

Powell County Schools Guaranteed Energy Savings Contract Year 6 Reconciliation Report

Submitted to:

Powell County Board of Education
691 Breckinridge Street
Stanton, KY 40380

Submitted by:



July 5, 2023

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Performance Contracting | MEP Engineering | Zero Energy Engineering | Technology | Commissioning

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Executive Summary

CMTA is pleased to present the Year 6 Guaranteed Savings Reconciliation Report for the Powell County Schools project. The tables below contain basic project and scope of work information.

Table 1: Project Information

Project Name	Powell County Savings
Project Locations	Stanton, KY
# of Buildings	13 Total
Final Completion	December 15, 2017
Contract Year	6
Current Savings Period	June 1, 2022, through May 31, 2023
Report Type	Year 6 Annual Report
Report Date	July 5 th , 2023

Table 2: Annual Savings Summary

Year	Guaranteed Annual Savings			Actual Savings Through Year 6			Excess Savings
	Energy	O&M	Total Savings	Energy	O&M	Total Savings	
1	\$ 202,336	\$ 15,457	\$ 217,793	\$ 223,628	\$ 15,457	\$ 239,085	\$ 21,292
2	\$ 210,429	\$ 15,766	\$ 226,196	\$ 212,246	\$ 15,766	\$ 228,012	\$ 1,817
3	\$ 218,846	\$ 16,082	\$ 234,928	\$ 283,360	\$ 16,082	\$ 299,442	\$ 64,514
4	\$ 227,600	\$ 16,403	\$ 244,004	\$ 282,970	\$ 16,403	\$ 299,373	\$ 55,370
5	\$ 236,704	\$ 16,731	\$ 253,436	\$ 261,299	\$ 16,731	\$ 278,030	\$ 24,594
6	\$ 246,173	\$ 17,066	\$ 263,239	\$ 276,753	\$ 17,066	\$ 293,819	\$ 30,581
7	\$ 256,019	\$ 17,407	\$ 273,427				
8	\$ 266,260	\$ 17,756	\$ 284,016				
9	\$ 276,911	\$ 18,111	\$ 295,021				
10	\$ 287,987	\$ 18,473	\$ 306,460				
11	\$ 299,507	\$ 18,842	\$ 318,349				
12	\$ 311,487	\$ 19,219	\$ 330,706				
13	\$ 323,946	\$ 19,604	\$ 343,550				
14	\$ 336,904	\$ 19,996	\$ 356,900				
15	\$ 350,380	\$ 20,396	\$ 370,776				
16	\$ 364,395	\$ 20,804	\$ 385,199				
17	\$ 378,971	\$ 21,220	\$ 400,191				
18	\$ 394,130	\$ 21,644	\$ 415,774				
19	\$ 409,895	\$ 22,077	\$ 431,972				
20	\$ 426,291	\$ 22,518	\$ 448,810				
	\$ 6,025,173	\$ 375,572	\$ 6,400,745	\$ 1,540,256	\$ 97,507	\$ 1,637,762	\$ 198,167

District Savings Summary

Table 3 details the actual units of energy saved and the value of those units. The following sections of this report break down the savings information by facility including baseline usage, actual usage, and savings. For Year 6, the total project dollar savings are **12% ahead** of the guaranteed level!

Table 3: Actual Energy Cost Savings for Year 6

Powell County High School		
Unit	Units Saved	Total Savings
Consumption (kWh)	535,110	\$ 37,195
Demand (kW)	1,252	\$ 8,373
Natural Gas (CCF)	22,940	\$ 33,213
Water Consumption (kgal) *	380	\$ 5,521
Powell County Middle School		
Unit	Units Saved	Total Savings
Consumption (kWh)	421,409	\$ 29,292
Demand (kW)	785	\$ 5,250
Natural Gas (CCF)	34,434	\$ 48,597
Water Consumption (kgal) *	252	\$ 3,560
Clay City Elementary		
Unit	Units Saved	Total Savings
Consumption (kWh)	306,243	\$ 21,287
Demand (kW)	1,107	\$ 7,405
Natural Gas (CCF)	2,130	\$ 3,965
Water Consumption (kgal) *	320	\$ 7,277
Bowen Elementary		
Unit	Units Saved	Total Savings
Consumption (kWh)	226,572	\$ 15,749
Demand (kW)	366	\$ 2,449
Natural Gas (CCF)	4,932	\$ 7,861
Water Consumption (kgal) *	190	\$ 1,145
Stanton Elementary		
Unit	Units Saved	Total Savings
Consumption (kWh)	182,790	\$ 12,706
Demand (kW)	521	\$ 3,488
Natural Gas (CCF)	12,163	\$ 18,202
Water Consumption (kgal) *	152	\$ 2,821
Miscellaneous Facilities		
Unit	Units Saved	Total Savings
Consumption (kWh) **	10,122	\$ 1,396
TOTAL SAVINGS FROM ALL FACILITIES		\$ 276,753
GUARANTEED ENERGY SAVINGS - ALL FACILITIES		\$ 246,173
% AHEAD OF GUARANTEE		12%
Total kWh Saved		1,682,246
Total kW Saved		4,031
Total CCF Saved		76,599
Total kgal Saved		1,294

* Water savings figures are IPMVP Option A

** Miscellaneous Facilities electric savings figures are IPMVP Option A

Figures 1 and 2 show the district-wide electric consumption and gas profiles for the sixth year of the guarantee period (June 2022 – May 2023). The baseline period is the two-year average of January 2013 through December 2014 as presented in Exhibit K of the contract.

Figure 1: District-wide electricity consumption tracker showing a **41% reduction** in kWh

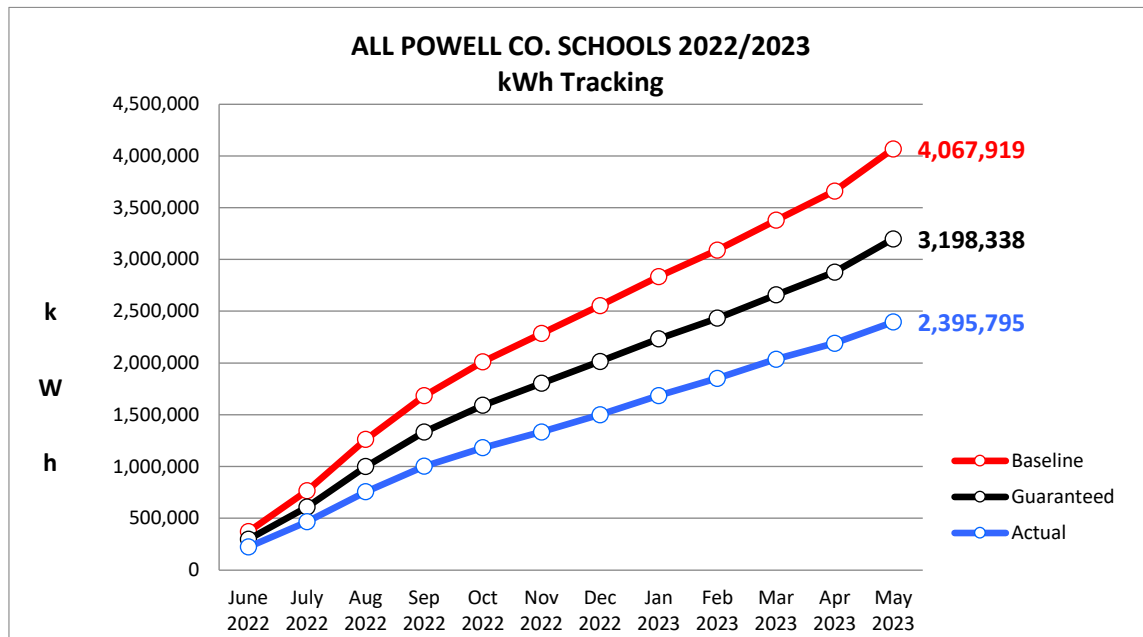


Figure 2: District-wide Natural Gas consumption tracker showing a **50% reduction** in CCF.

