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University of Maine System

FY18 Carbon Emissions Analysis

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

Comprehensive Facilities Intelligence Solutions

FACILITIES BENCHMARKING & ANALYSIS

Take control of your facilities and make the case for change without the guesswork

FACILITIES ASSESSMENT & PLANNING

Plan and execute capital investment plans that are inclusive, credible, flexible, affordable and sustainable

SPACE UTILIZATION

Ensure your space is working up to its full potential

SUSTAINABILITY SOLUTIONS

Measure, compare and improve environmental stewardship

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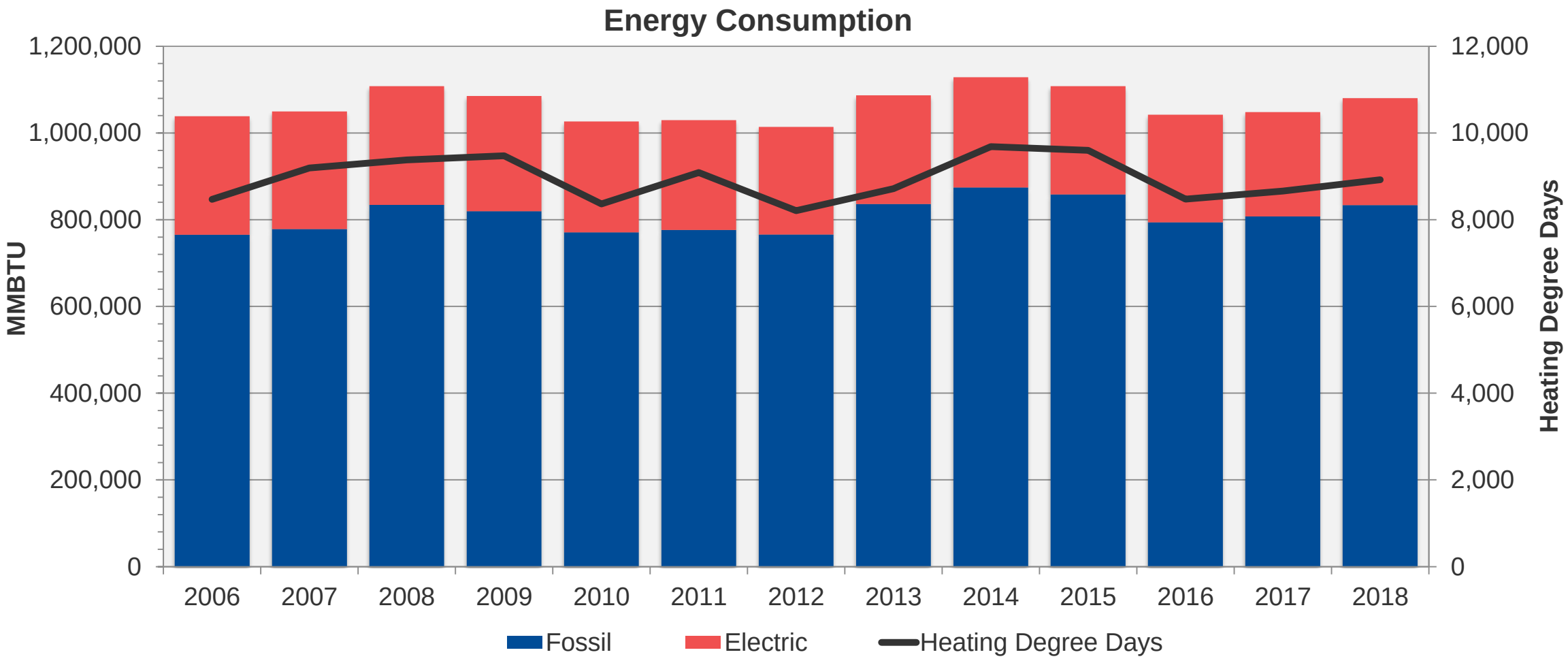
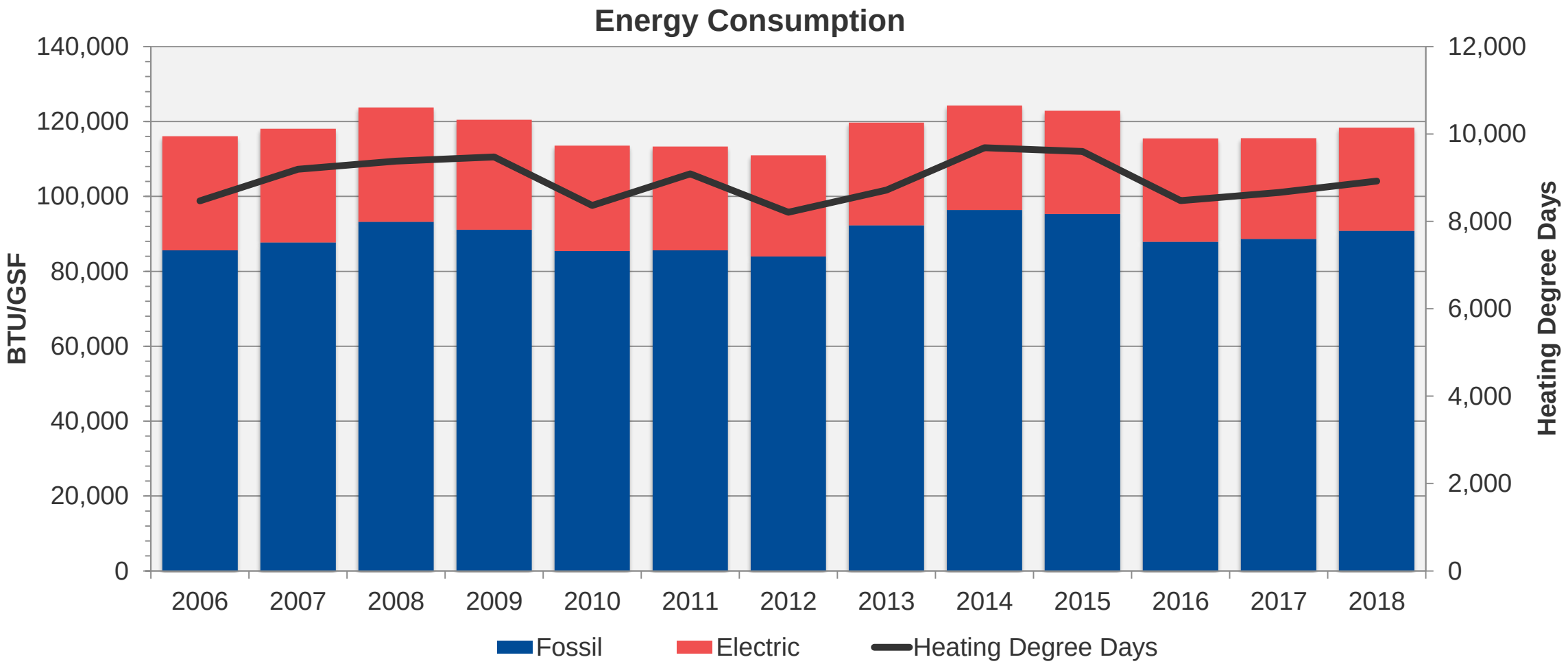
Total Gross Energy Consumption Across UMS



**Degree days noted are based on the Orono, Maine location*
***Fossil fuels contain all heating fuel sources, including alternative fuel sources (ie biomass, wood chips, etc.)*

Total Energy Consumption Increased in FY18

Consumption correlates with Heating Degree Days

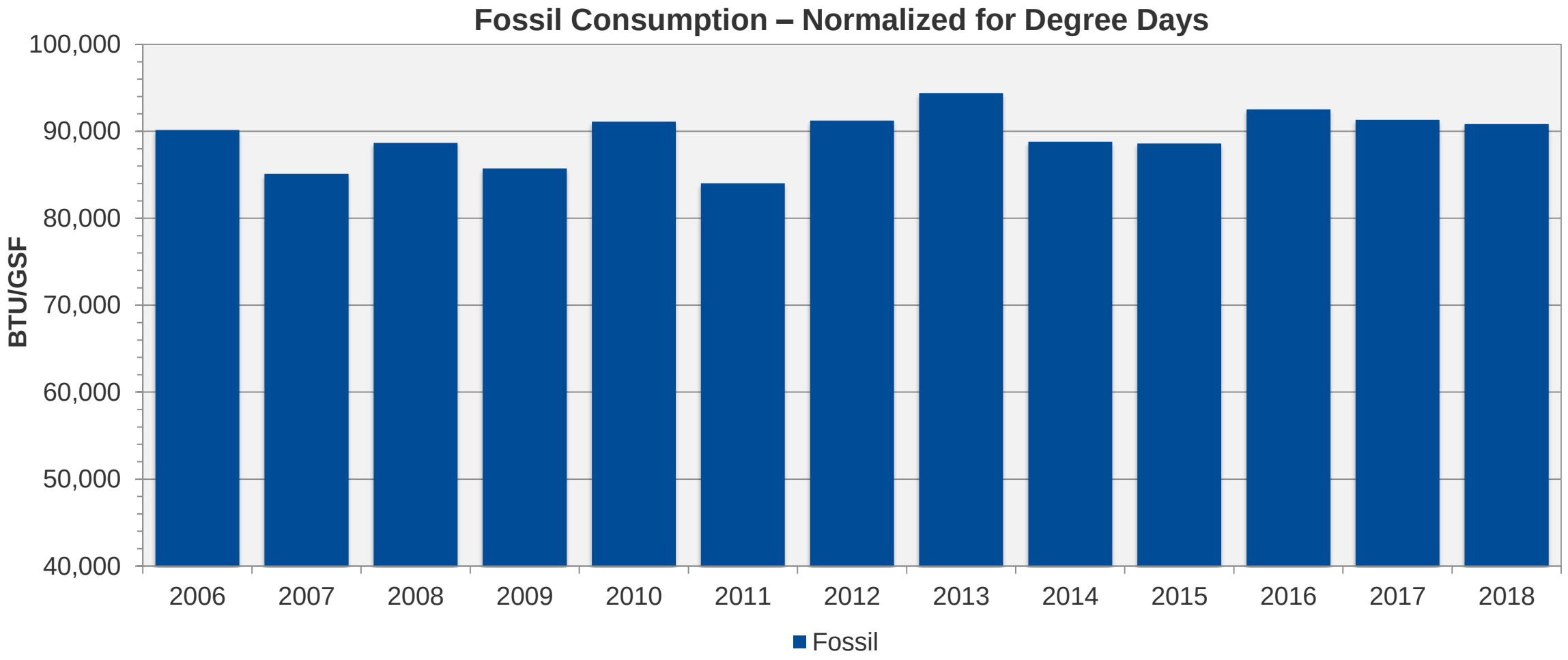


**Degree days noted are based on the Orono, Maine location*

***Fossil fuels contain all heating fuel sources, including alternative fuel sources (ie biomass, wood chips, etc.)*

Consumption Decreasing Since 2016 When Normalized for HDD

Graph shows what the consumption would be if each year experienced 2018 degree days



*Degree days noted are based on the Orono, Maine location

**Fossil fuels contain all heating fuel sources, including alternative fuel sources (ie biomass, wood chips, etc.)

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Sources of Campus Emissions

Analyzing utility-related emissions as MTCDE (Metric Tons of Carbon Dioxide Equivalent)

Scope 1:
From sources owned or controlled by UMS

- On-Campus Stationary
- Vehicle Fleet
- Refrigerants
- Fertilizer

Scope 2:
From the generation of electricity purchased by UMS

- Purchased Electricity

Scope 3:
From sources not directly controlled by UMS

- Directly Financed and Study Abroad Travel
- Waste and Wastewater
- Student, Faculty, and Staff Commuting
- Paper Purchasing
- Transmission and Distribution Losses

Sources required by Second Nature (formerly ACUPCC) not included in this analysis:

Scope 1:
- Fleet Fuel
- Refrigerants
- Agriculture

Scope 3:
- Employee & Student Commuting
- Air Travel
- Solid Waste & Wastewater

New 2018
In alignment with the World Resource Institute (WRI) scope 2 best practice recommendations, the industry has updated utility consumption and renewable energy accounting methodology from market based to location based.

Due to the limited information we receive from UMS, the scope 2 emissions from this report continue to be reported with the location based methodology.

Increasingly Difficult to Track, Control and/or Mitigate

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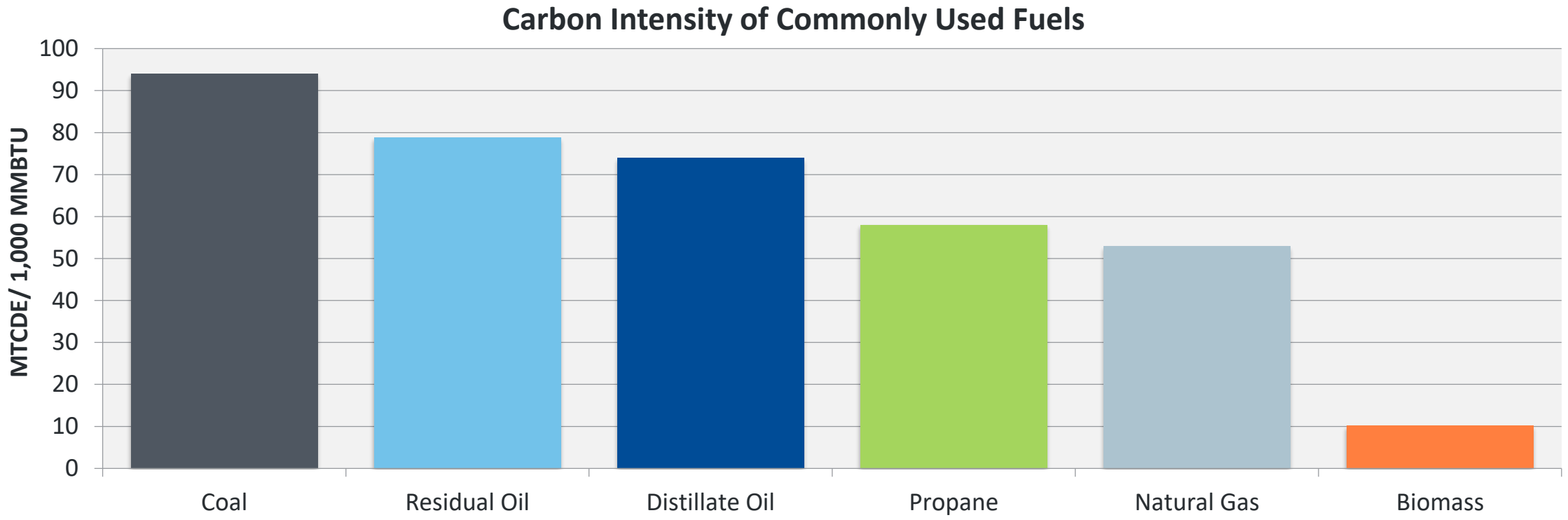
Carbon Intensity of Commonly Used Fuels

Shifting from oil usage to natural gas and biomass, less carbon intense fuel options



% of consumption:

UMaine & USM:	**0%**	**6%**	**1%**	**1%**	**92%**	**0%**
Other Campuses:	**0%**	**0%**	**34%**	**4%**	**12%**	**50%**

