

UCCS
Building Utility Report
FY2018

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Contents

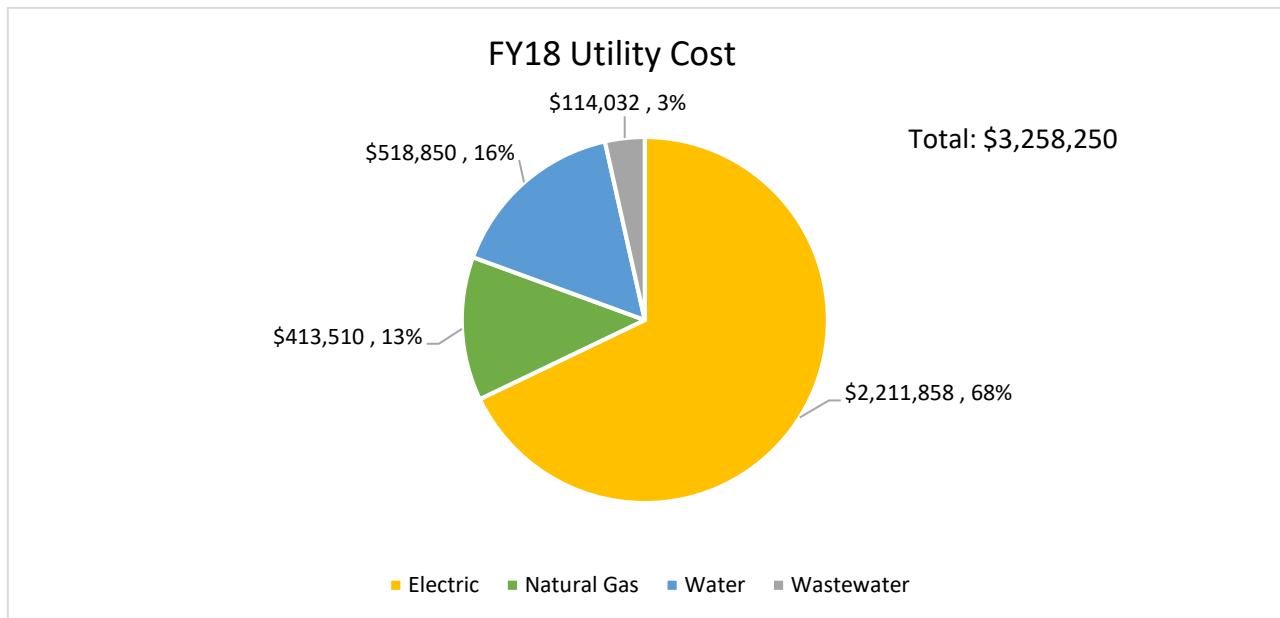
Executive Summary	Error! Bookmark not defined.
Total Utility Cost and Use	3
Electric Cost and Use	5
Electric Demand.....	6
Natural Gas Cost and Use	7
Normalized Natural Gas	8
Natural Gas Providers.....	9
Categories of Water on Campus.....	Error! Bookmark not defined.
Water Cost and Use.....	Error! Bookmark not defined.
Wastewater Cost and Use	12
Energy Use Intensity.....	14
Energy Conservation Measures.....	16
Renewable Energy	16
On-Site Solar	17
Off- Site Solar.....	18
Highlights and Recommendations for FY19	19
Building Energy Use Yearly Comparisons.....	19
Building Type Highlights	Error! Bookmark not defined.
Academic	Error! Bookmark not defined.
Office Buildings.....	Error! Bookmark not defined.
Residential Halls	Error! Bookmark not defined.
Support Facilities	Error! Bookmark not defined.
Appendix – Building Costs	Error! Bookmark not defined.

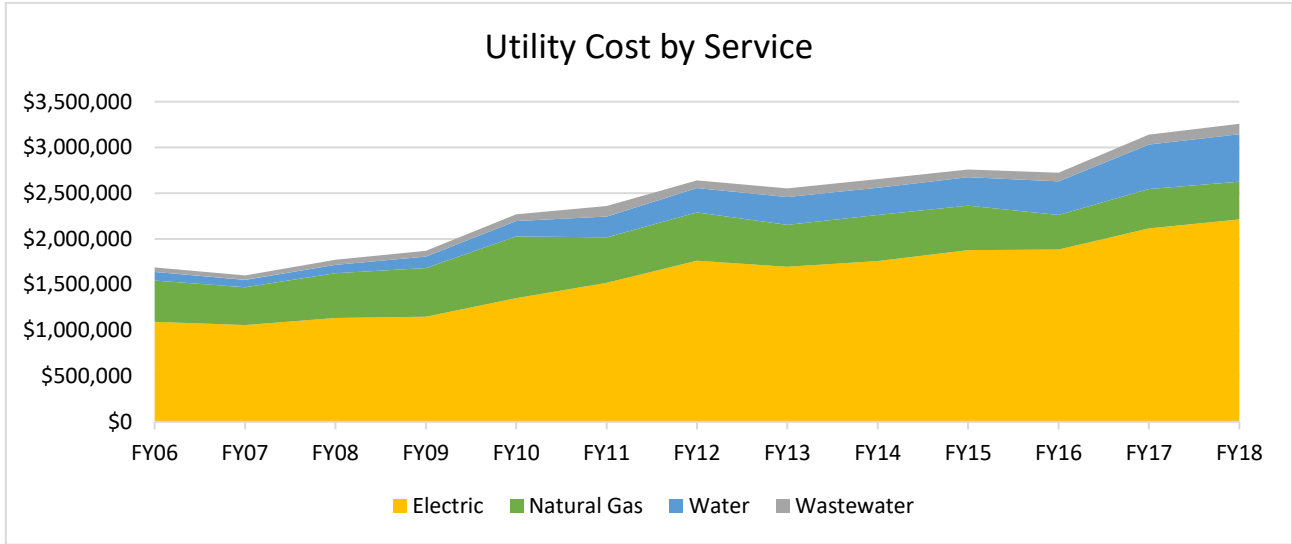
Executive Summary

Colorado Springs Utilities (CSU) provides all utilities for UCCS except for a transport gas contract from CenterPoint Energy that supplies natural gas for 9 buildings. Solar photovoltaic (PV) and solar thermal panels on and off campus provide energy and Renewable Energy Credits for buildings on campus as well. UCCS' growth in square footage, as well as student, staff and faculty members, accounts for continued increases in cost and usage of utilities. LEED Gold certification for new buildings, energy efficiency and conservation efforts, and increased renewables keeps costs and usage at a lower rate of increase than if they were absent.

Total Utility Costs

Total utility costs have risen an average of 7.5% per year since 2006. The increase in total costs FY17 to FY18 was 2.3% or \$74,610 for a total of \$3,258,250. While daily use and rates differ, UCCS spends approximately \$8,927 per day on utilities.





Compared to FY17, utility costs per unit in FY18 increased for electricity and decreased for natural gas. Wastewater charges are the same, but water costs went up for FY18.

Comparison of Usage and Cost by Utility for FY17 and FY18							
	FY17		FY18				
	Usage	Unit Cost	Usage	Unit Cost		Usage increase %	Cost/Unit increase %
Electricity	26,058,511 kWh	\$0.081	25,687,951 kWh	\$0.086		-1.4%	+6.2%
Natural Gas	923,233 CCF	\$0.466	948,218 CCF	\$0.436		+2.6% *	-6.4% *
Wastewater	3,563,708 CF	\$0.031	3,734,110 CF	\$0.031		+4.8%	0%
Water	7,720,532 CF	\$0.062	7,443,644 CF	\$0.069		-3.6% **	+11.3%**

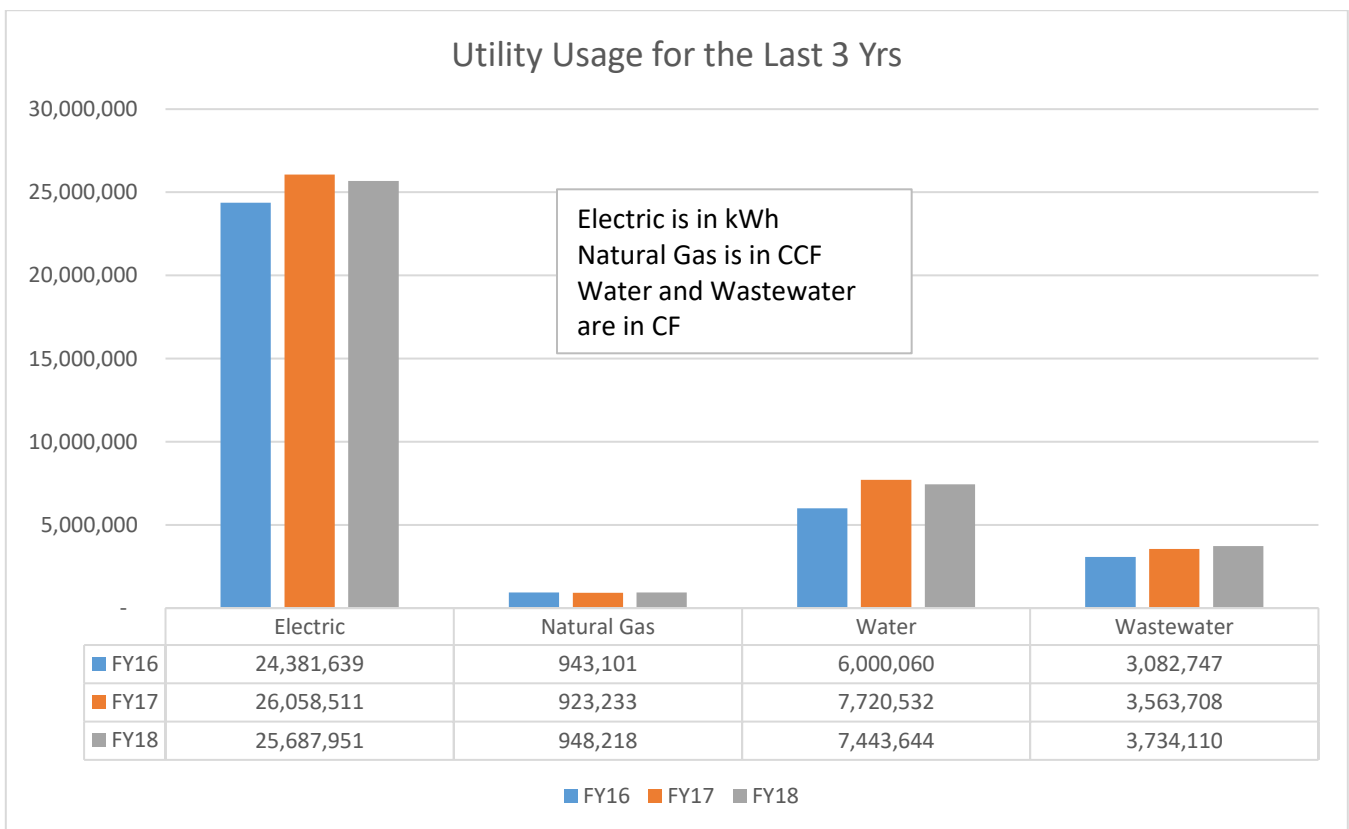
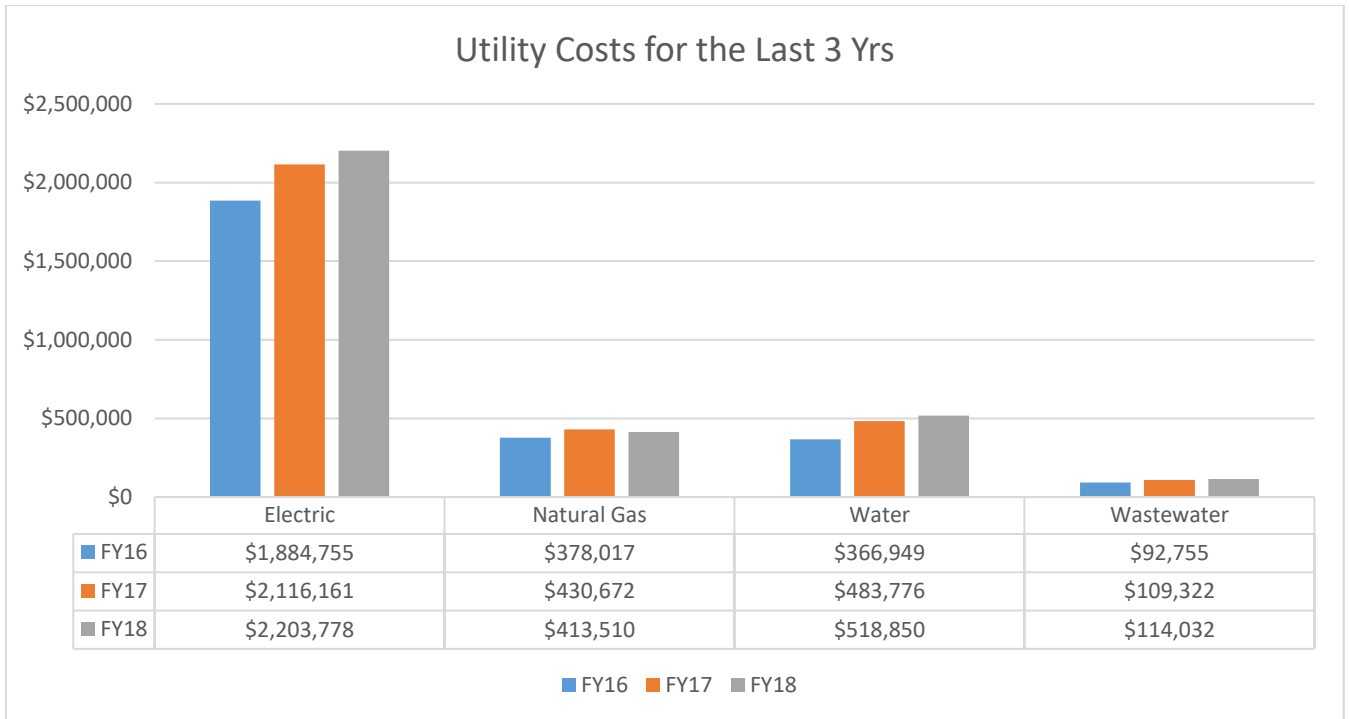
*Natural gas prices are more subjective to volatile changes based on market pricing.

