



# BULLITT COUNTY PUBLIC SCHOOLS ENERGY MANAGEMENT PROGRAM: 2017/2018 YEAR END REPORT



## History

Bullitt County Public Schools began an energy conservation program in November 2006 through the Kentucky Energy Efficiency Program for Schools (KEEPS). Through the program, basic steps were taken to establish an energy program by: hiring an energy manager, creating an energy management plan, promoting energy conservation, and making low/no-cost changes to reduce energy consumption. By 2008, the district was ready to address capital building improvements – leading to the energy savings performance contract (ESPC) with Harshaw Trane. Through the ESPC, 19 of our facilities received improvements such as new HVAC controls, lighting, and domestic water heater and boiler replacements.

## 2017/2018 School Year

This report summarizes the energy usage for the 2017/2018 fiscal year. Actions used for energy savings are included, as well as goals for the upcoming year.

- Total district electric consumption was **28% less** than the baseline usage. This resulted in a cost avoidance of approximately **\$727,293**
- Total district natural gas consumption was **43% less** than the baseline usage. This resulted in a cost avoidance of approximately **\$126,063**
- Propane for heating and cooking has been eliminated across the district (replaced with electricity or natural gas). This continues to result in a cost avoidance of approximately **\$78,135**

\*BCPS baseline data is an average of the 2004/2005 and the 2005/2006 data.

Had we not reduced our electric, natural gas, and propane usage by these amounts, given the adjustment with today's utility rates, we would have spent approximately **\$931,491 more** on the utility bills for the 2017/2018 school year.

The cost of the district's energy management program in 2017/2018 was approximately \$100,000 for the energy manager budget and salary. The ESPC bond re-payment was approximately \$250,000. This leaves a net savings of \$581,440. The district's investment in the ESPC continues to result in significant energy savings. The district's investment has also resulted in a better environment for our students, with increased reliability of our lighting and HVAC systems, and the added comfort to all of our building occupants.

Total savings and costs since the BCPS energy management program began in 2006:

- Approximately \$6,454,417 in savings/avoided utility costs

## Projects

Energy saving measures that were in place during the 2017/2018 school year includes:

- Energy manager tracking utility usage and costs monthly
- Utility rate review and evaluations
- Non-school hour energy conservation HVAC procedures including:
  - Shutdowns over long breaks
  - Temperature setbacks
  - Outside air units only operating during occupied school hours
- Staff education and awareness such as:
  - Turning off lighting when leaving a room
  - Turning off computer monitors and ancillary equipment at the end of the day
- Student energy teams active in 16 schools during the 17/18 school year
- School walkthroughs to monitor energy use behaviors and equipment operation
- Daily monitoring of HVAC building automation systems to ensure proper equipment operation and scheduling

- Participating with the US Department of Energy in the Better Buildings Challenge, specifically highlighting renovations at Maryville Elementary and Mt. Washington Elementary
- Monitoring of indoor air quality (IAQ) – temperature, relative humidity, and CO<sub>2</sub>
- Utility demand management program participation rebate of: **\$4,312**
- Partnership with Kentucky School Board Association (KSBA) and LG&E to receive grant funding towards the Energy Manager's salary: **\$11,957**
- KSBA/LG&E funding for an LED parking lot lighting project at FES, with a reimbursement of **\$15,405**

## Planned Projects for 2018/2019

- Continuation of student energy team program.
- ENERGY STAR® re-certification for eligible buildings
- Window film as part of a small energy savings project
- Continued monitoring of utility bills, utility rates, and building automation systems
- Continuation of building awareness throughout the district about energy efficiency and savings opportunities

