

June 11, 2018

# Rock Hill Schools

DISTRICT ENERGY UPDATE

FOR THE PERIOD OF JANUARY, 2017 – DECEMBER, 2017



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## Reference - Measuring the performance of an energy conservation program – M&V, IPMVP

1. We use the industry accepted standard for energy measurement and verification (M&V) known as the International Performance Measurement and Verification Protocol (IPMVP). The first step is to establish a baseline period of time and energy data set. This will be historic information about energy consumption and costs prior to the implementation of any conservation programs. This information is entered into a special utility accounting software package.
  - The baseline is a fixed period of time – typically 1 year. Ours is CY 2009. We then:
    - Record all energy consumption – standardized unit of measure is typically kBTU which abbreviates kilo British thermal unit. Electrical kWh and Natural Gas (NG) therm units are converted.
    - Record all energy costs.
    - Record measureable variables that affect energy consumption such as weather and occupancy.
  - Our baseline comparisons are expressed as “Cost Avoidance” because the savings figures are calculated or “normalized” to account for differences in weather conditions, utility rates, billing cycles and changes in construction.

1 kBTU = 1,000 BTU

1 MMBTU = 1,000,000 BTU

1 Therm NG = 100,000 BTU

1 kWh = 3,412 BTU

1 MWh = 1,000,000 kWh

## Reference - Measuring the performance of an energy conservation program - Benchmarking

2. Benchmarking is comparing common performance measurements to similar, “competing” facilities. For example, we benchmark against other National and State K-12 public school districts.
  - Common and universally accepted benchmark performance measurements are referred to as “Key Performance Indicators” abbreviated as KPI.
  - Consumption per square foot of conditioned floor area – units are **kBTU/sq.ft.** This value is also known as the “Energy Usage Intensity” abbreviated as EUI.
  - Energy cost per square foot of conditioned floor area – units are **\$/sq.ft.**
  - Consumption and cost per student. – **kBTU/student and \$/student.**

## Reference - Measuring the performance of an energy conservation program - Reporting

3. Periodic comparisons of historical and current data are done through regular reporting.
  - Our baseline report will always compare the current year to the baseline year.
  - KPI reporting will typically compare the current period to the previous reporting period or may cover several reporting periods.
  - Total consumption and cost reports are usually compared to the previous period as well as several periods prior to that. This will give the energy manager a better picture of energy long term trends.