** Water cost from CSU has historically increased in cost outpacing most utilities within the western United States.

Total Utility Use

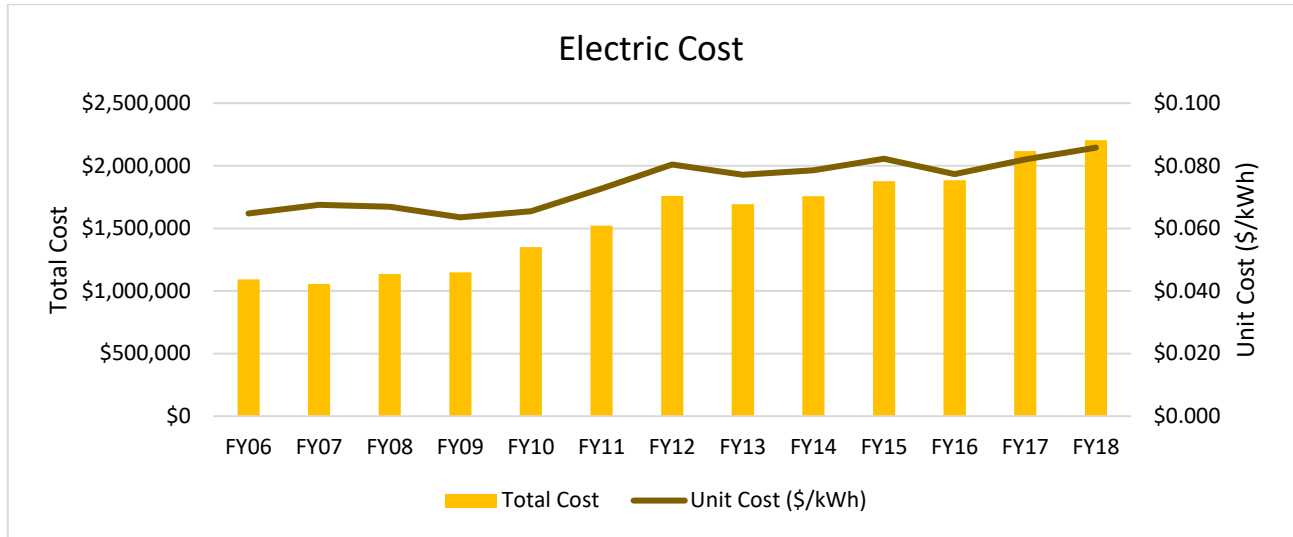
Utility data includes more than 112 utility meters across more than 66 accounts. The chart above displays the percentage change of each service compared to the previous fiscal year. Electricity consumption went down slightly, 1.4%, and natural gas use increased 2.6%. Wastewater also increased by 4.8%. Water overall decreased 3.6%. Of total water use, there was a 50%/50% split between irrigation and wastewater respectively for FY18. In FY 17, the split was 54% irrigation and 46% wastewater. More effort should be made to fully understand the irrigation on campus to determine what is needed without over watering.

The above chart and below graphs show the changes in spending for each utility. Below reflects total cost and usage for each of those utilities for the last 3 years. The gas consumption shown below is prior to weather normalization. Note that each utility has its own units for the Usage table.



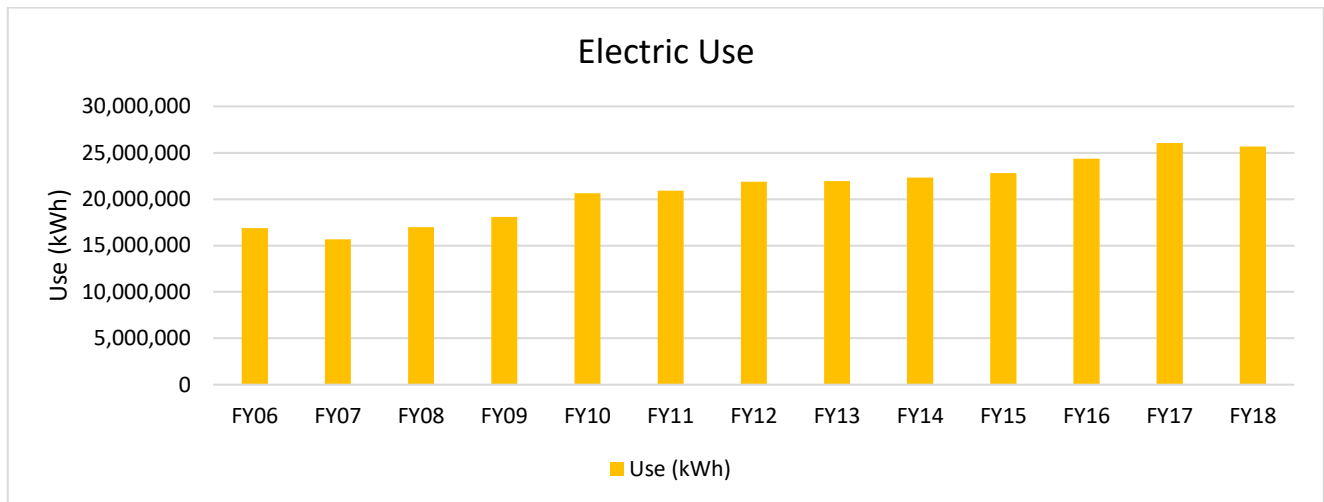
Electric Cost

The trend for total electricity cost on campus has increased an average of 6.24% per year since baseline FY 2006 with an average increased cost of \$92,575/year.



Electric Use

The trend for total electricity consumption on campus has increased an average of 4.3% per year since baseline FY 2006 with an average increased use of 733,313 kWh/year. Electricity use decreased 1.4% from FY17 to FY18.

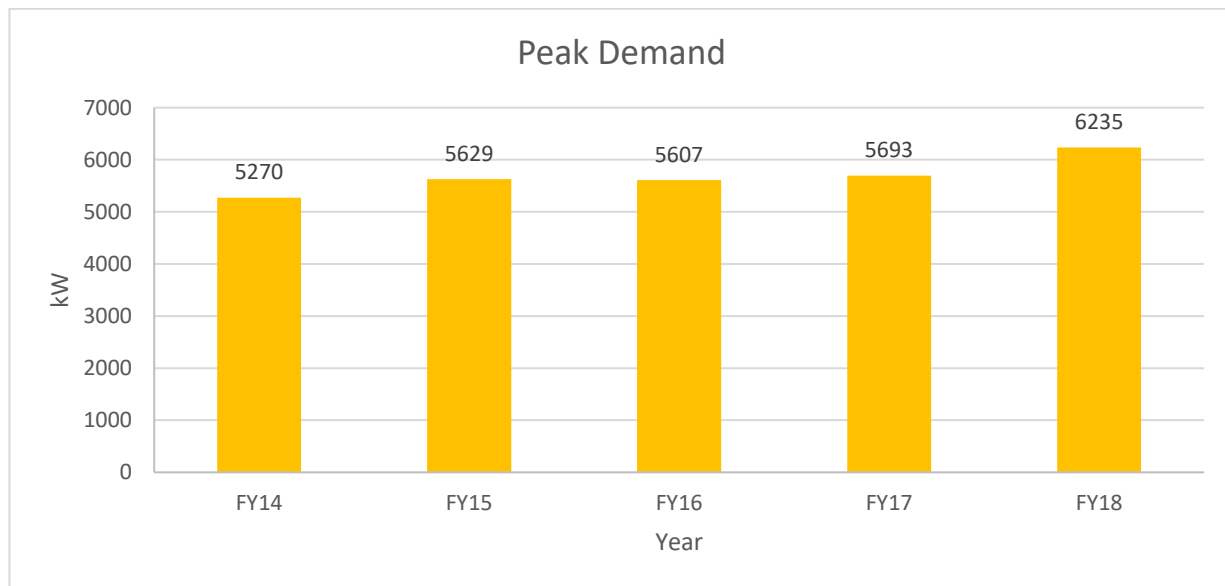


Electric Demand

Larger accounts are billed for electric demand, kW, (the rate at which electricity is consumed) as well as overall consumption, kWh. Electric used during On-Peak hours is more expensive than Off Peak. On-Peak hours for Summer are 11:00 a.m. to 6:00 p.m. For Winter, On-Peak hours are 4:00-10:00 p.m. For our demand accounts, demand charges represent about 70% of the billing charge to UCCS. The chart below shows the campus peak demand reached for the last four years. Demand has increased almost a 1 MW

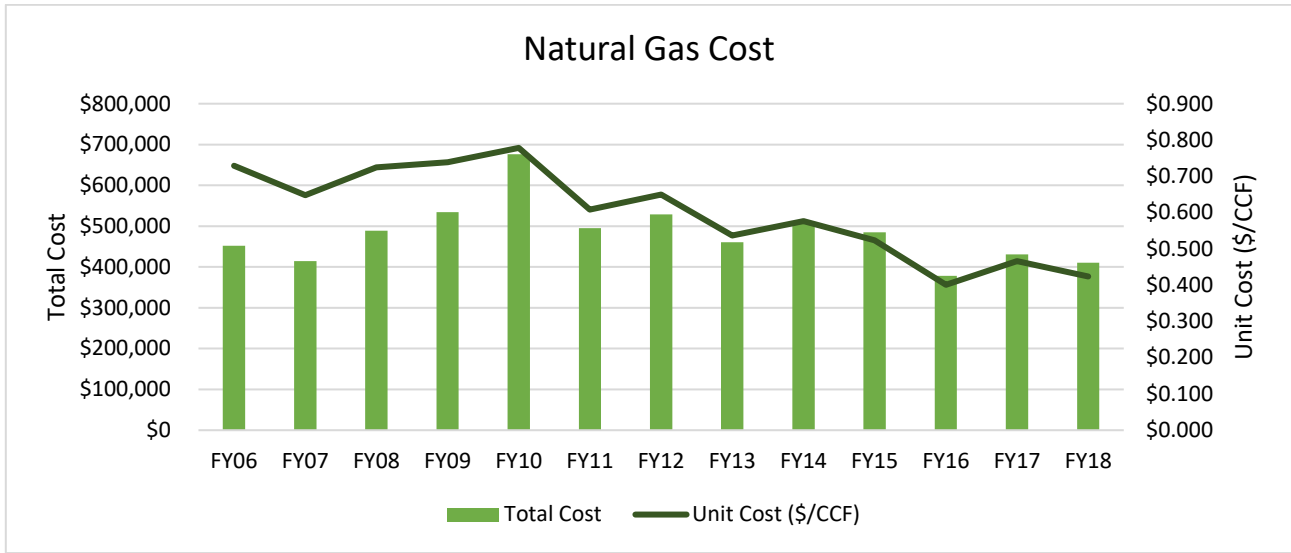
(965 kW) since 2014. For demand accounts where kW costs about \$20-23/kW/month, this increase is substantial, \$248,970, in just four years.

