ENERGY SAVINGS PLAN

SUBMITTED BY:
DCO Energy Efficiency Division
100 Lenox Drive
Lawrenceville, NJ 08648
Final
1/9/2020

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ENERGY SAVINGS PLAN

SECTION 1 – PROJECT OVERVIEW

Project Overview

The Energy Savings Plan (ESP) is the core of the Energy Savings Improvement Program (ESIP) process. It describes Jackson Township Board of Education's (JTBOE) preferred Energy Conservation Measures (ECMs), the budget cost for each ECM and the ECM energy savings calculations that self-fund the project via reduced operating costs. The ESP provides JTBOE the necessary information to decide which proposed ECMs to implement as part of your (ESIP) project. Working with the District's staff, your selected ESIP project would:

1. Self-fund a $26,219,142 project
2. Generate $1,274,457 in annual energy savings – 44% of current utility spend
3. Eligible for $2,767,486 in rebates and incentives - 50%, $1,383,743, has been applied to the project financial analysis
4. Reduce utility related annual CO2 emissions by 6,842 metric tons – a 66% reduction

NOTE: This submitted ESP doesn't constitute any contractual obligation between JTBOE and DCO Energy (DCO). Any contractual obligations will be performed under separate legal documents per mutual signed agreement of the parties involved and subject to the applicable laws and requirements of the ESIP legislation and State of New Jersey.

To ensure conformance with the requirements of Public Finance Notice LFN 2009-11, the ESP must address the following elements:

- *The results of the energy audit (APPENDIX G)*
- *A description of the energy conservation measures that will comprise the program; (Section 3)*
- *An estimate of greenhouse gas reductions resulting from those energy savings (Section 3);*
- *Identification of all design and compliance issues and identification of who will provide these services; (Section 5)*
- *An assessment of risks involved in the successful implementation of the plan; (Section 5)*
- *Identify the eligibility for, and costs and revenues associated with the PJM Independent System Operator for demand response and curtailable service activities; (Section 3)*
- *Schedules showing calculations of all costs of implementing the proposed energy conservation measures and the projected energy savings; (Section 3)*
- *Maintenance requirements necessary to ensure continued energy savings, and describe how they will be provided; and (Section 6)*

- *If developed by an ESCO, a description of, and cost estimates of a proposed energy savings guarantee. (Section 7)*

In addition, and per LFN 2009-11, the ESP requires several other important elements:

- *The calculations of energy savings must be made in accordance with protocols for their calculation adopted by the BPU. The calculation shall include all applicable State and federal rebates and tax credits, but shall not include the cost of an energy audit and the cost of verifying energy savings. (Section 3)*
- *An independent third party must review the plan and certify that the plan savings were properly calculated pursuant to the BPU protocols.*
- *If an ESCO is used to prepare the plan, the ESCO must provide an estimate of the cost of a guarantee of energy savings. When adopting the plan, the local unit must decide whether or not to accept the guarantee (covered below). (Section 7)*
- *The plan must be verified by an independent third party to ensure that the calculations were made in accordance with the BPU standards and that all required elements of the ESP are covered.*
- *After verification is completed, the governing body must formally adopt the plan. At that point, the plan must be submitted to the Board of Public Utilities where it will be posted on the BPU website. BPU approval is not required. If the contracting unit maintains its own website, the plan must also be posted on that site.*

DCO Energy looks forward to the third-party review of our energy calculations and Jackson Township Board of Education's approval of the Energy Savings Plan to implement via the requirements of the ESIP legislation. Your time, effort, and support is appreciated.

ENERGY SAVINGS PLAN

SECTION 2 – ENERGY BASELINE

Total Utility Consumption and Site EUI

The Jackson Township Board of Education Energy Savings Plan includes 13 Buildings. To develop the ESP, DCO Energy was provided with all available utility data (Electric, Natural Gas, & Water). DCO Energy tracked and documented this utility data from December 2017 thru November 2018. A listing of the buildings, the total utility consumption, and Energy Usage Index for the 13 buildings is detailed below.

BUILDINGS & FACILITIES		
BUILDING #	BUILDING/FACILITY NAME	SQFT
1	**Jackson Liberty High School**	**300,000**
2	**Jackson Memorial High School**	**306,000**
3	**Christa McAuliffe Middle School**	**130,000**
4	**Elms Elementary School**	**130,000**
5	**Goetz Middle School**	**126,081**
6	**Crawford Rodriguez Elementary School**	**107,400**
7	**Switlik Elementary School**	**72,077**
8	**Holman Elementary School**	**56,280**
9	**Johnson Elementary School**	**55,452**
10	**Rosenauer Elementary School**	**34,128**
11	**Administration Building**	**10,200**
12	**Transportation Building**	**6,640**
13	**Maintenance Garage**	**4,800**

JACKSON TOWNSHIP BOARD OF EDUCATION BUILDINGS/FACILITIES		ELECTRIC				
BUILDING/FACILITY NAME	SQFT	USAGE kWh	DEMAND kW	USAGE BTU / SQFT	TOTAL COST $$	BLENDED COST $$ / kWh
Jackson Liberty High School	300,000	2,397,108	909	27,263	$289,941	$0.121
Jackson Memorial High School	306,000	4,165,856	1,378	46,451	$528,646	$0.127
Christa McAuliffe Middle School	130,000	1,394,877	472	36,610	$176,708	$0.127
Elms Elementary School	130,000	760,683	513	19,965	$110,191	$0.145
Goetz Middle School	126,081	1,909,817	568	51,683	$231,745	$0.121
Crawford Rodriguez Elementary School	107,400	1,717,200	355	54,554	$196,097	$0.114
Switlik Elementary School	72,077	1,213,881	294	57,463	$156,201	$0.129
Holman Elementary School	56,280	1,014,964	277	61,533	$126,845	$0.125
Johnson Elementary School	55,452	672,200	233	41,361	$82,096	$0.122
Rosenauer Elementary School	34,128	249,562	66	24,950	$30,227	$0.121
Administration Building	10,200	258,773	101	86,562	$39,289	$0.152
Transportation Building	6,640	105,254	28	54,085	$13,092	$0.124
Maintenance Garage	4,800	22,273	0	15,832	$3,006	$0.135
TOTALS	**1,339,058**	**15,882,448**	**5,194**	**40,469**	**$1,984,082**	**$0.125**

JACKSON TOWNSHIP BOARD OF EDUCATION BUILDINGS/FACILITIES		NATURAL GAS			
BUILDING/FACILITY NAME	SQFT	USAGE THERMS	USAGE BTU / SQFT	TOTAL COST $$	BLENDED COST $$ / THERM
Jackson Liberty High School	300,000	46,075	15,358	$53,415	$1.16
Jackson Memorial High School	306,000	52,050	17,010	$56,054	$1.08
Christa McAuliffe Middle School	130,000	57,574	44,288	$63,623	$1.11
Elms Elementary School	130,000	0	0	0	$0.00
Goetz Middle School	126,081	0	0	0	$0.00
Crawford Rodriguez Elementary School	107,400	81,233	75,636	87,829	$1.08
Switlik Elementary School	72,077	15,167	21,042	17,726	$1.17
Holman Elementary School	56,280	0	0	0	$0.00
Johnson Elementary School	55,452	0	0	0	$0.00
Rosenauer Elementary School	34,128	20,223	59,256	22,644	$1.12
Administration Building	10,200	0	0	0	$0.00
Transportation Building	6,640	9,798	147,565	11,540	$1.18
Maintenance Garage	4,800	4,186	87,205	4,686	$1.12
TOTALS	**1,339,058**	**286,306**	**21,381**	**$317,517**	**$1.11**

JACKSON TOWNSHIP BOARD OF EDUCATION BUILDINGS/FACILITIES		Fuel Oil #2 (Gal)			
BUILDING/FACILITY NAME	SQFT	USAGE Fuel Oil #2 (Gal)	USAGE BTU / SQFT	TOTAL COST $$	UNIT COST $$ / Fuel Oil #2 (Gal)
Jackson Liberty High School	300,000	0	0	$0	-
Jackson Memorial High School	306,000	0	0	$0	-
Christa McAuliffe Middle School	130,000	0	0	$0	-
Elms Elementary School	130,000	0	0	$0	-
Goetz Middle School	126,081	58,470	64,925	$130,675	$2.23
Crawford Rodriguez Elementary School	107,400	0	0	$0	-
Switlik Elementary School	72,077	0	0	$0	-
Holman Elementary School	56,280	0	0	$0	-
Johnson Elementary School	55,452	0	0	$0	-
Rosenauer Elementary School	34,128	0	0	$0	-
Administration Building	10,200	0	0	$0	-
Transportation Building	6,640	0	0	$0	-
Maintenance Garage	4,800	0	0	$0	-
TOTALS	**1,339,058**	**58,470**	**4,366**	**$130,675**	**$2.23**

JACKSON TOWNSHIP BOARD OF EDUCATION BUILDINGS/FACILITIES		Solar PPA (kWh)			
BUILDING/FACILITY NAME	SQFT	USAGE Solar PPA (kWh)	USAGE BTU / SQFT	TOTAL COST $$	UNIT COST $$ / Solar PPA (kWh)
Jackson Liberty High School	300,000	1,606,776	18,274	$130,384	$0.0811
Jackson Memorial High School	306,000	0	0	$0	-
Christa McAuliffe Middle School	130,000	0	0	$0	-
Elms Elementary School	130,000	1,074,721	28207	$87,473	$0.0814
Goetz Middle School	126,081	0	0	$0	-
Crawford Rodriguez Elementary School	107,400	0	0	$0	-
Switlik Elementary School	72,077	0	0	$0	-
Holman Elementary School	56,280	0	-	$0	-
Johnson Elementary School	55,452	0	0	$0	-
Rosenauer Elementary School	34,128	0	0	$0	-
Administration Building	10,200	0	0	$0	-
Transportation Building	6,640	0	-	$0	-
Maintenance Garage	4,800	0	0	$0	-
TOTALS	**1,339,058**	**2,681,497**	**21,277**	**$217,857**	**$0.0812**

JACKSON TOWNSHIP BOARD OF EDUCATION BUILDINGS/FACILITIES		Water & Sewer (Gal)			
BUILDING/FACILITY NAME	SQFT	USAGE Water & Sewer (Gal)	USAGE GAL / SQFT	TOTAL COST $$	UNIT COST $$ / Water & Sewer (Gal)
Jackson Liberty High School	300,000	11,160,000	37.20	$33,227	$0.0030
Jackson Memorial High School	306,000	24,530,000	80.16	$44,906	$0.0018
Christa McAuliffe Middle School	130,000	10,140,000	78.00	$21,106	$0.0021
Elms Elementary School	130,000	0	0.00	$0	-
Goetz Middle School	126,081	20,278,773	160.84	$32,472	$0.0016
Crawford Rodriguez Elementary School	107,400	15,840,000	147.49	$25,364	$0.0016
Switlik Elementary School	72,077	13,270,000	184.11	$22,504	$0.0017
Holman Elementary School	56,280	8,180,000	145.34	$12,308	$0.0015
Johnson Elementary School	55,452	6,540,000	117.94	$12,562	$0.0019
Rosenauer Elementary School	34,128	7,690,000	225.33	$9,608	$0.0012
Administration Building	10,200	720,000	70,588.2	$1,269	$0.0018
Transportation Building	6,640	2,140,000	322,289.2	$3,218	$0.0015
Maintenance Garage	4,800	0	0	$0	-
TOTALS	**1,339,058**	**120,488,773**	**0.00**	**$218,544**	**$0.0018**

JACKSON TOWNSHIP BOARD OF EDUCATION BUILDINGS/FACILITIES		SITE ENERGY	SOURCE ENERGY	TOTAL COST
BUILDING/FACILITY NAME	SQFT	USAGE BTUs	USAGE BTUs	$$
Jackson Liberty High School	300,000	18,268,723,754	33,221,175,797	$506,967
Jackson Memorial High School	306,000	19,418,879,672	45,264,149,832	$629,606
Christa McAuliffe Middle School	130,000	10,516,751,324	19,371,399,457	$261,436
Elms Elementary School	130,000	6,262,398,168	10,934,208,881	$197,664
Goetz Middle School	126,081	14,702,053,604	26,513,243,271	$394,891
Crawford Rodriguez Elementary School	107,400	13,982,411,400	24,934,933,170	$309,290
Switlik Elementary School	72,077	5,658,427,972	13,189,432,822	$196,431
Holman Elementary School	56,280	3,463,055,462	9,696,555,294	$139,153
Johnson Elementary School	55,452	2,293,546,400	6,421,929,920	$94,658
Rosenauer Elementary School	34,128	2,873,800,544	4,507,625,273	$62,479
Administration Building	10,200	882,933,476	2,472,213,733	$40,558
Transportation Building	6,640	1,338,958,648	2,034,378,214	$27,849
Maintenance Garage	4,800	494,578,476	652,299,483	$7,692
TOTALS	**1,339,058**	**100,156,518,900**	**199,213,545,146**	**$2,868,676**

JACKSON TOWNSHIP BOARD OF EDUCATION BUILDINGS/FACILITIES		SITE EUI			SITE ECI		
BUILDING/FACILITY NAME	SQFT	USAGE BTU / SQFT	NATIONAL MEDIAN BTU / SQFT	NATIONAL MEDIAN +/- %	COST $$ / SQFT	NATIONAL MEDIAN $$ / SQFT	NATIONAL MEDIAN +/- %
Jackson Liberty High School	300,000	60,896	68,800	11%	$1.69	$1.38	-23%
Jackson Memorial High School	306,000	63,460	68,800	8%	$2.06	$1.38	-49%
Christa McAuliffe Middle School	130,000	80,898	68,800	-18%	$2.01	$1.38	-46%
Elms Elementary School	130,000	48,172	68,800	30%	$1.52	$1.38	-10%
Goetz Middle School	126,081	116,608	68,800	-69%	$3.13	$1.38	-127%
Crawford Rodriguez Elementary School	107,400	130,190	68,800	-89%	$2.88	$1.38	-109%
Switlik Elementary School	72,077	78,505	68,800	-14%	$2.73	$1.38	-98%
Holman Elementary School	56,280	61,533	68,800	11%	$2.47	$1.38	-79%
Johnson Elementary School	55,452	41,361	68,800	40%	$1.71	$1.38	-24%
Rosenauer Elementary School	34,128	84,207	68,800	-22%	$1.83	$1.38	-33%
Administration Building	10,200	86,562	77,800	-11%	$3.98	$1.56	-155%
Transportation Building	6,640	201,650	58,700	-244%	$4.19	$1.18	-257%
Maintenance Garage	4,800	103,037	58,700	-76%	$1.60	$1.18	-36%
TOTALS	**1,339,058**	**74,796**	**68,782**	**-9%**	**$2.14**	**$1.38**	**-55%**

On the following pages is a detailed account of each of the utility accounts and meters provided to DCO Energy.

DCO Energy Efficiency Division
100 Lenox Drive
Lawrenceville, NJ 08648

Jackson Township BOE			Electric #1	Electric #2	Electric #3	Electric #4	Gas #1	Gas #2	Fuel Oil (Gal)	Solar (kWh)	Water & Sewer (Gal)	Comments
1	Jackson Liberty HS	Utility Company	JCP&L				NJNG			Solar City / Tesla	Jackson MUA	Water & Sewer Account #'s: 440219-0, 440223-0, 440224-0, 440226-0
		Account #	100070 775 273				22-0009-8372-37			JB-085352-00	Various	
		Meter #	S314063929				851923					
		Description	Main Meter				Main Meter			Roof & Ground Mount		
		Rate Tariff	GSP				GSL			PPA		
		Commodity Company	East Coast				Constellation					
		Commodity Pricing	Fixed				Fixed, Firm			2.5% Annual Escalation		
2	JMHS Memorial	Utility Company	JCP&L	JCP&L	JCP&L	JCP&L	NJNG	NJNG			Jackson MUA	Memorial HS does not get charged for gas serving the boiler plant or the RTU right above the boiler plant. No meter was found on site. NJNG has not been contacted about the missing meter. Water & Sewer Account #'s: 440232-0, 440230-0, 440231-0
		Account #	100020 543 011	100 020 542 948	100015 458 142	100015 458 092	22-0016-4103-97	04-3472-7325-29			Various	
		Meter #	L014779487	L014947464	G28168729	G28370793	1039421	425688				
		Description	Memorial Wing	Clayton Wing	Fine Arts Wing	Field House	Clayton RTUs	Fine Arts RTUs				
		Rate Tariff	GST	GST	GST	GS	GSL	GSL				
		Commodity Company	East Coast	East Coast	East Coast	East Coast	Constellation	Constellation				
		Commodity Pricing	Fixed	Fixed	Fixed	Fixed	Fixed, Firm	Fixed, Firm				
3	McAuliffe MS	Utility Company	JCP&L				NJNG				Jackson MUA	
		Account #	100016 675 173				04-3473-0870-23				440214-0	
		Meter #	A021052251				1039519					
		Description	Main Meter				Main Meter					
		Rate Tariff	GS				GSL					
		Commodity Company	East Coast				Constellation					
		Commodity Pricing	Fixed				Fixed, Firm					
4	Goetz MS	Utility Company	JCP&L						Pedroni Fuel Oil		Jackson MUA	
		Account #	100020 670 103						8795V		440208-0	
		Meter #	L75698410									
		Description	Main Meter						Fuel Oil Boilers		Sewer only	
		Rate Tariff	GSP									
		Commodity Company	East Coast									
		Commodity Pricing	Fixed									
5	Switlik ES	Utility Company	JCP&L	JCP&L	JCP&L		NJNG				Jackson MUA	Trailer Account #'s: 100015 458 605, 100015 458 647, 100015 458 696, 100015 458 712, 100015 458 761, 100015 458 803, 100015 458 852, 100015 458 928, 100023 945 155, 100023 962 507, 100032 515 650, 100032 580 472, 100035 422 516, 100035 422 532
		Account #	100015 458 530	100 015 458 571	Various		04-3472-9080-29				440229-0	
		Meter #	G23632704	S315290829	Various		720762					
		Description	Main Meter	Relocation Bldg	(14) Trailers		Main Meter					
		Rate Tariff	GS	GS	GS		GSL					
		Commodity Company	East Coast	East Coast	East Coast		Constellation					
		Commodity Pricing	Fixed	Fixed	Fixed		Fixed, Firm					
6	Howard C. Johnson ES	Utility Company	JCP&L								Jackson MUA	
		Account #	100042 513 539								440210-0	
		Meter #	S310131177									
		Description	Main Meter									
		Rate Tariff	GS									
		Commodity Company	East Coast									
		Commodity Pricing	Fixed									
7	Crawford-Rodriguez ES	Utility Company	JCP&L				NJNG				Jackson MUA	
		Account #	100035 841 251				22-0006-7059-68				440218-0	
		Meter #	G23539273				657983					
		Description	Main Meter				Main Meter					
		Rate Tariff	GS				GSL					
		Commodity Company	East Coast				Constellation					
		Commodity Pricing	Fixed				Fixed, Firm					

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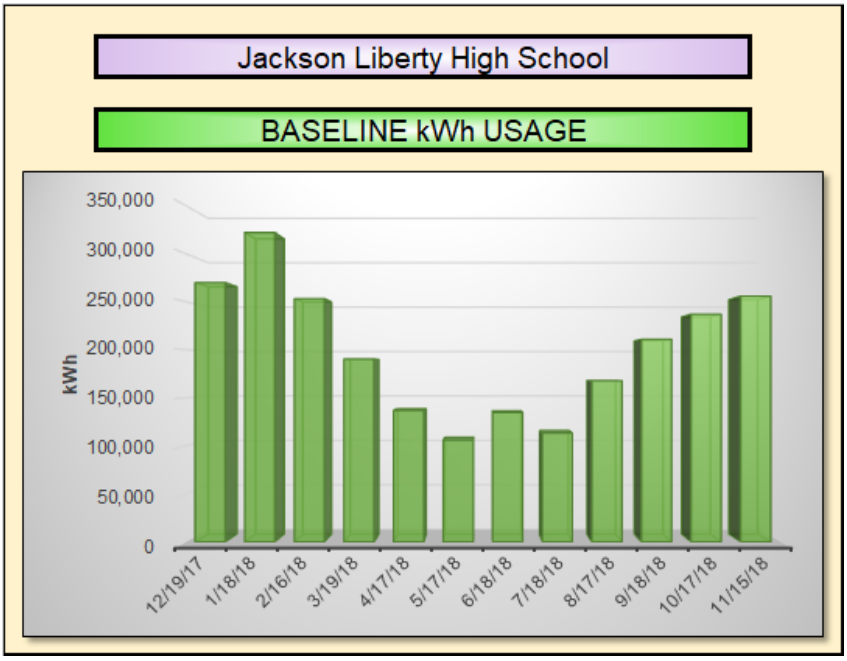
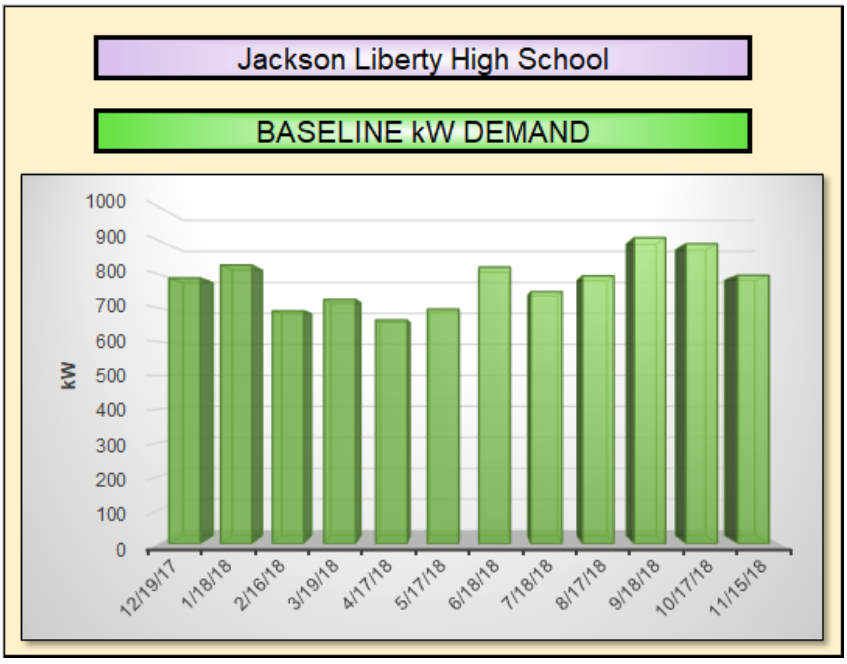
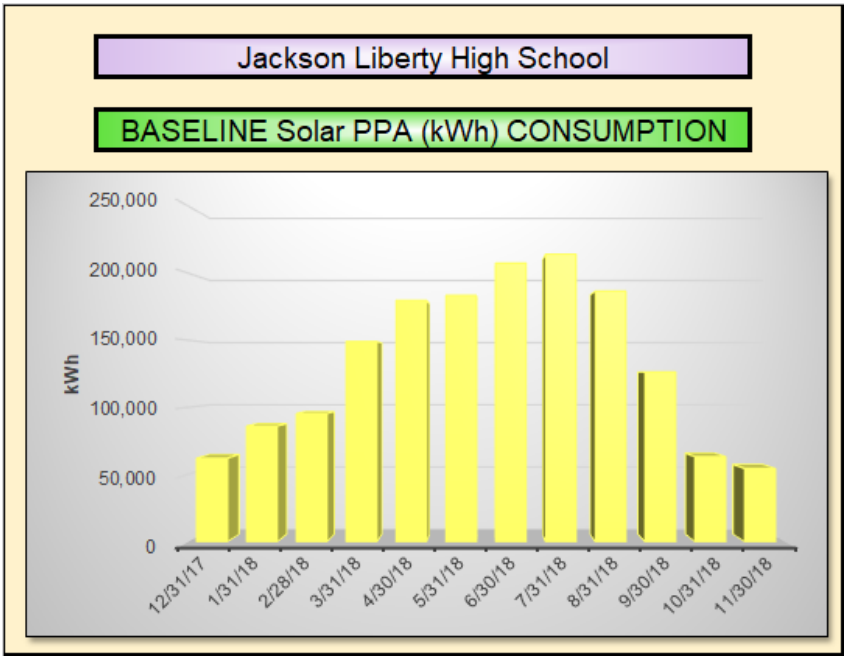
Jackson Township BOE			Electric #1	Electric #2	Electric #3	Electric #4	Gas #1	Gas #2	Fuel Oil (Gal)	Solar (kWh)	Water & Sewer (Gal)	Comments
8	Elms ES	Utility Company	JCP&L							Solar City / Tesla		
		Account #	100052024872							JB-085353-00		
		Meter #	S314063930									
		Description	Main Meter							Ground Mount		
		Rate Tariff	GS							PPA		
		Commodity Company	East Coast									
		Commodity Pricing	Fixed							2.5% Annual Escalation		
9	Lucy N. Holman ES	Utility Company	JCP&L	JCP&L							Jackson MUA	Trailer Account #'s: 100 017 365 113, 100 024 582 973, 100 032 560 383, 100 035 436 870, 100 036 382 123
		Account #	100017365170	Various							440211-0	
		Meter #	S312994717	Various								
		Description	Main Meter	(5) Trailers								
		Rate Tariff	GS	GS								
		Commodity Company	East Coast	East Coast								
		Commodity Pricing	Fixed	Fixed								
10	Rosenauer ES	Utility Company	JCP&L	JCP&L	JCP&L		NJNG				Jackson MUA	
		Account #	100018491728	100018491728	100018491850		09-3460-0700-20				440212-0, 440213	
		Meter #	S309603532	N/A	N/A		546083					
		Description	Main Meter	Outdoor Lighting	Outdoor Lighting		Main Meter					
		Rate Tariff	GS	OL	OL		GSL					
		Commodity Company	East Coast	East Coast	East Coast		Constellation					
		Commodity Pricing	Fixed	Fixed	Fixed		Fixed, Firm					
11	Admin Bldg	Utility Company	JCP&L	JCP&L	JCP&L	JCP&L					Jackson MUA	
		Account #	100015457979	100015457979	100024666347	100018031797					440228-0	
		Meter #	S310588674	N/A	S38827300	N/A						
		Description	Main Meter	Outdoor Lighting	Payroll Trailer	Street Lighting						
		Rate Tariff	GS	OL	GS	SVL						
		Commodity Company	East Coast	East Coast	East Coast	East Coast						
		Commodity Pricing	Fixed	Fixed	Fixed	Fixed						
12	Transportation Bldg	Utility Company	JCP&L				NJNG				Jackson MUA	
		Account #	100015457821				22-0006-1507-12				440227-0	
		Meter #	G15145662				658561					
		Description	Main Meter				Main Meter					
		Rate Tariff	GS				GSL					
		Commodity Company	East Coast				Constellation					
		Commodity Pricing	Fixed				Fixed, Firm					
13	Maintenance Bldg	Utility Company	JCP&L				NJNG					
		Account #	100015457938				22-0006-1506-32					
		Meter #	G21257829				706864					
		Description	Main Meter				Main Meter					
		Rate Tariff	GS				GSS					
		Commodity Company	East Coast				Constellation					
		Commodity Pricing	Fixed				Fixed, Firm					

Jackson Liberty High School Baseline Energy Use

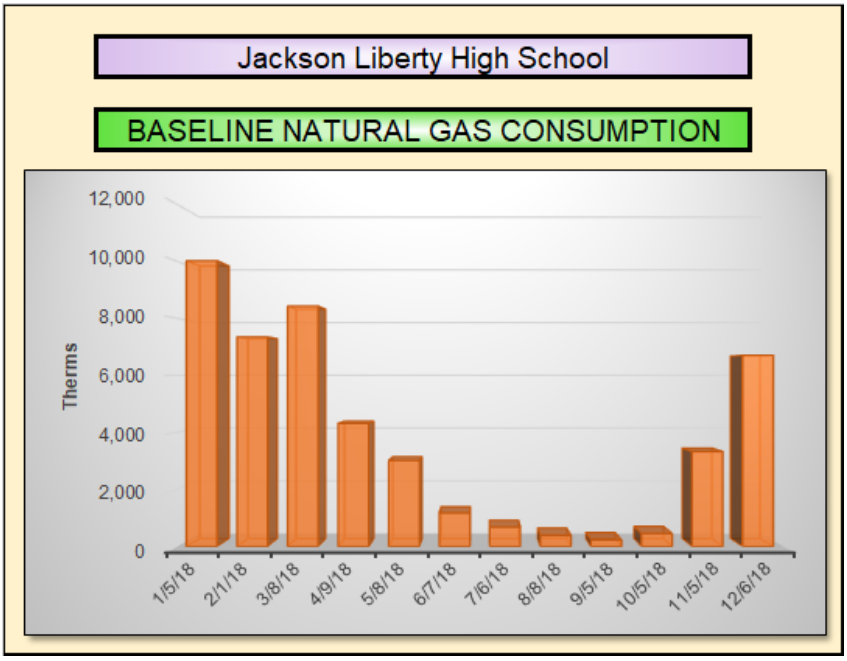




Jackson Liberty High School						ELECTRIC METER #1					
Provider:	JCP&L			Account #:	100 070 775 273			Meter #:	S314063929		
Commodity:	Constellation / East Coast			Commodity:	Fixed Price			Rate Tariff:	GSP		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
11/18/17	12/19/17	269,824	789	$4,759	$22,593	$4,292	$31,644	$0.117	32	45%	920,639,488
12/20/17	1/18/18	321,870	828	$5,649	$26,757	$4,498	$36,905	$0.115	30	54%	1,098,220,440
1/19/18	2/16/18	253,105	692	$4,454	$21,276	$3,756	$29,486	$0.116	29	53%	863,594,260
2/17/18	3/19/18	190,451	726	$3,385	$16,326	$3,941	$23,651	$0.124	31	35%	649,818,812
3/20/18	4/17/18	136,896	664	$2,482	$11,939	$3,501	$17,922	$0.131	29	30%	467,089,152
4/18/18	5/17/18	105,907	697	$1,995	$9,473	$3,594	$15,062	$0.142	30	21%	361,354,684
5/18/18	6/18/18	134,585	821	$2,470	$11,938	$4,575	$18,983	$0.141	32	21%	459,204,020
6/19/18	7/18/18	113,317	748	$2,159	$10,264	$4,169	$16,591	$0.146	30	21%	386,637,604
7/19/18	8/17/18	167,744	795	$3,076	$15,729	$4,430	$23,236	$0.139	30	29%	572,342,528
8/18/18	9/18/18	210,785	909	$3,781	$15,155	$5,062	$23,999	$0.114	32	30%	719,198,420
9/19/18	10/17/18	236,866	891	$4,093	$17,031	$4,598	$25,721	$0.109	29	38%	808,186,792
10/18/18	11/15/18	255,758	797	$4,241	$18,389	$4,113	$26,742	$0.105	29	46%	872,646,296
TOTALS		2,397,108	909	$42,542	$196,869	$50,530	$289,941	$0.121	363	30%	8,178,932,496

