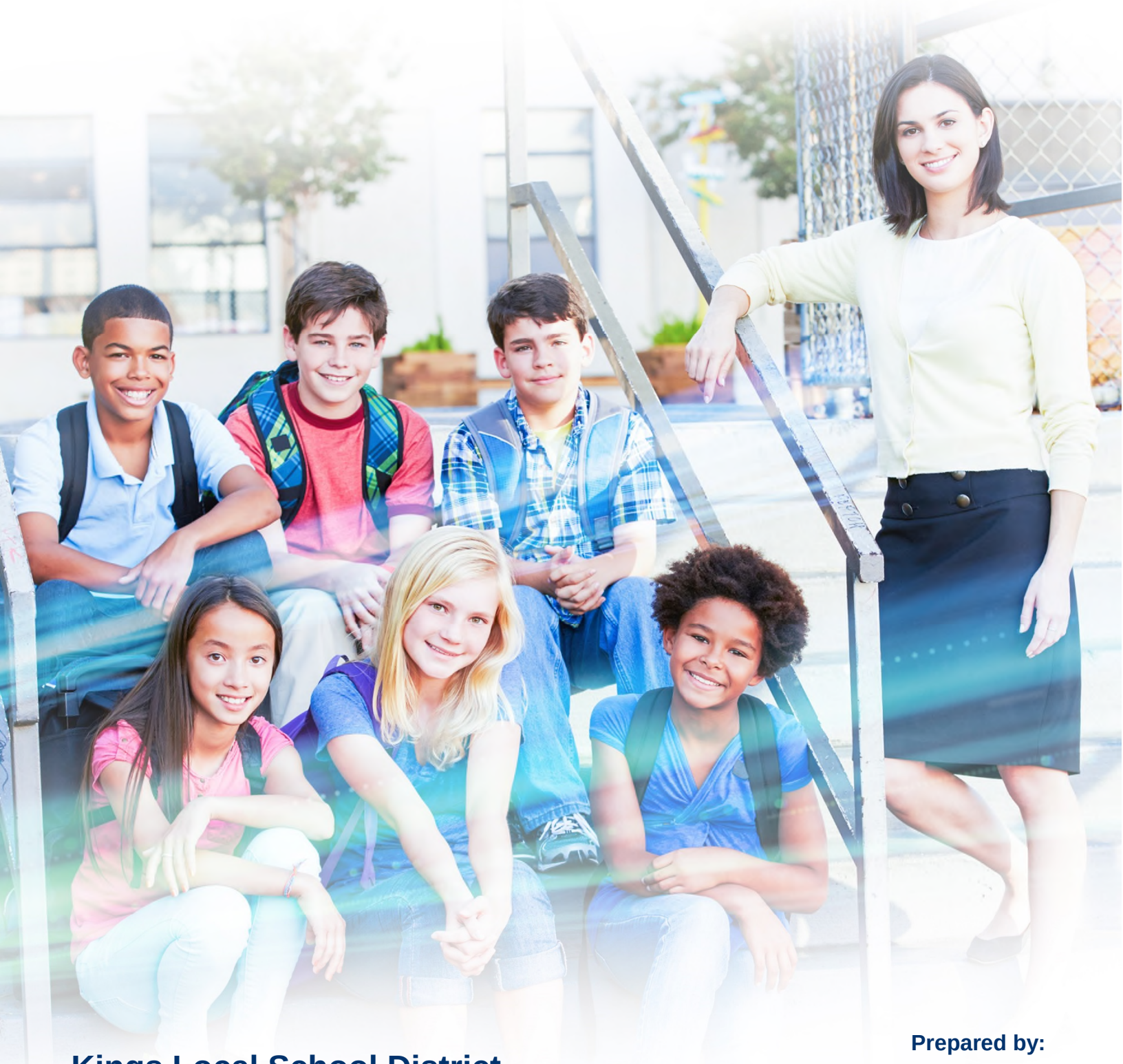
TRANE

Year 1

Measurement and Verification Report



Kings Local School District

Kings Mills, Ohio

Prepared by:

Karen Mann, CMVP

Measurement & Verification Engineer

September, 2017

September 30, 2017

Mr. Tim A. Ackermann
Kings Local School District
1797 King Avenue
Kings Mills, OH 45034

RE: Trane Project #N214933
Kings Local School District
Year 1 Measurement and Verification Report

Dear Mr. Ackermann:

The following report is provided to reconcile the energy savings for year 1 of the PACT™ Agreement between Trane and the Kings Local School District.

The actual savings for the first year was $175,124, and the guaranteed savings was $177,136. During the construction period (March 1, 2015 – December 31, 2015), the project realized savings of $88,243. The table below summarizes the guaranteed and verified savings to date.

	Guaranteed Savings	Verified Savings	Excess/Shortfall
Construction Period		$88,243	$88,243
Guarantee Period Year 1	$177,136	$175,124	-$2,012
Total Savings	$177,136	$263,367	$86,231

In keeping with the standards of the International Performance Measurement and Verification Protocol (IPMVP), the attached report provides detailed information regarding the methodology used for measuring and verifying the energy savings achieved.

We appreciate the opportunity to be your partner in energy efficiency.

Best regards,

Karen L. Mann

Karen L. Mann, CMVP

Measurement and Verification Engineer

Kings Local Schools

Year 1 Measurement and Verification Report

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Section 1: Measurement and Verification Summary

Background

This document is in reference to the PACT™ Agreement (hereinafter the "agreement") made and entered into as of February 5, 2015, by and between Trane and Kings Local School District, for the purpose of furnishing services designed to reduce energy consumption and operational costs at the premises, to guarantee a specified minimum level of energy savings.

Year 1 - Energy Savings

This section summarizes the savings generated during the year 1 guarantee period, June 1, 2016 to May 30, 2017. Two (2) different methods are utilized to measure and calculate energy savings, based on International Performance Measurement and Verification Protocol (IPMVP): 1) Whole Facility IPMVP Option C, and 2) Mutually agreed upon (stipulated) savings, which is data that will not be measured, monitored or adjusted. The type and location of each Energy Conservation Measure (ECM) were factors in determining which method was used.

Whole Facility Metering Guarantee (IPMVP Option C)

Energy savings from a total of 7 electric and 7 natural gas meters are measured and calculated using IPMVP Option C (Whole Facility). This method involves continuous measurements of the 7 Option C sites by collecting utility bills throughout the year and comparing them to baseline utility bills, using the “Metrix” energy accounting software application copyrighted by Abraxas Energy Services, Inc., as further detailed in section 6 of Exhibit E of the agreement. *Table 1.1* shows the verified energy savings during year 1 for the whole facility Option C meters. Cost savings are calculated using the base utility rates in the agreement, and section 5 of this report. Detailed results are included in the appendix of this report.

Table 1.1 - Whole Facility (Option C) Savings - Year 1

Utility	Guaranteed Savings	Verified Energy Savings	Excess/Shortfall
Electric Energy (kWh)	1,873,895 kWh	1,167,247 kWh	-706,648 kWh
Electric Demand (kW)	4,497 kW	5,382 kW	885 kW
Natural Gas (therms)	15,377 therms	24,925 therms	9,548 therms
Water (gallons)	0 gallons	0 gallons	0 gallons
Cost Savings	**$163,129**	**$161,117**	**-$2,012**

Mutually Agreed Upon Savings

Mutually agreed upon savings are savings that have been agreed upon and will not be measured, monitored, or adjusted for the duration of the contract. *Table 1.2* shows the mutually agreed upon savings during year 1. Cost savings are calculated using the base utility rates in the agreement, and section 5 of this report.

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Table 1.2 - Mutually Agreed Upon Savings - Year 1

Utility	Guaranteed Savings	Mutually Agreed Upon Savings	Excess/Shortfall
Electric Energy (kWh)	173 kWh	173 kWh	0 kWh
Electric Demand (kW)	0 kW	0 kW	0 kW
Natural Gas (therms)	229 therms	229 therms	0 therms
Water (gallons)	1,806,000 gallons	1,806,000 gallons	0 gallons
Cost Savings	**$14,007**	**$14,007**	**$0**

Total Year 1 Savings

The total year 1 savings shown below in *Table 1.3* is the sum of the option C verified savings and the mutually agreed upon savings.

