Sustainability at DU: Historical Perspective

Presented By:

Jeff Bemelen
Director of Facilities
Email: jozef.bemelen@du.edu

Tom McGee
Energy Engineer
Email: thomas.mcgee@du.edu

UNIVERSITY of DENVER
FACILITIES MANAGEMENT & PLANNING
Energy Conservation FY16

Overview

- Our Carbon Foot Print
- What have we been DU'ing?
- How are we DU'ing?
- Questions

UNIVERSITY of DENVER

FACILITIES MANAGEMENT & PLANNING

Energy Conservation FY16

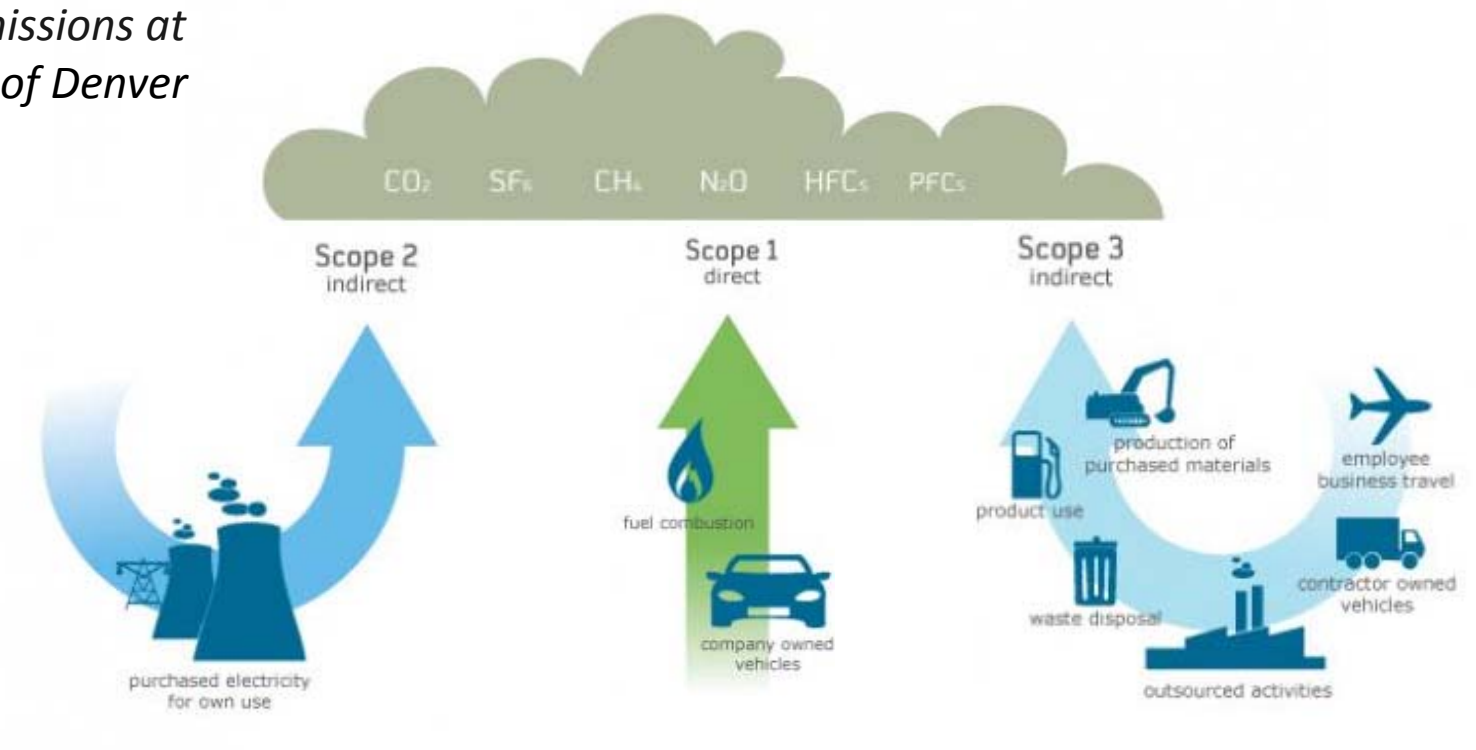
Climate Action Plan for University of Denver

"The University of Denver is committed to seeking carbon neutrality by the year 2050 through conservation, reduced consumption, and pursuing appropriate and responsible alternative energy sources. To achieve this goal, the University is working toward a **24%** carbon reduction by the year **2020**."

What causes our CARBON footprint?