## District Energy Management Program Success

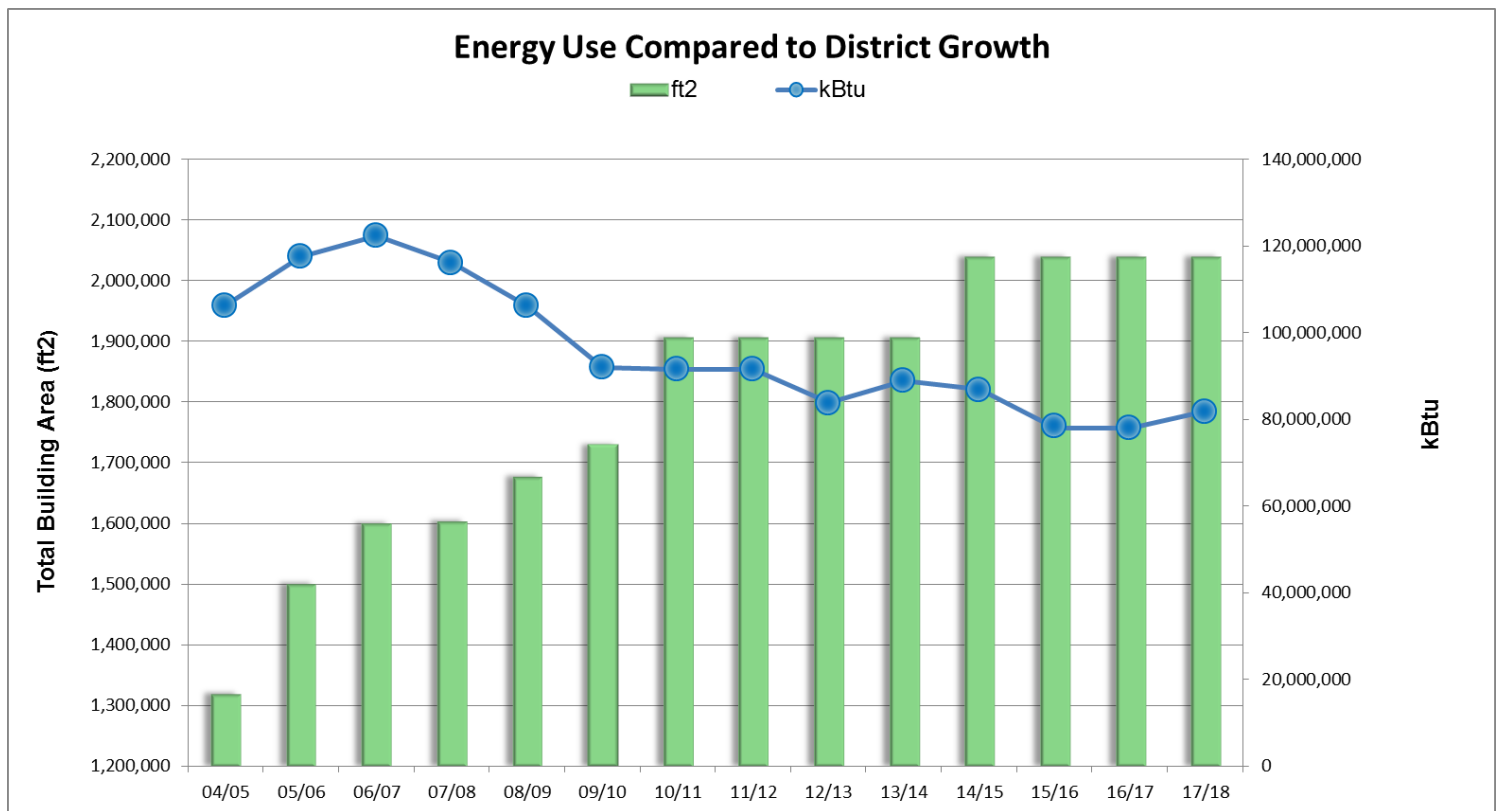
On the following page, Figure 1 illustrates how our district's energy use has decreased, while our growth in building space (square footage) has significantly increased since the 2004/2005 school year.

Table 1 provides a glimpse of the hard data that was used to create Figure 1. From 2004/2005 to 2006/2007, the district started its growth period, and the utility use was increasing with it. The first column is the 2006/2007 school year, which was the peak of the district's energy use. The second column, for comparison, has the 2017/2018 school year utility use and cost data.

Weather played a role in seeing increases in natural gas use, including bitter cold in January 2018, and the coolest April on record for April 2018. Electric use was still down 41,576 kWh, when comparing 16/17 to 17/18. The cold weather impact was seen on the natural gas use, which was up 38,017 ccf more in 17/18 than 16/17. Overall energy costs, also impacted by utility rate increases, were only \$42,515 higher in 17/18 versus 16/17. (Construction activity at BLMS also had a significant impact at that site on electricity and natural gas usage.)

From just over 1.6 million square feet in 06/07, to the current square footage of just over 2 million square feet – the district is currently using 40,589,652 kBtu less than the 2006/2007 school year. Comparisons like these, to the early years of our utility tracking, help to illustrate where the over \$6.4 million in cost savings/cost avoidance comes from. With utility rates continuing to increase year to year, the district is being extremely fiscally responsible by participating and supporting an energy management program.