MTCDE = Metric Tons of Carbon Dioxide Equivalent

**Biomass includes wood pellets and wood chips*

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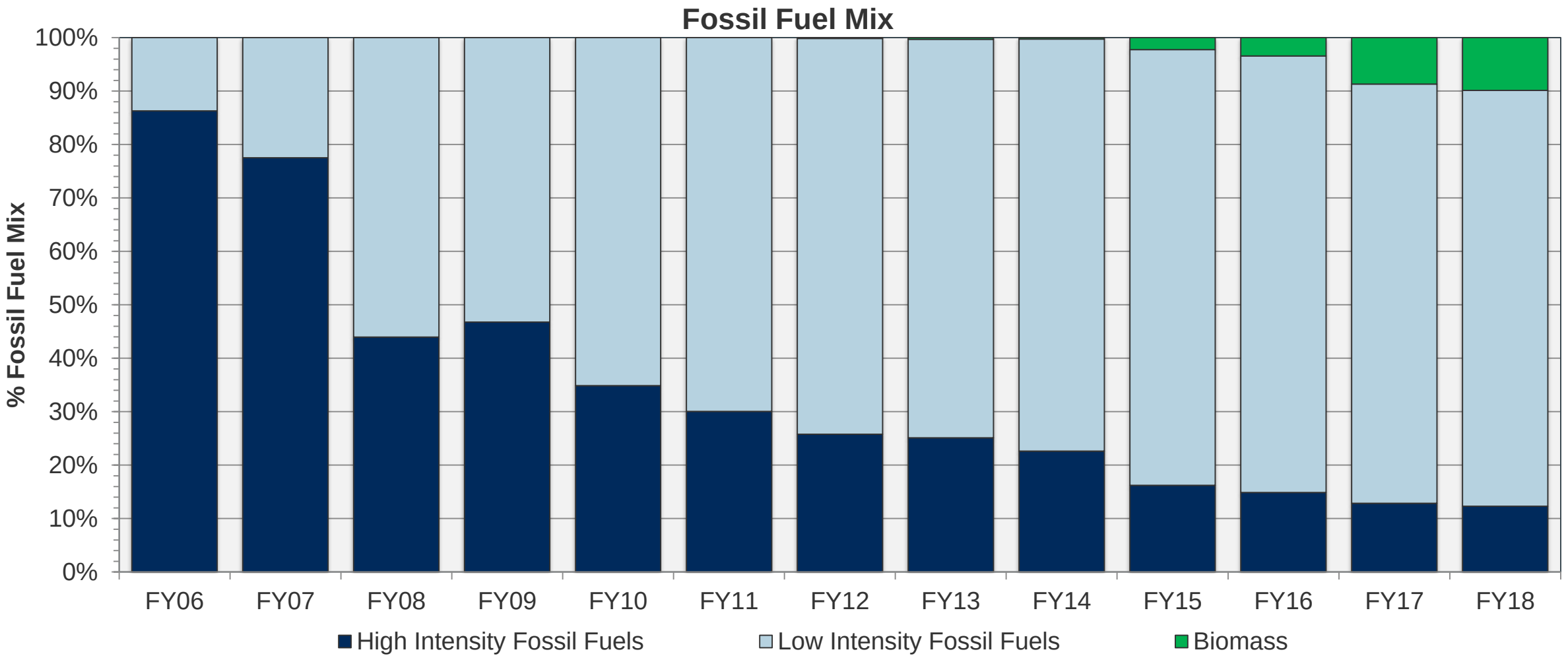
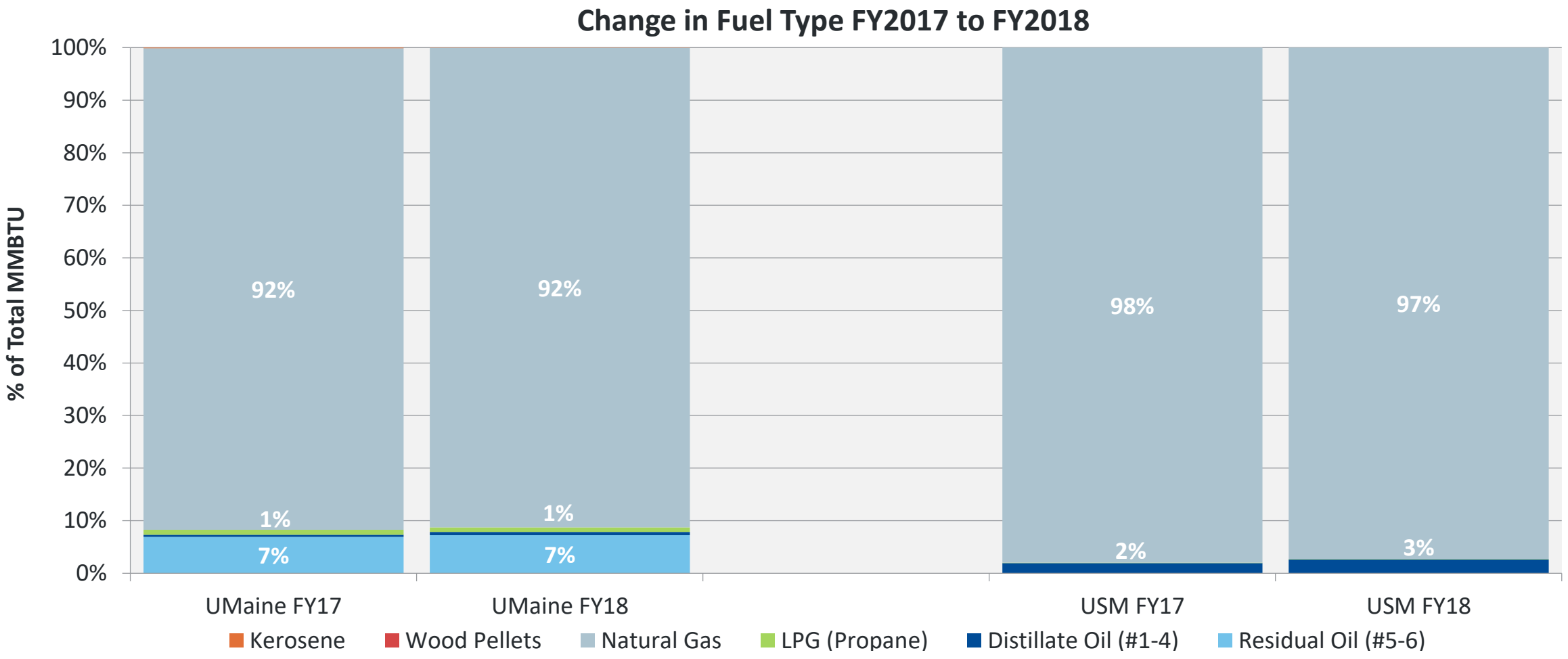
Fuel Mix Continues to Trend Towards Emitting Less Carbon



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

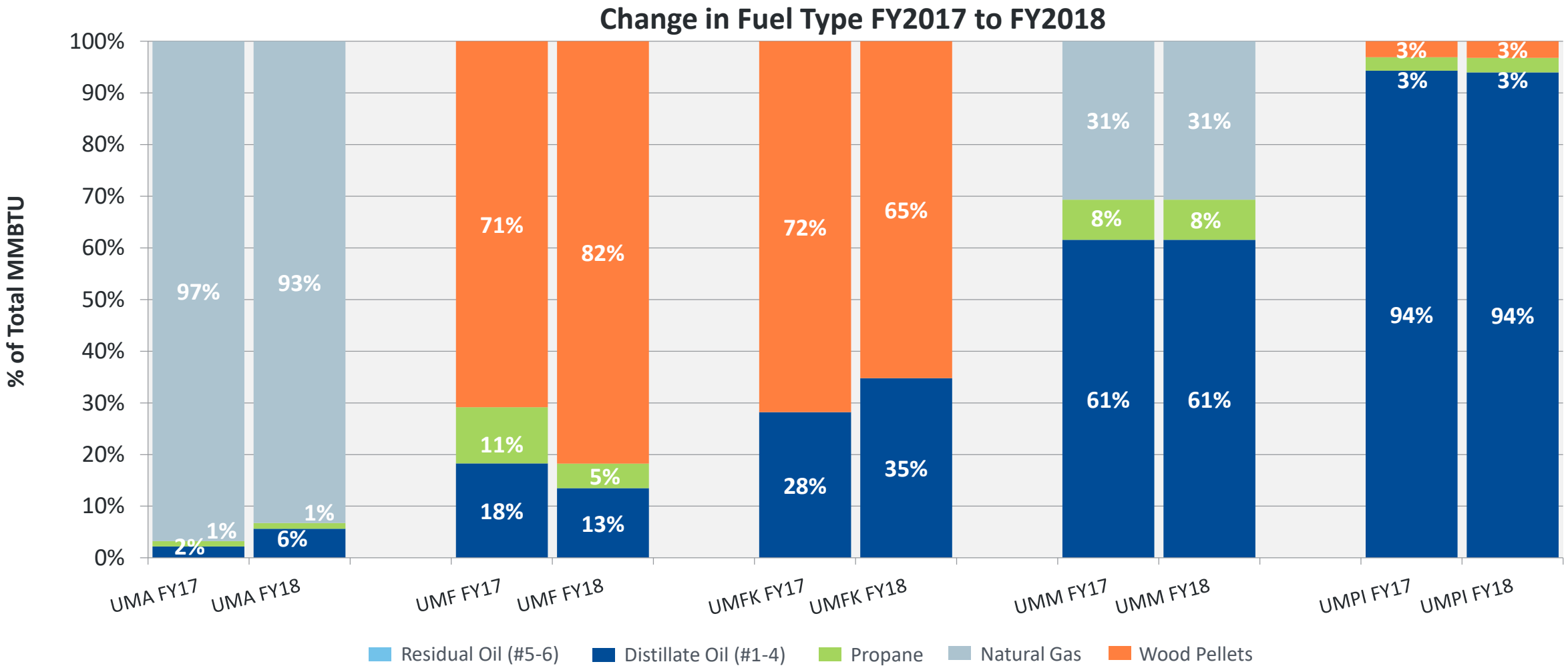
**Low intensity fuels include natural gas and propane

UM and USM Continue to Use Natural Gas as Primary Fuel Source



Smaller UMS Institutions Vary in Fuel Source Mix

UMF and UMFK benefit from biomass consumption



*UMM 2018 energy consumption pulled forward from 2017

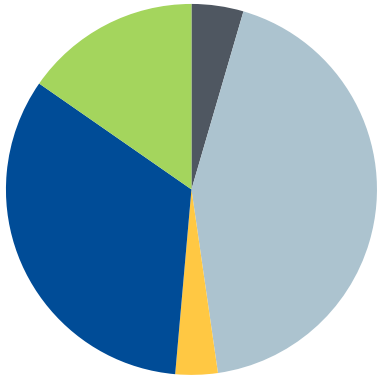
Scope 2 Purchased Electric: Fuel Mix

Maine is located in a less carbon intense region of the country

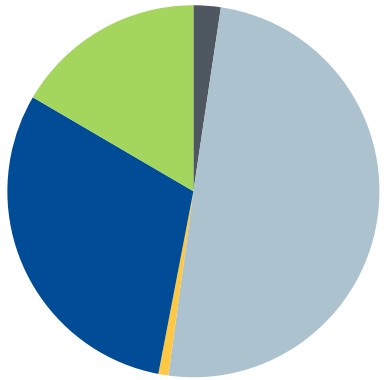
More Activity

Less Activity

NEWE Grid Fuel Mix (2014)

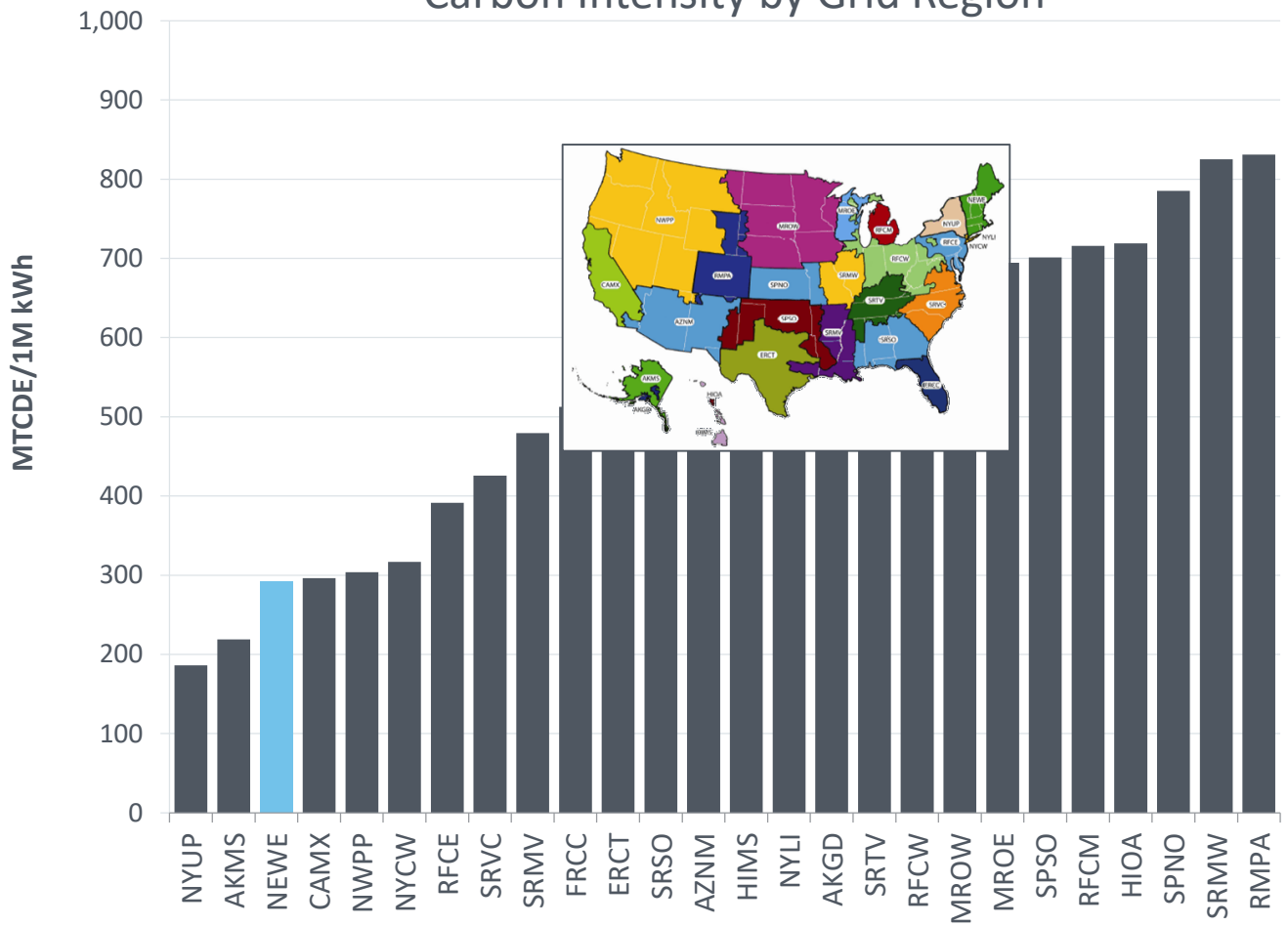


NEWE Grid Fuel Mix (2016)



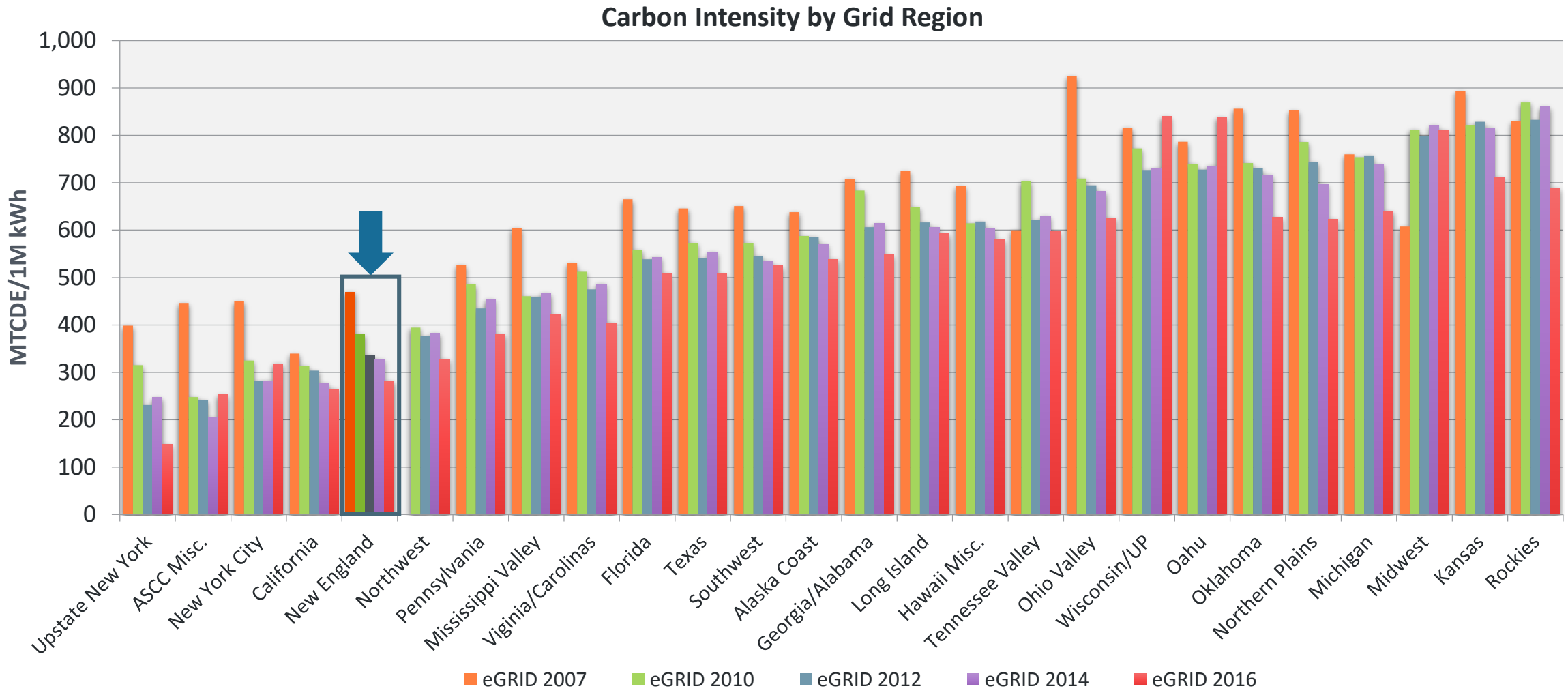
Coal Natural Gas Other Fossil Nuclear Renewable

