



BULLITT COUNTY PUBLIC SCHOOLS ENERGY MANAGEMENT PROGRAM: 2015/2016 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.

2015/2016 School Year

This report summarizes the energy usage for the 2015/2016 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 **\$539,439**
- Total district natural gas consumption was **51% less** than the baseline usage. This resulted in a cost avoidance of approximately **\$111,268**.
- 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 **\$728,842 more** on the utility bills for the 2015/2016 school year.

The cost of the district's energy management program in 2015/2016 was approximately \$90,000 for the energy manager budget and salary. The ESPC bond re-payment was approximately \$250,000. This leaves a net savings of \$388,842. 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 \$4,708,075 in savings/avoided utility costs
- Average cost of energy management program annually: \$75,500
- Total bond repayment for the ESPC (to date): \$2,136,523

This leaves a net cost avoidance of approximately: \$1,816,552

Projects

Energy saving measures that were in place during the 2015/2016 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 17 schools during the 15/16 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
- Monitoring of indoor air quality (IAQ) – temperature, relative humidity, and CO₂
- Requests for reimbursements electric companies totaling: **\$1,582**
- Rate change request on one of the new meters, saving a total of: **\$12,000**
- Utility demand management program participation rebate of: **\$3,400**
- Partnership with Kentucky School Board Association (KSBA) and LG&E to receive grant funding towards the Energy Manager's salary: **\$9,565**

Planned Projects for 2016/2017

- Continuation of student energy team program. There are 18 schools that have signed up to participate in the program for the 2016/2017 school year
- ENERGY STAR[®] re-certification for eligible buildings (already approved for 2016; 16 re-certifications – Maryville is still an ENERGY STAR[®] building, but is not eligible this year due to construction)
- Installation of LED lights and 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
- Continued participation in the KSBA School Energy Manager Project
 - KSBA SEMP and LG&E grant to fund \$11,957 of energy manager's salary for 2016/2017
 - LED parking lot lighting projects; funded through KSBA/LG&E grant, for up to \$41,000 of matching funds

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. The first column is the 2006/2007 school year, which was the peak of the district's energy use. From 2004/2005 to 2006/2007, the district has started its growth period, and the utility use was increasing with it. The second column, for comparison, has the 2015/2016 school year utility use and cost data.

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 44,064,995 kBtu. Comparisons like these, to the early years of our utility tracking, help to illustrate where the over \$4.7 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