### Actual Calendar CDD (ROCK HILLSC: Base 65) for Rock Hill Schools Project

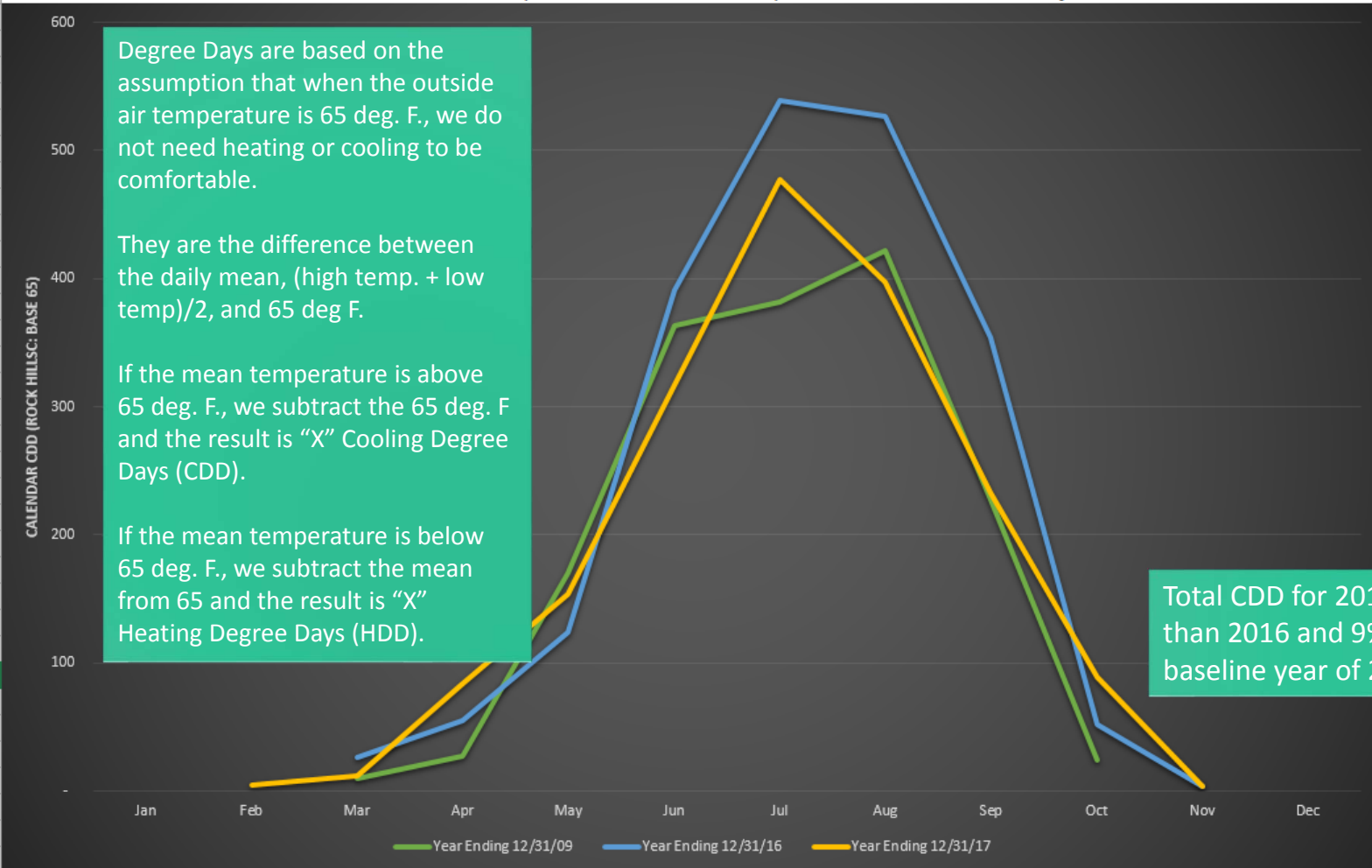
Degree Days are based on the assumption that when the outside air temperature is 65 deg. F., we do not need heating or cooling to be comfortable.

They are the difference between the daily mean, (high temp. + low temp)/2, and 65 deg F.

If the mean temperature is above 65 deg. F., we subtract the 65 deg. F and the result is "X" Cooling Degree Days (CDD).

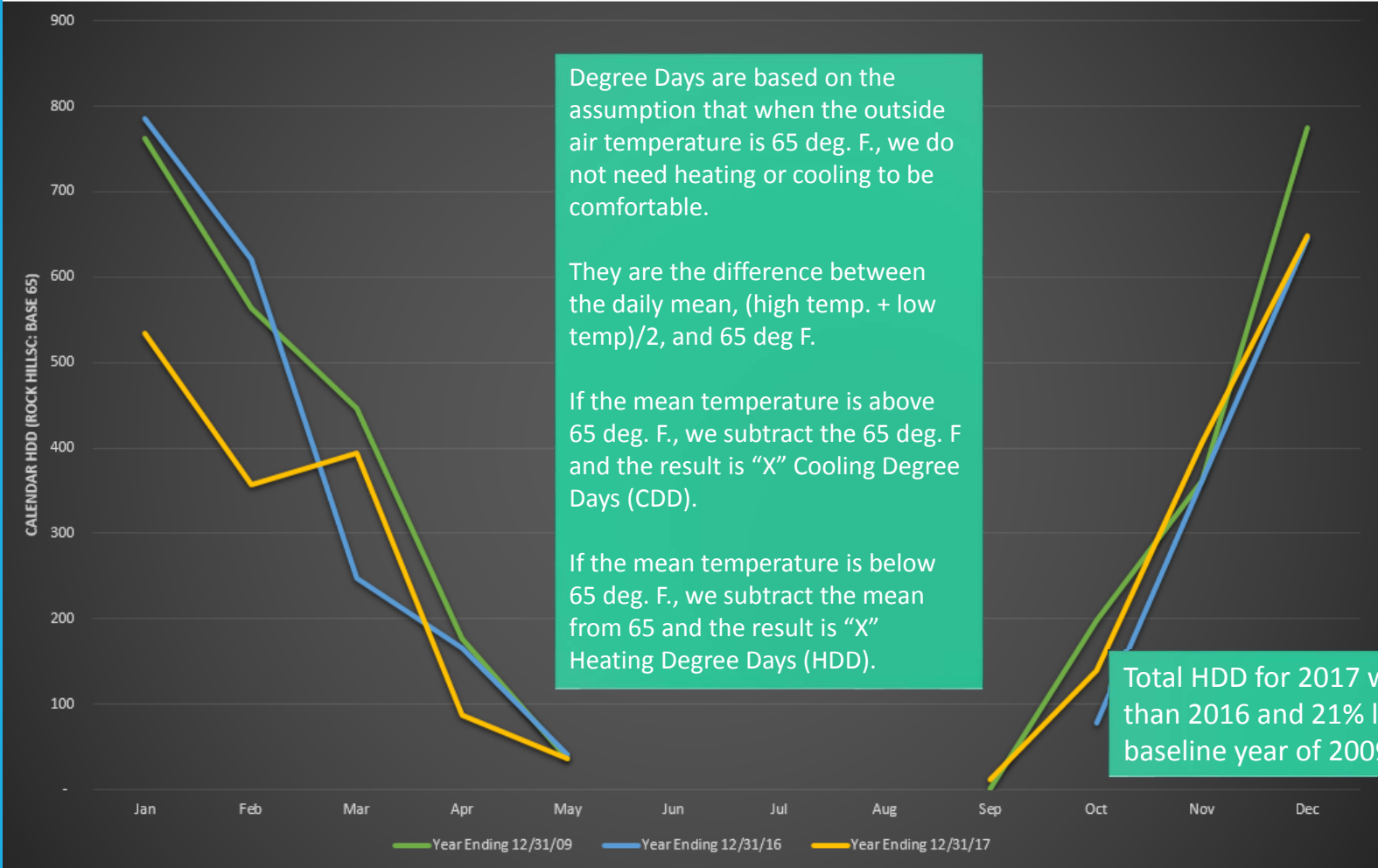
If the mean temperature is below 65 deg. F., we subtract the mean from 65 and the result is "X" Heating Degree Days (HDD).