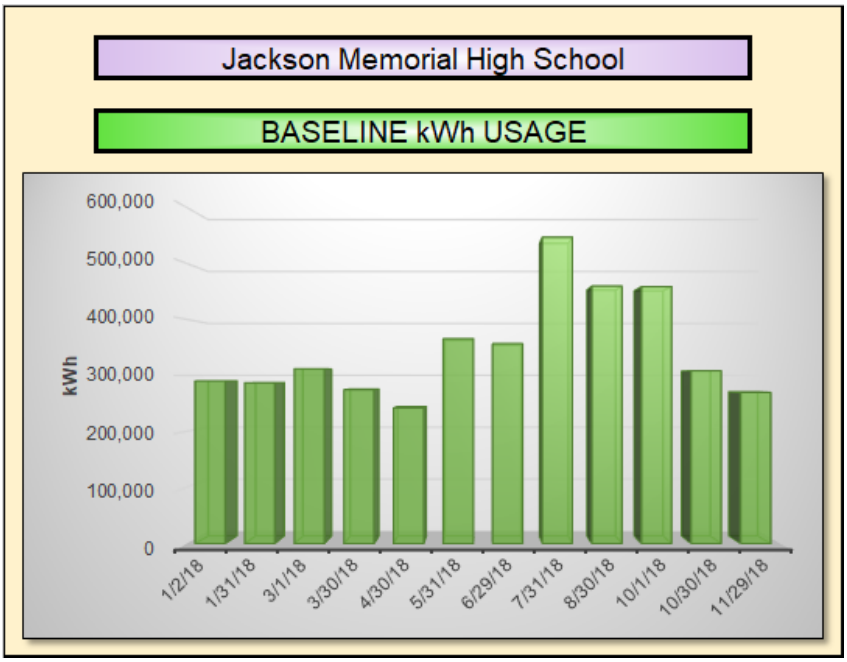


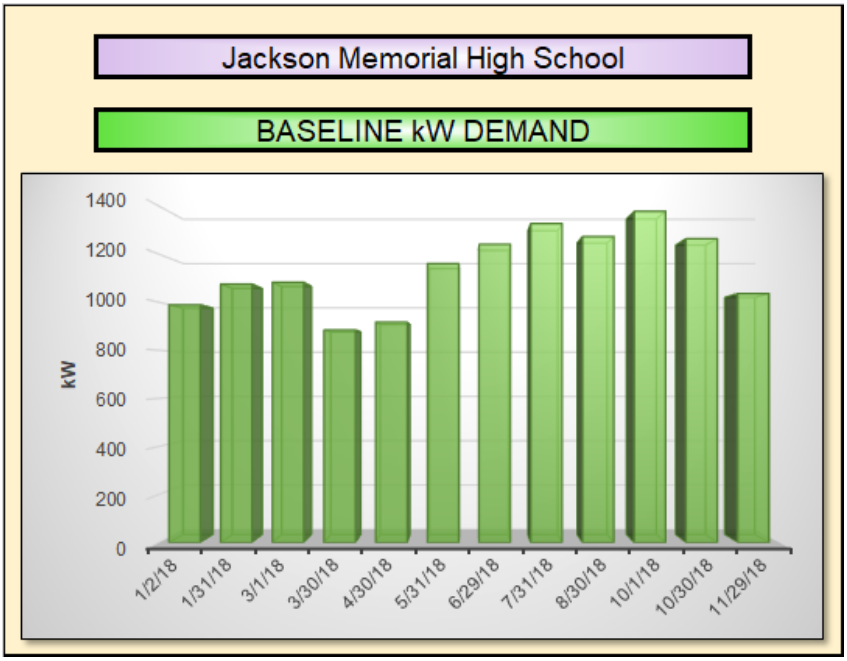
Jackson Liberty High School					
Provider	SolarCity / Tesla		Solar PPA (kWh)		
Meter/Acct #	JB-085352-00				
Billing Period Start Date	Actual Reading	Solar PPA (kWh)	$$	Cost / Unit Checksum	BTU
12/1/17	12/31/17	62,170	$5,036	$0.081	212,124,313
1/1/18	1/31/18	86,106	$6,975	$0.081	293,793,945
2/1/18	2/28/18	95,499	$7,735	$0.081	325,841,087
3/1/18	3/31/18	148,946	$12,065	$0.081	508,205,117
4/1/18	4/30/18	179,504	$14,540	$0.081	612,466,556
5/1/18	5/31/18	183,155	$14,836	$0.081	624,924,451
6/1/18	6/30/18	207,112	$16,776	$0.081	706,666,690
7/1/18	7/31/18	213,847	$17,322	$0.081	729,645,009
8/1/18	8/31/18	186,407	$15,099	$0.081	636,019,729
9/1/18	9/30/18	126,363	$10,235	$0.081	431,151,238
10/1/18	10/31/18	63,244	$5,249	$0.083	215,787,982
11/1/18	11/30/18	54,424	$4,517	$0.083	185,694,142
TOTALS		1,606,776	$130,384	$0.081	5,482,320,258



Jackson Liberty High School								Natural Gas Meter #1	
Provider	NJNG		Account #	22-0009-8372-37				Meter #	851923
Commodity	Constellation		Commodity	Fixed Price, Firm				Rate Tariff:	GSL
Billing Period Start Date	Actual Reading	Therms	Gas Delivery Charges	Gas Customer Charge	Gas Demand Charge	Gas Commodity Charges	Gas Total Charges	$/Therm Marginal Rate	BTU
12/6/17	1/5/18	10,014	$4,627	$56	$680	$5,172	$10,535	$0.98	1,001,375,000
1/6/18	2/1/18	7,346	$3,387	$56	$680	$3,786	$7,910	$0.98	734,599,000
2/2/18	3/8/18	8,426	$3,885	$67	$816	$4,343	$9,111	$0.98	842,571,000
3/9/18	4/9/18	4,316	$1,959	$54	$679	$2,224	$4,917	$0.97	431,583,000
4/10/18	5/8/18	3,014	$1,317	$50	$677	$1,553	$3,597	$0.95	301,354,000
5/9/18	6/7/18	1,175	$514	$50	$677	$606	$1,846	$0.95	117,533,000
6/8/18	7/6/18	680	$297	$50	$677	$350	$1,374	$0.95	67,977,000
7/7/18	8/8/18	390	$170	$50	$677	$201	$1,098	$0.95	38,951,000
8/9/18	9/5/18	228	$100	$50	$677	$118	$944	$0.95	22,802,000
9/6/18	10/5/18	454	$234	$51	$678	$197	$1,159	$0.95	45,431,000
10/6/18	11/5/18	3,329	$1,425	$52	$678	$1,716	$3,870	$0.94	332,920,000
11/6/18	12/6/18	6,704	$2,869	$52	$678	$3,455	$7,053	$0.94	670,375,000
TOTALS		46,075	$20,783	$639	$8,273	$23,721	$53,415	$0.97	4,607,471,000

Jackson Memorial High School Baseline Energy Use





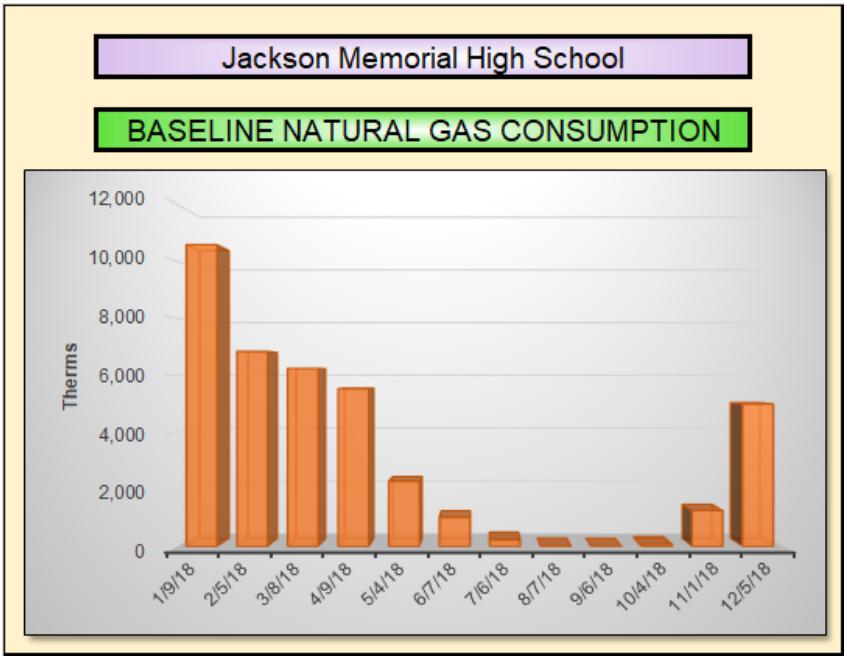
Jackson Memorial High School						ELECTRIC METER #1					
Provider:	JCP&L			Account #	100 020 543 011, Memorial Wing			Meter #	L014779487		
Commodity:	Constellation / East Coast			Commodity:	Fixed Price			Rate Tariff:	GST		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
12/2/17	1/2/18	125,148	328	$2,320	$10,794	$2,304	$15,418	$0.123	32	50%	427,004,976
1/3/18	1/31/18	128,753	354	$2,380	$11,057	$2,483	$15,920	$0.124	29	52%	439,305,236
2/1/18	3/1/18	128,316	429	$2,372	$11,049	$3,006	$16,427	$0.128	29	43%	437,814,192
3/2/18	3/30/18	120,600	339	$2,232	$10,401	$2,377	$15,010	$0.124	29	51%	411,487,200
3/31/18	4/30/18	112,646	331	$2,059	$9,808	$2,202	$14,069	$0.125	31	46%	384,348,152
5/1/18	5/31/18	153,087	487	$2,782	$13,026	$3,239	$19,047	$0.124	31	42%	522,332,844
6/1/18	6/29/18	156,177	541	$2,862	$13,387	$3,853	$20,102	$0.129	29	41%	532,875,924
6/30/18	7/31/18	205,917	548	$3,781	$17,631	$3,899	$25,311	$0.123	32	49%	702,588,804
8/1/18	8/30/18	208,952	559	$3,837	$15,559	$3,983	$23,378	$0.112	30	52%	712,944,224
8/31/18	10/1/18	200,487	621	$3,634	$14,928	$4,130	$22,692	$0.113	32	42%	684,061,644
10/2/18	10/30/18	141,170	562	$2,537	$10,512	$3,735	$16,784	$0.119	29	36%	481,672,040
10/31/18	11/29/18	117,419	454	$1,985	$18,561	$3,016	$23,563	$0.201	30	36%	400,633,628
TOTALS		1,798,672	621	$32,782	$156,711	$38,226	$227,720	$0.127	363	33%	6,137,068,864

Jackson Memorial High School						ELECTRIC METER #2					
Provider:	JCP&L			Account #	100 020 542 948, Clayton Wing			Meter #	L014947464		
Commodity:	Constellation / East Coast			Commodity	Fixed Price			Rate Tariff	GST		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
12/2/17	1/2/18	71,599	233	$1,347	$6,218	$1,633	$9,198	$0.128	32	40%	244,295,788
1/3/18	1/31/18	76,316	279	$1,429	$6,574	$1,953	$9,956	$0.130	29	39%	260,390,192
2/1/18	3/1/18	79,672	317	$1,490	$6,858	$2,221	$10,570	$0.133	29	36%	271,840,864
3/2/18	3/30/18	67,569	229	$1,271	$5,874	$1,605	$8,751	$0.130	29	42%	230,545,428
3/31/18	4/30/18	71,039	254	$1,315	$6,177	$1,693	$9,185	$0.129	31	38%	242,385,068
5/1/18	5/30/18	105,980	371	$1,939	$8,945	$2,640	$13,524	$0.128	30	40%	361,603,760
5/31/18	6/29/18	122,621	398	$2,237	$10,458	$2,835	$15,530	$0.127	30	43%	418,382,852
6/30/18	7/31/18	150,282	391	$2,747	$12,839	$2,784	$18,370	$0.122	32	50%	512,762,184
8/1/18	8/30/18	151,331	369	$2,766	$11,268	$2,630	$16,665	$0.110	30	57%	516,341,372
8/31/18	10/1/18	165,349	453	$2,978	$12,312	$3,012	$18,302	$0.111	32	48%	564,170,788
10/2/18	10/30/18	95,819	412	$1,721	$7,135	$2,738	$11,594	$0.121	29	33%	326,934,428
10/31/18	11/29/18	72,327	302	$1,228	$11,809	$2,006	$15,043	$0.208	30	33%	246,779,724
TOTALS		1,229,904	453	$22,468	$106,467	$27,751	$156,686	$0.127	363	31%	4,196,432,448

Jackson Memorial High School				ELECTRIC METER #3							
Provider:	JCP&L			Account #	100 015 458 142, Fine Arts Bldg			Meter #	G28168729		
Commodity:	Constellation / East Coast			Commodity	Fixed Price			Rate Tariff	GST		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
12/2/17	1/3/18	73,600	313	$1,409	$6,390	$1,008	$8,808	$0.12	33	30%	251,123,200
1/4/18	1/31/18	64,320	313	$1,237	$5,609	$1,005	$7,851	$0.12	28	31%	219,459,840
2/1/18	3/2/18	89,600	213	$1,698	$7,678	$1,342	$10,718	$0.12	30	58%	305,715,200
3/3/18	3/30/18	73,600	241	$1,406	$6,340	$1,522	$9,268	$0.13	28	46%	251,123,200
3/31/18	4/30/18	52,480	222	$1,006	$4,699	$1,330	$7,035	$0.13	31	32%	179,061,760
5/1/18	5/31/18	101,760	261	$1,895	$8,622	$1,686	$12,203	$0.12	31	53%	347,205,120
6/1/18	6/29/18	72,000	255	$1,360	$6,342	$1,647	$9,349	$0.13	29	41%	245,664,000
6/30/18	7/31/18	181,760	321	$3,351	$15,526	$2,090	$20,967	$0.12	32	74%	620,165,120
8/1/18	8/29/18	90,560	266	$1,703	$6,743	$1,724	$10,171	$0.11	29	49%	308,990,720
8/30/18	10/1/18	82,240	229	$1,529	$6,124	$1,370	$9,023	$0.11	33	45%	280,602,880
10/2/18	10/30/18	65,280	217	$1,210	$4,861	$1,295	$7,366	$0.11	29	43%	222,735,360
10/31/18	11/30/18	71,360	196	$1,236	$10,766	$1,163	$13,166	$0.18	31	49%	243,480,320
TOTALS		1,018,560	321	$19,042	$89,699	$17,184	$125,926	$0.12	364	36%	3,475,326,720

Jackson Memorial High School				ELECTRIC METER #4							
Provider:	JCP&L			Account #	100 015 458 092, Field House			Meter #	G28370793		
Commodity:	Constellation / East Coast			Commodity	Fixed Price			Rate Tariff	GS, Space Heating		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
12/2/17	1/3/18	19,520	115	$422	$1,600	$698	$2,720	$0.139	33	21%	66,602,240
1/4/18	1/31/18	17,040	130	$376	$1,402	$789	$2,567	$0.151	28	20%	58,140,480
2/1/18	3/2/18	14,080	124	$322	$1,172	$754	$2,248	$0.160	30	16%	48,040,960
3/3/18	3/30/18	12,640	76	$296	$1,050	$436	$1,782	$0.141	28	25%	43,127,680
3/31/18	4/30/18	5,680	110	$164	$498	$631	$1,293	$0.228	31	7%	19,380,160
5/1/18	5/31/18	4,480	42	$147	$402	$217	$765	$0.171	31	14%	15,285,760
6/1/18	6/29/18	5,600	47	$167	$498	$248	$914	$0.163	29	17%	19,107,200
6/30/18	7/31/18	7,840	68	$208	$689	$207	$1,105	$0.141	32	15%	26,750,080
8/1/18	8/29/18	8,080	78	$213	$602	$457	$1,271	$0.157	29	15%	27,568,960
8/30/18	10/1/18	9,600	76	$233	$715	$412	$1,360	$0.142	33	16%	32,755,200
10/2/18	10/30/18	5,840	74	$165	$435	$401	$1,000	$0.171	29	11%	19,926,080
10/31/18	11/30/18	8,320	85	$199	$620	$470	$1,289	$0.155	31	13%	28,387,840
TOTALS		118,720	130	$2,913	$9,683	$5,719	$18,315	$0.154	364	10%	405,072,640

Jackson Memorial High School											
TOTAL ELECTRIC											
Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kW Checksum	Cost / kWh Checksum	Total Cost / kWh Checksum	Days	Load Factor	BTU
289,867	990	$5,498	$25,002	$5,643	$36,143	$5.70	$0.105	$0.125	32	38%	989,026,204
286,429	1076	$5,423	$24,641	$6,230	$36,294	$5.79	$0.105	$0.127	29	38%	977,295,748
311,668	1083	$5,883	$26,757	$7,323	$39,963	$6.76	$0.105	$0.128	29	41%	1,063,411,216
274,409	885	$5,205	$23,665	$5,941	$34,811	$6.71	$0.105	$0.127	29	45%	936,283,508
241,845	917	$4,544	$21,182	$5,856	$31,582	$6.39	$0.106	$0.131	31	35%	825,175,140
365,307	1161	$6,763	$30,994	$7,782	$45,539	$6.71	$0.103	$0.125	31	42%	1,246,427,484
356,398	1241	$6,626	$30,685	$8,583	$45,894	$6.92	$0.105	$0.129	29	41%	1,216,029,976
545,799	1327	$10,088	$46,685	$8,980	$65,753	$6.77	$0.104	$0.120	32	54%	1,862,266,188
458,923	1273	$8,519	$34,171	$8,794	$51,485	$6.91	$0.093	$0.112	30	50%	1,565,845,276
457,676	1378	$8,375	$34,079	$8,923	$51,376	$6.48	$0.093	$0.112	32	43%	1,561,590,512
308,109	1264	$5,633	$22,942	$8,169	$36,744	$6.46	$0.093	$0.119	29	35%	1,051,267,908
269,426	1036	$4,648	$41,756	$6,656	$53,060	$6.43	$0.172	$0.197	30	36%	919,281,512
4,165,856	1378	$77,205	$362,560	$88,881	$528,646	$6.52	$0.106	$0.127	363	35%	14,213,900,672

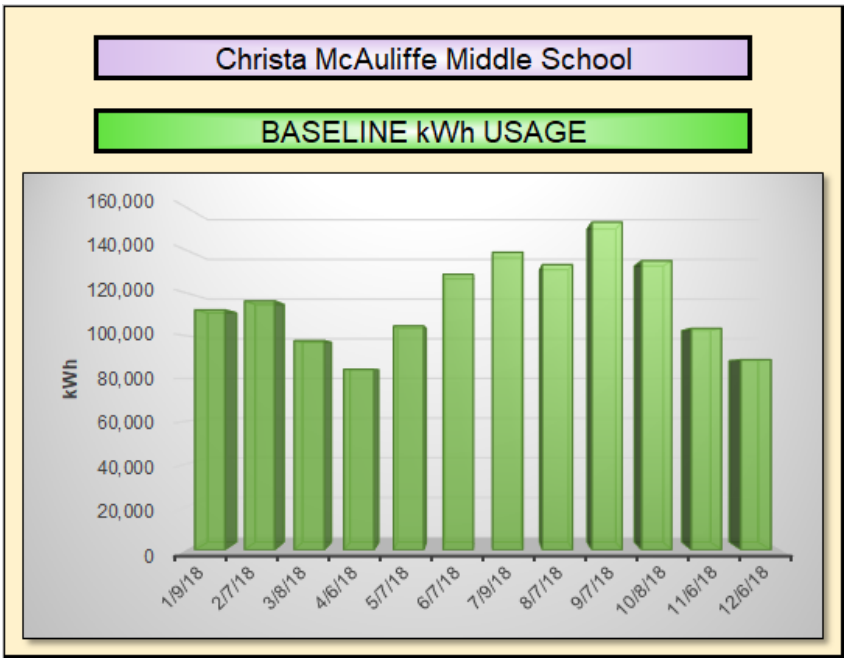


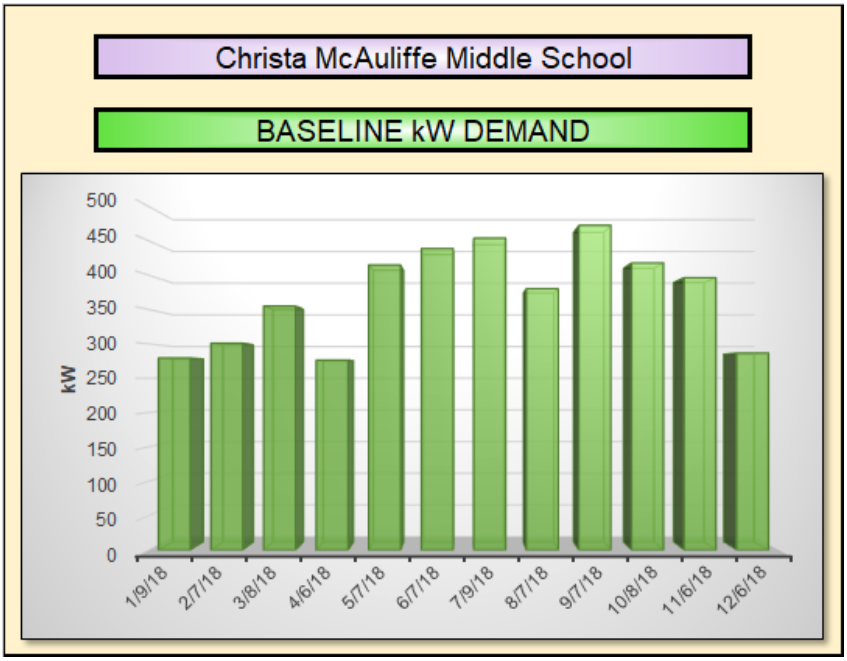
Jackson Memorial High School								Natural Gas Meter #1	
Provider	NJNG		Account #	22-0016-4103-97, Clayton Wing				Meter #	1039421
Commodity	Constellation		Commodity	Fixed Price, Firm				Rate Tariff:	GSL
Billing Period Start Date	Actual Reading	Therms	Gas Delivery Charges	Gas Customer Charge	Gas Demand Charge	Gas Commodity Charges	Gas Total Charges	$/Therm Marginal Rate	BTU
12/6/17	1/9/18	10,577	$4,886	$56	$336	$4,492	$9,769	$0.89	1,057,699,000
1/10/18	2/5/18	6,840	$3,154	$56	$336	$2,883	$6,429	$0.88	683,961,000
2/6/18	3/8/18	6,244	$2,879	$56	$336	$2,850	$6,121	$0.92	624,402,000
3/9/18	4/9/18	5,534	$2,412	$54	$335	$2,163	$4,964	$0.83	553,412,000
4/10/18	5/4/18	2,284	$998	$40	$267	$910	$2,215	$0.84	228,410,000
5/5/18	6/7/18	1,026	$448	$50	$334	$413	$1,245	$0.84	102,624,000
6/8/18	7/6/18	238	$104	$50	$334	$95	$583	$0.83	23,839,000
7/7/18	8/7/18	17	$7	$50	$334	$7	$398	$0.85	1,657,000
8/8/18	9/6/18	12	$5	$50	$334	$5	$394	$0.86	1,186,000
9/7/18	10/4/18	75	$33	$50	$547	$32	$662	$0.86	7,491,000
10/5/18	11/1/18	1,261	$539	$52	$547	$551	$1,689	$0.86	126,070,000
11/2/18	12/5/18	4,996	$2,138	$52	$547	$2,545	$5,282	$0.94	499,589,000
TOTALS		39,103	$17,604	$617	$4,584	$16,946	$39,751	$0.88	3,910,340,000

Jackson Memorial High School							Natural Gas Meter #2		
Provider	NJNG		Account #	04-3472-7325-29, Fine Arts Wing			Meter #	425688	
Commodity	Constellation		Commodity	Fixed Price, Firm			Rate Tariff	GSL	
Billing Period Start Date	Actual Reading	Therms	Gas Delivery Charges	Gas Customer Charge	Gas Demand Charge	Gas Commodity Charges	Gas Total Charges	Cost / Unit Checksum	BTU
12/6/17	1/9/18	2,717	$1,255	$56	$314	$1,403	$3,027	$0.98	271,652,000
1/10/18	2/5/18	1,692	$780	$56	$314	$872	$2,022	$0.98	169,202,000
2/6/18	3/8/18	1,697	$782	$56	$314	$874	$2,026	$0.98	169,673,000
3/9/18	4/9/18	1,536	$697	$54	$313	$791	$1,856	$0.97	153,567,000
4/10/18	5/4/18	585	$256	$40	$249	$302	$847	$0.95	58,524,000
5/5/18	6/7/18	476	$208	$50	$312	$245	$815	$0.95	47,575,000
6/8/18	7/6/18	425	$185	$50	$312	$219	$766	$0.95	42,459,000
7/7/18	8/7/18	574	$251	$50	$312	$296	$909	$0.95	57,414,000
8/8/18	9/6/18	561	$245	$50	$312	$289	$896	$0.95	56,107,000
9/7/18	10/4/18	593	$258	$50	$137	$306	$751	$0.95	59,331,000
10/5/18	11/1/18	617	$264	$52	$137	$319	$771	$0.94	61,729,000
11/2/18	12/7/18	1,474	$631	$63	$164	$760	$1,617	$0.94	147,406,000
TOTALS		12,946	$5,812	$628	$3,189	$6,676	$16,304	$0.96	1,294,639,000

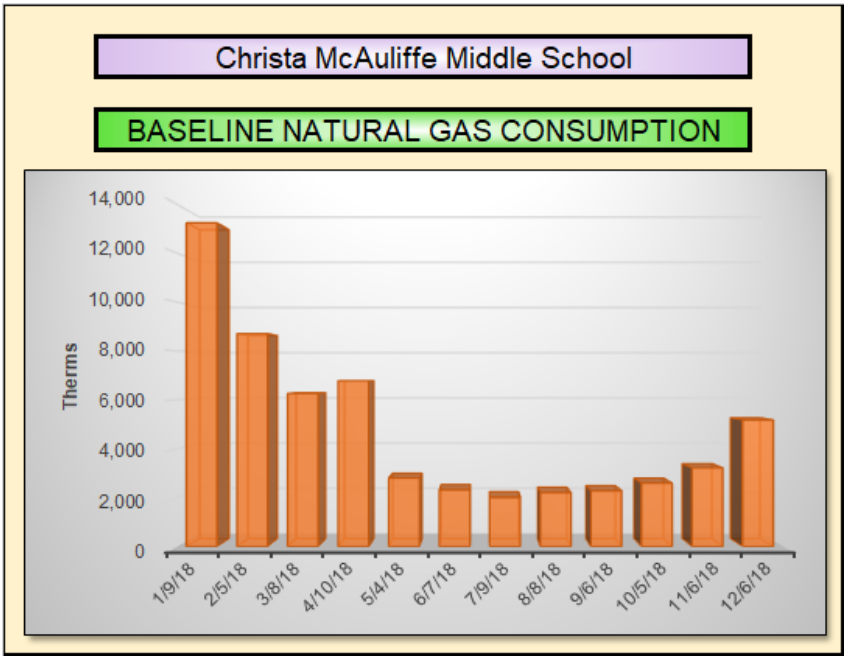
Jackson Memorial High School							
TOTAL NATURAL GAS							
Therms	Gas Delivery Charges	Gas Customer Charge	Gas Demand Charge	Gas Commodity Charges	Gas Total Charges	Cost / Unit Checksum	BTU
13,294	$6,141	$112	$649	$5,895	$12,797	$0.91	1,329,351,000
8,532	$3,934	$112	$649	$3,756	$8,451	$0.90	853,163,000
7,941	$3,661	$112	$649	$3,725	$8,148	$0.93	794,075,000
7,070	$3,109	$108	$648	$2,954	$6,819	$0.86	706,979,000
2,869	$1,254	$80	$517	$1,211	$3,062	$0.86	286,934,000
1,502	$656	$100	$646	$658	$2,060	$0.88	150,199,000
663	$290	$100	$646	$314	$1,349	$0.91	66,298,000
591	$258	$100	$646	$303	$1,306	$0.95	59,071,000
573	$250	$100	$646	$294	$1,290	$0.95	57,293,000
668	$291	$101	$684	$338	$1,413	$0.94	66,822,000
1,878	$803	$104	$684	$870	$2,461	$0.89	187,799,000
6,470	$2,768	$115	$711	$3,305	$6,899	$0.94	646,995,000
52,050	$23,415	$1,245	$7,773	$23,621	$56,054	$0.90	5,204,979,000

Christa McAuliffe Middle School Baseline Energy Use



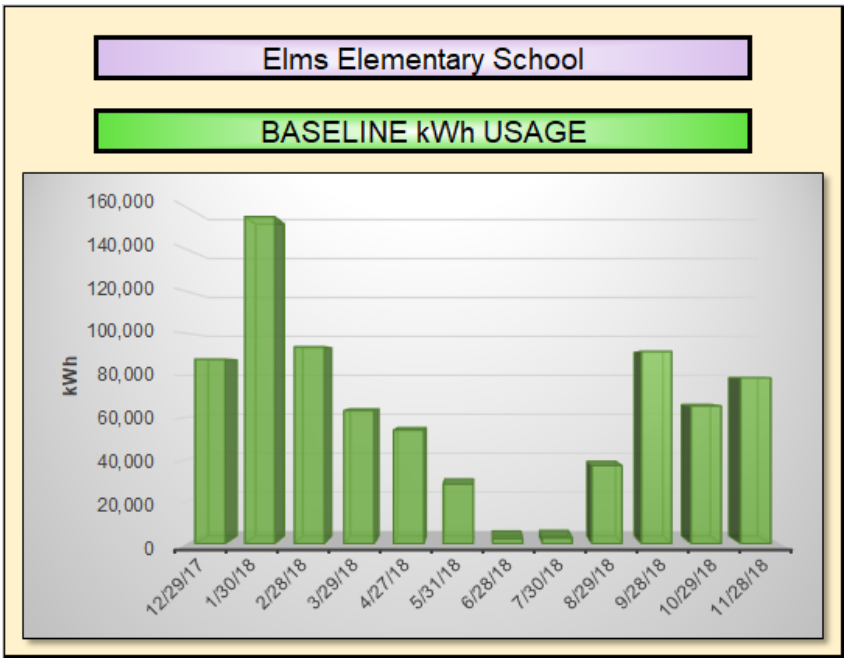


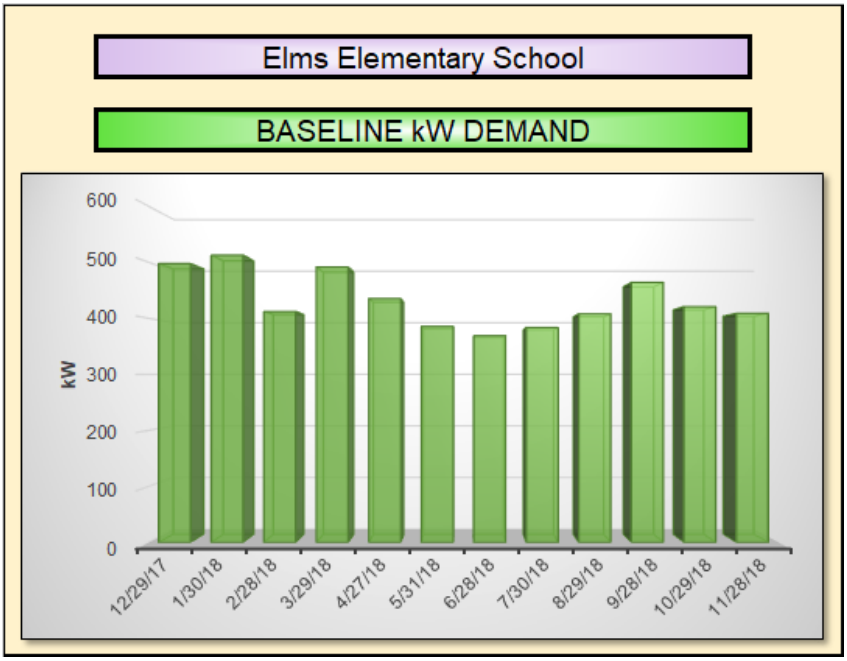
Christa McAuliffe Middle School						ELECTRIC METER #1					
Provider:	JCP&L			Account #	100 016 675 173			Meter #	A021052251		
Commodity:	Constellation / East Coast			Commodity:	Fixed Price			Rate Tariff:	GS		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
12/9/17	1/9/18	111,992	279	$2,110	$9,568	$1,782	$13,460	$0.120	32	52%	382,116,704
1/10/18	2/7/18	116,146	301	$2,182	$9,878	$1,921	$13,980	$0.120	29	55%	396,290,152
2/8/18	3/8/18	97,626	355	$1,844	$8,413	$2,277	$12,534	$0.128	29	40%	333,099,912
3/9/18	4/6/18	84,276	277	$1,596	$7,317	$1,741	$10,654	$0.126	29	44%	287,549,712
4/7/18	5/7/18	104,484	415	$1,939	$8,965	$2,537	$13,442	$0.129	31	34%	356,499,408
5/8/18	6/7/18	128,588	439	$2,377	$10,938	$2,884	$16,199	$0.126	31	39%	438,742,256
6/8/18	7/9/18	138,836	454	$2,565	$12,007	$2,985	$17,557	$0.126	32	40%	473,708,432
7/10/18	8/7/18	133,077	380	$2,472	$11,643	$2,491	$16,606	$0.125	29	50%	454,058,724
8/8/18	9/7/18	152,906	472	$2,830	$11,385	$3,111	$17,327	$0.113	31	44%	521,715,272
9/8/18	10/8/18	134,888	418	$2,451	$10,044	$2,556	$15,051	$0.112	31	43%	460,237,856
10/9/18	11/6/18	103,354	396	$1,855	$7,696	$2,420	$11,971	$0.116	29	37%	352,643,848
11/7/18	12/6/18	88,704	287	$1,040	$14,674	$2,212	$17,927	$0.202	30	43%	302,658,048
TOTALS		1,394,877	472	$25,261	$122,529	$28,918	$176,708	$0.127	363	34%	4,759,320,324



