April 3, 2016

Rock Hill Schools

District Energy Update
For the period of January, 2016 – December, 2016

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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) know 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

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.***

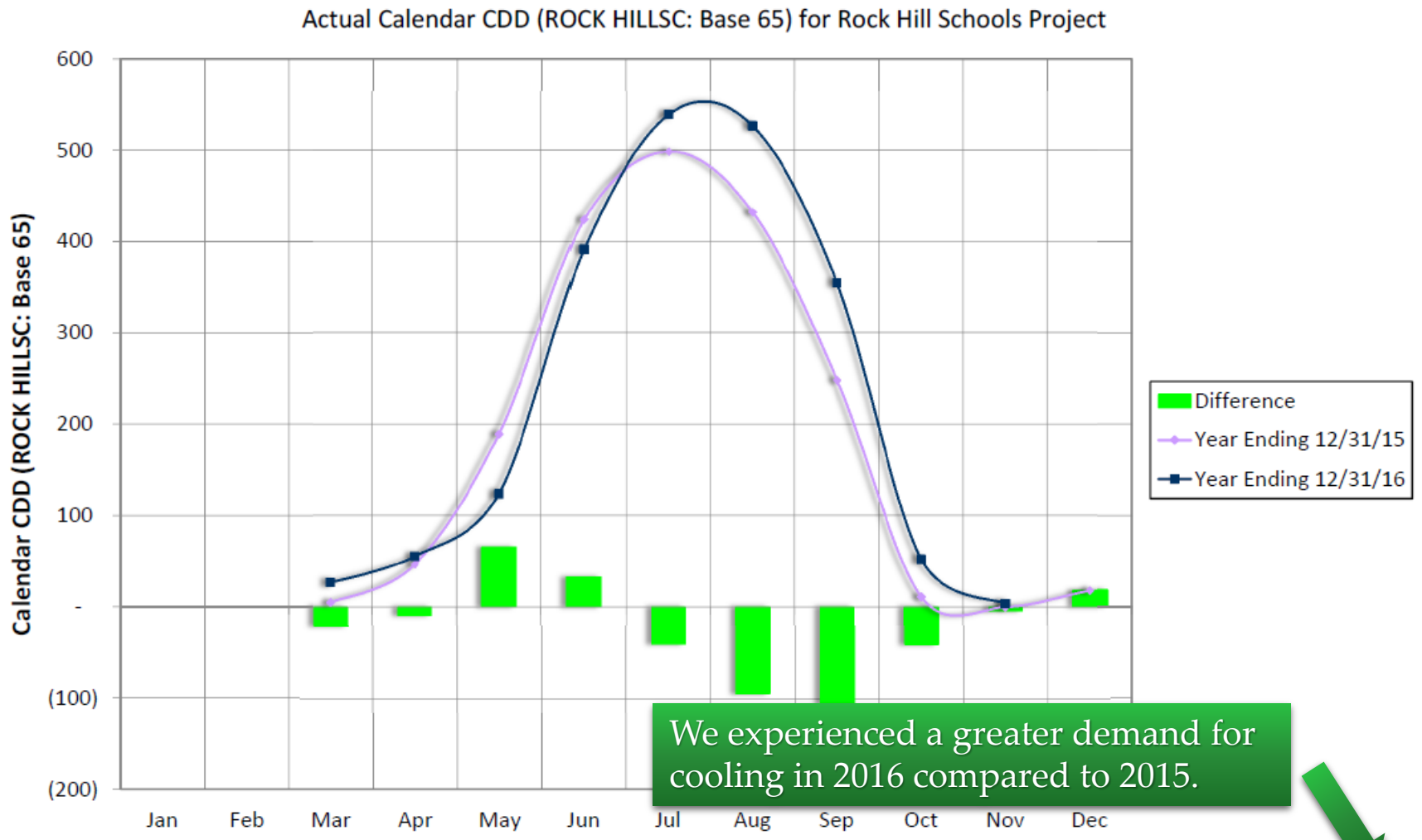
Measuring the performance of an energy conservation program - Reporting

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.