**FIGURE 1--ENERGY USE COMPARED TO DISTRICT GROWTH**



**TABLE 1--COMPARING HEIGHT OF BCPS UTILITY USE TO THE 2017/2018 SCHOOL YEAR**

Utility Type - Usage	2006/2007	2017/2018
Electric (kWh)	25,286,477	19,750,114
Natural Gas (ccf)	328,762	139,692
Propane (Gal)	24,321	0
Total Energy (kBtu)	122,365,317	81,775,665
Water/Sewer (Gal)	28,696,410	20,159,630
Utility Type - Cost	2006/2007	2017/2018
Electric (kWh)	\$ 1,878,962	\$ 2,205,925
Natural Gas (ccf)	\$ 326,271	\$ 147,034
Propane (Gal)	\$ 40,337	\$ -
Total Energy (kBtu)	\$ 2,245,570	\$ 2,352,959
Water/Sewer Cost	\$ 166,568	\$ 219,438
Total Building Area (ft <sup>2</sup> )	1,600,859	2,039,528

**ENERGY STAR®**

As of the 2017/2018 school year, using ENERGY STAR's benchmarking tool (Portfolio Manager), the district has 18 ENERGY STAR® rated buildings.

**TABLE 2—BCPS ENERGY STAR RATED BUILDINGS AND FY18 SCORES**

School	Energy Star Rating
Brooks Elementary	94
Bullitt Lick Middle	91
Cedar Grove Elementary	91
Crossroads Elementary	96
Eastside Middle	78
Freedom Elementary	92
Hebron Middle	94
Lebanon Junction Elementary	88
Maryville Elementary	98
Mt. Washington Elementary (new 2017)	98
Mt. Washington Middle	85
Nichols Elementary	86
North Bullitt High School	90
Overdale Elementary	97
Pleasant Grove Elementary	89
Roby Elementary	88
Shepherdsville Elementary	93
Zoneton Middle	97

The EPA's energy performance rating system, based on source energy, accounts for the impact of weather variations as well as changes in key physical and operating characteristics of each building. A building score of 75 means that (from an energy consumption standpoint), the building performs better than 75% of all similar buildings nationwide.

Table 3 demonstrates the district’s utility use and cost for each year since 2004/2005.

**Table 3 – Yearly Utility Use and Costs**

Utility Type - Usage	2004/2005	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Electric (kWh)	20,238,383	23,968,514	25,286,477	23,731,788	21,368,945	20,188,729	21,702,211	20,684,107	20,056,854	20,498,172	20,437,868	19,513,015	19,791,690	19,750,114
Natural Gas (ccf)	344,412	324,933	328,762	317,432	301,614	223,715	168,058	124,929	148,647	183,984	165,613	113,805	101,675	139,692
Propane (Gal)	18,307	24,547	24,321	26,067	22,637	738	726	264	0	0	0	0	0	0
Total Energy (kBtu)	106,202,889	117,494,719	122,365,317	116,053,487	106,048,368	91,994,115	91,424,347	91,423,984	83,744,627	88,890,115	86,792,145	78,300,322	78,001,771	81,775,665
Water/Sewer (Gal)	31,983,000	30,180,000	28,696,410	27,645,360	22,885,080	18,335,600	19,310,020	19,069,729	19,650,014	18,547,260	19,983,830	20,808,890	22,058,630	20,159,630
Utility Type - Cost	2004/2005	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Electric (kWh)	\$ 1,347,257	\$ 1,731,618	\$ 1,878,962	\$ 1,874,410	\$ 1,888,880	\$ 1,841,316	\$ 2,052,474	\$ 2,052,474	\$ 2,131,190	\$ 2,225,301	\$ 2,282,901	\$ 2,183,273	\$ 2,199,326	\$ 2,205,925
Natural Gas (ccf)	\$ 361,814	\$ 500,245	\$ 326,271	\$ 359,626	\$ 413,207	\$ 182,260	\$ 155,724	\$ 155,724	\$ 131,426	\$ 170,870	\$ 159,694	\$ 106,868	\$ 111,118	\$ 147,034
Propane (Gal)	\$ 22,543	\$ 36,697	\$ 40,337	\$ 63,841	\$ 52,343	\$ 1,497	\$ 1,405	\$ 1,405	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Energy (kBtu)	\$ 1,731,614	\$ 2,268,560	\$ 2,245,570	\$ 2,297,877	\$ 2,354,430	\$ 2,025,073	\$ 2,209,602	\$ 2,209,602	\$ 2,262,616	\$ 2,396,171	\$ 2,442,595	\$ 2,290,141	\$ 2,310,444	\$ 2,352,959
Water/Sewer Cost	\$ 174,520	\$ 161,663	\$ 166,568	\$ 177,149	\$ 159,270	\$ 131,292	\$ 159,127	\$ 185,462	\$ 198,366	\$ 198,647	\$ 200,611	\$ 223,406	\$ 232,918	\$ 219,438
Total Building Area (ft <sup>2</sup> )	1,319,733	1,501,305	1,600,859	1,604,359	1,677,440	1,729,599	1,906,093	1,906,093	1,906,093	1,906,093	2,039,528	2,039,528	2,039,528	2,039,528