Table 1.3 - Total Year 1 Savings

Utility	Guaranteed Savings	Verified + Mutually Agreed Upon Savings	Excess/Shortfall
Electric Energy (kWh)	1,874,068 kWh	1,167,420 kWh	-706,648 kWh
Electric Demand (kW)	4,497 kW	5,382 kW	885 kW
Natural Gas (therms)	15,606 therms	25,154 therms	9,548 therms
Water (gallons)	1,806,000 gallons	1,806,000 gallons	0 gallons
Cost Savings	**$177,136**	**$175,124**	**-$2,012**

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Section 2: Energy Savings Summary and Graphs

Kings Local School District

Project No.: N214933

Energy Savings Summary

Guaranteed Savings Year 1 through 15 1,874,068 kWh 4,497 kW 15,605 therms 1,806,000 gallons

Year	Period	Verified + Mutually Agreed Upon Energy Savings				Deviation from Guaranteed Savings*				Guaranteed Savings*			Cost Savings			
		Electrical Energy (kWh)	Electrical Demand (kW)	Nat Gas (therms)	Water (gallons)	Electrical Energy (kWh)	Electrical Demand (kW)	Nat Gas (therms)	Water (gallons)	Energy Savings	Operational Cost Savings	Total	Energy Cost Savings	Operational Cost Savings	Total	Excess/ Shortfall
Const.	Mar 1, 2015 - Dec 31, 2015	718,271	2,006	13,087	1,207,299								$88,243		$88,243	$88,243
1	**June 1, 2016 - May 30, 2017**	**1,167,420**	**5,382**	**25,154**	**1,806,000**	**-706,648**	**885**	**9,549**	**0**	**$177,136**	**$7,800**	**$184,936**	**$175,124**	**$7,800**	**$182,924**	**-$2,012**
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TOTALS		**1,885,692**	**7,388**	**38,241**	**3,013,299**	**-706,648**	**885**	**9,549**	**0**	**$177,136**	**$7,800**	**$0**	**$263,367**	**$7,800**	**$271,167**	**$86,231**

* Note: During the construction period there are no guaranteed savings. Savings are guaranteed in years 1-15. The construction period savings have been updated from the construction period report, dated March 24, 2017.

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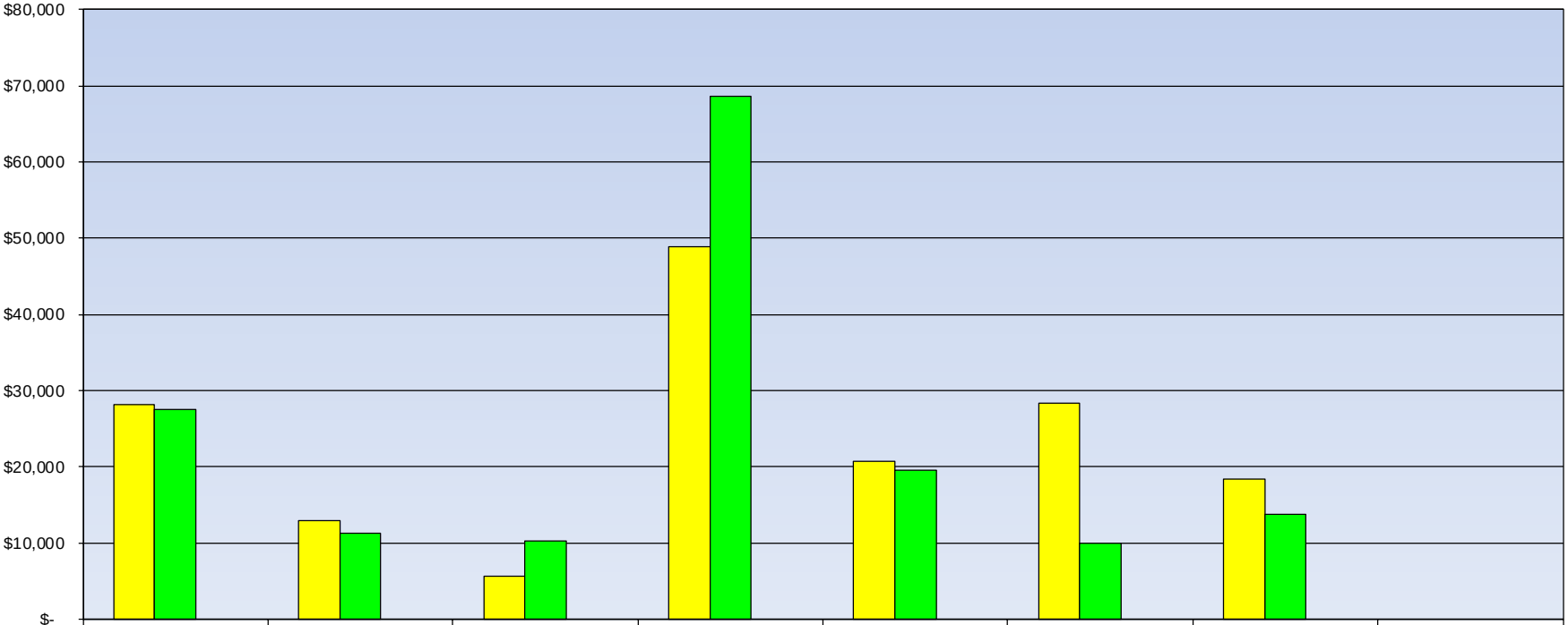
Kings Schools

Guarantee vs. Verified Cost Savings by Building

14 Option C Meters

Year 1: June 1, 2016 to May 31, 2017



	Columbia IS	JF Burns ES	Kings Education Center	Kings HS	Kings JHS	Kings Mills ES	South Lebanon ES	Y1 Savings Total
Guarantee	$28,200	$12,902	$5,664	$48,846	$20,761	$28,392	$18,365	$163,129
Verified Svgs	$27,529	$11,241	$10,325	$68,625	$19,633	$10,020	$13,745	$161,117
Over/Under	$(671)	$(1,661)	$4,661	$19,779	$(1,127)	$(18,373)	$(4,620)	$(2,012)

Kings Education Center and Kings High School's cost savings exceeded the guaranteed savings. Columbia, JF Burns and Kings Junior High fell just short of the guarantee. Kings Mills and South Lebanon experienced greater shortfalls, due in large part to the inability to completely eliminate the HRUs as planned. The exhaust fan operation was needed to maintain building exhaust and pressure, so the savings for that ECM were not fully recognized. Overall, verified cost saving fell short of the guarantee by $2,012.

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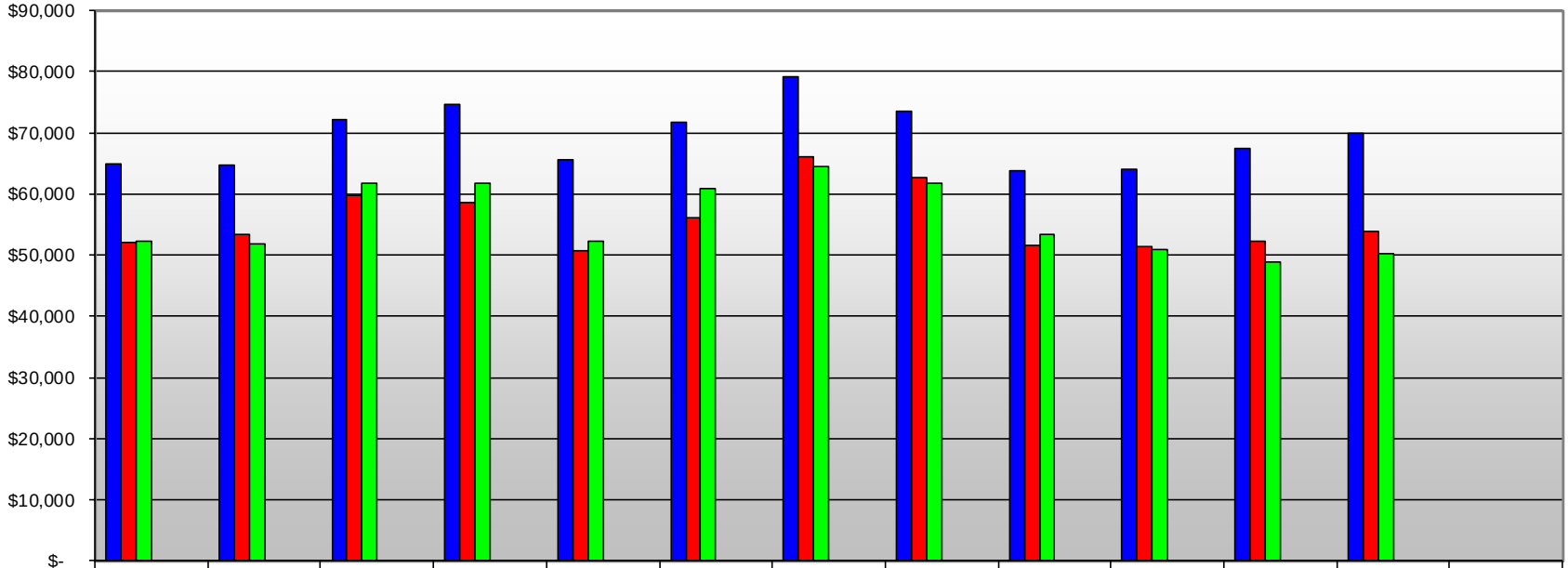
Kings Schools
Guarantee vs. Verified Cost Savings by Month
14 Option C Meters
Year 1: June 1, 2016 to May 31, 2017



	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Total
Baseline	$64,986	$64,606	$72,190	$74,723	$65,710	$71,652	$79,142	$73,577	$63,871	$64,139	$67,365	$69,840	$831,801
Target	$52,064	$53,392	$59,842	$58,719	$50,624	$56,062	$65,976	$62,743	$51,622	$51,294	$52,361	$53,973	$649,788
SimActual	$52,348	$51,813	$61,855	$61,769	$52,231	$60,972	$64,419	$61,847	$53,460	$50,842	$48,825	$50,303	$670,684
Guar Svgs	$12,922	$11,214	$12,347	$16,005	$15,086	$15,590	$13,166	$10,835	$12,249	$12,844	$15,005	$15,867	$163,129
Verified Svgs	$12,638	$12,794	$10,335	$12,955	$13,479	$10,680	$14,722	$11,731	$10,411	$13,297	$18,540	$19,537	$161,117
Over/(Under)	$(284)	$1,579	$(2,013)	$(3,050)	$(1,607)	$(4,911)	$1,557	$896	$(1,838)	$452	$3,536	$3,670	$(2,012)

- Baseline is the calculated total utility dollars based on historic utility bill patterns and the contracted rate.
- Target is the predicted total utility dollars after measures are implemented, based on the contracted rate.
- SimActual is the total utility dollars from the utility bills, corrected/simulated to the contracted rate.