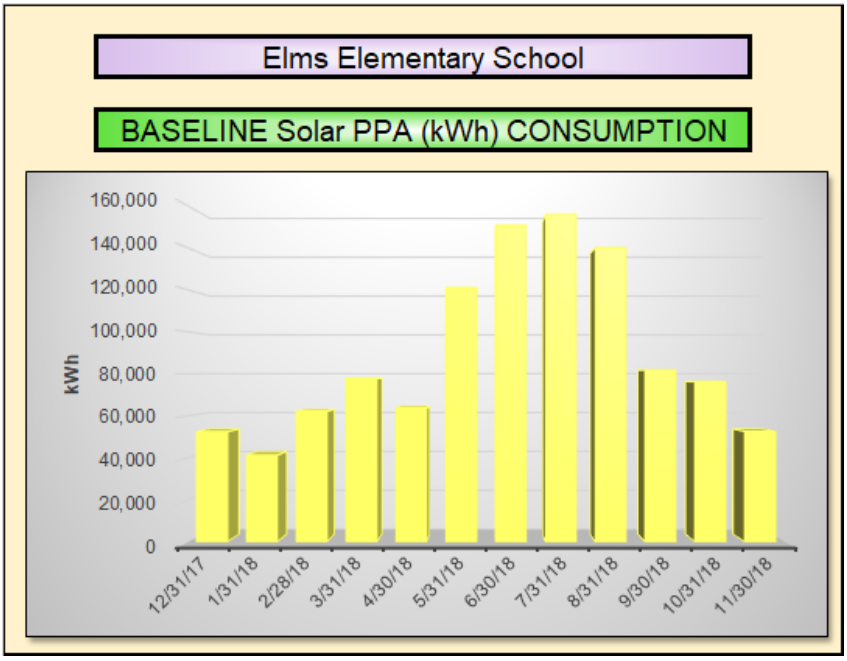
Christa McAuliffe Middle School								Natural Gas Meter #1	
Provider	NJNG		Account #	04-3473-0870-23				Meter #	1039519
Commodity	Constellation		Commodity	Fixed Price, Firm				Rate Tariff:	GSL
Billing Period Start Date	Actual Reading	Therms	Gas Delivery Charges	Gas Customer Charge	Gas Demand Charge	Gas Commodity Charges	Gas Total Charges	$/Therm Marginal Rate	BTU
12/6/17	1/9/18	13,235	$6,114	$56	$616	$6,834	$13,619	$0.98	1,323,465,000
1/10/18	2/5/18	8,700	$4,012	$56	$616	$4,484	$9,168	$0.98	869,995,000
2/6/18	3/8/18	6,257	$2,885	$56	$616	$3,225	$6,782	$0.98	625,688,000
3/9/18	4/10/18	6,775	$3,075	$54	$615	$3,492	$7,236	$0.97	677,502,000
4/11/18	5/4/18	2,804	$1,225	$40	$490	$1,445	$3,201	$0.95	280,365,000
5/5/18	6/7/18	2,320	$1,014	$50	$613	$1,196	$2,872	$0.95	231,979,000
6/8/18	7/9/18	2,010	$878	$50	$613	$1,036	$2,577	$0.95	201,034,000
7/10/18	8/8/18	2,209	$964	$50	$613	$1,138	$2,765	$0.95	220,850,000
8/9/18	9/6/18	2,275	$993	$50	$613	$1,172	$2,828	$0.95	227,484,000
9/7/18	10/5/18	2,595	$1,126	$51	$679	$1,338	$3,193	$0.95	259,509,000
10/6/18	11/6/18	3,218	$1,377	$52	$679	$1,658	$3,766	$0.94	321,765,000
11/7/18	12/6/18	5,178	$2,216	$52	$679	$2,669	$5,615	$0.94	517,795,000
TOTALS		57,574	$25,879	$617	$7,440	$29,686	$63,623	$0.97	5,757,431,000

Elms Elementary School Baseline Energy Use



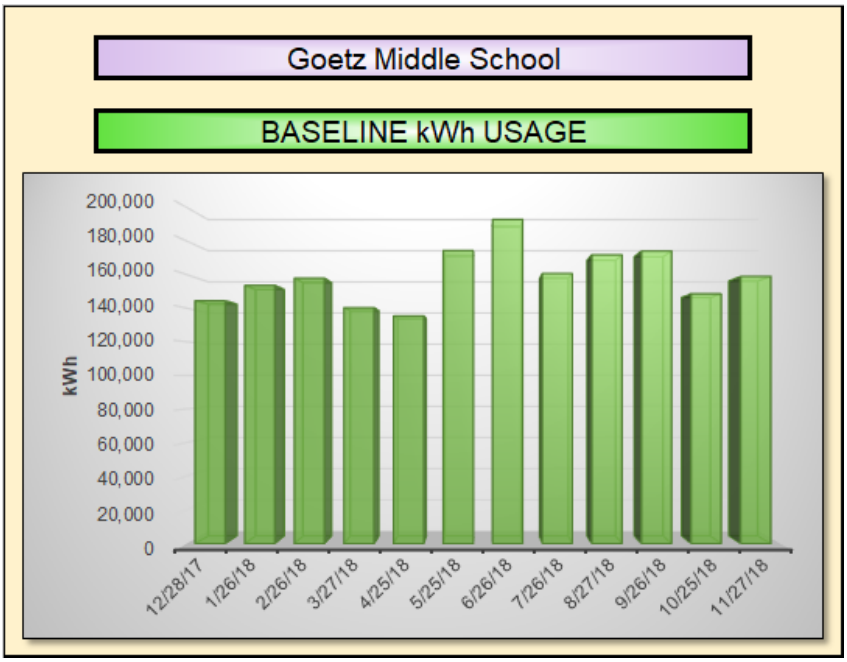


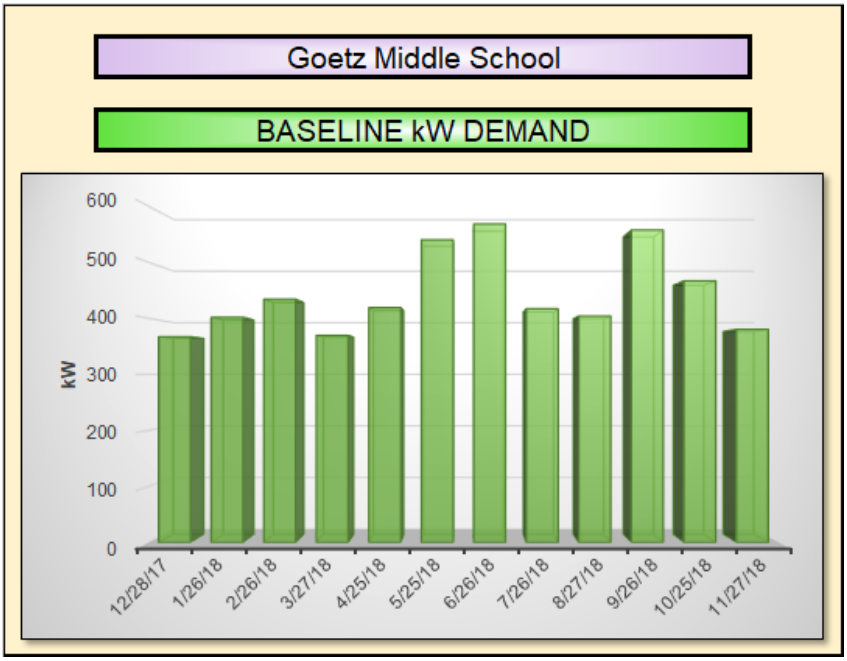
Elms Elementary School						ELECTRIC METER #1					
Provider:	JCP&L			Account #	100 052 024 872			Meter #	S314063930		
Commodity:	Constellation / East Coast			Commodity:	Fixed Price			Rate Tariff:	GS		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
12/1/17	12/29/17	87,688	497	$1,681	$7,378	$3,227	$12,286	$0.140	29	25%	299,191,456
12/30/17	1/30/18	155,266	513	$2,920	$12,905	$3,317	$19,141	$0.123	32	39%	529,767,592
1/31/18	2/28/18	93,611	412	$1,786	$7,956	$2,653	$12,396	$0.132	29	33%	319,400,732
3/1/18	3/29/18	63,328	491	$1,229	$5,487	$3,177	$9,894	$0.156	29	19%	216,075,136
3/30/18	4/27/18	54,005	435	$1,042	$4,746	$2,676	$8,464	$0.157	29	18%	184,265,060
4/28/18	5/31/18	28,437	386	$578	$2,761	$2,355	$5,694	$0.200	34	9%	97,027,044
6/1/18	6/28/18	2,512	369	$112	$582	$2,415	$3,109	$1.237	28	1%	8,570,944
6/29/18	7/30/18	2,864	383	$118	$642	$2,513	$3,273	$1.143	32	1%	9,771,968
7/31/18	8/29/18	37,207	408	$739	$2,770	$2,677	$6,186	$0.166	30	13%	126,950,284
8/30/18	9/28/18	91,409	464	$1,694	$6,806	$2,846	$11,346	$0.124	30	27%	311,887,508
9/29/18	10/29/18	65,485	421	$1,215	$4,876	$2,575	$8,666	$0.132	31	21%	223,434,820
10/30/18	11/28/18	78,871	409	$1,363	$5,873	$2,500	$9,736	$0.123	30	27%	269,107,852
TOTALS		760,683	513	$14,477	$62,783	$32,931	$110,191	$0.145	363	17%	2,595,450,396



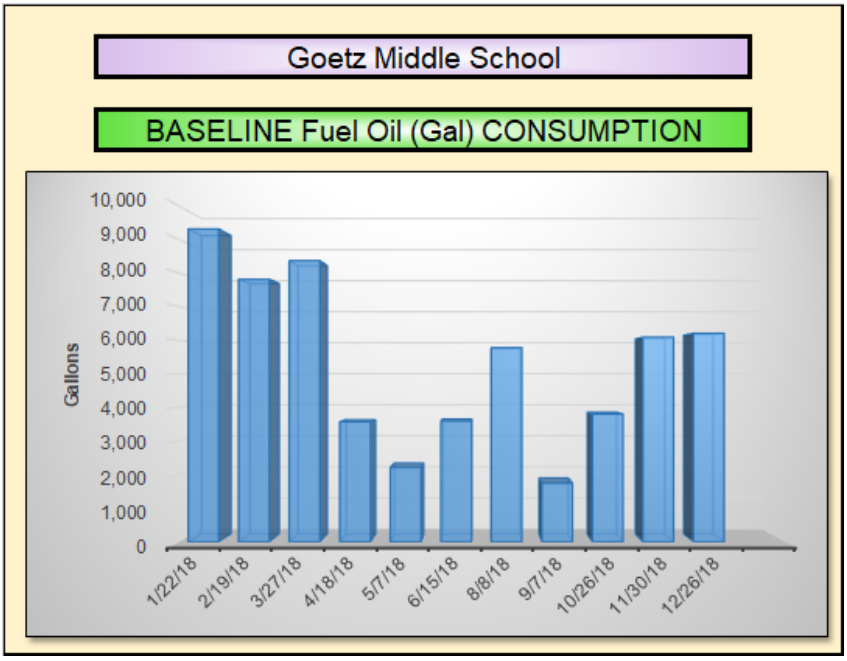
Elms Elementary School					
Provider	SolarCity / Tesla		Solar PPA (kWh)		
Meter/Acct #	JB-085353-00				
Billing Period Start Date	Actual Reading	Solar PPA (kWh)	$$	Cost / Unit Checksum	BTU
12/1/17	12/31/17	52,451	$4,249	$0.081	178,962,403
1/1/18	1/31/18	41,242	$3,341	$0.081	140,719,035
2/1/18	2/28/18	62,155	$5,035	$0.081	212,072,887
3/1/18	3/31/18	77,694	$6,293	$0.081	265,091,109
4/1/18	4/30/18	63,645	$5,155	$0.081	217,158,241
5/1/18	5/31/18	120,944	$9,796	$0.081	412,662,020
6/1/18	6/30/18	150,585	$12,197	$0.081	513,796,975
7/1/18	7/31/18	155,658	$12,608	$0.081	531,105,915
8/1/18	8/31/18	139,920	$11,334	$0.081	477,407,040
9/1/18	9/30/18	81,744	$6,785	$0.083	278,910,528
10/1/18	10/31/18	76,160	$6,321	$0.083	259,857,920
11/1/18	11/30/18	52,522	$4,359	$0.083	179,203,699
TOTALS		1,074,721	$87,473	$0.081	3,666,947,772

Goetz Middle School Baseline Energy Use



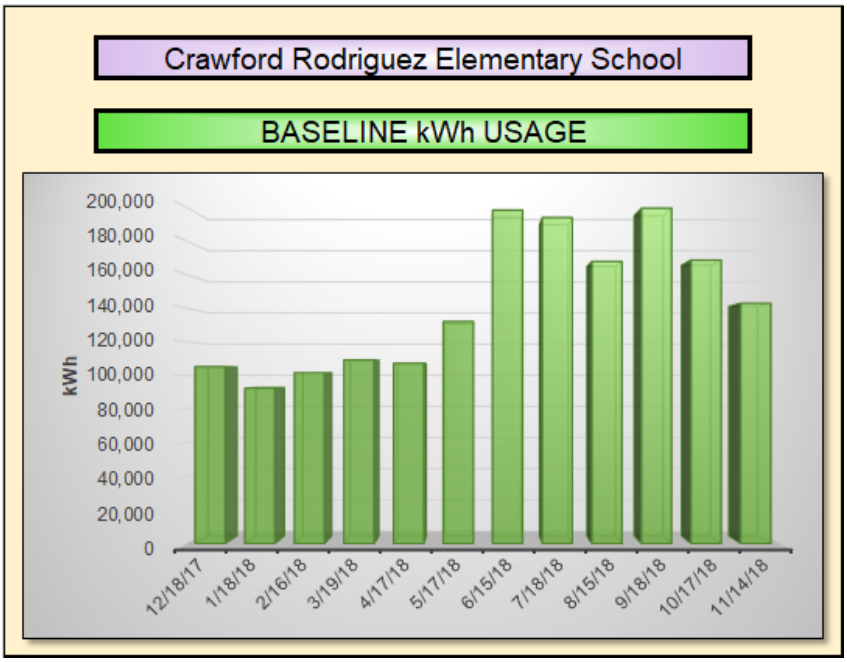


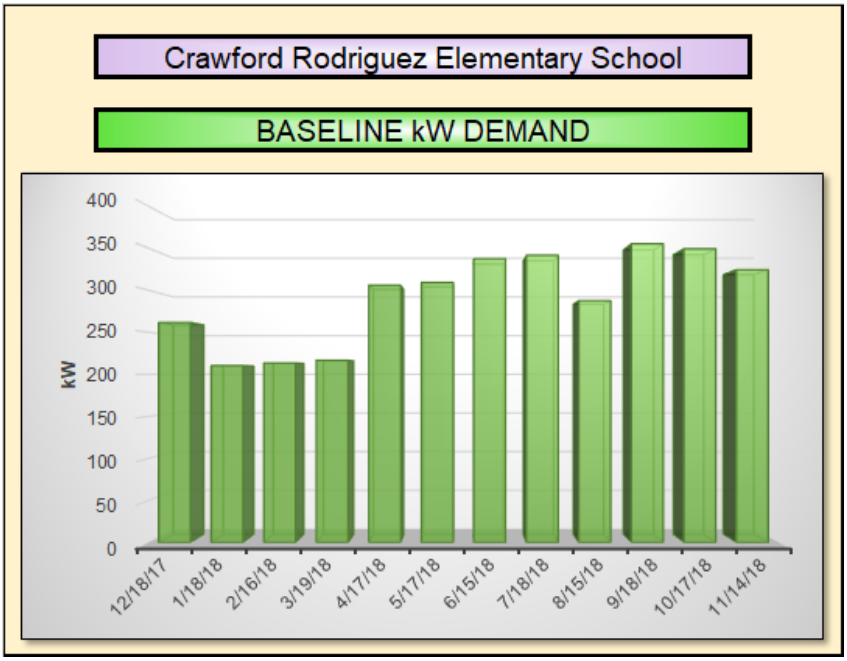
Goetz Middle School						ELECTRIC METER #1					
Provider:	JCP&L			Account #	100 020 670 103			Meter #	L75698410		
Commodity:	Constellation / East Coast			Commodity:	Fixed Price			Rate Tariff:	GSP		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
11/30/17	12/28/17	144,236	367	$2,567	$12,249	$1,998	$16,814	$0.117	29	56%	492,133,232
12/29/17	1/26/18	153,383	402	$2,731	$13,075	$2,182	$17,988	$0.117	29	55%	523,342,796
1/27/18	2/26/18	157,647	434	$2,812	$13,496	$2,358	$18,666	$0.118	31	49%	537,891,564
2/27/18	3/27/18	140,104	369	$2,500	$11,996	$2,006	$16,502	$0.118	29	54%	478,034,848
3/28/18	4/25/18	135,291	419	$2,407	$11,601	$2,178	$16,186	$0.120	29	46%	461,612,892
4/26/18	5/25/18	174,067	540	$3,071	$14,705	$2,786	$20,562	$0.118	30	45%	593,916,604
5/26/18	6/26/18	192,443	568	$3,385	$16,516	$3,164	$23,065	$0.120	32	44%	656,615,516
6/27/18	7/26/18	160,441	417	$2,848	$13,939	$2,322	$19,109	$0.119	30	53%	547,424,692
7/27/18	8/27/18	171,504	404	$3,036	$15,586	$2,250	$20,872	$0.122	32	55%	585,171,648
8/28/18	9/26/18	173,696	557	$3,052	$12,489	$3,104	$18,644	$0.107	30	43%	592,650,752
9/27/18	10/25/18	148,347	467	$2,580	$10,666	$2,408	$15,654	$0.106	29	46%	506,159,964
10/26/18	11/27/18	158,658	380	$2,574	$23,146	$1,962	$27,682	$0.174	33	53%	541,341,096
TOTALS		1,909,817	568	$33,564	$169,463	$28,717	$231,745	$0.121	363	39%	6,516,295,604



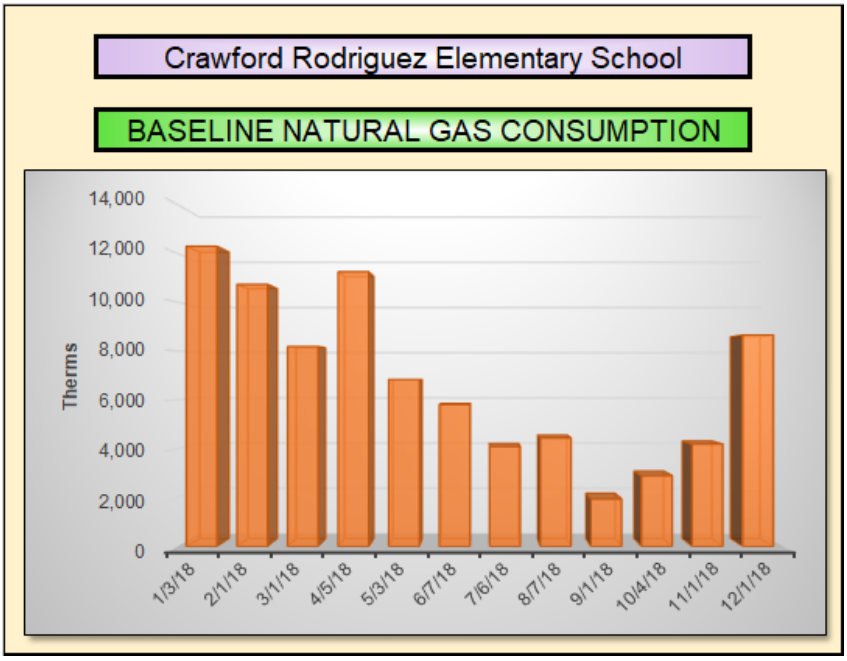
Goetz Middle School					
Provider	Pedroni Fuel Oil		Fuel Oil (Gal)		
Meter/Acct #					
Billing Period Start Date	Actual Reading	Fuel Oil (Gal)	$$	Cost / Unit Checksum	BTU
1/1/18	1/22/18	9,306	$21,397	$2.30	21,403,476
9/30/16	2/19/18	7,810	$16,529	$2.12	15,930,628
11/1/16	3/27/18	8,364	$17,732	$2.12	12,767,704
12/2/16	4/18/18	3,569	$7,940	$2.22	8,045,496
12/31/16	5/7/18	2,215	$5,217	$2.36	8,581,180
2/1/17	6/15/18	3,591	$8,504	$2.37	14,036,968
3/2/17	8/8/18	5,775	$13,597	$2.35	17,844,760
3/31/17	9/7/18	1,750	$4,195	$2.40	21,478,540
4/29/17	10/26/18	3,803	$9,588	$2.52	29,223,780
4/29/17	11/30/18	6,086	$13,209	$2.17	29,223,780
6/2/17	12/26/18	6,201	$12,766	$2.06	27,292,588
				$0.00	25,876,608
TOTALS		58,470	$130,675	$2.23	8,711,985,300

Crawford Rodriguez Middle School Baseline Energy Use



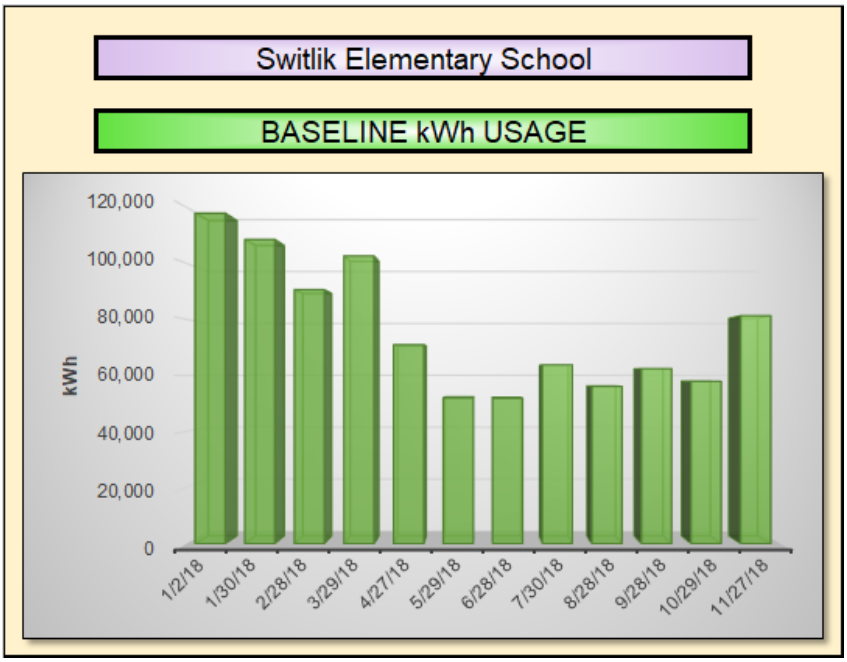


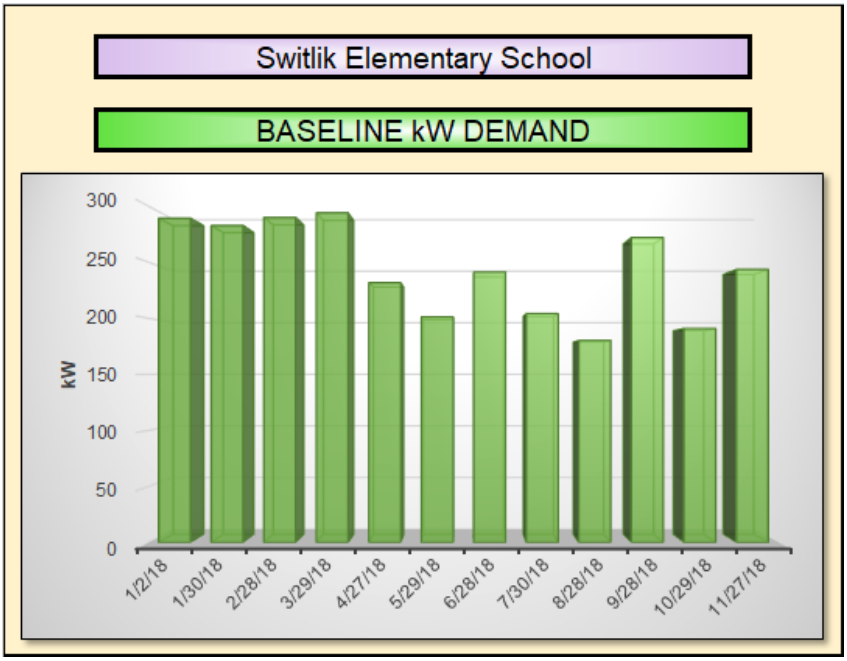
Crawford Rodriguez Elementary School						ELECTRIC METER #1					
Provider:	JCP&L			Account #	100 035 841 251			Meter #	G23539273		
Commodity:	Constellation / East Coast			Commodity:	Fixed Price			Rate Tariff:	GS		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
11/17/17	12/18/17	105,200	262	$1,983	$9,353	$1,666	$13,002	$0.124	32	52%	358,942,400
12/19/17	1/18/18	92,400	210	$1,751	$8,340	$1,324	$11,415	$0.124	31	59%	315,268,800
1/19/18	2/16/18	101,600	214	$1,917	$9,027	$1,344	$12,287	$0.121	29	68%	346,659,200
2/17/18	3/19/18	109,200	217	$2,055	$9,689	$1,365	$13,109	$0.120	31	68%	372,590,400
3/20/18	4/17/18	107,200	306	$2,001	$9,445	$1,896	$13,342	$0.124	29	50%	365,766,400
4/18/18	5/17/18	132,000	309	$2,434	$11,439	$1,876	$15,749	$0.119	30	59%	450,384,000
5/18/18	6/15/18	198,000	338	$3,624	$16,756	$2,205	$22,585	$0.114	29	84%	675,576,000
6/16/18	7/18/18	193,600	342	$3,556	$16,701	$2,232	$22,489	$0.116	33	72%	660,563,200
7/19/18	8/15/18	167,600	288	$3,096	$14,865	$1,868	$19,829	$0.118	28	87%	571,851,200
8/16/18	9/18/18	199,200	355	$3,646	$14,322	$2,323	$20,291	$0.102	34	69%	679,670,400
9/19/18	10/17/18	168,400	349	$3,035	$12,108	$2,127	$17,270	$0.103	29	69%	574,580,800
10/18/18	11/14/18	142,800	324	$2,490	$10,267	$1,971	$14,728	$0.103	28	66%	487,233,600
TOTALS		1,717,200	355	$31,587	$142,313	$22,197	$196,097	$0.114	363	55%	5,859,086,400



Crawford Rodriguez Elementary School								Natural Gas Meter #1	
Provider	NJNG		Account #	22-0006-7059-68				Meter #	657983
Commodity	Constellation		Commodity	Fixed Price, Firm				Rate Tariff:	GSL
Billing Period Start Date	Actual Reading	Therms	Gas Delivery Charges	Gas Customer Charge	Gas Demand Charge	Gas Commodity Charges	Gas Total Charges	$/Therm Marginal Rate	BTU
12/2/17	1/3/18	12,279	$5,675	$56	$760	$6,343	$12,833	$0.98	1,227,882,000
1/4/18	2/1/18	10,715	$4,941	$56	$760	$5,523	$11,279	$0.98	1,071,547,000
2/2/18	3/1/18	8,182	$3,773	$56	$760	$4,217	$8,805	$0.98	818,202,000
3/2/18	4/5/18	11,232	$5,125	$55	$759	$5,789	$11,728	$0.97	1,123,199,000
4/6/18	5/3/18	6,826	$2,984	$50	$755	$3,518	$7,307	$0.95	682,598,000
5/4/18	6/7/18	5,798	$2,534	$50	$755	$2,988	$6,328	$0.95	579,837,000
6/8/18	7/6/18	4,084	$1,783	$50	$755	$2,105	$4,693	$0.95	408,350,000
7/7/18	8/7/18	4,440	$1,939	$50	$755	$2,288	$5,033	$0.95	444,016,000
8/8/18	9/1/18	1,946	$850	$40	$604	$1,003	$2,497	$0.95	194,620,000
9/2/18	10/4/18	2,898	$1,260	$50	$770	$1,493	$3,574	$0.95	289,760,000
10/5/18	11/1/18	4,187	$1,792	$52	$770	$2,158	$4,772	$0.94	418,687,000
11/2/18	12/1/18	8,646	$3,700	$52	$770	$4,456	$8,979	$0.94	864,627,000
TOTALS		81,233	$36,355	$618	$8,975	$41,882	$87,829	$0.96	8,123,325,000

Switlik Elementary School Baseline Energy Use



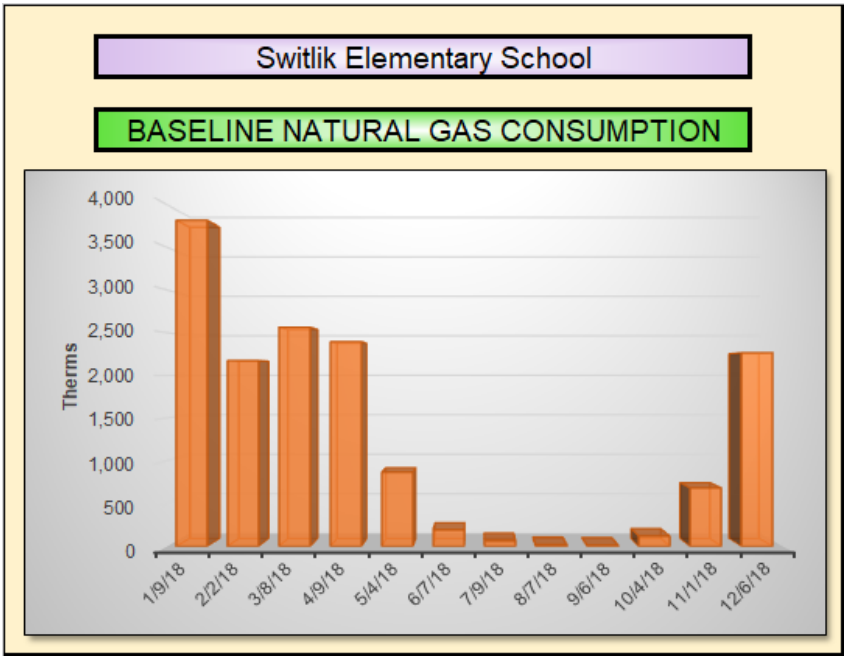


Switlik Elementary School						ELECTRIC METER #1					
Provider:	JCP&L			Account #	100 015 458 530			Meter #	G23632704		
Commodity:	Constellation / East Coast			Commodity:	Fixed Price			Rate Tariff:	GS		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
11/30/17	1/2/18	117,720	289	$2,215	$9,713	$1,848	$13,776	$0.117	34	50%	401,660,640
1/3/18	1/30/18	108,360	283	$2,040	$8,949	$1,800	$12,788	$0.118	28	57%	369,724,320
1/31/18	2/28/18	90,480	290	$1,714	$7,552	$1,847	$11,113	$0.123	29	45%	308,717,760
3/1/18	3/29/18	102,480	294	$1,933	$8,489	$1,875	$12,297	$0.120	29	50%	349,661,760
3/30/18	4/27/18	70,920	232	$1,339	$5,961	$1,394	$8,694	$0.123	29	44%	241,979,040
4/28/18	5/29/18	51,960	201	$1,000	$4,474	$1,287	$6,761	$0.130	32	34%	177,287,520
5/30/18	6/28/18	51,840	241	$998	$4,481	$1,556	$7,036	$0.136	30	30%	176,878,080
6/29/18	7/30/18	63,720	204	$1,218	$5,505	$1,307	$8,030	$0.126	32	41%	217,412,640
7/31/18	8/28/18	56,040	180	$1,080	$4,173	$1,145	$6,398	$0.114	29	45%	191,208,480
8/29/18	9/28/18	62,400	272	$1,176	$4,646	$1,643	$7,465	$0.120	31	31%	212,908,800
9/29/18	10/29/18	57,840	191	$1,080	$4,307	$1,134	$6,520	$0.113	31	41%	197,350,080
10/30/18	11/27/18	81,240	244	$1,402	$6,049	$1,464	$8,915	$0.110	29	48%	277,190,880
TOTALS		915,000	294	$17,194	$74,299	$18,300	$109,794	$0.120	363	36%	3,121,980,000

Switlik Elementary School						ELECTRIC METER #2					
Provider:	JCP&L			Account #	100 015 458 571, Relocation Building			Meter #	S315290829		
Commodity:	Constellation / East Coast			Commodity	Fixed Price			Rate Tariff	GS, Space Heating		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
11/30/17	1/2/18	3,959	0	$129	$323	$0	$452	$0.114	34	-	13,508,108
1/3/18	1/30/18	3,602	11	$122	$295	$9	$426	$0.118	28	47%	12,290,024
1/31/18	2/28/18	2,970	11	$111	$245	$4	$360	$0.121	29	40%	10,133,640
3/1/18	3/29/18	2,887	10	$109	$238	$2	$349	$0.121	29	40%	9,850,444
3/30/18	4/27/18	2,102	0	$92	$175	$0	$267	$0.127	29	-	7,172,024
4/28/18	5/29/18	1,045	0	$77	$91	$0	$168	$0.161	32	-	3,565,540
5/30/18	6/28/18	979	0	$75	$86	$0	$161	$0.164	30	-	3,340,348
6/29/18	7/30/18	1,601	0	$87	$138	$0	$226	$0.141	32	-	5,462,612
7/31/18	8/28/18	1,859	0	$92	$138	$0	$231	$0.124	29	-	6,342,908
8/29/18	9/28/18	1,265	0	$77	$94	$0	$171	$0.135	31	-	4,316,180
9/29/18	10/29/18	1,107	0	$74	$82	$0	$156	$0.141	31	-	3,777,084
10/30/18	11/27/18	2,062	0	$88	$154	$0	$242	$0.117	29	-	7,035,544
TOTALS		25,438	11	$1,134	$2,059	$15	$3,208	$0.126	363	26%	86,794,456