		Peak Demand, kW	% Change from Previous Year
FY 14	September	5,270	
FY 15	September	5,618	7%
FY 16	May	5,629	0%
FY 17	October	5,721	2%
FY 18	September	6,235	9%



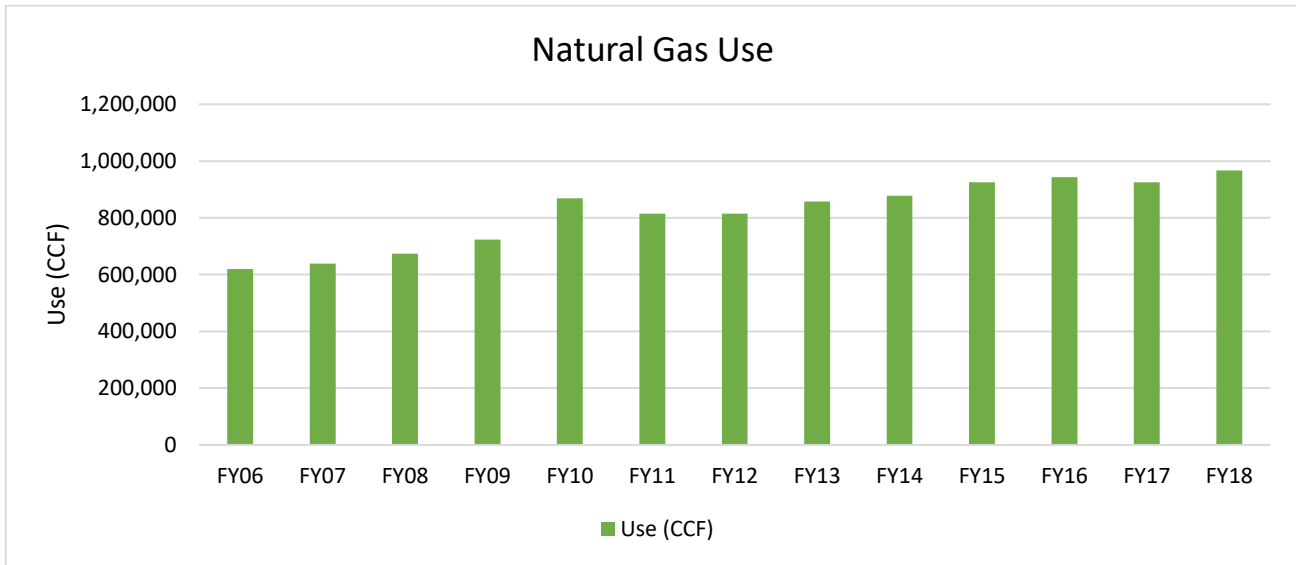
Natural Gas Cost

This graph includes natural gas costs for all accounts, including transport gas. The trend for total gas cost on campus has decreased \$38,569 since baseline FY 2006. This is due to falling natural gas costs, not consumption on campus since use has increased since that time. The unit cost of natural gas has fallen from \$0.729/CCF to \$0.436/CCF. From FY17 to FY18 natural gas cost decreased 4% per CCF.



Natural Gas Use

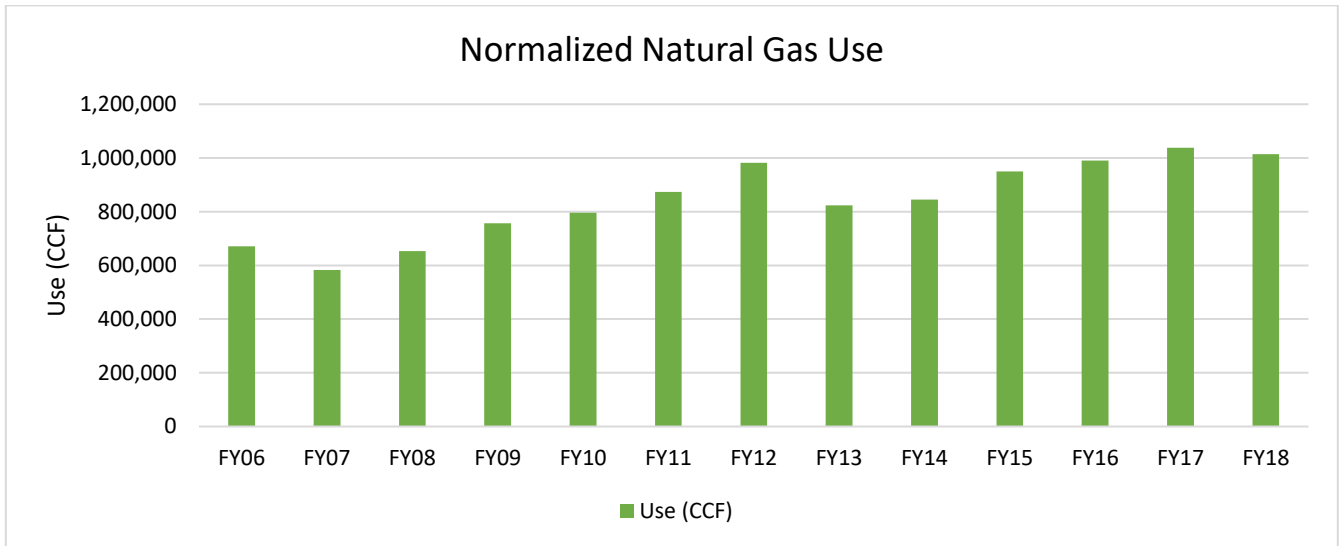
The graph below includes the data for all natural gas consumption. The trend for total gas use on campus has increased an average of 4.4% per year since baseline FY 2006 with an average increased use of 27,360 CCF /year. Natural Gas CCF use increased 2.7% from FY17 to FY18.



Normalized Natural Gas Use

It is also important to review natural gas use in respect to weather because most natural gas use is associated with heating whereas electric is not usually used for heating. Weather normalized natural gas is the natural gas your building would have used under average conditions. The weather in a given year may be much hotter or colder than your building’s normal climate so weather normalized energy accounts for this difference. Weather normalization was done by looking at one year and comparing it to the last 5 years of average heating degrees days (HDD). For example, the normalization factor for 2018 takes the HDD for 2018 and compares it to the average HDD for 2017, 2016, 2015, 2014 and 2013. For 2017 HDD, we would compare to the average of 2016, 2015, 2014, 2013 and 2012.

The graph below includes the data for all normalized natural gas use. The trend for total gas use on campus has increased an average of 4.2% per year since baseline FY 2006 with an average increased use of 28,685 CCF /year. Normalized natural gas use decreased 2.3% from FY17 to FY18. These numbers are similar to their non-normalized counterparts discussed above.

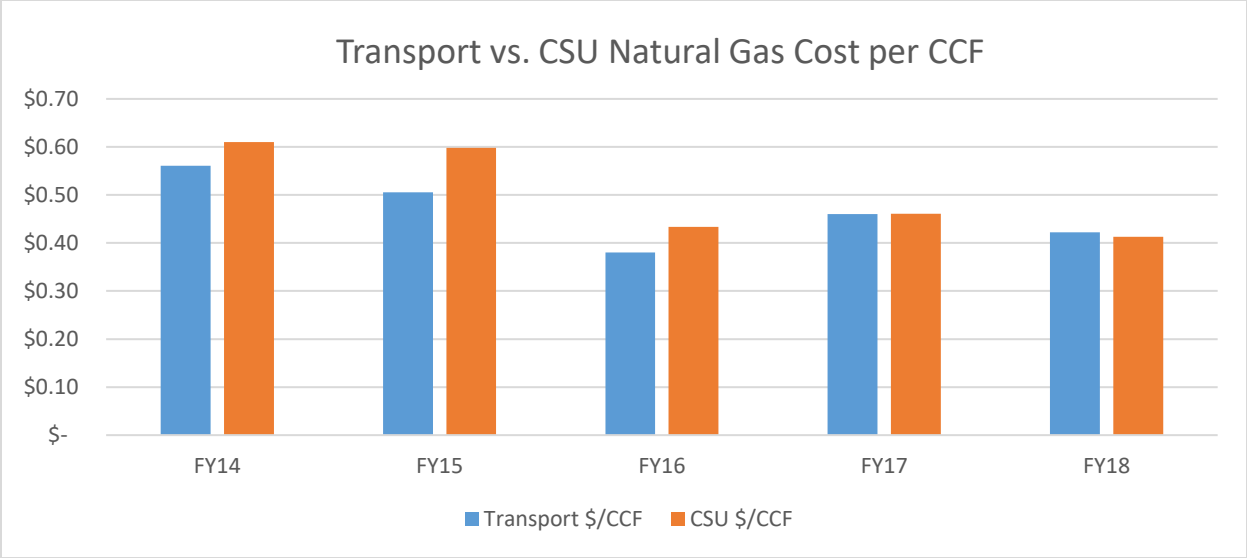


Natural Gas Providers

UCCS receives natural gas from the local utility company, CSU, and has a contract for transport gas from CenterPoint Energy for 9 buildings. The goal of pursuing transport gas is to diversify the risks of increasing gas prices. Transport gas contracts have provided savings over the municipal rates of \$45,304 over the last 3 years, but this is never guaranteed. It is important to analyze and evaluate each year. Additional cost savings may be achieved by fixing a portion of the transport gas. Our current composition of natural gas is 67% from transport and the remaining from CSU.

Buildings on Transport Gas from Centerpoint	
Centennial Hall	Gallogly Recreation and Wellness Center
Cragmor and Main Hall (one gas meter)	Shavano House
Osborne Center for Science and Engineering	The Lodge
Kraemer Family Library	Summit Village (Monarch, etc.)
Columbine Hall	

This graph shows the difference in cost between Transport provider, Centerpoint Energy and CSU. Traditionally transport gas is cheaper than buying from the local utility. If, in FY16, transport gas had been purchased by CSU instead, UCCS would have paid about \$20,000 more. In FY17, the transport cost came into line with CSU costs. For FY18, natural gas cost per unit was \$0.01 more for transport gas. We need to maintain diligence in checking real market pricing for transport gas to reap potential cost savings for the future.



Categories of Water on Campus

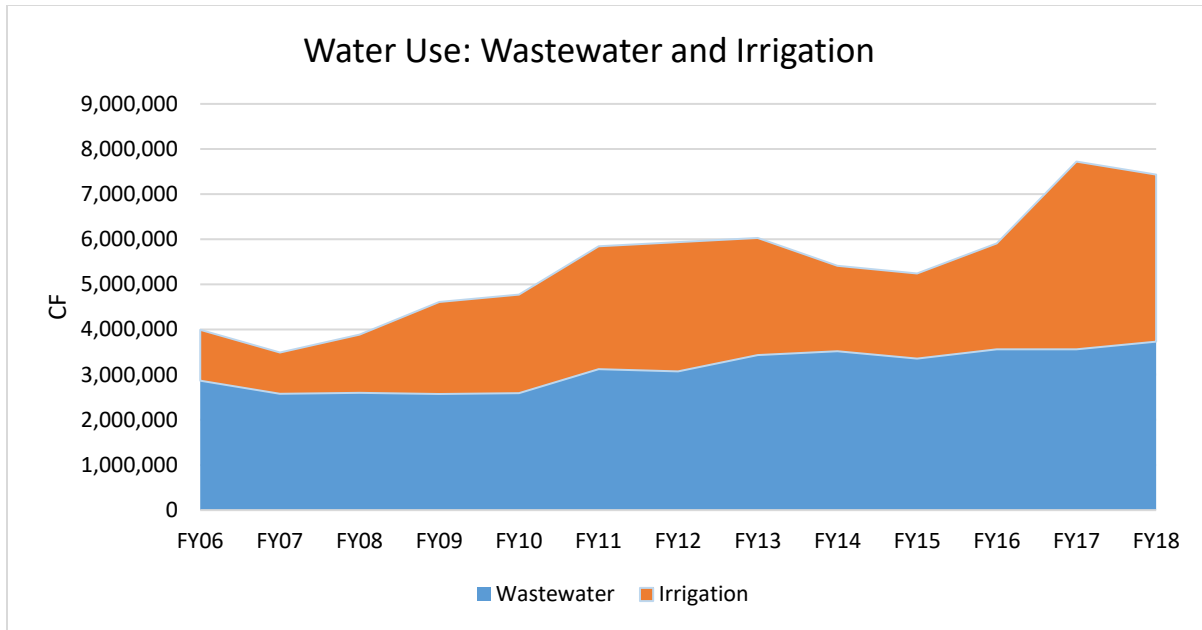
There are 3 different types of water on campus. UCCS is billed by CSU for the water that enters each building and at which point is split between two different streams: Wastewater and Irrigation.