Target = Baseline - Guaranteed Savings

In the last 6 months of the year 1 performance period, only one month (February) experienced a shortfall. If this trend continues, year 2 cost savings should exceed the guarantee.

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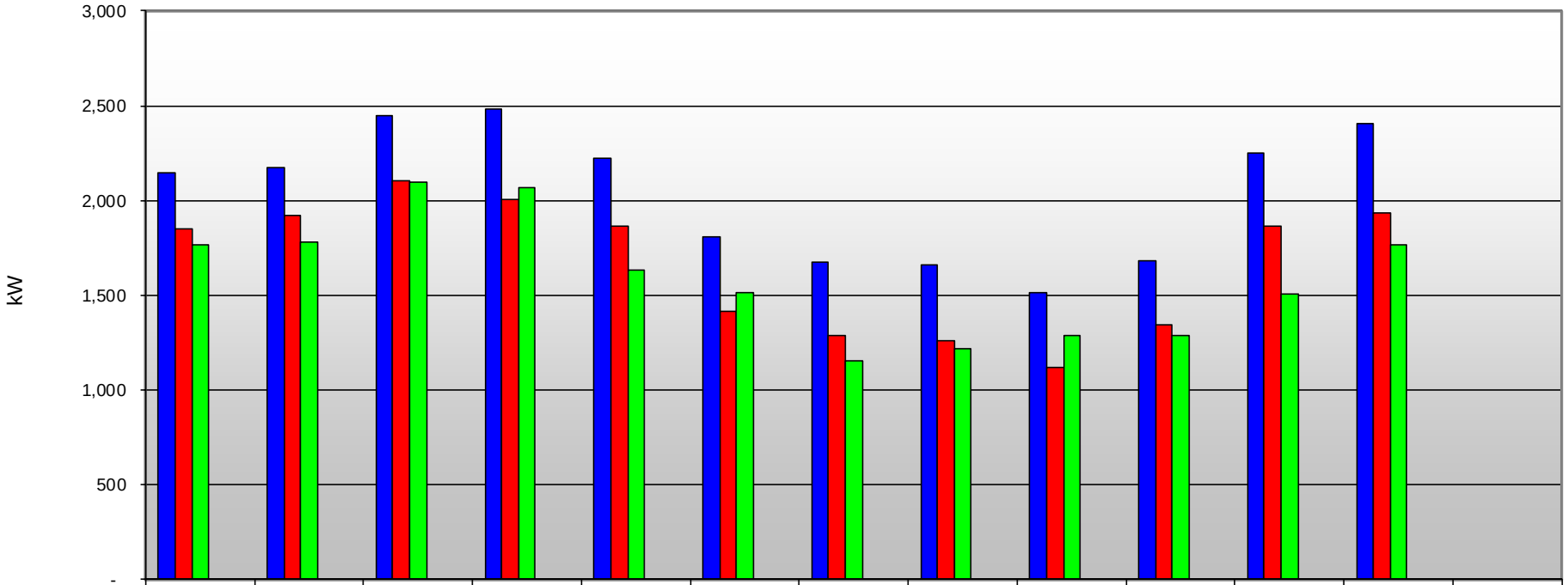
Kings Schools

Performance Summary - Electric kW

7 total electric meters



	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Total
Baseline	2,146	2,175	2,445	2,483	2,220	1,811	1,677	1,658	1,516	1,683	2,251	2,405	24,468
Target	1,851	1,917	2,102	2,004	1,865	1,418	1,289	1,260	1,122	1,344	1,865	1,932	19,972
Actual	1,765	1,782	2,099	2,070	1,631	1,516	1,157	1,217	1,285	1,291	1,508	1,765	19,086
Guar Svgs	295	257	342	479	355	393	388	398	393	339	385	472	4,497
Verified Svgs	381	393	346	413	589	295	520	441	231	391	742	640	5,382

- Baseline is the calculated kW peak demand based on historic utility bill patterns.
- Target is the predicted kW peak demand after measures are implemented.
- Actual is the kW peak demand direct from the utility bills.

Target = Baseline - Guaranteed Savings

Verified savings for electric demand exceeded the guarantee by 885 kW (verified savings – guarantee savings). See the Appendix at the end of this report for building-specific charts.

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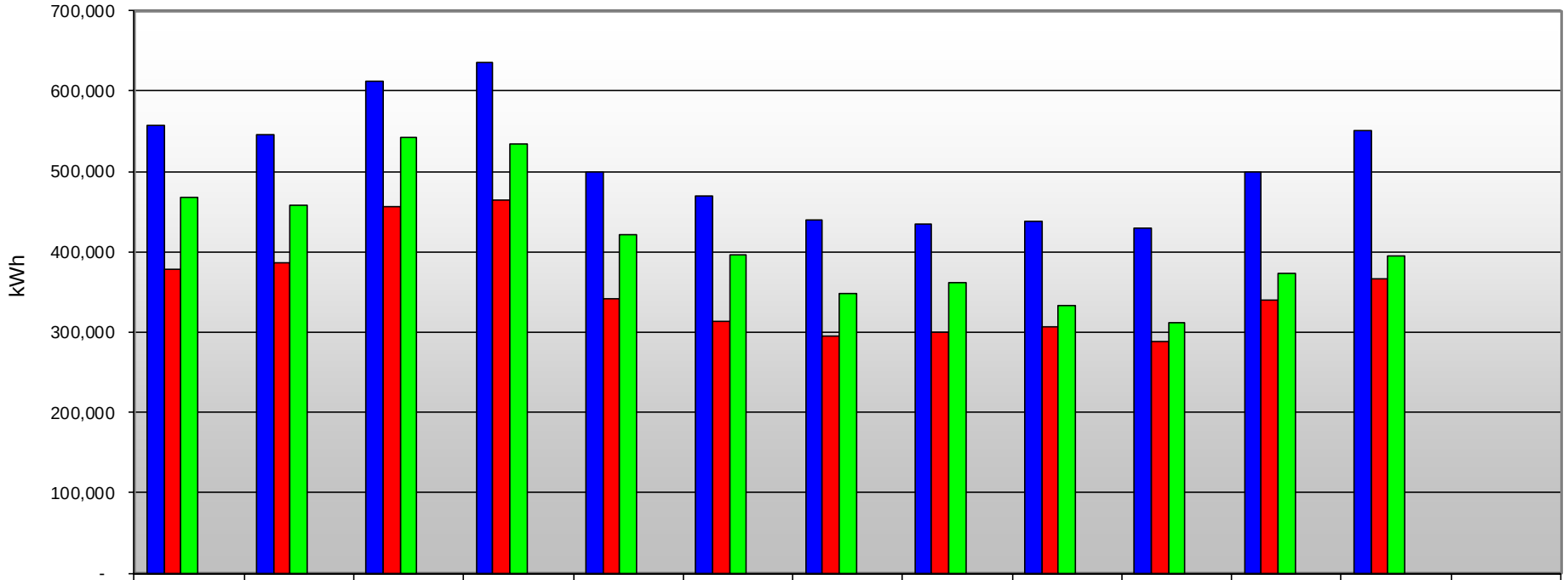
Kings Schools

Performance Summary - Electric kWh

7 total electric meters



	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Total
Baseline	557,043	545,368	612,417	634,953	499,929	468,817	439,305	434,355	437,731	429,617	498,403	551,367	6,109,304
Target	377,360	386,168	455,926	464,733	341,639	312,514	294,517	299,832	307,381	288,509	339,664	367,167	4,237,088
Actual	467,436	458,295	543,054	533,787	421,734	395,577	348,485	361,361	332,887	311,482	373,236	394,723	4,942,057
Guar Svgs	179,683	159,200	156,491	170,220	158,290	156,303	144,788	134,523	130,350	141,107	158,739	184,200	1,873,895
Verified Svgs	89,607	87,073	69,363	101,166	78,195	73,240	90,820	72,994	104,844	118,135	125,167	156,644	1,167,247

- Baseline is the calculated kWh consumption based on historic utility bill patterns.
- Target is the predicted kWh consumption after measures are implemented.
- Actual is the kWh consumption direct from the utility bills.