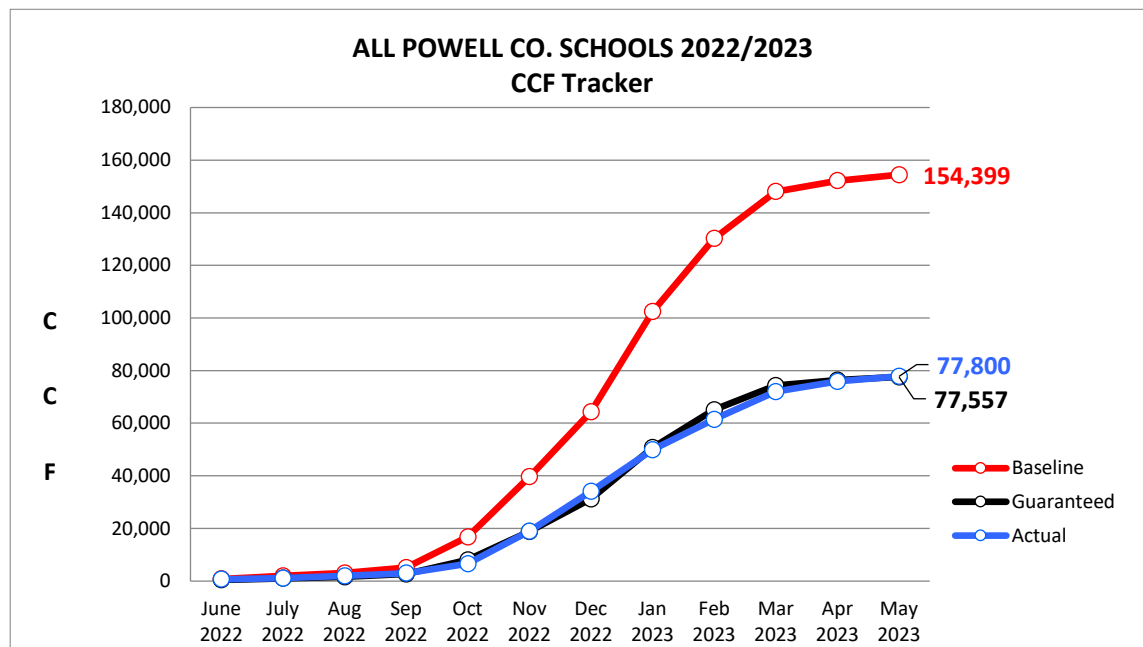
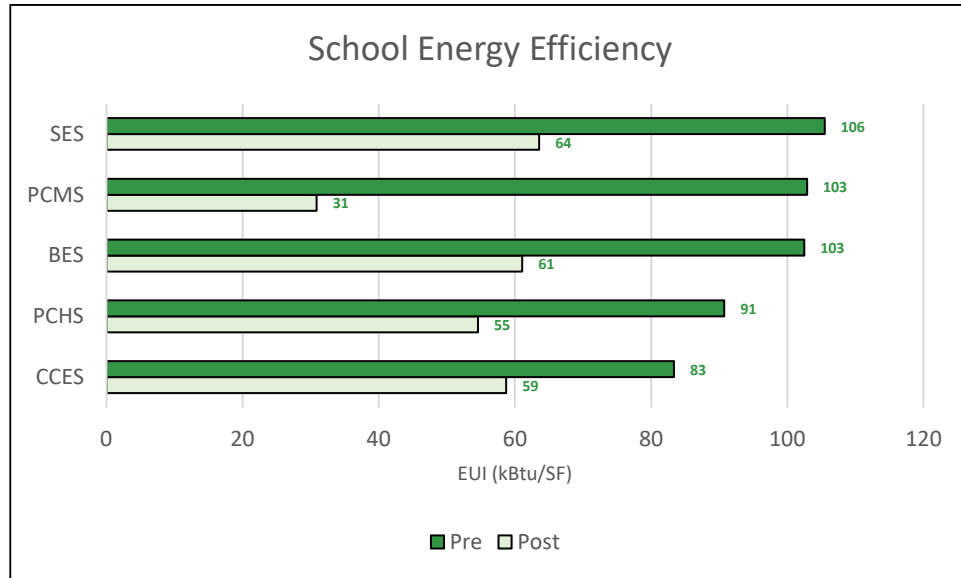


Figure 3: School-by-School Energy Efficiency Performance.



School Energy Efficiency

Figure 3 shows how energy efficient your schools were before the Guaranteed Energy Savings Project compared to after the project. The industry standard of comparing energy efficiency of a building is called the EUI, or Energy Use Index. This value is determined by using actual kWh and natural gas consumption from utility bills and converting them into their BTU, or British Thermal Unit, equivalent and then dividing that by the square footage of the building. The **lower the score, the more energy efficient the building is.**

Powell County Middle School is the best performer of the Powell County Schools. The geothermal HVAC system installed at the middle school is the most energy efficient system available in today's market – and Figure 3 illustrates this. **PCMS experienced a 70% reduction in energy use with this system installed!** The middle school is operating with an EUI of 31, which is far below the national average. The national average EUI for education facilities is 62.7, based on the 2018 CBECS report published by the U.S Energy Information Association (EIA).

Powell County High School

Scope of Work:

1. HVAC Control System Upgrade

Equipment control devices were replaced and linked to a new direct digital controls system. The control device for each piece of equipment was programmed to have a graphics screen for interfacing on the controls system with various adjustable energy parameters.

2. Lighting Upgrades

LED lighting upgrades were made for both the interior and exterior of the facility. This included gym lighting, tube retrofits for all interior fixtures, exterior wall pack and canopy lights, and shoebox-style pole light fixtures.

3. Plumbing Fixture Replacements

The plumbing fixtures were upgraded to optimize flow for a balance of functionality and energy savings. These upgrades included water flow moderators for sinks and flush valve retrofits for toilets and urinals. Please refer to the Water Savings section of this report for more details.

Savings Summary:

Table 4: Powell County High school savings summary showing kWh, kW, and CCF savings

Month	Baseline			Year 6 Post-Project			Year 6 Post-Project Savings		
	Electrical		Gas	Electrical		Gas	Electrical		Gas
	kWh	kW	CCF	kWh	kW	CCF	kWh	kW	CCF
June 2022	124,951	376	164	104,950	324	216	20,001	52	-52
July 2022	137,487	362	370	114,754	318	149	22,733	44	221
Aug 2022	179,001	538	283	126,229	441	228	52,772	97	55
Sep 2022	154,573	543	373	99,947	443	268	54,626	99	105
Oct 2022	121,509	490	2,623	67,903	306	1,096	53,606	184	1,527
Nov 2022	107,535	371	7,321	59,040	270	4,448	48,495	101	2,873
Dec 2022	110,757	363	7,139	64,270	239	6,525	46,487	124	614
Jan 2023	118,202	366	12,548	72,668	255	5,699	45,534	111	6,849
Feb 2023	109,045	368	10,203	67,096	279	4,059	41,949	89	6,144
Mar 2023	115,133	361	7,227	71,834	247	3,516	43,299	114	3,711
Apr 2023	113,757	434	1,819	67,350	305	1,048	46,407	129	771
May 2023	148,970	456	666	89,769	349	544	59,201	108	122
Totals	1,540,920	5,028	50,736	1,005,810	3,777	27,796	535,110	1,252	22,940

Figure 4: Powell County High School consumption tracker showing a **35% reduction** in kWh

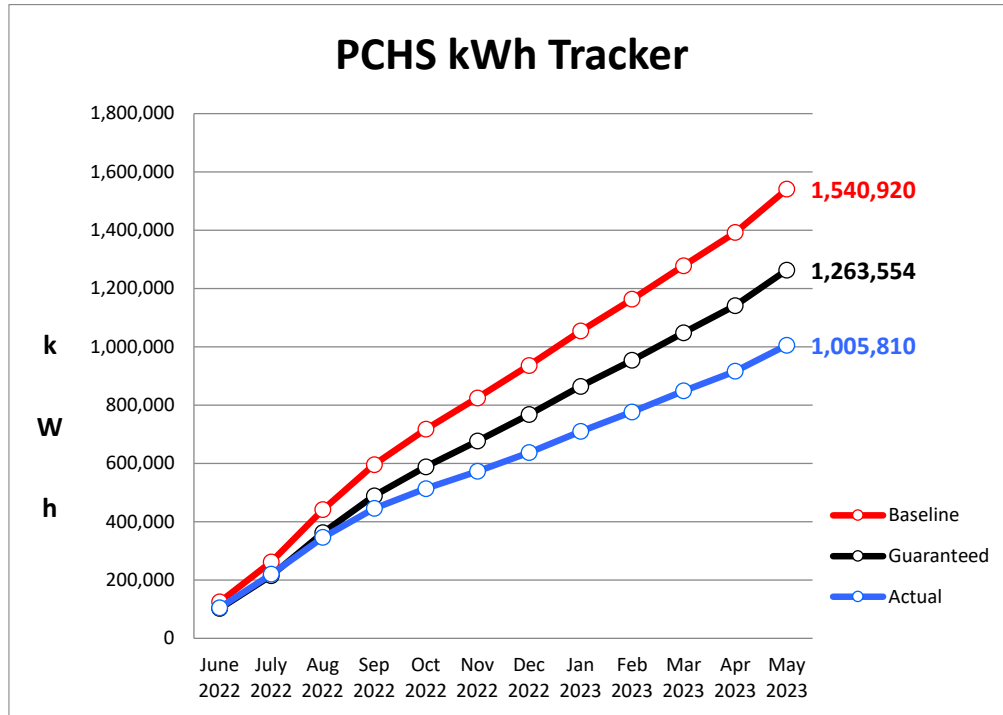
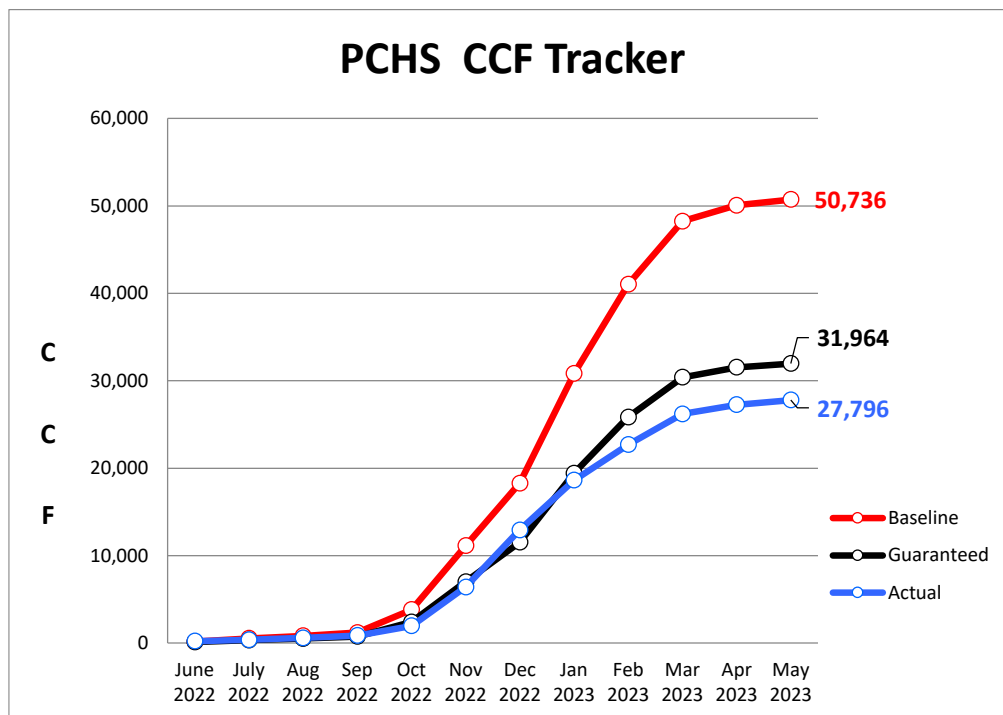


