

ANNUAL ENERGY REPORT FY19-20

Colorado Springs School District 11

Website: www.d11.org > Departments > Energy and Sustainability



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TO OUR STAKEHOLDERS

Executive Summary

This Energy Report provides an overview of the Colorado Springs School District 11 Energy and Sustainability Program. This document includes annual utility expenditures and details the steps taken over the last year to meet the program goals. This Report is provided to the Board of Education as required under Board of Education Policy ECF: *Energy Conservation Management*.

The District 11 Energy and Sustainability program has a long history of successful energy and resource saving initiatives and has received numerous accolades for these efforts. Looking to the future, with the help of the right initiatives and the entire D11 community, we are expecting District 11 to once again be a frontrunner in the field of energy management and sustainability.

Program Introduction

The first school in Colorado Springs was organized by Mary Mellen “Queen” Palmer, the wife of city founder William Jackson Palmer, in late 1871. Colorado Springs School District 11 was established in August of the following year. The District enrollment reached 1,776 students on opening day of the Colorado Springs High School (now Palmer High School) in 1893. In 1919, the school districts of Colorado City (annexed by Colorado Springs in 1917) and Colorado Springs were consolidated.

The rich history of School District 11 comes with a unique set of challenges. One such challenge is maintaining an infrastructure that is significantly older than our neighboring school districts. With an average building age of 53 years, Colorado Springs School District 11 is the oldest school district in El Paso County. The Energy and Sustainability Program is continually looking for ways to optimize our aging infrastructure by implementing modern materials and equipment that are more efficient and reliable than what was previously available. This is an ongoing pursuit and a key component of our Program’s charter.

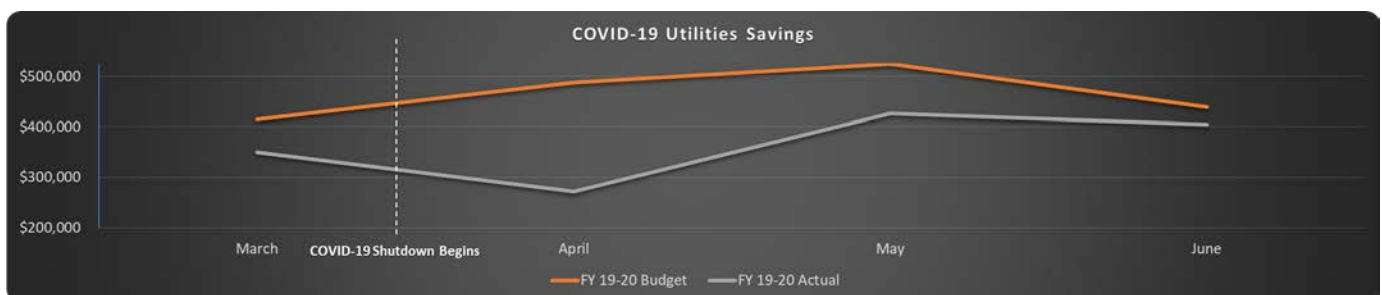
Operating Highlights

FY 19-20 has proven to be a much different year than any the District has seen. The COVID-19 pandemic that has swept the planet has forced the District to meet the demands of a new normal. Like many organizations, District 11 has altered our operations and modified the way we carry out essential functions. From educating and transporting students to ventilating buildings, once simple tasks have become complicated logistical challenges that must be handled with care and attention.

The COVID-19 pandemic has significantly impacted the energy consumption of District 11 Facilities. In March of 2020, District leadership made the difficult decision to transition all District 11 staff and students to remote learning. This learning model presented a unique opportunity to lower the set point of all unoccupied District facilities which resulted in significant electricity and natural gas savings in the last quarter of FY 19-20.

Prior to the COVID-19 shutdown, District 11 was using less energy than anticipated and on track to finish the year significantly under our projections. The District-wide closure that began on March 13, 2020 amplified these savings and resulted in an overall utility savings of \$461,000 (8.6%) compared to last fiscal year.

Of these savings, \$181,000 are attributed to COVID-19 related operational changes. The remainder of the savings are believed to have resulted from favorable weather conditions and energy and water management efforts. The graph below shows the utility savings realized during the last four months of FY 19-20.



KEY TERMS AND ABBREVIATIONS

BTU - *British thermal unit. Unit of energy used in this report to discuss electricity and natural gas consumption*

District 11 Energy and Sustainability Program- *Formerly the Resource Conservation Management (RCM) Program*

EER - *Energy Efficiency Ratio is an energy performance rating for cooling equipment that compares the cooling capacity of the equipment to the power input. Higher EER = more efficient*

Energy - *This term is used in this report to denote electricity & natural gas consumption*

FOTC - *School District 11 Facilities, Operations & Transportation Complex*

FY 19-20- *The 2019/2020 Fiscal Year spanning from July 1, 2019 to June 30, 2020*

FY 18-19- *The 2020/2021 Fiscal Year spanning from July 1, 2018 to June 30, 2019*

G1C - *Natural gas service used by our smaller facilities that purchase gas through Colorado Springs Utilities*

HVAC - *Heating, ventilation and air conditioning*

Irrigation - *Water use outdoors to promote the growth of trees, turf and vegetation*

Irrigation Controller - *Computer used to control the irrigation process*

KBTU - *1,000 British Thermal Units*

KBTU per Square Foot - *Metric that denotes the annual energy consumption of a building relative to its size. Also known as Energy Use Intensity (EUI).*

Kilowatt - *1,000 watts*

LED Lighting - *Energy-efficient lighting technology. Stands for 'light-emitting diode'*

Set Point - *The space temperature that HVAC equipment is programmed to maintain*

Transport Natural Gas - *Natural gas that is purchase from 3rd party providers and transported to Colorado Springs through underground pipelines*

Utilities - *In this report, this term refers to gas, water & electricity*

VRF - *Variable Refrigerant Flow is an HVAC technology that uses a refrigerant as the both the cooling and heating medium*

Watt - *a unit of power used to describe how quickly energy is flowing from one point to another*

Weather Corrected Data - *Energy consumption data that has been adjusted to remove abnormalities associated with weather that is warmer or cooler than normal.*