Cooling Degree Day (CDD) is a measure of the total number of degrees needed to get to set point times the number of days in a period. For more information please see: https://www3.epa.gov/climatechange/pdfs/print_heating-cooling-2014.pdf

Metrix4 Utility Accounting System



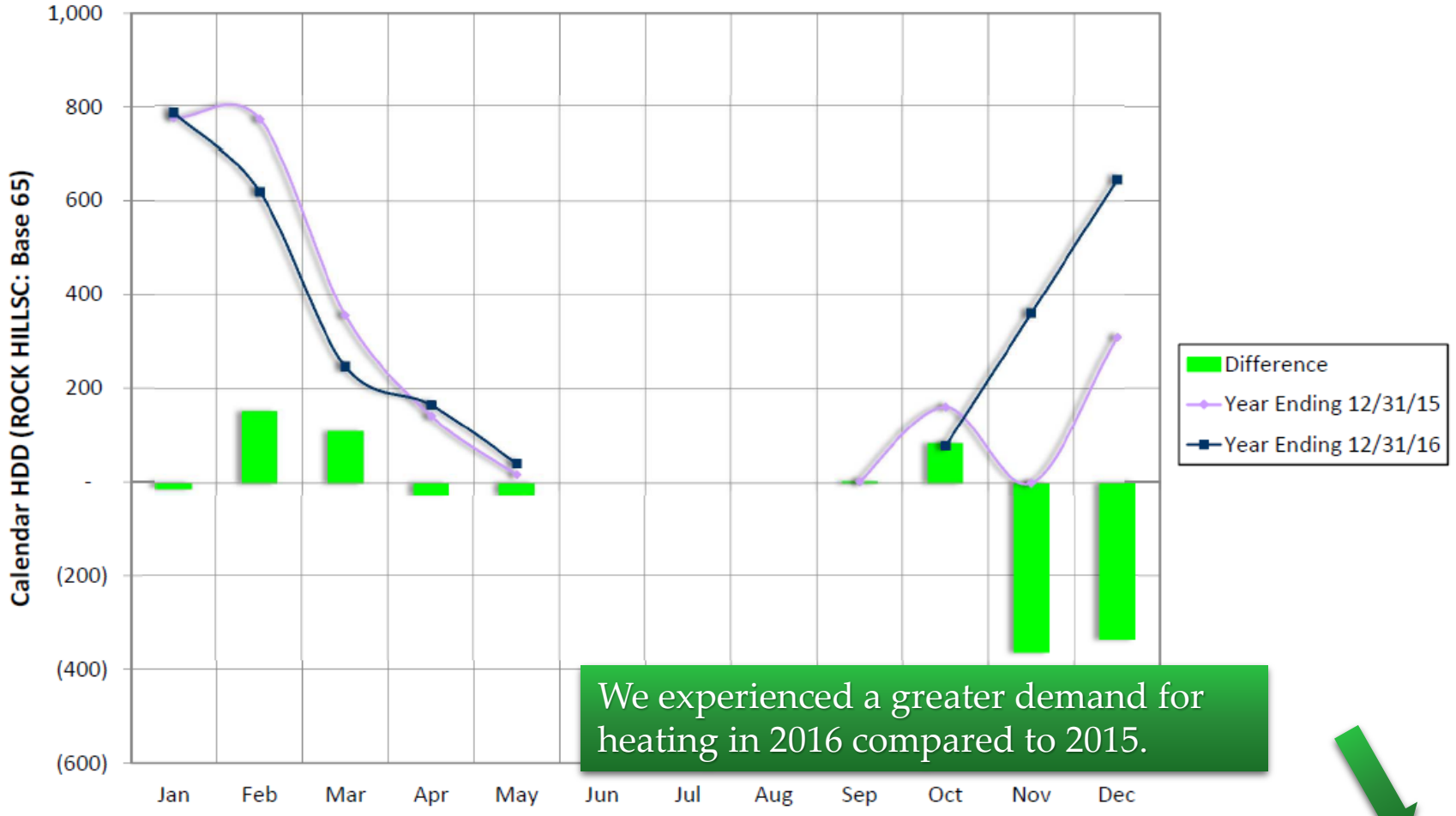
We experienced a greater demand for cooling in 2016 compared to 2015.