Wastewater is defined as any water that leaves the campus that needs to be treated; mainly domestic water. For wastewater, UCCS has to pay charges for the water costs and the sewer costs to CSU because CSU has to treat the water for drinking and domestic use but also clean the wastewater for discharge after use.

Irrigation water is used for landscaping. Currently, UCCS requires potable water on campus so all irrigation water is charged water fees from CSU but not wastewater fees. Some buildings on campus do not have their own irrigation meter which means that UCCS is paying wastewater fees for water that is used for irrigation. If irrigation meters had been installed on those buildings, we would not have to pay the wastewater fees. One example is LaPlata which supplies irrigation water for Alpine Village but does not have an irrigation meter. CSU can install an irrigation meter free of charge which we pursued, but the water entry room could not accommodate what CSU requires to have an irrigation meter.

Both wastewater and irrigation has increased since FY06, 35% and 200% respectively. Overall water use increased 86%.

According to the El Paso County Water Master Plan, by 2040, the current supply of water is estimated to be sufficient to supply 72% of the projected population. Areas with a significant share of Denver Basin groundwater could serve another 20% of the population, but that share of production may not be economical. Given projected growth in our population by 2060 the current supply of water is estimated to be sufficient to supply 56% of the projected population. Areas with a significant share of Denver Basin groundwater could serve another 15% of the population, but that share of production may not be economical.

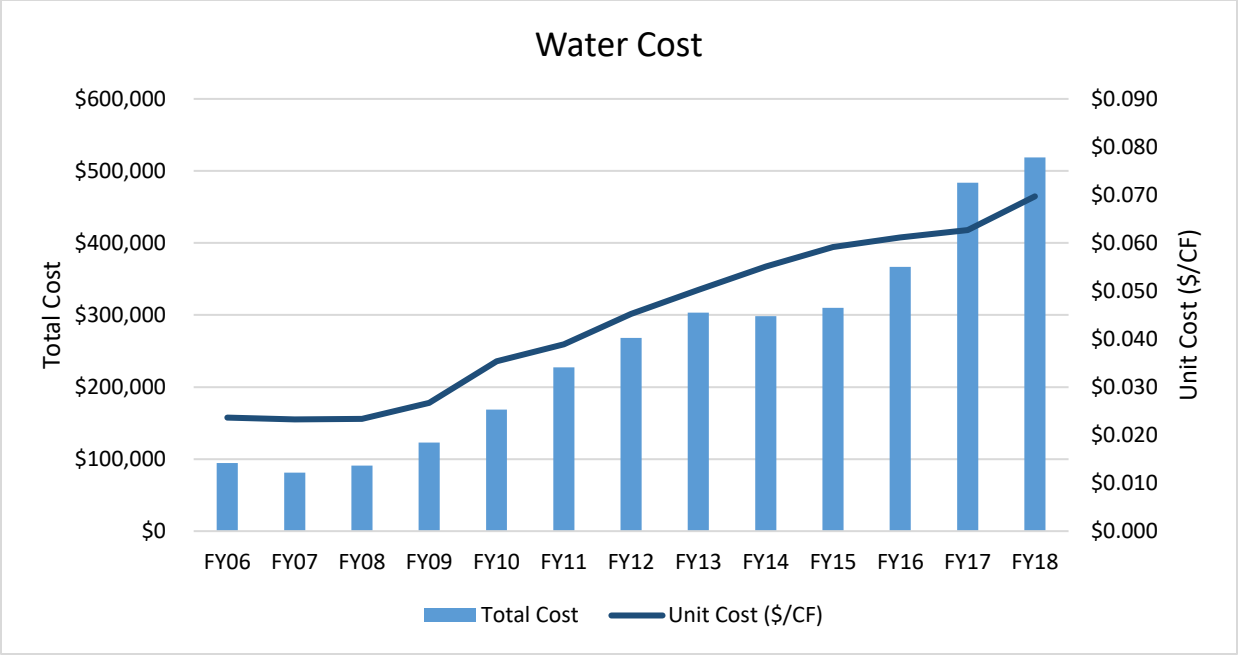


FY17 to FY18, water usage decreased by 3.6%, domestic water increased by 4.8% and irrigation decreased by 11%. The reason for overall water reduction is due to reduction of irrigation water by 450,000 CF. The plot below shows the proportion of wastewater to irrigation water to make up total water use over several years.

Water CF			Wastewater CF			Irrigation CF		
FY17	FY18	% Change	FY17	FY18	% Change	FY17	FY18	% Change
7,720,532	7,443,644	-11.0%	3,563,708	3,734,110	4.8%	4,158,244	3,701,509	-3.6%

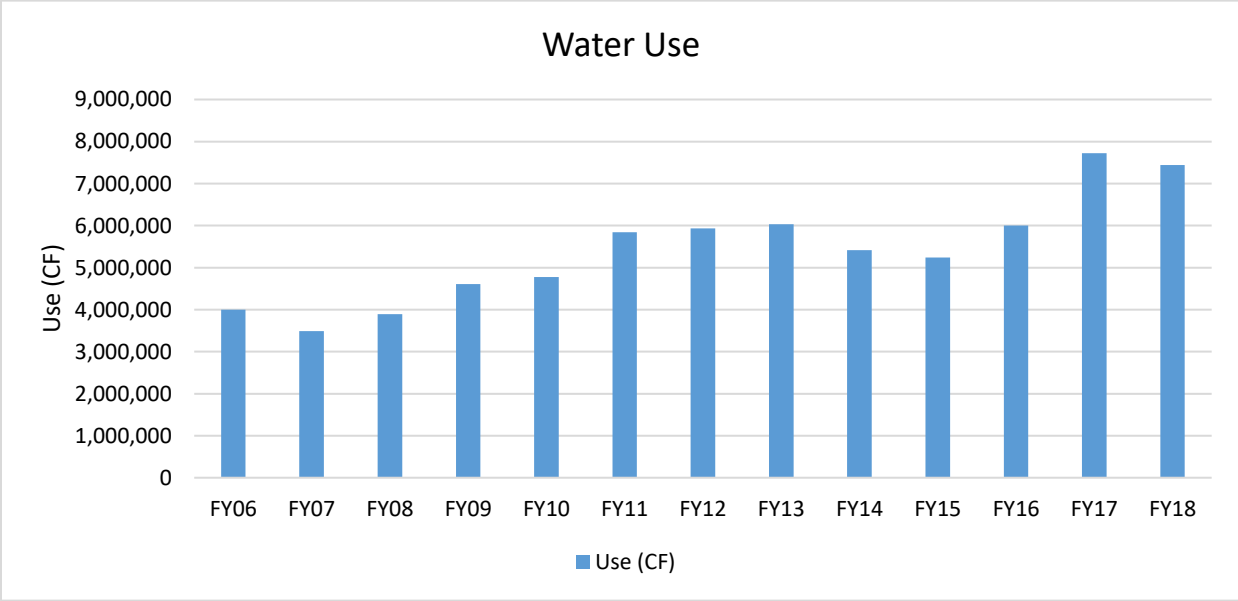
Water Costs

Water costs have sharply increased since FY06. Costs increased from \$94,420 to \$528,850 which is a 450% increase. The cost per CF of water increased from \$0.024 to \$0.07 which is a 192% increase since FY06. According to CSU in April of 2019, water costs are expected to rise another 3.5% in 2020. Long term forecasts show increasing demand from Widefield-Security areas.



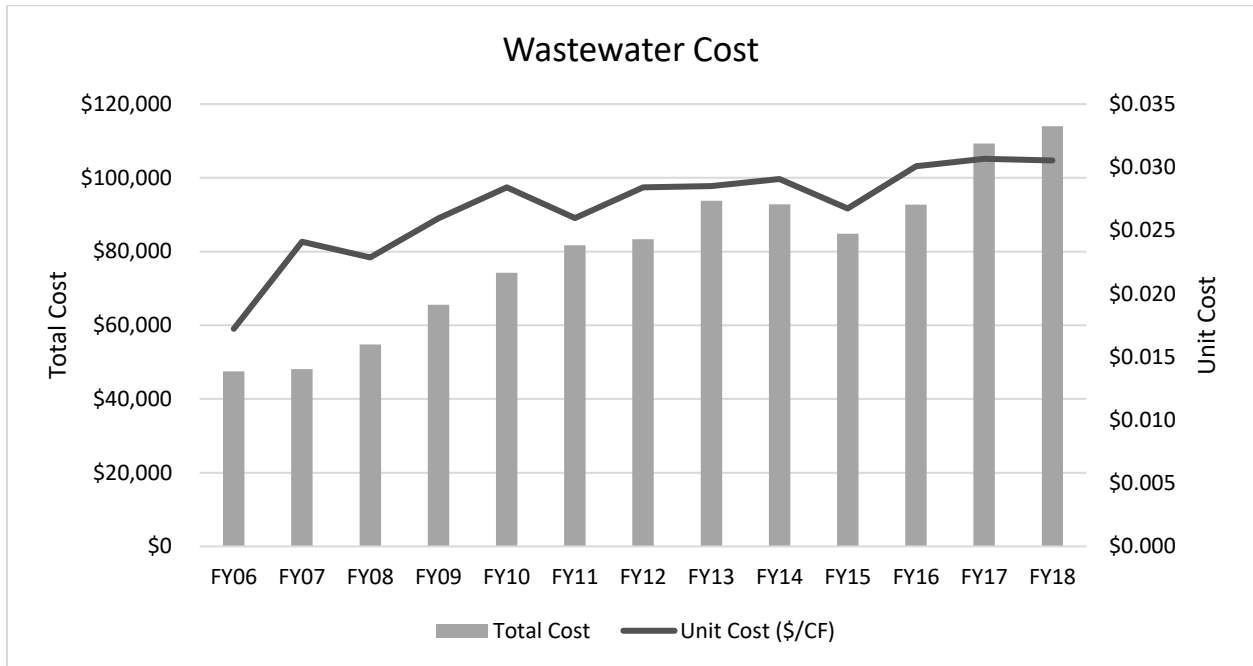
Water Use

Since FY06, water use on campus has also sharply increased. In FY06, UCCS used 3,997,572 CF compared to FY18 where UCCS used 7,443,644 CF which is an 86% increase. Campus has expanded over that time which explains part of the picture for the increased water use.