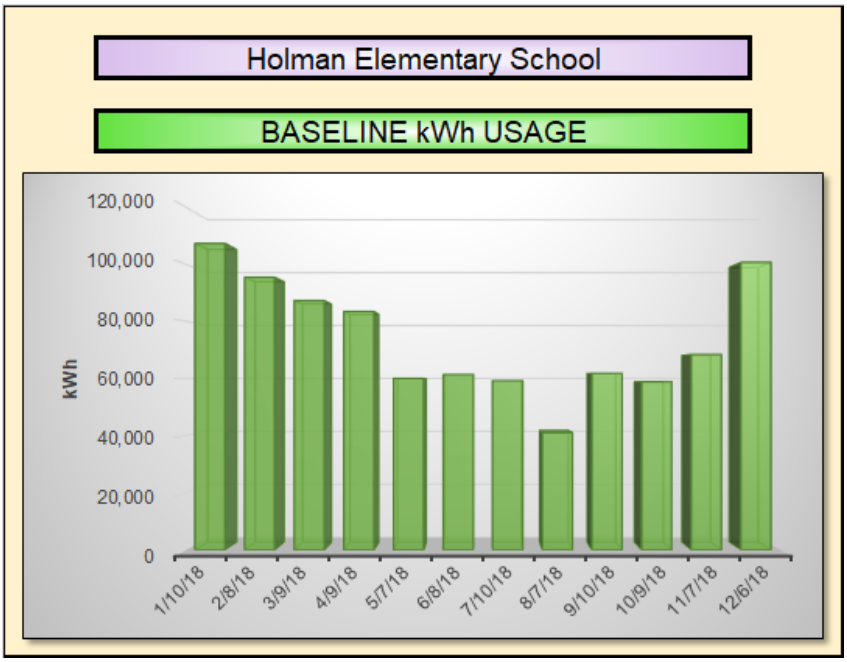
Switlik Elementary School						ELECTRIC METER #3					
Provider:	JCP&L			Account #	Various, (14) Trailers			Meter #	Various		
Commodity:	Constellation / East Coast			Commodity	Fixed Price			Rate Tariff	GS		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
11/30/2017	1/2/2018	43,025	185	$1,609	$3,536	$381	$5,526	$0.13	34	28%	146,801,300
1/3/18	1/30/2018	38,414	178	$1,513	$3,113	$382	$5,008	$0.13	28	32%	131,068,568
1/31/18	2/28/2018	30,769	140	$1,374	$2,529	$302	$4,204	$0.14	29	32%	104,983,828
3/1/18	3/29/2018	34,668	171	$1,445	$2,840	$368	$4,653	$0.13	29	29%	118,287,216
3/30/18	4/27/2018	21,263	161	$1,156	$1,769	$365	$3,290	$0.15	29	19%	72,549,356
4/28/18	5/29/2018	10,309	172	$780	$908	$367	$2,055	$0.20	32	8%	35,174,308
5/30/18	6/28/2018	11,056	121	$821	$959	$309	$2,088	$0.19	30	13%	37,723,072
6/29/18	7/30/2018	17,830	76	$1,093	$1,538	$231	$2,862	$0.16	32	31%	60,835,960
7/31/18	8/28/2018	15,581	76	$1,729	$1,160	$231	$3,120	$0.20	29	30%	53,162,372
8/29/18	9/28/2018	13,373	76	$1,544	$996	$231	$2,770	$0.21	31	24%	45,628,676
9/29/18	10/29/2018	13,044	194	$1,576	$969	$417	$2,962	$0.23	31	9%	44,506,128
10/30/18	11/27/2018	24,111	165	$2,506	$1,793	$360	$4,659	$0.19	29	21%	82,266,732
TOTALS		273,443	194	$17,146	$22,108	$3,945	$43,199	$0.16	363	16%	932,987,516

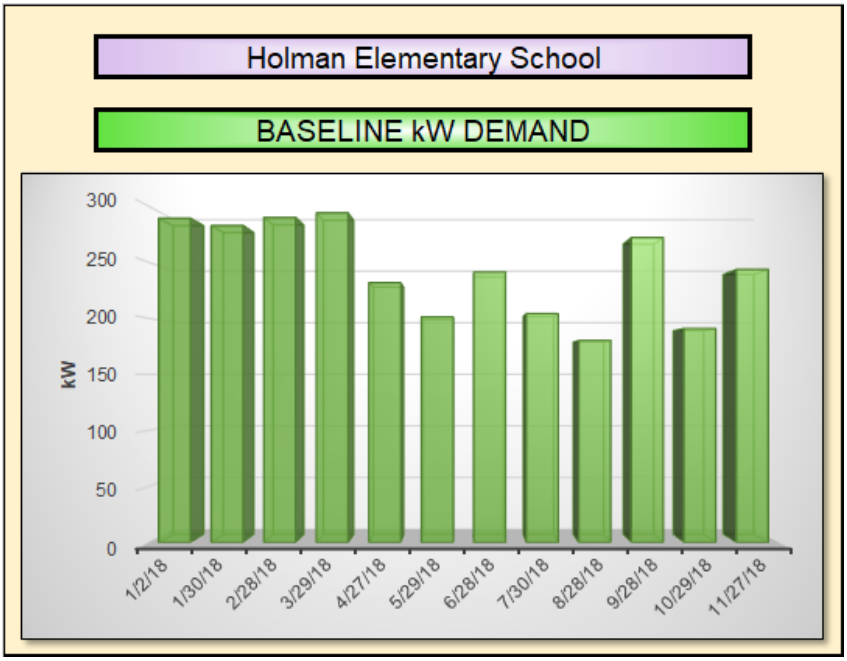
Switlik Elementary School											
TOTAL ELECTRIC											
Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kW Checksum	Cost / kWh Checksum	Total Cost / kWh Checksum	Days	Load Factor	BTU
164,704	289	$3,953	$13,572	$2,229	$19,755	$7.71	$0.106	$0.120	34	70%	561,970,048
150,376	283	$3,675	$12,356	$2,191	$18,222	$7.75	$0.107	$0.121	28	79%	513,082,912
124,219	290	$3,199	$10,325	$2,153	$15,677	$7.43	$0.109	$0.126	29	62%	423,835,228
140,035	294	$3,487	$11,567	$2,245	$17,299	$7.63	$0.108	$0.124	29	68%	477,799,420
94,285	232	$2,587	$7,905	$1,759	$12,251	$7.59	$0.111	$0.130	29	58%	321,700,420
63,314	201	$1,857	$5,472	$1,654	$8,984	$8.22	$0.116	$0.142	32	41%	216,027,368
63,875	241	$1,894	$5,526	$1,865	$9,285	$7.73	$0.116	$0.145	30	37%	217,941,500
83,151	204	$2,399	$7,181	$1,538	$11,118	$7.53	$0.115	$0.134	32	53%	283,711,212
73,480	180	$2,901	$5,471	$1,376	$9,748	$7.64	$0.114	$0.133	29	59%	250,713,760
77,038	272	$2,797	$5,736	$1,874	$10,407	$6.89	$0.111	$0.135	31	38%	262,853,656
71,991	194	$2,729	$5,358	$1,550	$9,638	$8.00	$0.112	$0.134	31	50%	245,633,292
107,413	244	$3,996	$7,996	$1,824	$13,816	$7.49	$0.112	$0.129	29	63%	366,493,156
1,213,881	294	$35,475	$98,467	$22,259	$156,201	$7.61	$0.110	$0.129	363	47%	4,141,761,972



Switlik Elementary School								Natural Gas Meter #1	
Provider	NJNG		Account #	04-3472-9080-29				Meter #	720762
Commodity	Constellation		Commodity	Fixed Price, Firm				Rate Tariff:	GSL
Billing Period Start Date	Actual Reading	Therms	Gas Delivery Charges	Gas Customer Charge	Gas Demand Charge	Gas Commodity Charges	Gas Total Charges	$/Therm Marginal Rate	BTU
12/6/17	1/9/18	3,813	$1,761	$56	$203	$1,969	$3,989	$0.98	381,305,000
1/10/18	2/2/18	2,172	$1,002	$45	$162	$1,120	$2,328	$0.98	217,240,000
2/3/18	3/8/18	2,562	$1,181	$67	$243	$1,320	$2,812	$0.98	256,182,000
3/9/18	4/9/18	2,393	$1,086	$54	$202	$1,233	$2,576	$0.97	239,277,000
4/10/18	5/4/18	868	$379	$40	$161	$447	$1,028	$0.95	86,768,000
5/5/18	6/7/18	193	$85	$50	$201	$100	$436	$0.95	19,345,000
6/8/18	7/9/18	66	$29	$50	$201	$34	$314	$0.95	6,590,000
7/10/18	8/7/18	19	$8	$50	$201	$10	$270	$0.95	1,941,000
8/8/18	9/6/18	12	$5	$50	$201	$6	$263	$0.95	1,189,000
9/7/18	10/4/18	120	$52	$50	$203	$62	$368	$0.95	12,022,000
10/5/18	11/1/18	685	$293	$52	$203	$353	$901	$0.94	68,453,000
11/2/18	12/6/18	2,264	$969	$63	$244	$1,167	$2,442	$0.94	226,354,000
TOTALS		15,167	$6,850	$628	$2,427	$7,821	$17,726	$0.97	1,516,666,000

Holman Elementary School Baseline Energy Use



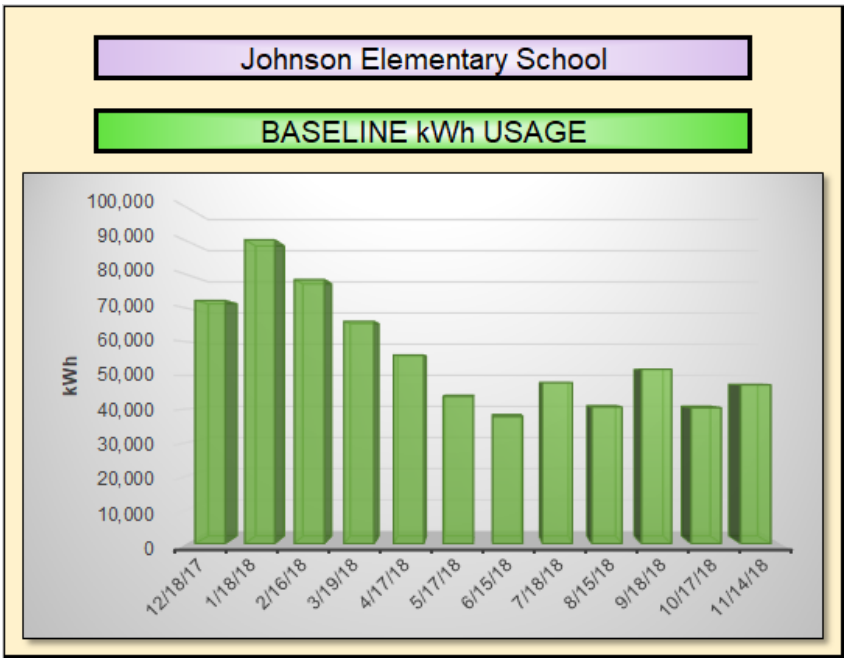


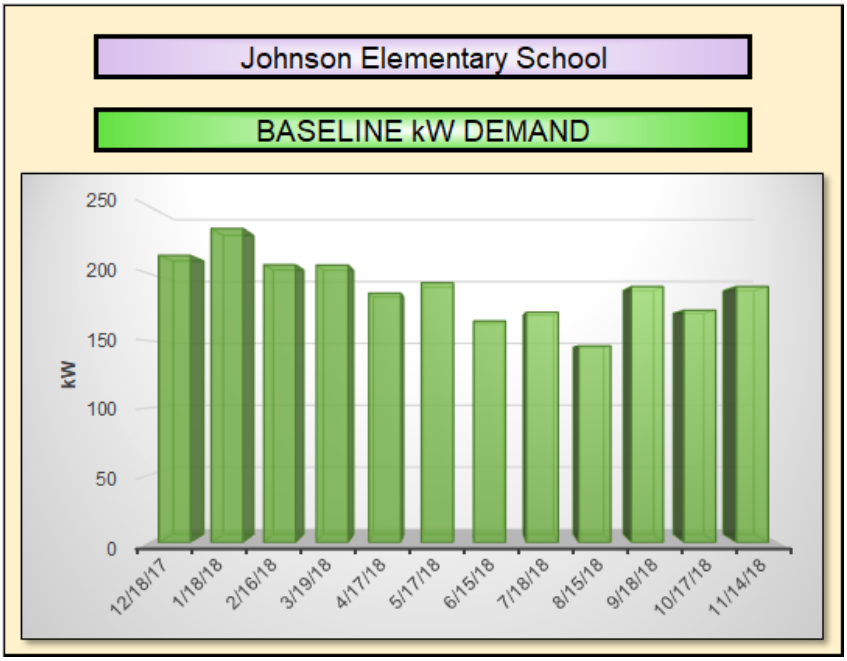
Holman Elementary School						ELECTRIC METER #1					
Provider:	JCP&L			Account #	100 017 365 170			Meter #	S312994717		
Commodity:	Constellation / East Coast			Commodity:	Fixed Price			Rate Tariff:	GS, Space Heating		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
12/8/17	1/10/18	107,200	273	$2,022	$8,446	$1,737	$12,205	$0.114	34	48%	365,766,400
1/11/18	2/8/18	95,400	277	$1,804	$7,517	$1,760	$11,080	$0.116	29	50%	325,504,800
2/9/18	3/9/18	87,200	244	$1,654	$6,895	$1,544	$10,093	$0.116	29	51%	297,526,400
3/10/18	4/9/18	83,400	272	$1,578	$6,609	$1,707	$9,894	$0.119	31	41%	284,560,800
4/10/18	5/7/18	60,000	202	$1,140	$4,738	$1,203	$7,081	$0.118	28	44%	204,720,000
5/8/18	6/8/18	61,400	183	$1,170	$4,899	$1,166	$7,235	$0.118	32	44%	209,496,800
6/9/18	7/10/18	59,200	209	$1,132	$4,844	$1,342	$7,319	$0.124	32	37%	201,990,400
7/11/18	8/7/18	41,000	128	$808	$3,416	$797	$5,020	$0.122	28	48%	139,892,000
8/8/18	9/10/18	61,800	212	$1,182	$4,602	$1,359	$7,143	$0.116	34	36%	210,861,600
9/11/18	10/9/18	58,800	197	$1,103	$4,378	$1,171	$6,653	$0.113	29	43%	200,625,600
10/10/18	11/7/18	68,400	219	$1,246	$5,093	$1,310	$7,649	$0.112	29	45%	233,380,800
11/8/18	12/6/18	100,600	238	$1,714	$11,517	$1,428	$14,659	$0.146	29	61%	343,247,200
TOTALS		884,400	277	$16,552	$72,954	$16,524	$106,030	$0.120	364	37%	3,017,572,800

Holman Elementary School						ELECTRIC METER #2					
Provider:	JCP&L			Account #	Various, (5) Trailers			Meter #	Various		
Commodity:	Constellation / East Coast			Commodity	Fixed Price			Rate Tariff	GS		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
12/8/17	1/10/18	29,538	74	$832	$2,349	$201	$3,382	$0.114	34	49%	100,781,950
1/11/18	2/8/18	16,675	70	$596	$1,347	$174	$2,118	$0.127	29	34%	56,896,465
2/9/18	3/9/18	12,707	83	$524	$1,035	$215	$1,773	$0.140	29	22%	43,357,308
3/10/18	4/9/18	14,118	73	$547	$1,142	$190	$1,879	$0.133	31	26%	48,169,934
4/10/18	5/7/18	7,617	73	$403	$629	$182	$1,214	$0.159	28	16%	25,988,522
5/8/18	6/8/18	4,810	68	$332	$409	$163	$905	$0.188	32	9%	16,411,379
6/9/18	7/10/18	6,552	52	$401	$556	$115	$1,071	$0.164	32	16%	22,355,083
7/11/18	8/7/18	6,720	36	$420	$568	$110	$1,098	$0.163	28	28%	22,928,299
8/8/18	9/10/18	8,428	36	$829	$639	$110	$1,577	$0.187	34	29%	28,756,336
9/11/18	10/9/18	3,891	36	$552	$298	$109	$958	$0.246	29	16%	13,276,092
10/10/18	11/7/18	6,729	73	$875	$501	$147	$1,523	$0.226	29	13%	22,959,348
11/8/18	12/6/18	12,779	64	$1,837	$1,349	$130	$3,317	$0.260	29	29%	43,601,948
TOTALS		130,564	83	$8,148	$10,821	$1,845	$20,815	$0.159	364	18%	445,482,662

Holman Elementary School											
TOTAL ELECTRIC											
Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kW Checksum	Cost / kWh Checksum	Total Cost / kWh Checksum	Days	Load Factor	BTU
136,738	273	$2,854	$10,795	$1,938	$15,587	$7.11	$0.100	$0.114	34	61%	466,548,350
112,075	277	$2,400	$8,864	$1,934	$13,198	$6.99	$0.101	$0.118	29	58%	382,401,265
99,907	244	$2,178	$7,929	$1,759	$11,866	$7.21	$0.101	$0.119	29	59%	340,883,708
97,518	272	$2,125	$7,751	$1,897	$11,773	$6.96	$0.101	$0.121	31	48%	332,730,734
67,617	202	$1,543	$5,367	$1,384	$8,294	$6.86	$0.102	$0.123	28	50%	230,708,522
66,210	183	$1,502	$5,308	$1,329	$8,139	$7.25	$0.103	$0.123	32	47%	225,908,179
65,752	209	$1,533	$5,400	$1,457	$8,390	$6.96	$0.105	$0.128	32	41%	224,345,483
47,720	128	$1,228	$3,984	$906	$6,119	$7.06	$0.109	$0.128	28	55%	162,820,299
70,228	212	$2,011	$5,240	$1,469	$8,720	$6.93	$0.103	$0.124	34	41%	239,617,936
62,691	197	$1,655	$4,676	$1,280	$7,611	$6.50	$0.101	$0.121	29	46%	213,901,692
75,129	219	$2,121	$5,594	$1,457	$9,172	$6.65	$0.103	$0.122	29	49%	256,340,148
113,379	238	$3,551	$12,866	$1,559	$17,976	$6.55	$0.145	$0.159	29	69%	386,849,148
1,014,964	277	$24,700	$83,775	$18,369	$126,845	$6.92	$0.107	$0.125	364	42%	3,463,055,462

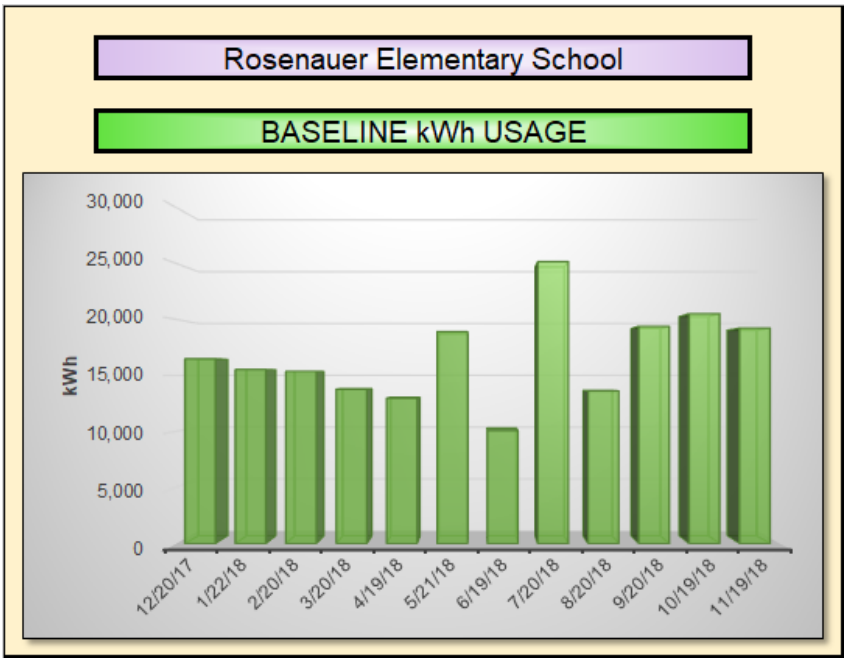
Johnson Elementary School Baseline Energy Use

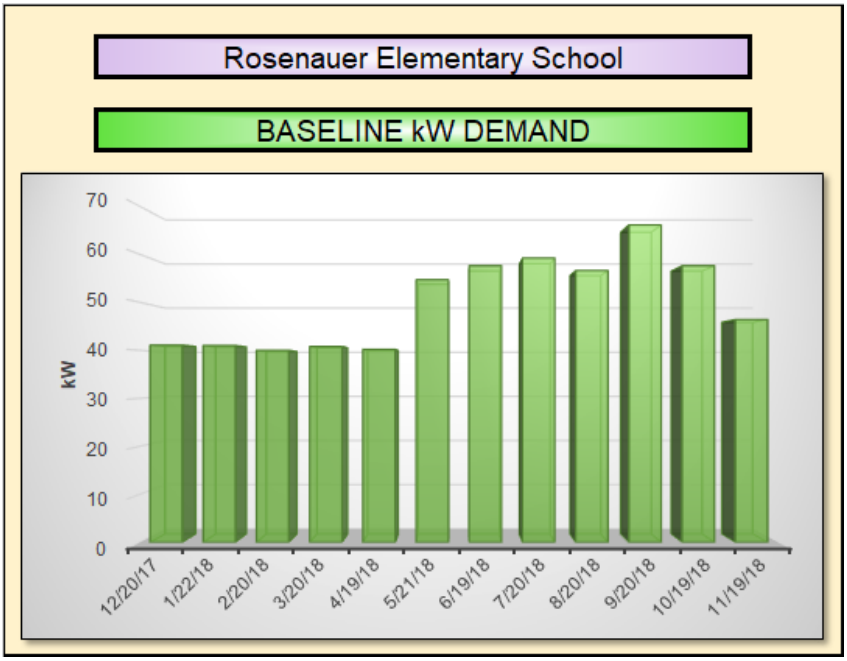




Johnson Elementary School						ELECTRIC METER #1					
Provider:	JCP&L			Account #	100 042 513 539			Meter #	G28408040 / S310131177		
Commodity:	Constellation / East Coast			Commodity:	Fixed Price			Rate Tariff:	GS		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
11/17/17	12/18/17	72,200	213	$1,382	$6,004	$1,347	$8,732	$0.121	32	44%	246,346,400
12/19/17	1/18/18	90,200	233	$1,711	$7,434	$1,476	$10,621	$0.118	31	52%	307,762,400
1/19/18	2/16/18	78,400	206	$1,494	$6,494	$1,296	$9,284	$0.118	29	55%	267,500,800
2/17/18	3/19/18	66,000	206	$1,268	$5,518	$1,295	$8,081	$0.122	31	43%	225,192,000
3/20/18	4/17/18	56,000	185	$1,075	$4,693	$1,124	$6,893	$0.123	29	43%	191,072,000
4/18/18	5/17/18	43,800	193	$849	$3,722	$1,147	$5,719	$0.131	30	32%	149,445,600
5/18/18	6/15/18	37,800	165	$746	$3,260	$1,040	$5,046	$0.134	29	33%	128,973,600
6/16/18	7/18/18	47,800	171	$928	$4,137	$1,085	$6,150	$0.129	33	35%	163,093,600
7/19/18	8/15/18	40,600	146	$800	$3,623	$917	$5,341	$0.132	28	41%	138,527,200
8/16/18	9/18/18	51,800	190	$997	$3,724	$1,213	$5,935	$0.115	34	33%	176,741,600
9/19/18	10/17/18	40,400	173	$775	$2,905	$1,020	$4,700	$0.116	29	34%	137,844,800
10/18/18	11/14/18	47,200	190	$865	$3,394	$1,130	$5,388	$0.114	28	37%	161,046,400
TOTALS		672,200	233	$12,891	$54,908	$14,089	$81,888	$0.122	363	33%	2,293,546,400

Rosenauer Elementary School Baseline Energy Use



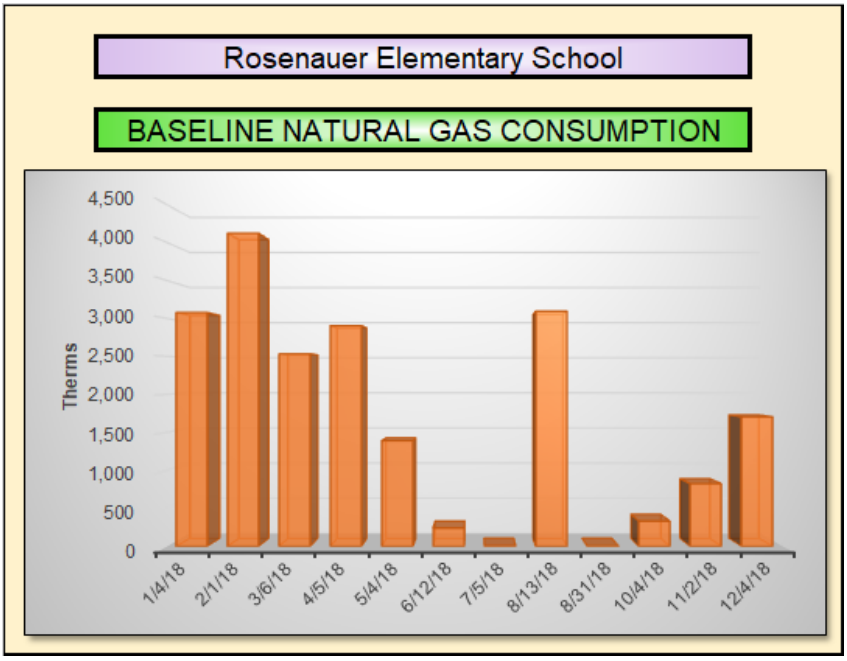


Rosenauer Elementary School						ELECTRIC METER #1					
Provider:	JCP&L			Account #	100 018 491 728			Meter #	S309603532		
Commodity:	Constellation / East Coast			Commodity:	Fixed Price			Rate Tariff:	GS		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
11/19/17	12/20/17	16,480	41	$366	$1,431	$206	$2,003	$0.122	32	52%	56,229,760
12/21/17	1/22/18	15,520	41	$349	$1,362	$205	$1,915	$0.123	33	48%	52,954,240
1/23/18	2/20/18	15,360	40	$345	$1,337	$198	$1,881	$0.122	29	55%	52,408,320
2/21/18	3/20/18	13,760	41	$316	$1,204	$203	$1,723	$0.125	28	50%	46,949,120
3/21/18	4/19/18	12,960	40	$297	$1,145	$193	$1,636	$0.126	30	45%	44,219,520
4/20/18	5/21/18	18,880	55	$401	$1,623	$280	$2,305	$0.122	32	45%	64,418,560
5/22/18	6/19/18	10,080	58	$248	$907	$320	$1,475	$0.146	29	25%	34,392,960
6/20/18	7/20/18	25,120	59	$520	$2,159	$331	$3,010	$0.120	31	57%	85,709,440
7/21/18	8/20/18	13,600	57	$313	$1,257	$314	$1,884	$0.138	31	32%	46,403,200
8/21/18	9/20/18	19,360	66	$414	$1,392	$378	$2,183	$0.113	31	39%	66,056,320
9/21/18	10/19/18	20,480	58	$424	$1,473	$298	$2,195	$0.107	29	51%	69,877,760
10/20/18	11/19/18	19,200	46	$386	$1,380	$228	$1,995	$0.104	31	56%	65,510,400
TOTALS		200,800	66	$4,379	$16,671	$3,154	$24,203	$0.121	366	35%	685,129,600

Rosenauer Elementary School						ELECTRIC METER #2					
Provider:	JCP&L			Account #	100 018 491 728			Meter #	N/A		
Commodity:	Constellation / East Coast			Commodity	Fixed Price			Rate Tariff	OL - Outdoor Lighting Service		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
11/19/17	12/20/17	5,284	15	$153	$438	$35	$627	$0.119	32	45%	18,029,008
12/21/17	1/22/18	9,144	23	$224	$746	$83	$1,053	$0.115	33	51%	31,199,328
1/23/18	2/20/18	6,214	22	$170	$512	$81	$763	$0.123	29	40%	21,202,168
2/21/18	3/20/18	5,332	20	$154	$441	$63	$658	$0.123	28	40%	18,192,784
3/21/18	4/19/18	4,903	14	$144	$407	$27	$578	$0.118	30	48%	16,729,036
4/20/18	5/21/18	2,981	13	$108	$254	$19	$381	$0.128	32	30%	10,171,172
5/22/18	6/19/18	2,398	0	$102	$206	$0	$307	$0.128	29	0%	8,181,976
6/20/18	7/20/18	2,327	0	$101	$202	$0	$302	$0.130	31	0%	7,939,724
7/21/18	8/20/18	1,642	0	$88	$152	$0	$241	$0.146	31	0%	5,602,504
8/21/18	9/20/18	1,800	0	$91	$129	$0	$220	$0.122	31	0%	6,141,600
9/21/18	10/19/18	1,335	0	$78	$96	$0	$174	$0.130	29	0%	4,555,020
10/20/18	11/19/18	3,626	0	$115	$261	$0	$376	$0.104	31	0%	12,371,912
TOTALS		46,986	23	$1,526	$3,845	$309	$5,680	$0.121	366	24%	160,316,232

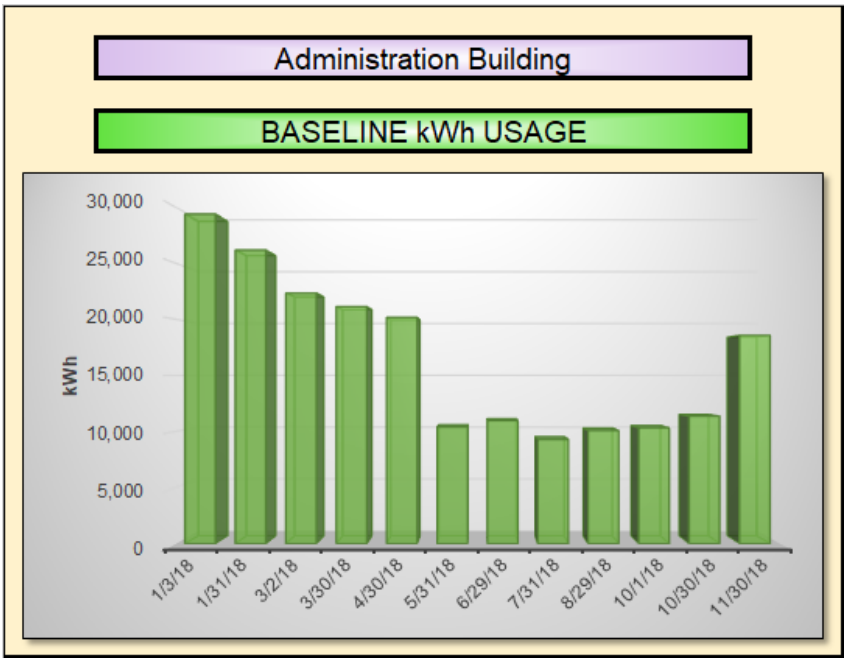
Rosenauer Elementary School						ELECTRIC METER #3					
Provider:	JCP&L			Account #	100 018 491 850			Meter #	N/A		
Commodity:	Constellation / East Coast			Commodity	Fixed Price			Rate Tariff	OL - Outdoor Lighting Service		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
11/21/17	12/20/17	148		$16	$12		$28	$0.19	30	$0.00	504,976
12/21/17	1/19/18	148		$16	$12		$28	$0.19	30	$0.00	504,976
1/20/18	2/19/18	148		$16	$12		$28	$0.19	31	$0.00	504,976
2/20/18	3/20/18	148		$16	$12		$28	$0.19	29	$0.00	504,976
3/21/18	4/18/18	148		$15	$12		$27	$0.18	29	$0.00	504,976
4/19/18	5/18/18	148		$15	$12		$27	$0.18	30	$0.00	504,976
5/19/18	6/19/18	148		$15	$12		$27	$0.18	32	$0.00	504,976
6/20/18	7/19/18	148		$15	$12		$28	$0.19	30	$0.00	504,976
7/20/18	8/20/18	148		$15	$12		$28	$0.19	32	$0.00	504,976
8/21/18	9/20/18	148		$26	$6		$32	$0.22	31	$0.00	504,976
9/21/18	10/19/18	148		$26	$6		$32	$0.22	29	$0.00	504,976
10/20/18	11/19/18	148		$26	$6		$32	$0.22	31	$0.00	504,976
TOTALS		1,776	0	$217	$126	$0	$344	$0.19	364	$0.00	6,059,712