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Year Ending 12/31/15			5	47	190	424	499	432	249	11	(0)	18	1,873
Year Ending 12/31/16			27	56	124	392	539	527	355	52	4		2,074
Difference	-	-	(22)	(9)	66	33	(41)	(95)	(106)	(41)	(4)	18	(201)

Heating Degree Day (HDD) is a measure of the total number of degrees needed to get to set point times the number of days in a period. For more information please see: https://www3.epa.gov/climatechange/pdfs/print_heating-cooling-2014.pdf

Metrix4 Utility Accounting System

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



We experienced a greater demand for heating in 2016 compared to 2015.

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Year Ending 12/31/15	775	772	357	143	18				3	162	(0)	311	2,540
Year Ending 12/31/16	786	620	248	166	41					79	362	646	2,946
Difference	(11)	152	110	(24)	(23)	-	-	-	3	84	(362)	(335)	(406)

Energy Program Performance - CY 2016

Baseline period (CY2009)

Current period (CY2016)

Difference between baseline and current periods

Adjustments to baseline data using current weather and cost data

Actual Use and Cost for Base Period (1/2009 through 12/2009)

Energy Type	Base Use Recorded	Units	Avg Unit Cost	Energy Cost
Electric	34,433,341	kWh	0.1037	$3,571,424
Natural Gas	339,816	Therm	1.2069	$410,114
Total Energy:	151,502,593	kBtu	Total Cost	***$3,981,538***

Actual Use and Cost With Energy Management Program (1/2016 through 12/2016)

Energy Type	Current Use Recorded	Units	Avg Unit Cost	
Electric	26,258,214	kWh	0.1354	$3,556,074
Natural Gas	228,708	Therm	1.0246	$234,338
Total Energy:	112,490,084	kBtu	Total Cost	***$3,790,412***

Energy Saved CY 2016 Compared to CY 2009

Energy Type	Base - Current	Units	Percent Saved	Total Cost
Electricity	8,175,127	kWh	**24%**	$15,350
Natural Gas	111,108	Therm	**33%**	$175,776
Total EnergySaved:	39,012,508	kBtu	Gross Savings:	***$191,126***
Percent Savings:	**26%**			***5%***

Cost Avoidance - Without Our Energy Program:

Rates: Base period consumption at current period rates would be an additional:	$1,029,851
"Load Creep": Additional equipment, operating hours and efficiency lost due to age would cost:	$186,528
Adjustments for weather, bill period differences & other deviations.	$795,324
Total Cost Avoidance:	***$2,202,829***
Adjusted Savings:	***38%***