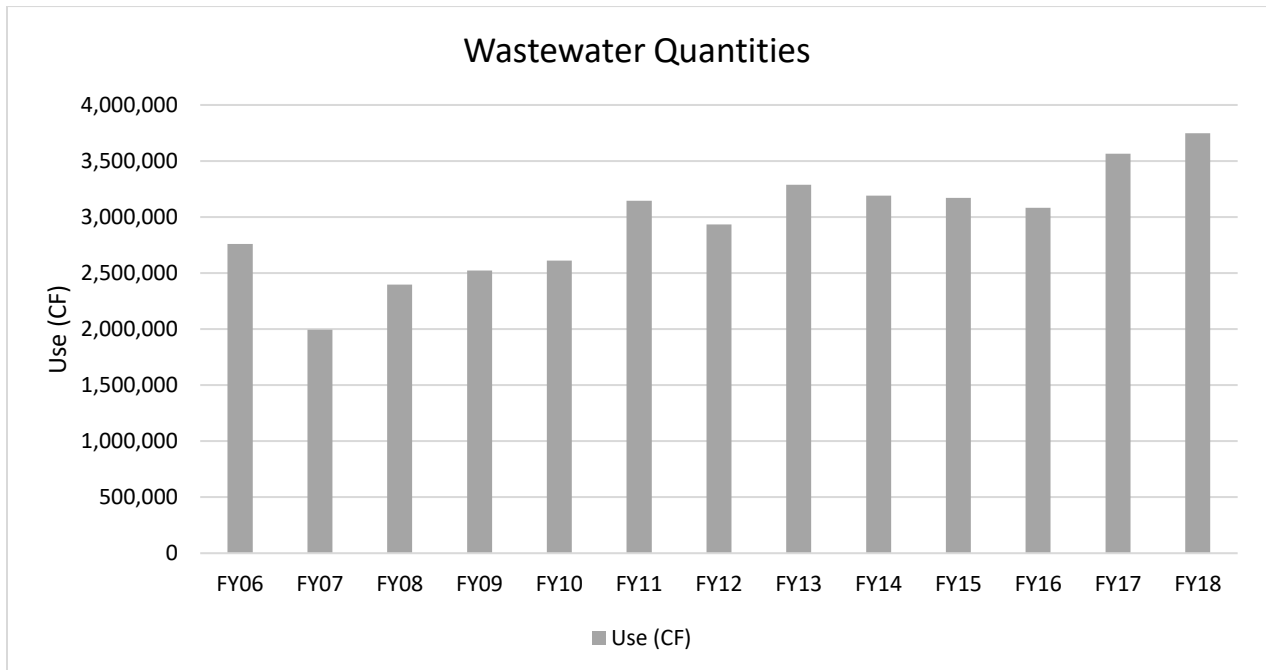
Wastewater Costs

The cost of wastewater has increased 6.8% per year since FY06. Cost of wastewater has been flat at \$0.3/CF for FY17 and FY18 but is expected to increase significantly over the next few years. According to CSU, April 2019, wastewater costs are projected to rise 2% in 2020.



Wastewater

Wastewater increased by 170,402 CF or 4.8% for FY17 to FY18. On average wastewater use has increased 3% each year since FY06.



Energy Use Intensity

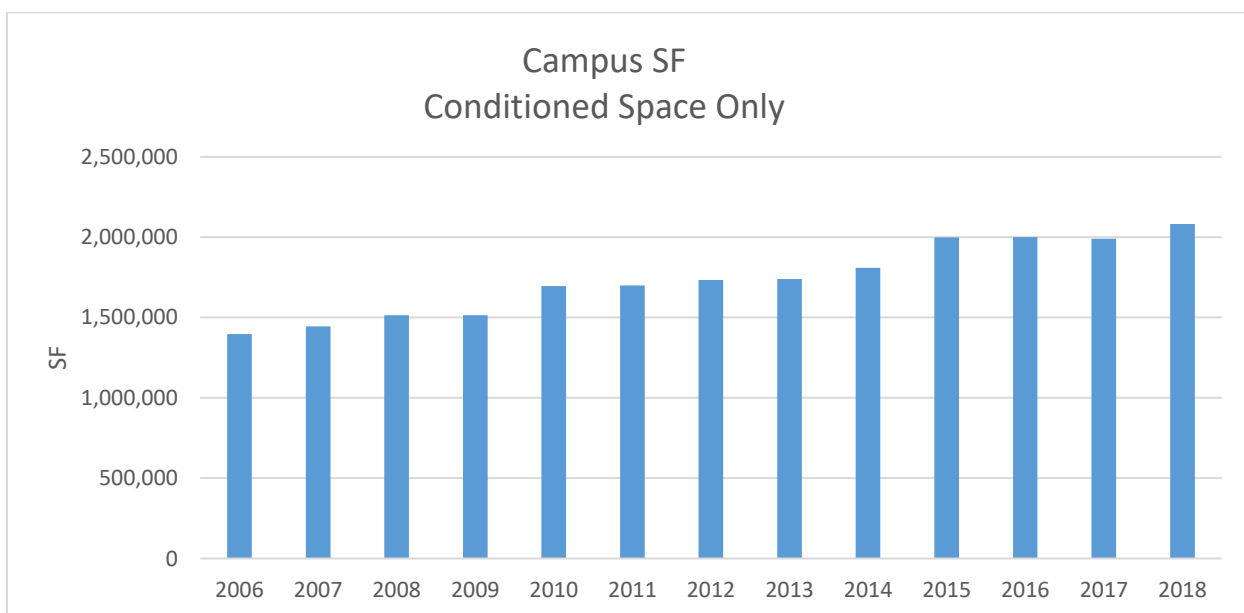
The campus increased its square footage by 92,000 with the addition of Ent Center for the Arts which represents a 4.6% increase of conditioned space. The student population increase, represented by Full Time Equivalent, FTE, for FY 2018 was 1.8% or 189 FTE for a total of 10,664.

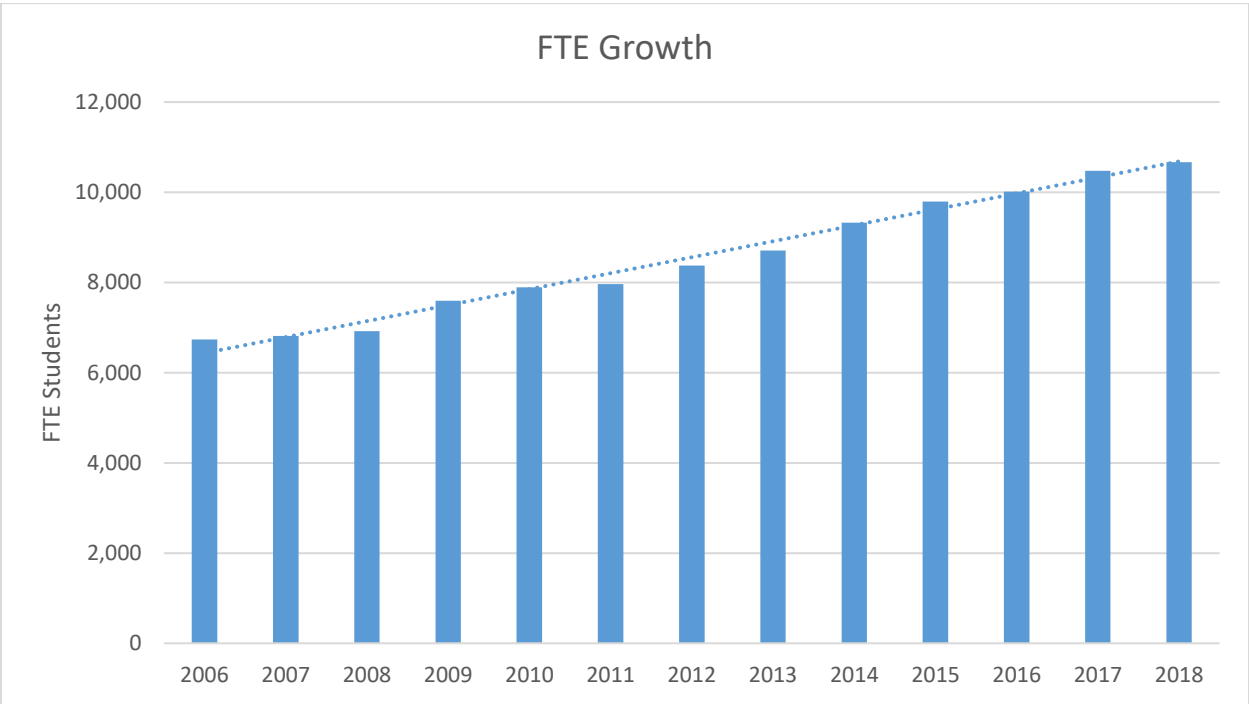
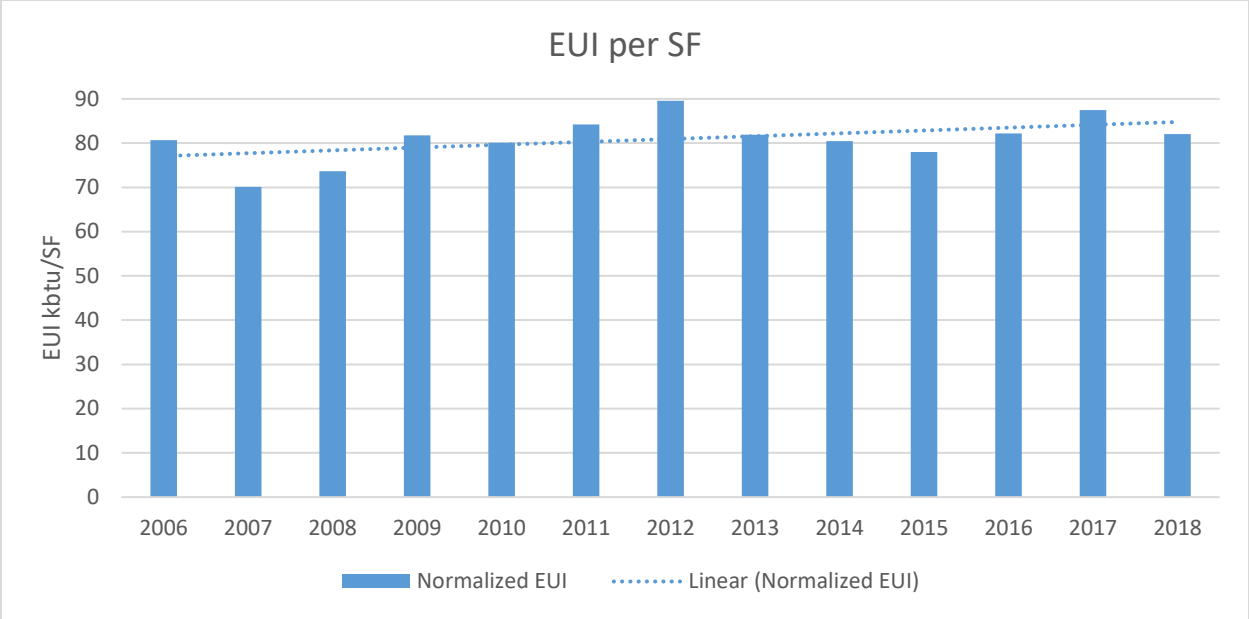
Measurements of Energy Use Intensity, EUI, and Energy Use per FTE (students) can communicate some approximation of efficiency when both total energy and total costs are rising. Energy Use Intensity per square foot for FY 18 decreased from 87 kBtu/sq. ft. to 82 kBtu/sq. Ft using weather normalized data. Energy Use Intensity per FTE decreased from 16,621 to 16,024 which represents a 3.6% decrease.