Target = Baseline - Guaranteed Savings

Verified savings for electric fell short of the guarantee by 706,148 kWh. See the Appendix at the end of this report for building-specific charts.

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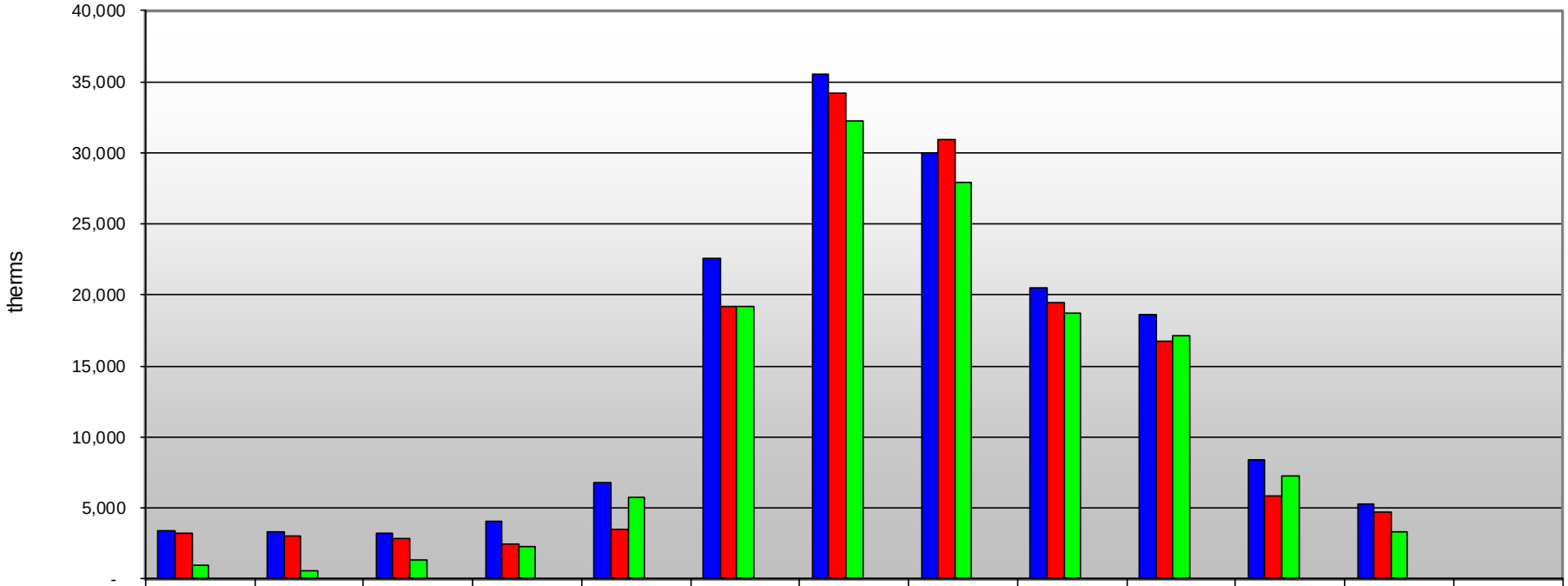
Kings Schools

Performance Summary - Natural Gas Therms

7 total gas meters



	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Total
Baseline	3,424	3,291	3,209	4,073	6,752	22,578	35,564	29,985	20,509	18,664	8,355	5,270	161,673
Target	3,192	3,054	2,886	2,505	3,502	19,185	34,182	30,965	19,506	16,754	5,828	4,736	146,296
Actual	936	606	1,381	2,304	5,728	19,176	32,240	27,922	18,746	17,155	7,259	3,295	136,748
Guar Svgs	232	237	322	1,568	3,251	3,392	1,382	-980	1,003	1,910	2,527	533	15,377
Verified Svgs	2,488	2,685	1,828	1,769	1,024	3,402	3,324	2,063	1,763	1,509	1,096	1,975	24,925

- Baseline is the calculated natural gas therms based on historic utility bill patterns.
- Target is the predicted natural gas therms after measures are implemented.
- Actual is the natural gas therms direct from the utility bills.

Target = Baseline - Guaranteed Savings

Verified savings for natural gas exceeded the guaranteed savings by 9,548 therms. See the Appendix at the end of this report for building-specific charts.

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Section 3: Mutually Agreed Upon ECM Verification

Water Conservation

This performance guarantee applies to the energy conservation measure involving the retrofits of urinals, sinks, showers, and toilets located in the following buildings:

- Kings High School
- Kings Junior High
- Columbia Intermediate School
- JF Burns Elementary School
- Kings Mills elementary School
- South Lebanon Elementary School
- Kings Education Center

The urinals, sinks, toilets, showers, and cooling towers of Kings Local Schools were surveyed and water flow rates analyzed. For the purposes of the agreement, the number of urinals, sinks, toilets and usage characteristics are stipulated.

Computation of Savings:
The following describes the stipulated methodology for computing savings based on the agreed to water flow rates, usage rates, and flush data.

Water Savings Calculation for Toilets:
Annual Water Savings (gallons) = [(EXISTWTR NEWWTR) * FLUSH# * TOILET# * DAYS#]
Annual Cost Savings = [Annual Water Savings 11,000] * WTRCOST

Water Savings Calculation for Urinals:
Annual Water Savings (gallons) = [(EXISTWTR - NEWWTR) * FLUSH# * URINAL# * DAYS#]
Annual Cost Savings = [Annual Water Savings 11,000] * WTRCOST

Water Savings Calculation for Sinks:
Annual Water Savings (gallons) = [(EXISTWTR - NEWWTR) * USE# * SINK# * DAYS#]
Annual Cost Savings = [Annual Water Savings / 1,000] * WTRCOST

Water Savings Calculation for Showers:
Annual Water Savings (gallons) = [(EXISTWTR - NEWWTR) * USE# * SHOWER# *DAYS#]
Annual Cost Savings = [Annual Water Savings 11,000] * WTRCOST

Water Savings Calculation for Leaks:
Annual Water Savings (gallons) = [(EXISTLEAK - FIXLEAK) * MINUTE# *DAYS#]
Annual Cost Savings = [Annual Water Savings / 1,000] * WTRCOS

Year 1 Savings – Water Conservation

Table 3.1 below summarizes the mutually agreed upon savings for water conservation. Cost savings have been calculated using the base utility rates as described in the agreement and section 5 of this report.

Table 3.1 Water Conservation Savings

Utility	Mutually Agreed Upon Savings
Water (gallons)	1,806,000 gallons
Cost Savings	**$13,788**

Building Envelope

This performance guarantee applies to the energy conservation measure involving building envelope improvements in the Transportation Building.

Computation of Savings:
The following describes the stipulated methodology for computing savings:

> Building Envelope Calculations for Leaks:
> (bldg. leakage x bldg. "k") x (wind P factor) x (HDD x 24 x 60) x (.075) x (.243) /100,000 x systems Efficiency %

Year 1 Savings – Building Envelope

Table 3.2 below summarizes the mutually agreed upon savings for the building envelope ECM. Cost savings have been calculated using the base utility rates as described in the agreement and section 5 of this report.

Table 3.2 Building Envelope Savings

Utility	Mutually Agreed Upon Savings
Electric Energy (kWh)	173 kWh
Natural Gas (therms)	228 therms
Cost Savings	**$219**

Year 1 – Total Mutually Agreed Savings

The following table indicates the total mutually agreed upon savings for the project. These savings have been agreed to and will not be measured, monitored, or adjusted.

Table 3.3 Total Mutually Agreed Upon Savings

Utility	Mutually Agreed Upon Savings
Electric Energy (kWh)	173 kWh
Natural Gas (therms)	228 therms
Water (gallons)	1,806,000 gallons
Cost Savings	**$14,007**

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Section 4: Building Operation

The following operational parameters were collaboratively agreed upon by Kings Schools and Trane and are stipulated as fact for the purposes of the Agreement. The parameters were used in the detailed energy analysis process to determine energy use savings and Kings Schools bears the risk of decreased energy savings if the facilities are operated outside of these parameters. Variation from these parameters will permit Trane to make an adjustment to the baseline as indicated in Section 18 of the agreement.