ENERGY STAR

Key Performance Indicator Comparisons

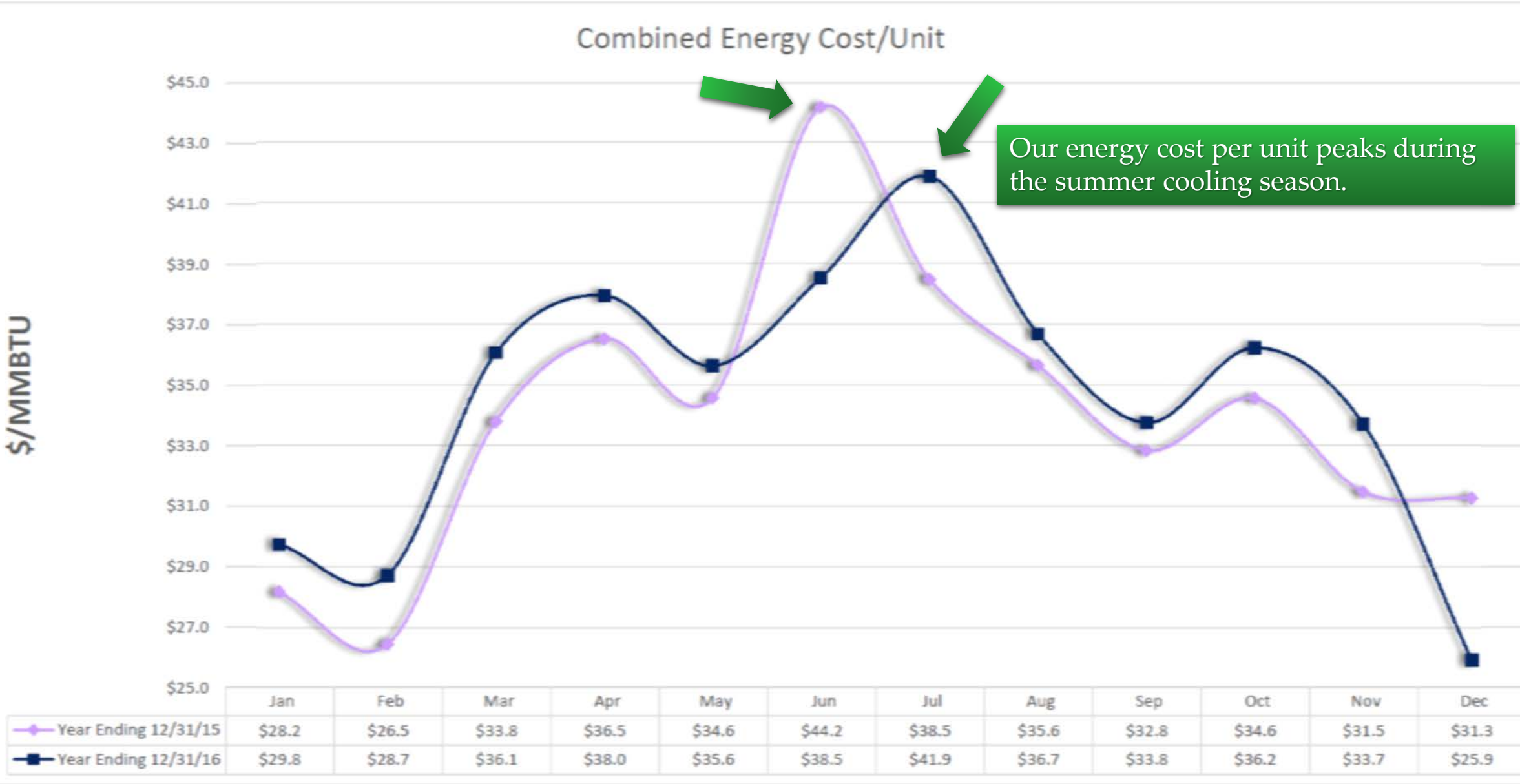
- 17,937 students (2016 Master Plan)
- 3,446,777 Square Feet (2016 Master Plan)

We experienced an increase in our cost and usage KPI's compared to last year. Part of this is due to the increased heating and cooling loads, part is due to the increased utility costs. It is likely that the increase in construction activities throughout 2016 helped elevate these figures.