**\*The only propane purchases that Bullitt County Public Schools continues to make are for the generator at Hebron Middle School.**

Tables 4 and 5 illustrate the energy usage per school, compared to their respective baseline. Energy savings and cost avoidance calculations account for changes in the number of days in the billing period, current costs (rates), and heating or cooling degree days (weather corrections). Figure 2 illustrates how the district’s buildings compare by energy use intensity (kBtu per square foot). Figures 3 through 5 illustrate the district’s non-adjusted energy profile per month, as compared to weather trends.

Tables 2 and 3 have columns that represent calculations to make adjustments for weather, or specifically the cooling and heating degree days. From July 2017 to June 2018, we had 132 less cooling degree days than the 2016/2017 school year, but our natural gas use reflects that we had 944 more heating degree days. Compared to our baseline data, we had 461 more cooling degree days and 435 more heating degree days. We had unusually cold weather in January 2018, and one of the coldest Aprils on record for April 2018. We had more cooling degree days throughout the school year. Cooling degree days have a huge impact on electricity use (kWh), and the electricity demand (kW) charges from utility providers. We had significant cooling needs in July, October, May, and June of FY18.

Special note should also be made about the electricity use at Lebanon Junction and Nichols Elementary. Due to their previous renovations, both schools had a major change in energy use – shifting from propane to electricity. Both buildings have increased efficiency since their renovations, and the absence of propane clearly offsets the increased electricity consumption.

**Table 4 – Electricity Cost Avoidance Report**

Cost Avoidance Report								
Electric Consumption: 2017/2018 Compared to Baseline								
Building	Base Year Actual (kWh)	Base Year Weather Adjusted (kWh)	Evaluation Year Actual (kWh)	Use Avoidance Non-Adjusted (kWh)	Use Avoidance Weather Adjusted (kWh)	Change - Non Adjusted %	Change - Weather Adjusted %	Cost Avoidance Weather Adjusted \$
Bernheim	968,378	1,090,529	548,400	-419,978	-542,129	-43%	-50%	\$ (32,214)
Brooks	840,640	925,122	766,880	-73,760	-158,242	-9%	-17%	\$ (9,503)
Bullitt Central	1,749,023	1,956,393	1,430,269	-318,754	-526,124	-18%	-27%	\$ (31,280)
Bullitt East	2,058,205	2,299,723	1,608,363	-449,842	-691,360	-22%	-30%	\$ (40,991)
Bullitt Lick	1,199,102	1,338,520	743,680	-455,422	-594,840	-38%	-44%	\$ (45,374)
Cedar Grove	862,445	962,654	722,280	-140,165	-240,374	-16%	-25%	\$ (25,465)
Central Office	438,922	495,504	336,640	-102,282	-158,864	-23%	-32%	\$ (10,034)
Crossroads	828,036	911,565	690,600	-137,436	-220,965	-17%	-24%	\$ (8,689)
Eastside	1,677,878	1,883,212	1,253,952	-423,926	-629,260	-25%	-33%	\$ (37,461)
Freedom	1,196,862	1,331,944	678,800	-518,062	-653,144	-43%	-49%	\$ (25,590)
Hebron	1,364,982	1,528,593	736,320	-628,662	-792,273	-46%	-52%	\$ (30,969)
Lebanon Junction	474,697	528,864	593,640	118,943	64,776	25%	12%	\$ 4,073
Maintenance	70,569	76,705	88,739	18,170	12,034	26%	16%	\$ 1,028
Maryville	847,754	943,787	434,700	-413,054	-509,087	-49%	-54%	\$ (51,527)
MW Elementary	1,293,255	1,453,328	443,040	-850,215	-1,010,288	-66%	-70%	\$ (60,253)
MW Middle	1,357,261	1,523,602	814,800	-542,461	-708,802	-40%	-47%	\$ (27,661)
Nichols	212,232	236,113	427,920	215,688	191,807	102%	81%	\$ 16,078
North Bullitt	2,494,791	2,791,235	1,612,178	-882,613	-1,179,057	-35%	-42%	\$ (122,965)
Old Mill	625,863	698,912	501,480	-124,383	-197,432	-20%	-28%	\$ (11,674)
Overdale	616,080	686,732	640,560	24,480	-46,172	4%	-7%	\$ (1,764)
Pleasant Grove	1,173,670	1,317,049	720,576	-453,094	-596,473	-39%	-45%	\$ (37,753)
BAC/ROC	391,633	433,434	300,480	-91,153	-132,954	-23%	-31%	\$ (7,918)
Roby	877,360	981,826	826,480	-50,880	-155,346	-6%	-16%	\$ (9,779)
Shepherdsville	1,067,200	1,189,500	727,686	-339,514	-461,814	-32%	-39%	\$ (18,087)
Transportation	197,383	217,969	226,920	29,537	8,951	15%	4%	\$ 561
Zoneton	1,678,209	1,868,208	858,200	-820,009	-1,010,008	-49%	-54%	\$ (102,084)
<b>TOTAL</b>	<b>26,562,430</b>	<b>29,671,023</b>	<b>18,733,583</b>	<b>-7,828,847</b>	<b>-10,937,440</b>	<b>-29%</b>	<b>-37%</b>	<b>\$ (727,293)</b>