Carbon Intensity by Grid Region



*NEWE is the electric grid serving all of New England

Maine's Grid Getting Greener Since 2007



MTCDE = Metric Tons of Carbon Dioxide Equivalent

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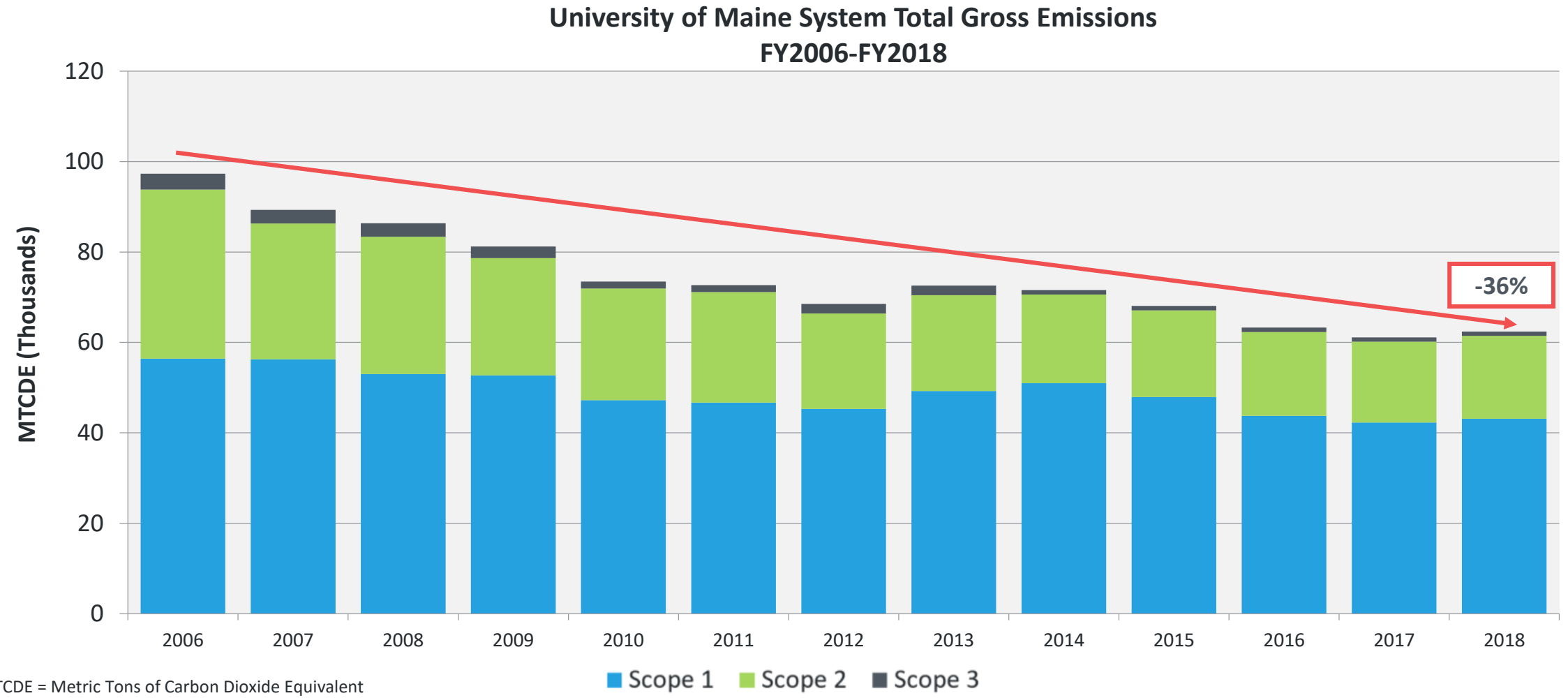
Total UMS Gross Utility Emissions Over Time

Total gross emissions have decreased 36% since FY2006



MTCDE = Metric Tons of Carbon Dioxide Equivalent

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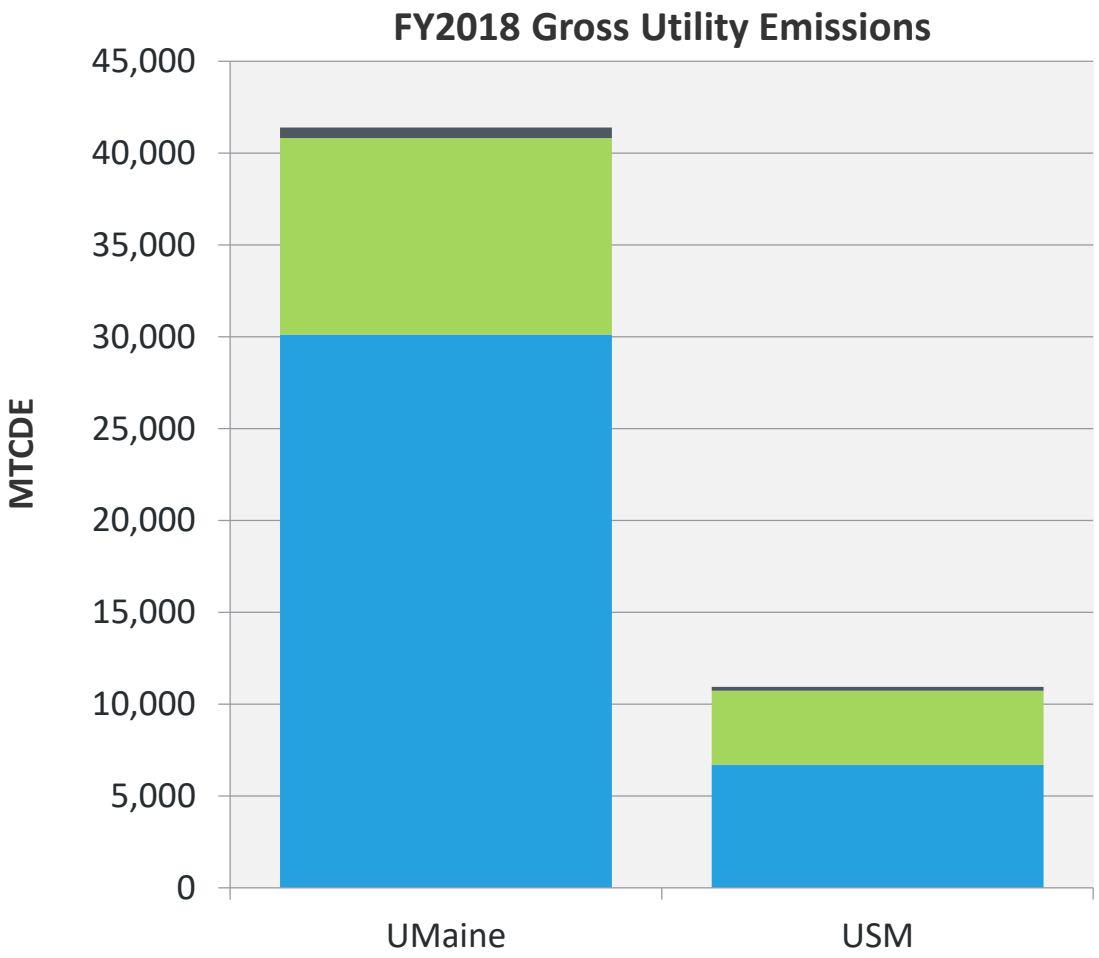
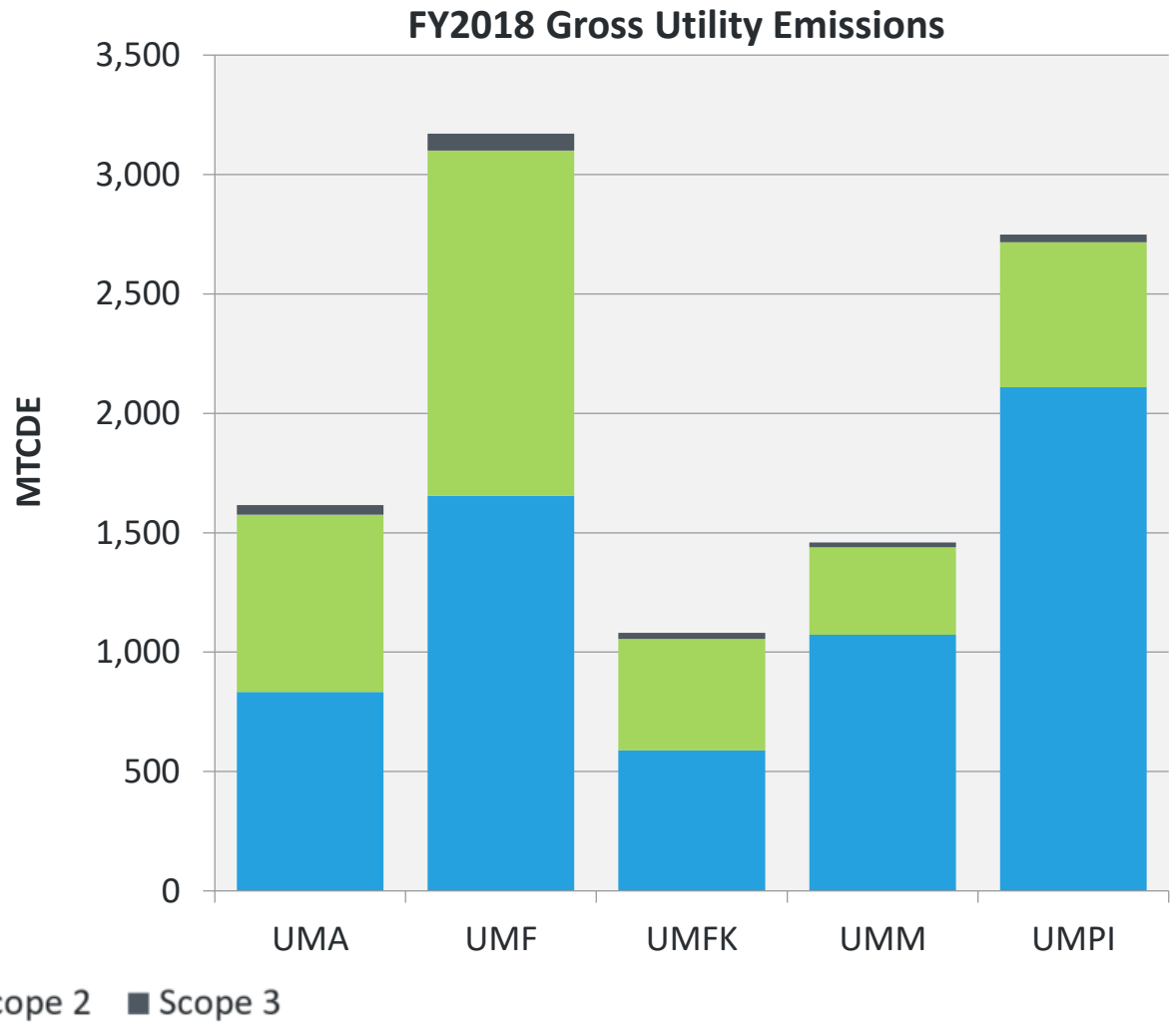
University of Maine System Gross Utility Emissions 2018

FY2018 Utility Emissions by Campus





MTCDE = Metric Tons of Carbon Dioxide Equivalent

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Benchmarking GHG Emissions

Emissions per student; emissions per 1,000 GSF

GHG Emissions per Student

Stresses intensity of operations and commuting.

$$\frac{\text{Gross GHG Emissions}}{\text{Total Student FTE}}$$

GHG Emissions per 1,000 GSF

Stresses efficient use of space.

$$\frac{\text{Gross GHG Emissions}}{\text{Total GSF in Footprint}} \times 1{,}000$$

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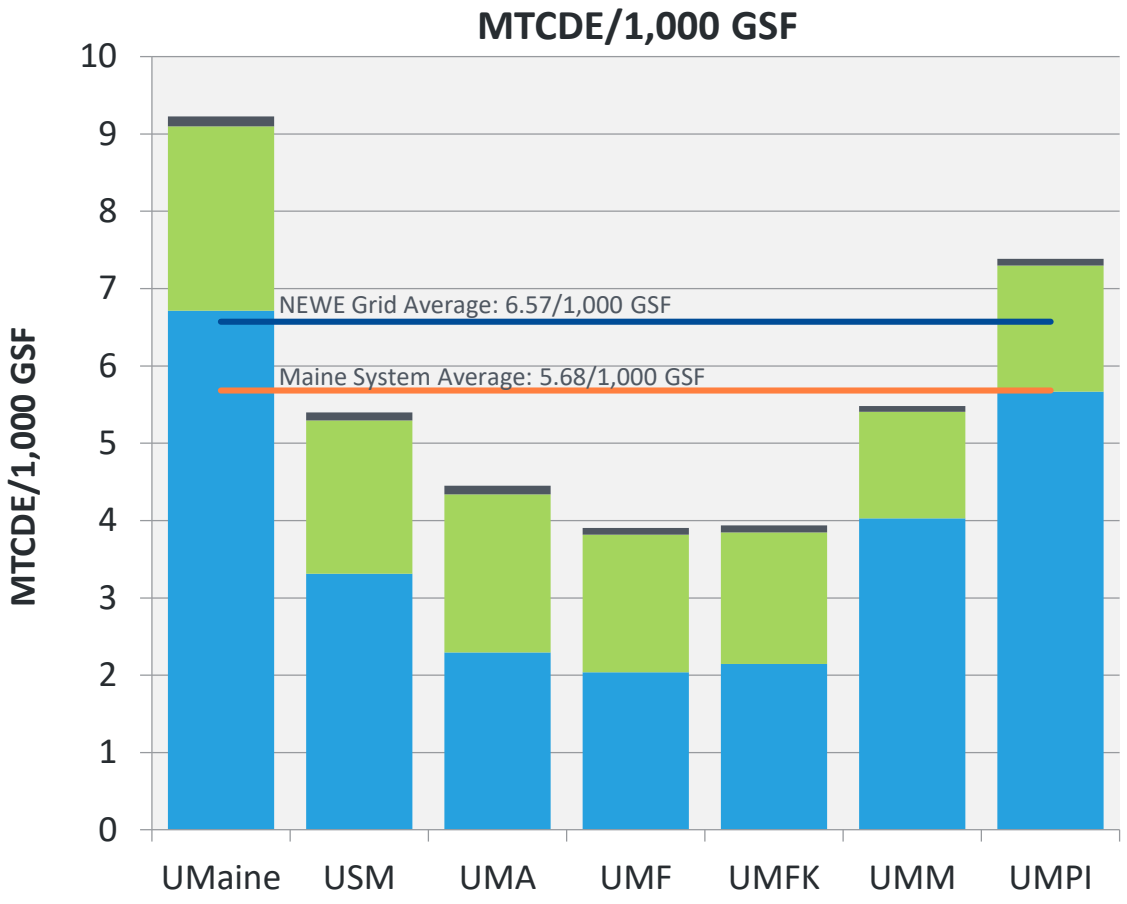
New industry standard uses EUI adjusted floor area rather than GSF in sustainability benchmarks. Due to the scope of this analysis, we have continued to use GSF.

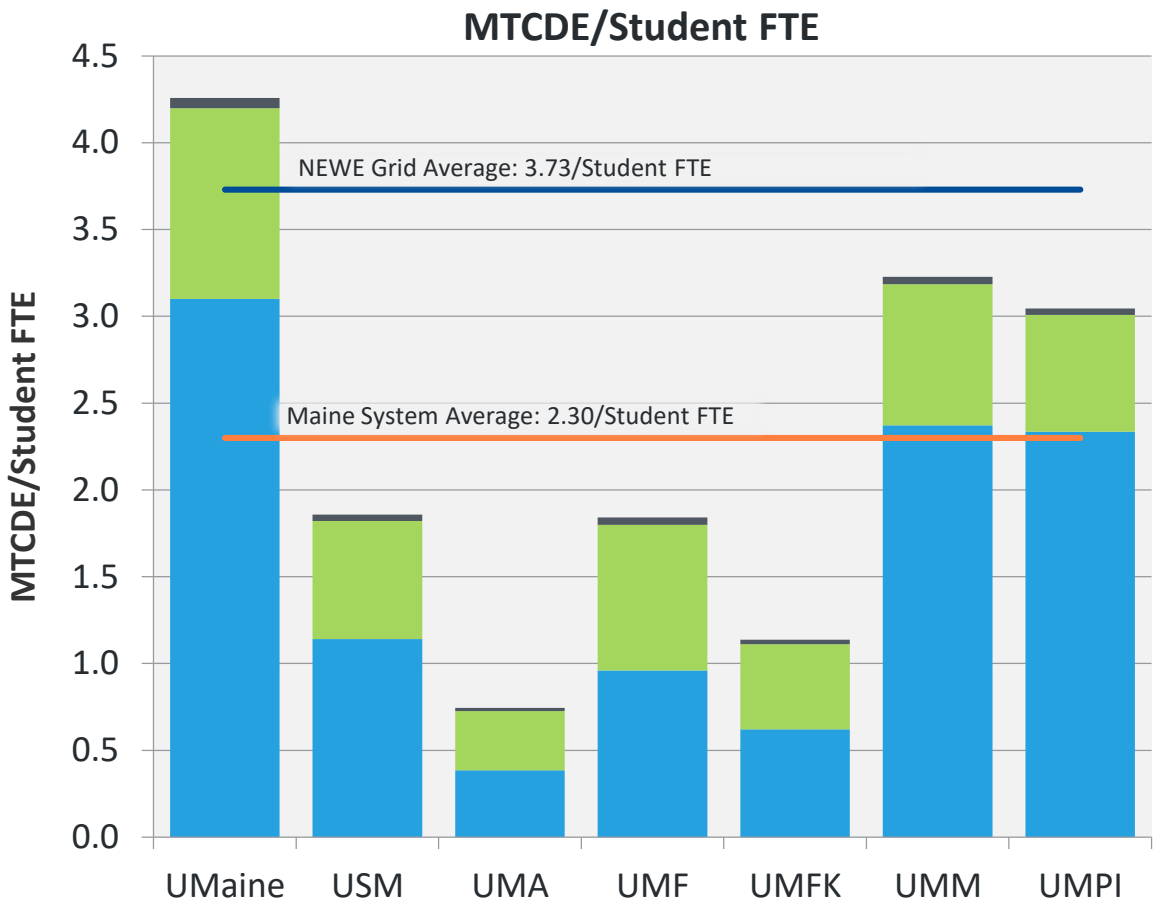
NEWE Grid Peers

Institution	Location
Amherst College	Amherst, MA
Berkshire Community College	Pittsfield, MA
Berkshire School	Sheffield, MA
Bowdoin College	Brunswick, ME
Champlain College	Burlington, VT
Hampshire College	Amherst, MA
Husson University	Bangor, ME
Keene State College	Keene, NH
Mount Holyoke College	Hadley, MA
North Essex Community College	Haverhill, MA
Plymouth State University	Plymouth, NH
Smith College	Northampton, MA
University of Massachusetts Amherst	Amherst, MA
University of Massachusetts Worcester	Worcester, MA
University of New Hampshire	Durham, NH
University of Vermont	Burlington, VT
Williams College	Williamstown, MA