Operational Parameters – Original Contract

Kings High School

Kings High School HVAC Schedules and Setpoints									
Type	Day	Start	Stop	Days	Weekly Hours	Heating Setpoint		Cooling Setpoint	
						Occupied	Unoccupied	Occupied	Unoccupied
AHU1 Multi/Nurse	M-F	6.05	21.00	5	74.75	70	55	74	85
AHU2 Classroom	M-F	6.12	15.30	5	45.9	70	55	74	85
AHU2R Counselors	M-F	6.11	17.00	5	54.45	70	55	74	85
AHU3 Auditorium	M-F	7.00	17.28	5	51.4	70	55	74	85
AHU4 Gym	M-F	6.25	21.30	2	30.1	70	55	74	85
AHU6 Vocal/Art	M-F	6.07	15.30	5	46.15	70	55	74	85
AHU7 Locker Room	M-F	7.02	15.30	5	41.4	70	55	74	85
AHU8 Kitchen	M-F	6.06	17.30	5	56.2	70	55	74	85
AHU9 Cafeteria	M-F	6.06	17.30	5	56.2	70	55	74	85
AHU B1 Media	M-F	6.09	16.00	5	49.55	70	55	74	85
AHU B2 Media	M-F	6.09	15.30	5	46.05	70	55	74	85
AHU B3 Media	M-F	6.00	15.30	5	46.5	70	55	74	85
AHU D1 Band	M-F	6.00	16.00	5	50	70	55	74	85
RTU1 East Commons	M-F	6.08	16.00	5	49.6	70	55	74	85
RTU2 West Commons	M-F	6.08	16.00	5	49.6	70	55	74	85
RTU3 Offices	M-F	6.00	17.00	5	55	70	55	74	85
RTU4 Band Room	M-F	6.31	15.30	5	44.95	70	55	74	85
RTU5 Band Room	M-F	6.38	15.30	5	44.6	70	55	74	85
RTU7 New Kitchen	M-F	6.01	19.00	5	64.95	70	55	74	85
FCUs Classrooms	M-F	6.10	15.30	5	46	70	55	74	85
Building	S-S	0.00	24.00	2	48	55	55	85	85
Event Mode Specific to Zone		Programed and Scheduled as needed							
Boiler Plant		0.00	24.00	Enable at OA < 55°F					
Chiller Ice Build		21.00	6.00	Chiller enable at OA > 45°F, Chiller off at RWT = 22°F					
Chiller + Ice Melt		6.00	21.00	Chiller enable at OA > 60°F, Ice melt, enable chiller at RWT = 50°F					
Ice Mely Only		6.00	Varies	Chiller enable at RWT = 45°F, next chiller staged on at ice depletion					
Chiller Only		Varies	Varies	Chiller enable at OA > 60°F					

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Kings Junior High School

Kings Junior High School HVAC Schedules and Setpoints									
Type	Day	Start	Stop	Days	Weekly Hours	Heating Setpoint		Cooling Setpoint	
						Occupied	Unoccupied	Occupied	Unoccupied
AHU1 Band Room	M-F	6.30	15.30	5	45	70	55	74	85
AHU2 Cafeteria	M-F	6.30	14.00	5	38.5	70	55	74	85
AHU3 Kitchen	M-F	6.00	15.00	5	45	70	55	74	85
AHU4 Locker Room	M-F	6.30	16.00	5	48.5	70	55	74	85
AHU5&6 Gym	M-F	6.30	20.00	2	27.4	70	55	74	85
AHU10 Clinic	M-F	6.30	15.30	5	45	70	55	74	85
RTU6 Admin Offices	M-F	6.30	15.30	5	45	70	55	74	85
RTU8&9 Weight Room	M-F	5.30	14.30	5	45	70	55	74	85
RTU10 Multipurpose	M-F	6.30	20.00	5	68.5	70	55	74	85
UVs Classrooms	M-F	6.30	15.00	5	43.5	70	55	74	85
Building	S-S	0.00	24.00	2	48	55	55	85	85
Event Mode Specific to Zone		Programed and Scheduled as needed							
Boiler Plant	M-S	0.00	24.00	Boiler enable at OA < 55°F					
Chiller Plant	M-S	0.00	24.00	Chiller enable at OA > 60°F					

Columbia Intermediate School

Columbia Intermediate School HVAC Schedules and Setpoints									
Type	Day	Start	Stop	Days	Weekly Hours	Heating Setpoint		Cooling Setpoint	
						Occupied	Unoccupied	Occupied	Unoccupied
AHU1 Building	M-F	6.30	15.30	5	45	70	55	74	85
AHU2 Office, DX Cooling	M-F	6.30	16.00	5	48.5	70	55	74	85
Building	S-S	0.00	24.00	2	48	55	55	85	85
Event Mode Specific to Zone		Programed and Scheduled as needed							
Boiler Plant		0.00	24.00	Enable at OA < 55°F					
Chiller Ice Build		-	-	Ice disabled					
Chiller + Ice Melt		-	-	Ice disabled					
Ice Mely Only		-	-	Ice disabled					
Chiller Only		0.00	24.00	Chiller enable at OA > 60°F					

JF Burns Elementary School

JF Burns Elementary School HVAC Schedules and Setpoints									
Type	Day	Start	Stop	Days	Weekly Hours	Heating Setpoint		Cooling Setpoint	
						Occupied	Unoccupied	Occupied	Unoccupied
AHU Office	M-F	6.00	16.00	5	50	70	55	74	85
AHUGym	M-F	6.00	16.00	5	50	70	55	74	85
AHU Old Gym	M-F	6.00	16.00	5	50	70	55	74	85
AHU Café/Kitchen	M-F	6.00	16.00	5	50	70	55	74	85
RTU DX Cooling only	M-F	6.00	16.00	5	50	-	-	74	85
UVs Classrooms	M-F	6.00	16.00	5	50	70	55	74	85
Building	S-S	0.00	24.00	2	48	55	55	85	85
Event Mode Specific to Zone		Programed and Scheduled as needed							
Boiler Plant		0.00	24.00	Enable at OA < 55°F					
Chiller Ice Build		21.00	6.00	Chiller enable at OA > 45°F, Chiller off at RWT = 22°F					
Chiller + Ice Melt		6.00	17.00	Chiller enable at OA > 60°F, Ice melt, enable chiller at RWT = 50°F					
Ice Mely Only		8.00	21.00	Chiller enable at RWT = 45°F					
Chiller Only		6.00	8.00	Chiller enable at OA > 60°F					

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Kings Mills Elementary School

Kings Mills Elementary School HVAC Schedules and Setpoints									
Type	Day	Start	Stop	Days	Weekly Hours	Heating Setpoint		Cooling Setpoint	
						Occupied	Unoccupied	Occupied	Unoccupied
AHU-D101	M-F	6.30	16.00	5	48.5	70	55	74	85
AHU-D103	M-F	6.30	16.00	5	48.5	70	55	74	85
AHU-D103	M-F	6.30	16.00	5	48.5	70	55	74	85
HRU-D101	Disabled								
HRU-D102	Disabled								
Building	S-S	0.00	24.00	2	48	55	55	85	85
Event Mode Specific to Zone		Programed and Scheduled as needed							
Boiler Plant		0.00	24.00	Enable at OA < 55°F					
Chiller Ice Build		21.00	6.00	Chiller enable at OA > 45°F, Chiller off at RWT = 22°F					
Chiller + Ice Melt		6.00	21.00	Chiller enable at OA > 60°F, Ice melt, enable chiller at RWT = 50°F					
Ice Mely Only		8.00	Varies	Chiller enable at RWT = 45°F					
Chiller Only		6.00	8.00	Chiller enable at OA > 60°F					

South Lebanon Elementary School

South Lebanon Elementary School HVAC Schedules and Setpoints									
Type	Day	Start	Stop	Days	Weekly Hours	Heating Setpoint		Cooling Setpoint	
						Occupied	Unoccupied	Occupied	Unoccupied
AHU-A001	M-F	6.30	16.00	5	48.5	70	55	74	85
AHU-C201	M-F	6.30	16.00	5	48.5	70	55	74	85
AHU-C202	M-F	6.30	16.00	5	48.5	70	55	74	85
HRU-D101	Disabled								
HRU-D102	Disabled								
Building	S-S	0.00	24.00	2	48	55	55	85	85
Event Mode Specific to Zone		Programed and Scheduled as needed							
Boiler Plant		0.00	24.00	Enable at OA < 55°F					
Chiller Ice Build		21.00	6.00	Chiller enable at OA > 45°F, Chiller off at RWT = 22°F					
Chiller + Ice Melt		6.00	21.00	Chiller enable at OA > 60°F, Ice melt, enable chiller at RWT = 50°F					
Ice Mely Only		8.00	Varies	Chiller enable at RWT = 45°F					
Chiller Only		6.00	8.00	Chiller enable at OA > 60°F					

Kings Education Center

Kings Education Center HVAC Schedules and Setpoints									
Type	Day	Start	Stop	Days	Weekly Hours	Heating Setpoint		Cooling Setpoint	
						Occupied	Unoccupied	Occupied	Unoccupied
AHU1	M-F	6.30	17.00	5	53.5	70	55	74	85
AHU2	M-F	6.30	16.00	5	48.5	70	55	74	85
AHU3 Gym	M-F	6.30	16.00	5	48.5	70	55	74	85
UVs Classrooms	M-F	6.30	16.00	5	48.5	70	55	74	85
Building	S-S	0.00	24.00	2	48	55	55	85	85
Event Mode Specific to Zone		Programed and Scheduled as needed							
Boiler Plant 1		0.00	24.00	Enable at OA < 55°F					
Boiler Plant 2		0.00	24.00	Enable at OA < 55°F					
Chiller Ice Build		21.00	6.00	Chiller enable at OA > 45°F, Chiller off at RWT = 22°F					
Chiller + Ice Melt		6.00	21.00	Chiller enable at OA > 60°F, Ice melt, enable chiller at RWT = 50°F					
Ice Mely Only		8.00	Varies	Chiller enable at RWT = 45°F					
Chiller Only		6.00	8.00	Chiller enable at OA > 60°F					

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Revised Operational Parameters

Energy savings have been adjusted due to the increase in heating setpoints and the decrease in cooling setpoints in all building. Changes in operating hours from the original agreed to schedules were also accounted for. The revised operating schedules and setpoints are detailed below.