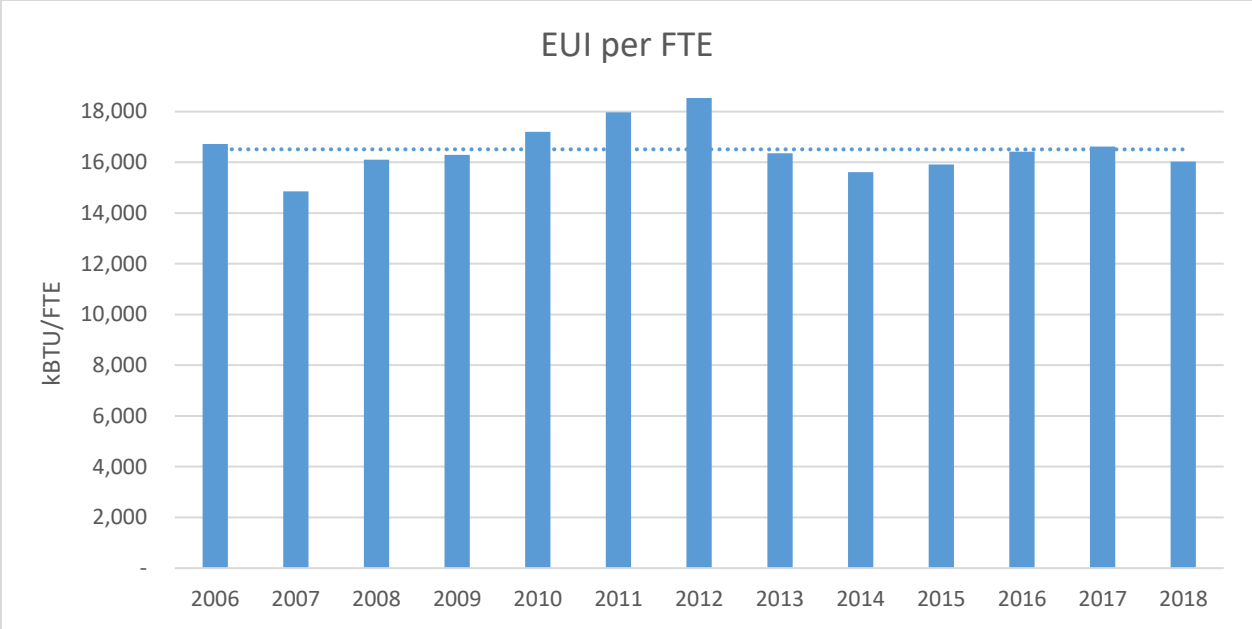
Campus-wide EUI is an important metric to see how the campus is doing with respect to itself in other years. It should be noted that campus EUI should not be used in determining performance against other campuses due to how different all campuses are. Overall, UCCS is maintaining its EUI with a slight increase from FY17 to FY18. The reason for this is the implementation of energy efficiency projects and all new buildings being LEED certified. Colorado College has a EUI of 70 kBtu per square foot, as stated in its 2017 energy report; however, CC does not have classes schedule in buildings in the evenings. Most colleges in Colorado have a EUI in the 100's.

The table below shows the total energy used on campus over the last four fiscal years.

	2015	2016	2017	2018
Student FTE	9,791	10,014	10,475	10,664
Conditioned Sq. Feet	1,997,652	1,999,847	1,990,745	2,082,745
kBtu	155,771,268	164,429,642	174,105,196	170,880,707
EUI	78	82	87	82
Energy Intensity/FTE	15,910	16,420	16,621	16,024







Energy Conservation Measures

In FY18, UCCS completed a large scale lighting project in the Kraemer Family Library and El Pomar Center. The project replaced fluorescent lamps with LED tubes. The project replaced over 2,200 fixtures and resulted in energy savings of 81 kW and 530,403 kWh. Utility bills are showing a 17.4% reduction in building energy use. The project cost about \$147,870 and had a cost savings of \$44,261. The final payback including the CSU incentive was 1.8 yrs. In addition to the significant energy savings and economics, the new LED lighting is providing better light levels and color rendering for UCCS students.

Renewable Energy

UCCS renewables include on-site solar photovoltaic, an on-site solar thermal system, purchase agreements in local off-site solar photovoltaic gardens, and the purchase of Renewable Energy Credits. The percentage of electricity from on-site solar is 0.3%. The percentage of electricity from off-site solar is 5.8%. With the addition of RECS, the percentage of UCCS electricity offset by renewables for FY 17 was approximately 70%. UCCS purchases RECS to cover 100% of electricity for all new LEED Buildings and most larger buildings on campus also have 100% of electricity offset.

In October 2017 UCCS installed its largest on-site photovoltaic system to date, 150kW. Situated on the Gallogly Event and University Centers roofs, the PV systems makes it almost net zero. For calendar year 2018 the system produced 279,613 kWh.

Alpine Parking Garage solar had some issues that caused the inverters to have an electric arc detected. This caused the system to shut down and had reduced production than what it should have. The contractor has since come out and replaced connections and we have not had an arc fault since.

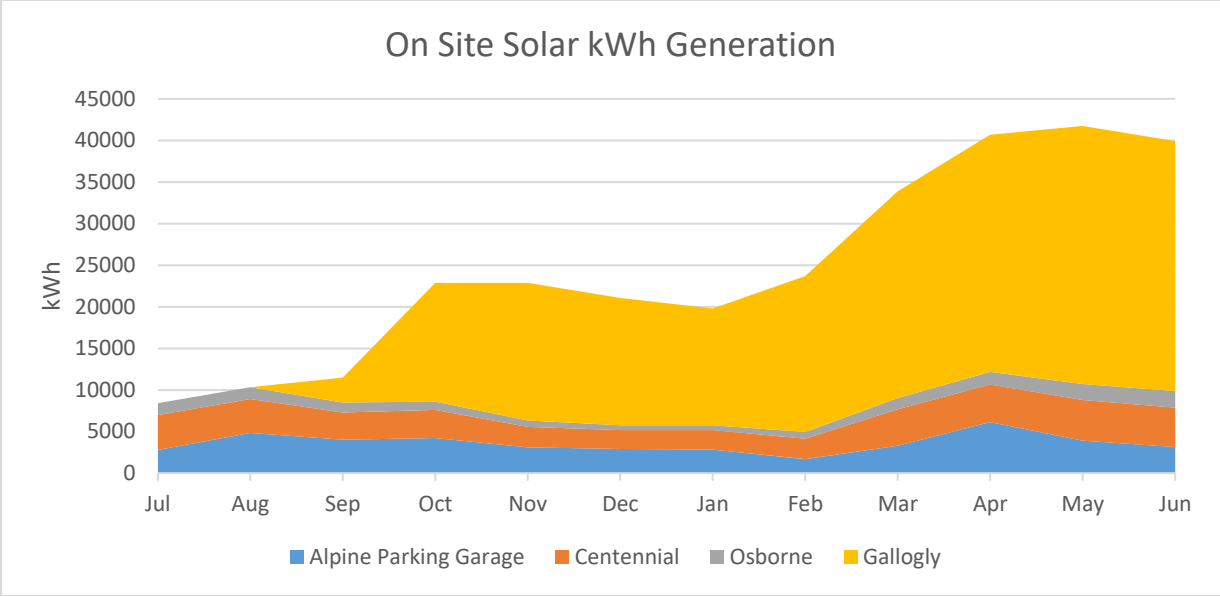
The solar thermal system on top of the Recreation Center has been deteriorating due to scale up of the heat exchanger and design issues on the system. UCCS is currently looking for ways to improve the system and get it back on line.

Building	Type	FY2018 Electric Consumption	FY2018 Solar Production	% of elec. from Renewables	RECs that UCCS can claim*
Alpine Parking Garage	On-site	255,600 kWh	172,878 kWh	40%	40% = 69,151 kWh/yr
Gallogly Events Center	On-site	12,552 kWh	316,547 kWh	96%	
Centennial Hall	On-site	1,454,250 kWh	42,966 kWh	3%	0%
Osborne Center	On-site	4,370,662 kWh	16,684 kWh	Less than 1%	0%
Total On-site			549,075 kWh		
Columbine Hall	Off-site	1,498,400 kWh	249,459 kWh	17%	100% = 249,459 kWh/yr
Heller Center	Off-site	10,736	Est. 6200	58%	Sunshare needs to purchase
Engineering - 1	Off-site	1,964,382 kWh	324,073 kWh	48%	100% = 324,073 kWh/yr
Engineering - 2	Off-site		593,797 kWh		100% = 1,000,000 kWh/yr
Total Off Site			1,173,529 kWh		

- Due to rebates received from CSU, UCCS cannot claim all attributes from on-site systems. For Engineering-2, and Heller, Sunshare must purchase RECS for the university each year as part of contract.

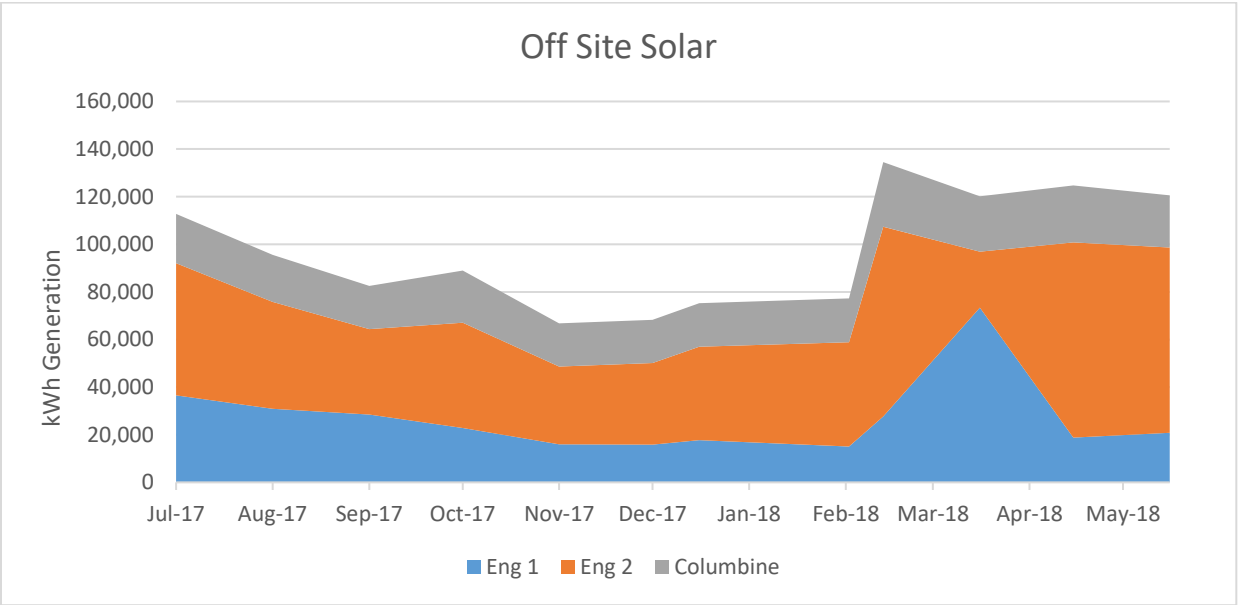
On-Site Solar

This graph represents the amount of energy produced by campus' on-site solar panels. The inverted bell shape is expected as there is less sunshine during the winter months. Solar production for Alpine Parking Garage drastically increased during April since the second inverter was brought back online. The increase throughout the year reflects Gallogly coming online.



Off-Site Solar (Solar Gardens)

In 2015, UCCS entered into 3 contracts for solar electricity production in local solar gardens. These are 20 year purchase agreements and the electricity is credited to the Engineering and Columbine Hall buildings. There is a very small contract for Heller Center for 4kW. The graph below shows total offsite production.



Highlights and Recommendations for FY19

UCCS has several potential projects that would reduce energy on campus. Of these projects, the ones that have been quantified with the best return on investments are listed below.

1. There are (4) 100 HP exhausts on Osborne that are running with no variable frequency drives (VFD). Since airflow changes based on air needs for the building, the fans ramp up and down in speed. Currently the fan uses a discharge damper to adjust airflow which reduces doesn't significantly reduce motor power. A VFD controlled motor uses adjustable frequency and voltage for controlling the motor speed. The reduced airflow will reduce motor power much greater than the existing control.
2. Expand LED retrofit lighting projects throughout campus. This will reduce energy as well as improve light levels for occupants
3. Add a VFD to the Library chiller. This will reduce the energy consumption of the oversized chiller and also extend the chiller life.
4. investigate an irrigation map so that better data can be collected on how much water is needed for irrigation without wasting water.
5. Participate in CSU's new Peak Demand Savings Program which aims at reducing peak loads on the hottest summer days.

Total Energy Use per Building Yearly Comparisons

This chart displays the changes in energy use from FY17 to FY18. Since this is a working document, there may be explanations that Facilities Services can provide for significant changes in some buildings.