Total CDD for 2017 were 17% less than 2016 and 9% more than our baseline year of 2009.



Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Year Ending 12/31/09			10	28	171	364	382	422	228	25			1,627
Year Ending 12/31/16			27	56	124	392	539	527	355	52	4		2,074
Year Ending 12/31/17		5	12	84	154	318	478	398	233	89	4		1,772

### Actual Calendar HDD (ROCK HILLSC: Base 65) for Rock Hill Schools Project




Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Year Ending 12/31/09	762	564	446	176	37				1	198	362	776	3,319
Year Ending 12/31/16	786	620	248	166	41					79	362	646	2,946
Year Ending 12/31/17	534	357	394	88	36				12	140	407	648	2,615

Baseline period (CY2009)

Current period (CY2017)

Difference between baseline and current periods

Adjustments to baseline data using current weather and cost data

<i>Actual Use and Cost for Base Period (1/2009 through 12/2009)</i>				
<u>Energy Type</u>	<u>Base Use Recorded</u>	<u>Units</u>	<u>Avg Unit Cost</u>	<u>Energy Cost</u>
Electric	34,433,341	kWh	0.1037	\$3,571,424
Natural Gas	339,816	Therm	1.2069	\$410,114
<b>Total Energy:</b>	<b>151,502,593</b>	<b>kBtu</b>	<b>Total Cost</b>	<b>\$3,981,538</b>
<i>Actual Use and Cost With Energy Management Program (1/2017 through 12/2017)</i>				
<u>Energy Type</u>	<u>Current Use Recorded</u>	<u>Units</u>	<u>Avg Unit Cost</u>	<u>Energy Cost</u>
Electric	26,415,185	kWh	0.1389	\$3,668,287
Natural Gas	235,170	Therm	1.0706	\$251,766
<b>Total Energy:</b>	<b>113,672,026</b>	<b>kBtu</b>	<b>Total Cost</b>	<b>\$3,920,053</b>
<i>Energy Saved 2017 Compared to Base Period</i>				
<u>Energy Type</u>	<u>Base - Current</u>	<u>Units</u>	<u>Percent Saved</u>	<u>Total Cost</u>
Electricity	8,018,156	kWh	23%	(\$96,863)
Natural Gas	104,646	Therm	31%	\$158,348
<b>Total Energy Saved:</b>	<b>37,830,566</b>	<b>kBtu</b>	<b>Gross Savings:</b>	<b>\$61,485</b>
<b>Percent Savings:</b>	<b>25%</b>			<b>2%</b>
<b>Cost Avoidance - Without Our Energy Program:</b>				
	Rates: Base period consumption at current period rates would be an additional:			\$1,164,030
	"Load Creep": Additional equipment, operating hours and efficiency lost due to age would cost:			\$191,271
	Adjustments for weather, bill period differences & other deviations.			\$258,270
	<b>Total Cost Avoidance:</b>			<b>\$1,675,056</b>
			<b>Adjusted Savings:</b>	<b>31%</b>