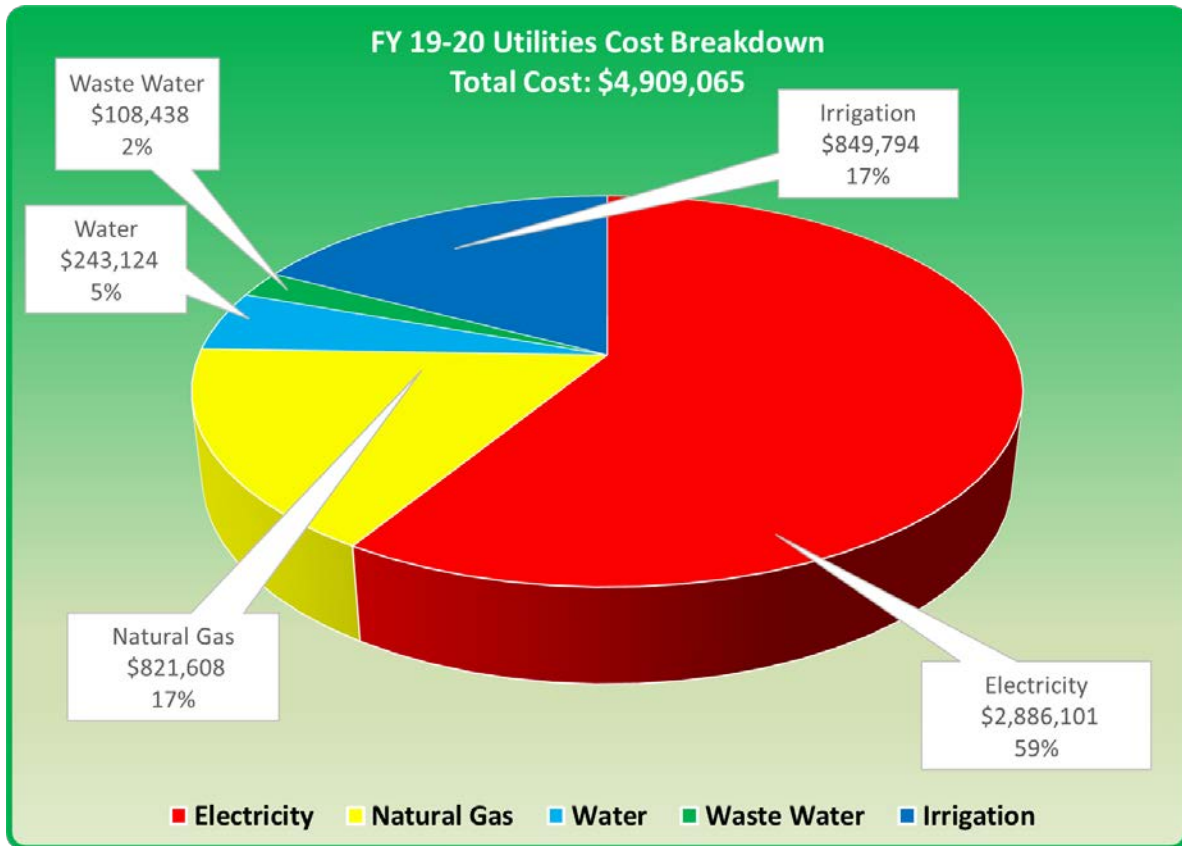
D11 ENERGY RELATED CHARACTERISTICS

Energy-Related Characteristics of School District 11	
FY 18-19	FY 19-20
3,852,578 square feet (all facilities)	3,852,578 square feet (all facilities)
47 schools (4 HS, 9 MS, 33 ES, 1 ALT)	47 schools (4 HS, 9 MS, 33 ES, 1 ALT)
39 schools with air conditioning	39 schools with air conditioning
Approximately 39,060 computers	Approximately 46,183 computers
Energy Performance Statistics of School District 11	
FY 18-19	FY 19-20
Average energy use of 76.84 KBTU per square foot (13.3% increase from previous 3 yr average)	Average energy use of 72.90 KBTU per square foot (3.53% decrease from previous 3 yr average)
Average energy cost of \$1.08 per square foot (4.04% increase from previous 3 year average)	Average energy cost of \$0.95 per square foot (4.81% decrease from previous 3 year average)
Annual Energy Cost Per Student: \$166.20 (12.8% increase from 3 year average)	Annual Energy Cost Per Student: \$148.99 (3.72% decrease from previous 3 year average)
Annual Utilities Expense Total	
FY 18-19	FY 19-20
District-wide Utility Bill Total: \$5,370,939	District-wide Utility Bill Total: \$4,909,065

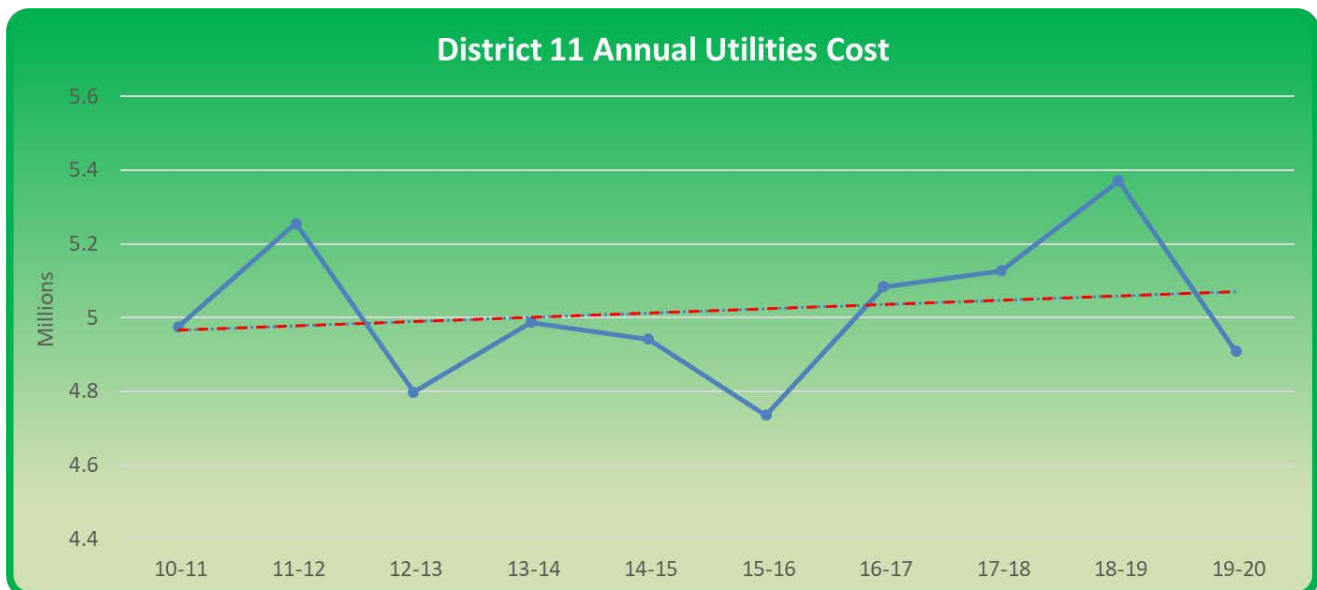
"Colorado Springs School District 11 Board of Education . . . place a high priority on reducing carbon consumption in making decisions regarding capital improvement, energy use, and transportation, and take actions on climate change and environmental education that are within the purview of the District."