**Table 5 – Natural Gas and Propane Cost Avoidance Report**

Cost Avoidance Report								
Natural Gas Consumption: 2017/2018 Compared to Baseline								
Building	Base Year Actual (ccf)	Base Year Weather Adjusted (ccf)	Evaluation Year Actual (ccf)	Use Avoidance Non-Adjusted (ccf)	Use Avoidance Weather Adjusted (ccf)	Change Non-Adjusted %	Change Weather Adjusted %	Cost Avoidance Weather Adjusted \$
Bernheim	19,203	20,278	5,243	-13,960	-15,035	-73%	-74%	\$ (9,352)
Brooks	17,874	19,056	0	-17,874	-19,056	-100%	-100%	\$ (12,780)
Bullitt Central	41,767	43,677	25,321	-16,446	-18,356	-39%	-42%	\$ (12,366)
Bullitt East	35,419	38,305	11,357	-24,062	-26,948	-68%	-70%	\$ (15,959)
Bullitt Lick	9,001	9,535	7,831	-1,170	-1,704	-13%	-18%	\$ (1,124)
Cedar Grove	22,476	23,843	3,011	-19,465	-20,832	-87%	-87%	\$ (14,046)
Central Office	244	261	2	-242	-259	-99%	-99%	\$ (175)
Crossroads								
Eastside								
Freedom	11,448	12,435	2,695	-8,753	-9,740	-76%	-78%	\$ (6,395)
Hebron	13,532	14,720	0	-13,532	-14,720	-100%	-100%	\$ (14,400)
Lebanon Junction	25,234	26,625	4,729	-20,505	-21,896	-81%	-82%	\$ (14,750)
Maintenance	1,567	2,774	8,471	6,904	5,697	441%	205%	\$ 3,862
Maryville	3,894	4,237	3,500	-394	-737	-10%	-17%	\$ (92)
MW Elementary	7,831	8,170	2,821	-5,010	-5,349	-64%	-65%	\$ (3,412)
MW Middle	13,549	14,609	11,233	-2,316	-3,376	-17%	-23%	\$ (2,283)
Nichols								
North Bullitt	12,371	13,161	16,139	3,768	2,978	30%	23%	\$ 2,011
Old Mill	10,468	11,396	6,734	-3,734	-4,662	-36%	-41%	\$ (2,504)
Overdale	23,174	24,631	1,827	-21,347	-22,804	-92%	-93%	\$ (15,365)
Pleasant Grove	8,412	8,962	7,625	-787	-1,337	-9%	-15%	\$ (528)
Riverview/DT	8,784	9,412	8,582	-202	-830	-2%	-9%	\$ (123)
Roby	8,463	9,016	31	-8,432	-8,985	-100%	-100%	\$ (5,692)
Shepherdsville	3,201	3,478	2,021	-1,180	-1,457	-37%	-42%	\$ (974)
Transportation	3,159	3,405	3,742	583	337	18%	10%	\$ 382
Zoneton								
<b>TOTAL</b>	<b>301,071</b>	<b>321,986</b>	<b>132,915</b>	<b>-168,156</b>	<b>-189,071</b>	<b>-56%</b>	<b>-59%</b>	<b>\$ (126,063)</b>