# Key Performance Indicator Comparisons

17,807 students (45<sup>th</sup> day as of 10/23/2017)

3,446,777 Square Feet (2016 Master Plan)

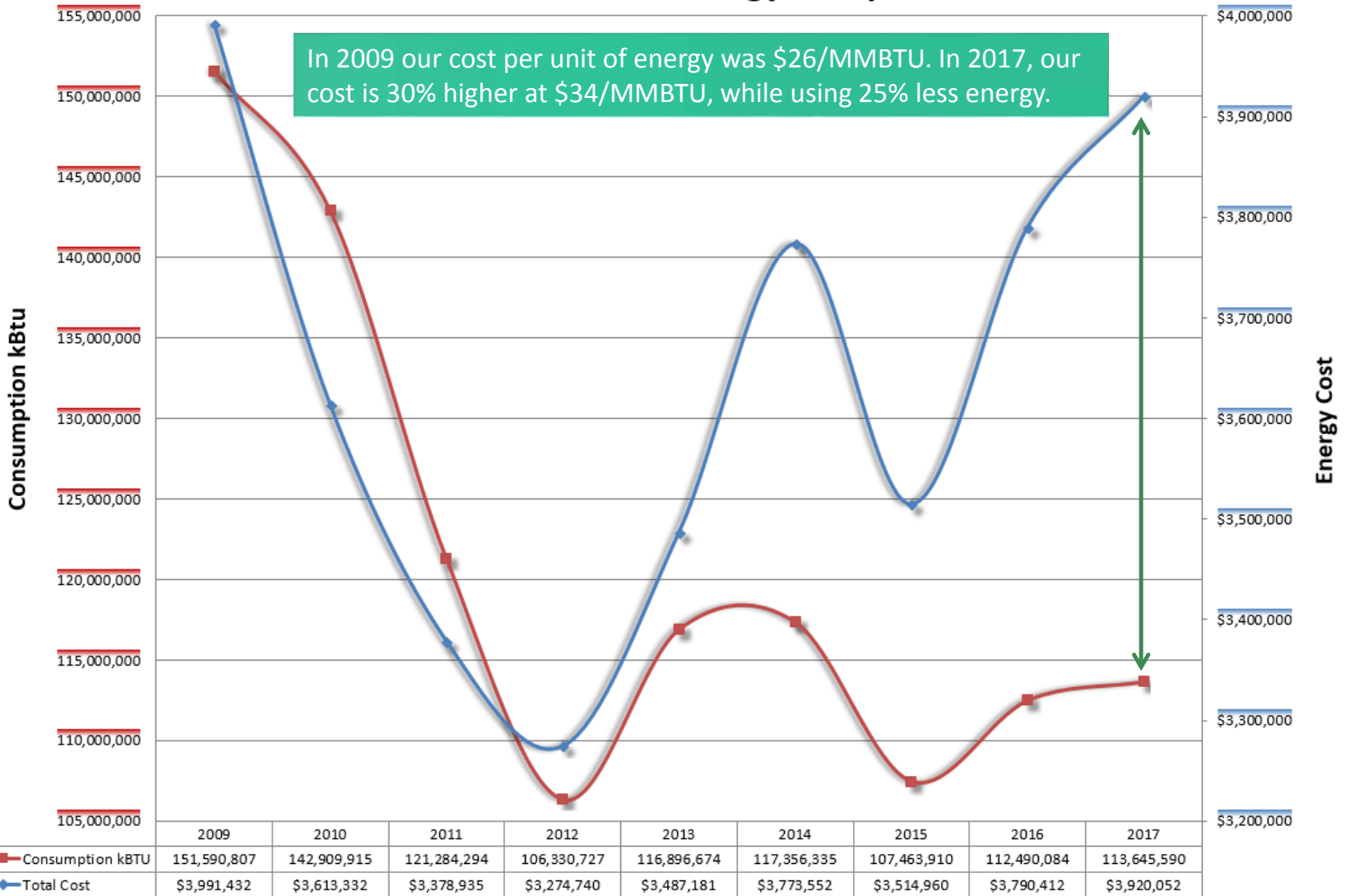
We are outperforming SC State and National averages according to the Energy.SC.GOV and CGCS.ORG websites.