Kings High School - Revised

Kings High School		Actual Setpoints and Schedules								
Type	Day	Start	Stop	Days	Exhibit E Hours	Hours 8/14/17	ECM Heating Setpoint		ECM Cooling Setpoint	
							Occupied	Unoccupied	Occupied	Unoccupied
AHU1 Multi/Nurse	M-F	6.00	16.00	5	75	50	72.5	60	72.5	80
AHU2 Classroom	M-F	6.00	16.00	5	46	50	72.5	60	72.5	80
AHU2R Counselors	M-F	6.15	17.00	5	55	54	72.5	60	72.5	80
AHU3 Auditorium	M-F	7.00	16.45	5	52	47	72.5	60	72.5	80
AHU4 Gym	M-F	6.15	21.00	5	30	74	72.5	60	72.5	80
AHU6 Vocal/Art	M-F	6.00	15.00	5	46	45	72.5	60	72.5	80
AHU7 Locker Room	M-F	6.15	21.00	5	42	74	72.5	60	72.5	80
AHU8 Kitchen	M-F	6.00	13.50	5	56	38	72.5	60	72.5	75
AHU9 Cafeteria	M-F	6.00	13.50	5	56	38	72.5	60	72.5	80
AHU B1 Media	M-F	6.00	16.00	5	50	50	72.5	60	72.5	80
AHU B2 Media	M-F	6.00	16.00	5	46	50	72.5	60	72.5	80
AHU B3 Media	M-F	6.00	16.00	5	47	50	72.5	60	72.5	80
AHU D1 Band	M-F	6.00	15.00	5	50	45	72.5	60	72.5	80
RTU1 East Commons	M-F	6.00	16.00	5	50	50	72.5	60	72.5	80
RTU2 West Commons	M-F	6.00	16.00	5	50	50	72.5	60	72.5	80
RTU3 Offices	M-F	6.00	17.00	5	55	55	72.5	60	72.5	80
RTU4 Band Room	M-F	6.00	15.00	5	45	45	72.5	60	72.5	80
RTU5 Band Room	M-F	6.00	15.00	5	45	45	72.5	60	72.5	80
RTU7 New Kitchen	M-F	6.01	13.30	5	65	36	72.5	60	72.5	75
FCUs Classrooms	M-F	6.00	16.00	5	46	50	72.5	60	72.5	80
Building	S-S	0.00	24.00	2		0	72.5	60	72.5	80
Event Mode Specific to Zone				Programmed and Scheduled as Needed						
Boiler Plant		0.00	24.00	Enable at OA < 50°F						
Chiller Ice Build		21.00	6.00	Chiller enable at OA > 45°F, Chiller off at RWT = 22°F						
Chiller + Ice Melt		0.00	0.00	Chiller enable at OA > 55°F, Ice melt, enable chiller at RWT = 50°F						
Ice Melt Only		10.00	20.00	Chiller enable at RWT = 45°F, next chiller staged on at ice depletion						
Chiller Only		6.00	10.00	Chiller enable at OA > 55°F						

Kings Junior High - Revised

Kings Junior High		Actual Setpoints and Schedules								
Type	Day	Start	Stop	Days	Exhibit E Hours	Hours 8/14/17	ECM Heating Setpoint		ECM Cooling Setpoint	
							Occupied	Unoccupied	Occupied	Unoccupied
AHU1 Band Room	M-F	6.00	15.00	5	45	45	72.5	60	72.5	80
AHU2 Cafeteria	M-F	5.00	13.30	5	39	42	72.5	60	72.5	80
AHU3 Kitchen	M-F	5.30	13.30	5	45	40	72.5	60	72.5	80
AHU4 Locker Room	M-F	6.00	15.00	5	49	45	72.5	60	72.5	80
AHU5&6 Gym	M-F	6.00	21.00	5	27	75	72.5	60	72.5	80
AHU10 Clinic	M-F	6.00	15.00	5	45	45	72.5	60	72.5	80
RTU6 Admin Offices	M-F	6.00	16.00	5	45	50	72.5	60	72.5	80
RTU8&9 Weight Room	M-F	5.00	18.30	5	45	67	72.5	60	72.5	80
RTU10 Multipurpose	M-F	6.00	15.30	5	69	47	72.5	60	72.5	80
UVs Classrooms	M-F	7.00	16.00	5	44	45	72.5	60	72.5	80
Building	S-S	0.00	24.00	2			72.5	60	72.5	80
Event Mode Specific to Zone		Programed and Scheduled as needed								
Boiler Plant	M-S	0.00	24.00	Boiler enable at OA < 50°F						
Chiller Plant	M-S	0.00	24.00	Chiller enable at OA > 55°F						

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Columbia Intermediate - Revised

Columbia Intermediate School		Actual Setpoints and Schedules								
Type	Day	Start	Stop	Days	Exhibit E Hours	Hours 8/14/17	ECM Heating Setpoint		ECM Cooling Setpoint	
							Occupied	Unoccupied	Occupied	Unoccupied
AHU1 Building	M-F	6.00	15.30	5	45	47	72.5	60	72.5	80
Gym	M-F	6.00	15.30	5	49	47	72.5	60	72.5	80
AHU2 Office, DX Cooling	M-F	7.00	16.00	5	48	45	72.5	60	72.5	80
Building	S-S	0.00	24.00	2			72.5	60	72.5	80
Event Mode Specific to Zone		Programed and Scheduled as needed								
Boiler Plant		0.00	24.00	Enable at OA < 50°F						
Chiller Ice Build		-	-	Ice disabled						
Chiller + Ice Melt		-	-	Ice disabled						
Ice Mely Only		-	-	Ice disabled						
Chiller Only		0.00	24.00	Chiller enable at OA >60°F						

JF Burns Elementary - Revised

JF Burns Elementary School		Actual Setpoints and Schedules								
Type	Day	Start	Stop	Days	Exhibit E Hours	Hours 8/14/17	ECM Heating Setpoint		ECM Cooling Setpoint	
							Occupied	Unoccupied	Occupied	Unoccupied
AHU Office	M-F	7.00	15.30	5	50	42	72.5	60	72.5	80
AHU Gym	M-F	7.00	15.30	5	50	42	72.5	60	72.5	80
AHU Old Gym	M-F	7.00	15.30	5	50	42	72.5	60	72.5	80
AHU Café/Kitchen	M-F	7.00	15.30	5	50	42	72.5	60	72.5	80
RTU DX Cooling only	M-F	7.00	15.30	5	50	42	72.5	60	72.5	80
UVs Classrooms	M-F	7.00	15.30	5	50	42	72.5	60	72.5	80
Building	S-S	0.00	24.00	2			72.5	60	72.5	80
Event Mode Specific to Zone		Programed and Scheduled as needed								
Boiler Plant		0.00	24.00	Enable at OA < 50°F						
Chiller Ice Build		21.00	6.00	Chiller enable at OA > 45°F, Chiller off at RWT = 22°F						
Chiller + Ice Melt		6.00	21.00	Chiller enable at OA > 55°F, Ice melt, enable chiller at RWT = 50°F						
Ice Mely Only		6.00	Varies	Chiller enable at RWT = 45°F						
Chiller Only		Varies	Varies	Chiller enable at OA > 60°F						

Kings Mills Elementary - Revised

Kings Mills Elementary School		Actual Setpoints and Schedules								
Type	Day	Start	Stop	Days	Exhibit E Hours	Hours 8/14/17	ECM Heating Setpoint		ECM Cooling Setpoint	
							Occupied	Unoccupied	Occupied	Unoccupied
AHU-D101	M-F	7.00	15.30	5	48.5	42	72.5	60	72.5	80
AHU-D102	M-F	7.00	16.30	5	48.5	47	72.5	60	72.5	80
AHU-D103	M-F	7.00	15.30	5	48.5	42	72.5	60	72.5	80
HRU-D101 EF	M-F	7.00	15.30	5	0	42	72.5	60	72.5	80
HRU-D102 EF	M-F	7.00	16.30	5	0	47	72.5	60	72.5	80
Building	S-S	0.00	24.00				72.5	60	72.5	80
Event Mode Specific to Zone		Programed and Scheduled as needed								
Boiler Plant		0.00	24.00	Enable at OA < 50°F						
Chiller Ice Build		20.00	6.00	Chiller enable at OA > 45°F, Chiller off at RWT = 22°F						
Chiller + Ice Melt		10.45	20.00	Chiller enable at OA > 55°F, Ice melt, enable chiller at RWT = 50°F						
Ice Melt Only		6.00	10.45	Chiller enable at RWT = 45°F						
Chiller Only		Varies	Varies	Chiller enable at OA >60°F						