Figure 5: Powell County High School natural gas tracker showing a **45% reduction** in natural gas usage



Powell County Middle School

Scope of Work:

1. Geothermal Wellfield and HVAC System Upgrade

The existing HVAC system was replaced by a ground-source heat pump system with an accompanying geothermal wellfield. Additionally, this new HVAC system was equipped with the necessary infrastructure to be incorporated into Powell County's district-wide building automation system.

2. Lighting Upgrades

LED lighting upgrades were made for both the interior and exterior of the facility. This included gym lighting, tube retrofits for all interior fixtures, exterior wall pack and canopy lights, and shoebox-style pole light fixtures.

3. Plumbing Fixture Replacements

The plumbing fixtures were upgraded to optimize flow for a balance of functionality and energy savings. These upgrades included water flow moderators for sinks and flush valve retrofits for toilets and urinals. Please refer to the Water Savings section of this report for more details.

Savings Summary:

Table 5: Powell County Middle School savings summary showing kWh, kW, and CCF savings

Month	Baseline			Year 6 Post-Project			Year 6 Post-Project Savings		
	Electrical		Gas	Electrical		Gas	Electrical		Gas
	kWh	kW	CCF	kWh	kW	CCF	kWh	kW	CCF
June 2022	111,047	248	173	36,666	105	31	74,381	142	142
July 2022	100,635	223	180	41,828	123	23	58,807	99	157
Aug 2022	126,469	331	205	51,657	195	41	74,812	136	164
Sep 2022	110,657	343	518	52,268	201	62	58,389	141	456
Oct 2022	75,652	274	4,258	48,151	183	192	27,501	91	4,066
Nov 2022	59,620	209	7,132	41,744	179	248	17,876	30	6,884
Dec 2022	57,056	189	6,088	46,912	180	447	10,144	10	5,641
Jan 2023	59,121	181	8,263	50,026	184	378	9,095	-4	7,885
Feb 2023	49,621	193	5,728	42,667	181	384	6,954	12	5,344
Mar 2023	59,172	187	3,256	49,068	184	361	10,104	2	2,895
Apr 2023	53,724	205	946	34,555	149	191	19,169	56	755
May 2023	98,211	255	184	44,031	185	139	54,180	69	45
Totals	960,982	2,836	36,931	539,573	2,051	2,497	421,409	785	34,434

Figure 6: Powell County Middle School consumption tracker showing **44% reduction** in kWh

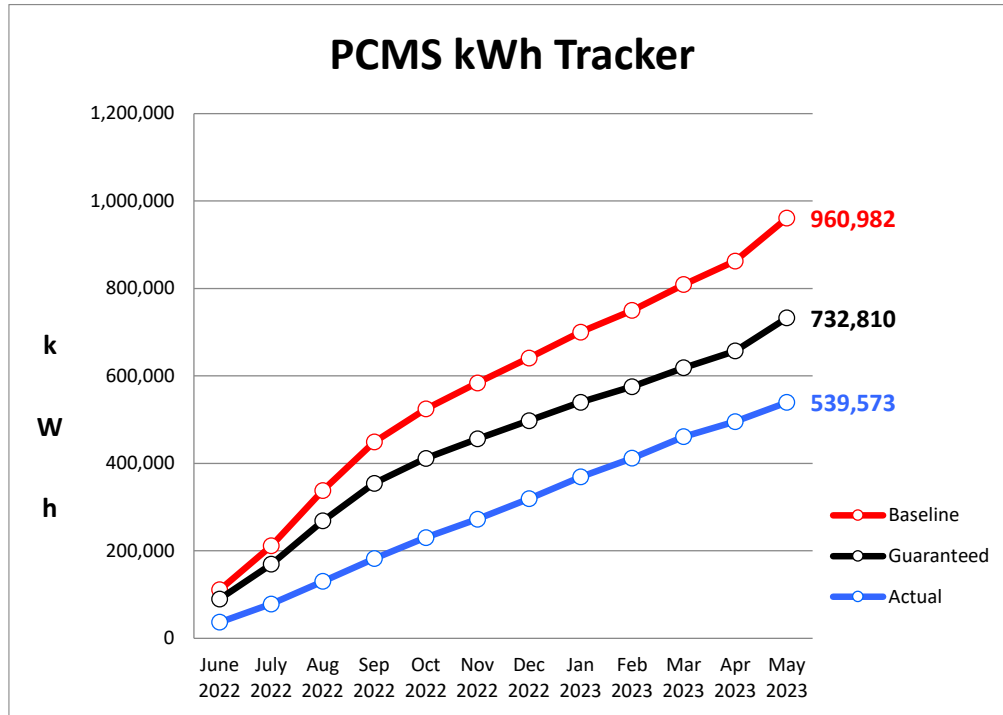
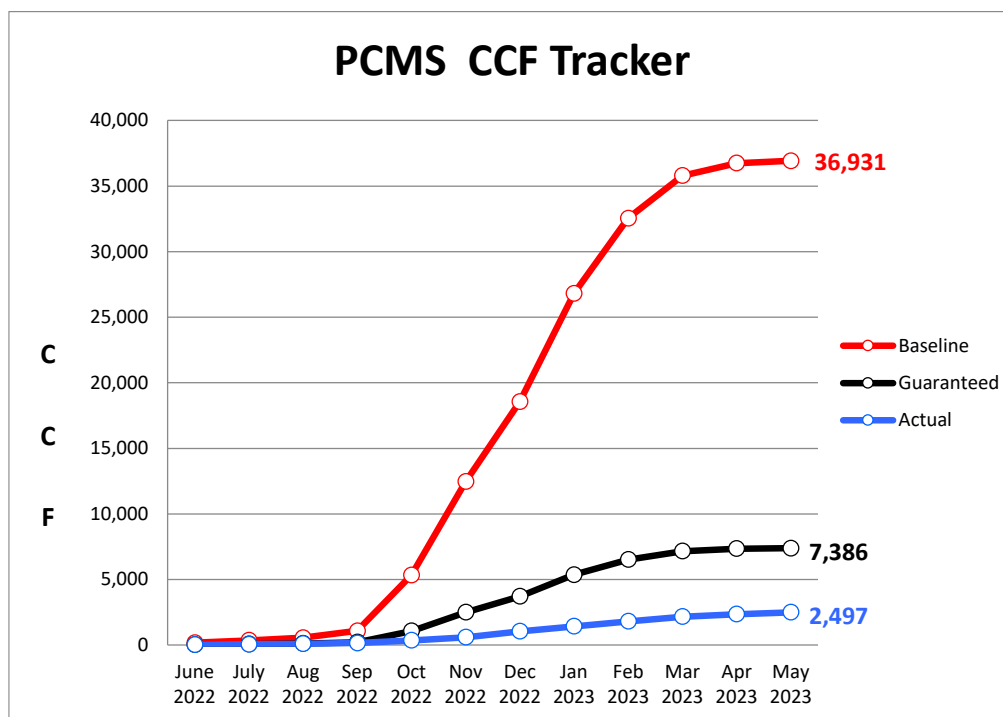


Figure 7: Powell County Middle School natural gas tracker showing **93% reduction** in natural gas usage



Clay City Elementary

Scope of Work:

1. HVAC Control System Upgrade

Equipment control devices were replaced and linked to a new direct digital controls system. The control device for each piece of equipment was programmed to have a graphics screen for interfacing on the controls system with various adjustable energy parameters.