<u>Key Performance Indicator</u>	<u>2017 RHSD</u>	<u>2017 SC State Average (k-12)</u>	<u>2017 CGCS.org Report (2015-2016)</u>
Energy Usage Intensity (kBTU/Sq. Ft.)	33 (+1.2%)	37 (+2.8%)	51.5 (-14%)
Energy \$/Sq. Ft.	\$1.14 (+3.6%)	\$1.17 <b>(+3.5%)</b>	\$1.30 (-11%)
Energy \$/Student	\$220 (+4.3%)	NA	NA

**Note: Values in parenthesis are percent change from previous year.**



## Total Annual Energy Comparison



## 7 Year Total Energy Savings and Cost Avoidance (cumulative)

<i>Year</i>	<i>Energy Saved kBTU</i>	<i>Energy Cost Avoided \$</i>
2011	32,068,070	\$1,174,213
2012	49,514,735	\$1,251,370
2013	36,922,222	\$1,217,002
2014	34,231,845	\$1,629,316
2015	44,038,683	\$2,048,188
2016	39,012,508	\$2,202,829
2017	37,830,566	\$1,675,056
<b>Total</b>	<b>273,618,629</b>	<b>\$11,197,974</b>

Figures represent yearly values compared to baseline (2009) period.

According to the U.S. Energy Information Administration, Rock Hill Schools has saved enough energy since 2011 to power 3,040 homes for 1 year. The average household consumes 90 MMBTU/year.

We are always working to enhance our Green Apple Energy Conservation Program.

For the 2017-2018 School year, we are awarding 247 of these cups to Principal's, Teachers and Staff for their efforts helping us save energy and money. We will be distributing the cups at the Back-To-School event in the fall.

We receive about 2500 shutdown certifications per year. Assuming the average person submits 3 of the possible 5 chances, about 833 people are actively participating in the District. This means that we are able to award about 30% of the participants with a prize that they truly appreciate!

We are proud of this program and grateful for all the people that support it and make it possible.



# Notable Projects, Responsibilities and Accomplishments:

## Energy Management Operations:

- Green Apple Program
- Apply best practices and LCC calculations to all areas of influence.
- Utility bill database management.
- Utility bill reconciliation and verification – address billing problems.
- Identify, plan and execute priority savings improvements/opportunities.

## Facilities Services Operations:

- Administrative and Staff support (District and Schools)
- Climate control, BAS, HVAC repair and replacement services and projects
- Lighting repair and replacement services and projects.
- Construction Program Support
- HVAC, Electrical and Plumbing support. (Facilities Services)

## Project engineering – Bond & Capital projects:

- ✓ IES Solar project
- ✓ The Children's School at Sylvia Circle.
- ✓ Rosewood ES
- ✓ Rock Hill HS
- ✓ Northside ES
- ✓ Finley Road ES
- ✓ Oakdale ES
- ✓ Rosewood ES
- ✓ Richmond Drive ES

2018 – 2019 Energy Program Initiatives



EMS Software & Hardware  
Upgrades

Construction & Efficiency  
Projects

Green Apple Program

Energy Star Program

## Independence Elementary School Solar Project

### Project Update:

- Nearly complete. Awaiting installation of protective bollards and anti-climb fencing on conduits. SCADA integration.
- Kiosk and solar module display in front lobby.
- March 2018 utility bill was \$469 with 1,152 KWH surplus. March 2017 bill was \$3,825 with 35,532 KWH consumed. **88% savings.**
- April 2018 utility bill was \$496 with 8,832 KWH surplus. April 2017 bill was \$3,310 with 31,058 KWH consumed. **85% savings.**



**June 11, 2018**

A special thank you to the leadership, administration, faculty and staff of The Rock Hill School District for your dedication and support.

Kim Melander, Energy & Systems Manager



**Have a Great Summer!**