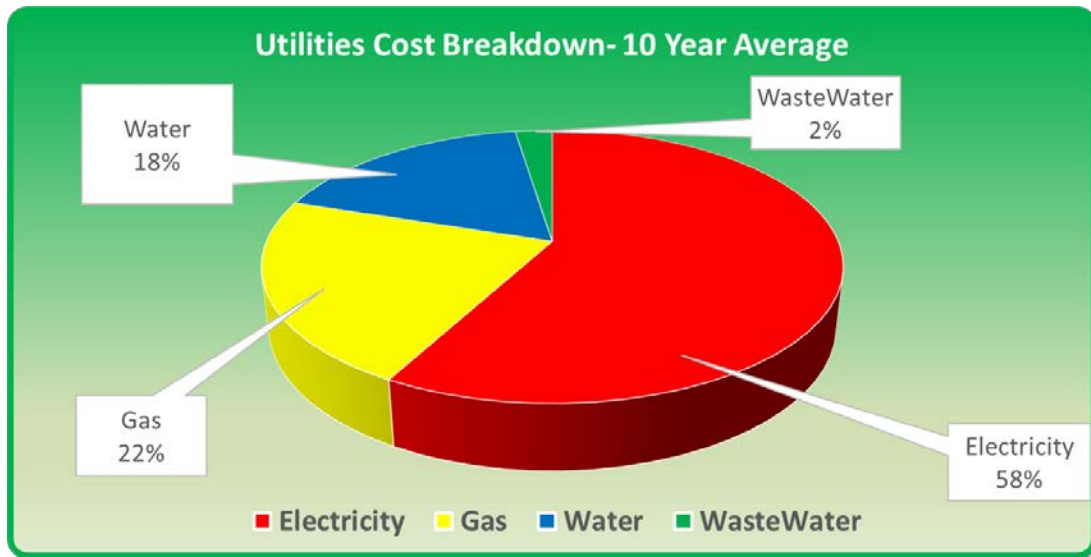
OVERVIEW OF UTILITIES

The chart below shows utilities outlays for the 19-20 fiscal year.

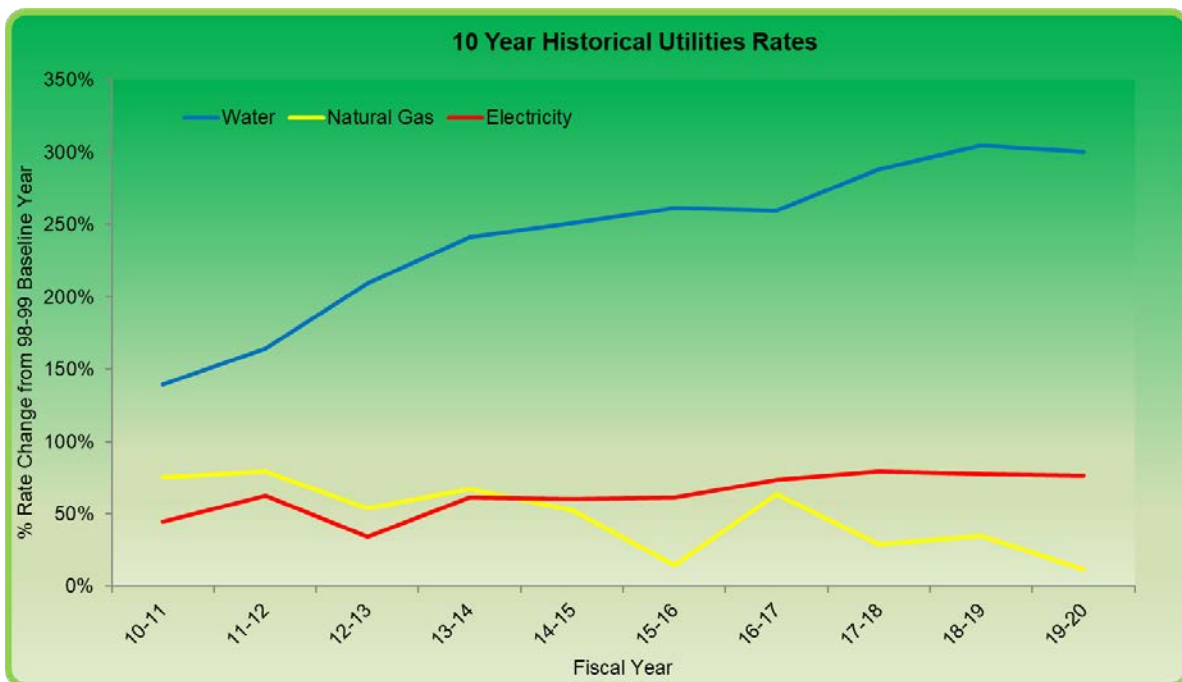


The annual utilities expenditure has remained near the \$5 million mark for the last 10 years.
(trendline shown in red on the graph below).





Utilities Rates



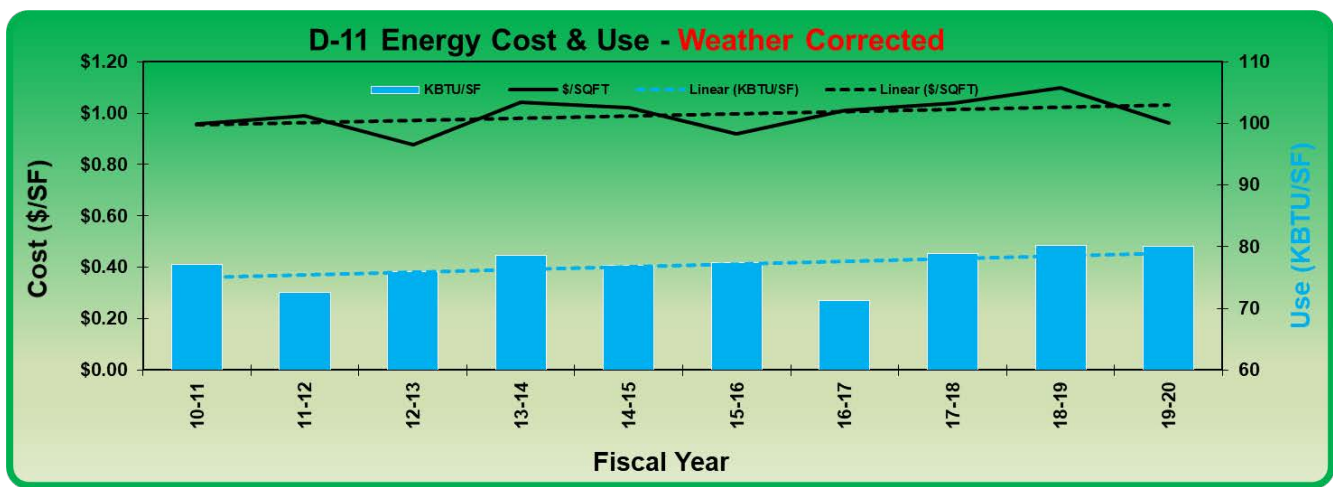
The utilities rate fluctuations experienced by School District 11 over the last 10 years (shown in the graph above) are precisely why the Energy and Sustainability Program exists. These commodities will likely continue to increase in price in the coming years. With continued active oversight and management, we are aiming to:

- Curtail the consumption of non-renewable resources
- Minimize the impact of inevitable utilities rate increases
- Divert taxpayer dollars back to the classroom to directly empower students

Energy Rate & Use

For the last 20 years, District 11 has been carefully tracking the energy efficiency of our schools and facilities. The District's standard procedure for this involves monitoring the gas, electricity, and water consumption (and associated costs) at each District facility, then comparing those values with historical District 11 values as well as local and national average values for K-12 schools.