Cost Avoidance Report								
Propane Consumption: 2017/2018 Compared to Baseline								
Building	Base Year Actual (Gal)	Base Year Weather Adjusted (Gal)	Evaluation Year Actual (Gal)	Use Avoidance Non-Adjusted (Gal)	Use Avoidance Weather Adjusted (Gal)	Change Non-Adjusted %	Change Weather Adjusted %	Cost Avoidance Weather Adjusted \$
Cedar Grove	22,476	12,450	0	-22,476	-12,450	-100%	-100%	\$ (23,655)
Lebanon Junction	841	841	0	-841	-841	-100%	-100%	\$ (1,597)
Nichols	19,421	20,352	0	-19,421	-20,352	-100%	-100%	\$ (36,900)
Roby	8,412	8,412	0	-8,412	-8,412	-100%	-100%	\$ (15,982)
<b>TOTAL</b>	<b>51,150</b>	<b>42,054</b>	<b>0</b>	<b>-51,150</b>	<b>-42,054</b>	<b>-100%</b>	<b>-100%</b>	<b>\$ (78,135)</b>

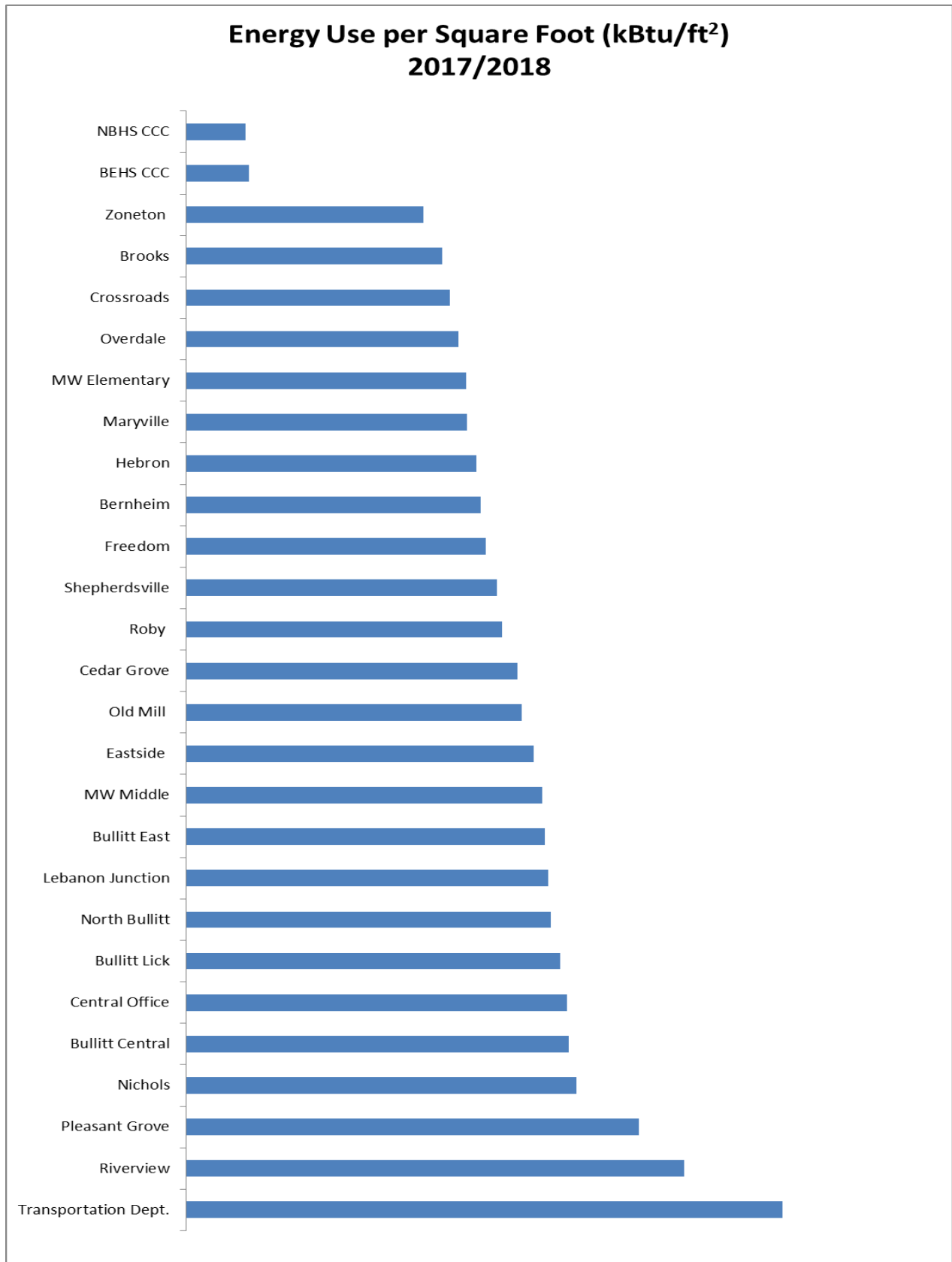


## Baseline Explanation

The baseline for the majority of the facilities is the average use of fiscal years 2004/2005 and 2005/2006, which are two years prior to the start of the energy management program. Schools such as Eastside, Zoneton, and Shepherdsville Elementary were constructed in mid-2005; therefore the 2006/2007 was used as their baseline. Old Mill Elementary had a building addition in 2005, so only the 2005/2006 