2. Lighting Upgrades

LED lighting upgrades were made for both the interior and exterior of the facility. This included gym lighting, tube retrofits for all interior fixtures, exterior wall pack and canopy lights, and shoebox-style pole light fixtures.

3. Plumbing Fixture Replacements

The plumbing fixtures were upgraded to optimize flow for a balance of functionality and energy savings. These upgrades included water flow moderators for sinks and flush valve retrofits for toilets and urinals. Please refer to the Water Savings section of this report for more details.

Savings Summary:

Table 6: Clay City Elementary savings summary showing kWh, kW, and CCF

Month	Baseline			Year 6 Post-Project			Year 6 Post-Project Savings		
	Electrical		Gas	Electrical		Gas	Electrical		Gas
	kWh	kW	CCF	kWh	kW	CCF	kWh	kW	CCF
June 2022	54,716	186	148	29,002	92	126	25,714	93	22
July 2022	61,419	193	223	32,003	83	95	29,416	110	128
Aug 2022	84,143	283	189	46,410	169	180	37,733	115	9
Sep 2022	72,565	276	649	40,004	151	254	32,561	125	395
Oct 2022	54,247	238	2,059	27,410	105	1,028	26,837	133	1,031
Nov 2022	44,949	197	2,029	21,428	106	3,128	23,521	91	-1,099
Dec 2022	41,936	166	4,173	22,831	103	2,512	19,105	62	1,661
Jan 2023	41,356	157	5,643	26,228	110	3,578	15,128	47	2,065
Feb 2023	39,054	171	3,863	23,223	107	3,005	15,831	64	858
Mar 2023	44,471	167	902	27,224	108	2,831	17,247	59	-1,929
Apr 2023	48,846	196	271	21,613	98	1,086	27,233	98	-815
May 2023	63,325	229	180	27,408	119	376	35,917	111	-196
Totals	651,027	2,458	20,329	344,784	1,351	18,199	306,243	1,107	2,130

Figure 8: Clay City Elementary consumption tracker showing 47% reduction in kWh

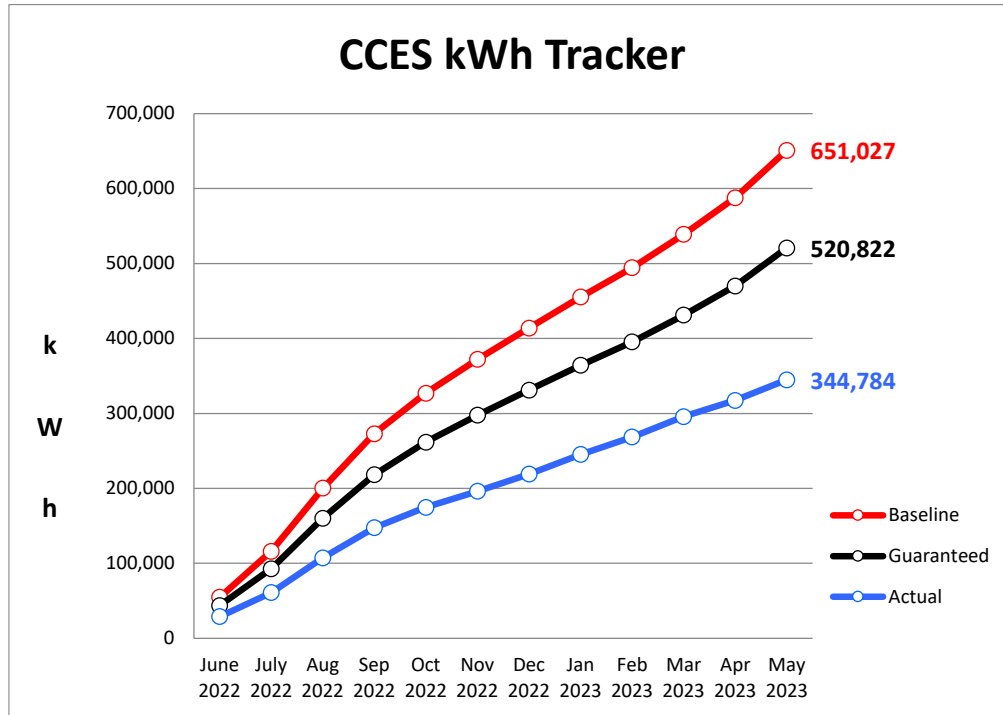
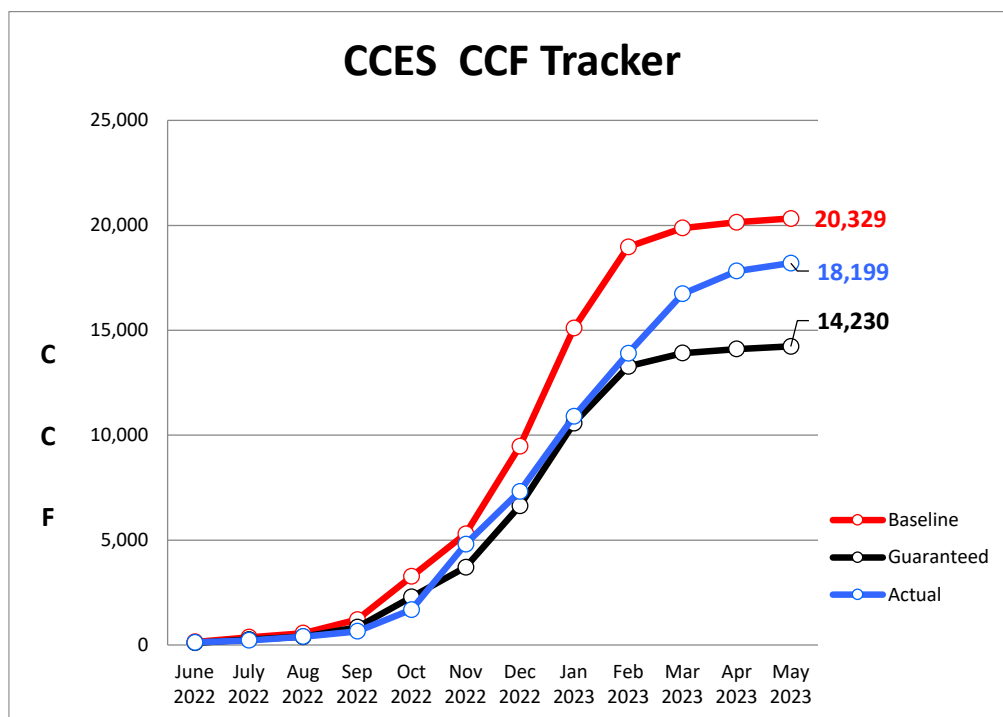


Figure 9: Clay City Elementary natural gas tracker showing 10% reduction in natural gas usage



Bowen Elementary

Scope of Work:

1. HVAC Control System Upgrade

Equipment control devices were replaced and linked to a new direct digital controls system. The control device for each piece of equipment was programmed to have a graphics screen for interfacing on the controls system with various adjustable energy parameters.

2. Lighting Upgrades

LED lighting upgrades were made for both the interior and exterior of the facility. This included gym lighting, tube retrofits for all interior fixtures, exterior wall pack and canopy lights, and shoebox-style pole light fixtures.

3. Plumbing Fixture Replacements

The plumbing fixtures were upgraded to optimize flow for a balance of functionality and energy savings. These upgrades included water flow moderators for sinks and flush valve retrofits for toilets and urinals. Please refer to the Water Savings section of this report for more details.

Savings Summary:

Table 7: Bowen Elementary School savings summary showing kWh, kW, and CCF savings

Month	Baseline			Year 6 Post-Project			Year 6 Post-Project Savings		
	Electrical		Gas	Electrical		Gas	Electrical		Gas
	kWh	kW	CCF	kWh	kW	CCF	kWh	kW	CCF
June 2022	38,648	93	89	21,778	78	90	16,870	15	-1
July 2022	54,323	113	131	25,614	79	106	28,709	35	25
Aug 2022	54,450	153	169	30,041	111	159	24,409	42	10
Sep 2022	45,700	145	240	24,898	116	158	20,802	29	82
Oct 2022	41,419	117	1,395	16,862	91	362	24,557	26	1,033
Nov 2022	30,985	88	1,831	15,151	61	1,954	15,834	27	-123
Dec 2022	28,592	83	2,468	15,741	54	2,088	12,851	28	380
Jan 2023	29,654	84	3,807	18,212	59	2,594	11,442	25	1,213
Feb 2023	25,883	86	2,066	16,109	61	1,234	9,774	25	832
Mar 2023	30,735	85	2,274	17,737	57	1,155	12,998	28	1,119
Apr 2023	35,672	129	162	14,207	59	454	21,465	70	-292
May 2023	47,619	119	873	20,758	104	219	26,861	16	654
Totals	463,680	1,295	15,505	237,108	929	10,573	226,572	366	4,932

Figure 10: Bowen Elementary School consumption tracker showing **49% reduction** in kWh