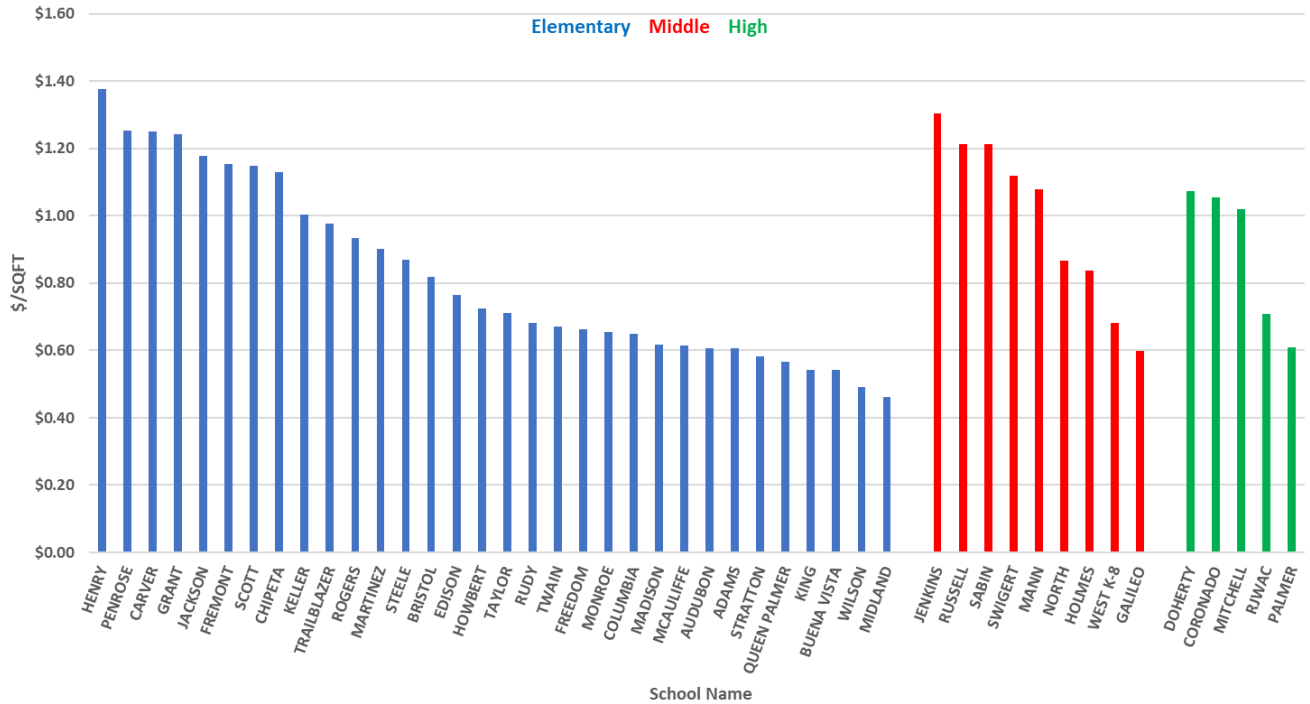
We use this data to assess the performance of the District as a whole, as well as individual buildings. This method enables the Energy and Sustainability Program team to identify lower performing buildings (where the greatest energy saving opportunities exist) and assess the ongoing efficacy of previous energy efficiency projects. Below is a graph comparing our District-wide performance last year to previous program years.



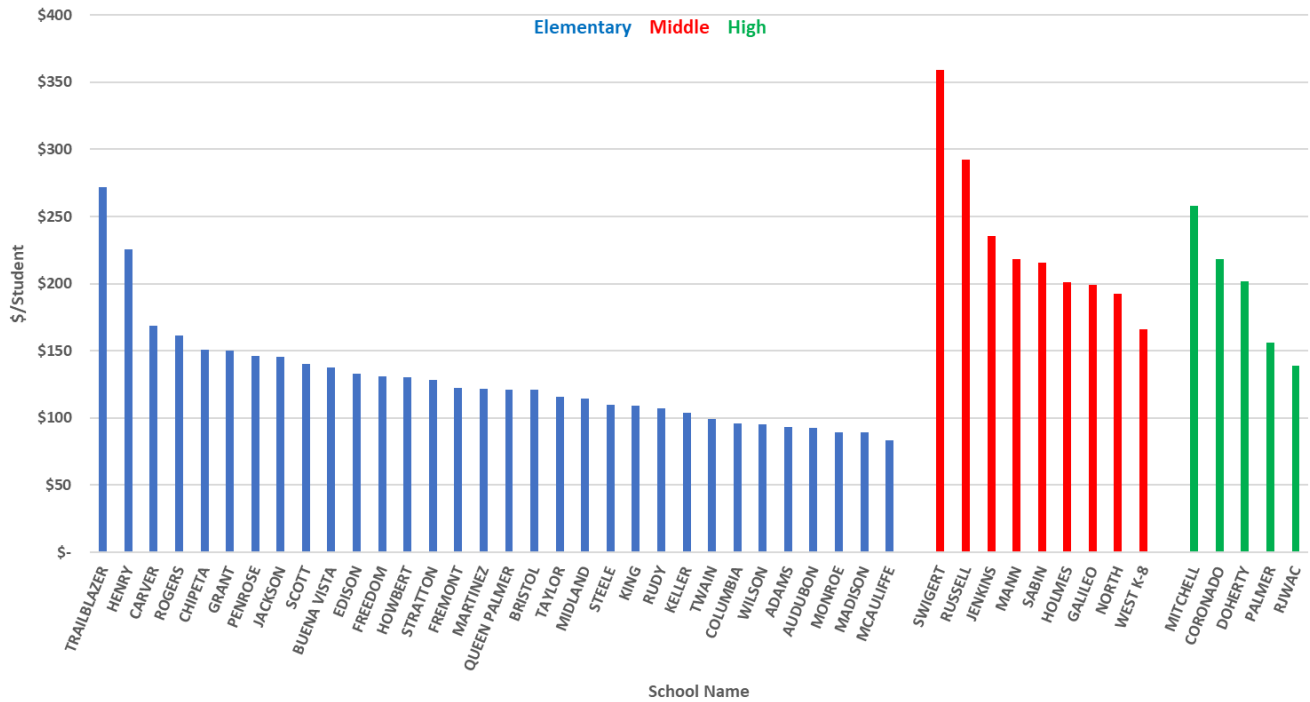
Note that the above data is 'weather corrected'. This method allows us to normalize the data and accurately compare facility performance across multiple years while correcting for temperature variances each year.