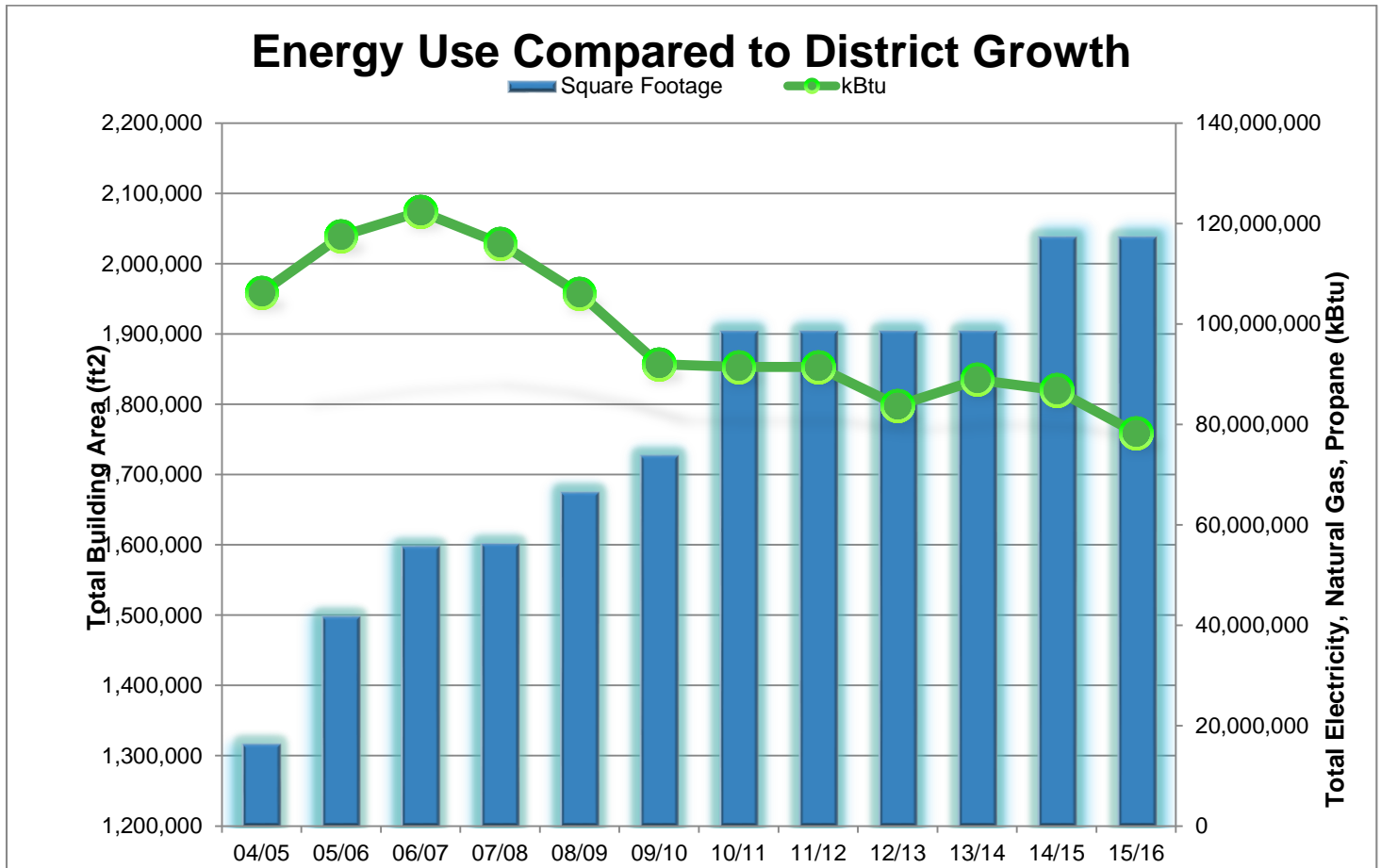


TABLE 1--COMPARING HEIGHT OF BCPS UTILITY USE TO THE 2015/2016 SCHOOL YEAR

Utility Type - Usage	2006/2007	2015/2016
Electric (kWh)	25,286,477	19,513,015
Natural Gas (ccf)	328,762	113,805
Propane (Gal)	24,321	0
Total Energy (kBtu)	122,365,317	78,300,322
Water/Sewer (Gal)	28,696,410	20,808,890
Utility Type - Cost	2006/2007	2015/2016
Electric (kWh)	\$ 1,878,962	\$ 2,183,273
Natural Gas (ccf)	\$ 326,271	\$ 106,868
Propane (Gal)	\$ 40,337	\$ -
Total Energy (kBtu)	\$ 2,245,570	\$ 2,290,141
Water/Sewer Cost	\$ 166,568	\$ 223,406
Total Building Area (ft²)	1,600,859	2,039,528

ENERGY STAR®

As of the 2015/2016 school year, using ENERGY STAR's benchmarking tool (Portfolio Manager), the district has 17 ENERGY STAR® rated buildings. A highlight of the 2015/2016 school year was that BCPS was recognized as one of the ENERGY STAR® Partners of the Year for 2016.

TABLE 2—BCPS ENERGY STAR RATED BUILDINGS AND FY16 SCORES

School	Energy Star Rating
Brooks Elementary	95
Bullitt Lick Middle	93
Cedar Grove Elementary	90
Crossroads Elementary	97
Eastside Middle	79
Freedom Elementary	94
Hebron Middle	92
Lebanon Junction Elementary	90
Maryville Elementary	86
Mt. Washington Middle	91
Nichols Elementary	88
North Bullitt High School	93
Overdale Elementary	97
Pleasant Grove Elementary	89
Roby Elementary	89
Shepherdsville Elementary	88
Zoneton Middle	96

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
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
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
Propane (Gal)	18,307	24,547	24,321	26,067	22,637	738	726	264	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
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
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
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
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
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
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
Total Building Area (ft²)	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

*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). Compared to FY15, the overall district lowered our EUI by 106 kBtu/ft². 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 2015 to June 2016, we had only 129 more cooling degree days than the 2014/2015 school year and almost 1,000 less heating degree days. Compared to our baseline data, we had 257 more cooling degree days and 323 less heating degree days. While the winter was not as harsh in 2015/2016, it had significantly more cooling degree days. 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, September, October, March, and June of FY16.

