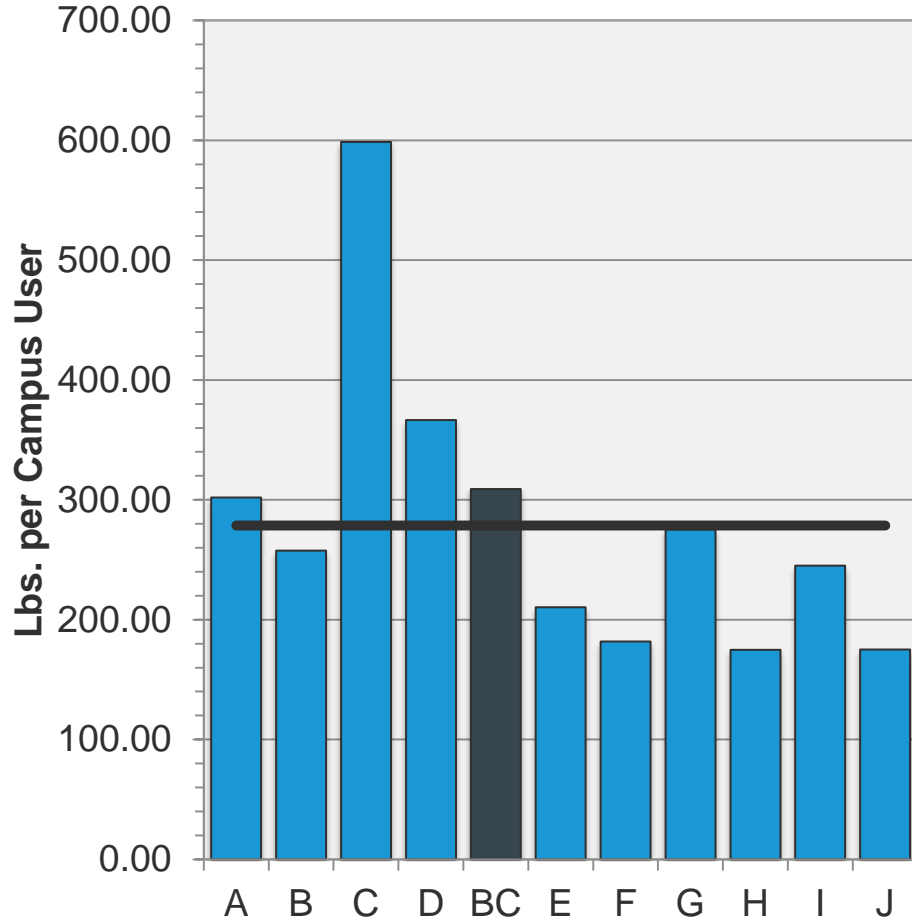
*Ordered by Density Factor

Boston College Producing More Waste

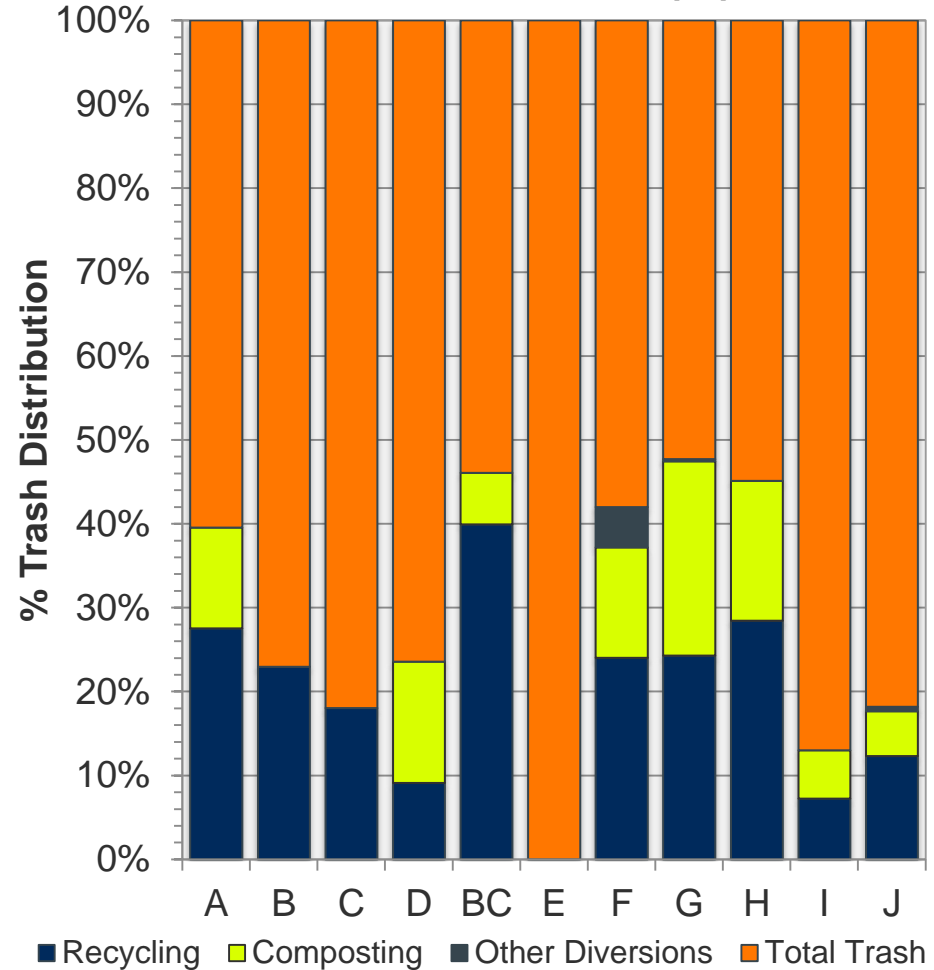


Recycling and composting a focus to drive down the waste mix

Total Waste Production



Total Waste Mix (%)