US Electric Grids

Gross FY2018 Utility Emissions by Campus





Scope 1 Scope 2 Scope 3

MTCDE = Metric Tons of Carbon Dioxide Equivalent

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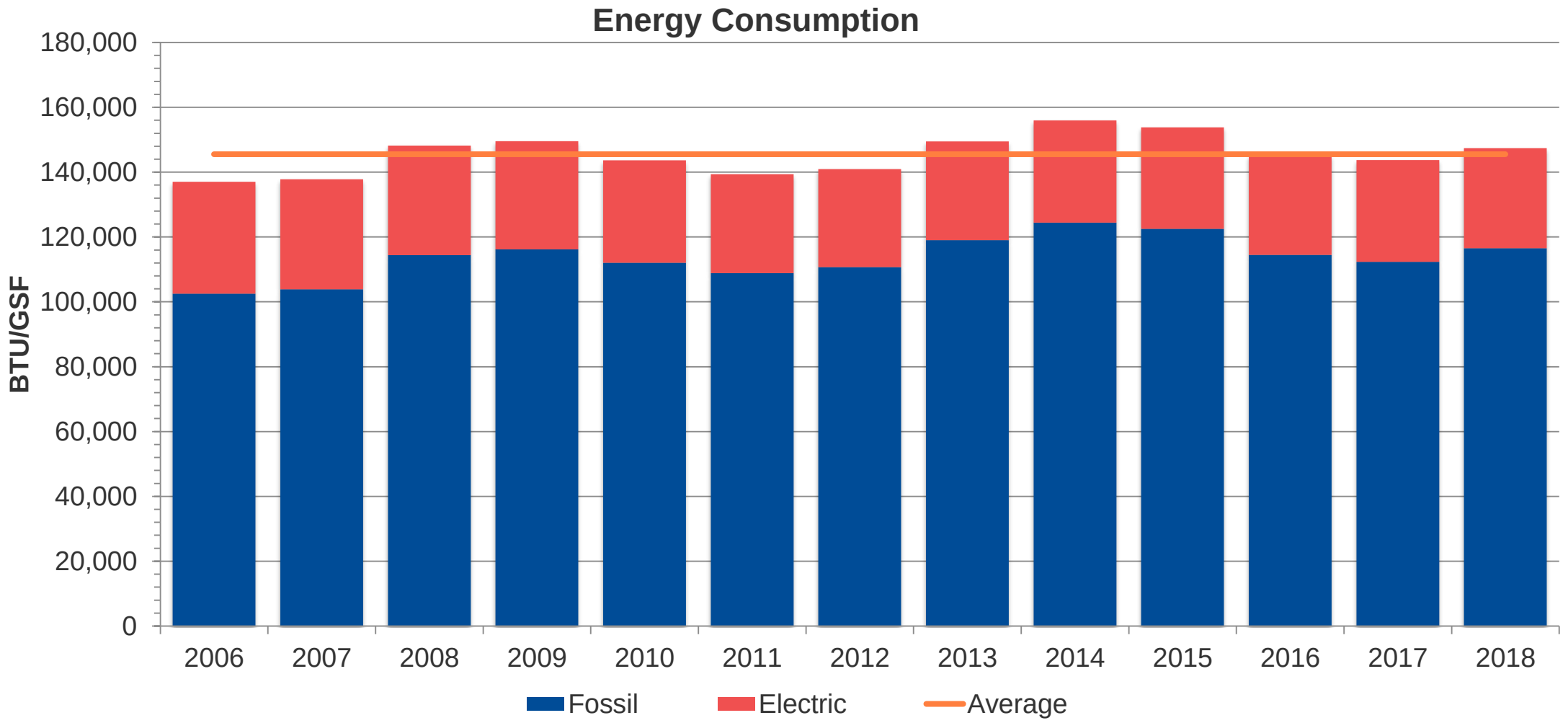
University of Maine System Emissions by Institution

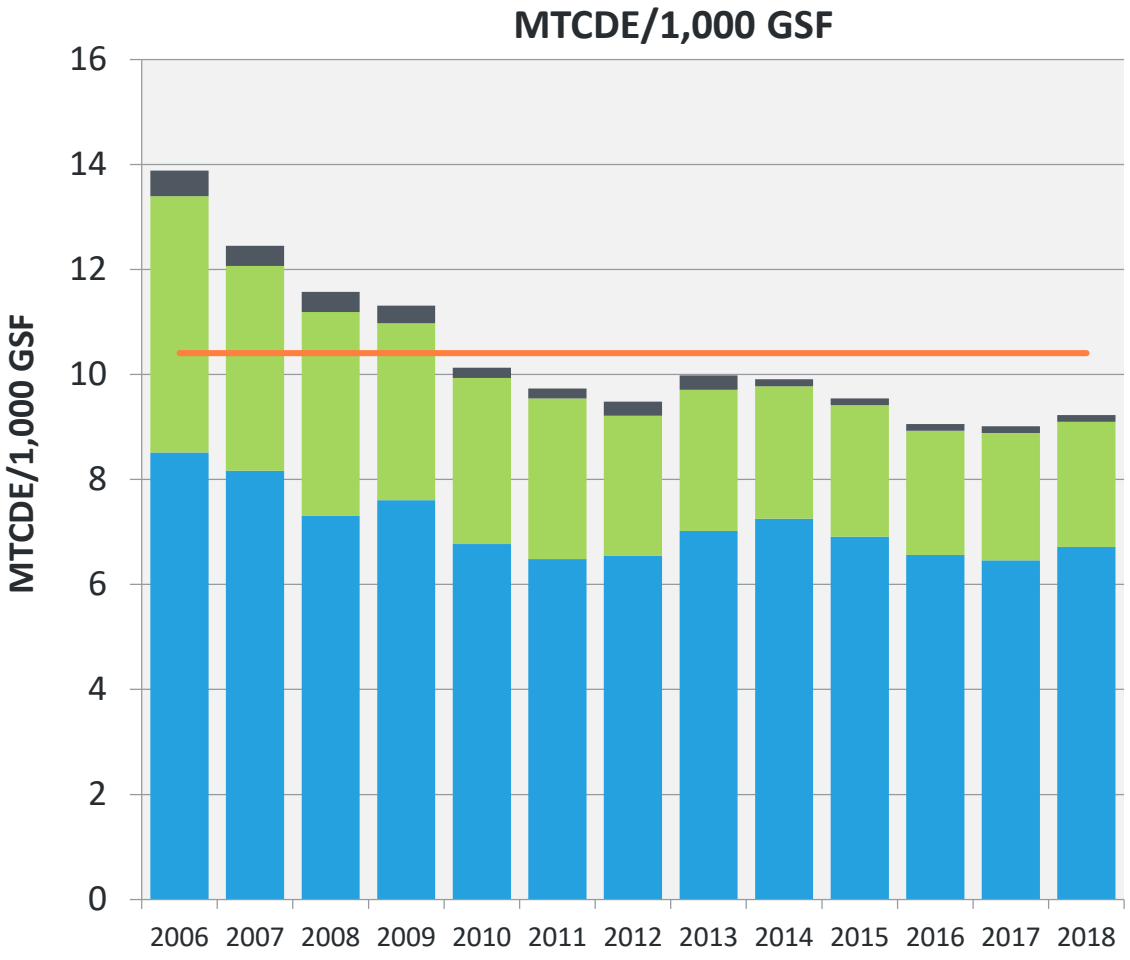
FY2006-FY2018

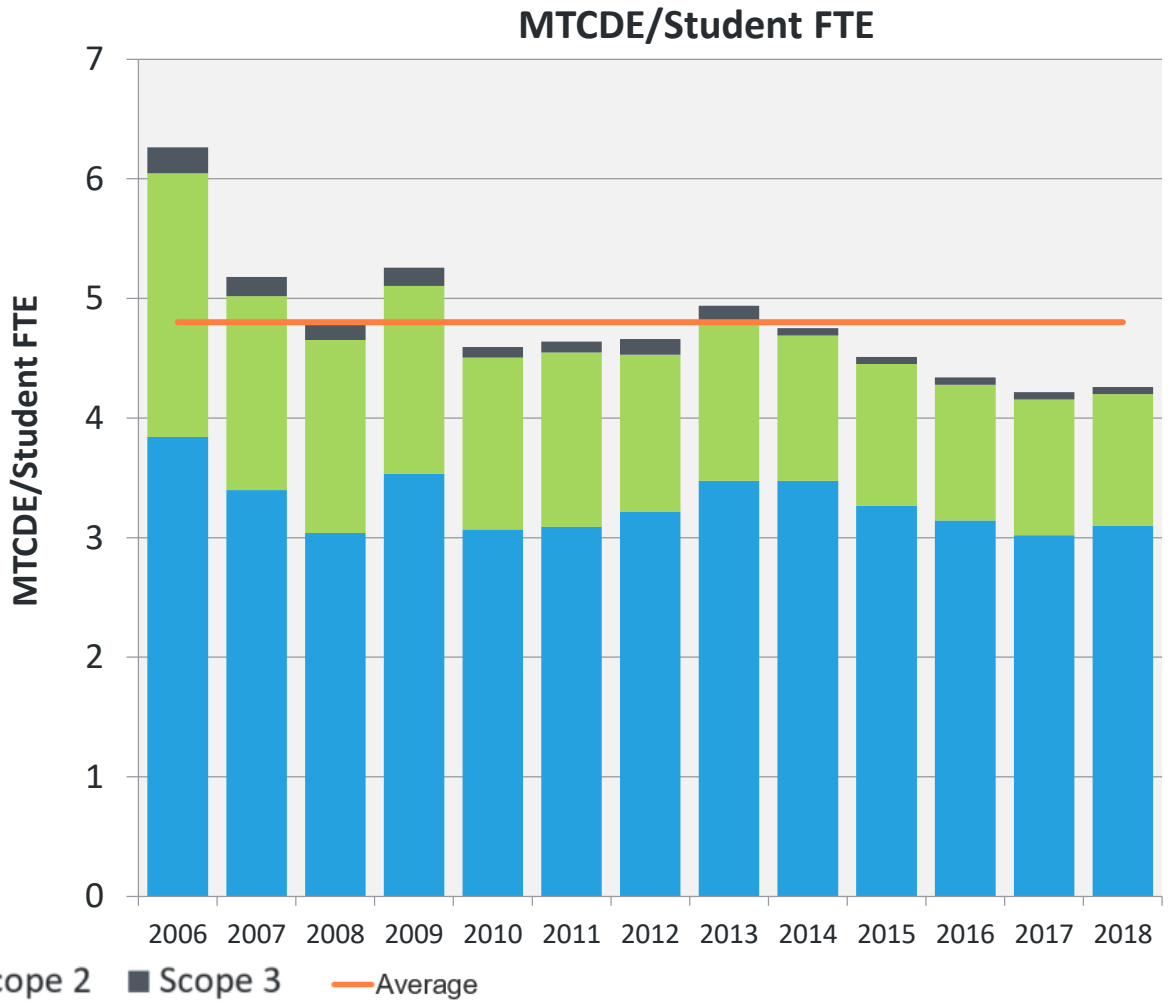
The University of Maine

FY2006 - FY2018 consumption at The University of Maine (BTU/GSF)



The University of Maine





MTCDE = Metric Tons of Carbon Dioxide Equivalent

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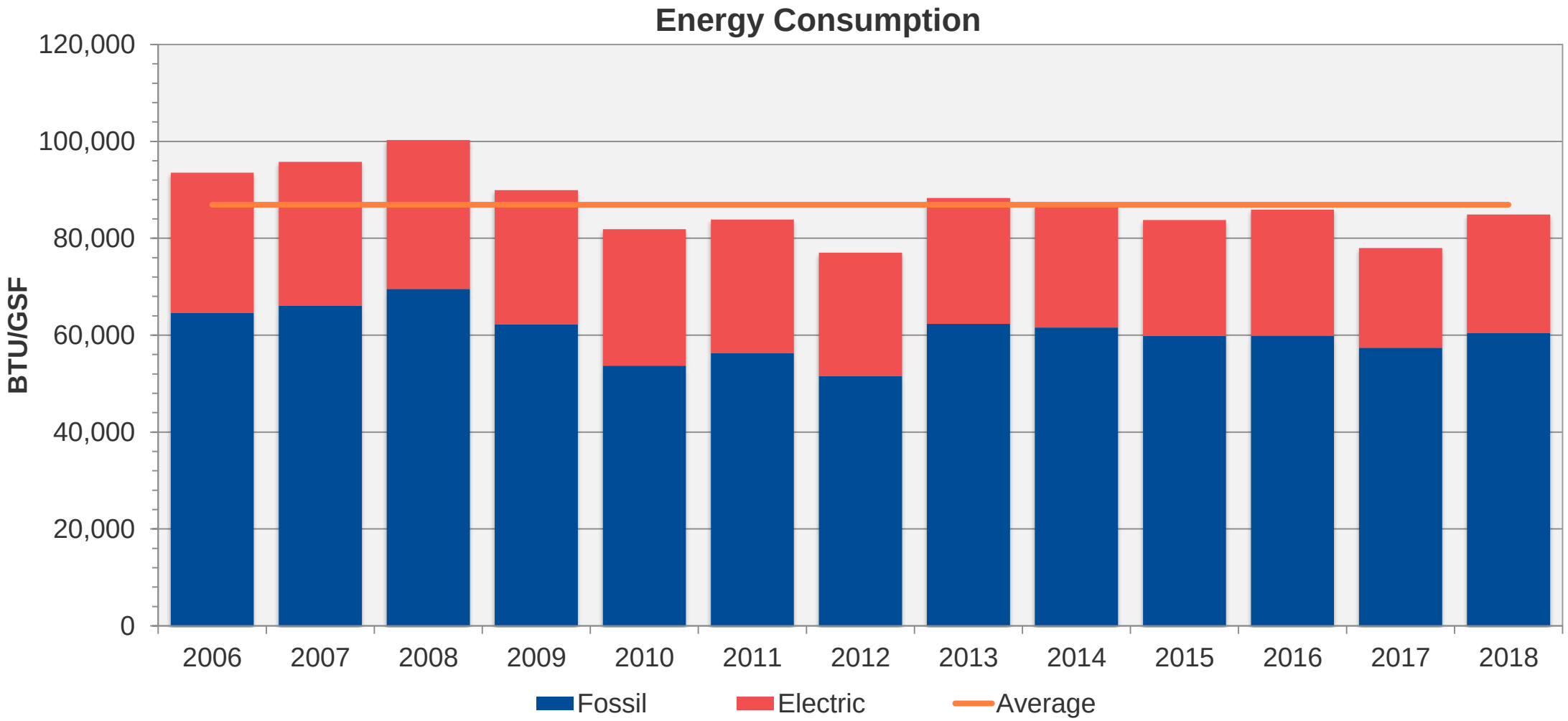
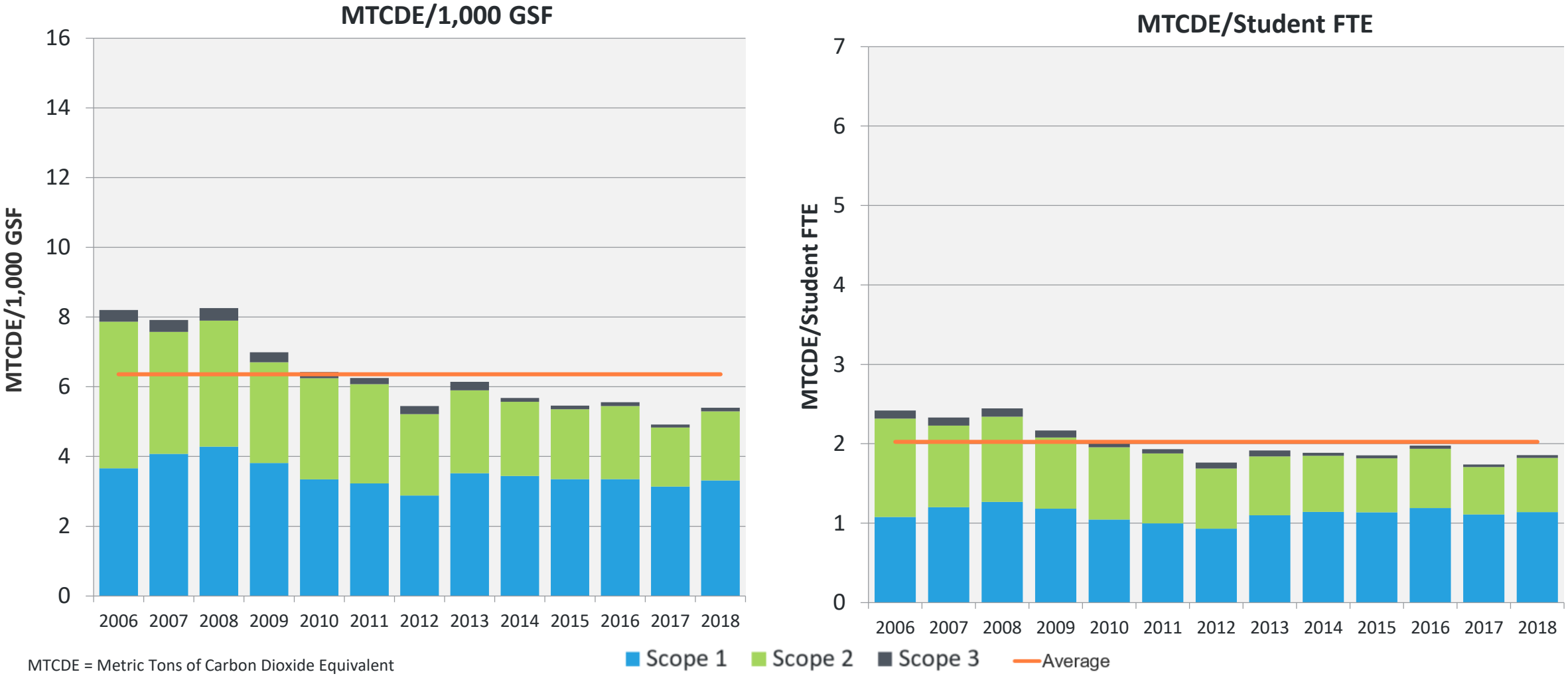
The University of Southern Maine