Greenhouse Gases by Scope

Carbon emissions at University of Denver



Scope 2:

- ***Electricity***

Scope 1:

- ***Natural Gas***
- ***Vehicle Fleet***
- ***Refrigerants***
- ***Fertilizer***

Scope 3:

- ***Commuting***
- ***Directly financed travel & study abroad***
- ***Waste, wastewater, paper, & T&D losses***

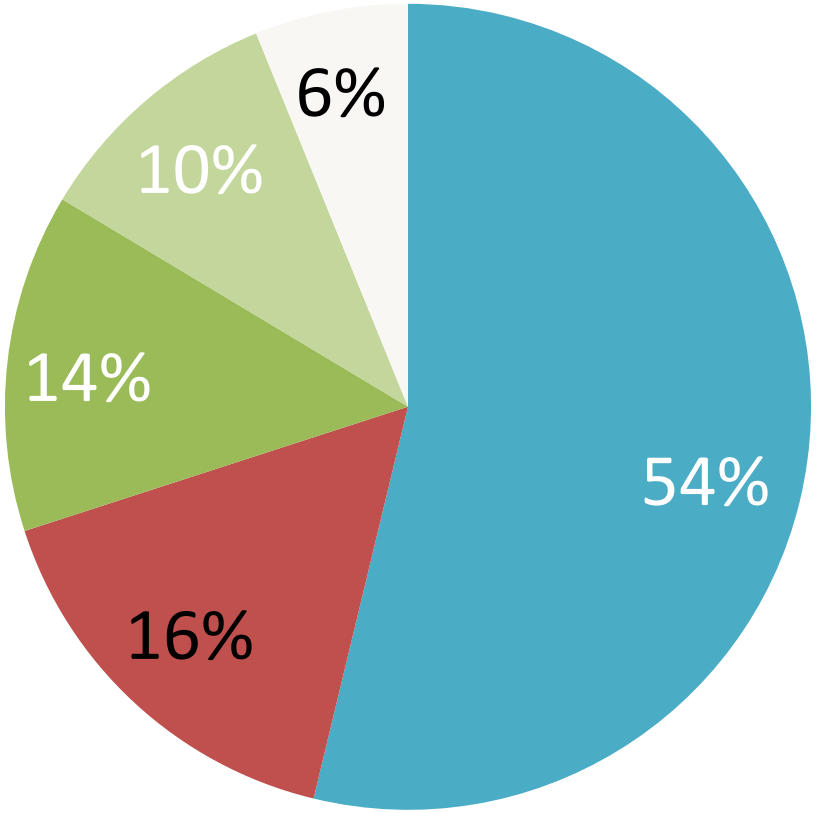
Image: www.env.gov.bc.ca

Emissions Source Overview

Purchased electricity makes up over 50% of total emissions

Summary of FY15 Gross Emissions:

Total 66,744 MTCDE



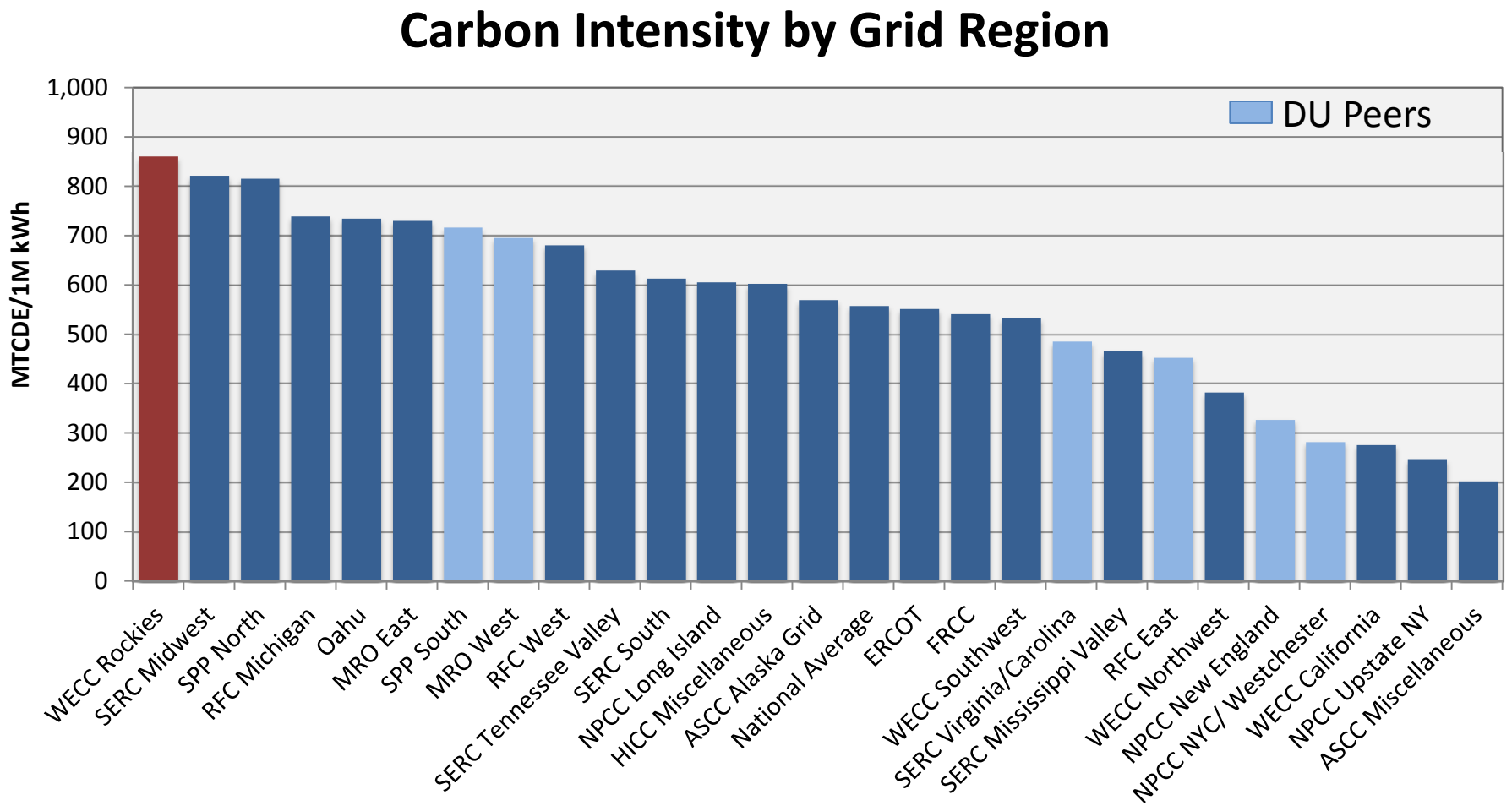
Source	MTCDE
Purchased Electricity	35,881
Directly Financed Travel	10,848
Other On-Campus Stationary	9,071
Commuting	6,843
De Minimus*	4,101