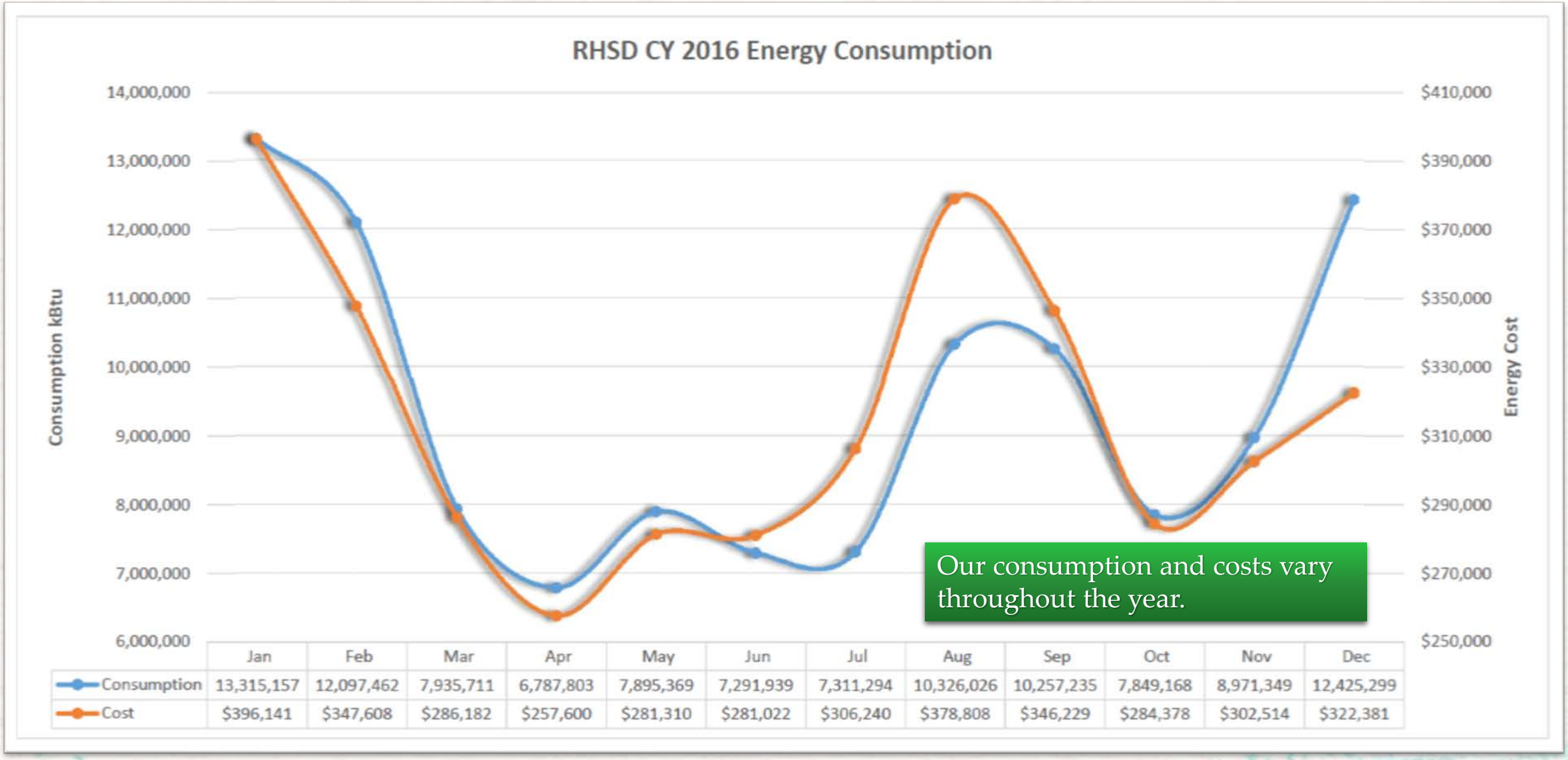
We are outperforming State and National averages. We are in the top 30% of all schools in the Nation according to Energy Star and the Council of Great City Schools.