FY2006 - FY2018 consumption at The University of Southern Maine (BTU/GSF)



The University of Southern Maine



MTCDE = Metric Tons of Carbon Dioxide Equivalent

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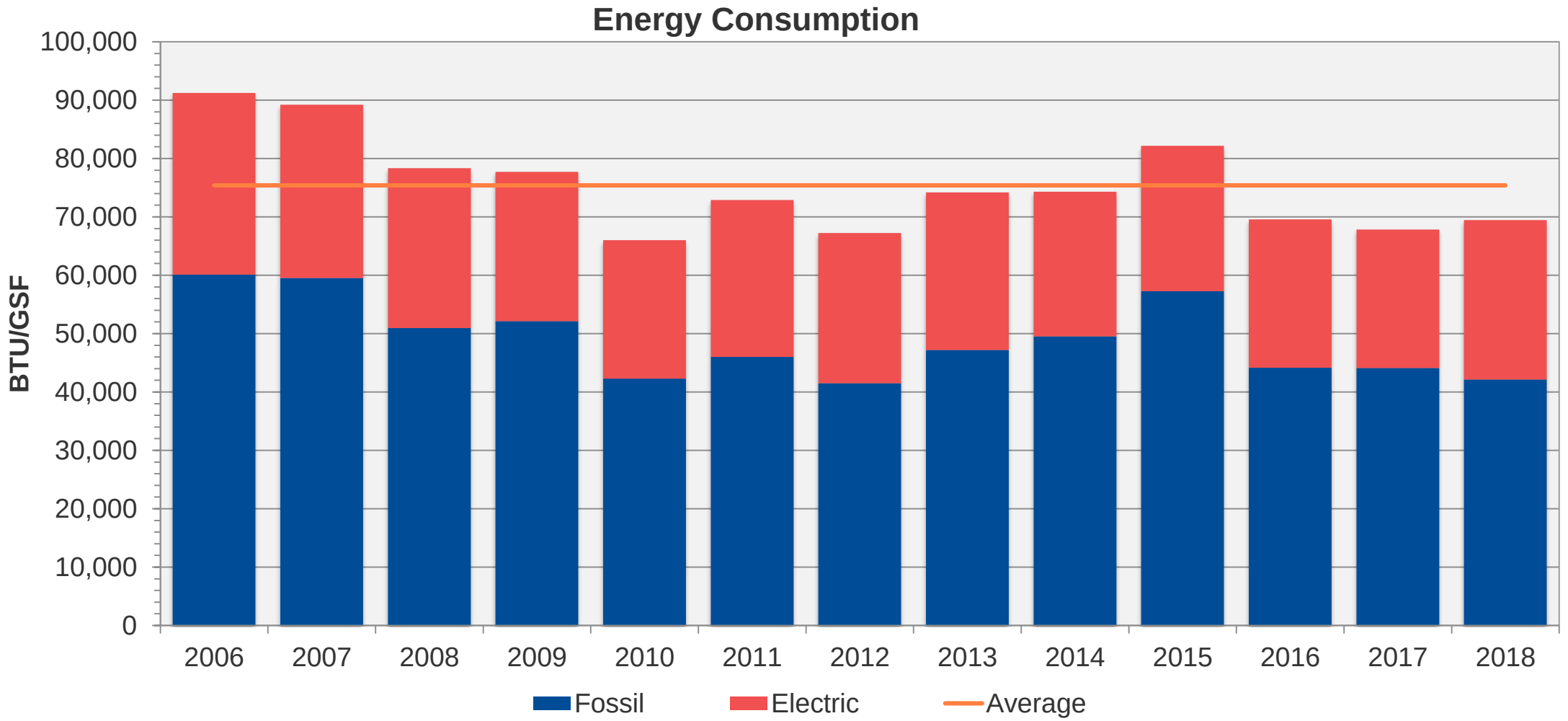
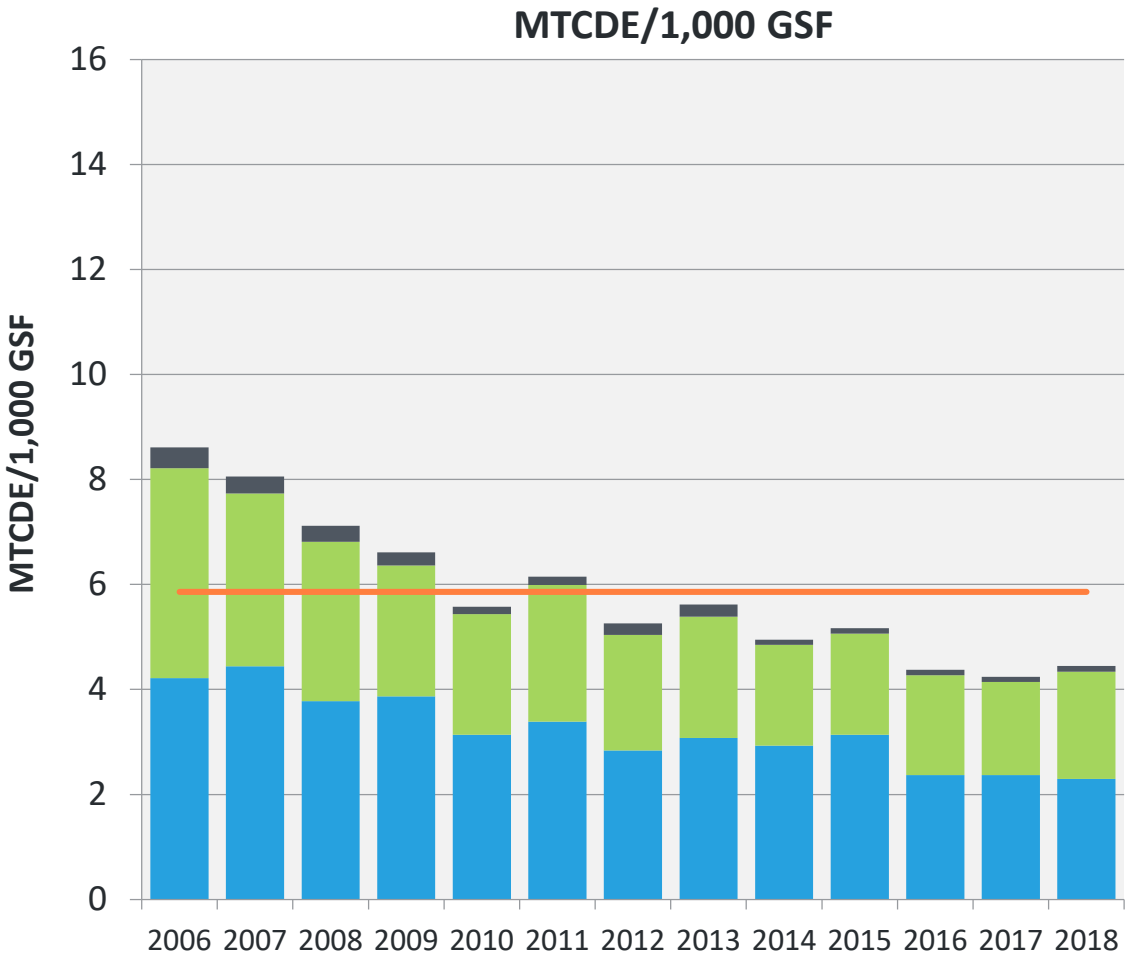
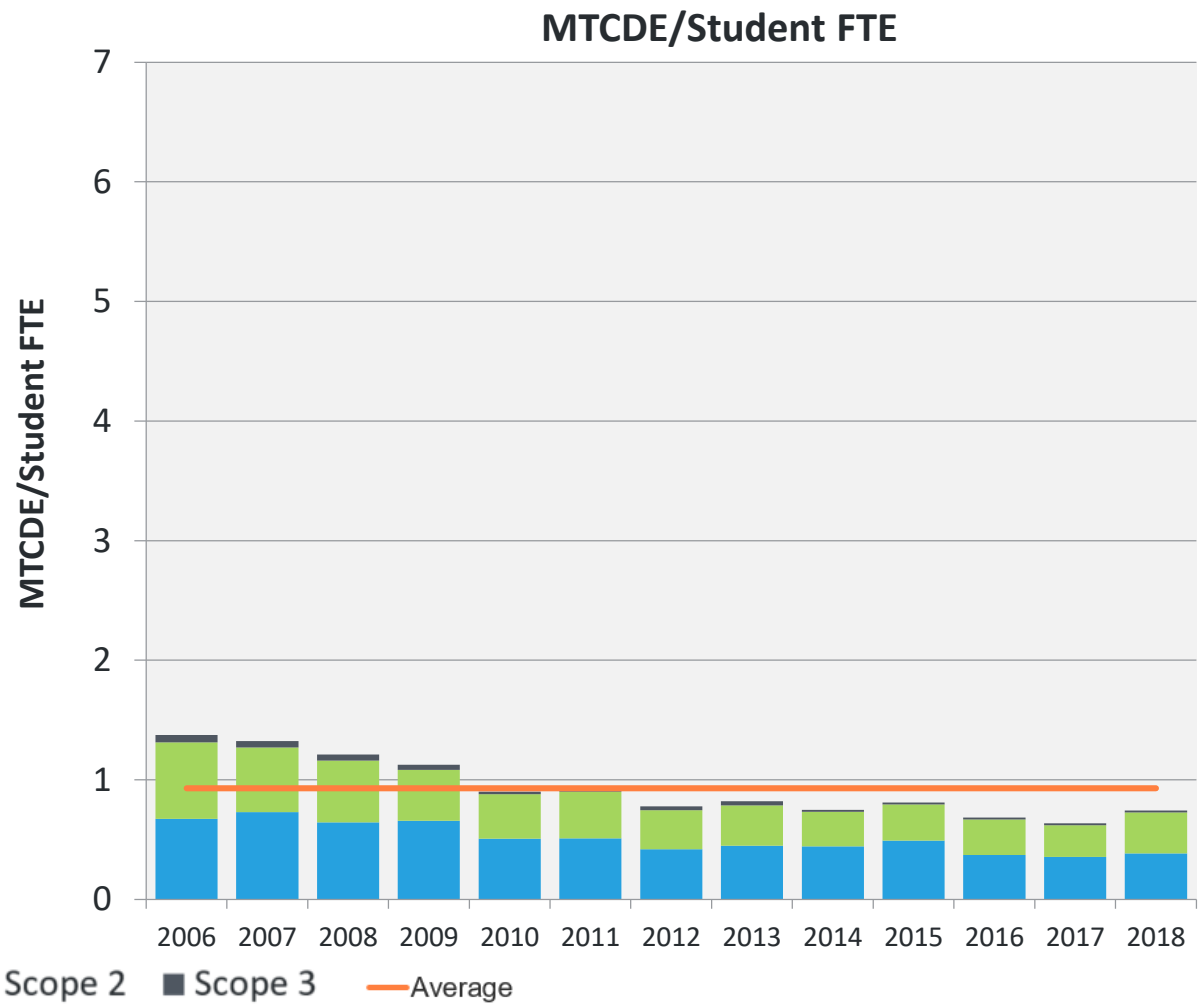
The University of Maine at Augusta

FY2006 - FY2018 consumption at The University of Maine at Augusta (BTU/GSF)