**Includes Refrigerants, Agriculture, Fleet, Waste, Wastewater, Paper, and T&D Losses*

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

Scope 2 eGrid emissions

DU within the most carbon intense region

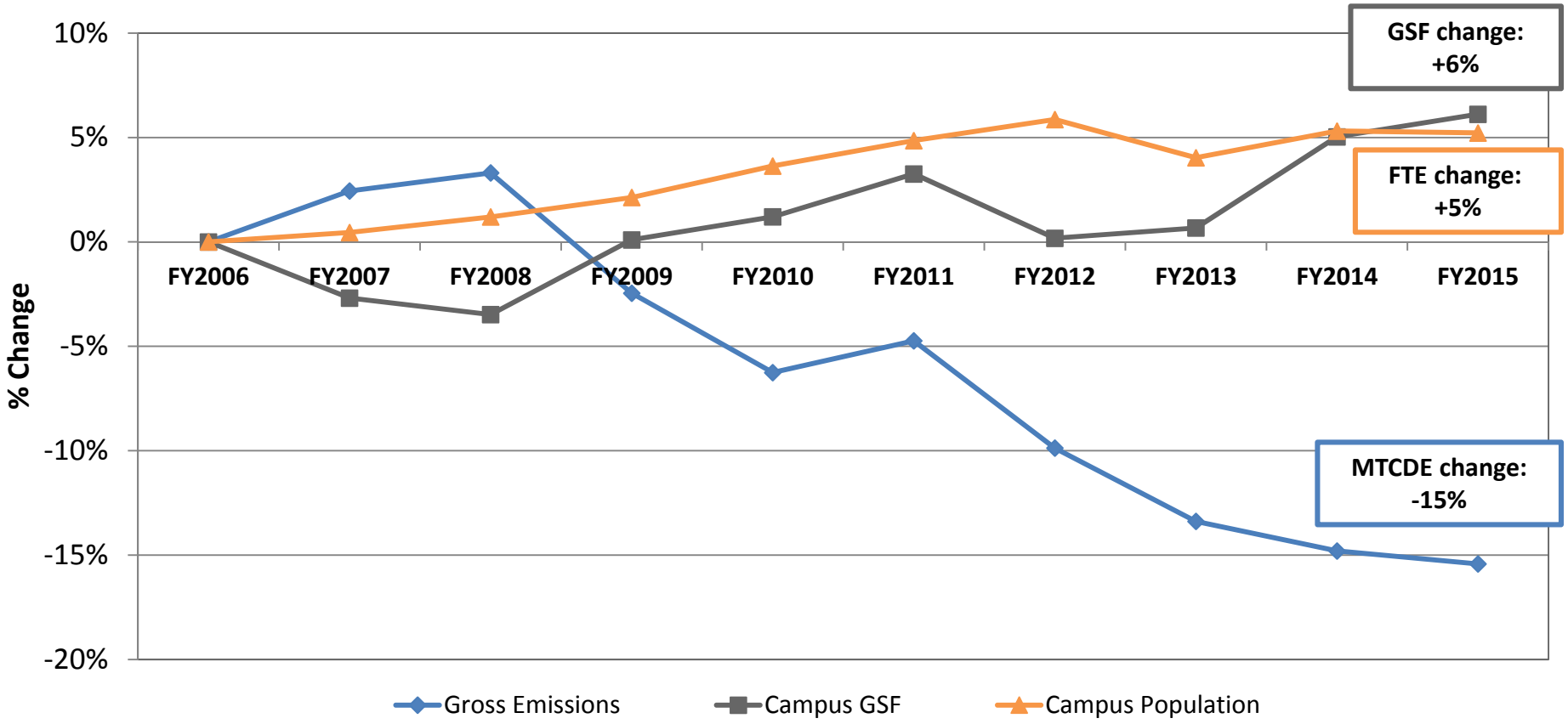


Improvements Despite Growing Campus Population

Emissions dropped by 15% in over 9 years

Change in Emissions (MTCDE) vs. Campus Size and Population (FTE)

Indexed to FY2006



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

sightlines

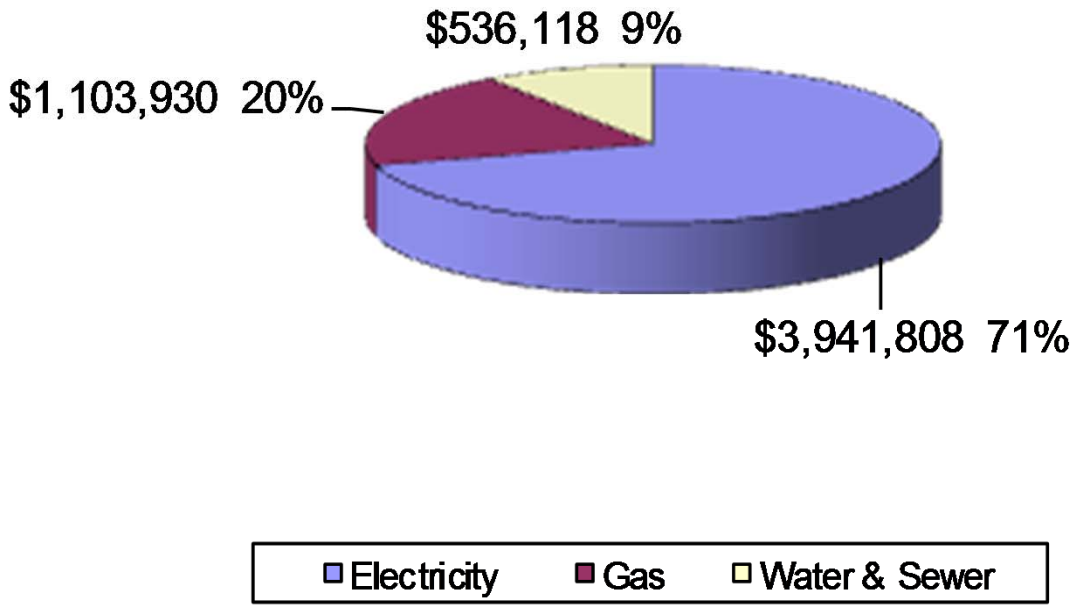
What are we DU'ing?

Energy Conservation - Goals

- **Save Utility Dollars**
- **Leverage Xcel's Utility Rebates**
- **Lower our Carbon Footprint**

FY2015

Utility Cost Breakdown



What are we using electricity for?

- Ventilation to supply fresh air
- Comfort cooling
- Lighting
- Plug loads (ex. computers, tv's, refrigerators, ect.)

Campus Energy Consumption

What effects our consumption?

- Weather
- Total square footage
- Number of students and faculty
- **Behavior**
- **Maintenance**
- **Energy Conservation Measures**

Energy Reserve Funded Projects

- Facilities identifies potential projects having relatively short pay back periods.
- Investments are often off-set by Xcel rebates.
- The projects are funded from an Institutional Utility Savings Reserve which has been built up from year end savings in the Utility budgets.