Key Performance Indicator	2016 RHSD	2015 RHSD	2016 National Average (K-12)	2016 SC State Average (k-12)
Energy Usage Intensity (kBTU/Sq. Ft.)	32.6 (+3%)	31.6 (-8.4%)	45 Source EPA	36 (-7.7%)
Energy $/Sq. Ft.	$1.10 (+6.8%)	%1.03 (-7.2%)	$1.18 Source SchoolDude	$1.19 (-1.7%)
Energy $/Student	$211 (+6.5%)	$198 (+7%)	$211 Source SchoolDude	NA

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

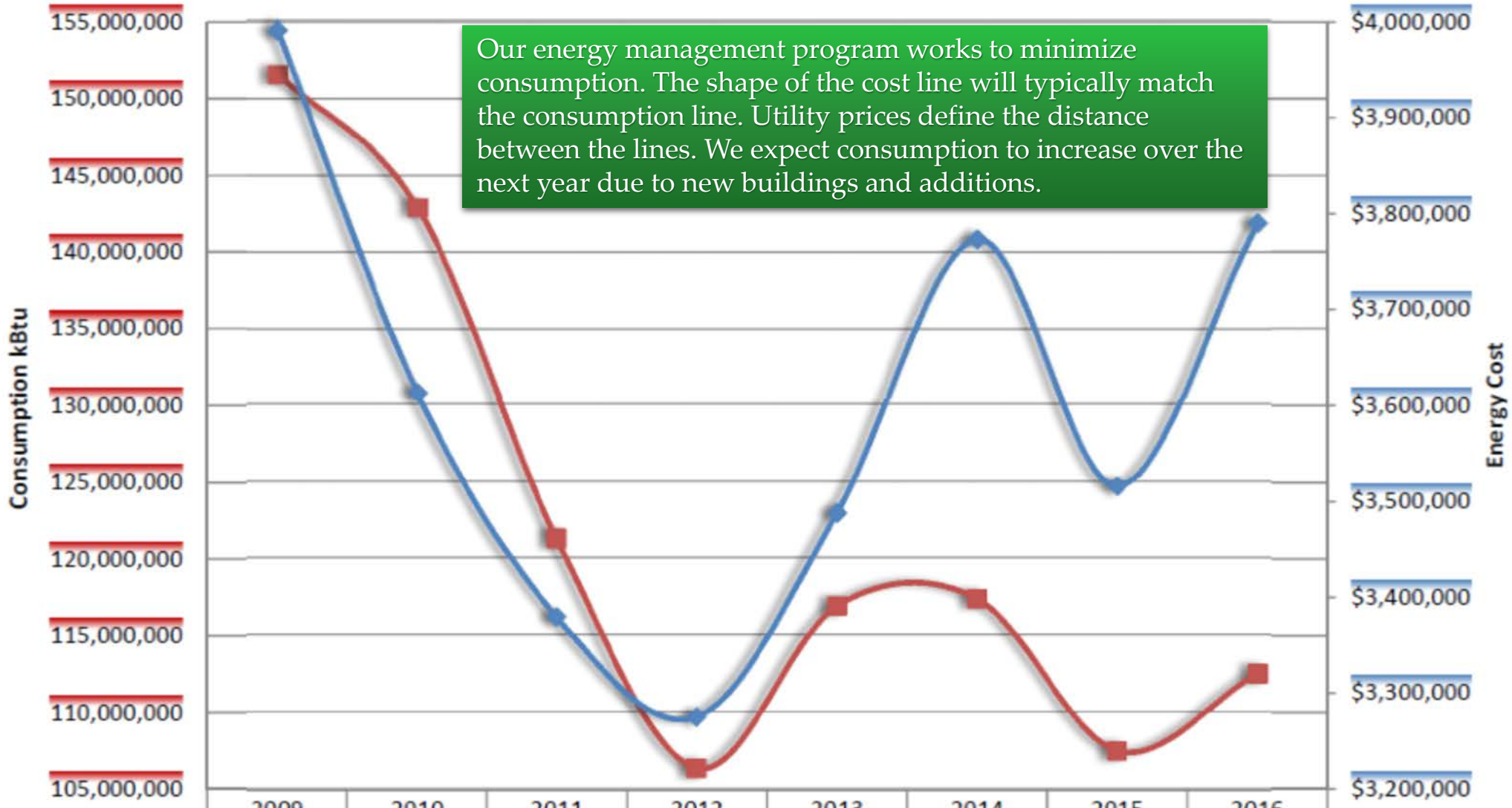


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Year Ending 12/31/15	$28.2	$26.5	$33.8	$36.5	$34.6	$44.2	$38.5	$35.6	$32.8	$34.6	$31.5	$31.3
Year Ending 12/31/16	$29.8	$28.7	$36.1	$38.0	$35.6	$38.5	$41.9	$36.7	$33.8	$36.2	$33.7	$25.9



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Consumption	13,315,157	12,097,462	7,935,711	6,787,803	7,895,369	7,291,939	7,311,294	10,326,026	10,257,235	7,849,168	8,971,349	12,425,299
Cost	$396,141	$347,608	$286,182	$257,600	$281,310	$281,022	$306,240	$378,808	$346,229	$284,378	$302,514	$322,381

Total Annual Energy Comparison