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: 2015/2016 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	980,185	556,000	-412,378	-424,185	-43%	-43%	\$ (26,134)
Brooks	840,640	845,196	744,480	-96,160	-100,716	-11%	-12%	\$ (6,205)
Bullitt Central	1,749,023	1,777,230	1,494,202	-254,821	-283,028	-15%	-16%	\$ (17,437)
Bullitt East	2,058,205	2,081,960	1,493,537	-564,668	-588,423	-27%	-28%	\$ (36,253)
Bullitt Lick	1,199,102	1,209,273	631,000	-568,102	-578,273	-47%	-48%	\$ (30,789)
Cedar Grove	862,445	872,014	713,880	-148,565	-158,134	-17%	-18%	\$ (19,628)
Central Office	438,922	443,348	349,360	-89,562	-93,988	-20%	-21%	\$ (6,148)
Crossroads	828,036	830,385	653,100	-174,936	-177,285	-21%	-21%	\$ (7,178)
Eastside	1,677,878	1,693,476	1,225,536	-452,342	-467,940	-27%	-28%	\$ (28,830)
Freedom	1,196,862	1,198,178	620,400	-576,462	-577,778	-48%	-48%	\$ (23,521)
Hebron	1,364,982	1,376,337	755,200	-609,782	-621,137	-45%	-45%	\$ (25,286)
Lebanon Junction	474,697	480,534	569,400	94,703	88,866	20%	18%	\$ 5,813
Maintenance	70,569	70,702	60,915	-9,654	-9,787	-14%	-14%	\$ (824)
Maryville	847,754	856,410	542,280	-305,474	-314,130	-36%	-37%	\$ (29,085)
MW Elementary	1,293,255	1,310,930	571,680	-721,575	-739,250	-56%	-56%	\$ (45,545)
MW Middle	1,357,261	1,369,517	726,800	-630,461	-642,717	-46%	-47%	\$ (26,165)
Nichols	212,232	229,969	443,280	231,048	213,311	109%	93%	\$ 16,603
North Bullitt	2,494,791	2,534,780	1,464,781	-1,030,010	-1,069,999	-41%	-42%	\$ (101,683)
Old Mill	625,863	631,207	511,200	-114,663	-120,007	-18%	-19%	\$ (7,394)
Overdale	616,080	619,629	633,600	17,520	13,971	3%	2%	\$ 569
Pleasant Grove	1,173,670	1,189,129	720,576	-453,094	-468,553	-39%	-39%	\$ (30,648)
BAC/ROC	391,633	393,996	295,840	-95,793	-98,156	-24%	-25%	\$ (6,047)
Roby	877,360	883,580	800,720	-76,640	-82,860	-9%	-9%	\$ (5,420)
Shepherdsville	1,067,200	1,072,573	802,797	-264,403	-269,776	-25%	-25%	\$ (10,983)
Transportation	197,383	197,828	197,640	257	-188	0%	0%	\$ (12)
Zoneton	1,678,209	1,689,782	894,000	-784,209	-795,782	-47%	-47%	\$ (71,207)
TOTAL	26,562,430	26,838,148	18,472,204	-8,090,226	-8,365,944	-30%	-31%	\$ (539,439)

Table 5 – Natural Gas and Propane Cost Avoidance Report

Cost Avoidance Report								
Natural Gas Consumption: 2015/2016 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	17,874	3,280	-15,923	-14,594	-83%	-82%	\$ (9,387)
Brooks	17,874	17,122	0	-17,874	-17,122	-100%	-100%	\$ (10,075)
Bullitt Central	41,767	39,437	21,281	-20,486	-18,156	-49%	-46%	\$ (11,141)
Bullitt East	35,419	34,989	11,989	-23,430	-23,000	-66%	-66%	\$ (13,714)
Bullitt Lick	9,001	8,563	5,870	-3,131	-2,693	-35%	-31%	\$ (1,604)
Cedar Grove	22,476	21,294	3,549	-18,927	-17,745	-84%	-83%	\$ (10,519)
Central Office	244	244	12	-232	-232	-95%	-95%	\$ (138)
Crossroads								
Eastside								
Freedom	11,448	11,316	3,228	-8,220	-8,088	-72%	-71%	\$ (4,485)
Hebron	13,532	13,348	0	-13,532	-13,348	-100%	-100%	\$ (11,471)
Lebanon Junction	25,234	23,892	3,627	-21,607	-20,265	-86%	-85%	\$ (12,020)
Maintenance	1,567	2,576	5,297	3,730	2,721	238%	106%	\$ 1,631
Maryville	3,894	3,824	2,316	-1,578	-1,508	-41%	-39%	\$ (569)
MW Elementary	7,831	7,265	4,443	-3,388	-2,822	-43%	-39%	\$ (2,090)
MW Middle	13,549	13,292	8,918	-4,631	-4,374	-34%	-33%	\$ (2,619)
Nichols								
North Bullitt	12,371	11,844	11,703	-668	-141	-5%	-1%	\$ (203)
Old Mill	10,468	10,273	5,607	-4,861	-4,666	-46%	-45%	\$ (2,907)
Overdale	23,174	21,979	1,764	-21,410	-20,215	-92%	-92%	\$ (11,956)
Pleasant Grove	8,412	8,170	5,626	-2,786	-2,544	-33%	-31%	\$ (1,671)
Riverview/DT	8,784	8,377	7,461	-1,323	-916	-15%	-11%	\$ (774)
Roby	8,463	8,221	33	-8,430	-8,188	-100%	-100%	\$ (5,028)
Shepherdsville	3,201	3,176	2,284	-917	-892	-29%	-28%	\$ (525)
Transportation	3,159	3,030	3,169	10	139	0%	5%	\$ (0)
Zoneton								
TOTAL	301,071	290,105	111,457	-189,614	-178,648	-63%	-62%	\$ (111,268)