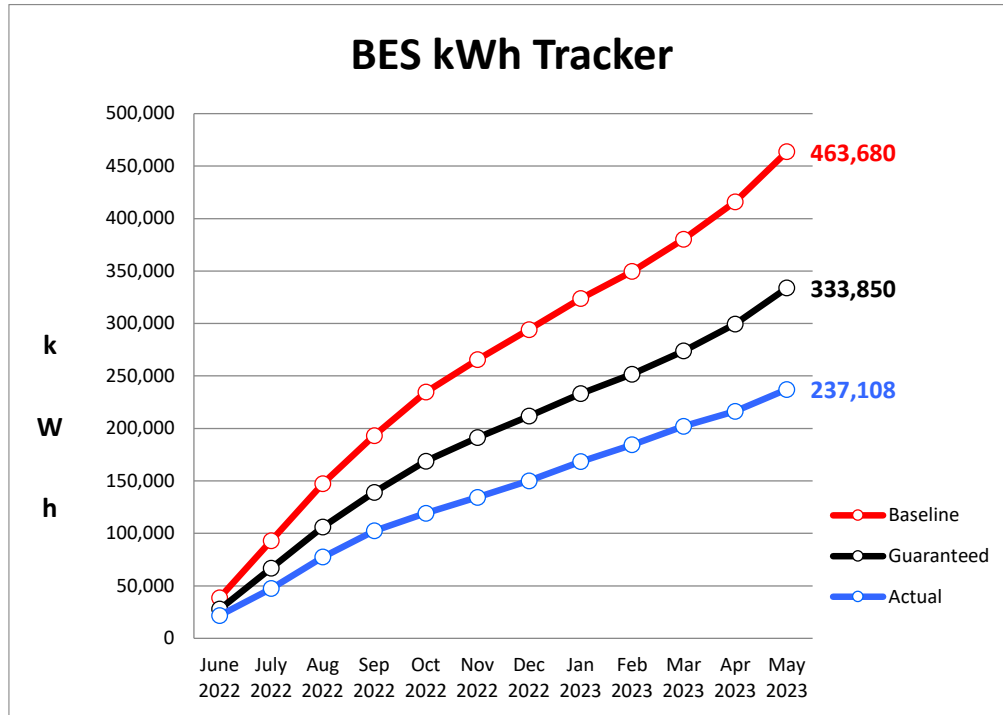
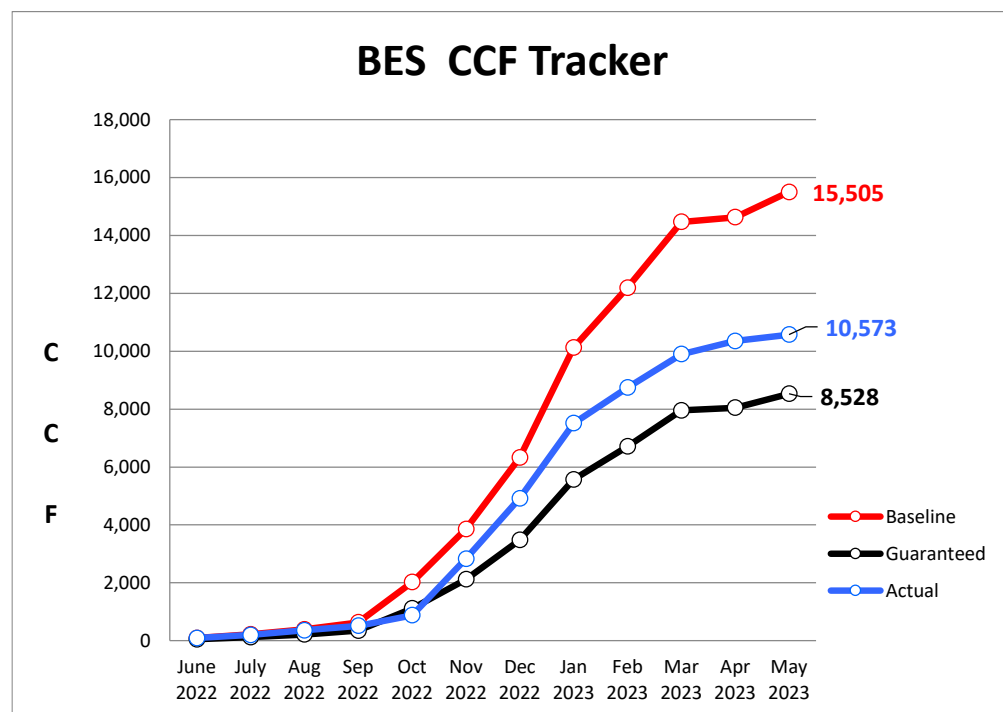


Figure 11: Bowen Elementary School natural gas tracker showing **32% reduction** in natural gas usage



Stanton Elementary

Scope of Work:

1. HVAC Control System Upgrade

Equipment control devices were replaced and linked to a new direct digital controls system. The control device for each piece of equipment was programmed to have a graphics screen for interfacing on the controls system with various adjustable energy parameters.

2. Lighting Upgrades

LED lighting upgrades were made for both the interior and exterior of the facility. This included gym lighting, tube retrofits for all interior fixtures, exterior wall pack and canopy lights, and shoebox-style pole light fixtures.

3. Plumbing Fixture Replacements

The plumbing fixtures were upgraded to optimize flow for a balance of functionality and energy savings. These upgrades included water flow moderators for sinks and flush valve retrofits for toilets and urinals. Please refer to the Water Savings section of this report for more details.

Savings Summary:

Table 8: Stanton Elementary School savings summary showing kWh, kW, and CCF savings

Month	Baseline			Year 6 Post-Project			Year 6 Post-Project Savings		
	Electrical		Gas	Electrical		Gas	Electrical		Gas
	kWh	kW	CCF	kWh	kW	CCF	kWh	kW	CCF
June 2022	41,792	86	216	29,800	56	157	11,992	30	59
July 2022	40,125	90	205	30,600	56	98	9,525	34	107
Aug 2022	52,060	129	247	34,160	79	199	17,900	50	48
Sep 2022	38,426	124	286	29,640	75	315	8,786	49	-29
Oct 2022	35,986	100	1,340	18,640	48	932	17,346	52	408
Nov 2022	29,410	88	4,596	14,620	30	2,571	14,790	58	2,025
Dec 2022	31,385	72	4,781	17,040	37	3,550	14,345	35	1,231
Jan 2023	33,050	73	7,841	18,460	37	3,571	14,590	36	4,270
Feb 2023	31,964	74	5,915	17,100	34	2,893	14,864	40	3,022
Mar 2023	38,319	79	4,234	19,340	34	2,661	18,979	45	1,573
Apr 2023	30,855	97	893	16,360	47	1,121	14,495	50	-228
May 2023	47,938	112	344	22,760	69	667	25,178	43	-323
Totals	451,310	1,123	30,898	268,520	601	18,735	182,790	521	12,163

Figure 12: Stanton Elementary School consumption tracker showing **41% reduction** in kWh