Our energy management program works to minimize consumption. The shape of the cost line will typically match the consumption line. Utility prices define the distance between the lines. We expect consumption to increase over the next year due to new buildings and additions.

	2009	2010	2011	2012	2013	2014	2015	2016
Consumption kBTU	151,590,807	142,909,915	121,284,294	106,330,727	116,896,674	117,356,335	107,463,910	112,490,084
Total Cost	$3,991,432	$3,613,332	$3,378,935	$3,274,740	$3,487,181	$3,773,552	$3,514,960	$3,790,412

6 Year Total Energy Savings and Cost Avoidance (cumulative)

Year	Energy Saved kBTU	Energy Cost Avoided $
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
Total	**235,788,063**	**$9,522,918**

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 2,600 average homes. The average household consumed 90 MMBTU/year.

Utilities Budget

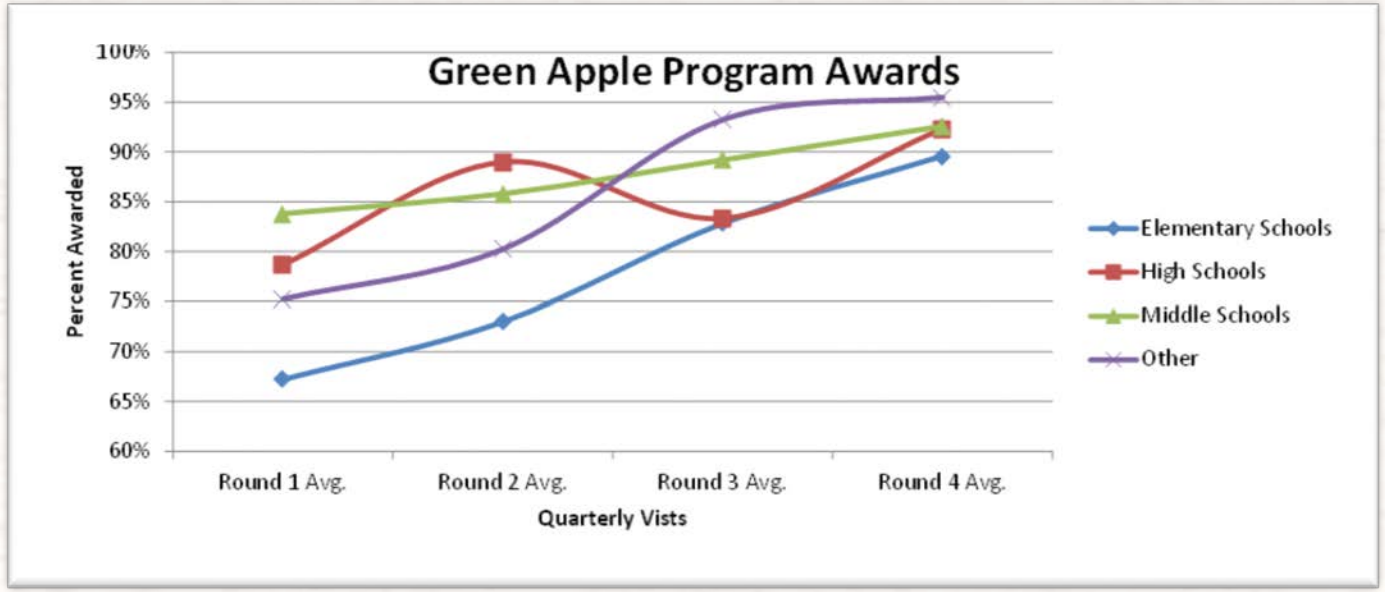
2016-2017 Utilities as of 3/20/2017. 38% of funds remaining with 25% of the school year remaining.