The University of Maine at Augusta





MTCDE = Metric Tons of Carbon Dioxide Equivalent

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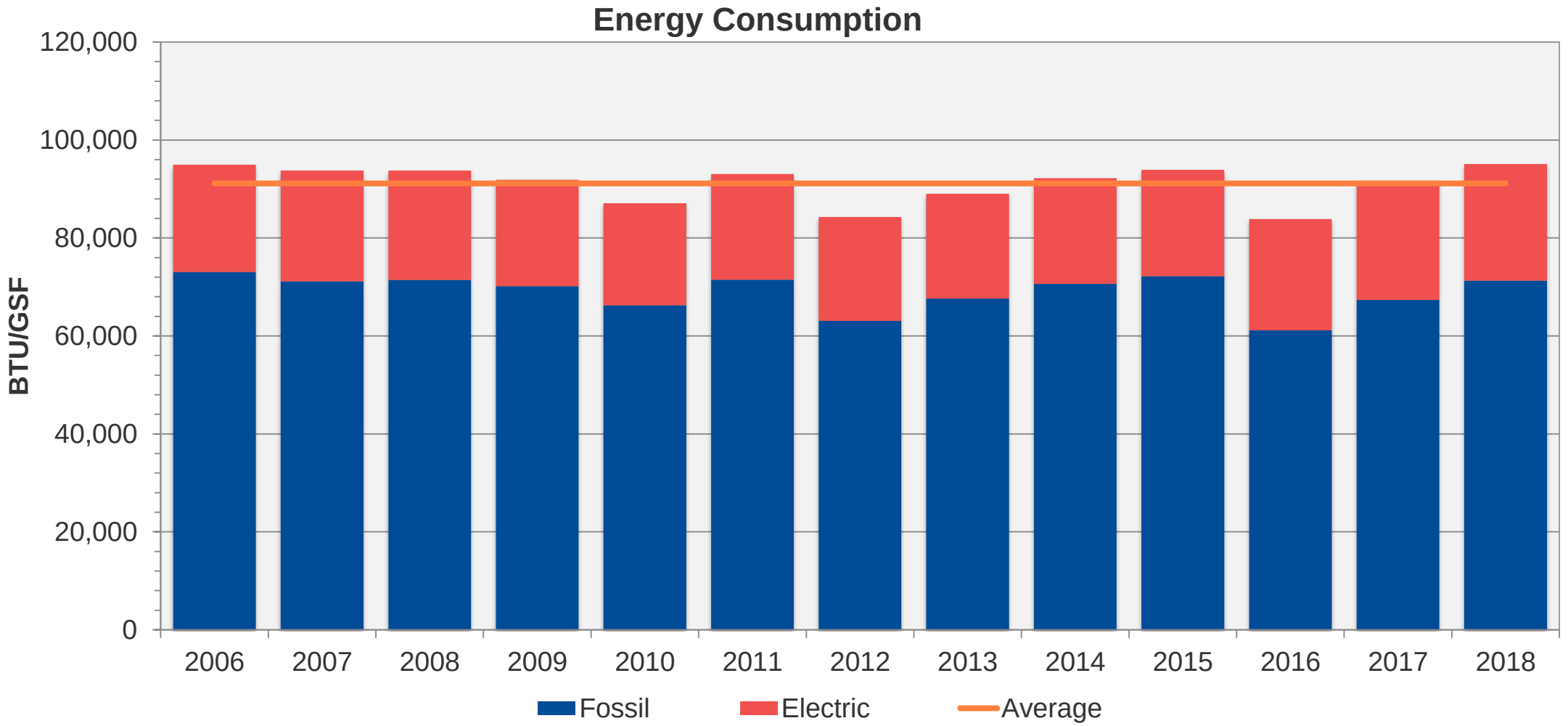
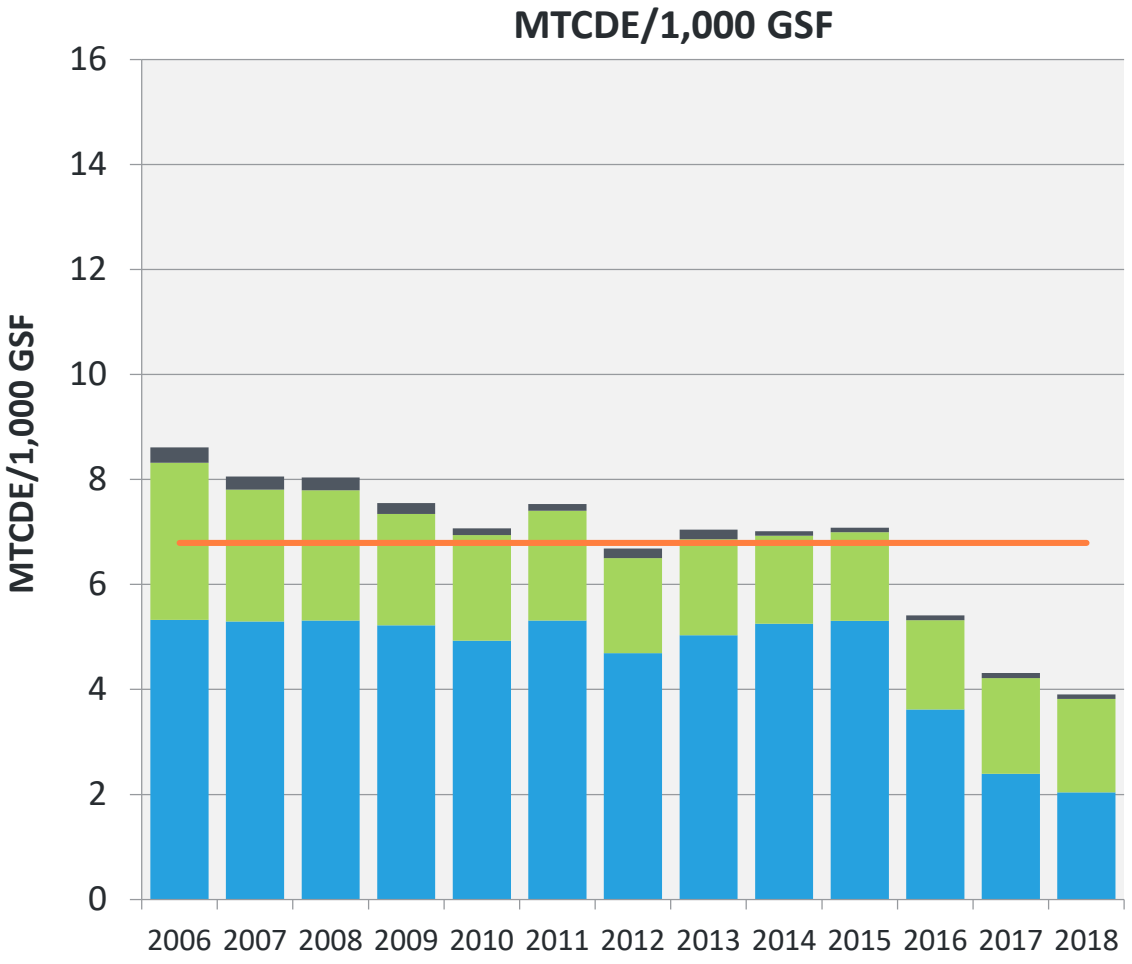
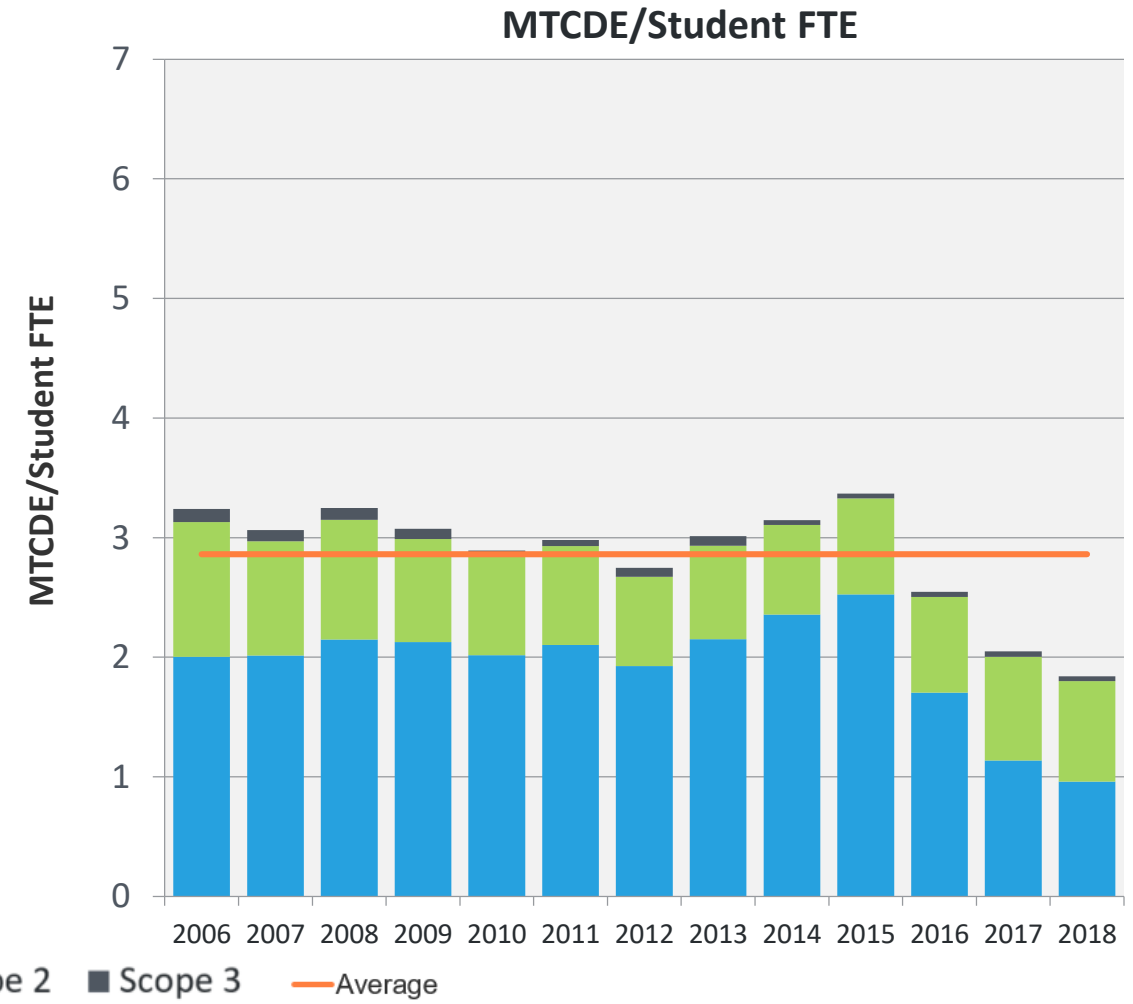
The University of Maine at Farmington

FY2006 - FY2018 consumption at The University of Maine at Farmington (BTU/GSF)



The University of Maine at Farmington





MTCDE = Metric Tons of Carbon Dioxide Equivalent

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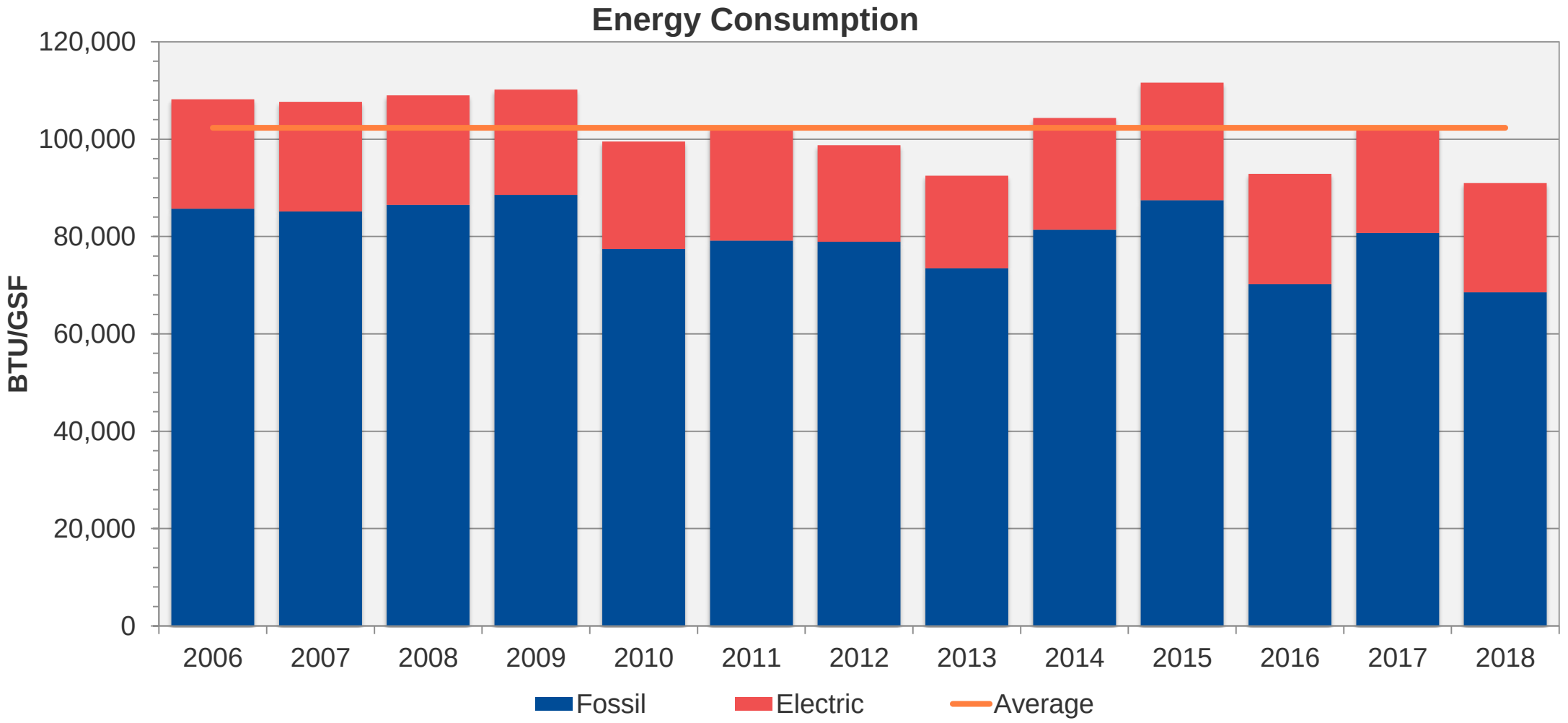
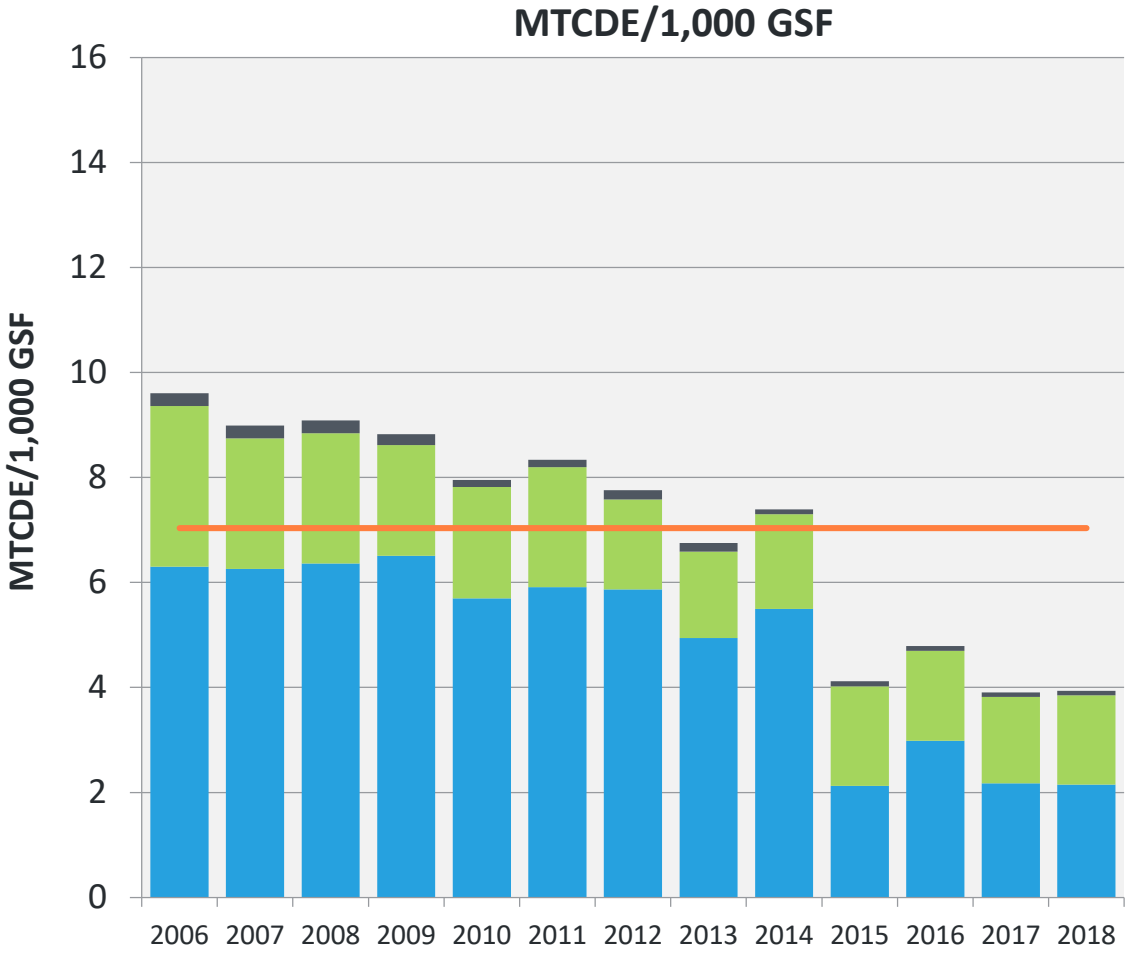
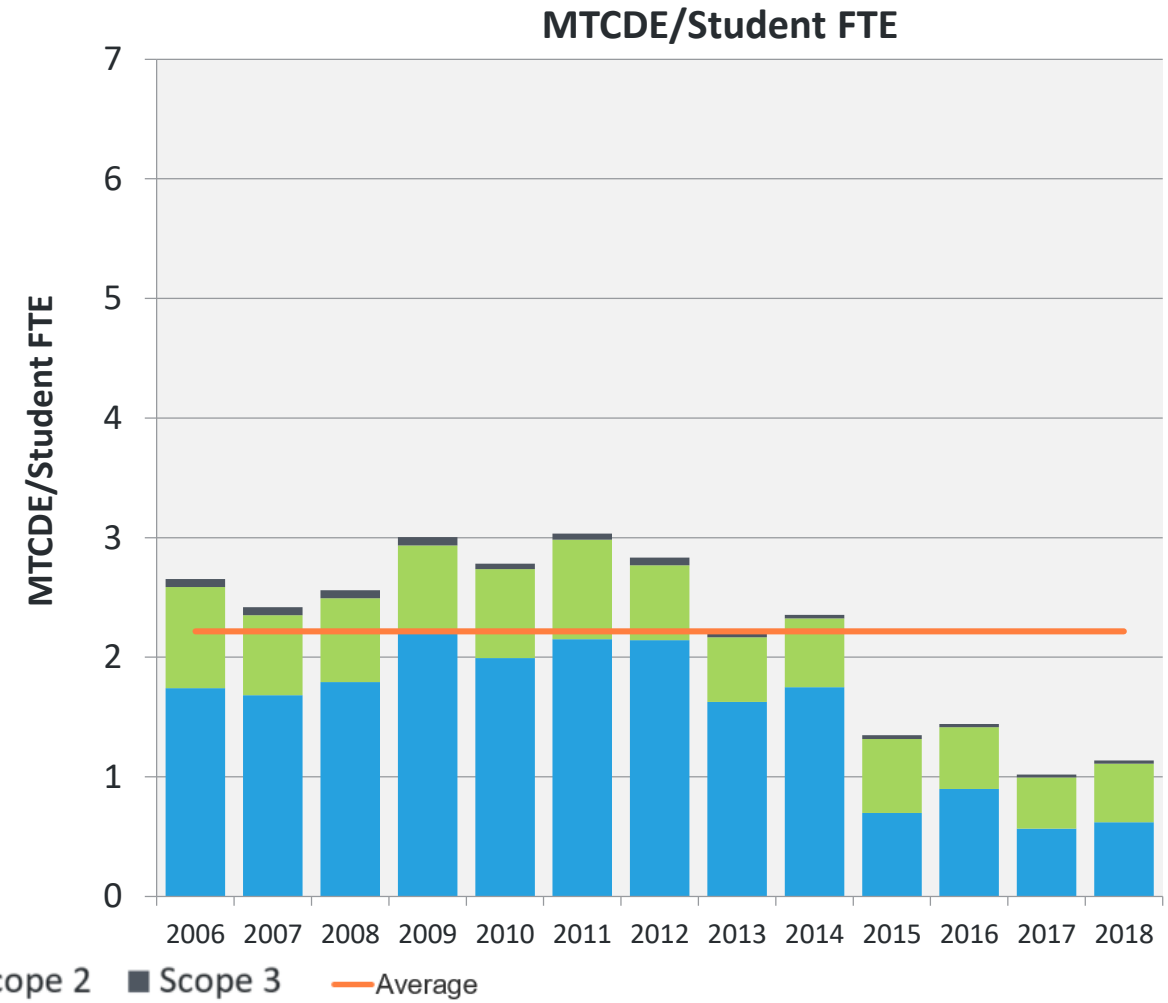
The University of Maine at Fort Kent

FY2006 - FY2018 consumption at The University of Maine at Fort Kent (BTU/GSF)