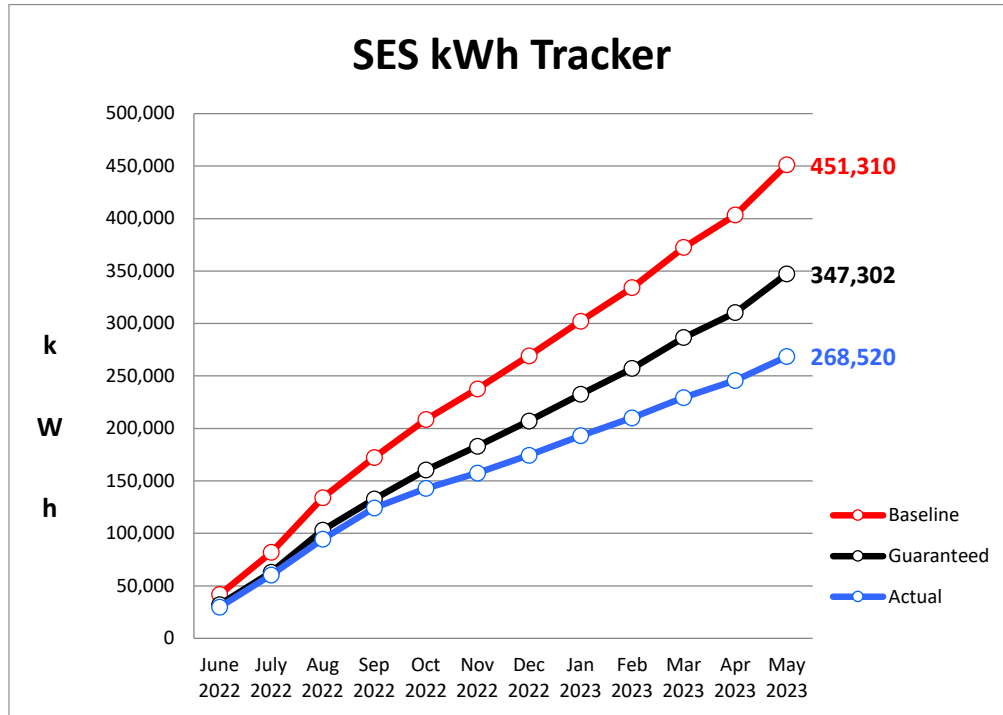
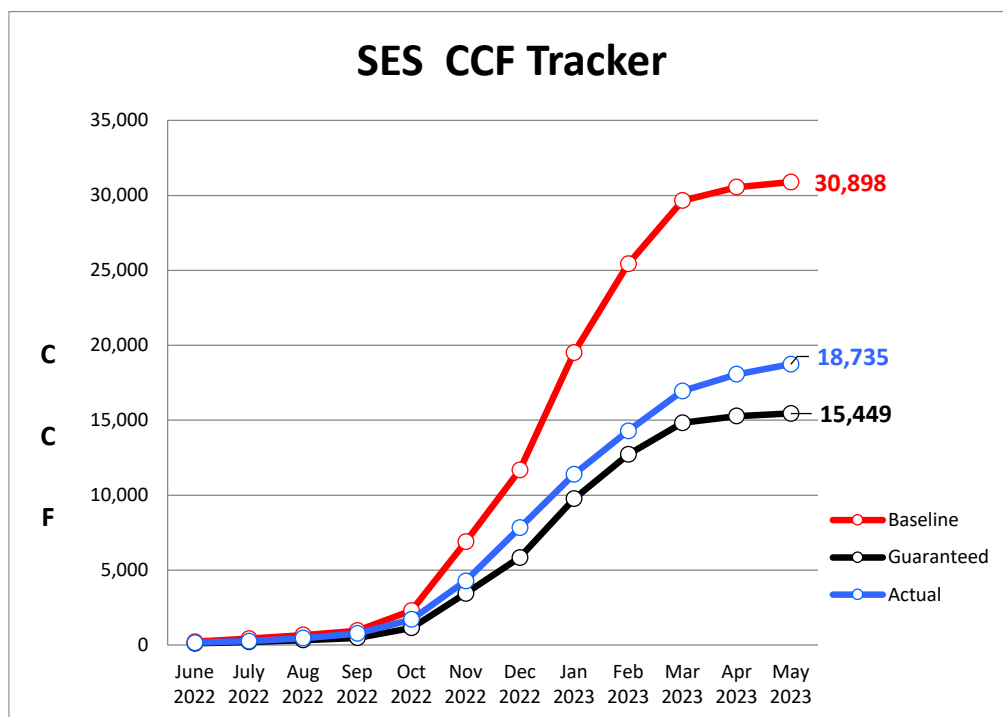


Figure 13: Stanton Elementary School natural gas tracker showing **39% reduction** in natural gas usage



Miscellaneous Facilities

Scope of Work:

1. Lighting Upgrades

LED lighting upgrades were made for both the interior and exterior of the following non-school facilities throughout the district: the Academy, Adult Education, Annex, Board Office, Bus Garage, Greenhouse, High School Fieldhouse, and Maintenance buildings. This included tube retrofits, LED fixtures and screw-in lamps, and exterior wall packs. Due to the small savings generated from this work, field measurements were performed on the lighting circuits directly before and after the upgrades to verify the savings generated (known as Option A) instead of using utility bill comparisons (known as Option C).

Savings Summary:

Table 9: Miscellaneous Facilities savings summary showing kWh savings

Miscellaneous Facilities Electric Savings				
Month	Baseline	Guarantee	Year 6 Post-Project Savings	
	kWh	kWh	kWh	\$
June 2022	14,112	13,336	776	\$107.12
July 2022	18,933	18,217	716	\$98.82
Aug 2022	16,829	16,073	756	\$104.34
Sep 2022	14,062	13,315	747	\$103.10
Oct 2022	10,798	9,819	979	\$135.01
Nov 2022	14,299	13,478	821	\$113.24
Dec 2022	15,374	14,471	903	\$124.60
Jan 2023	27,450	26,274	1,176	\$162.22
Feb 2023	20,910	19,895	1,015	\$140.09
Mar 2023	14,001	13,203	798	\$110.12
Apr 2023	12,111	11,405	706	\$97.46
May 2023	11,726	10,998	728	\$100.38
Totals	190,605	180,483	10,122	\$1,396

O&M Savings

The following table identifies the areas of O&M (Operation and Maintenance) cost that are reduced as a result of implementing this project.

Table 10: O&M Savings Summary Year 6

Description	O&M Savings
Geothermal Wellfield and HVAC System Upgrades	\$6,472
Lighting Upgrades	\$10,594
Totals	\$17,066

Water Savings

The contractual approach for measurement and verification of the water savings did not use the actual utility bill comparison like the electric and natural gas savings. Instead, the IPMVP Option A approach of using field measurements on the equipment was used to determine the savings amount. Pre and Post field measurements consisted of measuring gallons per flush (GPF) for the toilets and urinals that were replaced and gallons per minute (GPM) of the restroom hand sinks that received aerators. CMTA used the contractual M&V approach to determine the savings included previously in this report, however CMTA also prides itself on being fully transparent on how well our projects perform by using actual utility data to support our Guarantees. The following graphs indicate the water consumption trends for the facilities. The data shows an increase in water consumption at the high school. After correspondence with Powell County maintenance staff, a leak was previously identified and corrected in 2021. CMTA will continue to monitor the water consumption for future reports. The following charts show the cumulative trend for Year 6 and the monthly bar chart compares the Baseline and first six years of the Guarantee showing the magnitude of the increased consumption at the high school and the growing trend of water consumption.

Figure 14: Powell County High School water tracker showing an unexpected increase in usage.

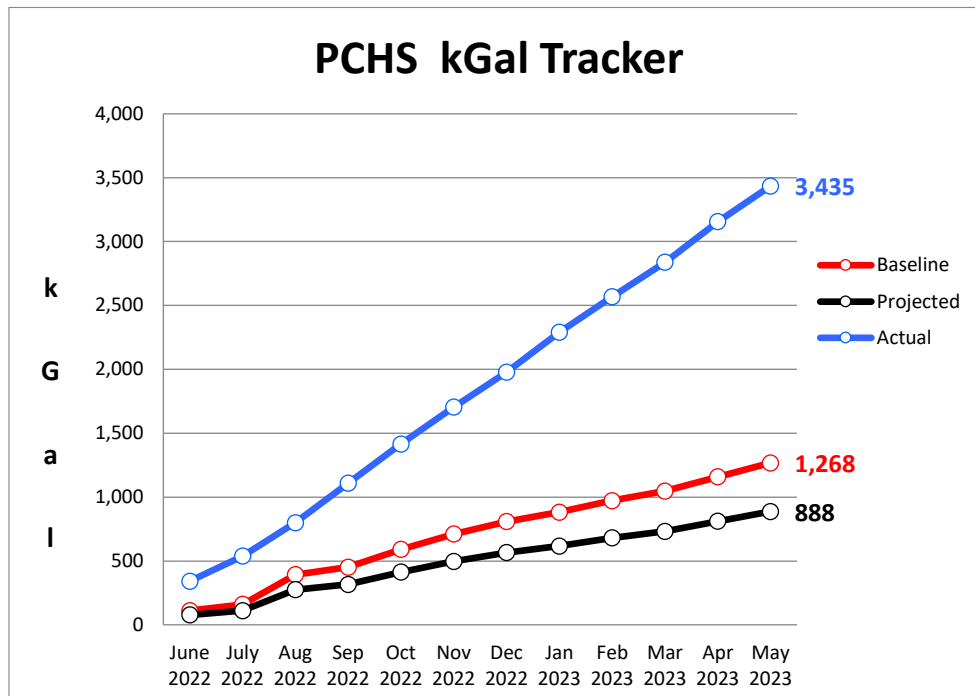
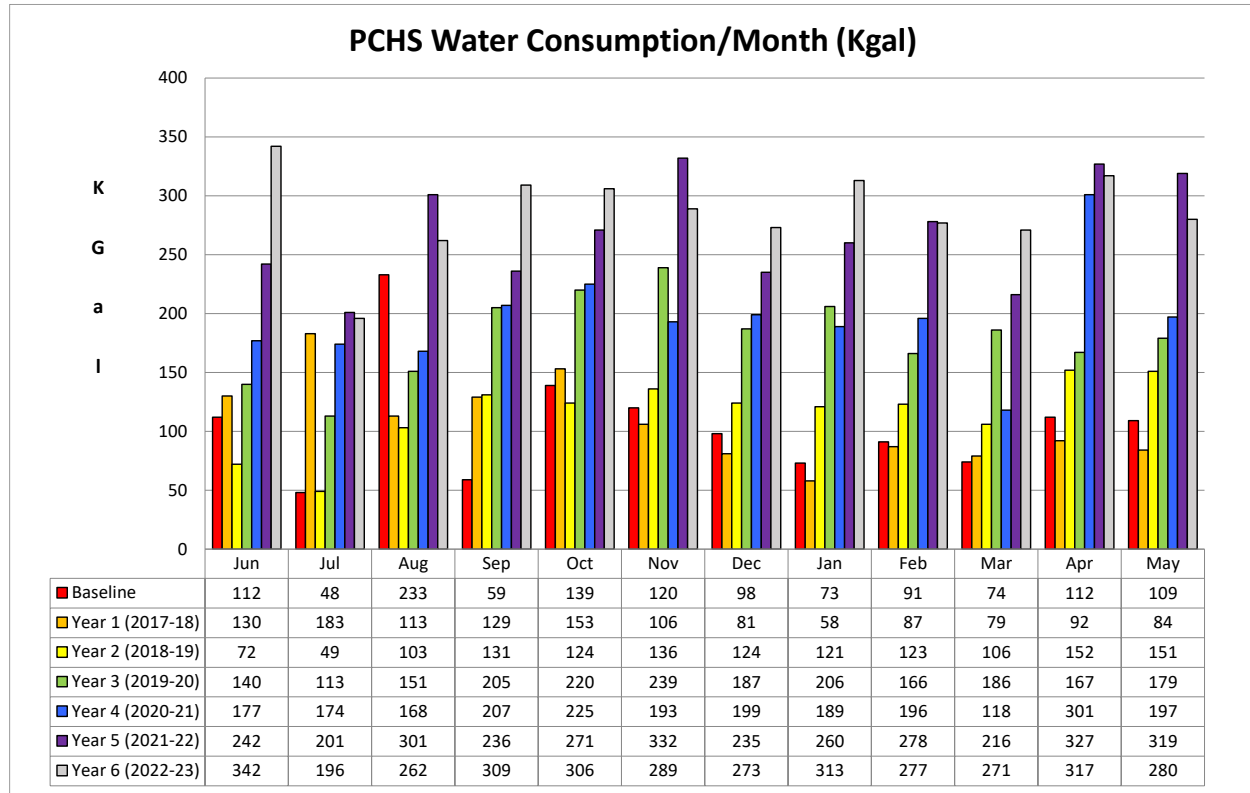