Budget	YTD	Balance	% Remaining
$4,090,000	$2,535,547	$1,554,453	38%

We have continued to enhance and streamline our Green Apple Energy Conservation Program. Rather than try to develop many different programs, we try to incorporate new and innovative ideas into the existing program.

We have successfully added the holiday and summer shutdowns to this program giving everyone additional chances of winning a Tervis cup. This year we have increased the number of cups each school will receive to 5. Previous years were 3.

We have also added a comments feature which allows people to send us suggestions and feedback.



2/16/2017 17:16:06	Veronica Goree	B114	Oakdale ES	Loving the new streamlined form!
2/16/2017 14:10:40	Shelby N. Patterson	111	Parent Smart	This is a great tool!
2/16/2017 14:18:33	Mary Freeman		Independence ES	Please send this form out earlier in the day.
2/16/2017 14:24:54	Samuelle Davis	G133	Independence ES	Suggestions for employees at multiple locations?

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.
- ***Independence ES Solar project.***
- YEC solar hosting + negotiations for OES solar opportunity.

Facilities Services Operations:

- Climate control, BAS, HVAC repair and replacement services and projects
- Lighting repair and replacement services and projects.
- New District Office design build project - HVAC.
- Flex LC IT relocation project - HVAC.
- AEE CEM re-certification
- ASHRAE OPMP certification

Project engineering – Bond projects & Operations:

- ***NHS and RRMS HVAC project***
- RDES bathroom addition - HVAC
- RHS & NHS Athletic HVAC renovations
- EPES addition -HVAC
- RHS and NHS Gym HVAC up-fit
- ATC building B&C HVAC up-fit
- EAES addition - HVAC
- SMS addition – HVAC
- ***TPX - Site lighting***

RRMS Heating Fuel Conversion + New HE Chiller

Project cost = $420k

Heating energy savings = $700k

Cooling energy savings = $260k

Simple payback = 8.75 years

Lifetime (20 years) savings $960k

Transportation Site Lighting Replacement

Project cost = $85k

Annual energy savings = $23k

Simple payback = 4 years

Lifecycle = 10 years @ 4000hrs./year

Lifetime savings = $230k

Independence ES Rooftop Solar Project

Project cost = $475k

Duke Energy Rebate = $281k

Annual savings = $40k

Simple payback = 4.6 years

Lifetime savings = $1 Million

Energy Program Initiatives and Future Goals

- Energy Star Rock Hill High School
- Energy Star Northwestern High School
- Metal Halide Gym and Site Lighting Replacements
- Replacement of Electric Heating HVAC units
- Green Apple Program Enhancement
- Increase Social Media Presence

April 3, 2016

A special thank you to the leadership, administration, faculty and staff of The Rock Hill School District for your dedication and support. Without you, none of this would be possible.

Kim Melander, Energy & Systems Manager

ROCK HILL Schools
Energy Conservation Program

Thank you for your time and support!