Energy Saving Projects - Cumulative Q4 FY15

FY14 and Prior - Completed

Type	#	Construction Cost	Less Rebates	Net Investment	Annual Savings (@Prior Rates) Therms	Kwh	Amount	Average Payback (yrs)
Controls	15	$ 406,687	$ (126,882)	$ 279,805	30,650	2,020,433	$ 204,615	1.37
Lighting	19	$ 497,844	$ (235,431)	$ 262,413	-	2,313,791	$ 210,667	1.25
Mechanical	22	$ 684,698	$ (139,929)	$ 544,769	24,975	1,541,132	$ 152,701	3.57
Survey	12	$ 280,556	$ (133,357)	$ 147,199	-	-	$ -	-
Totals	68	$ 1,869,785	$ (635,600)	$ 1,234,185	55,625	5,875,356	$ 567,982	2.17

FY15 - Completed or In Process

Type	#	Construction Cost	Less Rebates	Net Investment	Annual Savings (FY15 Rates) Therms	Kwh	Amount	Average Payback (yrs)
Controls	0	$ -	$ -	$ -	-	-	$ -	-
Lighting	5	$ 155,264	$ (20,787)	$ 134,477	-	535,361	$ 37,297	3.61
Mechanical	1	$ 385,179	$ (187,317)	$ 197,862	63,343	599,866	$ 81,159	2.44
Survey	0	$ -	$ -	$ -	-	-	$ -	-
Totals	6	$ 540,443	$ (208,104)	$ 332,339	63,343	1,135,227	$ 118,456	2.81

Cumulative	**74**	**$ 2,410,228**	**$ (843,704)**	**$ 1,566,524**	**118,968**	**7,010,583**	**$ 686,438**	**2.28**

ENERGY CONSERVATION MEASURES
(completed prior to FY15)

- Vending Misers on all Pepsi machines
- Ritchie Pool Lighting Upgrade
- Ritchie Ice Systems Upgrade
- Tennis Parking Garage LED Lighting Upgrade
- Centennial Halls Stairwell Lighting Upgrades
- Seeley Mudd High Efficiency Heat Recovery System
- Walk In Freezer Lighting Upgrades
- Ritchie Display Case LED Lighting Upgrades
- Johnson McFarlane only residence hall in Colorado which was Energy Star Certified, 2011

- **http://www.du.edu/sustainability/council/facilities.html** What DU's Doing: Energy: Energy Conservation Projects Summary (PDF)

ENERGY CONSERVATION MEASURES
(completed since the start of FY15)

- Daniels Parking Garage Lighting Retrofit
- Nelson Parking Garage Lighting Retrofit
- Ritchie Magness Arena LED Upgrades
- Seeley Mudd Lighting Upgrades
- Ben Cherrington Lighting Upgrades
- UTS & Sturm Data Center LED Lighting Upgrades
- Buchtel Parking Garage LED Lighting Retrofit

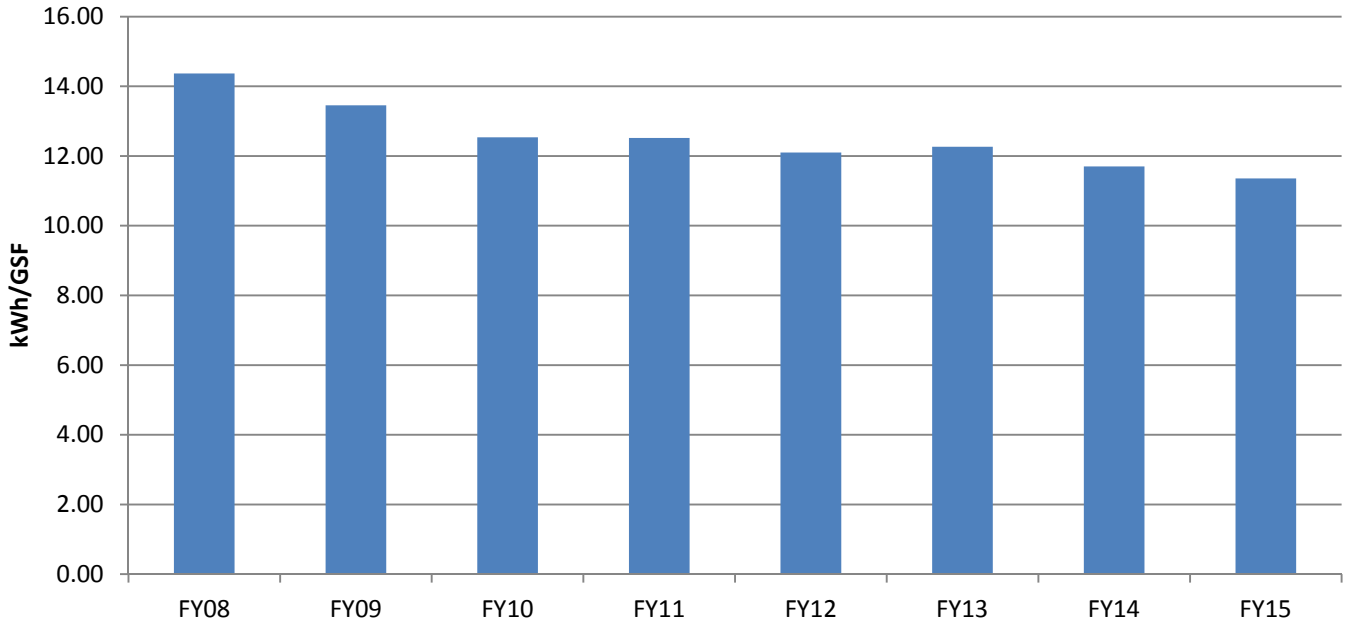
How are we DU'ing?