School-Specific Energy Metrics

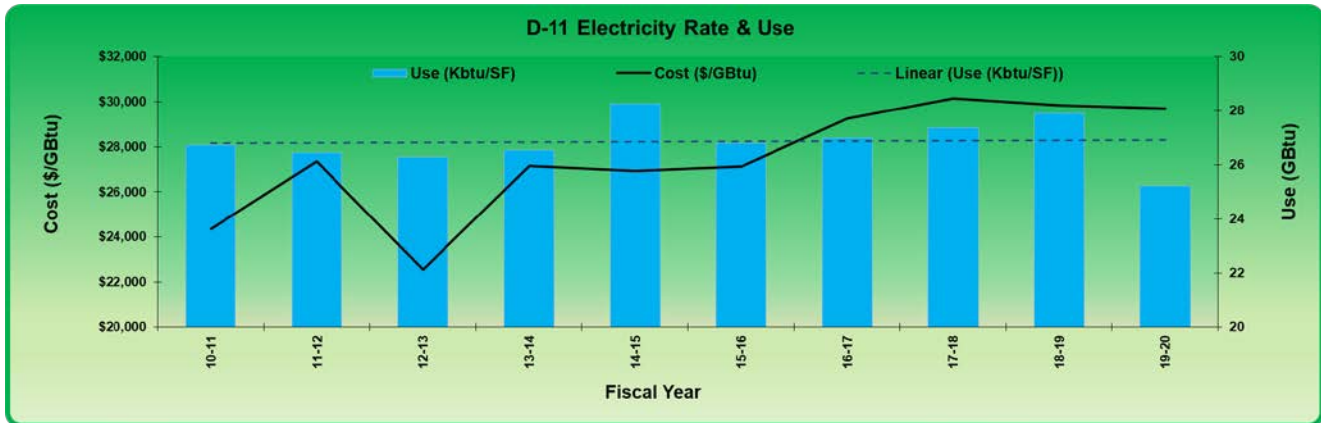
FY 19-20 Annual Energy Cost (\$/SQFT)



FY 19-20 Annual Utility Cost (\$/Student)



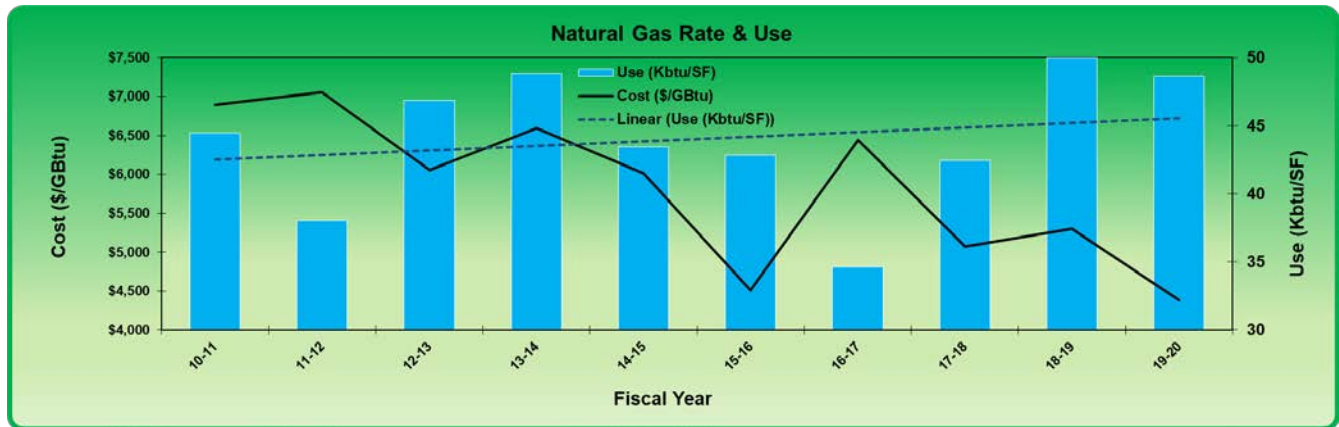
Electricity Rate & Use



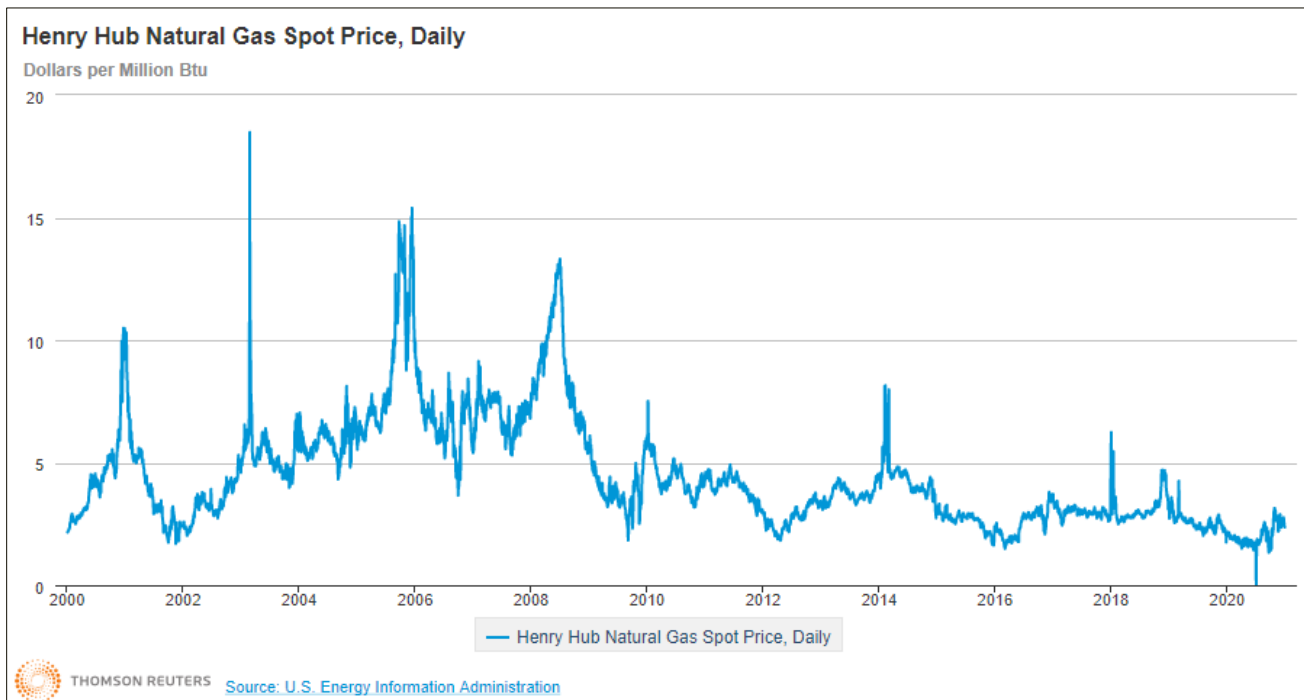
The graph above reflects the price paid for electricity (black line) and the electricity consumed (blue bars) by District 11 during the last ten years.