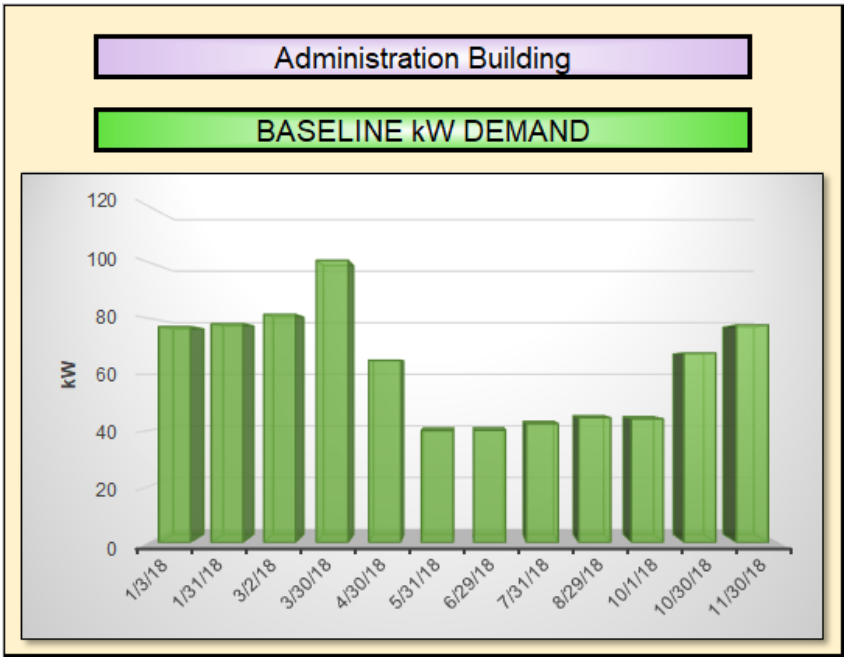
Rosenauer Elementary School											
TOTAL ELECTRIC											
Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kW Checksum	Cost / kWh Checksum	Total Cost / kWh Checksum	Days	Load Factor	BTU
21,912	41	$535	$1,881	$241	$2,657	$5.86	$0.110	$0.121	32	69%	74,763,744
24,812	41	$588	$2,120	$288	$2,996	$7.03	$0.109	$0.121	33	76%	84,658,544
21,722	40	$531	$1,861	$279	$2,671	$6.96	$0.110	$0.123	29	78%	74,115,464
19,240	41	$486	$1,656	$267	$2,409	$6.54	$0.111	$0.125	28	70%	65,646,880
18,011	40	$456	$1,564	$220	$2,241	$5.48	$0.112	$0.124	30	62%	61,453,532
22,009	55	$524	$1,889	$300	$2,713	$5.48	$0.110	$0.123	32	52%	75,094,708
12,626	58	$365	$1,125	$320	$1,810	$5.56	$0.118	$0.143	29	31%	43,079,912
27,595	59	$636	$2,373	$331	$3,340	$5.59	$0.109	$0.121	31	63%	94,154,140
15,390	57	$416	$1,422	$314	$2,152	$5.54	$0.119	$0.140	31	37%	52,510,680
21,308	66	$531	$1,528	$378	$2,436	$5.71	$0.097	$0.114	31	43%	72,702,896
21,963	58	$527	$1,575	$298	$2,400	$5.18	$0.096	$0.109	29	55%	74,937,756
22,974	46	$527	$1,648	$228	$2,403	$4.92	$0.095	$0.105	31	67%	78,387,288
249,562	66	$6,122	$20,642	$3,463	$30,227	$5.76	$0.107	$0.121	366	43%	851,505,544



Rosenauer Elementary School								Natural Gas Meter #1	
Provider	NJNG		Account #	09-3460-0700-20				Meter #	546083
Commodity	Constellation		Commodity	Fixed Price, Firm				Rate Tariff:	GSL
Billing Period Start Date	Actual Reading	Therms	Gas Delivery Charges	Gas Customer Charge	Gas Demand Charge	Gas Commodity Charges	Gas Total Charges	$/Therm Marginal Rate	BTU
12/5/17	1/4/18	3,076	$1,422	$56	$198	$1,589	$3,264	$0.98	307,593,000
1/5/18	2/1/18	4,118	$1,899	$56	$198	$2,123	$4,275	$0.98	411,821,000
2/2/18	3/6/18	2,532	$1,168	$67	$237	$1,305	$2,777	$0.98	253,232,000
3/7/18	4/5/18	2,903	$1,324	$55	$198	$1,496	$3,073	$0.97	290,251,000
4/6/18	5/4/18	1,389	$607	$50	$197	$716	$1,570	$0.95	138,906,000
5/5/18	6/12/18	241	$105	$65	$256	$124	$550	$0.95	24,064,000
6/13/18	7/5/18	5	$2	$40	$157	$3	$203	$0.95	532,000
7/6/18	8/13/18	3,093	$1,351	$65	$256	$1,594	$3,266	$0.95	309,276,000
8/14/18	8/31/18	4	$2	$30	$118	$2	$152	$0.95	426,000
9/1/18	10/4/18	333	$145	$50	$219	$172	$586	$0.95	33,306,000
10/5/18	11/2/18	825	$353	$52	$219	$425	$1,049	$0.94	82,493,000
11/3/18	12/4/18	1,704	$729	$52	$219	$878	$1,879	$0.94	170,395,000
TOTALS		20,223	$9,107	$639	$2,472	$10,426	$22,644	$0.97	2,022,295,000

Administration Building Baseline Energy Use





Administration Building				ELECTRIC METER #1							
Provider:	JCP&L			Account #	100 015 457 979			Meter #	S310588674		
Commodity:	Constellation / East Coast			Commodity:	Fixed Price			Rate Tariff:	GS, Space Heating		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
12/2/17	1/3/18	29,360	77	$605	$2,402	$440	$3,448	$0.117	33	48%	100,176,320
1/4/18	1/31/18	26,160	78	$542	$2,147	$449	$3,139	$0.120	28	50%	89,257,920
2/1/18	3/2/18	22,320	81	$472	$1,850	$471	$2,793	$0.125	30	38%	76,155,840
3/3/18	3/30/18	21,120	101	$452	$1,745	$597	$2,794	$0.132	28	31%	72,061,440
3/31/18	4/30/18	20,160	65	$425	$1,672	$345	$2,442	$0.121	31	42%	68,785,920
5/1/18	5/31/18	10,400	40	$254	$892	$201	$1,347	$0.130	31	35%	35,484,800
6/1/18	6/29/18	10,960	40	$264	$948	$202	$1,413	$0.129	29	39%	37,395,520
6/30/18	7/31/18	9,280	42	$234	$816	$218	$1,268	$0.137	32	28%	31,663,360
8/1/18	8/29/18	10,080	45	$249	$751	$232	$1,232	$0.122	29	33%	34,392,960
8/30/18	10/1/18	10,320	44	$246	$768	$214	$1,229	$0.119	33	30%	35,211,840
10/2/18	10/30/18	11,360	68	$262	$846	$361	$1,469	$0.129	29	24%	38,760,320
10/31/18	11/30/18	18,560	78	$368	$2,135	$424	$2,927	$0.158	31	32%	63,326,720
TOTALS		200,080	101	$4,372	$16,972	$4,155	$25,500	$0.127	364	23%	682,672,960

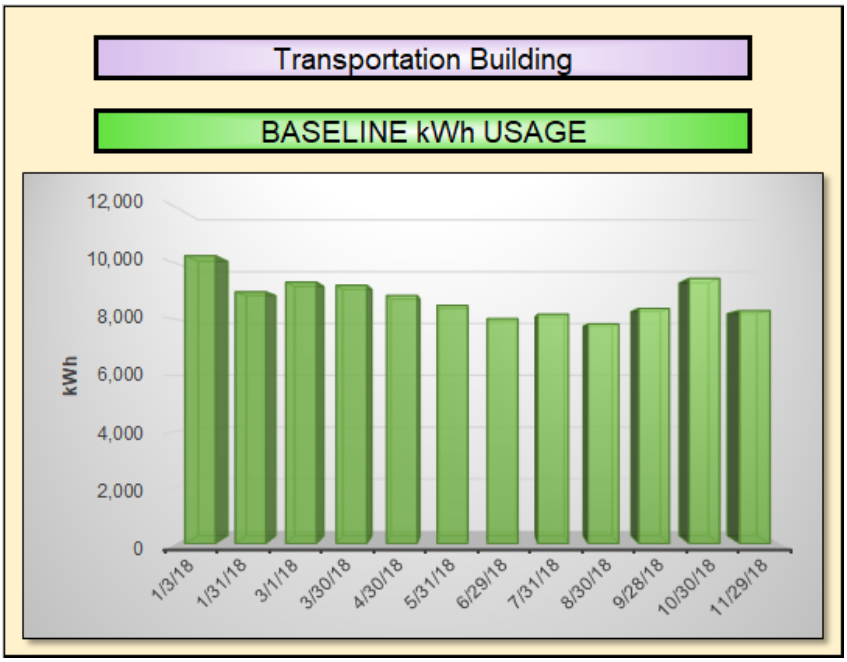
Administration Building				ELECTRIC METER #2							
Provider:	JCP&L			Account #	100 015 457 979			Meter #	N/A		
Commodity:	Constellation / East Coast			Commodity	Fixed Price			Rate Tariff	OL - Outdoor Lighting Service		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
12/2/17	1/2/18	2,191		$394	$174		$569	$0.260	32	-	7,475,692
1/3/18	1/31/18	2,191		$393	$175		$568	$0.259	29	-	7,475,692
2/1/18	3/2/18	2,191		$393	$175		$569	$0.260	30	-	7,475,692
3/3/18	3/30/18	2,191		$393	$175		$569	$0.260	28	-	7,475,692
3/31/18	4/30/18	2,191		$376	$175		$551	$0.251	31	-	7,475,692
5/1/18	5/30/18	2,191		$375	$175		$550	$0.251	30	-	7,475,692
5/31/18	6/29/18	2,191		$375	$181		$556	$0.254	30	-	7,475,692
6/30/18	7/31/18	2,191		$376	$182		$558	$0.255	32	-	7,475,692
8/1/18	8/29/18	2,191		$376	$163		$539	$0.246	29	-	7,475,692
8/30/18	10/1/18	2,191		$375	$163		$538	$0.246	33	-	7,475,692
10/2/18	10/30/18	2,191		$374	$163		$538	$0.245	29	-	7,475,692
10/31/18	11/30/18	2,191		$372	$321		$693	$0.316	31	-	7,475,692
TOTALS		26,292	0	$4,574	$2,222	$0	$6,796	$0.258	364	-	89,708,304

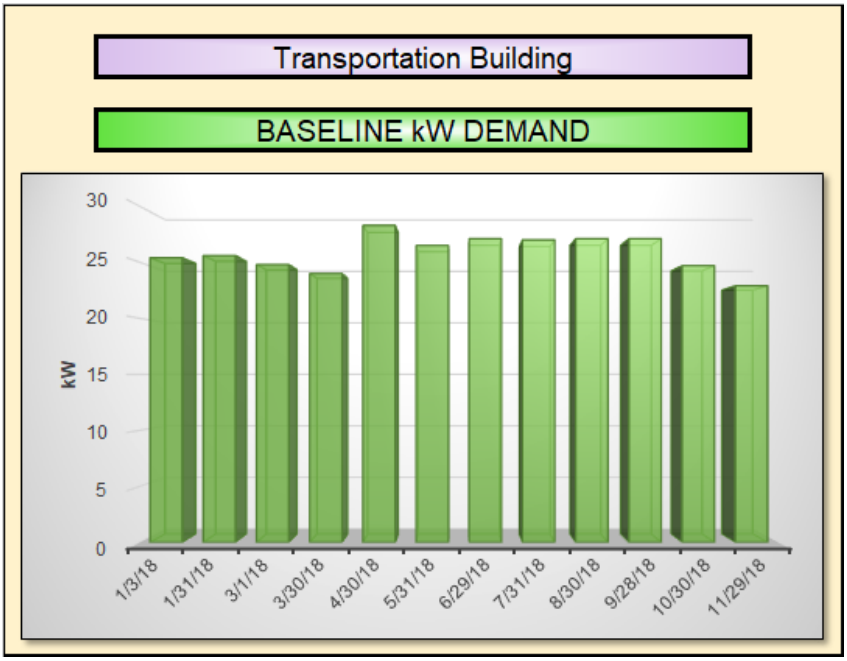
Administration Building				ELECTRIC METER #3							
Provider:	JCP&L			Account #	100 024 666 347, PAYROLL TRAILER			Meter #	S38827300		
Commodity:	Constellation / East Coast			Commodity	Fixed Price			Rate Tariff	GS		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
12/2/17	1/3/18	3,252	12	$116	$263	$13	$393	$0.12	33	34%	11,095,824
1/4/18	1/31/18	2,848	11	$109	$232	$8	$348	$0.12	28	38%	9,717,376
2/1/18	3/2/18	2,335	12	$99	$191	$16	$307	$0.13	30	26%	7,967,020
3/3/18	3/30/18	2,284	11	$98	$187	$7	$292	$0.13	28	31%	7,793,008
3/31/18	4/30/18	1,712	12	$85	$141	$11	$237	$0.14	31	20%	5,841,344
5/1/18	5/31/18	708	12	$55	$61	$10	$126	$0.18	31	8%	2,415,696
6/1/18	6/29/18	734	11	$57	$64	$9	$130	$0.18	29	9%	2,504,408
6/30/18	7/31/18	807	2	$62	$70	$6	$139	$0.17	32	53%	2,753,484
8/1/18	8/29/18	704	2	$107	$52	$6	$166	$0.24	29	51%	2,402,048
8/30/18	10/1/18	720	2	$106	$54	$6	$166	$0.23	33	45%	2,456,640
10/2/18	10/30/18	1,074	12	$153	$80	$13	$245	$0.23	29	13%	3,664,488
10/31/18	11/30/18	2,119	2	$315	$226	$6	$547	$0.26	31	142%	7,230,028
TOTALS		19,297	12	$1,364	$1,621	$110	$3,095	$0.16	364	18%	65,841,364

Administration Building				ELECTRIC METER #4							
Provider:	JCP&L			Account #	100 018 031 797, (26) SVL 100w fixture			Meter #	N/A		
Commodity:	Constellation / East Coast			Account #	Fixed Price			Meter #	SVL - Street Lighting Service		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
11/21/17	12/20/17	1,092		$234	$79		$313	$0.286	30	-	3,725,904
12/21/17	1/19/18	1,092		$234	$79		$312	$0.286	30	-	3,725,904
1/20/18	2/19/18	1,092		$234	$79		$312	$0.286	31	-	3,725,904
2/20/18	3/20/18	1,092		$234	$79		$312	$0.286	29	-	3,725,904
3/21/18	4/18/18	1,092		$227	$79		$305	$0.280	29	-	3,725,904
4/19/18	5/18/18	1,092		$223	$79		$301	$0.276	30	-	3,725,904
5/19/18	6/19/18	1,092		$223	$79		$301	$0.276	32	-	3,725,904
6/20/18	7/19/18	1,092		$223	$79		$301	$0.276	30	-	3,725,904
7/20/18	8/20/18	1,092		$223	$79		$301	$0.276	32	-	3,725,904
8/21/18	9/19/18	1,092		$301	$79		$380	$0.348	30	-	3,725,904
9/20/18	10/18/18	1,092		$301	$79		$379	$0.347	29	-	3,725,904
10/19/18	11/16/18	1,092		$300	$79		$379	$0.347	29	-	3,725,904
TOTALS		13,104	0	$2,956	$942	$0	$3,898	$0.297	361	-	44,710,848

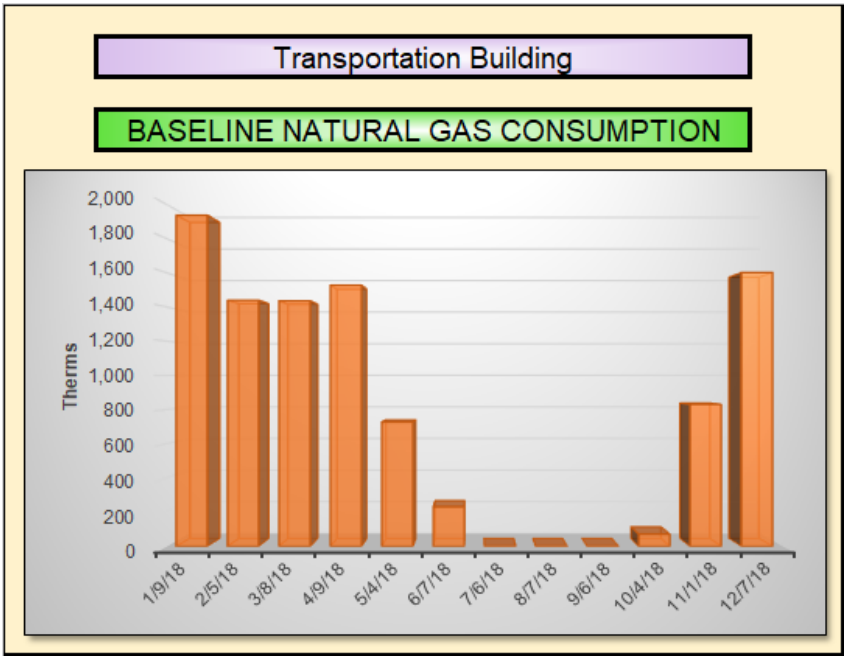
Administration Building											
TOTAL ELECTRIC											
Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kW Checksum	Cost / kWh Checksum	Total Cost / kWh Checksum	Days	Load Factor	BTU
35,895	77	$1,349	$2,919	$454	$4,722	$5.89	$0.119	$0.132	33	59%	122,473,740
32,291	78	$1,278	$2,632	$457	$4,368	$5.86	$0.121	$0.135	28	62%	110,176,892
27,938	81	$1,199	$2,295	$487	$3,981	$5.98	$0.125	$0.142	30	48%	95,324,456
26,687	101	$1,178	$2,185	$603	$3,966	$5.99	$0.126	$0.149	28	39%	91,056,044
25,155	65	$1,112	$2,067	$356	$3,535	$5.48	$0.126	$0.141	31	52%	85,828,860
14,391	40	$907	$1,206	$211	$2,324	$5.30	$0.147	$0.162	31	48%	49,102,092
14,977	40	$919	$1,271	$211	$2,401	$5.27	$0.146	$0.160	29	54%	51,101,524
13,370	42	$895	$1,147	$224	$2,266	$5.29	$0.153	$0.169	32	41%	45,618,440
14,067	45	$955	$1,045	$238	$2,238	$5.35	$0.142	$0.159	29	45%	47,996,604
14,323	44	$1,029	$1,064	$220	$2,312	$4.99	$0.146	$0.161	33	41%	48,870,076
15,717	68	$1,090	$1,167	$374	$2,631	$5.53	$0.144	$0.167	29	33%	53,626,404
23,962	78	$1,355	$2,761	$430	$4,545	$5.54	$0.172	$0.190	31	42%	81,758,344
258,773	101	$13,266	$21,758	$4,265	$39,289	$5.62	$0.135	$0.152	364	29%	882,933,476

Transportation Building Baseline Energy Use



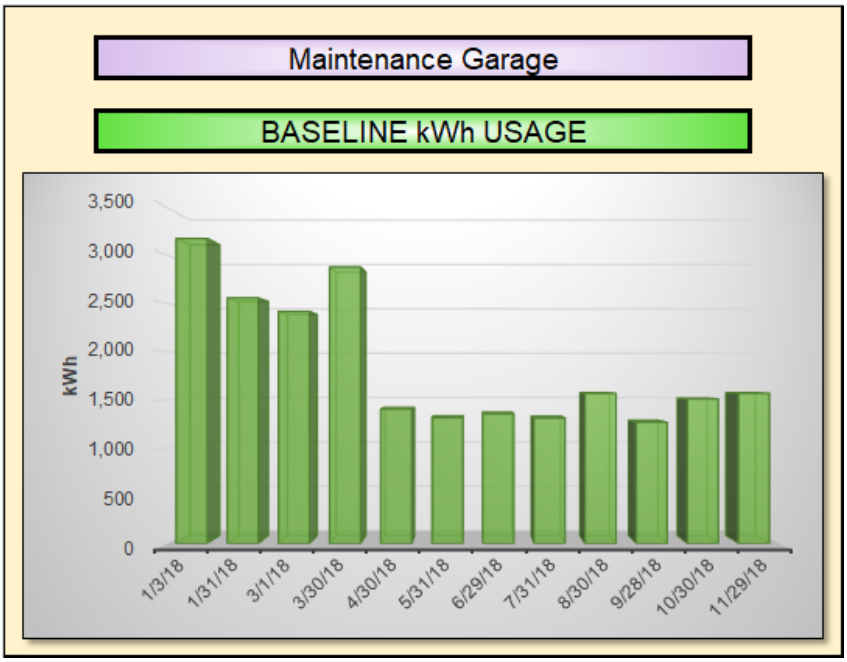


Transportation Building						ELECTRIC METER #1					
Provider:	JCP&L			Account #	100 015 457 821			Meter #	G15145662		
Commodity:	Constellation / East Coast			Commodity:	Fixed Price			Rate Tariff:	GS		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
12/1/17	1/3/18	10,259	25	$253	$865	$102	$1,220	$0.119	34	49%	35,003,708
1/4/18	1/31/18	8,973	26	$229	$759	$103	$1,091	$0.122	28	52%	30,615,876
2/1/18	3/1/18	9,320	25	$235	$790	$98	$1,123	$0.120	29	54%	31,799,840
3/2/18	3/30/18	9,208	24	$233	$778	$92	$1,104	$0.120	29	55%	31,417,696
3/31/18	4/30/18	8,845	28	$225	$751	$111	$1,088	$0.123	31	42%	30,179,140
5/1/18	5/31/18	8,488	27	$219	$722	$111	$1,052	$0.124	31	43%	28,961,056
6/1/18	6/29/18	8,017	27	$211	$693	$115	$1,019	$0.127	29	43%	27,354,004
6/30/18	7/31/18	8,176	27	$214	$711	$114	$1,040	$0.127	32	39%	27,896,512
8/1/18	8/30/18	7,834	27	$208	$583	$115	$907	$0.116	30	40%	26,729,608
8/31/18	9/28/18	8,379	27	$212	$624	$107	$943	$0.113	29	44%	28,589,148
9/29/18	10/30/18	9,450	25	$228	$704	$92	$1,024	$0.108	32	50%	32,243,400
10/31/18	11/29/18	8,305	23	$199	$1,202	$81	$1,482	$0.178	30	50%	28,336,660
TOTALS		105,254	28	$2,667	$9,183	$1,242	$13,092	$0.124	364	43%	359,126,648

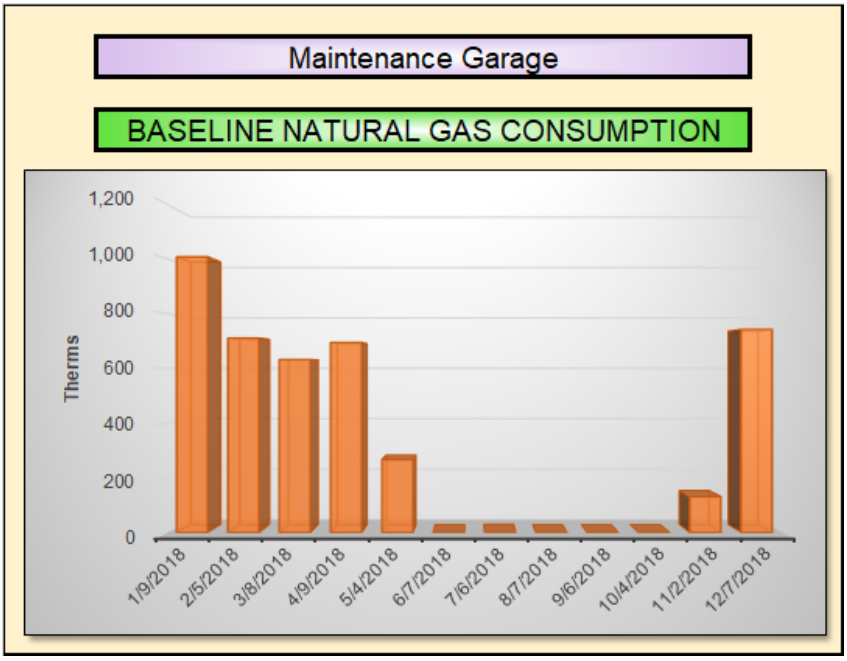


Transportation Building								Natural Gas Meter #1	
Provider	NJNG		Account #	22-0006-1507-12				Meter #	658561
Commodity	Constellation		Commodity	Fixed Price, Firm				Rate Tariff:	GSL
Billing Period Start Date	Actual Reading	Therms	Gas Delivery Charges	Gas Customer Charge	Gas Demand Charge	Gas Commodity Charges	Gas Total Charges	$/Therm Marginal Rate	BTU
12/6/17	1/9/18	1,936	$890	$56	$123	$995	$2,064	$0.97	193,621,000
1/10/18	2/5/18	1,439	$663	$56	$123	$742	$1,584	$0.98	143,875,000
2/6/18	3/8/18	1,435	$662	$56	$123	$740	$1,581	$0.98	143,541,000
3/9/18	4/9/18	1,527	$693	$54	$123	$787	$1,657	$0.97	152,702,000
4/10/18	5/4/18	726	$318	$40	$98	$374	$830	$0.95	72,644,000
5/5/18	6/7/18	232	$101	$50	$123	$120	$394	$0.95	23,219,000
6/8/18	7/6/18	0	$0	$50	$123	$0	$173	-	0
7/7/18	8/7/18	0	$0	$50	$123	$0	$173	-	0
8/8/18	9/6/18	0	$0	$50	$123	$0	$173	-	0
9/7/18	10/4/18	72	$31	$50	$121	$37	$239	$0.95	7,152,000
10/5/18	11/1/18	830	$355	$52	$121	$428	$956	$0.94	83,026,000
11/2/18	12/7/18	1,601	$685	$63	$145	$825	$1,717	$0.94	160,052,000
TOTALS		9,798	$4,398	$628	$1,467	$5,047	$11,540	$0.96	979,832,000

Maintenance Garage Baseline Energy Use



Maintenance Garage						ELECTRIC METER #1					
Provider:	JCP&L			Account #	100 015 457 938			Meter #	G21257829		
Commodity:	Constellation / East Coast			Commodity:	Fixed Price			Rate Tariff:	GS		
Billing Period Start Date	Actual Reading	Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
12/1/17	1/3/18	3,173	0	$115	$263	$0	$378	$0.119	34	$0.00	10,826,276
1/4/18	1/31/18	2,555	0	$103	$213	$0	$316	$0.124	28	$0.00	8,717,660
2/1/18	3/1/18	2,414	0	$101	$203	$0	$303	$0.126	29	$0.00	8,236,568
3/2/18	3/30/18	2,876	0	$109	$239	$0	$348	$0.121	29	$0.00	9,812,912
3/31/18	4/30/18	1,401	0	$79	$121	$0	$201	$0.143	31	$0.00	4,780,212
5/1/18	5/31/18	1,310	0	$82	$114	$0	$196	$0.150	31	$0.00	4,469,720
6/1/18	6/29/18	1,350	0	$83	$117	$0	$200	$0.148	29	$0.00	4,606,200
6/30/18	7/31/18	1,306	0	$82	$115	$0	$197	$0.151	32	$0.00	4,456,072
8/1/18	8/30/18	1,562	0	$87	$116	$0	$203	$0.130	30	$0.00	5,329,544
8/31/18	9/28/18	1,260	0	$77	$94	$0	$170	$0.135	29	$0.00	4,299,120
9/29/18	10/30/18	1,503	0	$80	$112	$0	$192	$0.128	32	$0.00	5,128,236
10/31/18	11/29/18	1,563	0	$80	$221	$0	$300	$0.192	30	$0.00	5,332,956
TOTALS		22,273	0	$1,078	$1,927	$0	$3,006	$0.135	364	$0.00	75,995,476



Maintenance Garage								Natural Gas Meter #1	
Provider	NJNG		Account #	22-0006-1506-32				Meter #	706864
Commodity	Constellation		Commodity	Fixed Price, Firm				Rate Tariff:	GSS
Billing Period Start Date	Actual Reading	Therms	Gas Delivery Charges	Gas Customer Charge	Gas Demand Charge	Gas Commodity Charges	Gas Total Charges	$/Therm Marginal Rate	BTU
12/3/17	1/9/2018	1,007	$551	$27		$520	$1,098	$1.06	100,708,000
1/10/18	2/5/2018	711	$388	$27		$366	$781	$1.06	71,081,000
2/6/18	3/8/2018	632	$345	$27		$326	$698	$1.06	63,201,000
3/9/18	4/9/2018	695	$373	$27		$358	$758	$1.05	69,468,000
4/10/18	5/4/2018	267	$137	$21		$138	$296	$1.03	26,696,000
5/5/18	6/7/2018	0	$0	$26		$0	$26	-	0
6/8/18	7/6/2018	1	$1	$26		$1	$27	$1.04	106,000
7/7/18	8/7/2018	0	$0	$26		$0	$26	-	0
8/8/18	9/6/2018	0	$0	$26		$0	$26	-	0
9/7/18	10/4/2018	0	$0	$26		$0	$26	-	0
10/5/18	11/2/2018	131	$62	$26		$68	$156	$0.99	13,109,000
11/3/18	12/7/2018	742	$353	$32		$383	$768	$0.99	74,214,000
TOTALS		4,186	$2,211	$317	$0	$2,158	$4,686	$1.04	418,583,000

Energy Savings Utility Rates

DCO Energy used the following rates to calculate the energy savings:

CALCULATED UTILITY RATES - MARGINAL RATES USED FOR SAVINGS								
BUILDING/FACILITY	ELECTRIC				NATURAL GAS	Fuel Oil #2 (Gal)	Solar PPA (kWh)	Water & Sewer (Gal)
	$ / kW Oct. thru May	$ / kW June thru Sept.	$ / kWh Marginal Rate	$ / kWh Blended Rate	$ / Therm Marginal Rate	$ / Gal Marginal Rate	$ / kWh Marginal Rate	$ / Gal Marginal Rate
Jackson Liberty High School	$5.31	$5.57	$0.100	$0.121	$0.97	$0.00	$0.081	$0.0030
Jackson Memorial High School	$6.37	$6.76	$0.106	$0.127	$0.90	$0.00		$0.0018
Christa McAuliffe Middle School	$6.47	$6.47	$0.106	$0.127	$0.97	$0.00		$0.0021
Elms Elementary School	$6.31	$6.44	$0.102	$0.145	$0.00	$0.00	$0.081	$0.00
Goetz Middle School	$5.29	$5.57	$0.106	$0.121	$0.96	$2.23		$0.0016
Crawford Rodriguez Elementary School	$6.19	$6.53	$0.101	$0.114	$0.96	$0.00		$0.0016
Switlik Elementary School	$7.70	$7.41	$0.110	$0.129	$0.97	$0.00		$0.0017
Holman Elementary School	$6.95	$6.85	$0.107	$0.125	$0.00	$0.00		$0.0015
Johnson Elementary School	$6.14	$6.33	$0.101	$0.122	$0.00	$0.00		$0.0019
Rosenauer Elementary School	$5.86	$5.60	$0.107	$0.121	$0.97	$0.00		$0.0012
Administration Building	$5.74	$5.22	$0.135	$0.152	$0.00	$0.00		$0.0018
Transportation Building	$3.91	$4.17	$0.113	$0.124	$1.18	$0.00		$0.0015
Maintenance Garage			$0.135	$0.135	$1.12	$0.00		$0.00

Electric Commodity Charges

As of August 1, 2018, JTBOE began a 36-month energy purchase agreement with East Coast Power and Gas to supply electricity. The fixed rate is $0.0719/kWh plus applicable taxes. The agreement includes 100% swing, meaning the historic usage can increase or decrease by 100% without penalty. Therefore, the projected energy savings will not incur liquidation of the existing energy purchase agreements.

Electric utility savings are calculated using un-blended, marginal rates. Electric demand charges ($/kW) have been separated from the delivery and supply charges ($/kWh).