Energy Conservation - Goals

- **Save Utility Dollars**
- **Leverage Xcel's Utility Rebates**
- **Lower our Carbon Footprint**

Electric Utility Savings - FY09 thru FY15

$4,027,363



	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15
kwh/GSF	14.37	13.46	12.54	12.52	12.10	12.27	11.70	11.36
GSF	3,162,168	3,267,486	3,300,422	3,367,351	3,266,941	3,296,708	3,439,022	3,474,266
kWh	45,433,486	43,964,329	41,374,022	42,144,346	39,534,746	40,436,453	40,232,957	39,454,235

Peer Group for Comparison

Similar tech rating and climate zone peers

Peer Institutions	GSF	Student Enrollment	Tech Rating	Climate Zone
University of Denver	***3,460,569***	***10,638***	***2.96 (Mid)***	**2**
Bentley University	1M to 2M	5,000 to 10,000	Mid	2
Bowling Green State University	4M to 6M	> 10,000	Mid	2
Fitchburg State University	1M to 2M	5,000 to 10,000	Low-Mid	2
Loyola University Maryland	2M to 3M	5,000 to 10,000	Mid	3
Millersville University of PA	2M to 3M	5,000 to 10,000	Mid	2
Rensselaer Polytechnic Institute	4M to 6M	5,000 to 10,000	Mid	2
Towson University	4M to 6M	> 10,000	Mid	3
Wesleyan University	2M to 3M	< 5,000	Low-Mid	2
Westfield State University	1M to 2M	5,000 to 10,000	Low-Mid	2