It should be noted that throughout the ten-year period represented in the graph above, District 11 added air conditioning to nine of our schools. This is an important enhancement to the learning environment that inherently increases the electricity consumption of our buildings.

Natural Gas Rate & Use



District 11 has been fortunate to benefit from a downward trend in natural gas prices in recent years (see black line in graph above). History has shown that the natural gas market is far from predictable and we know this downward trend will not continue indefinitely. The graph above depicts a slight upward trend in the District's use of natural gas (~7% increase in ten years). Based on the information we have, we would expect to see the District's gas use trending the other way. It is a high priority for our department to understand and reverse this trend.

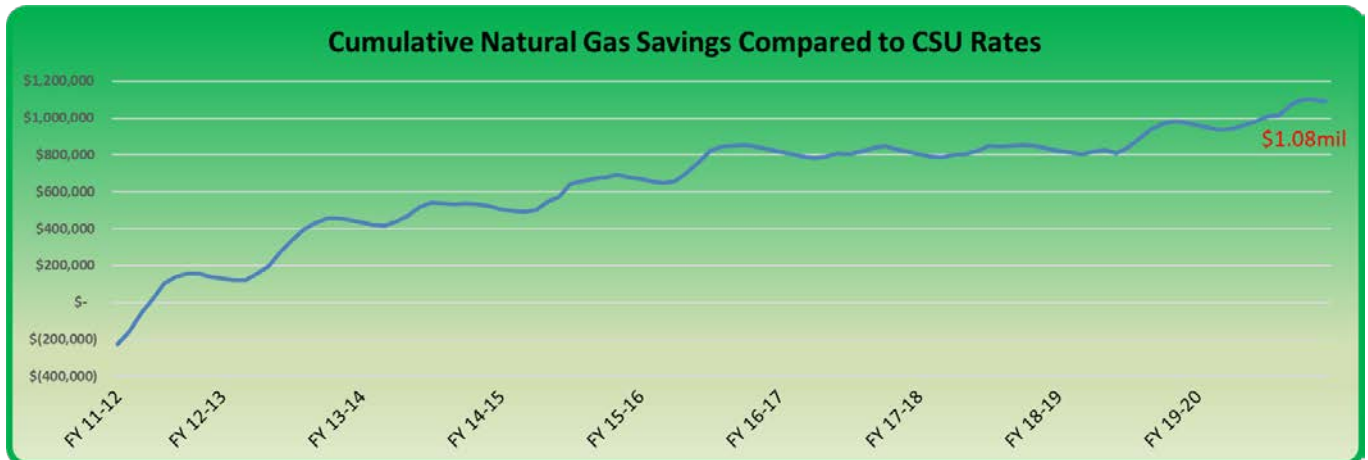


The graph above shows the market price of natural gas over the last twenty years and portrays the inherent volatility of the natural gas commodity. Due to the fluctuations of natural gas pricing, the District must continue to carefully monitor the procurement and use of natural gas.

Transport Gas Purchasing

In October of 2011, School District 11 began purchasing transport natural gas. This entails purchasing natural gas on the open market (through a third party broker) and paying to transport it to “the city gate”. Employing this strategy enables District 11 to pay a more competitive price (9% less on average) for natural gas. Prior to this, District 11 had purchased natural gas exclusively through Colorado Springs Utilities.

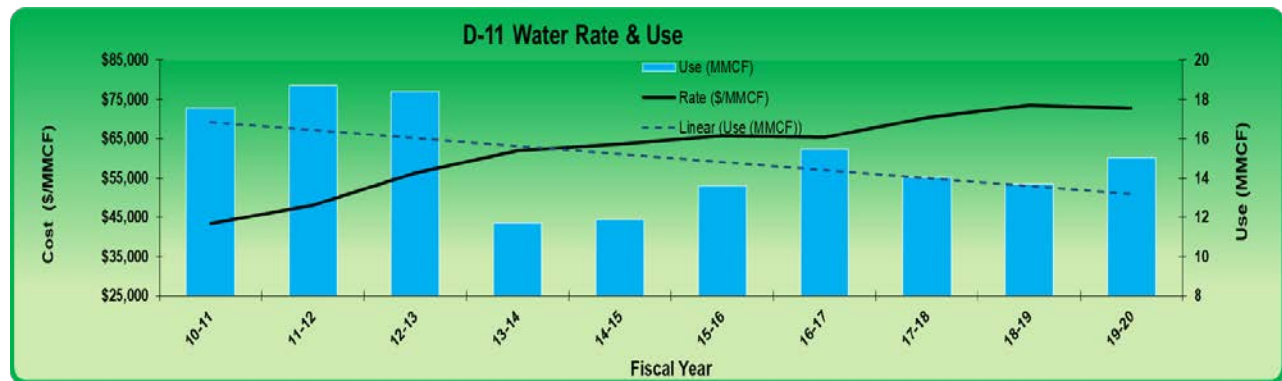
Converting our facilities to accommodate transport natural gas initially cost the District \$225,000 in required system upgrades. The savings resulting from this initiative quickly paid for the upfront costs, and after only three months, the District was experiencing net savings. Our savings to date now total \$1,088,815.



**Note: The expected savings from purchasing transport gas at our smaller sites were not substantial enough to offset the conversion costs. For this reason, approximately 25% of our schools still purchase gas through Colorado Springs Utilities.*

Water Rate & Use

In addition to the careful tracking of the energy consumption of District buildings over the past 20 years, water consumption of our facilities and grounds has been closely monitored. During any given year, approximately 70% of the District's water use is irrigation-related. Our demand for water varies from year to year based on rainfall, water restrictions, temperature, etc. The graph below shows District 11's decreased water consumption over the last 10 years alongside the rapidly increasing cost of water during that the same period.



*Note: MMCF = Million Cubic Feet

As shown on the "Historical Utilities Rates" graph on page 8 of this report, the rate District 11 pays for water has increased by 300% in the last 21 years. In an effort to reduce the impact of this seemingly perpetual increase, The Energy and Sustainability Department personnel are constantly pursuing ways to curtail the District's water use.