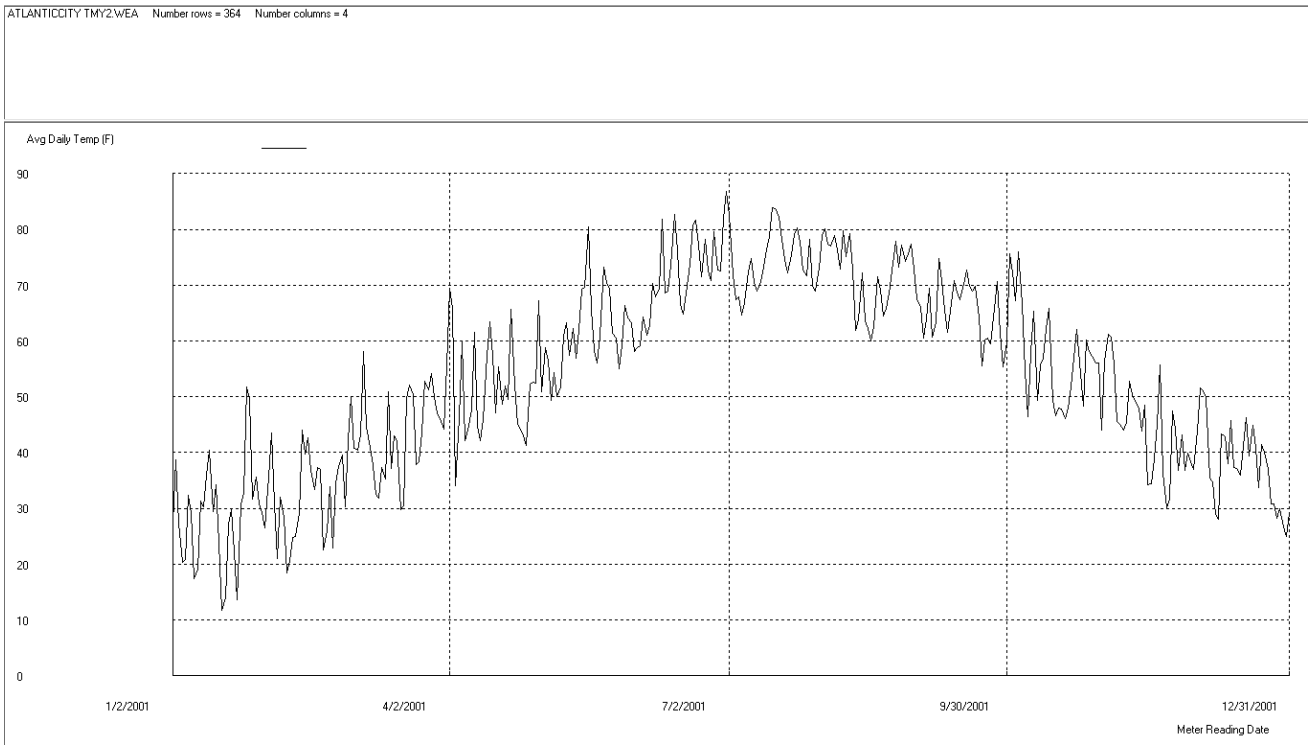
Natural Gas Commodity Charges

As of January 1, 2019, JTBOE began a 24-month energy purchase agreement with Constellation to supply natural gas. The fixed rate is $0.42200/therm plus applicable taxes. The natural gas supply is “firm” – deliveries and receipts may not be interrupted without liability except for reasons of Force Majeure. The agreement includes 100% swing, meaning the historic usage can increase or decrease by 100% without penalty. Therefore, the projected energy savings will not incur liquidation of the existing energy purchase agreements.

The marginal natural gas rate shown is the delivery and commodity charge per therm. The natural gas rate has the gas demand charge extracted and is not used to calculate savings.

Jackson Township BOE – Baseline Weather Data

In accordance with the New Jersey Pay for Performance incentive program, TMY2 weather data was used for all weather normalized calculations and energy models utilizing weather data. The graph below represents the Atlantic City TMY2 weather file used for the Jackson Township BOE area.

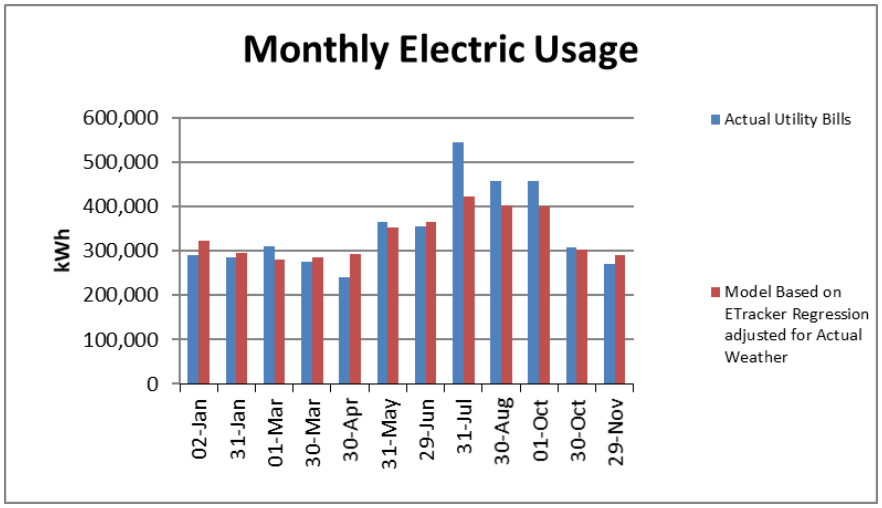


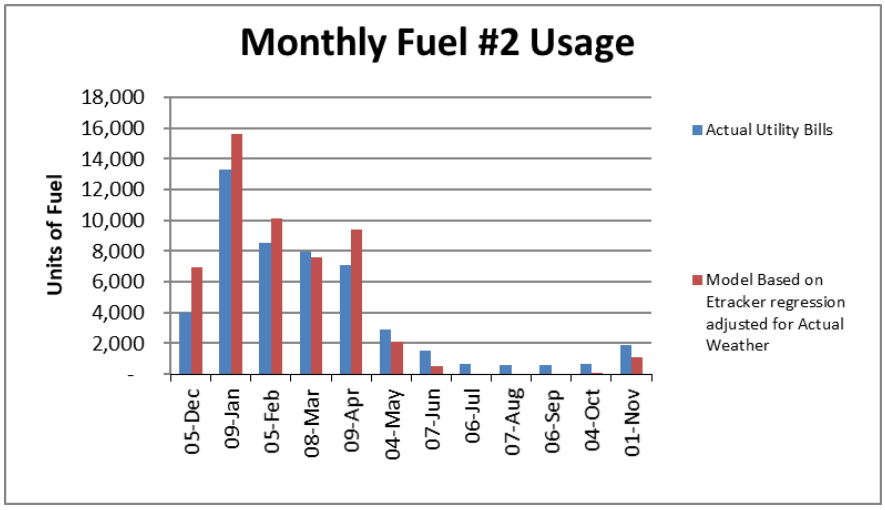
Jackson Liberty High School – Energy Modeling Baseline

Jackson Liberty High School was not energy modeled because it does not meet the Pay for Performance eligibility requirement of 15% overall site energy savings with no more than 50% derived from lighting measures. Please see Section 3 – Energy Conservation Measures for energy savings calculations.

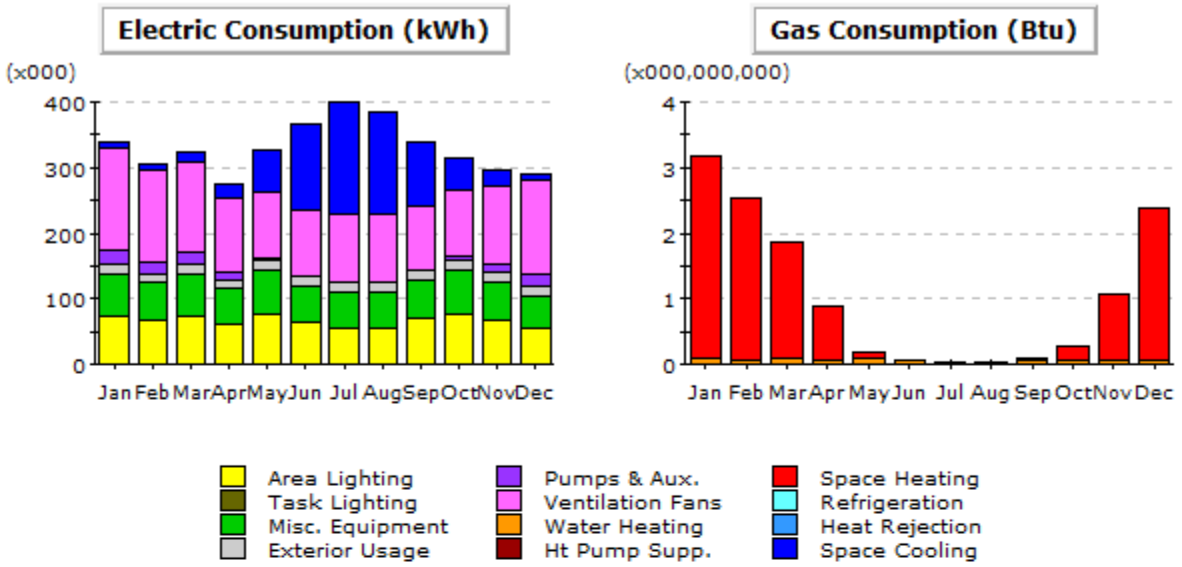
Jackson Memorial High School – Energy Modeling Baseline

Baseline energy use has been analyzed using eQuest energy simulation software. The New Jersey Pay for Performance incentive program requires +/- 5% accuracy when simulating baseline annual energy use. To calibrate the model, eTracker weather normalization software was used to establish the relationship between weather and energy use of each building. Shown below are the comparison charts and the modeling software baseline output reports. The reports show the model baseline produced by DCO Energy is within acceptable tolerances.





Below is the monthly energy consumption output for the baseline model.



Electric Consumption (kWh x000)

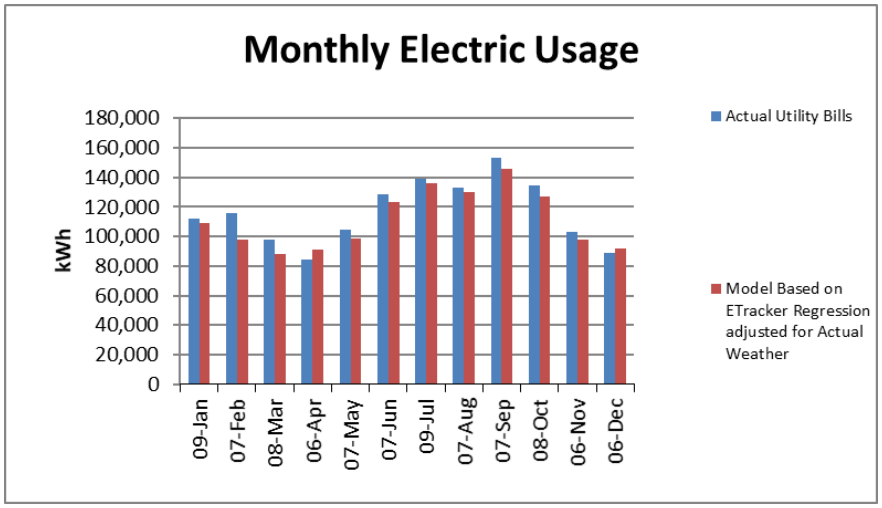
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	9.7	9.2	14.7	19.0	63.0	133.2	169.9	155.0	97.4	51.0	23.3	9.5	754.9
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	1.2	1.0	0.7	0.3	0.0	-	-	-	0.0	0.1	0.5	1.0	4.8
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	154.7	138.2	137.3	112.8	100.1	98.2	102.6	103.4	96.2	100.2	117.3	142.6	1,403.8
Pumps & Aux.	21.1	18.6	17.7	12.5	4.4	0.7	0.3	0.6	1.9	6.3	13.3	19.5	116.9
Ext. Usage	14.7	13.3	14.7	14.3	14.7	14.3	14.7	14.7	14.3	14.7	14.3	14.7	173.5
Misc. Equip.	63.7	57.6	63.7	52.8	66.3	57.4	55.7	55.7	59.8	66.3	58.1	47.8	704.9
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	74.3	67.2	74.3	61.9	77.3	63.0	55.6	55.6	68.9	77.3	67.9	56.3	799.7
Total	339.4	305.1	323.2	273.7	325.8	366.9	398.9	385.1	338.5	315.9	294.7	291.3	3,958.4

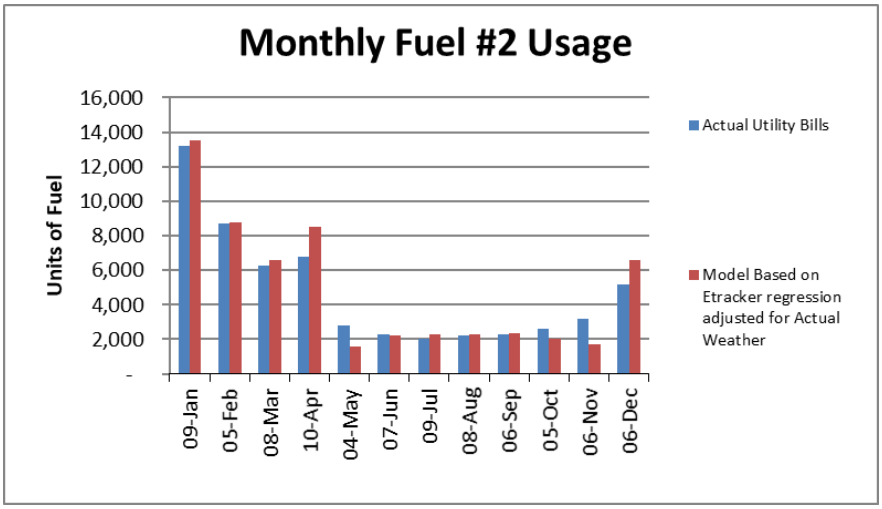
Gas Consumption (Btu x000,000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	3.09	2.46	1.79	0.81	0.11	0.01	0.00	0.00	0.03	0.21	1.02	2.33	11.85
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.07	0.07	0.08	0.06	0.07	0.05	0.03	0.03	0.05	0.06	0.06	0.05	0.69
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.06
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	3.17	2.53	1.87	0.87	0.19	0.06	0.04	0.04	0.08	0.27	1.08	2.39	12.60

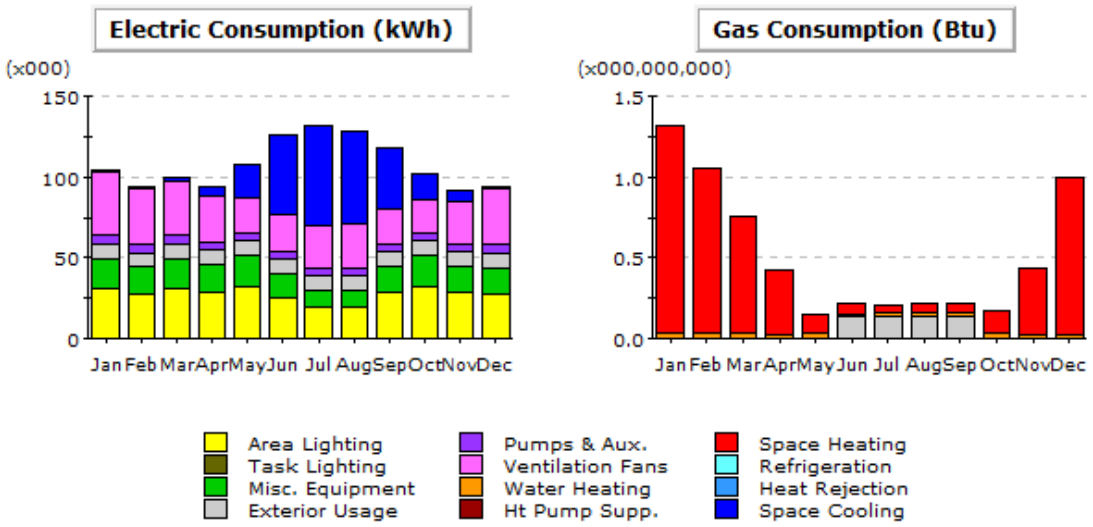
Christa McAuliffe Middle School – Energy Modeling Baseline

Baseline energy use has been analyzed using eQuest energy simulation software. The New Jersey Pay for Performance incentive program requires +/- 5% accuracy when simulating baseline annual energy use. To calibrate the model, eTracker weather normalization software was used to establish the relationship between weather and energy use of each building. Shown below are the comparison charts and the modeling software baseline output reports. The reports show the model baseline produced by DCO Energy is within acceptable tolerances.





Below is the monthly energy consumption output for the baseline model.



Electric Consumption (kWh x000)

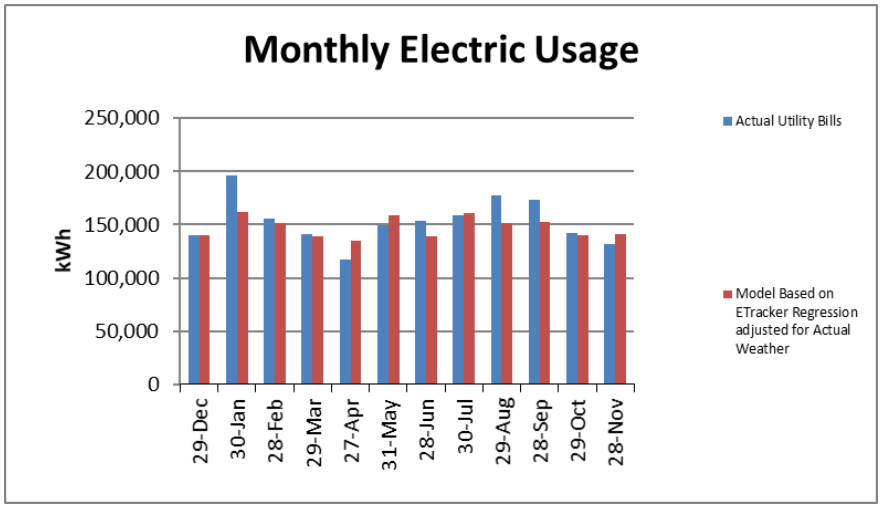
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.6	0.7	2.2	5.3	20.5	49.6	61.1	57.8	38.6	16.3	6.3	0.7	259.7
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	0.5	0.4	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.4	2.3
HP Supp.	0.6	0.3	0.2	0.0	0.0	-	-	-	-	0.0	0.1	0.3	1.5
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	38.5	34.6	33.3	27.8	21.7	23.0	26.5	26.7	21.3	20.8	25.6	34.5	334.2
Pumps & Aux.	5.3	4.8	5.2	4.8	4.5	4.2	4.4	4.4	4.2	4.6	4.7	5.2	56.4
Ext. Usage	9.5	8.6	9.5	9.2	9.5	9.2	9.5	9.5	9.2	9.5	9.2	9.5	111.8
Misc. Equip.	18.3	16.5	18.3	17.0	19.0	14.4	10.5	10.5	16.7	19.0	16.7	15.9	192.7
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	31.0	28.0	31.0	29.2	32.2	25.5	19.5	19.5	28.4	32.2	28.3	27.5	332.2
Total	104.2	93.9	99.9	93.4	107.5	125.8	131.5	128.4	118.5	102.4	91.1	94.1	1,290.8

Gas Consumption (Btu x000,000,000)

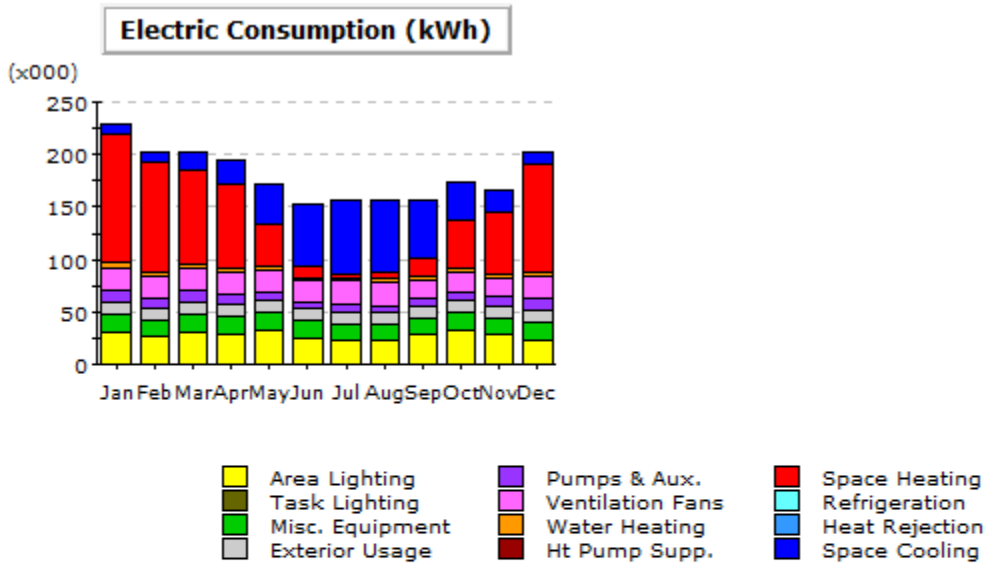
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	1.29	1.02	0.72	0.40	0.11	0.06	0.05	0.06	0.06	0.14	0.41	0.97	5.30
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.03	0.03	0.03	0.03	0.03	0.02	0.01	0.01	0.02	0.03	0.03	0.02	0.30
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	0.13	0.14	0.14	0.14	0.00	-	-	0.56
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	1.32	1.05	0.76	0.42	0.14	0.22	0.21	0.21	0.22	0.17	0.43	1.00	6.16

Elms Elementary School – Energy Modeling Baseline

Baseline energy use has been analyzed using eQuest energy simulation software. The New Jersey Pay for Performance incentive program requires +/- 5% accuracy when simulating baseline annual energy use. To calibrate the model, eTracker weather normalization software was used to establish the relationship between weather and energy use of each building. Shown below are the comparison charts and the modeling software baseline output reports. The reports show the model baseline produced by DCO Energy is within acceptable tolerances.



Below is the monthly energy consumption output for the baseline model.

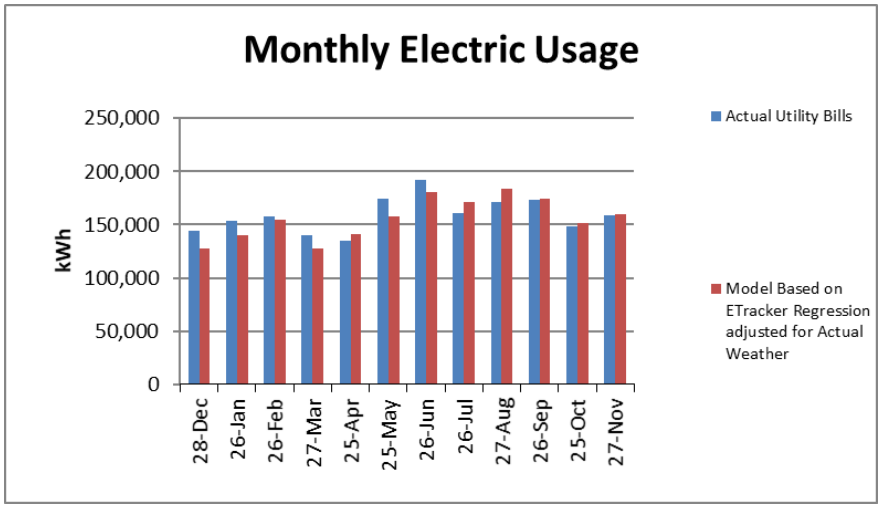


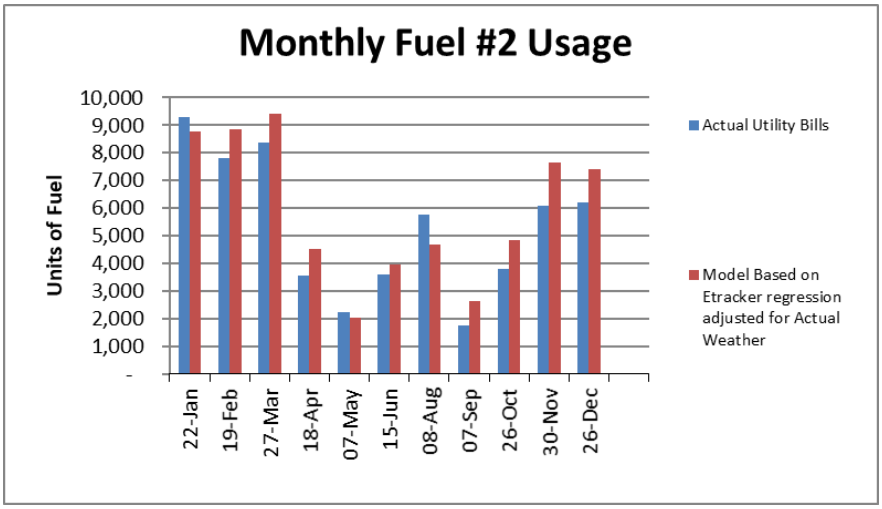
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	10.1	10.5	16.0	22.3	37.8	59.2	70.9	68.3	54.2	36.5	22.0	10.4	418.2
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	122.0	103.8	89.3	81.0	39.9	9.9	3.5	6.6	18.1	45.6	59.0	104.7	683.3
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	4.8	4.5	5.0	4.0	4.7	3.3	2.4	2.2	3.3	4.0	3.8	3.3	45.4
Vent. Fans	22.4	20.0	21.0	20.2	19.5	19.8	23.0	22.7	18.5	19.6	18.0	21.4	246.2
Pumps & Aux.	11.5	10.4	11.1	10.0	8.3	6.9	7.4	7.0	6.4	6.8	9.4	11.2	106.5
Ext. Usage	11.6	10.5	11.6	11.3	11.6	11.3	11.6	11.6	11.3	11.6	11.3	11.6	137.0
Misc. Equip.	17.0	15.4	17.0	16.9	17.7	15.9	15.2	15.2	16.2	17.7	15.5	16.3	196.0
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	30.0	27.5	30.5	29.0	31.7	25.7	22.4	22.4	28.2	31.7	27.9	23.1	330.2
Total	229.4	202.6	201.5	194.7	171.2	152.1	156.4	156.1	156.2	173.6	166.8	202.0	2,162.8

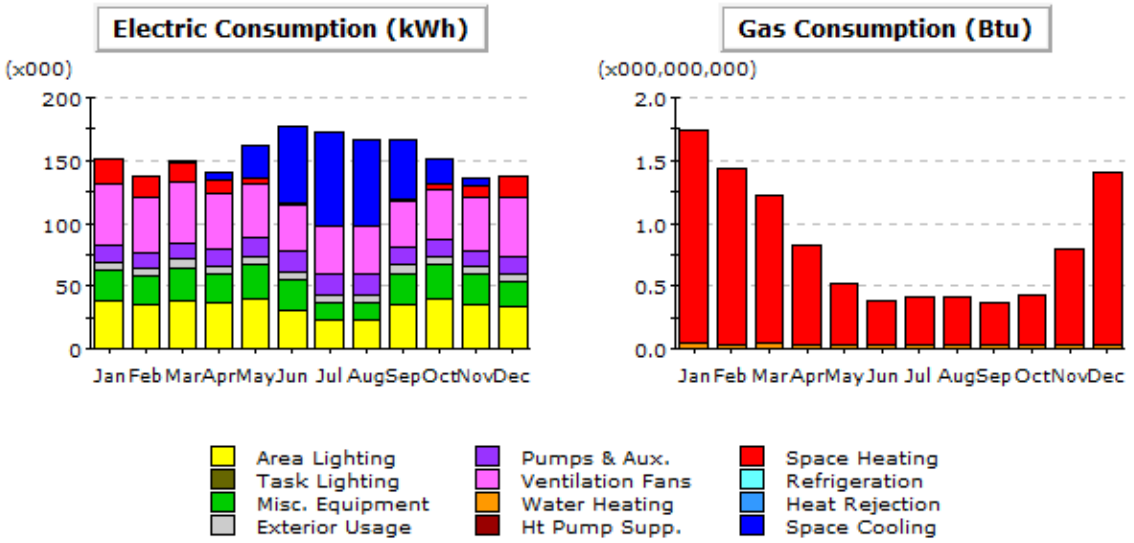
Goetz Middle School – Energy Modeling Baseline

Baseline energy use has been analyzed using eQuest energy simulation software. The New Jersey Pay for Performance incentive program requires +/- 5% accuracy when simulating baseline annual energy use. To calibrate the model, eTracker weather normalization software was used to establish the relationship between weather and energy use of each building. Shown below are the comparison charts and the modeling software baseline output reports. The reports show the model baseline produced by DCO Energy is within acceptable tolerances.





Below is the monthly energy consumption output for the baseline model.



Electric Consumption (kWh x000)

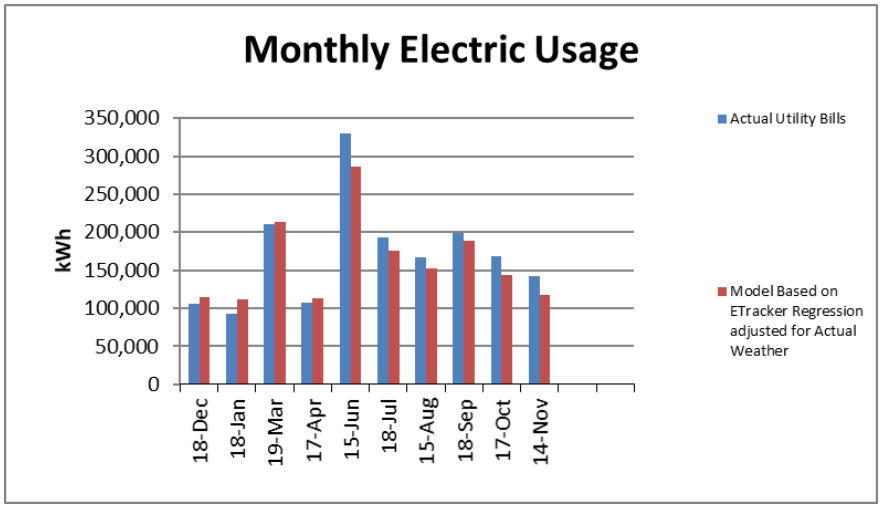
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.1	0.0	1.7	6.2	25.9	61.1	73.9	68.4	46.5	20.4	6.3	0.3	310.9
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	18.7	16.2	14.6	10.4	5.3	1.5	0.5	0.5	1.4	3.9	9.0	15.5	97.4
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	49.8	44.9	48.7	45.4	42.6	36.6	37.7	37.8	36.2	39.7	43.4	48.6	511.3
Pumps & Aux.	12.9	11.6	12.9	12.6	14.3	16.0	17.3	17.1	15.2	13.8	12.5	12.8	169.2
Ext. Usage	6.8	6.2	6.8	6.6	6.8	6.6	6.8	6.8	6.6	6.8	6.6	6.8	80.2
Misc. Equip.	24.6	23.2	25.6	23.5	26.7	24.5	13.2	13.2	24.5	26.7	23.4	19.2	268.2
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	38.0	35.1	38.8	36.2	40.4	30.6	22.7	22.7	35.4	40.4	35.4	34.0	409.5
Total	150.8	137.1	149.2	140.8	162.0	176.8	172.1	166.5	165.7	151.8	136.6	137.1	1,846.6

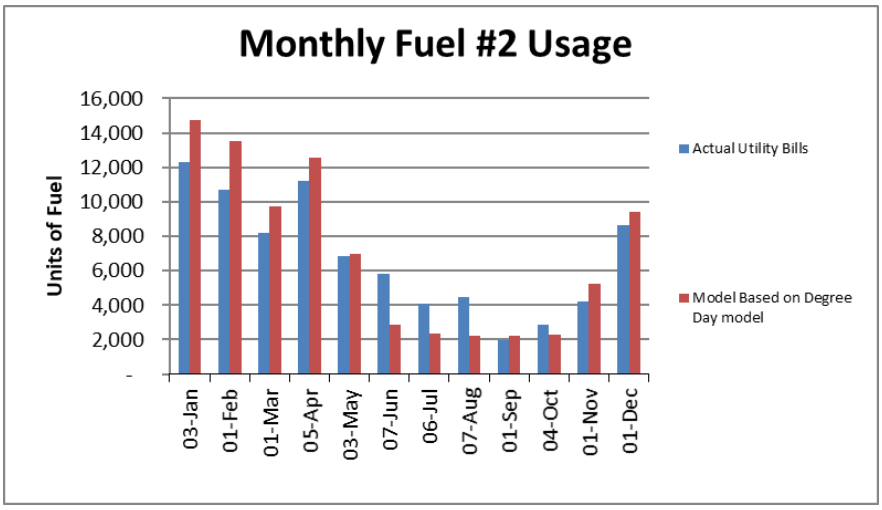
Gas Consumption (Btu x000,000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	1.70	1.40	1.18	0.78	0.48	0.35	0.38	0.38	0.33	0.40	0.76	1.37	9.52
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.04	0.04	0.04	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.40
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	1.74	1.43	1.22	0.82	0.52	0.38	0.41	0.41	0.36	0.43	0.79	1.40	9.91

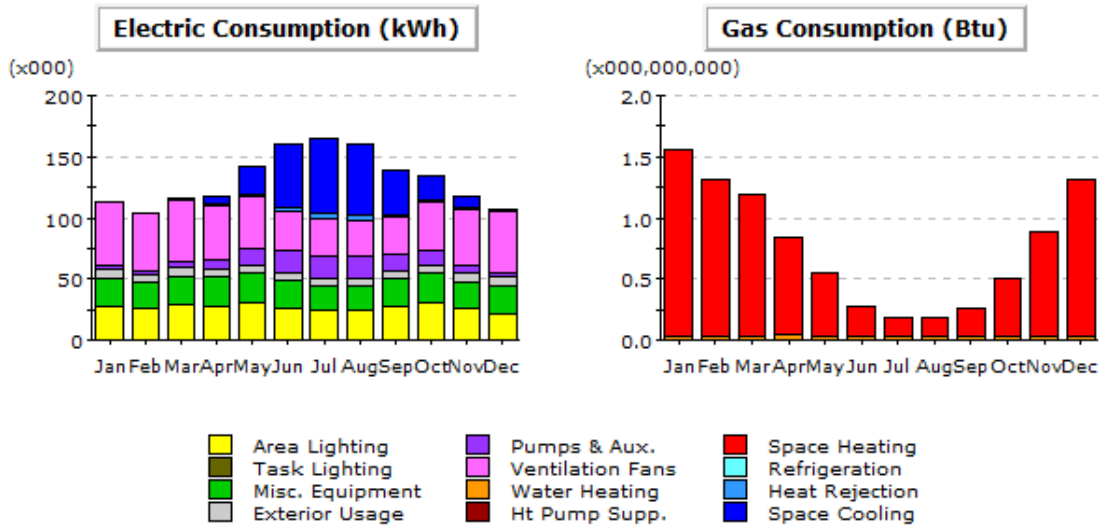
Crawford Rodriguez Middle School – Energy Modeling Baseline

Baseline energy use has been analyzed using eQuest energy simulation software. The New Jersey Pay for Performance incentive program requires +/- 5% accuracy when simulating baseline annual energy use. To calibrate the model, eTracker weather normalization software was used to establish the relationship between weather and energy use of each building. Shown below are the comparison charts and the modeling software baseline output reports. The reports show the model baseline produced by DCO Energy is within acceptable tolerances.