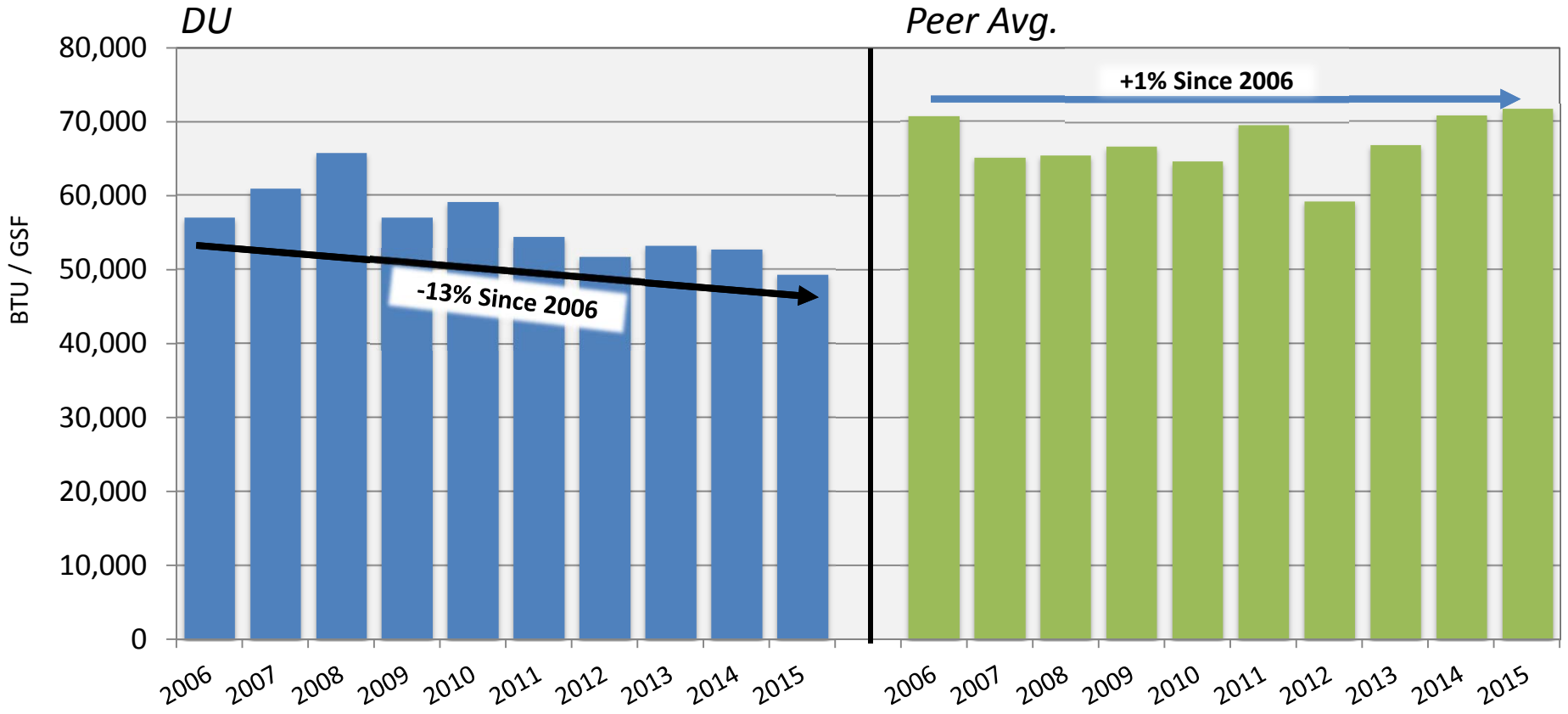
Climate Zone	
Zone 1:	<2,000 CDD and >7,000 HDD
Zone 2:	<2,000 CDD and 5,500-7,000 HDD
Zone 3:	<2,000 CDD and 4,000-5,499 HDD
Zone 4:	<2,000 CDD and <4,000 HDD
Zone 5:	≥ 2,000 CDD and <4,000 HDD

Peer Group Based On: All with the latest fiscal year data, GSF, Total Student Enrollment, Technical complexity, and Climate Zone