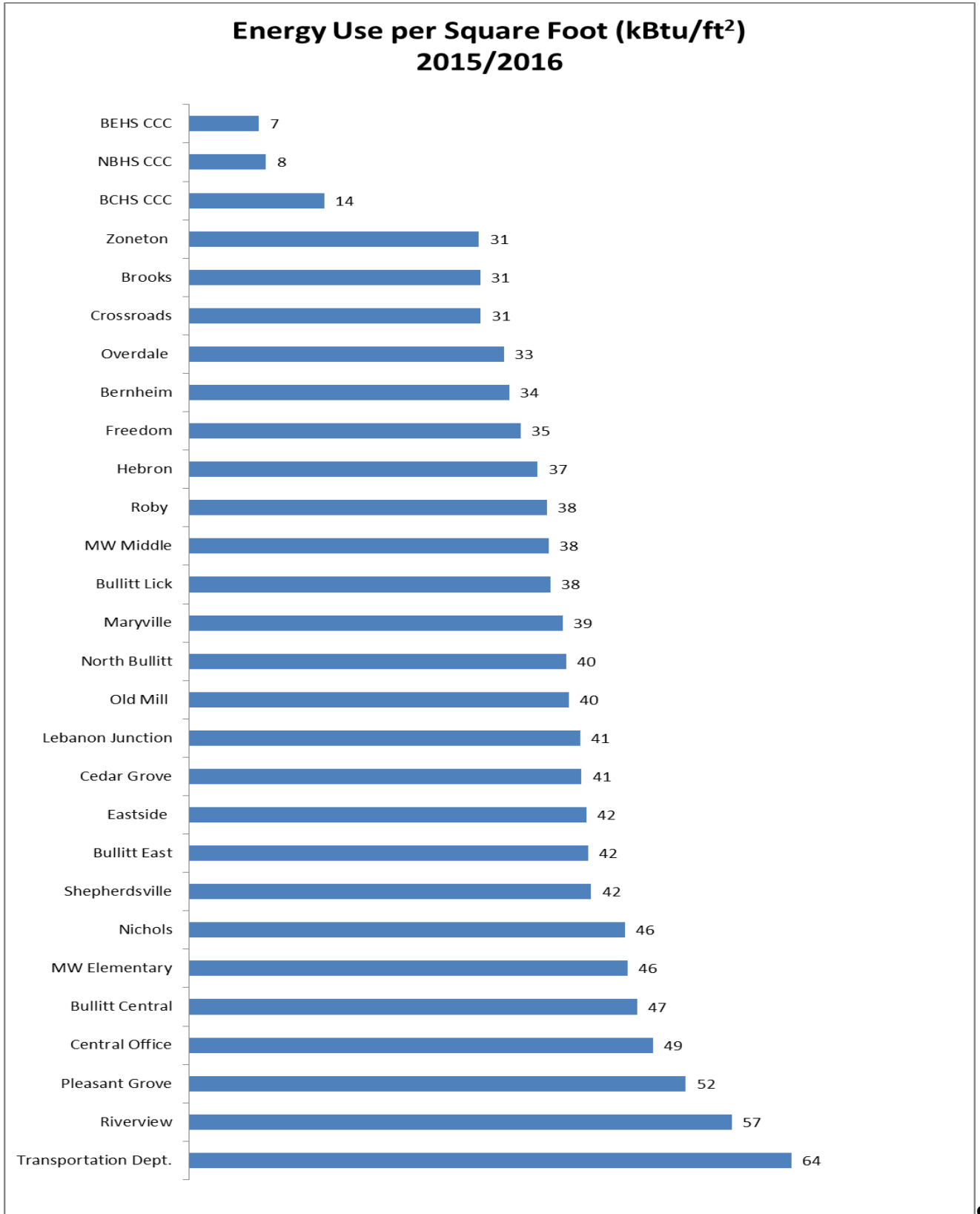
Cost Avoidance Report								
Propane Consumption: 2015/2016 Compared to Baseline								
Building	Base Year Actual (Gal)	Base Year Weather Adjusted (Gal)	Evaluation Year Actual (Gal)	Use Avoidance Non-Adjusted (Gal)	Use Avoidance Weather Adjusted (Gal)	Change Non-Adjusted %	Change Weather Adjusted %	Cost Avoidance Weather Adjusted \$
Cedar Grove	22,476	12,450	0	-22,476	-12,417	-100%	-100%	\$ (23,655)
Lebanon Junction	841	841	0	-841	1,443	-100%	-100%	\$ (1,597)
Nichols	19,421	18,104	0	-19,421	-14,935	-100%	-100%	\$ (36,900)
Roby	8,412	8,412	0	-8,412	-8,412	-100%	-100%	\$ (15,982)
TOTAL	51,150	39,806	0	-51,150	-34,320	-100%	-100%	\$ (78,135)