Below is the monthly energy consumption output for the baseline model.



Electric Consumption (kWh x000)

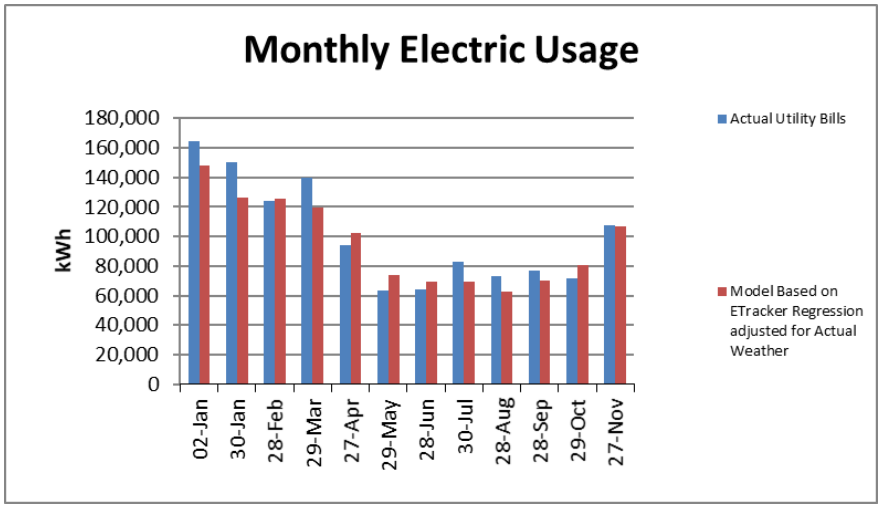
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.1	0.2	1.9	6.9	23.9	51.7	61.5	58.1	36.6	20.5	9.0	0.7	271.1
Heat Reject.	-	0.0	0.0	0.2	1.0	3.3	4.2	3.9	2.2	1.0	0.4	0.0	16.1
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	0.8	0.7	0.6	0.4	0.3	0.2	0.1	0.1	0.2	0.3	0.5	0.7	4.9
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	51.9	46.8	50.3	45.7	42.0	32.7	30.1	29.6	29.8	39.5	45.9	50.9	495.1
Pumps & Aux.	3.0	2.8	4.3	6.7	13.7	17.7	17.7	17.2	13.7	11.5	6.9	3.5	118.8
Ext. Usage	6.9	6.3	6.9	6.7	6.9	6.7	6.9	6.9	6.7	6.9	6.7	6.9	81.5
Misc. Equip.	23.3	21.5	23.7	23.4	24.7	22.7	20.2	20.2	22.7	24.7	21.7	22.5	271.2
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	27.6	26.0	28.8	28.1	29.9	25.8	23.9	23.9	27.5	29.9	26.3	21.8	319.4
Total	113.7	104.2	116.5	118.2	142.5	160.7	164.6	159.9	139.2	134.3	117.3	106.9	1,578.1

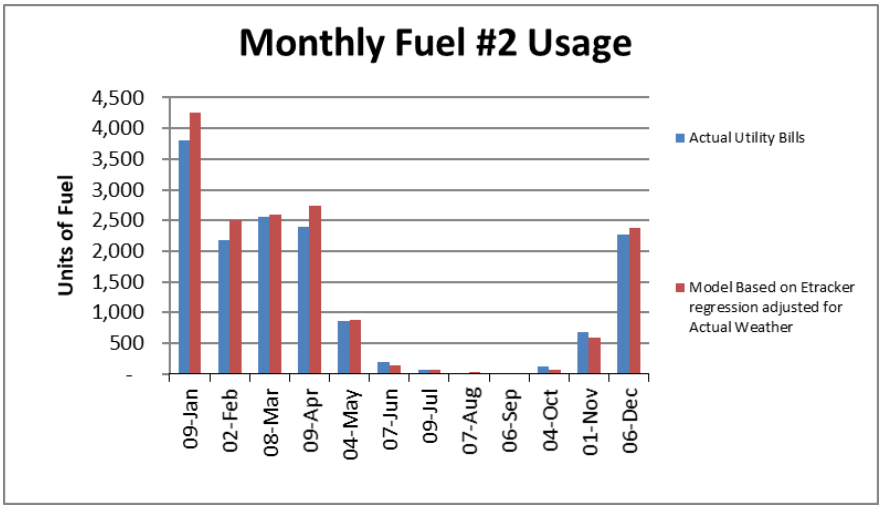
Gas Consumption (Btu x000,000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	1.51	1.28	1.15	0.80	0.51	0.24	0.15	0.15	0.23	0.48	0.85	1.28	8.64
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.04	0.03	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.39
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	1.55	1.31	1.19	0.84	0.55	0.27	0.19	0.18	0.25	0.51	0.88	1.32	9.03

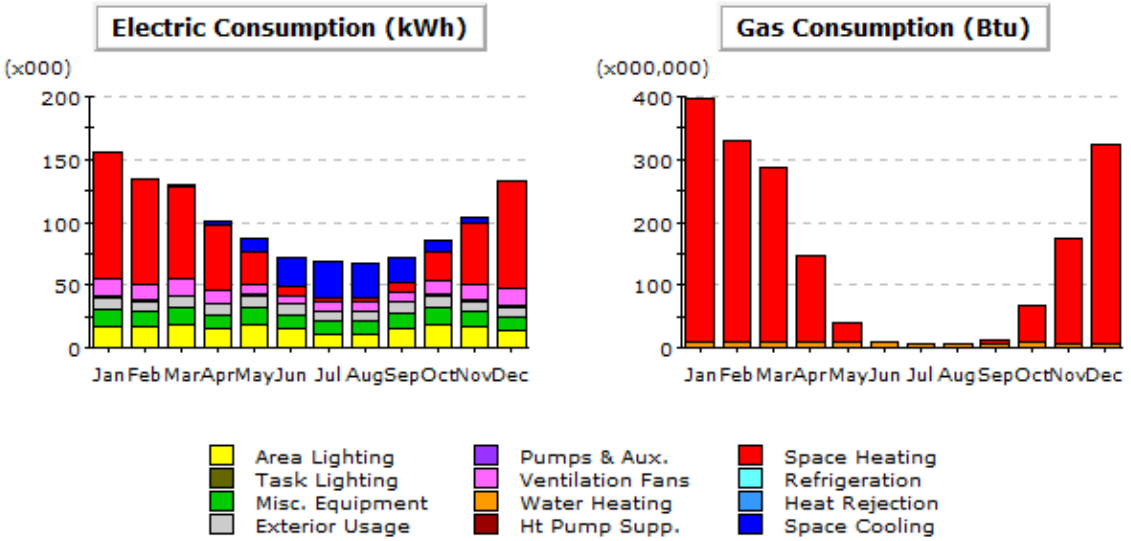
Switlik Elementary School – Energy Modeling Baseline

Baseline energy use has been analyzed using eQuest energy simulation software. The New Jersey Pay for Performance incentive program requires +/- 5% accuracy when simulating baseline annual energy use. To calibrate the model, eTracker weather normalization software was used to establish the relationship between weather and energy use of each building. Shown below are the comparison charts and the modeling software baseline output reports. The reports show the model baseline produced by DCO Energy is within acceptable tolerances.





Below is the monthly energy consumption output for the baseline model.



Electric Consumption (kWh x000)

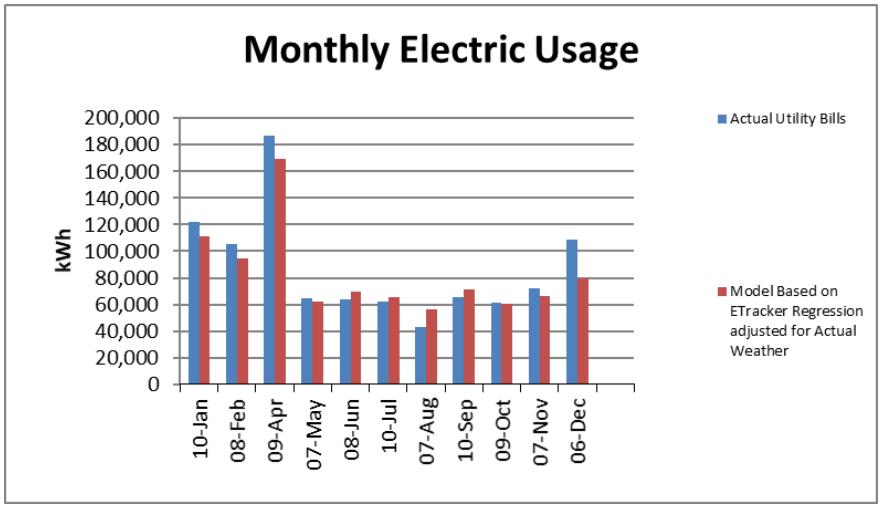
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.4	0.3	1.8	3.6	11.0	22.6	29.5	28.0	18.5	10.3	4.5	0.4	130.8
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	101.5	84.0	73.2	50.7	25.0	6.8	2.2	2.5	8.7	22.7	48.8	85.2	511.3
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	13.8	12.5	13.5	11.0	8.2	6.9	7.9	7.8	7.0	10.4	12.3	13.7	124.8
Pumps & Aux.	1.5	1.3	1.4	1.1	0.7	0.2	0.1	0.2	0.4	0.9	1.2	1.4	10.4
Ext. Usage	8.9	8.2	9.1	8.2	9.3	8.1	7.3	7.3	8.4	9.3	8.6	8.1	101.0
Misc. Equip.	12.6	11.9	13.1	10.9	13.6	11.7	11.2	11.2	12.1	13.6	12.0	9.9	143.9
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	17.5	16.5	18.3	15.2	19.0	14.8	10.7	10.7	15.9	19.0	16.7	13.8	188.1
Total	156.2	134.8	130.5	100.8	86.7	71.1	68.8	67.6	71.0	86.2	104.0	132.5	1,210.3

Gas Consumption (Btu x000,000)

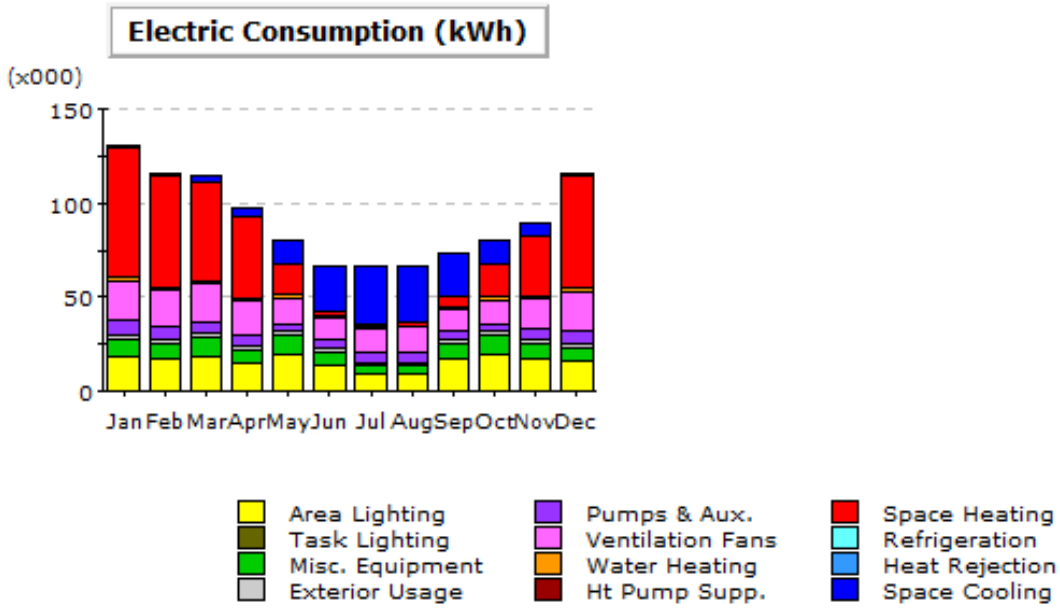
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	387.2	322.2	276.8	138.1	29.2	0.8	-	0.2	4.5	58.4	166.8	317.8	1,702.1
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	9.0	8.8	9.8	8.1	9.4	7.7	7.2	6.9	6.9	8.0	7.5	6.7	96.0
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	396.3	331.0	286.6	146.2	38.6	8.5	7.2	7.1	11.4	66.4	174.3	324.5	1,798.1

Holman Elementary School – Energy Modeling Baseline

Baseline energy use has been analyzed using eQuest energy simulation software. The New Jersey Pay for Performance incentive program requires +/- 5% accuracy when simulating baseline annual energy use. To calibrate the model, eTracker weather normalization software was used to establish the relationship between weather and energy use of each building. Shown below are the comparison charts and the modeling software baseline output reports. The reports show the model baseline produced by DCO Energy is within acceptable tolerances.



Below is the monthly energy consumption output for the baseline model.

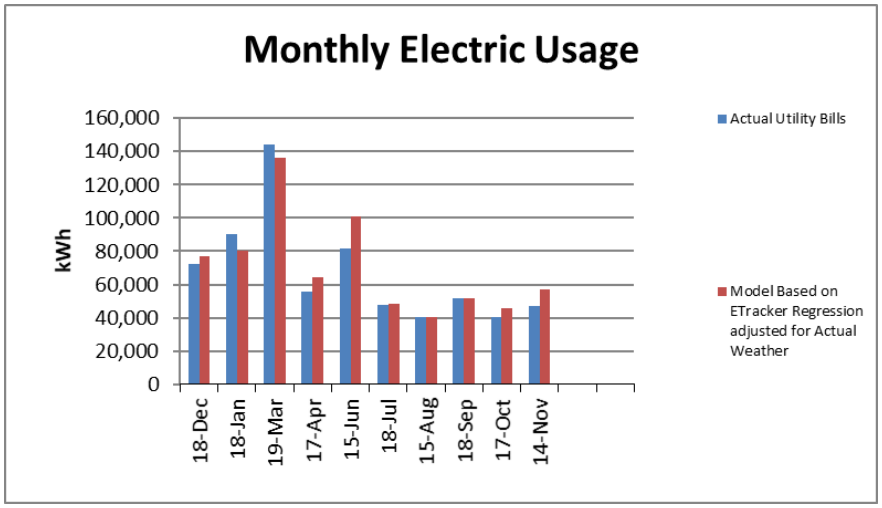


Electric Consumption (kWh x000)

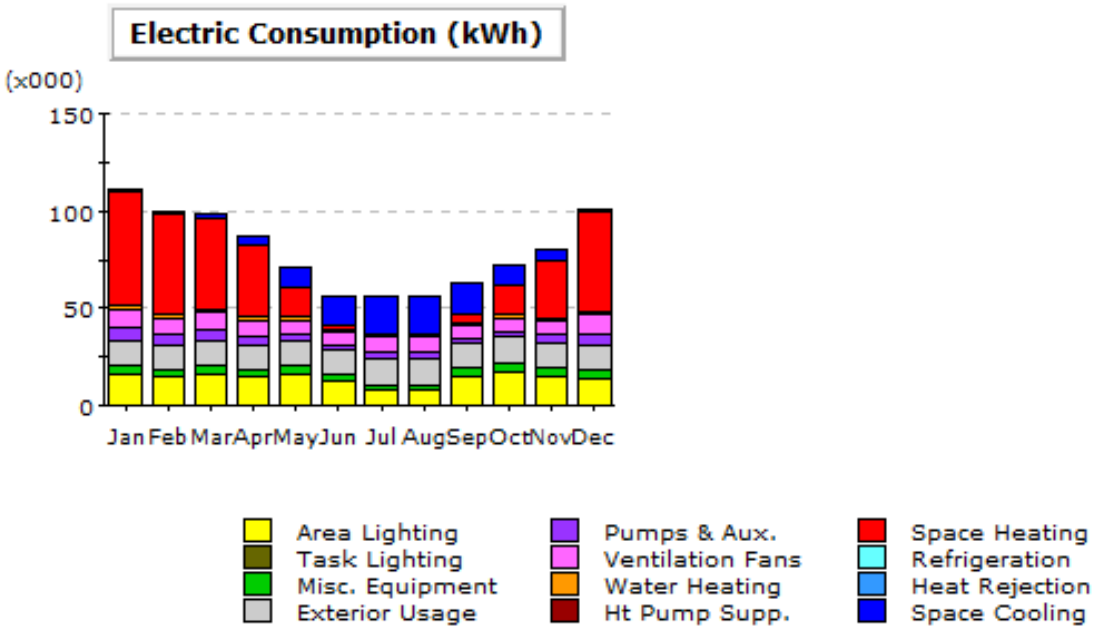
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	1.0	1.0	2.5	4.3	12.6	24.6	31.0	29.8	22.8	12.7	6.0	1.2	149.5
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	69.1	59.3	52.6	43.7	16.5	2.3	0.6	1.7	5.7	17.3	32.1	59.7	360.3
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	1.9	1.8	2.0	1.6	1.9	1.2	0.6	0.6	1.3	1.6	1.5	1.3	17.3
Vent. Fans	21.2	19.1	19.8	18.0	13.9	11.7	13.6	13.6	11.5	13.5	16.4	20.7	193.1
Pumps & Aux.	8.0	7.0	6.7	5.5	3.6	4.1	5.0	5.1	4.1	3.3	5.1	7.3	64.8
Ext. Usage	2.2	2.1	2.3	2.0	2.3	1.9	1.6	1.6	2.1	2.3	2.1	2.1	24.7
Misc. Equip.	9.1	8.6	9.5	7.5	9.9	7.0	4.2	4.2	8.5	9.9	8.7	7.1	94.1
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	18.2	16.9	18.7	14.8	19.5	14.2	9.3	9.3	16.9	19.5	17.1	15.9	190.4
Total	130.8	115.8	114.0	97.4	80.1	67.0	65.9	65.9	73.0	80.1	89.0	115.3	1,094.3

Johnson Elementary School – Energy Modeling Baseline

Baseline energy use has been analyzed using eQuest energy simulation software. The New Jersey Pay for Performance incentive program requires +/- 5% accuracy when simulating baseline annual energy use. To calibrate the model, eTracker weather normalization software was used to establish the relationship between weather and energy use of each building. Shown below are the comparison charts and the modeling software baseline output reports. The reports show the model baseline produced by DCO Energy is within acceptable tolerances.



Below is the monthly energy consumption output for the baseline model.

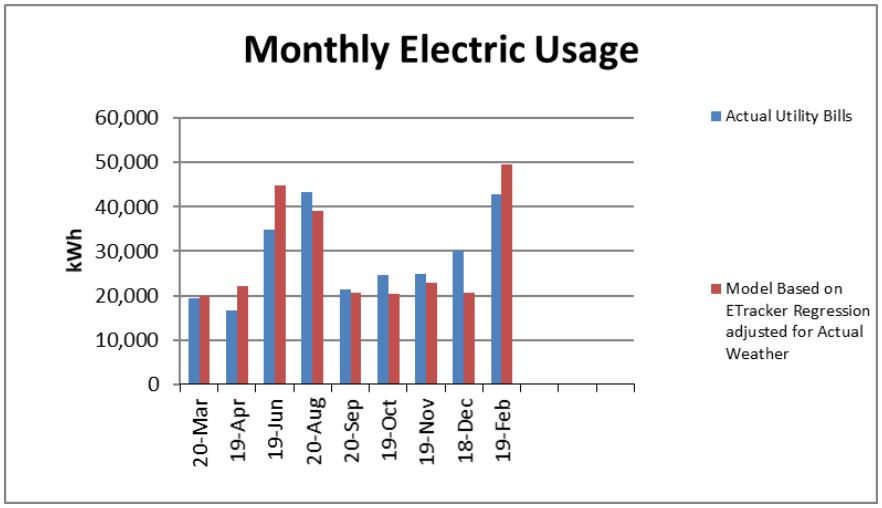


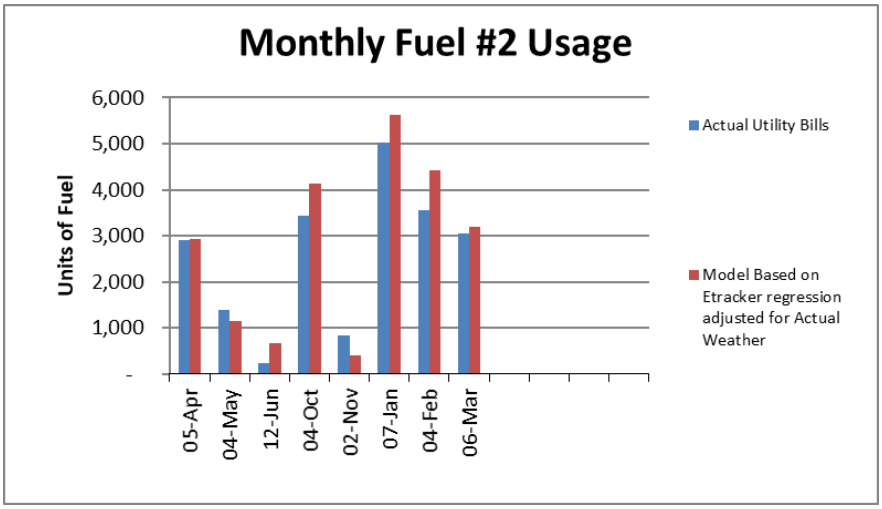
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	1.13	1.09	2.25	4.24	9.77	15.09	20.11	19.68	16.19	10.12	5.53	1.27	106.47
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	58.49	51.43	46.86	37.48	15.55	1.98	0.22	1.03	4.53	15.66	29.47	52.03	314.74
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	1.71	1.60	1.78	1.38	1.69	1.17	0.79	0.75	1.22	1.45	1.36	1.21	16.11
Vent. Fans	9.79	8.75	8.74	8.09	7.11	6.82	8.06	7.98	6.84	7.40	7.22	9.31	96.12
Pumps & Aux.	6.37	5.60	5.47	4.42	3.05	2.45	3.10	3.17	2.66	2.73	4.51	5.98	49.53
Ext. Usage	13.27	11.99	13.27	12.84	13.27	12.84	13.27	13.27	12.84	13.27	12.84	13.27	156.27
Misc. Equip.	4.51	4.17	4.20	4.15	3.87	3.37	2.52	2.52	4.19	4.79	4.22	3.99	46.48
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	15.85	14.70	16.25	14.45	16.51	12.34	8.20	8.20	14.72	16.91	14.85	13.87	166.84
Total	111.12	99.33	98.81	87.05	70.83	56.07	56.27	56.61	63.20	72.33	80.01	100.94	952.56

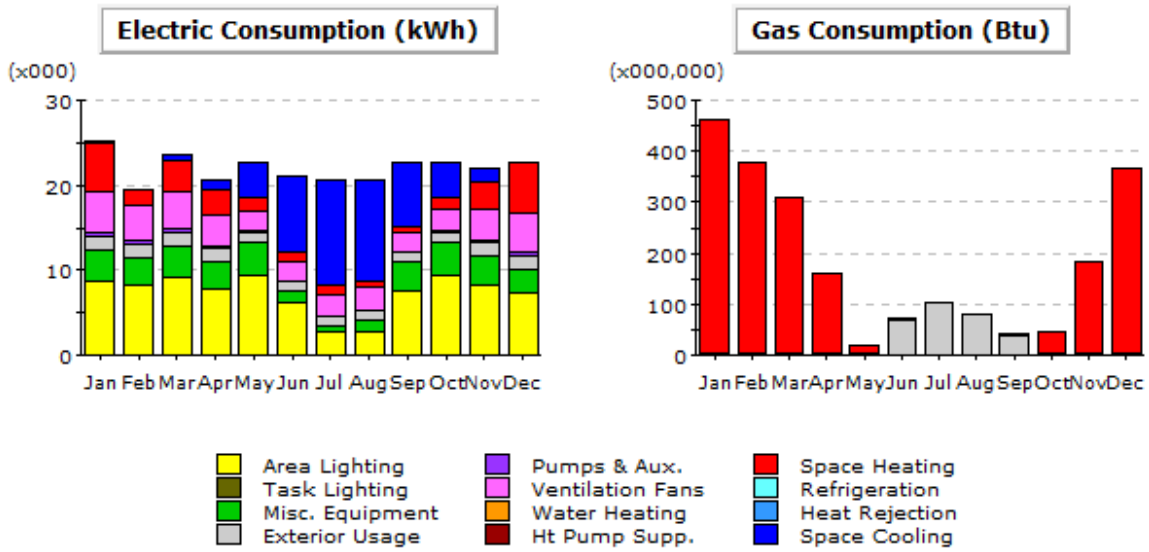
Rosenauer Elementary School – Energy Modeling Baseline

Baseline energy use has been analyzed using eQuest energy simulation software. The New Jersey Pay for Performance incentive program requires +/- 5% accuracy when simulating baseline annual energy use. To calibrate the model, eTracker weather normalization software was used to establish the relationship between weather and energy use of each building. Shown below are the comparison charts and the modeling software baseline output reports. The reports show the model baseline produced by DCO Energy is within acceptable tolerances.





Below is the monthly energy consumption output for the baseline model.



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.09	0.05	0.59	1.14	4.20	8.91	12.33	11.71	7.58	3.98	1.60	0.09	52.26
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	5.92	1.80	3.70	3.02	1.57	1.16	1.05	0.76	0.68	1.34	3.21	5.92	30.14
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	4.66	4.22	4.42	3.60	2.38	2.13	2.56	2.68	2.15	2.50	3.66	4.51	39.47
Pumps & Aux.	0.56	0.49	0.49	0.38	0.19	0.04	0.01	0.02	0.10	0.23	0.37	0.52	3.41
Ext. Usage	1.61	1.45	1.61	1.56	1.16	1.11	1.15	1.15	1.11	1.24	1.56	1.61	16.31
Misc. Equip.	3.56	3.35	3.70	3.12	3.85	1.40	0.71	1.43	3.54	3.85	3.39	2.85	34.74
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	8.76	8.20	9.06	7.86	9.42	6.24	2.78	2.78	7.45	9.42	8.30	7.25	87.50
Total	25.15	19.56	23.57	20.67	22.78	20.99	20.59	20.52	22.60	22.57	22.08	22.73	263.82

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	458.5	375.0	303.0	155.5	13.0	-	-	-	0.1	43.8	180.0	365.2	1,894.2
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	4.1	4.0	4.4	3.6	4.2	2.4	0.5	0.5	2.6	3.6	3.4	3.1	36.5
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	70.2	103.4	80.1	39.9	-	-	-	293.6
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	462.6	379.0	307.5	159.1	17.2	72.6	104.0	80.6	42.7	47.4	183.4	368.3	2,224.3

Administration Building – Energy Modeling Baseline

The Administration Building was not energy modeled because it does not meet the Pay for Performance eligibility requirement of an annual peak demand over 200 kW. Please see Section 3 – Energy Conservation Measures for energy savings calculations.

Transportation Building – Energy Modeling Baseline

The Transportation Building was not energy modeled because it does not meet the Pay for Performance eligibility requirement of an annual peak demand over 200 kW. Please see Section 3 – Energy Conservation Measures for energy savings calculations.

Maintenance Garage – Energy Modeling Baseline

The Maintenance Garage was not energy modeled because it does not meet the Pay for Performance eligibility requirement of an annual peak demand over 200 kW. Please see Section 3 – Energy Conservation Measures for energy savings calculations.

ENERGY SAVINGS PLAN

SECTION 3 – ENERGY CONSERVATION MEASURES

Energy Conservation Measure Breakdown by Building

The matrix below details which ECMs were applied and evaluated by building. It also indicates which ECMs were included in the project and which ECMs were not included in the project.