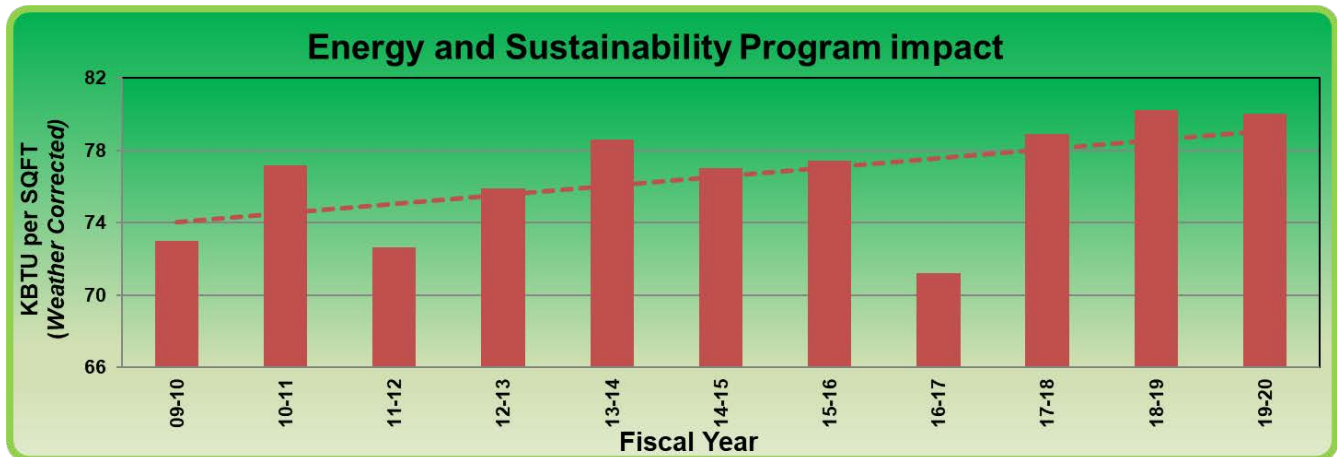
In some cases, this use reduction can be achieved without a capital expense. Each month, District Utility bills are carefully examined to search for anomalous data that might point to a problem in one of our facilities. During FY 19-20 alone, multiple water leaks were discovered using this method.

In addition to searching for faulty or broken equipment, we are continually in pursuit of new technologies that can be implemented at District 11 to improve the efficiency with which we use resources. After recognizing the upward trend of water rates, we set out to find a more advanced irrigation controller that could be installed at all District Facilities to ensure we were not wasting water during our irrigation process. We have recently concluded this investigation and selected an irrigation controller that will be the District 11 standard moving forward. This decision is detailed on page 20 of this report.

One exciting initiative on the horizon is the potential conversion of all District high school athletic fields from Kentucky Blue Grass to artificial turf. In addition to an aesthetic improvement for each site, this conversion will provide the District with maintenance and water savings. This idea was supported by the District 11 community in our recent Facilities Master Plan dialogue. We expect each converted field to yield approximately \$10,000 in annual water savings to the District.

Energy and Sustainability Program Impact

The Energy and Sustainability Program has made considerable progress over the years towards minimizing District 11 utility bills. It is crucial that we continue to work to reduce energy use (red dashed line in graph below) and to minimize utilities expenses. As utilities costs rise year after year, these efforts will become more and more impactful.



The upward trajectory of the red trend line in the graph above is a good reminder that there is plenty of work to be done. It should be noted that, despite the upward trend seen in the above graph, the District has experienced an overall decrease in total energy consumption. Although that decrease helps our annual utility expenses, the metric shown above (weather corrected energy use per square foot) is a better lens to use to assess the operating efficiency of our facilities.

ENERGY SAVINGS HIGHLIGHTS

In addition to managing the \$5 million annual utility budget, Colorado Springs School District 11 Energy and Sustainability Program team either assisted with or implemented the following energy savings projects during the 2019-2020 fiscal year:



Relamped Galileo Middle School cafeteria with LED - expected savings of \$987 / year (photo to the left)

Replaced TESLA Professional Development Building exterior lights with LED - expected savings of \$1047 / year

Relamped Queen Palmer Elementary School with LED - expected savings of \$705 / year

Relamped Rogers Elementary Exterior Lighting with LED - expected savings of \$1,154 / year

Relamped FOTC 2nd floor open space/hallways with LED - expected savings of \$726 / year

Relamped North Middle School Gym with LED - expected savings of \$893 / school year (as seen in photo to the right)



Relamped Madison Elementary School gym/kitchen with LED - expected savings \$604 / year

Relamped Twain Elementary School hallway lighting with LED - expected savings \$426 / year (photo to the right)

Replaced North Middle School irrigation controller with a Calsense smart irrigation controller - expected savings \$4,100/ year

Replaced Doherty High School irrigation controllers with Calsense smart irrigation controllers - expected savings \$18,900/year

Completed monthly utility bill audits resulting in the discovery of faulty meters, over-charges, system leaks, etc.

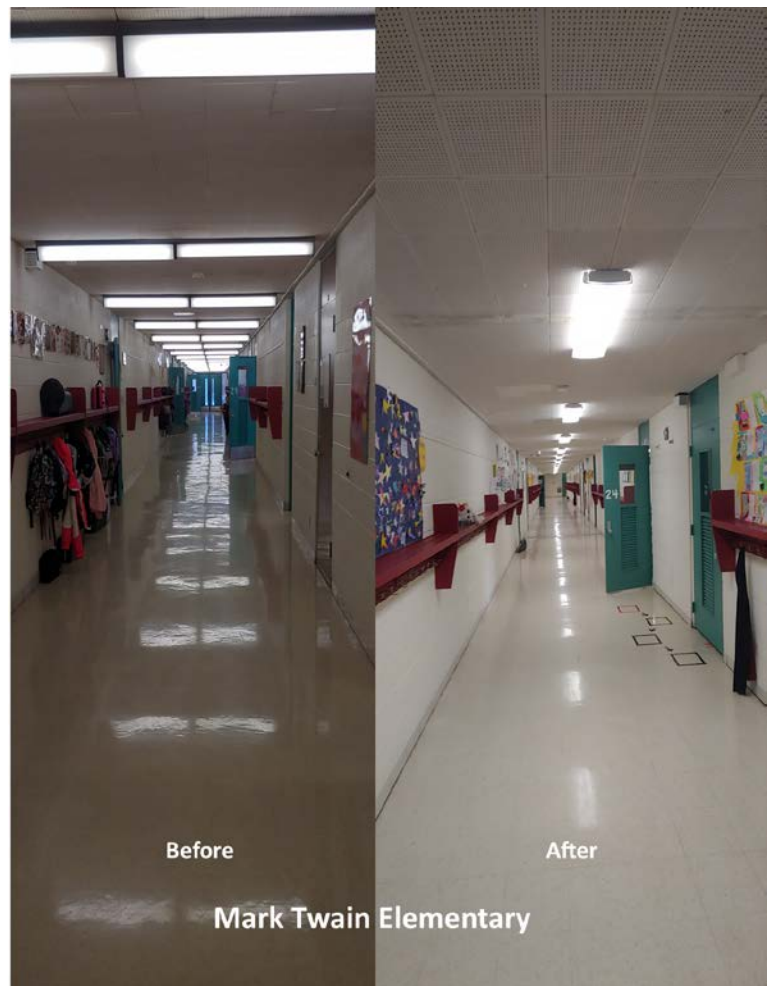


Photo above shows the hallways of Mark Twain Elementary School before and after a LED lighting upgrade. Through this project, we were able to increase light levels in the space by 199% while decreasing energy consumption of the lights by 49%.