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South Lebanon Elementary - Revised

South Lebanon Elementary School		Actual Setpoints and Schedules								
Type	Day	Start	Stop	Days	Exhibit E Hours	Hours 8/14/17	ECM Heating Setpoint		ECM Cooling Setpoint	
							Occupied	Unoccupied	Occupied	Unoccupied
AHU-A001	M-F	7.00	15.30	5	48.5	42	72.5	60	72.5	80
AHU-C201	M-F	7.00	18.00	5	48.5	55	72.5	60	72.5	80
AHU-C202	M-F	7.00	15.30	5	48.5	42	72.5	60	72.5	80
HRU-D101 EF	M-F	7.00	18.00	5	48.5	55	72.5	60	72.5	80
HRU-D102 EF	M-F	7.00	15.30	5	48.5	42	72.5	60	72.5	80
Building	S-S	0.00	24.00				72.5	60	72.5	80
Event Mode Specific to Zone		Programed and Scheduled as needed								
Boiler Plant		0.00	24.00	Enable at OA < 50°F						
Chiller Ice Build		20.30	6.00	Chiller enable at OA > 45°F, Chiller off at RWT = 22°F						
Chiller + Ice Melt		10.45	20.30	Chiller enable at OA > 55°F, Ice melt, enable chiller at RWT = 50°F						
Ice Melt Only		6.00	10.45	Chiller enable at RWT = 45°F						
Chiller Only		Varies	Varies	Chiller enable at OA >60°F						

Kings Education Center - Revised

Kings Education Center	Actual Setpoints and Schedules								
Type	Start	Stop	Days	Exhibit E Hours	Hours 8/14/17	ECM Heating		ECM Cooling Setpoint	
						Occupied	Unoccupied	Occupied	Unoccupied
AHU1	6.30	17.00	5	53.5	54	72.5	60	72.5	80
AHU2	6.30	16.00	5	48.5	49	72.5	60	72.5	80
AHU3 Gym	6.30	16.00	5	48.5	49	72.5	60	72.5	80
UVs Classrooms	6.30	16.00	5	48.5	49	72.5	60	72.5	80
Building	0.00	24.00	2			72.5	60	72.5	80
Event Mode Specific to Zo	Programed and Scheduled as needed								
Boiler Plant 1	0.00	24.00	Enable at OA < 50°F						
Boiler Plant 2	0.00	24.00	Enable at OA < 50°F						
Chiller Ice Build	21.00	6.00	Chiller enable at OA > 45°F, Chiller off at RWT = 22°F						
Chiller + Ice Melt	14.00	21.00	Chiller enable at OA > 55°F, Ice melt, enable chiller at RWT = 50°F						
Ice Melt Only	6.00	14.00	Chiller enable at RWT = 45°F						
Chiller Only	Varies	Varies	Chiller enable at OA > 60°F						

Kings Schools is responsible to perform the updates to the control system to conform to the above tables, and should limit access to thermostats to its maintenance staff.

Indoor temperature boundaries should be maintained at no warmer than *72.5*° F for heating and no cooler than *72.5*° F for cooling (within +/- 2 degrees).

It should also be noted that additional savings can be achieved by maintaining a lower temperature during the heating season and a higher temperature during the cooling season. Please see the recommendations section of this report for more suggestions.

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Section 5: Base Utility Rates and Meter Details

The base utility rates are those utility rates that are used to calculate the monetary value of the cost savings and are the rates set forth below in the tables. Trane will use the greater of the then current applicable utility rate unit cost or the base utility rates as adjusted (the "Adjusted Base Utility Rates"). Adjusted base utility rates are the base utility rates adjusted upward for inflation by zero percent (0%) per year, compounded annually. The parties agree that the 0% adjustment rate is a reasonable projection of inflation based on past inflation experience and Customer's budgetary practices. However, in the event verified energy savings are less than the Guarantee, the lesser of the then current applicable utility rate unit cost or the base utility rates will be used to determine the monetary value of the shortfall in verified energy savings.

The following are the Base Utility Rates:

Cost of Electricity

Duke Energy Electric Rate DS01 and Duke Retail Rate DE87

Duke Energy DS01 Rate, Duke Retail Rate DE87					
Retail Rate DE87			All kWh	$0.0521	kWh
Duke Energy Rate DS01					
Customer Charge				$45.95	per bill
Rate	Minimum Bill			5	kW
	All kW			$5.3815	kW
85% Demand Ratchet		85% of highest 15 minute monthly demand set May-Sep, for the next 11 months			per bill
90% Power Factor Adjustment		if PF < 90%, billing demand = kVA * .090			per bill
Rider	DR-IKE	Storm Recovery Rider		$0.00	per bill
	EER	Energy Efficiency Recovery Rider		$0.09	per bill
	OET	Ohio Excise Tax Rider	First 2,000 kWh	$0.00465	kWh
			Next 13,000 kWh	$0.00419	kWh
			Additional kWh	$0.00363	kWh
	USR	Universal Service Fund Rider	Up to 833,000 kWh	$0.0010791	kWh
			Over 833,000 kWh	$0.000469	kWh
	UE-GEN	Uncollectible Expense-Electric Generation		$0.07	per bill
	BTR	Base Transmission Rider	BTR Charge	$1.3216	kWh/kW
			RTEP Credit	$0.000655	kWh
	RTO	Regional Transmission Organization		$0.00	kWh
	DR-IM	Infrastructure Modernization		$7.17	per bill
	DR-ECF	Economic Competiveness Fund		$0.000312	kWh
	DR-SAWR	Energy Efficienct Recovery		$0.00	kWh
	UE-ED	Uncollectible Expense-Electric Distribution		$0.18	per bill
	AER-R	Alternative Energy Recovery		$0.000364	kWh
	RC	Retail Capacity	First 1,000 kW	$2.5065	kWh/kW
			Additional kW	$1.9828	kWh/kW
			Billing Demand Times 300	$0.005727	kWh/kW
			Additional kWh	$0.001733	kWh/kW
	RE	Retail Energy		$0.046167	kWh
	ESSC	Electric Security Stabilzation Charge	First 1,000 kW	$1.335983	kWh/kW
			Additional kW	$1.053909	kWh/kW
			Billing Demand Times 300	$0.003444	kWh/kW
			Additional kWh	$0.001297	kWh/kW
	LFA	Load Factor Adjustment	Charge	$8.00	kW/kVA
			Credit	$0.019510	kWh
	SCR	Supplier Cost Reconciliation		$0.001846	kWh
	EE-PDRR	Energy Efficiency & Peak Demand Response Recovery		$0.00167	kWh

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Cost of Fuel(s)

Gas Rate Structure Duke Energy Rate FTL1

Duke Energy Firm Transportation Service-Large, Rate FTL1					
Fixed Delivery Service Charge				$226.64	per bill
Usage-Based Transportation Charge				$0.10483	CCF
Rider	AMRP	Accelerated Main Replacement Program		$21.32	per bill
	AU	Advanced Utility		$1.40	per bill
	PIPP	Percentage of Income Payment Plan		$0.021642	CCF
	GSR	Gas Surcredit	Credit	$0.0012479	CCF
	UE-G	Uncollectible Expense		$0.009802	CCF
	MGP	Manufactured Gas Plant		$0.00	per bill
	STR	State Tax Rider	First 1,000 CCF	$0.01593	CCF
			Next 19,000 CCF	$0.00877	CCF
			Additional CCF	$0.00411	CCF
	CCCR	Contract Commitment Cost Recovery		$0.00	CCF
Constellation Natural Gas Forward Pricing					
		Winter Rate November-March		$4.073	MMBtu
		Summer Rate April-October		$3.850	MMBtu

Due to the complexity and variability of the electric and natural gas rate schedule structures, an average cost per kWh, an average cost per kW and an average cost per therm was calculated for each meter from the baseline utility costs. These average units were used to calculate project energy cost savings.

Cost of Water/Sewer

Cost	Water Charge	Sewer Charge	Fire Charge
Cost per gallon $/gal	$0.00345		
Cost per gallon $/gal		$0.00427	
Cost per quarter $/3 months ES			$5.00
Cost per quarter $/3 months HS			$80.00

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Meter Details

Option C verification requires metered energy and/or water usage data to be collected. The data collected was based on the meters and utility accounts listed below.