Figure 15: Powell County High School monthly water usage during all 6 years of the Guarantee.



The water consumption indicated on the bills for the remaining schools show the favorable results of the plumbing fixture replacements and indicated in the following charts. CMTA will continue to monitor the water consumption for future reports.

Figure 16: Powell County Middle School water tracker showing savings better than expected

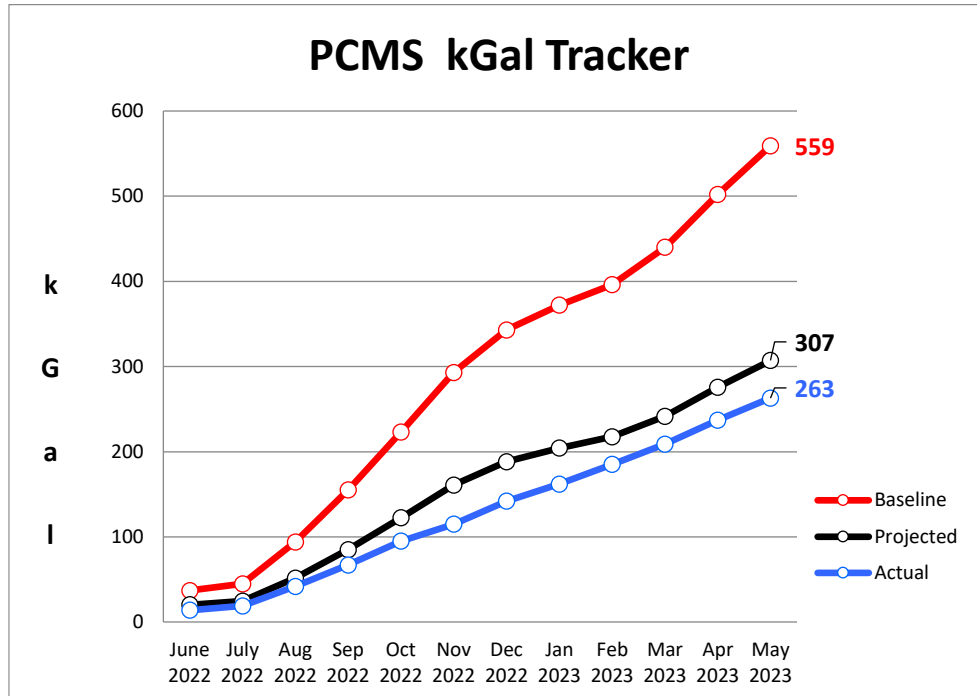


Figure 17: Clay City Elementary School water tracker showing savings better than expected.

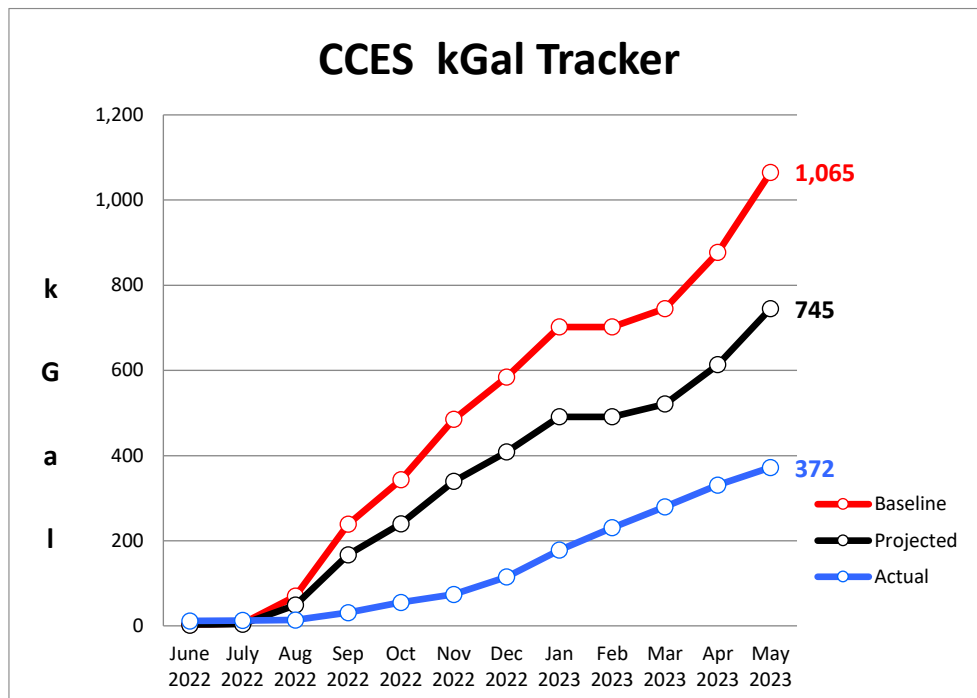


Figure 18: Bowen Elementary School water tracker showing an unexpected increase in usage.

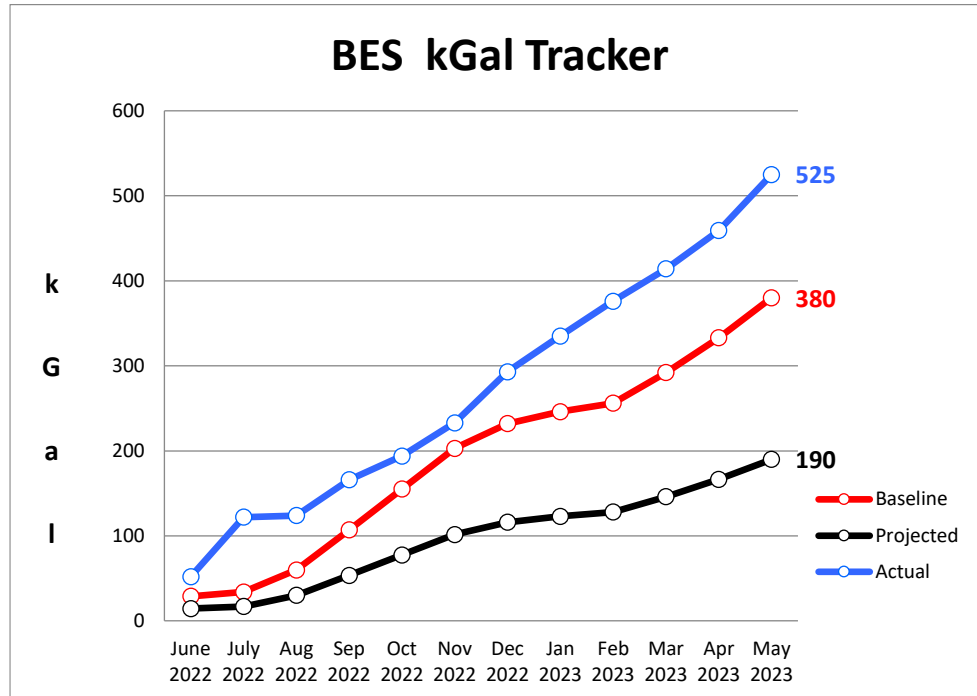


Figure 19: Bowen Elementary School monthly water trends.