Capital Projects - Energy Savings Highlights

In addition to the above-mentioned projects completed by the energy & sustainability program, the capital program completed several projects this year that will result in an energy savings to the District. These projects are value-added building improvements that help to create an environment for our students where they feel empowered to profoundly impact our world.



Steele Elementary - Replacement of old boilers with new, high-efficiency, condensing boilers (left).

Jackson Elementary - HVAC system was upgraded with roof top units that have a higher EER, thus savings the district energy dollars.

Academy ACL - A building-wide VRF installation. This HVAC system is highly efficient and offers the end user a high degree of comfort and temperature control. Energy savings of up to 55% could be seen using this technology over industry alternatives.

Roosevelt Academy - A VRF installation in the new addition. This HVAC system is highly efficient and offers the end user a high degree of comfort and temperature control. Energy savings of up to 55% could be seen using this technology over industry alternatives.

Palmer High School - Pool boiler was upgraded to a high-efficiency, condensing boiler.

District-wide - Auditorium Stage lighting was upgraded to LED lighting in Audubon Elementary, Palmer High School, Twain Elementary, Jack Swigert Aerospace Academy, and Martinez Elementary. LED lighting can reduce energy consumption and lead to an energy savings up to 75% while lasting up to 25 years.

Columbia Elementary -
Multi-Zone HVAC units replaced with
'triple deck' units which minimizes, if
not eliminates simultaneous heating
and cooling leading to significant
energy savings (photo to the right).



ENERGY SAVINGS PROJECTS & INITIATIVES

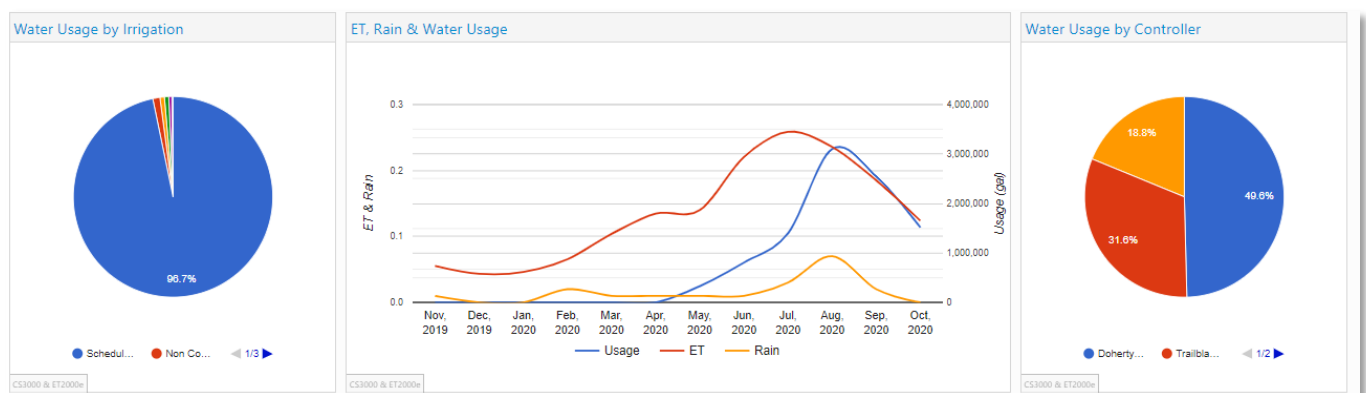
Smart Irrigation Controllers

It is critical that District 11 is a careful steward of the water we use. The vast majority of that water (70%) is used to maintain grass and other landscaping. If we make an effort to eliminate waste in our outdoor irrigation process, we can reduce the \$700,000 spent annually on irrigation while maintaining our properties to a high standard.

In an effort to accomplish this goal, The District initiated a pilot project of a *Calsense* “smart” irrigation controller in 2017. After monitoring the performance of the controller (installed at Trailblazer Elementary School) throughout the 2018 and 2019 watering seasons, we have elected to continue installing these controllers at other District facilities.

These controllers use factors such as temperature, humidity, rainfall, soil type, and property slope to determine how much water each irrigation zone should receive. We will leverage this technology to optimize the volume of water we use for irrigation while improving the appearance of our properties.

Doherty High School and North Middle School went live with smart irrigation controllers this fiscal year and we are currently monitoring the performance of those systems while planning the district-wide rollout of this technology in the coming years.



Rebates

The District 11 Energy and Sustainability Program team is continually working with Colorado Springs Utilities when pursuing energy and water saving projects to ensure we take full advantage of the rebates they offer.

In recent years, the District has used the rebates we have received to fund additional energy savings projects.

Over the last three years we have received a total of \$40,000 in rebate checks from Colorado Springs Utilities.



Energy Star

The Energy and Sustainability Program team at District 11 work in conjunction with school educators, administrators, and building managers to bring about a more energy efficient and sustainable learning environment.

Each year, we collect building data on behalf of our schools and submit applications for those schools that meet the Environmental Protection Agency's Energy Star Award criteria. This is a small way to recognize schools for their efforts in sustainability.



There are several District 11 schools that are expected to receive this certificate for the 2020 calendar year.

LOOKING AHEAD

Each year, the District 11 Energy and Sustainability Department personnel closely analyze District 11 facilities in an ongoing effort to increase the efficiency of our buildings and decrease our environmental footprint. Examining our buildings individually is an important ritual that has prompted many fruitful changes and upgrades over the years.

This year, the Board of Education and District leadership have elected to develop a Facilities Master Plan with the goal of closely examining our District as a whole to ensure we are operating as efficiently as possible. Guided by a consulting firm, we engaged in a year-long dialogue with our community. The Master Plan Committee took an objective look at data surrounding the condition and utilization of our facilities and strategized about how to make District 11 operate more efficiently. Although this process is not yet complete, we believe that the result of this effort will be a more modern District building portfolio that is right-sized to meet the needs of our community.

The thought of accomplishing this goal is exciting for many reasons, including the opportunity to operate more energy-efficient District 11 facilities with potential to expand our renewable energy portfolio. While the execution of this plan will take many years, we believe that each step taken towards this goal will result in tangible utility savings and a reduction in the environmental footprint of District 11.