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.

For this year (FY16), 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



(kBtu/ft²)

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

Month	Total Energy Usage (kBtu)				Weather Data			
	Baseline	2014/2015	2015/2016	% Change from Baseline	2015/2016		Baseline	
					CDD	HDD	CDD	HDD
Jul	7,842,724	4,710,743	4,719,894	-40%	436	0	429	0
Aug	9,163,947	7,148,442	6,590,064	-28%	346	4	389	5
Sep	9,724,941	7,025,489	7,141,564	-27%	277	31	218	17
Oct	8,119,551	5,741,997	5,284,257	-35%	70	196	47	167
Nov	8,785,461	7,287,849	6,096,541	-31%	17	390	4	436
Dec	11,421,630	8,120,106	6,607,412	-42%	8	489	0	910
Jan	11,009,598	9,922,407	8,360,181	-24%	1	952	0	725
Feb	10,839,871	10,228,697	8,900,542	-18%	3	715	0	702
Mar	9,523,164	7,279,833	6,233,448	-35%	28	367	0	595
Apr	7,649,624	5,059,196	5,518,387	-28%	81	235	45	171
May	8,102,269	6,129,684	5,895,376	-27%	131	119	93	97
Jun	7,672,321	4,809,506	4,771,262	-38%	399	3	317	0
Total YTD	109,855,102	83,463,948	76,118,929	-31%	1797	3501	1540	3824