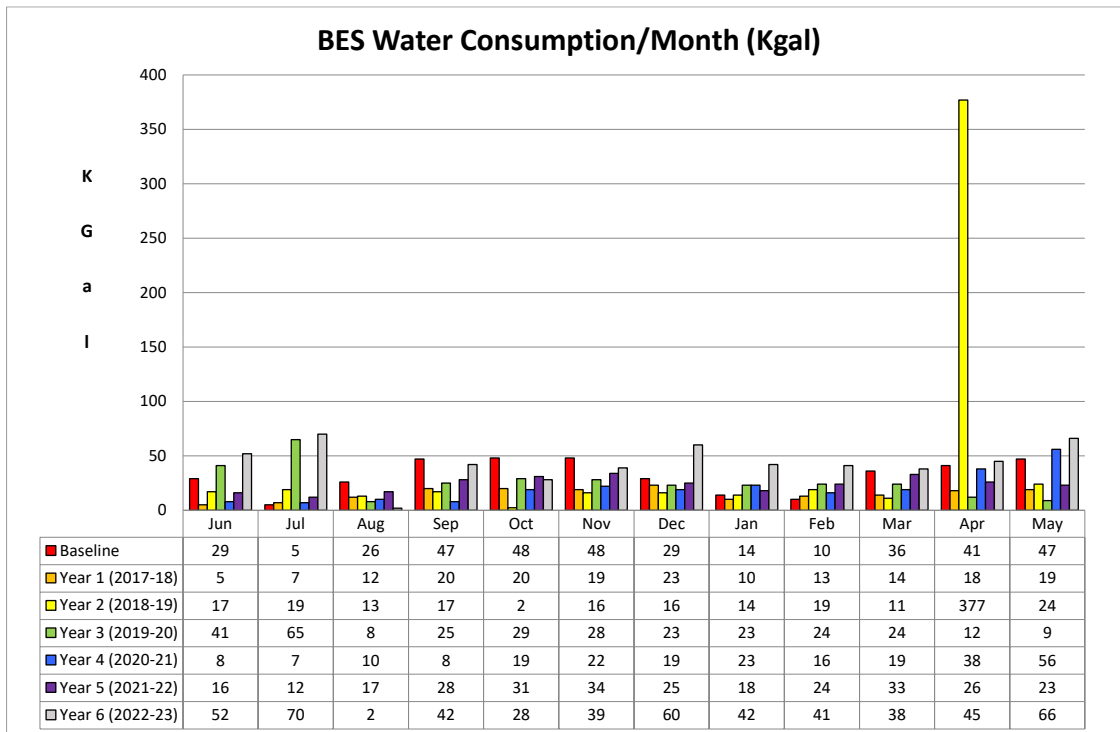


Figure 20: Stanton Elementary School water tracker showing an unexpected increase in usage.

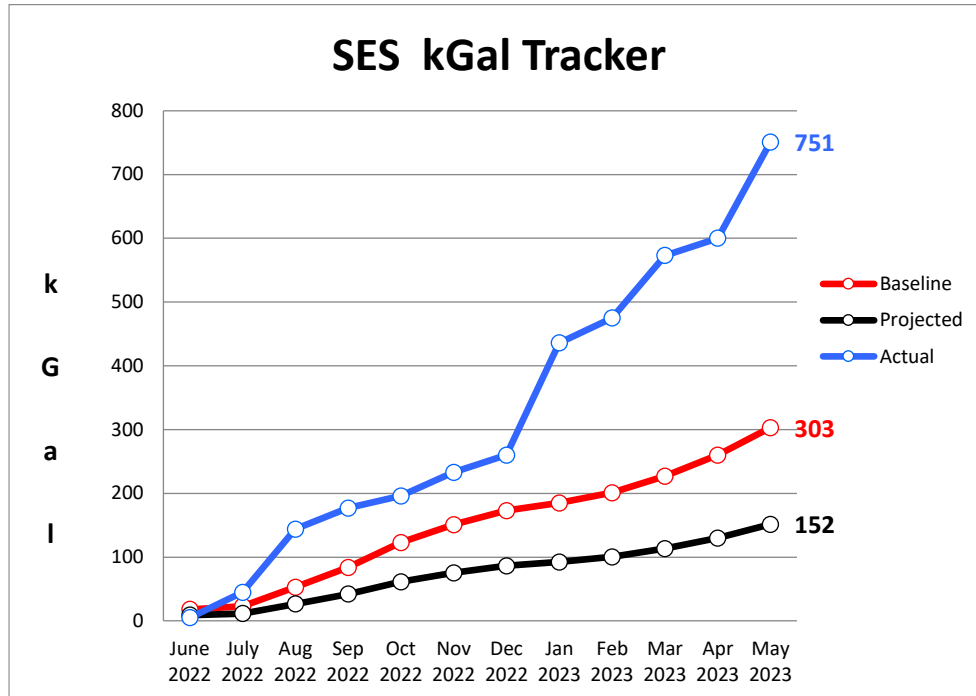
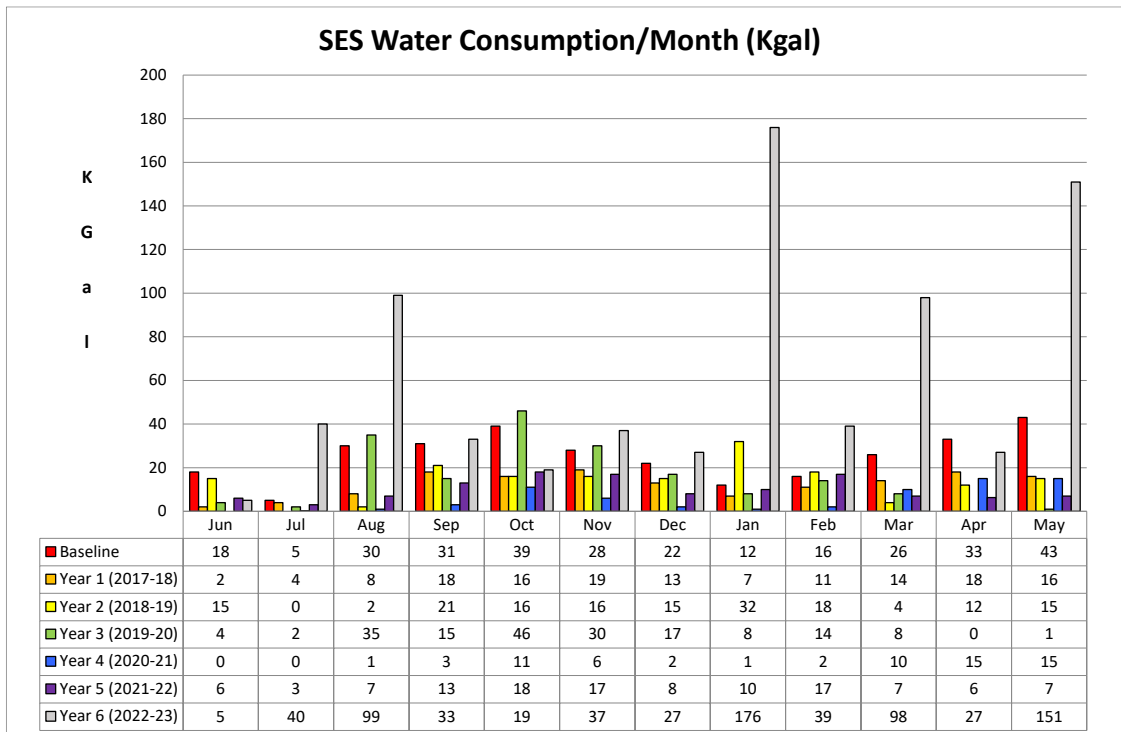


Figure 21: Stanton Elementary School monthly water trends.



Energy Management Discussion

Building Schedules

For the duration of Year 6, CMTA was engaged in facilitating building scheduling for Powell County Schools. The intent of the scheduling service is to help optimize utility savings and prevent excesses in HVAC runtime from occurring. This involves maintaining regular building schedules as well as putting in special schedules for afterhours events in coordination with the Powell County Schools facilities staff.

Table 11: Typical Building Schedules and Space Temperature Setpoints

Space Type	Occupied Schedule	Occupied Cooling Setpoint	Occupied Heating Setpoint	Unoccupied Cooling Setpoint	Unoccupied Heating Setpoint
Classrooms	6:30 am – 4:30 pm, M-F	72°F +/- 2°F	68°F +/- 2°F	80°F	60°F
Administration	6:30 am – 4:30 pm, M-F	72°F +/- 2°F	68°F +/- 2°F	80°F	60°F
Cafeteria	5:30 am – 5:00 pm, M-F	72°F +/- 2°F	68°F +/- 2°F	80°F	60°F
Kitchen	5:00 am – 2:00 pm, M-F	72°F +/- 2°F	68°F +/- 2°F	80°F	60°F
Gymnasium	6:00 am – 9:00 pm, M-F 12:00 pm – 3:00 pm, Sun	72°F +/- 2°F	68°F +/- 2°F	80°F	60°F
Summer School	6:30 am – 5:30 pm, M-F	72°F +/- 2°F	68°F +/- 2°F	80°F	60°F

Powell County Schools has been an excellent partner in these scheduling efficiency efforts. CMTA Energy Solutions will continue to help ensure that operating hours, and consequent utility expenditures, do not reach excessive levels again. The district's investment in the scheduling service pays for itself multiple times over in utility savings and will continue to do so. As a result, the district's investment in this Guaranteed Energy Savings Contract will be further protected in the years to come.