Building	Sq. Ft.	2017		2018		% Change
		kBtu	kBtu/Sq. Ft.	kBtu	kBtu/Sq. Ft.	
Campus Services	24,578	1,516,630	62	1,528,666	62	1%
Cragmor Hall	25,073	827,857	33	825,400	33	0%
Main Hall	48,780	5,132,116	105	5,429,435	111	6%
Dwire Hall	64,784	3,666,215	57	3,632,291	56	-1%
Centennial Hall	69,824	9,171,441	131	9,498,955	136	4%
Fine Arts	6,056	410,464	68	462,081	76	13%
Gallogly Events Center	25,165	2,145,968	85	871,140	35	-59%
Kraemer Family Library & El Pomar Center	173,660	15,513,800	89	16,036,911	92	3%
University Center	44,702	4,823,129	108	4,958,229	111	3%
Family Development Center	11,871	1,049,357	88	1,088,728	92	4%
Engineering and Applied Science	74,019	10,715,134	145	11,014,236	149	3%
Columbine Hall	107,532	8,851,547	82	9,354,719	87	6%
Forester	1,749	147,312	84	155,948	89	6%
Eagle Rock (ROTC)	917	806,970	880	893,523	974	11%
Academic Office Building	40,172	2,323,033	58	1,954,489	49	-16%
Summit Village	141,763	11,770,017	83	12,027,214	85	2%
Summit Lodge	45,171	9,053,150	200	8,119,651	180	-10%
Eldora House	34,304	358,900	10	361,900	11	1%
Copper House	33,294	3,706,341	111	3,656,473	110	-1%
Osborne Center	155,472	28,224,985	182	29,341,969	189	4%
Gateway Hall	14,768	1,880,873	127	1,949,214	132	4%
Gateway Garage	225,765	69,924	0	55,279	0	-21%
Innovation House	2,979	249,695	84	258,426	87	3%
Sustainability Demonstration House	4,328	105,037	24	102,584	24	-2%
Greenhouse	3,000	180,275	60	144,487	48	-20%
Farmhouse	3,756	263,662	70	277,556	74	5%
University Hall	87,263	6,522,327	75	6,237,474	71	-4%
Recreation and Wellness Center	97,085	11,275,865	116	12,332,455	127	9%
Alpine Garage and Field	472,484	724,239	2	769,973	2	6%
Antero House	39,963	1,237,619	31	1,182,865	30	-4%
Shavano House	49,896	5,373,838	108	4,996,138	100	-7%
Crestone House	50,149	2,860,931	57	1,741,413	35	-39%
Cucharas House	56,300	2,590,865	46	2,671,418	47	3%
La Plata House	47,980	2,808,745	59	2,510,991	52	-11%
Roaring Fork Dining Hall	35,612	9,745,390	274	10,058,997	282	3%
Francis House Rental	3,628	158,244	44	150,980	42	-5%
Lane Center	54,419	3,622,807	67	3,335,193	61	-8%
Heller Main House	3,050	176,942	58	176,866	58	0%
Heller Guest House	1,821	177,252	97	196,930	108	11%
1861 University Office Park	4,000	254,091	64	227,934	57	-10%
1867 University Office Park	8,247	471,704	57	442,376	54	-6%
Cyber Security	134,592	4,793,370	36	4,327,322	32	-10%
San Juan	69,447	2,905,189	42	3,046,876	44	5%

Building Electric

The following table shows the change in electricity (kWh) use over the last four years for larger buildings on campus.

Building	2015	2016		2017		2018	
	kWh	kWh	% Change	kWh	% Change	kWh	% Change
Campus Services	144,320	164,480	14%	168,160	2%	182,000	8%
Cragmor Hall	235,440	236,360	0%	242,560	3%	241,840	0%
Main Hall	713,800	692,000	-3%	627,400	-9%	604,200	-4%
Dwire Hall	651,600	660,000	1%	650,400	-1%	616,200	-6%
Centennial Hall	1,469,550	1,501,200	2%	1,413,900	-6%	1,454,250	3%
Fine Arts	21,500	21,763	1%	31,809	46%	36,707	13%
Gallogly Events Center	246,800	243,100	-1%	231,400	-5%	12,552	-1744%
Kraemer Family Library & El Pomar Center	2,879,192	2,916,198	1%	2,938,998	1%	2,749,725	-7%
University Center	612,000	634,400	4%	637,600	1%	637,600	0%
Family Development Center	152,880	149,440	-2%	137,960	-8%	144,280	4%
Engineering and Applied Science	1,997,666	1,955,637	-2%	2,036,781	4%	1,964,382	-4%
Columbine Hall	1,414,800	1,446,800	2%	1,523,600	5%	1,498,400	-2%
Forester	7,687	6,733	-12%	2,875	-57%	4,907	41%
Eagle Rock (ROTC)	277,720	273,800	-1%	236,440	-14%	261,800	10%
Academic Office Building	288,570	294,450	2%	284,100	-4%	272,250	-4%
Summit Village	1,103,800	1,108,200	0%	1,118,200	1%	1,087,200	-3%
Summit Lodge	831,000	683,600	-18%	759,200	11%	643,320	-18%
Copper House	411,660	479,640	17%	482,520	1%	477,900	-1%
Osborne Center	4,064,296	4,127,491	2%	4,393,784	6%	4,370,662	-1%
Gateway Hall	537,450	533,550	-1%	487,950	-9%	519,000	6%
Gateway Garage	7,051	6,602	-6%	8,504	29%	5,004	-70%
Innovation House	5,835	4,912	-16%	6,298	28%	5,311	-19%
Sustainability Demonstration House	3,700	5,193	40%	5,197	0%	4,947	-5%
Greenhouse	24,936	29,494	18%	31,988	8%	33,984	6%
Farmhouse	7,438	9,919	33%	11,035	11%	12,586	12%
University Hall	1,093,000	1,144,800	5%	1,179,000	3%	998,000	-18%
Recreation and Wellness Center	1,097,700	1,377,300	25%	1,495,800	9%	1,491,900	0%
Alpine Garage and Field	332,800	245,400	-26%	212,200	-14%	225,600	6%
Antero House	200,560	179,400	-11%	179,320	0%	163,160	-10%
Shavano House	328,200	308,800	-6%	330,600	7%	316,800	-4%
Crestone House	355,560	292,920	-18%	291,600	0%	263,760	-11%
Cucharas House		237,600		309,600	30%	295,200	-5%
La Plata House		297,000		417,300	41%	363,900	-15%
Roaring Fork Dining Hall		699,750		1,073,100	53%	1,161,675	8%
Francis House Rental	216	5,835	2601%	5,990	3%	4,768	-26%
Lane Center	455,250	486,300	7%	505,950	4%	475,650	-6%
Heller Main House	10,572	9,958	-6%	10,736	8%	8,692	-24%
Heller Guest House	8,082	8,704	8%	8,893	2%	10,088	12%
1861 University Office Park	30,363	25,228	-17%	25,488	1%	24,563	-4%
1867 University Office Park	36,940	39,206	6%	40,640	4%	39,196	-4%
Cyber Security	132,400	165,200	25%	399,200	142%	441,700	10%
Ent Center						389,250	100%
Cellsite D	3,960	3,820	-4%	6,378	67%	5,617	-14%
Foundation N Nevada	159,200	159,200	0%	226,400	42%	226,400	0%
Frontage Road Lights	51,217	45,744	-11%	46,468	2%	43,874	-6%
West Lawn Lightings	12,772	12,232	-4%	10,463	-14%	11,304	7%
Ent Center Storage and	67,919	46,912	-31%	42,040	-10%	44,572	6%
North Nevada Monument	1,462	1,470	1%	1,140	-22%	1,620	30%
Parking Lot Lights West	16,049	2,946	-82%		-100%		
Parking Lot 570	31,316	20,626	-34%	19,772	-4%	20,326	3%
Alpine Village Pump	100	100	0%	100	0%	100	0%
ROTC Parking Lot Lights	9,968	10,312	3%	8,121	-21%	6,467	-26%
Parking Lot 224	208,500	214,098	3%	206,400	-4%	193,050	-7%
Softball Field Lights	1,628	1,509	-7%	2,107	40%	4,688	55%
Bus Lights	33,161	39,139	18%	14,064	-64%	17,641	20%
Soccer Field Lights		59,644		77,264	30%	95,217	19%
VAPA Parking Lot Lights		23,325		28,445	22%	30,101	6%
Parking Lot 580	31,622	32,299	2%	37,152	15%	61,993	40%
Parking Lot 540				34,421		46,352	26%
San Juan				343,800		363,720	5%
TOTAL	22,821,208	24,381,739	7%	26,058,611	7%	25,687,951	-1.4%

Building Natural Gas

The following table shows the change in natural gas use over the last four years for the larger buildings on campus. Main Hall and Cragmor Hall are under the same natural gas meter so each building's natural gas usage was measured by distributing the total natural gas between both buildings based on their square footage. Buildings with larger square footage have a greater natural gas use.

Building	2015		2016		2017		2018	
	CCF	CCF	% Change	CCF	% Change	CCF	% Change	
Campus Services	9199	10,191	11%	9,427	-8%	9,075	-4%	
Cragmor Hall	9983	10,290	3%	10,154	-1%	11,432	13%	
Dwire Hall	17761	16,946	-5%	14,464	-17%	15,292	6%	
Gallery of Contemporary Art		3,566		3,019	-18%	3,368	12%	
Gallogly Events Center	14257	12,160	-15%	13,562	10%	8,283	-39%	
University Center	26658	31,212	17%	26,470	-18%	27,821	5%	
Family Development Center	8,206.0	8,104	-1%	5,785	-40%	5,963	3%	
Engineering and Applied Science	38306	35,309	-8%	37,636	6%	43,098	15%	
Veterans and Military Student Affairs	3337	1,417	-58%	1,392	-2%	1,375	-1%	
Eagle Rock (ROTC)	electric heat							
Academic Office Building	16356	12,188	-25%	13,534	11%	10,253	-24%	
Eldora House	3609	3,785	5%	3,589	-5%	3,619	1%	
Copper House	14108	21,807	55%	20,595	-6%	20,254	-2%	
Gateway Hall	545	719	32%	2,155	200%	1,779	-17%	
Gateway Garage	199	489	146%	409	-16%	382	-7%	
Innovation House	1880	2,315	23%	2,282	-1%	2,403	5%	
Sustainability Demonstration House	867	930	7%	873	-6%	857	-2%	
Greenhouse	977	352	-64%	711	102%	285	-60%	
Farmhouse	2614	2,443	-7%	2,260	-7%	2,346	4%	
University Hall	33226	26,182	-21%	24,984	-5%	28,313	13%	
Alpine Garage and Field	no heat							
Antero House	18935	10,884	-43%	6,256	-43%	6,260	0%	
Crestone House	21010	14,775	-30%	18,657	26%	8,412	-55%	
Cucharas House		20,746		15,342	-26%	16,639	8%	
La Plata House		14,395		13,845	-4%	12,690	-8%	
Roaring Fork Dining Hall		48,700		60,829	25%	60,942	0%	
Francis House Rental		1,971		1,378	-30%	1,347	-2%	
Lane Center	20056	19,902	-1%	18,960	-5%	17,118	-10%	
Heller Main House	1451	1,738	20%	1,403	-19%	1,472	5%	
Heller Guest House	1599	1,606	0%	1,469	-9%	1,625	11%	
1861 University Office Park	1794	1,637	-9%	1,671	2%	1,441	-14%	
1867 University Office Park	2679	2,106	-21%	3,330	58%	3,086	-7%	
Cyber Security	34621	31,956	-8%	34,309	7%	28,198	-18%	
San Juan				17,318		18,055	4%	
Main Hall	19424	20020	3%	19754	-1%	22241	11%	
Centennial Hall	54282	49,054	-10%	43,458	-11%	45,356	4%	
Kraemer Family Library & El Pomar Center	73887	65,039	-12%	54,830	-16%	66,521	18%	
Columbine Hall	49513	47,336	-4%	36,515	-23%	42,407	14%	
Summit Village	98880	85,746	-13%	79,536	-7%	83,166	4%	
Summit Lodge	75223	55,552	-26%	64,620	16%	59,240	-9%	
Osborne Center	138089	125,754	-9%	132,290	5%	144,249	8%	
Recreation and Wellness Center	50247	82,419	64%	61,707	-25%	72,406	15%	
Shavano House	59352	40,220	-32%	42,455	6%	39,149	-8%	
TOTAL	923,130	941,961	2.0%	923,233	-2.0%	948,218	2.7%	