The University of Maine at Fort Kent





MTCDE = Metric Tons of Carbon Dioxide Equivalent

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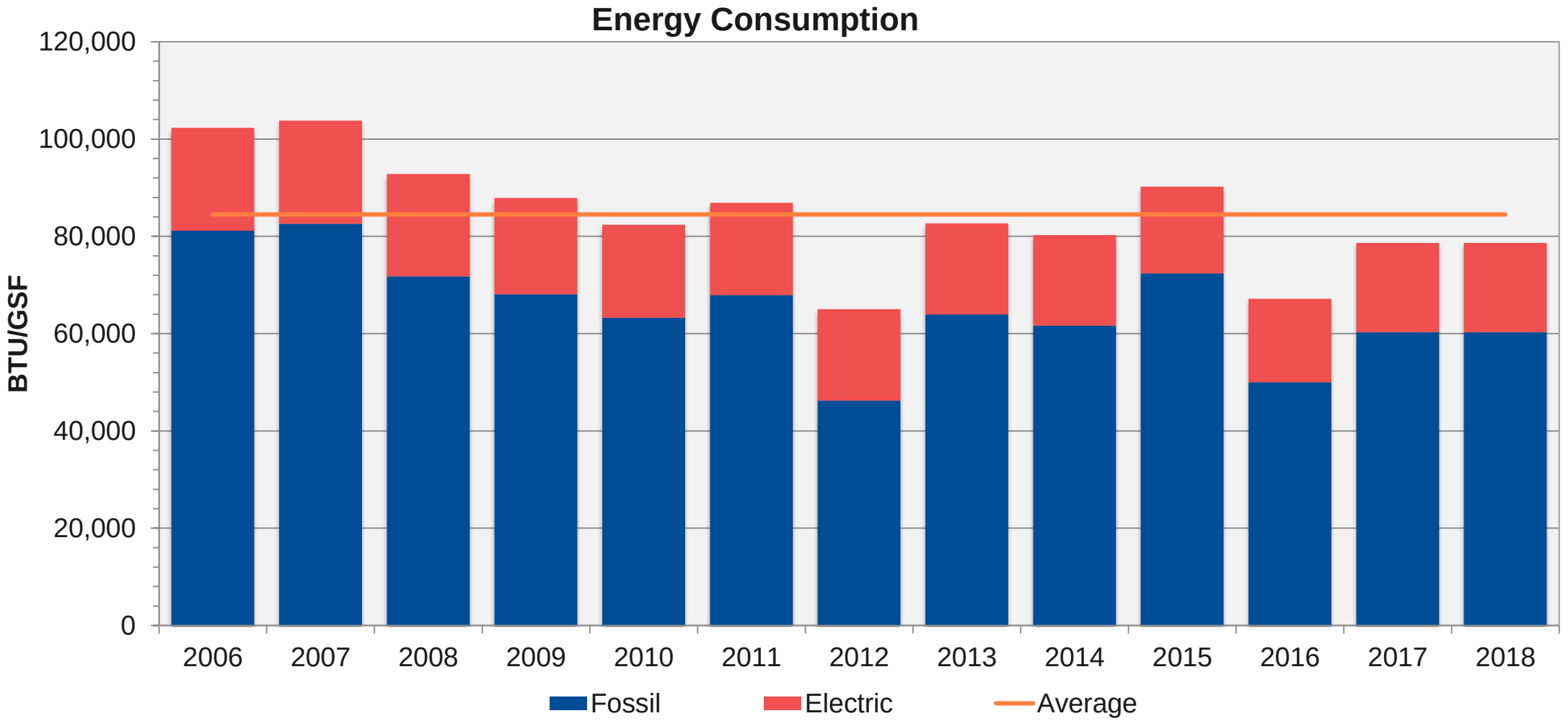
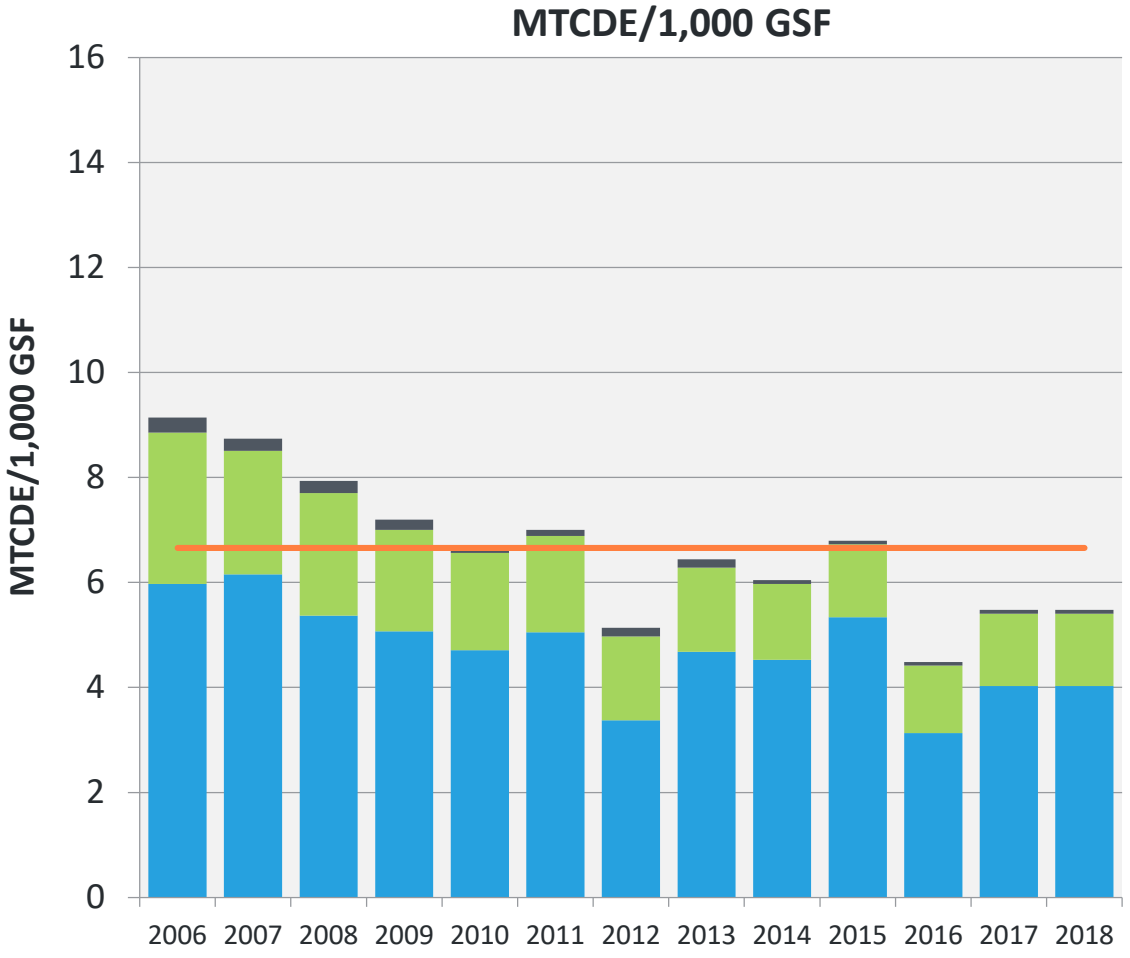
The University of Maine at Machias

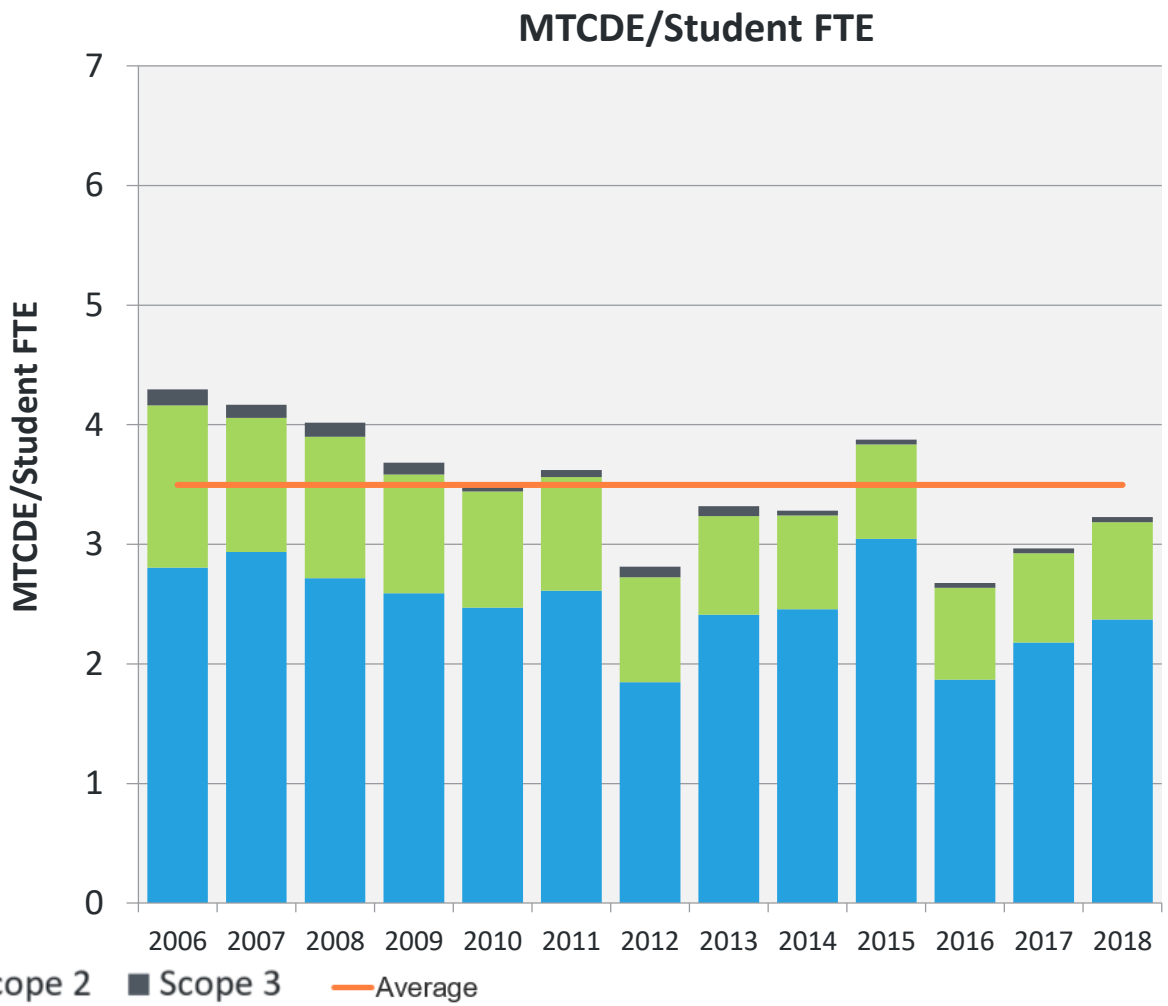
FY2006 - FY2018 consumption at The University of Maine at Machias (BTU/GSF)



*2018 energy consumption pulled forward from 2017

The University of Maine at Machias





MTCDE = Metric Tons of Carbon Dioxide Equivalent

*2018 energy consumption pulled forward from 2017

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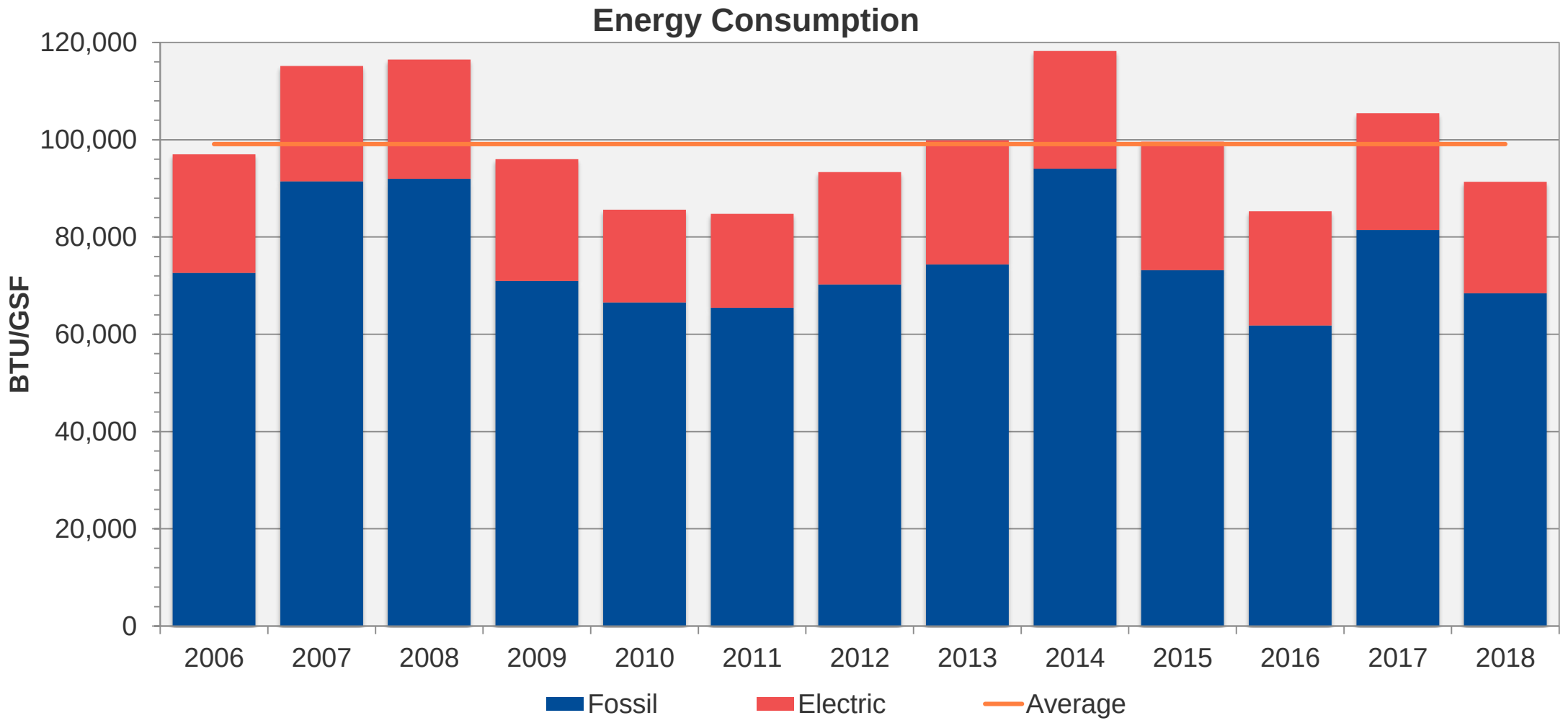
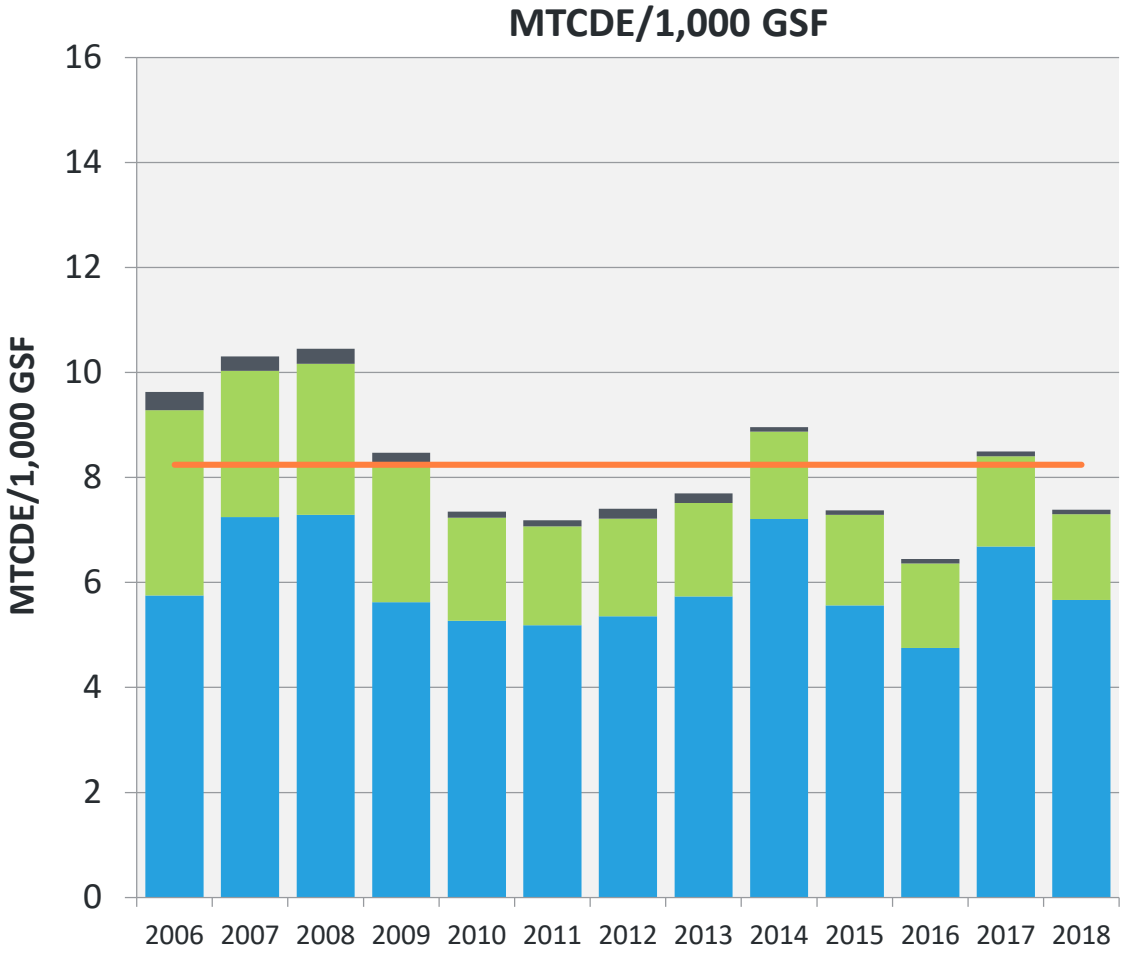
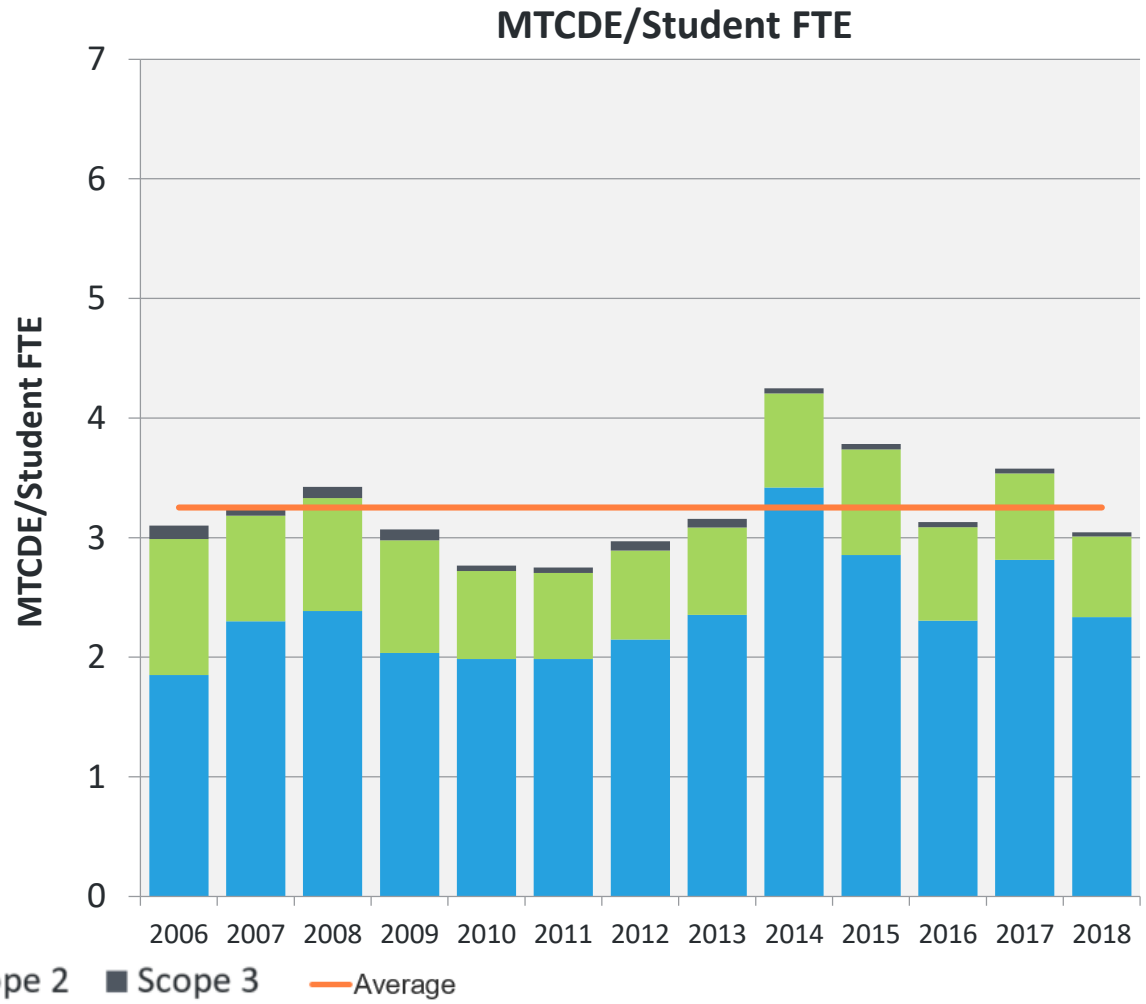
The University of Maine at Presque Isle