*Ordered by Density Factor

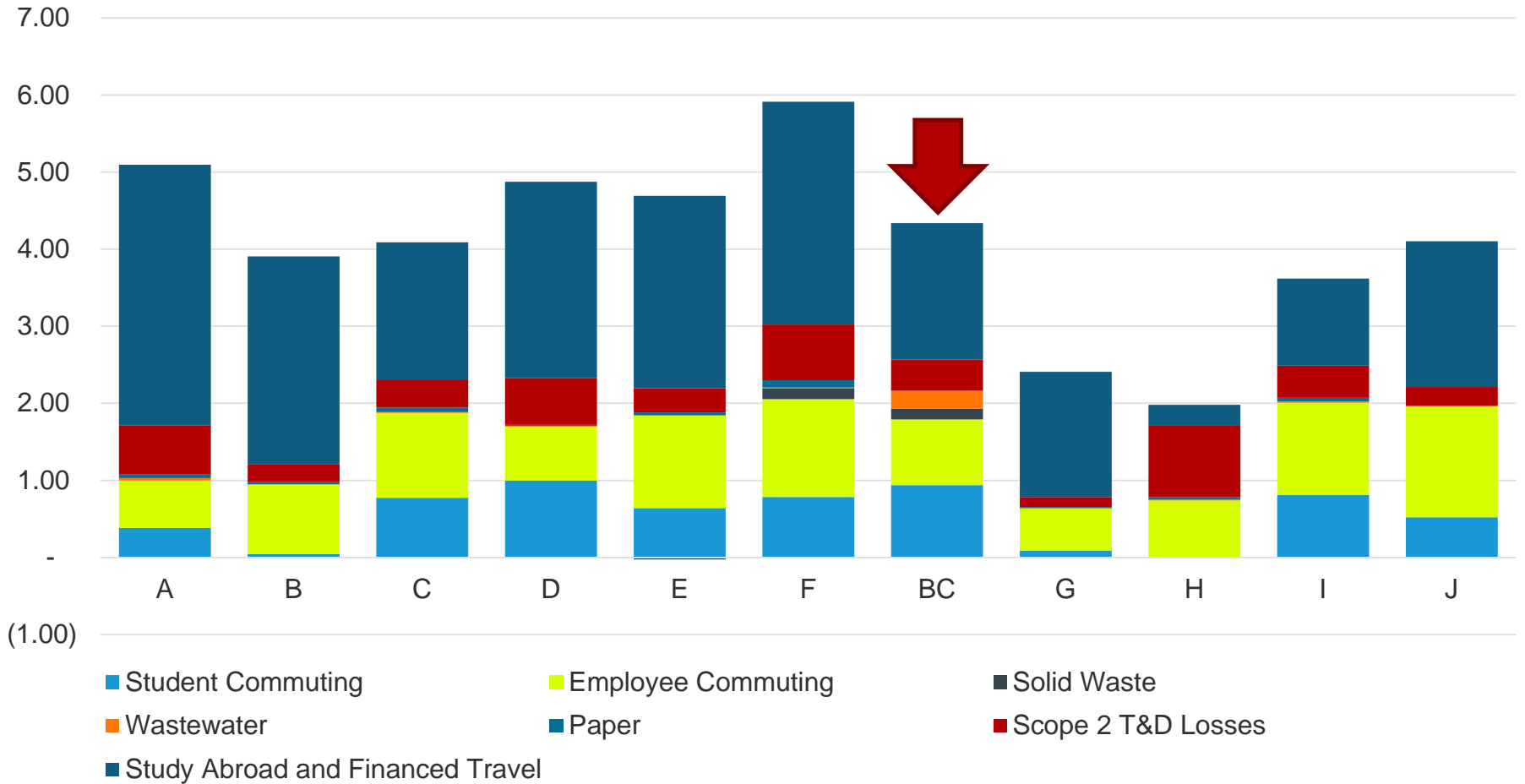


Scope 3 Emissions vs. Peers



Commuting and Travel drive Scope 3 emissions

Scope 3 Emissions vs. Peers

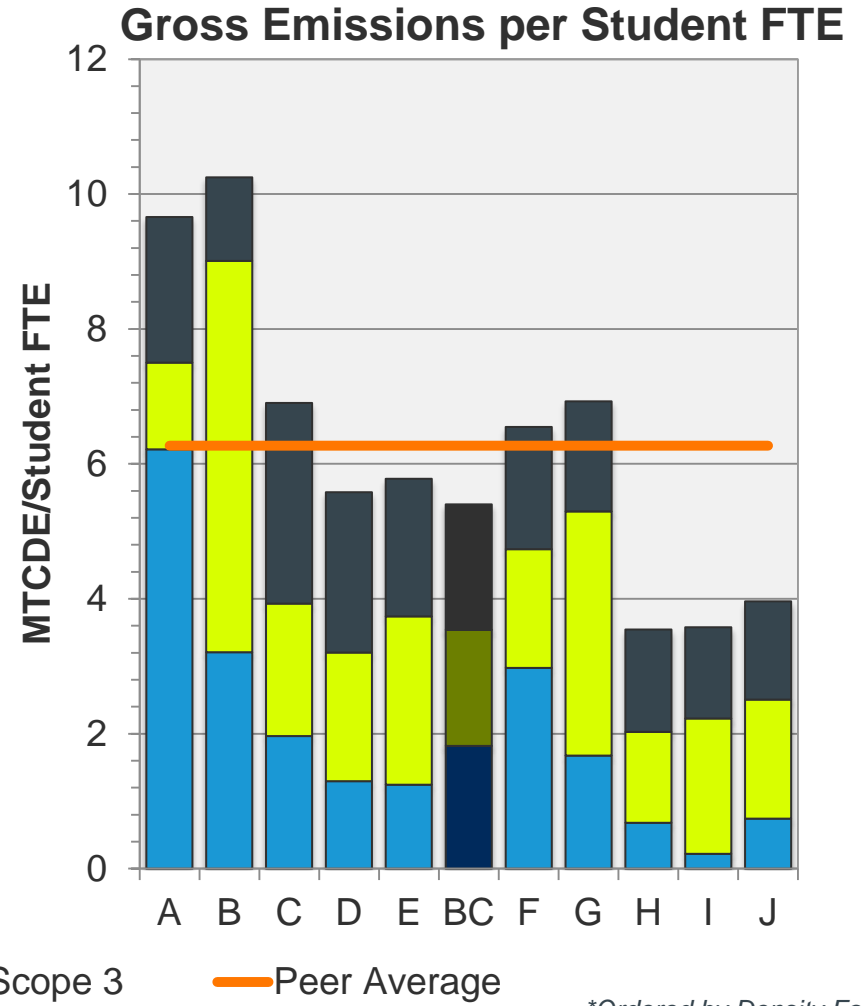
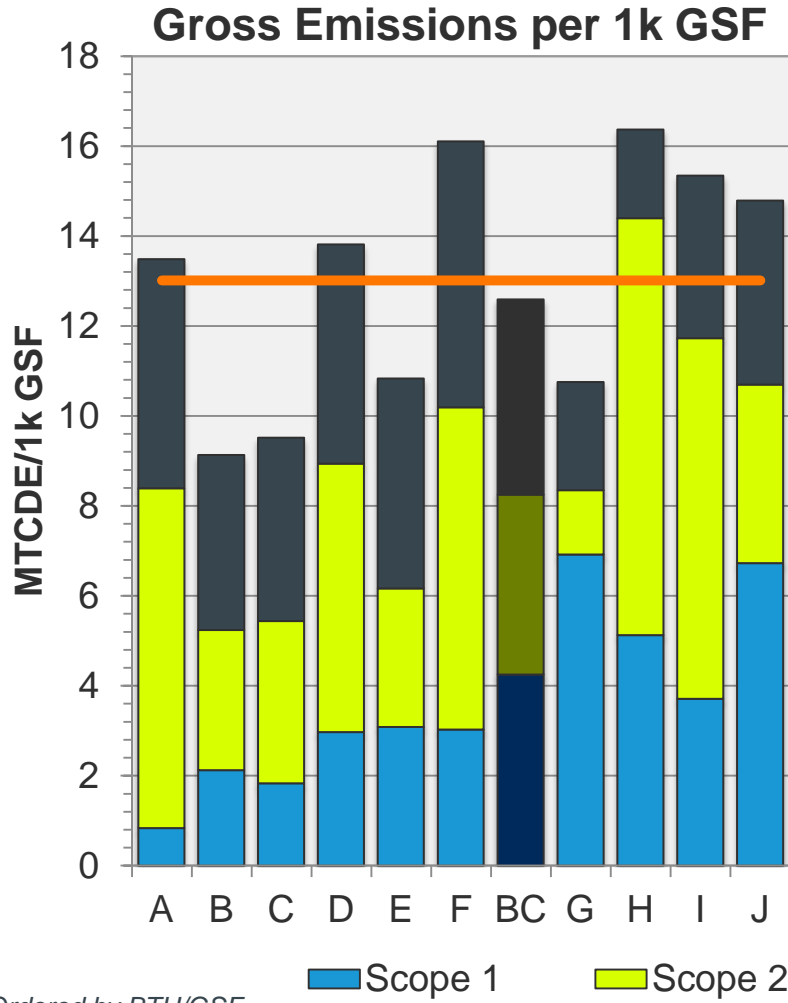


Conclusions

FY16 Performance vs Peers



Boston College performing below peer levels for both metrics



*Ordered by BTU/GSF

*Ordered by Density Factor



Net Emissions vs. Peers

RECs and Offsets are a part of some institutions Suitability plan