year is used for their baseline. The Central Office added numerous computer servers, as well as a new air conditioning unit for the server room in 2006, therefore the 2006/2007 year is used for their baseline. With newly constructed buildings such as Roby, Brooks, Overdale, and Crossroads, their respective baselines have now been set as their first full year of energy use after opening.

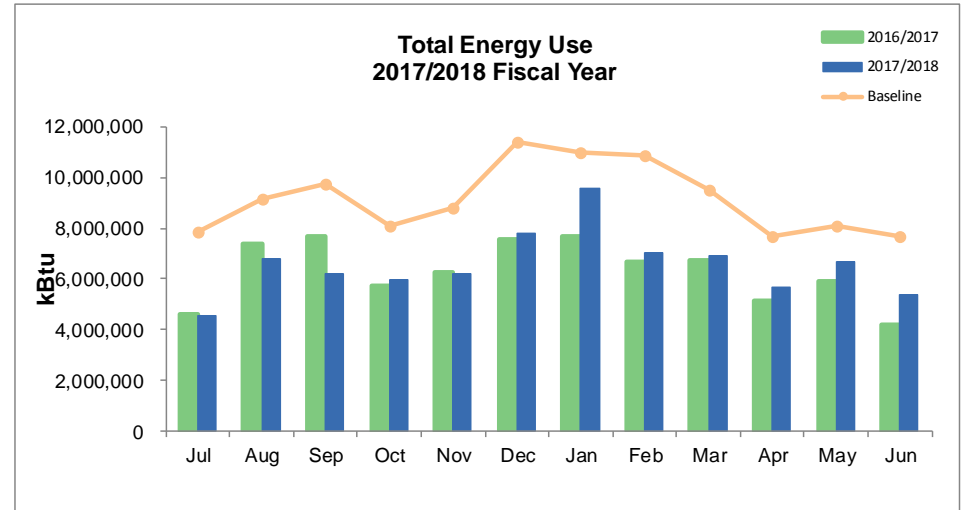
The baseline has also been revised for schools that went under major renovation in the past five to six years: Cedar Grove (baseline 2011/2012), Hebron (2012/2013), Lebanon Junction (2011/2012), Nichols (2010/2011). These renovations had major changes made to their mechanical, electrical, and plumbing systems – causing significant changes in energy consumption. The district is still tracking and accounting for the significant change in energy usage since the original energy management baseline, and those changes are reflected in the cost savings/cost avoidance metrics.

**Figure 2 – BCPS Building Energy Use Profile**



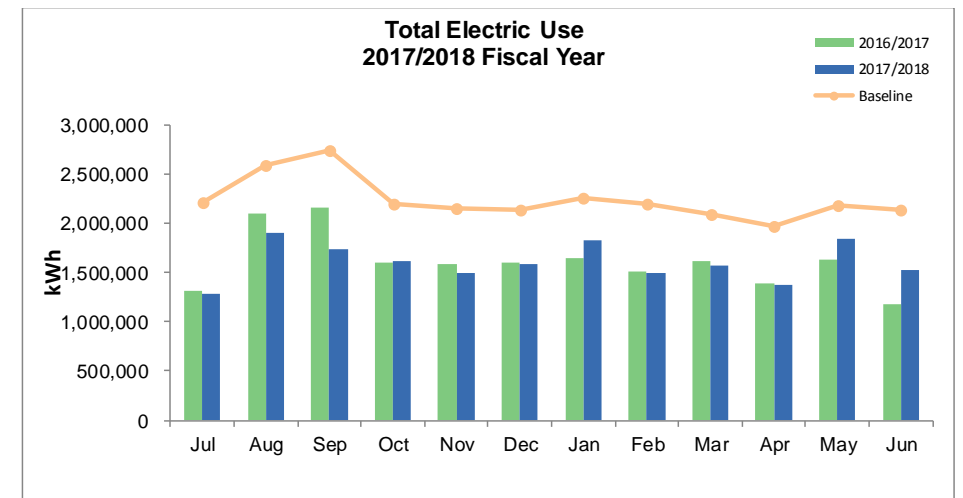
**Figure 3 – Total, Non-Adjusted Energy Use (Electric, Gas, and Propane)**