FY2006 - FY2018 consumption at The University of Maine at Presque Isle (BTU/GSF)



The University of Maine at Presque Isle





MTCDE = Metric Tons of Carbon Dioxide Equivalent

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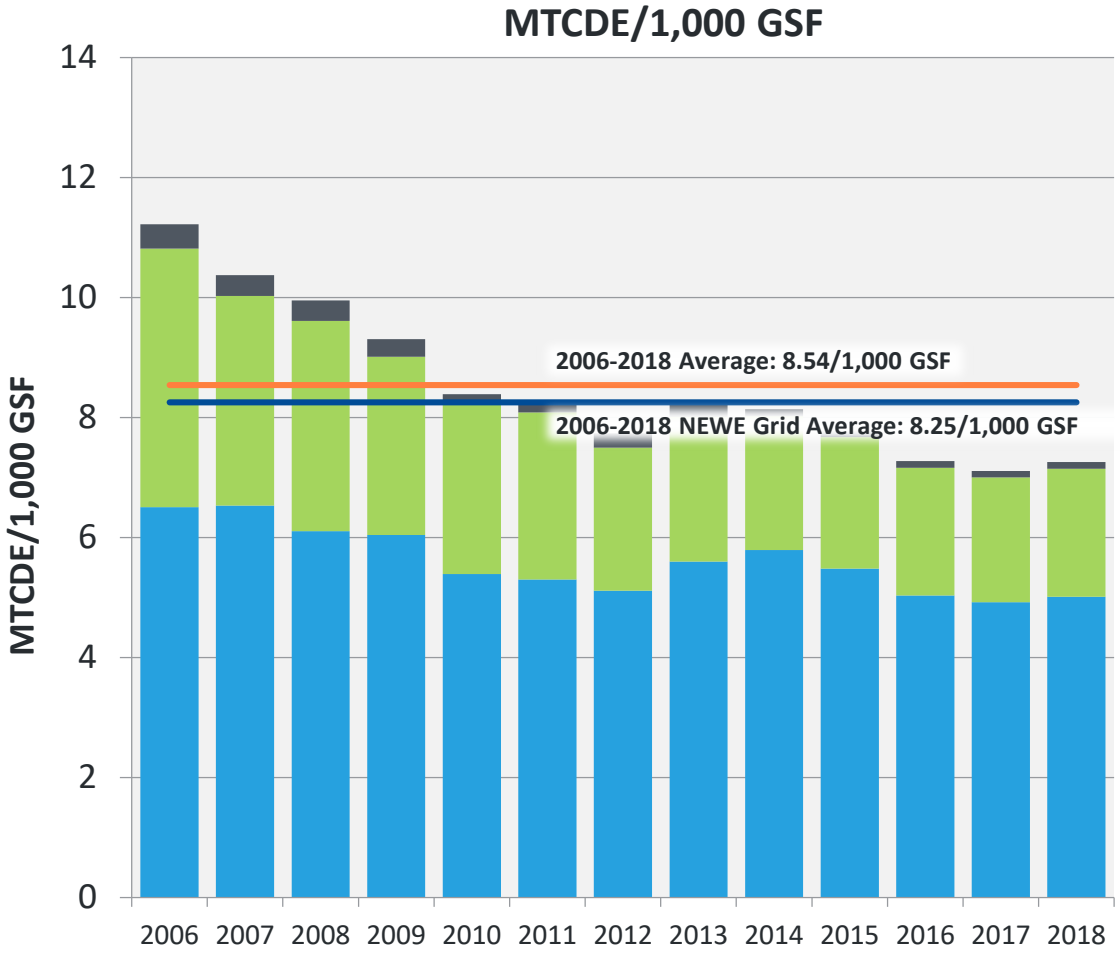
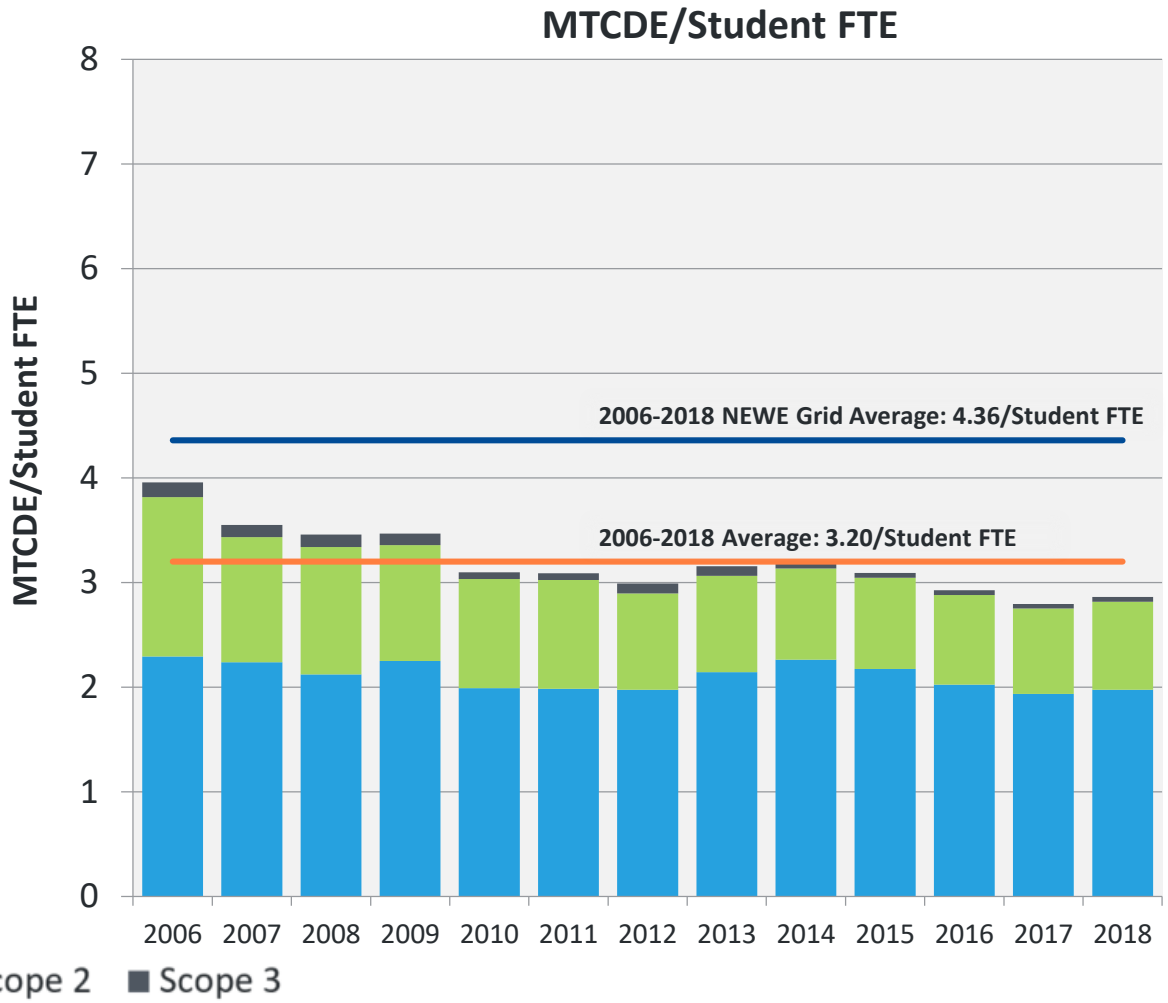
University of Maine System Total Utility Emissions

FY2006-FY2018

University of Maine System Emissions Summary





MTCDE = Metric Tons of Carbon Dioxide Equivalent

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Total GHG Emissions by Institution

% change is from FY2006 to FY2018

FY2018 Gross emissions by institution (MTCDE)				
Institution Name	**Scope 1**	**Scope 2**	**Scope 3**	**% change FY06-FY18**
The University of Maine	30,129	10,691	572	-31%
University of Southern Maine	6,720	4,013	215	-38%
University of Maine at Augusta	833	743	40	-57%
University of Maine at Farmington	1,654	1,446	71	-54%
University of Maine at Fort Kent	589	467	25	-56%
University of Maine at Machias	1,073	367	20	-46%
University of Maine at Presque Isle	2,109	608	33	-29%
Total Maine System FY2018	**43,107**	**18,333**	**975**	**-36%**

MTCDE = Metric Tons of Carbon Dioxide Equivalent

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Concluding Comments

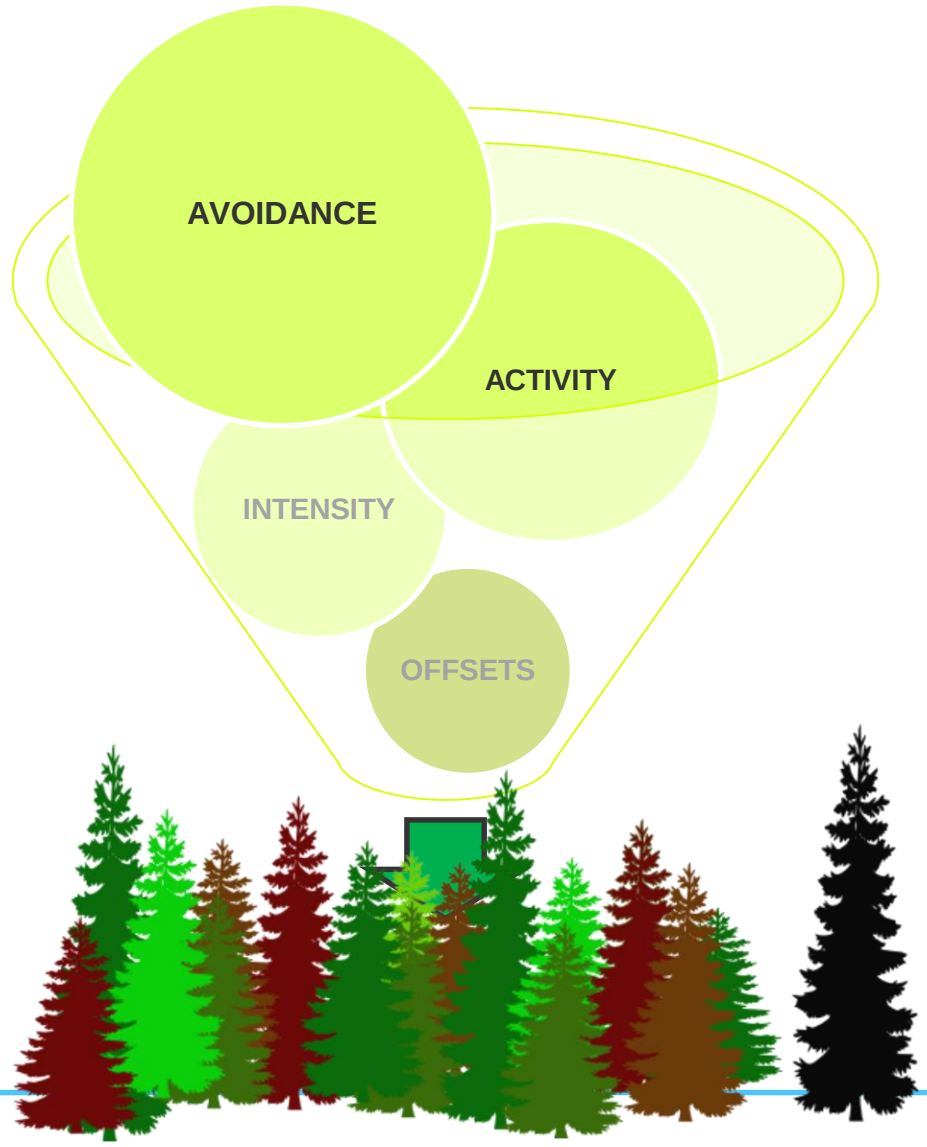
Carbon Management for Energy

AVOIDANCE:
- Prevent activities before they start
- **Example:** Adopt a net zero policy for new construction.

ACTIVITY:
- Reduce the existing level of an activity
- **Example:** Consume fewer BTUS' of energy or travel fewer miles. Adopt sustainable building guidelines.

INTENSITY:
- Lessening the carbon intensity of activities
- **Example:** Fuel switching - introducing renewables – solar, wind, biofuels, geothermal

OFFSETS:
- Utilizing carbon offsets to neutralize unavoidable GHGs
- **Example:** RECs; sequestration; retail offsets



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Concluding Comments

- ❑ UMS saw an uptick in total consumption from FY17 to FY18, resulting in a higher emissions profile. This is primarily due to an increase in heating degree days. Normalizing consumption to 2018 degree days shows a downward trend in consumption if weather was not a factor.
- ❑ Emissions are higher when looked at per 1000 GSF rather than by student FTE. This indicates that emissions are affected more by the facilities' campus footprint than by the strains users put on campus.
- ❑ UMF and UMFK continue to utilize biomass as a primary fuel source which helps keep their emissions lowest among the campuses.
- ❑ Overall, there has been a 36% decrease in emissions from 2006-2018. This is a result of strategic efforts to switch to cleaner fossil fuels, including the implementation of biomass at UMF and UMFK.

Prospects to impact Activity/Intensity of Emissions

- ❖ Begin to look at Cogeneration, Biomass, and/or Solar Panels as viable options to begin fuel switching on all campuses. This will reduce stationary carbon intensity and further reliance on the local grid.
- ❖ Energy-efficient practices—investment into efficient envelopes, green retrofits, mechanical systems and appliances and equipment—enable campuses to meet the needs of campus users and fulfill the institutional mission even while cutting GHG emissions.
- ❖ Assess current building automation and controls policies to further increase efficiency of existing systems on campus.
- ❖ Purchase offsets. Use the purchase as an educational opportunity. Try to procure local offsets, when possible, and give vendors the opportunity to educate campus through demonstrations on campus.

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Questions & Discussion