Decrease in Natural Gas by 13% Since 2006

DU continues to decrease Natural Gas consumption while peers stay flat

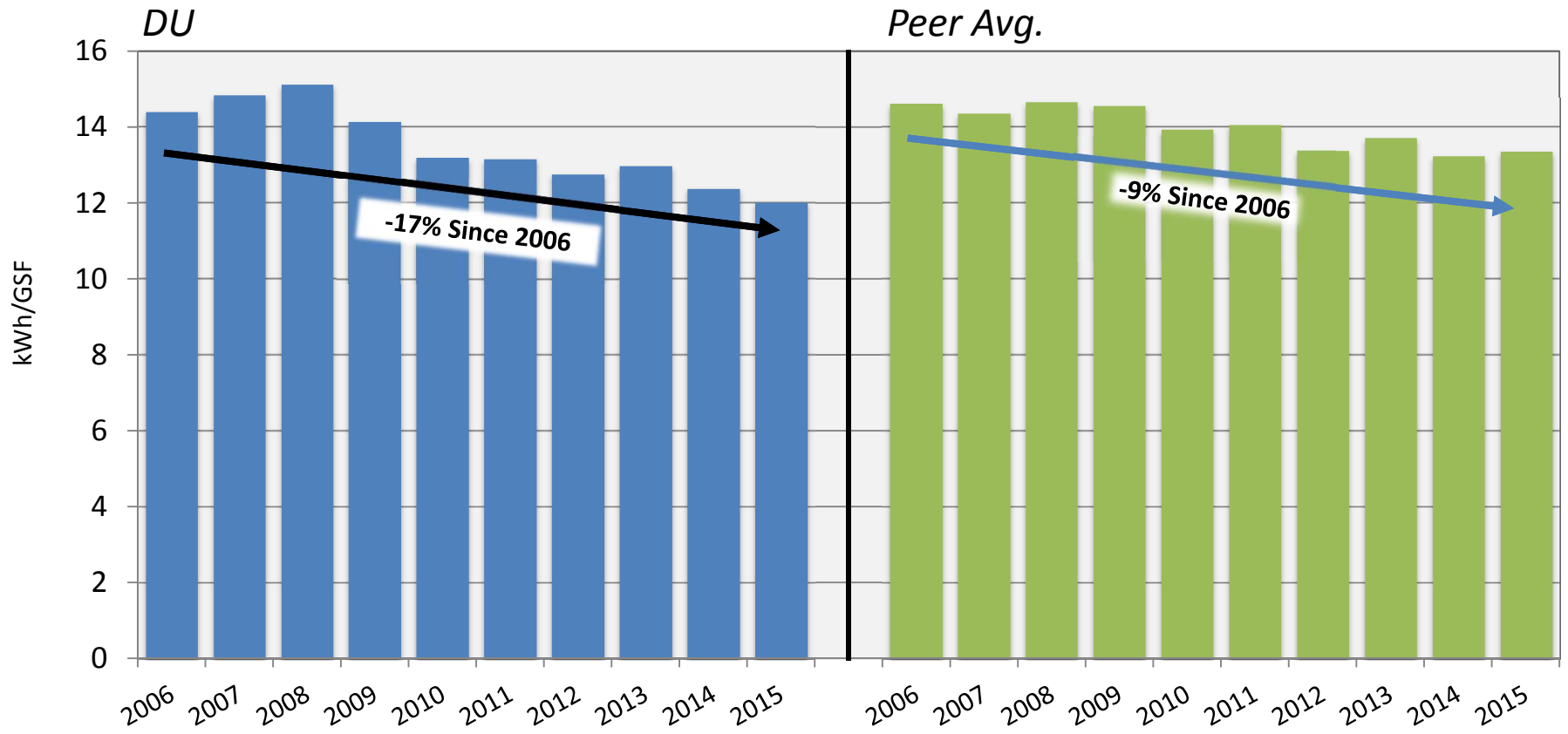
Stationary Fuel Consumption 2006-2015



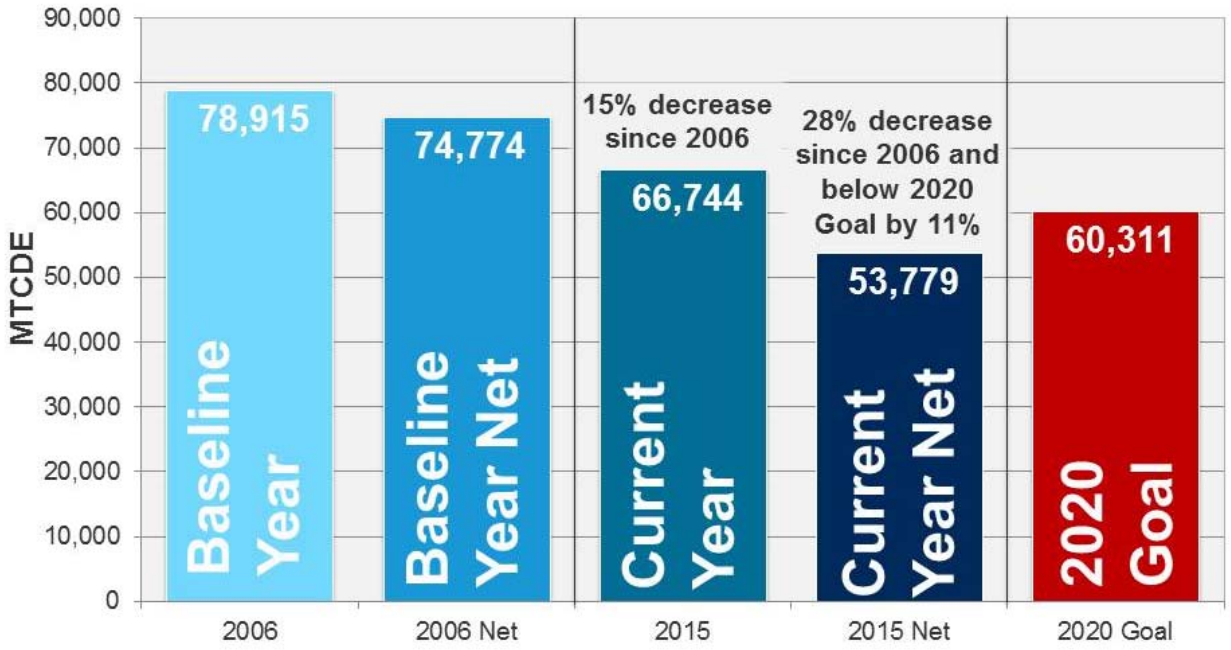
DU's Electricity Surpasses Peer Average

DU declining at a faster rate than peers over 10 year span

Electricity Consumption 2006-2015



Progress towards our CARBON goal



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

Questions?