Month	Total Energy Usage (kBtu)				Weather Data			
	Baseline	2016/2017	2017/2018	% Change from Baseline	2017/2018		Baseline	
					CDD	HDD	CDD	HDD
Jul	7,842,724	4,590,967	4,550,132	-42%	484	0	429	0
Aug	9,163,947	7,365,472	6,791,127	-26%	360	3	389	5
Sep	9,724,941	7,649,295	6,186,245	-36%	226	45	218	17
Oct	8,119,551	5,719,759	5,970,219	-26%	99	220	47	167
Nov	8,785,461	6,264,059	6,202,029	-29%	14	496	4	436
Dec	11,421,630	7,586,541	7,773,031	-32%	1	873	0	910
Jan	11,009,598	7,684,517	9,587,272	-13%	0	1010	0	725
Feb	10,839,871	6,648,683	7,013,487	-35%	18	581	0	702
Mar	9,523,164	6,729,346	6,903,097	-28%	0	626	0	595
Apr	7,649,624	5,129,367	5,661,526	-26%	37	390	45	171
May	8,102,269	5,900,394	6,655,933	-18%	348	14	93	97
Jun	7,672,321	4,212,103	5,391,496	-30%	414	1	317	0
Total YTD	109,855,102	75,480,502	78,685,593	-28%	2001	4259	1540	3824



**Figure 4 – Non-Adjusted Electricity Use**

Month	Total Electric Usage (kWh)				Weather Data			
	Baseline	2016/2017	2017/2018	% Change from Baseline	2017/2018		Baseline	
					CDD	HDD	CDD	HDD
Jul	2,223,084	1,312,812	1,288,105	-42%	484	0	429	0
Aug	2,599,889	2,101,491	1,912,059	-26%	360	3	389	5
Sep	2,746,156	2,166,562	1,733,148	-37%	226	45	218	17
Oct	2,207,277	1,596,157	1,618,123	-27%	99	220	47	167
Nov	2,155,313	1,581,319	1,503,911	-30%	14	496	4	436
Dec	2,133,395	1,600,507	1,589,808	-25%	1	873	0	910
Jan	2,262,714	1,652,376	1,834,659	-19%	0	1010	0	725
Feb	2,206,859	1,515,456	1,502,650	-32%	18	581	0	702
Mar	2,101,676	1,612,634	1,568,708	-25%	0	626	0	595
Apr	1,978,164	1,392,211	1,379,550	-30%	37	390	45	171
May	2,185,178	1,636,359	1,851,365	-15%	348	14	93	97
Jun	2,133,352	1,175,963	1,522,861	-29%	414	1	317	0
Total YTD	26,933,055	19,343,847	19,304,947	-28%	2001	4259	1540	3824



**Figure 5 – Non-Adjusted Natural Gas Use**

Month	Total Natural Gas Usage (CCF)				Weather Data			
	Baseline	2016/2017	2017/2018	% Change from Baseline	2017/2018		Baseline	
					CDD	HDD	CDD	HDD
Jul	4,621	1,084	1,506	-67%	484	0	429	0
Aug	5,811	1,895	2,594	-55%	360	3	389	5
Sep	6,417	2,495	2,648	-59%	226	45	218	17
Oct	8,363	2,657	4,361	-48%	99	220	47	167
Nov	18,053	8,433	10,395	-42%	14	496	4	436
Dec	45,479	20,637	22,802	-50%	1	873	0	910
Jan	37,859	19,870	32,305	-15%	0	1010	0	725
Feb	37,649	14,349	18,315	-51%	18	581	0	702
Mar	26,774	11,913	15,055	-44%	0	626	0	595
Apr	11,774	3,681	9,267	-21%	37	390	45	171
May	9,139	3,079	3,292	-64%	348	14	93	97
Jun	5,827	1,939	1,898	-67%	414	1	317	0
Average	217,763	92,032	124,438	-43%	2001	4259	1540	3824