Facility	Utility Type	Account #	Meter #	Rate Schedule
Kings High School	Electricity	1590-0782-01-1	108012741	DS01, DE87
	Natural Gas	6870-0790-20-0	518495	FTL1
Kings Junior High	Electricity	9240-2052-01-7	108023827	DS01, DE87
	Natural Gas	8420-3556-01-1	683036	FTL1
Columbia Intermediate	Electricity	7940-2095-01-1	106179899	DS01, DE87
	Natural Gas	64702097-01-9	477410	FTL1
JF Burns Elementary	Electricity	2820-2190-02-4	108197886	DS01, DE87
	Natural Gas	9660-3557-01-5	681665	FTL1
Kings Mills Elementary	Electricity	8680-2196-01-8	106179845	DS01, DE87
	Natural Gas	3520-3556-01-0	681695	FTL1
South Lebanon Elementary	Electricity	4090-2213-04-1	108048156	DS01, DE87
	Natural Gas	9840-2217-01-4	680690	FTL1
Kings Education Center	Electricity	4440-2052-01-2	106165256	DS01, DE87
	Natural Gas	7340-2052-01-2	471439	FTL1

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Section 6: Baseline Adjustments

Trane reserves the right to make baseline adjustments during the guarantee term in response to changes to the facility(s) or deviations in the operating parameters per the agreement.

It should also be noted that baselines are routinely adjusted for the number of days in the utility billing periods, and for changes in weather. These changes occur within the Metrix utility tacking software, used to calculate Option C savings.

In year 1, the following baseline adjustments were made:

Ice Tank failure - JF Burns Elementary

The JF Burns ice tanks failed at the startup of the cooling season in year 1 of the guarantee. The baseline adjustment below was taken to account for 2 chillers running continuously during the cooling season with no ice storage available for load shifting.

JF Burns - Ice Tank Failure Baseline Adjustment	kWh	kW	Therms
Total	**-27,692**	**436**	**0**

Note: Positive numbers indicate an increase in the baseline, negative numbers indicated a decrease**.**

Ice Tank Failure – Kings Education Center

The Ed Center ice tank failed in the summer of 2016 and was valved off. The chiller carried the building, and temporary air conditioning units were used to supplement the cooling needs. The following baseline adjustment was taken to account for this change.

Kings Ed Center - Ice Tank Failure Baseline Adjustment	kWh	kW	Therms
Total	**-7,303**	**422**	**0**

Note: Positive numbers indicate an increase in the baseline, negative numbers indicated a decrease**.**

LED Lighting Baseline Adjustment

After the completion of Trane's lighting retrofit project, the district undertook an LED lighting retrofit project, separate from the Trane guarantee. A lamp count was obtained from TMI, the district's contractor, and was used to calculate the baseline adjustment as follows:

# of LED lamps installed x 10 watts (wattage difference between 28w lamp and 18 watt LED) x 1850 burn hours (based on 185 school days per year x 10 hours/day)

Additionally, natural gas usage will increase due to the reduced heat gain from the new LED lamps. The calculation used for this adjustment is:

kWh adjustment from LED install x 3.142 (convert to Btus) x .01

The baseline adjustments by building are shown in the table below.

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Baseline Adjustment for LED Retrofit Project

Building	kWh	kW	therms
Kings High School	-53,484	-29	1,680
Kings Junior High	-30,803	-17	968
Columbia Intermediate	-41,699	-23	1,310
Kings Mills Elementary	-40,497	-22	1,272
South Lebanon Elementary	-24,420	-13	767
Kings Education Center	-15,984	-9	502
Total	**-206,886**	**-112**	**6,500**

The kWh and kW will be subtracted and the therms will be added to the original baseline to create the adjusted baseline.

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Section 7: Recommendations

Building Operation Strategies

Whenever possible, the following strategies should be employed to continually improve energy savings.

- HVAC Systems. It is extremely important to provide adequate maintenance to all HVAC systems, including proper temperature controls, filters, belts, and scheduling. Appropriate preventive maintenance of the entire HVAC system will grant a reliable comfort in the most efficient possible way resulting in additional energy savings.

- Building Automation System. The automation system provides ways to control a number of important building functions from a central point. Whenever possible, it is recommended to program exception schedules to accommodate special events that fall outside the normal schedule.

  Furthermore, it is a good conservation practice to evaluate the needs of the different zones allowing the systems to provide the least amount of work without compromising the ambient control. A simple step that will result in additional savings is to adjust the cooling setpoint upward or the heating setpoint downward a few degrees at a time paying close attention to comfort levels as well as building drift keeping in mind that these temperature adjustments will translate into additional energy savings.

  When possible, schedule after-hours activities in school buildings to one particular area or zone of the school building, and condition only that space as needed.

Building Occupant Strategies

Engage school staff and students in your energy-saving initiatives – they have the power to greatly enhance savings.

- Encourage building occupants to turn off lights when leaving the room, and turn off the lights in areas that are unoccupied.
- Use partial lighting when using only a portion of the room.
- Raise blinds or shades during the day to allow in natural light.
- Dress appropriately for the season to avoid adjusting temperature setpoints.
- Close blinds or shades at the end of the day to reduce overnight air temperature loss or gain.
- Turn off computer monitors when leaving work areas or when your computers are not in use.
- Turn off electronics and personal appliances when not in use, when leaving the room, or at the end of the day. Also, unplug these items during extended periods of non-use.
- Consider performing a plug-load audit to identify energy-using equipment that can be eliminated from classrooms.
- Work with your IT department to deploy computer power management features across the district.

Please remember that nobody benefits from wasted energy and conscientious energy utilization benefits your organization, our natural resources and the environment.

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Section 8: Measurement and Verification Glossary

Baseline Energy Usage: Energy consumption and demand occurring during the Baseline Period.

Baseline Period: The period of time that represents operation of the facility or system before implementation of an ECM.

Baseline Adjustment (BLA): The adjustments made during the reporting period due to changes in any energy governing characteristic of the facility within the measurement boundary.

Calibration: The process of checking simulated energy and demand against actual measured energy and demand. Once the mean difference between simulated and measured quantities is within acceptable tolerance, the simulation is called “calibrated”. See Option D.

Construction Period Savings: Savings realized after an ECM has been implemented but before the entire project has been completed. This is also referred to as Installation Period Savings and Interim Period Savings.

Consumption: Energy consumed as rate over time (kWh, Therm, kGal)

Cost savings: Monetary savings from the implementation of ECM(s).

Demand: The highest rate of power or gas use, measured by a utility between meter readings.

Energy Conservation Measure (ECM): An activity or set of activities designed to increase the energy efficiency of a facility, system, or piece of equipment.

Guaranteed Energy Savings: The amount of energy guaranteed to be saved resulting from the implementation of ECMs.

Guarantee Year: 12-month period starting from 1st day of the calendar month following customer’s execution of the Certificate of Final Completion, unless the Certification of Final Completion is signed on the first day of the calendar month- in which case the Guarantee Year would start on that day.

IPMVP: International Performance Measurement and Verification Protocol

Metrix: Third party energy software program used to normalize energy usage for weather and other variables and present true energy savings. In addition to normalizing for variables, Metrix also sets benchmarking, performs load factor analysis and rate analysis, helps determine changes in energy usage patterns, and offers performance reporting.

Measurement & Verification (M&V): The process of using measurements to reliably determine savings created within an individual facility by an energy management program. Savings cannot be directly measured, because they represent the absence of energy use. Instead, savings are determined by comparing measured use before and after implementation of one or more ECMs, making appropriate adjustments for changes in conditions.

Metering: Collection of energy data over time at a facility through the use of measurement devices.

Normalized Savings: The reduction in energy use or cost that occurred in the reporting period relative to what would have occurred if the facility had been equipped and operated as if it was in the baseline period using the previously agreed upon conditions.

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Option A: Methodology specified in IPMVP. Retrofit Isolation: Key parameter measurements. Energy savings are determined by measuring the agreed upon parameter before and after a retrofit, and multiplying the difference by an agreed-upon factor.

Option B: Methodology specified in IPMVP. Retrofit Isolation: All parameter measurements. Individual loads are continuously monitored to determine performance, and this measured performance is compared with a baseline to determine savings.

Option C: Methodology specified in IPMVP. Whole Facility. Savings are determined by measuring and analyzing overall energy use in a facility and identifying the effects of energy projects from changes in overall energy use patterns.

Option D: Methodology specified in IPMVP. Calibrated simulation. Savings are determined when calibrated simulation of baseline energy use is compared to calibrated simulation of post-installation energy consumption.

Performance Period: The defined period of time chosen for the purposes of verifying savings after implementation of ECMs. This is also referred to as the reporting period.

Scenario: A certain instance that happens within a project that could vary from project to project.

Sample Measurement: Measurements are performed on a subset of all units to determine average energy consumption per unit. Energy consumption is applied to entire population. This method is typically used in lighting, water, and Building Automation System ECMs.

Trends: Sampling of data over time such as space temperature, occupancy, set points, kW, kWh. It is used to verify savings. It is also referred to as data logging.

Verified Energy Savings: The substantiated reduction in energy use measured during the performance period.

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Section 9: Appendix

Below you will find the supporting building-level charts for Kings Local School District year 1 performance period, June 2016 – May 2017.

Year 1 building-level results