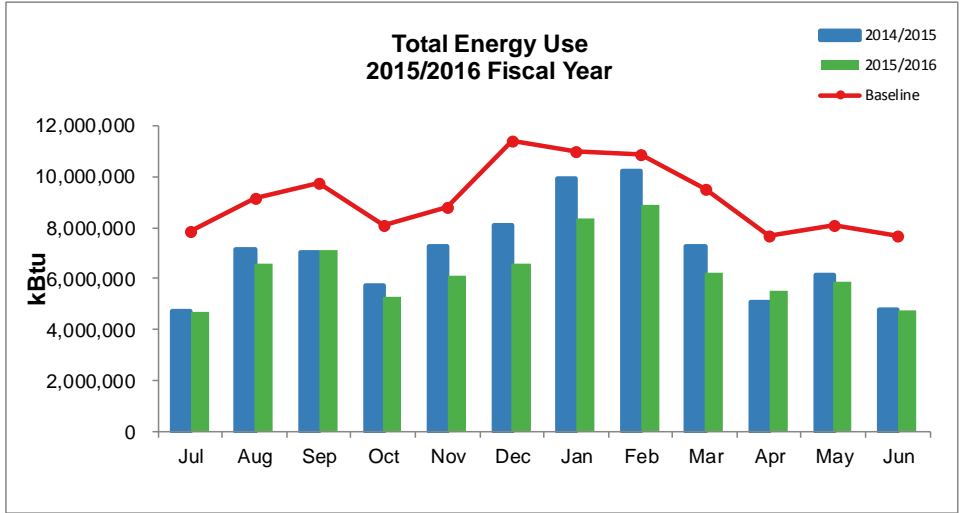


Figure 4 – Non-Adjusted Electricity Use

Month	Total Electric Usage (kWh)				Weather Data			
	Baseline	2014/2015	2015/2016	% Change from Baseline	2015/2016		Baseline	
					CDD	HDD	CDD	HDD
Jul	2,176,764	1,332,702	1,339,731	-38%	436	0	429	0
Aug	2,563,169	2,012,435	1,859,108	-27%	346	4	389	5
Sep	2,722,356	1,964,415	1,996,865	-27%	277	31	218	17
Oct	2,189,157	1,557,997	1,438,965	-34%	70	196	47	167
Nov	2,133,113	1,585,808	1,523,015	-29%	17	390	4	436
Dec	2,113,475	1,601,601	1,442,834	-32%	8	489	0	910
Jan	2,211,674	1,839,119	1,814,207	-18%	1	952	0	725
Feb	2,159,799	1,851,245	1,730,564	-20%	3	715	0	702
Mar	2,076,436	1,604,288	1,562,144	-25%	28	367	0	595
Apr	1,972,204	1,357,678	1,425,082	-28%	81	235	45	171
May	2,182,978	1,718,718	1,624,685	-26%	131	119	93	97
Jun	2,139,552	1,370,163	1,345,609	-37%	399	3	317	0
Total YTD	26,640,675	19,796,169	19,102,809	-28%	1797	3501	1540	3824

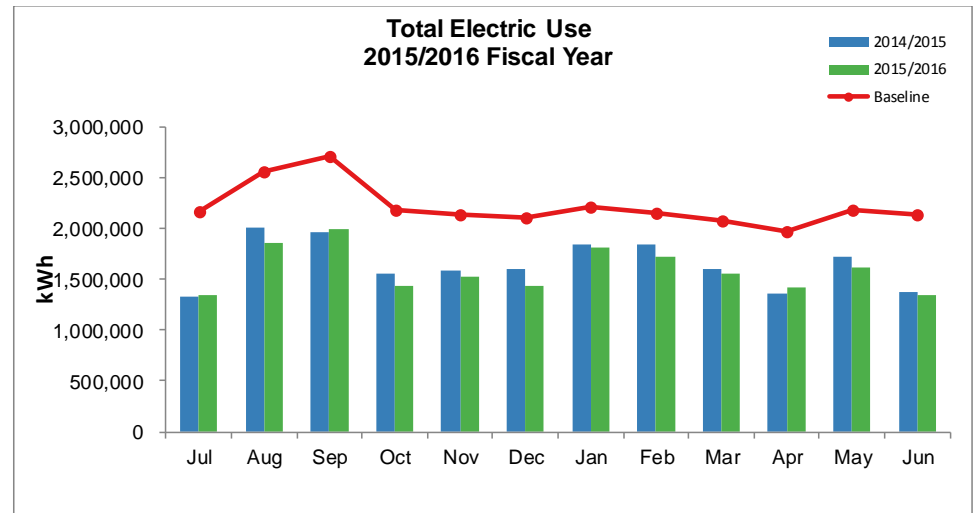


Figure 5 – Non-Adjusted Natural Gas Use

Month	Total Natural Gas Usage (CCF)				Weather Data			
	Baseline	2014/2015	2015/2016	% Change from Baseline	2015/2016		Baseline	
					CDD	HDD	CDD	HDD
Jul	4,621	1,588	1,444	-69%	436	0	429	0
Aug	5,811	2,738	2,396	-59%	346	4	389	5
Sep	6,417	3,135	3,187	-50%	277	31	218	17
Oct	8,363	4,137	3,636	-57%	70	196	47	167
Nov	18,053	18,224	8,738	-52%	17	390	4	436
Dec	45,479	25,781	16,354	-64%	8	489	0	910
Jan	37,859	35,411	21,069	-44%	1	952	0	725
Feb	37,649	37,983	29,086	-23%	3	715	0	702
Mar	26,774	17,534	8,771	-67%	28	367	0	595
Apr	11,774	4,838	6,369	-46%	81	235	45	171
May	9,139	3,356	3,417	-63%	131	119	93	97
Jun	5,827	2,093	1,748	-70%	399	3	317	0
Total YTD	217,763	156,818	106,215	-51%	1797	3501	1540	3824