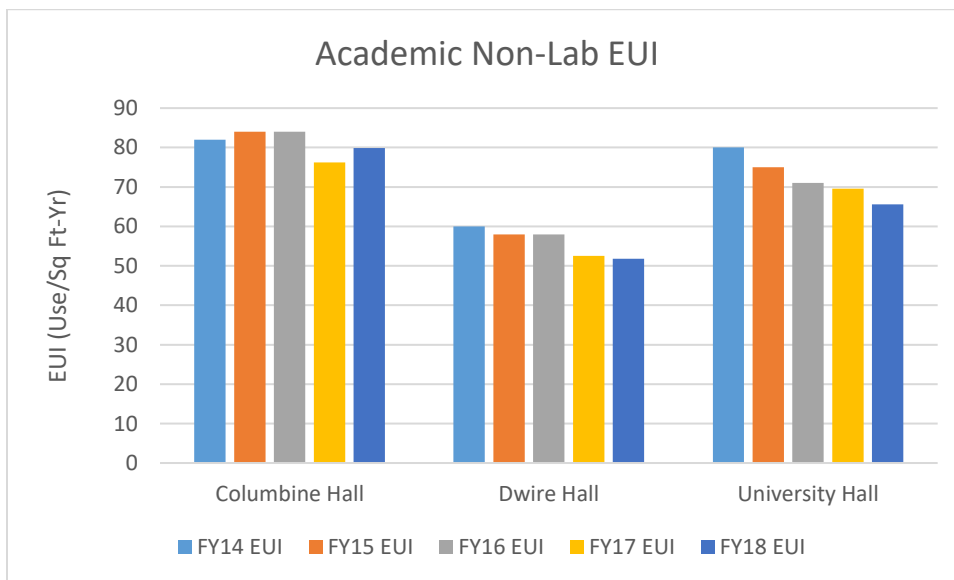
Building Highlights

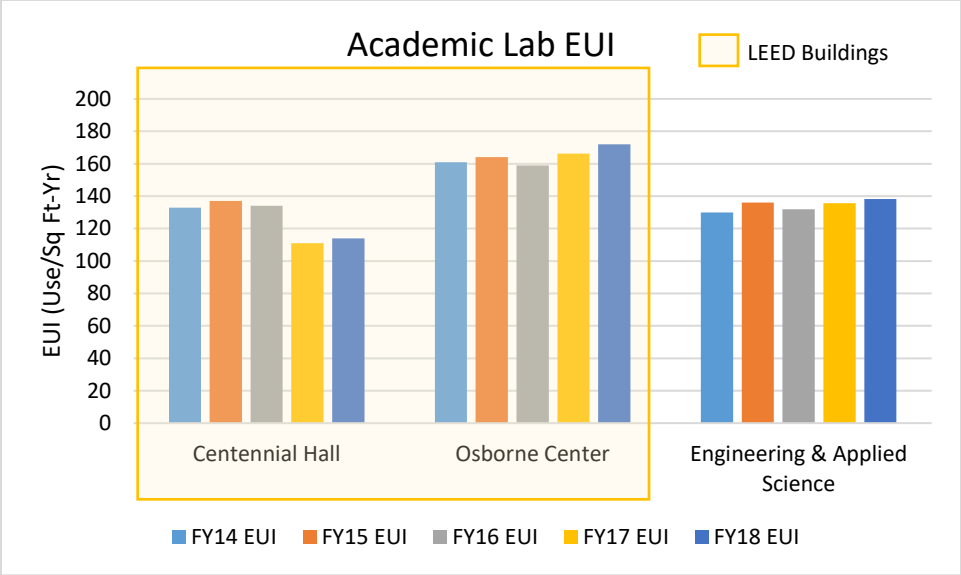
The sections below focus on the campus buildings that are most energy intensive. The buildings have been separated and compared to buildings of similar type. The four main types of buildings on campus are academic, office, residential halls, and support facilities.

Since September 2007, all new buildings on campus are LEED certified. These buildings are designed to perform better with regard to resource use.

Academic

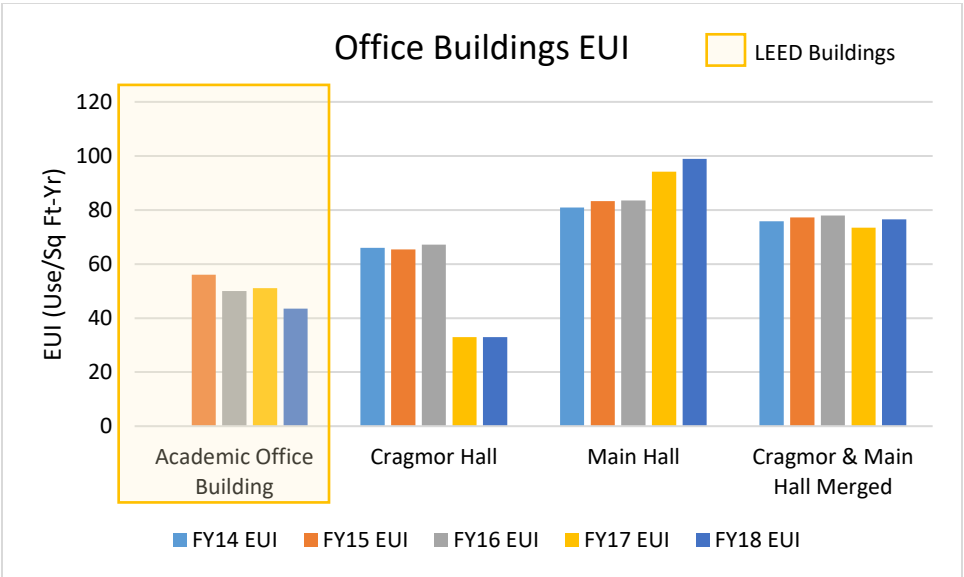
Academic buildings are primarily used for classrooms or laboratories. Some do include offices; however, that is not their primary purpose. There are two different kinds of academic buildings: non-lab and lab. The reasoning for this is the buildings that include labs are far more energy intensive than those without labs.





Office Buildings

Office buildings consist entirely of offices for faculty and staff. These buildings have moderate EUI's as each office is occupied every day during the work week. Main Hall appears to have a large EUI; however, its EUI also includes the natural gas for Cragmor Hall. This means that the EUI for each building is slightly lower and higher, respectively. Academic Office Building still has a higher than expected EUI since its construction. Work will continue to be done to bring it down to expected levels. Despite this, it has the lowest EUI of all the main office buildings on campus.

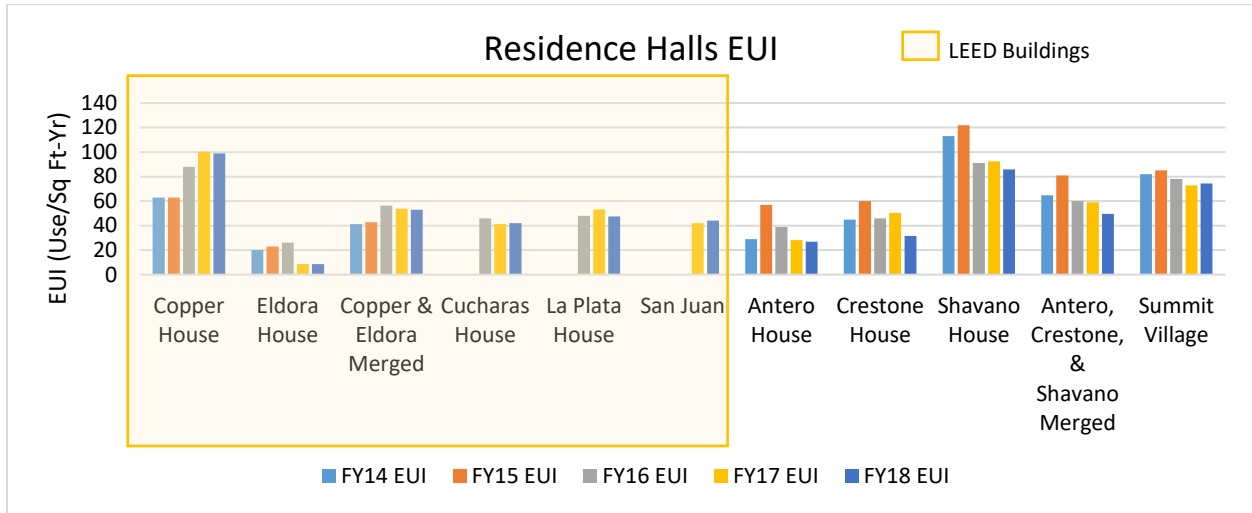


Residential Halls

Campus residents have the greatest impact on GHG emissions. The buildings they occupy are used on a daily basis for most of the year. The buildings are not fully occupied during breaks in between semesters. To reduce emissions, these are the buildings that should be focused on. It should be noted

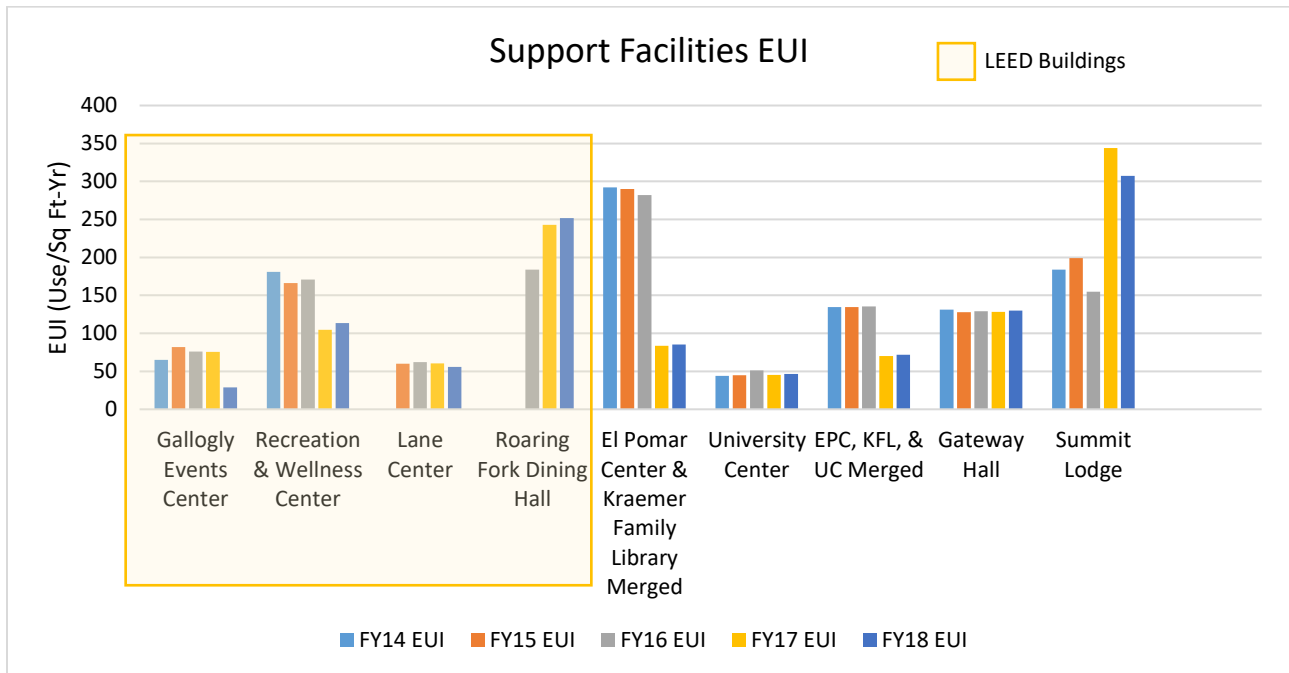
that Eldora's natural gas is on Copper's bill; therefore, Eldora's EUI is slightly larger while Copper's is less. This is the first year that San Juan has been occupied.

Campus residents contribute the most to GHG emissions. The graph below compares the residence halls to each other. It should be noted that the natural gas for Eldora is on Copper's bill which is why they have been merged. La Plata has a slightly higher EUI than Cucharas as the air conditioning for both buildings comes from La Plata. Shavano contains the boiler and laundry facilities for itself, Antero, and Crestone; therefore, its EUI is higher.



Support Facilities

Support facilities are buildings that provide extra services for the community, students, faculty, and staff. All of these buildings vary in use, so it is difficult to compare them to other buildings.



Appendix

This section provides additional, more detailed data on the buildings from the Building Highlights section. The graphs below show the usage of each commodity versus the total cost of the commodities per square foot.