JACKSON TOWNSHIP BOARD OF EDUCATION

✔	District ECM was evaluated
✔	District Optional ECM was evaluated
✔	DCO ECM was evaluated
	ECM included in the project

ECM #	ECM DESCRIPTION	Jackson Liberty High School	Jackson Memorial High School	Christa McAuliffe Middle School	Elms Elementary School	Goetz Middle School	Crawford Rodriguez Elementary School	Switlik Elementary School	Holman Elementary School	Johnson Elementary School	Rosenauer Elementary School	Administration Building	Transportation Building	Maintenance Garage
1	LED Lighting Replacement with Controls	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
2	Upgrade/Install Metasys Control System	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔			
3	Boiler Replacement			✔		✔	✔	✔					✔	
4	Burner Replacement			✔		✔	✔	✔						
5	Chiller and Cooling Tower Replacement						✔							
6	Premium Efficiency Pump Motors and VFDs			✔		✔	✔	✔	✔	✔				
7	Rooftop Unit Replacement			✔	✔	✔		✔			✔	✔		
8	Unit Ventilator Replacement					✔		✔			✔			
9	Split System AC Replacement			✔			✔	✔				✔	✔	
9a	Add Split System Cooling to Gym AHUs					✔								
10	Destratification Fans	✔	✔	✔	✔	✔	✔	✔	✔					
11	Building Envelope Weatherization	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔			
12	Plug Load Controls	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
13	High Efficiency Transformers	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔		
14	Solar PPA	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
15	Combined Heat & Power Unit			✔			✔							
16	Energy Education	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔			
17	Roof Refurbishment	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		
18	Window Replacement					✔			✔	✔				
19	Paving Upgrade		✔	✔		✔					✔			
20	Intercom System Upgrade			✔		✔		✔	✔		✔			
21	Tennis Court Upgrade		✔											
22	Running Track Upgrade	✔												

ECM Breakdown by Cost & Savings

JACKSON TOWNSHIP BOARD OF EDUCATION		INCLUDED IN PROJECT	INSTALLED COST	ANNUAL ELECTRIC COST SAVINGS	ANNUAL NATURAL GAS COST SAVINGS	ANNUAL Fuel Oil #2 (Gal) COST SAVINGS
ECM #	ENERGY CONSERVATION MEASURE	"Y" OR "N"	$	$	$	$
1	LED Lighting Replacement with Controls	Y	$4,281,745	$407,055	($19,912)	$0
2	Upgrade/Install Metasys Control System	Y	$2,010,600	$139,226	$88,598	$0
3	Boiler Replacement	Y	$1,494,869	($1,591)	($62,889)	$130,675
4	Burner Replacement	N	$0	$0	$0	$0
5	Chiller and Cooling Tower Replacement	N	$0	$0	$0	$0
6	Premium Efficiency Pump Motors and VFDs	Y	$240,408	$28,854	($3,917)	$0
7	Rooftop Unit Replacement	Y	$686,500	$7,248	($309)	$0
8	Unit Ventilator Replacement	Y	$1,160,216	$7,419	$0	$0
9	Split System AC Replacement	Y	$54,947	$1,299	$0	$0
9a	Add Split System Cooling to Gym AHUs	Y	$110,000	($1,998)	$113	$0
10	Destratification Fans	Y	$180,000	$12,801	$5,242	$0
11	Building Envelope Weatherization	Y	$286,337	$17,004	$5,358	$0
12	Plug Load Controls	Y	$81,366	$13,057	$0	$0
13	High Efficiency Transformers	Y	$1,257,505	$94,259	$0	$0
14	Solar PPA	Y	$0	$551,158	$0	$0
15	Combined Heat & Power Unit	Y	$539,627	$51,235	($21,057)	$0
16	Energy Education	Y	$50,000	$0	$0	$0
17	Roof Refurbishment	Y	$7,830,962	$9,593	$6,889	$0
18	Window Replacement	N	$0	$0	$0	$0
19	Paving Upgrade	N	$0	$0	$0	$0
20	Intercom System Upgrade	N	$0	$0	$0	$0
21	Tennis Court Upgrade	N	$0	$0	$0	$0
22	Running Track Upgrade	N	$0	$0	$0	$0
TOTALS			$20,265,083	$1,336,619	($1,884)	$130,675

JACKSON TOWNSHIP BOARD OF EDUCATION		INCLUDED IN PROJECT	ANNUAL Solar PPA (kWh) COST SAVINGS	ANNUAL Water & Sewer (Gal) COST SAVINGS	ANNUAL ENERGY COST SAVINGS	ANNUAL O&M COST SAVINGS	TOTAL ANNUAL COST SAVINGS	SIMPLE PAYBACK WITHOUT INCENTIVES
ECM #	ENERGY CONSERVATION MEASURE	"Y" OR "N"	$	$	$	$	$	YEARS
1	LED Lighting Replacement with Controls	Y	$0	$0	$387,144	$33,306	$420,450	10.2
2	Upgrade/Install Metasys Control System	Y	$0	$0	$227,824	$0	$227,824	8.8
3	Boiler Replacement	Y	$0	$0	$66,195	$0	$66,195	22.6
4	Burner Replacement	N	$0	$0	$0	$0	$0	0.0
5	Chiller and Cooling Tower Replacement	N	$0	$0	$0	$0	$0	0.0
6	Premium Efficiency Pump Motors and VFDs	Y	$0	$0	$24,937	$0	$24,937	9.6
7	Rooftop Unit Replacement	Y	$0	$0	$6,939	$0	$6,939	98.9
8	Unit Ventilator Replacement	Y	$0	$0	$7,419	$0	$7,419	156.4
9	Split System AC Replacement	Y	$0	$0	$1,299	$0	$1,299	42.3
9a	Add Split System Cooling to Gym AHUs	Y	$0	$0	($1,885)	$0	($1,885)	-58.4
10	Destratification Fans	Y	$0	$0	$18,043	$0	$18,043	10.0
11	Building Envelope Weatherization	Y	$0	$0	$22,362	$0	$22,362	12.8
12	Plug Load Controls	Y	$0	$0	$13,057	$0	$13,057	6.2
13	High Efficiency Transformers	Y	$0	$0	$94,259	$0	$94,259	13.3
14	Solar PPA	Y	($190,953)	$0	$360,205	$0	$360,205	0.0
15	Combined Heat & Power Unit	Y	$0	$0	$30,177	$0	$30,177	17.9
16	Energy Education	Y	$0	$0	$0	$0	$0	0.0
17	Roof Refurbishment	Y	$0	$0	$16,482	$0	$16,482	475.1
18	Window Replacement	N	$0	$0	$0	$0	$0	0.0
19	Paving Upgrade	N	$0	$0	$0	$0	$0	0.0
20	Intercom System Upgrade	N	$0	$0	$0	$0	$0	0.0
21	Tennis Court Upgrade	N	$0	$0	$0	$0	$0	0.0
22	Running Track Upgrade	N	$0	$0	$0	$0	$0	0.0
TOTALS			($190,953)	$0	$1,274,457	$33,306	$1,307,763	15.5

JACKSON TOWNSHIP BOARD OF EDUCATION		INCLUDED IN PROJECT	ELECTRIC CONSUMPTION SAVINGS	ELECTRIC DEMAND SAVINGS	NATURAL GAS SAVINGS	Fuel Oil #2 (Gal) SAVINGS	Solar PPA (kWh) SAVINGS	TOTAL SITE ENERGY SAVINGS	TOTAL SOURCE ENERGY SAVINGS
ECM #	ENERGY CONSERVATION MEASURE	"Y" OR "N"	kWh	kW	THERMS	Fuel Oil #2 (Gal)	Solar PPA (kWh)	MMBTU	MMBTU
1	LED Lighting Replacement with Controls	Y	3,519,534	546	(20,995)	0	0	9,909	31,420
2	Upgrade/Install Metasys Control System	Y	1,328,325	4	92,872	0	0	13,819	22,442
3	Boiler Replacement	Y	(14,876)	0	(65,459)	58,470	0	1,589	1,252
4	Burner Replacement	N	0	0	0	0	0	0	0
5	Chiller and Cooling Tower Replacement	N	0	0	0	0	0	0	0
6	Premium Efficiency Pump Motors and VFDs	Y	257,254	25	(4,064)	0	0	471	2,031
7	Rooftop Unit Replacement	Y	55,305	48	(321)	0	0	157	495
8	Unit Ventilator Replacement	Y	62,153	9	0	0	0	212	594
9	Split System AC Replacement	Y	9,572	4	0	0	0	33	91
9a	Add Split System Cooling to Gym AHUs	Y	(13,914)	(23)	117	0	0	-36	-121
10	Destratification Fans	Y	123,274	0	5,519	0	0	972	1,757
11	Building Envelope Weatherization	Y	142,926	38	5,713	0	0	1,059	1,965
12	Plug Load Controls	Y	124,313	0	0	0	0	424	1,188
13	High Efficiency Transformers	Y	863,449	60	0	0	0	2,946	8,249
14	Solar PPA	Y	5,231,584	0	0	0	(5,231,584)	0	32,130
15	Combined Heat & Power Unit	Y	442,867	70	(21,842)	0	0	-673	1,938
16	Energy Education	Y	0	0	0	0	0	0	0
17	Roof Refurbishment	Y	76,033	35	7,173	0	0	977	1,480
18	Window Replacement	N	0	0	0	0	0	0	0
19	Paving Upgrade	N	0	0	0	0	0	0	0
20	Intercom System Upgrade	N	0	0	0	0	0	0	0
21	Tennis Court Upgrade	N	0	0	0	0	0	0	0
22	Running Track Upgrade	N	0	0	0	0	0	0	0
TOTALS			12,207,798	816	(1,287)	58,470	(5,231,584)	31,860	106,911

DCO Energy Efficiency Division
100 Lenox Drive
Lawrenceville, NJ 08648

ECM Breakdown by Greenhouse Gas Reduction

JACKSON TOWNSHIP BOARD OF EDUCATION		INCLUDED IN PROJECT	Reduction of CO_2	Reduction of No_x	Reduction of SO_2	Reduction of Hg
ECM #	ENERGY CONSERVATION MEASURE	"Y" OR "N"	LBS	LBS	LBS	LBS
1	LED Lighting Replacement with Controls	Y	3,625,842	3,150	7,778	16,372
2	Upgrade/Install Metasys Control System	Y	2,547,759	2,116	2,936	6,179
3	Boiler Replacement	Y	539,768	-616	-33	-69
4	Burner Replacement	N	0	0	0	0
5	Chiller and Cooling Tower Replacement	N	0	0	0	0
6	Premium Efficiency Pump Motors and VFDs	Y	235,428	207	569	1,197
7	Rooftop Unit Replacement	Y	57,079	50	122	257
8	Unit Ventilator Replacement	Y	68,368	59	137	289
9	Split System AC Replacement	Y	10,529	9	21	45
9a	Add Split System Cooling to Gym AHUs	Y	-13,935	-12	-31	-65
10	Destratification Fans	Y	200,170	168	272	573
11	Building Envelope Weatherization	Y	224,063	188	316	665
12	Plug Load Controls	Y	136,744	118	275	578
13	High Efficiency Transformers	Y	949,794	820	1,908	4,017
14	Solar PPA	Y	5,754,742	4,970	11,562	24,336
15	Combined Heat & Power Unit	Y	231,607	220	979	2,060
16	Energy Education	Y	0	0	0	0
17	Roof Refurbishment	Y	167,559	138	168	354
18	Window Replacement	N	0	0	0	0
19	Paving Upgrade	N	0	0	0	0
20	Intercom System Upgrade	N	0	0	0	0
21	Tennis Court Upgrade	N	0	0	0	0
22	Running Track Upgrade	N	0	0	0	0
TOTALS			14,735,516	11,586	26,979	56,788

Note: Factors used to calculate Greenhouse Gas Reductions are as follows:

	UTILITIES				
	ELECTRIC	NATURAL GAS	OTHER ENERGY #1	OTHER ENERGY #2	OTHER ENERGY #3
UNITS	kW & kWh	Therms	Fuel Oil #2 (Gal)	Solar PPA (kWh)	Water & Sewer (Gal)
BTU MULTIPLIER	3,412	100,000	140,000	3,412	0
CO2 EMISSION FACTOR (LB CO2/UNIT FUEL)	1.10	11.70	22.61	0.00	0.00
SITE-SOURCE MULTIPLIER	2.80	1.05	1.01	1.00	0.00

- ***NOx = (0.00095*kWh Savings) + (0.0092*Therm Savings)***
- ***SO2 = (0.00221*kWh Savings)***
- ***Hg = (0.00465*kWh Savings)***

ECM Breakdown by Building

Please see Appendix F for ECM Breakdown by Building.

ECM Budgeting Narrative

Detailed plans, schematics and specifications for Jackson Township School District were not available to deliver a cost estimate for each ECM. The budgetary costs carried in the project are based on 30% design drawings (McAuliffe Middle School, Goetz Middle School, Crawford Rodriguez Elementary School, Switlik Elementary School, Rosenauer Elementary School) good faith estimates, contractor supplied budgets for similar ECMs on other recent projects and a database of actual installed costs for various ECMs.

JACKSON TOWNSHIP BOARD OF EDUCATION		INCLUDED IN PROJECT	INSTALLED COST
ECM #	ENERGY CONSERVATION MEASURE	"Y" OR "N"	$
1	LED Lighting Replacement with Controls	Y	$4,281,745
2	Upgrade/Install Metasys Control System	Y	$2,010,600
3	Boiler Replacement	Y	$1,494,869
4	Burner Replacement	N	$0
5	Chiller and Cooling Tower Replacement	N	$0
6	Premium Efficiency Pump Motors and VFDs	Y	$240,408
7	Rooftop Unit Replacement	Y	$686,500
8	Unit Ventilator Replacement	Y	$1,160,216
9	Split System AC Replacement	Y	$54,947
9a	Add Split System Cooling to Gym AHUs	Y	$110,000
10	Destratification Fans	Y	$180,000
11	Building Envelope Weatherization	Y	$286,337
12	Plug Load Controls	Y	$81,366
13	High Efficiency Transformers	Y	$1,257,505
14	Solar PPA	Y	$0
15	Combined Heat & Power Unit	Y	$539,627
16	Energy Education	Y	$50,000
17	Roof Refurbishment	Y	$7,830,962
18	Window Replacement	N	$0
19	Paving Upgrade	N	$0
20	Intercom System Upgrade	N	$0
21	Tennis Court Upgrade	N	$0
22	Running Track Upgrade	N	$0
TOTALS			$20,265,083

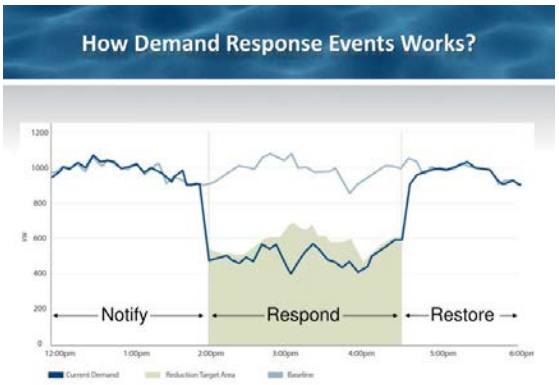
Demand Response & Project Incentives Analysis

Demand Response

Demand Response (DR) is a voluntary Pennsylvania-Jersey-Maryland (PJM) Interconnection program that allows end use customers to reduce their electricity usage during periods of higher power prices. In exchange, end-use customers are compensated through PJM members known as Curtailment Service Providers (CSPs) for decreasing their electricity use when requested by PJM.

Common reduction strategies used in Demand Response include:

- Manual or automatic load drop
- Energy management systems
- Load shedding strategies
- Lighting control strategies
- Backup generation
- Ice storage systems



Benefits of the program include:

- Significant source of new revenue
- Helps to ensure local grid reliability
- Reduces the need for new environmentally taxing energy generation

In the base product, customers commit to reducing their load at the direction of PJM during emergency conditions during the summer months. In the Capacity Performance product, the customer will need to be able to reduce load when directed during the entire year.

Jackson Township Board of Education is already enrolled in Demand Response so no additional savings are included in this project.

Pay for Performance Incentives

Jackson Township Board of Education is eligible for Pay for Performance Incentives. The P4P Guidelines require that a building be over the threshold of 200 kW based on the 12 months of utility bills submitted with the application. Eight schools are eligible for the incentives. The P4P Guidelines were used to calculate incentive values. The program incentive structure is as follows:

Incentive #1: Energy Reduction Plan			
Incentive Amount:		$0.15	per sq ft
Minimum Incentive:		$7,500	
Maximum Incentive:		$50,000	or 50% of facility annual energy cost
Incentive #2: Installation of Recommended Measures			
Minimum Savings Target:		**15%**	
Electric Incentives	Base Incentive based on 15% savings:	$0.09	per projected kWh saved
	For each % over 15% add:	$0.005	
	Maximum Incentive:	$0.11	
Gas Incentives	Base Incentive based on 15 % savings:	$0.90	per projected Therm saved
	For each % over 15% add:	$0.05	
	Maximum Incentive:	$1.25	
Incentive Cap:		**25%**	**of total project cost**
Incentive #3: Post-Construction Benchmarking Report			
Minimum Savings Target:		**15%**	
Electric Incentives	Base Incentive based on 15% savings:	$0.09	per actual kWh saved
	For each % over 15% add:	$0.005	
	Maximum Incentive:	$0.11	
Gas Incentives	Base Incentive based on 15% savings:	$0.90	per actual Therm saved
	For each % over 15% add:	$0.05	
	Maximum Incentive:	$1.25	
Incentive Cap:		**25%**	**of total project cost**

Enhanced Incentives are available for certain facility types as listed below:

- Commercial and Industrial
- Owned or operated by Municipalities
- Owned or operated by K-12 public schools
- Located within Urban Enterprise Zones (UEZ)
- Located within Opportunity Zones (OZ)

Jackson Township Board of Education qualifies for enhanced incentives. Enhanced incentives are equal to an additional 100% of the incentives #2 and #3 listed above. The incentives are subject to a cap of 80% of the Applicant's cost for the project allocated between Incentive #2 and #3:

Incentive #2: Installation of Recommended Measures			
Enhanced Incentives	Electric Savings Additional Incentive	$0.09-$0.11	per projected kWh saved
	Gas Savings Additional Incentive	$0.90-$1.25	per projected Therm saved
	Incentive Cap:	40%	of total project cost

Incentive #3: Post-Construction Benchmarking Report			
Enhanced Incentives	Electric Savings Additional Incentive	$0.09-$0.11	per actual kWh saved
	Gas Savings Additional Incentive	$0.90-$1.25	per actual Therm saved
	Incentive Cap:	40%	of total project cost

Incentive Calculations

Estimated incentive values were calculated in accordance with the New Jersey Clean Energy Program Guidelines The total incentive amount was calculated to be $2,767,486 in rebates and incentives - 50%, $1,383,743, has been applied to the project financial analysis (See Section 4). Please see below and Appendix F for building-by-building details.

Incentive Totals

BUILDING	INCENTIVE TYPE	QUANTITY	UNITS	INCENTIVE $/UNIT	INSTALL INCENTIVE	YEAR 1 INCENTIVE	YEAR 2 INCENTIVE	SUBTOTAL	TOTAL
JACKSON TOWNSHIP BOARD OF EDUCATION	P4P 2&3 (electric)	4,168,379	kWh	$0.44	$0	$917,043	$917,043	$1,834,087	$2,767,486
	P4P 2&3 (natural gas)	87,935	therms	$5.00	$0	$219,837	$219,837	$439,674	
	Direct Install	$303,501	hard cost	74%	$223,687	$0	$0	$223,687	
	SmartStart	Various	Various	Various	$0	$130,038	$0	$130,038	
	Combined Heat & Power	70	kW	$2,000	$42,000	$70,000	$28,000	$140,000	
				TOTALS	$265,687	$1,336,918	$1,164,880	$2,767,486	

Incentive Data

BUILDING	INCENTIVE TYPE	QUANTITY	UNITS	INCENTIV $/UNIT	INSTALL INCENTIVE	YEAR 1 INCENTIVE	YEAR 2 INCENTIVE	SUBTOTAL	TOTAL
Jackson Liberty High School	SmartStart	Various	Various	Various		$129,748		$129,748	$129,748
Jackson Memorial High School	P4P 2&3 (electric)	1,062,040	kWh	$0.44		$233,649	$233,649	$467,298	$539,507
Jackson Memorial High School	P4P 2&3 (natural gas)	14,442	therms	$5.00		$36,105	$36,105	$72,209	
Christa McAuliffe Middle School	P4P 2&3 (electric)	480,601	kWh	$0.44		$105,732	$105,732	$211,464	
Christa McAuliffe Middle School	P4P 2&3 (natural gas)	15,113	therms	$5.00		$37,782	$37,782	$75,563	$357,027
Christa McAuliffe Middle School	Combined Heat & Power	35	kW	$2,000	$21,000	$35,000	$14,000	$70,000	
Elms Elementary School	P4P 2&3 (electric)	473,005	kWh	$0.44		$104,061	$104,061	$208,122	$208,122
Goetz Middle School	P4P 2&3 (electric)	536,451	kWh	$0.44		$118,019	$118,019	$236,039	$372,574
Goetz Middle School	P4P 2&3 (natural gas)	27,307	therms	$5.00		$68,268	$68,268	$136,535	
Crawford Rodriguez Elementary School	P4P 2&3 (electric)	599,198	kWh	$0.44		$131,824	$131,824	$263,647	
Crawford Rodriguez Elementary School	P4P 2&3 (natural gas)	25,207	therms	$5.00		$63,019	$63,019	$126,037	$459,684
Crawford Rodriguez Elementary School	Combined Heat & Power	35	kW	$2,000	$21,000	$35,000	$14,000	$70,000	
Switlik Elementary School	P4P 2&3 (electric)	561,150	kWh	$0.44		$123,453	$123,453	$246,906	$276,235
Switlik Elementary School	P4P 2&3 (natural gas)	5,866	therms	$5.00		$14,665	$14,665	$29,329	
Holman Elementary School	P4P 2&3 (electric)	274,516	kWh	$0.44		$60,393	$60,393	$120,787	$120,787
Johnson Elementary School	P4P 2&3 (electric)	181,417	kWh	$0.44		$39,912	$39,912	$79,824	$79,824
Rosenauer Elementary School	Direct Install	$146,014	hard cost	80%	$116,811			$116,811	$116,811
Administration Building	Direct Install	$57,145	hard cost	61%	$34,846			$34,846	$34,846
Transportation Building	Direct Install	$100,342	hard cost	72%	$72,030			$72,030	$72,030
Maintenance Garage	SmartStart	Various	Various	Various		$290		$290	$290

ECM 1 – LED Lighting Replacement with Controls

Background & Existing Conditions

Lighting retrofits can greatly reduce energy consumption and lower energy bills, while maintaining lighting levels and quality by upgrading lighting components to more efficient and advanced technologies. Upgrading technologies can also offer employees greater control over lighting, allowing for additional energy savings

Improvements in lighting technologies have led to increased lifetimes for components that will result in fewer failures and lengthen the time between maintenance activities.

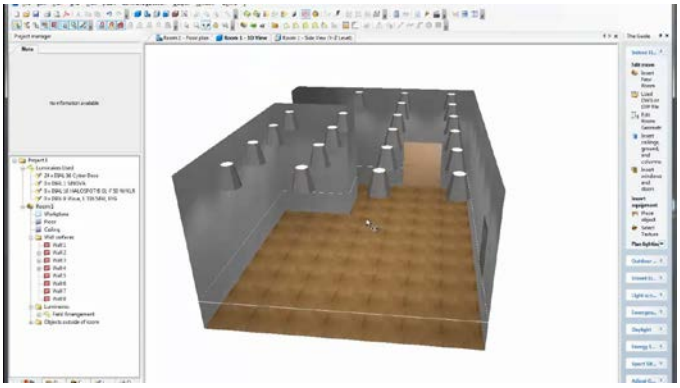
The implementation of a routine maintenance program in addition to the lighting retrofit will greatly simplify the maintenance practices and reduce the operational costs.

Several new LED lighting lamp and fixture products are now available that were not viable a few years ago. While conventional HID fixtures are controlled only by photocell and timer technologies to turn either on and off, the use of LED fixtures and digital technology allows additional trimming and the use of motion/occupancy-based controls to limit the output of exterior fixtures when sufficient natural lighting is present or for periods when the parking lots and authority grounds are unoccupied. The replacement of existing fixture heads with premium efficiency / LED-based fixtures is the basis of this listed ECM.

Lighting Level Testing and Commissioning

Assuring that the lighting levels of the interior and exterior spaces are a critical component of lighting retrofit project. Each space being retrofitted will have lighting levels measured and recorded during the design phase of the project.

The lighting system will be designed to assure that the lighting levels meet code and either meet or exceed the existing levels. Lighting measurements will be taken per IES Standards.



When the retrofit has been completed, the lighting levels in each space will be measured again to assure compliance with the system design. All documentation will be delivered to Jackson Township Board of Education for approval and record.

Scope of Work

- Retrofit the existing fixtures with new LED Bulbs.
  - Disconnect power at the breaker panel for the existing fixture circuit
  - Remove and dispose of existing bulbs and ballasts in a responsible manner
  - Install new ballast
  - Install new sockets (as necessary)
  - Install new bulbs
  - Test new fixture for operation and performance
  - Test existing space for proper lighting levels
  - All Retrofit Components will be UL Listed
  - Bid documents will call for UL Inspection of each retrofitted fixture

ECM Calculations

Energy Savings from the installation of new LED lighting is based on the reduction in electric power (Watts) from the existing bulbs/fixtures to new LED bulbs/fixture and were modeled using eQuest. A 67% coincidence factor was applied to the model demand savings to account for unknowns associated with estimating building peak demand. The simulation results from the LED Lighting Replacement are shown below.

ENERGY MODELING OUTPUTS

LED Lighting Replacement Savings

BUILDING	MODEL % DEMAND SAVINGS	COINCIDENCE FACTOR	kW Savings	MODEL % ELECTRIC SAVINGS	kWh SAVINGS	MODEL % THERM SAVINGS	THERM SAVINGS
Jackson Memorial High School	16.2%	57%	127	18.9%	787,492	-10.5%	(5,222)
Christa McAuliffe Middle School	15.4%	57%	41	24.0%	335,116	-8.3%	(4,805)
Elms Elementary School	16.2%	57%	47	19.0%	349,295	0.0%	0
Goetz Middle School	16.8%	57%	55	17.4%	332,445	-5.9%	(4,231)
Crawford Rodriguez Elementary School	11.8%	57%	24	18.1%	310,215	-5.4%	(4,386)
Switlik Elementary School	8.4%	57%	14	14.3%	173,737	-6.9%	(1,044)
Holman Elementary School	19.3%	57%	30	13.4%	135,535	0.0%	0
Johnson Elementary School	22.0%	57%	29	20.6%	138,474	0.0%	0
Rosenauer Elementary School	23.9%	57%	9	28.4%	70,989	-5.2%	(1,041)

CALCULATED SAVINGS

LED Lighting Replacement Savings

BUILDING	SQFT	SPACE	kW_{base}	LPD_{base}	kW_{inst}	LPD_{inst}	ΔkW	IF	CF	EFLH	Demand Savings (kW)	Energy Savings (kWh)
Jackson Liberty High School	300,000	INTERIOR	287.0	0.96	104.0	0.35	183.0	0.15	0.57	2,575	119.9	541,808
Jackson Liberty High School	300,000	EXTERIOR	71.4		23.1		48.3	0.15	0.57	4,380	31.6	243,081
Administration Building	10,200	INTERIOR	13.4	1.31	5.3	0.52	8.1	0.17	0.68	3,642	6.4	34,311
Administration Building	10,200	EXTERIOR	2.4		0.6		1.8	0.17	0.68	4,380	1.4	9,071
Maintenance Garage	4,800	INTERIOR	1.6	0.32	0.6	0.13	0.9	0.06	0.69	4,290	0.7	4,220
Maintenance Garage	4,800	EXTERIOR	1.8		0.1		1.7	0.06	0.69	4,380	1.2	7,661
Transportation Building	6,640	INTERIOR	8.9	1.34	3.6	0.54	5.3	0.06	0.69	4,290	3.9	24,047
Transportation Building	6,640	EXTERIOR	6.5		1.8		4.7	0.06	0.69	4,380	3.5	22,039

Algorithms

Demand Savings = (ΔkW) X (CF) X (1+ IF)

Energy Savings = (ΔkW) X (1 + IF) X (EFLH)

ΔKW = (Number of fixtures installed X baseline wattage for new fixture) – (number of replaced fixtures X wattage from table)

IF = Interactive Factor

0.28 = Conversion from kW to tons (Refrigeration)

Eff = Efficiency of typical refrigeration system in kW/ton

Definition of Variables

ΔkW = Change in connected load from baseline to efficient lighting level.

CF = Coincidence Factor

EFLH = Equivalent Full Load Hours

Lighting by Building Type

Building Type	EFLH	CF	IF
Education – Primary School	1,440	0.57	0.15
Education – Secondary School	*2,456*	0.57	0.15
Education – Community College	*3,416*	0.64	0.15
Education – University	*3,416*	0.64	0.15
Grocery	*6,019*	0.88	0.13
Medical – Hospital	8,736	0.72	0.18
Medical – Clinic	*4,007*	0.72	0.18
Lodging Hotel (Guest Rooms)	1,145	0.67	0.14
Lodging Motel	8,736	1.00	0.14
Manufacturing – Light Industrial	*4,781*	0.63	0.04
Office- Large	*3,642*	0.68	0.17
Office-Small	*3,642*	0.68	0.17
Restaurant – Sit-Down	*4,089*	0.76	0.15
Restaurant – Fast-Food	6,188	0.76	0.15
Retail – 3-Story Large	*4,103*	0.78	0.11
Retail – Single-Story Large	*4,103*	0.78	0.11
Retail – Small	*4,103*	0.78	0.11
Storage Conditioned	4,290	0.69	0.06
Storage Heated or Unconditioned	4,290	0.69	0.00
Warehouse	*4,009*	0.69	0.06
Average = Miscellaneous	*4,268*	0.72	0.13

*Note: Figures in italics are derived from NEEP Report – July 2011 (source #5)

ECM 2 – Upgrade/Install Metasys Control System

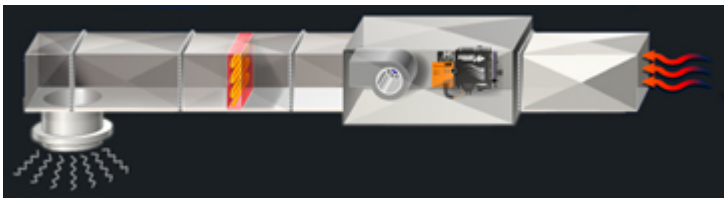
Background & Existing Conditions

Energy Management Systems (EMS) are systems comprised of sensors, operators, processors, and a front-end user interface that controls and monitors electrical and mechanical building systems. Such systems provide automated control and monitoring of the heating, cooling, ventilation, lighting and performance of a building or group of buildings. The energy management system will provide Jackson Township Board of Education with continuous monitoring & reporting of the Electric and Gas Meters.

Having building systems monitored from a central location enables the operator to receive alerts and predict future problems or troublesome conditions. The data obtained from these can be used to produce a trend analysis and annual consumption forecasts. Advanced control strategies implemented using these systems such as time scheduling, optimum start and stop, night set-back, demand-controlled ventilation, and peak demand limiting. The auditor will be able to use the EMS to diagnose current building system problems as well as tailor specific energy savings strategies that utilize the full capability of the given EMS.

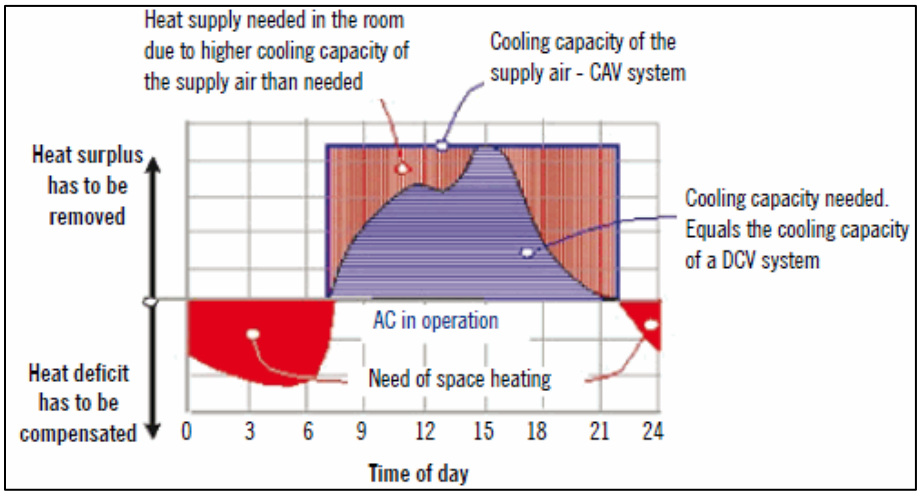
The new District Wide EMS will remove existing pneumatics and, replace or integrate existing proprietary systems with new DDC Controls. Control strategies will be designed and programmed into the system to maintain building comfort while operating the building mechanical system in the most efficient manner possible. Strategies include:

1. Occupancy Scheduling
2. Building Wide Night Set Back
3. Morning Warm Up
4. Individual Room Temperature Set Point Control
5. Supply Air Temperature Reset
6. Chilled & Heating Supply Water Temperature Resets
7. Economizer Control
8. CO2 Ventilation Control



Demand Control Ventilation - Background & Existing Conditions

In most commercial occupancies, ventilation is provided to deal with two types of indoor pollution: (1) odors from people, and (2) off-gassing from building components and furniture. When a space is vacant, it has no people pollution, so the people-related ventilation rate is not needed. Many types of high-occupancy spaces, such as classrooms, multipurpose rooms, theaters, conference rooms, or lobbies have ventilation designed for a high peak occupancy that rarely occurs. Ventilation can be reduced during the many hours of operation when spaces are vacant or at lower than peak occupancy. When ventilation is reduced, building owners or operators save energy because it is not necessary to heat or cool as much outside air. In colder climates, heating for ventilation air is greater and DCV saves the most energy.



The objective of a CO2 control strategy is to modulate ventilation to maintain target cfm/person ventilation rates based on actual occupancy. The strategy should allow for reduced overall ventilation during periods of less than full occupancy which will save energy. Typical control approaches have used a proportional or proportional-integral control algorithm to modulate ventilation between a base ventilation rate established for non-occupant-related sources and the design ventilation rate for the space. Typically, modulation of outside air above base ventilation begins when indoor CO2 is 100 ppm above outside levels and continues until the target CO2 levels are reached and the design ventilation rate is provided.

Duct sensors are best used where a single space or multiple spaces with common occupancy patterns are being ventilated. An example of this approach would be to place a sensor in the return duct of an air handler that serves multiple classrooms, using an upper limit set point of 500 or 600 ppm CO2 above ambient (instead of 700 ppm). Polarized-media electronic air cleaners can allow for the upper CO2 limit to be raised to 1,500 ppm. This approach works best when the AHU system is serving spaces that are occupied with very similar schedules and rates.

Scope of Work – Web Based, District Wide Energy Management System

- Fully Web Based Building Automation System with Remote access available from anywhere within the network.
- District wide Graphical Interface.
- Fully Automatic Database Back-ups that occur nightly to prevent data loss and reduce downtime.
- All New Field Level Controllers will be programmed with the same software package allowing for a streamline approach to Maintenance and Employee Training
- 24/7 365 days a week On-Call JCI Service available.
- Controllers provided shall have automatic self-tuning PID loop algorithms to help reduce energy consumption and provide optimized control.
- The New Metasys 10.0 User Interface is designed to enhance our customers' productivity and effectiveness. It allows users to navigate by space to view summaries, trends, and activities, emulating the way they work every day. The new user interface is also optimized for all client devices (smart phones, tablets, and computers), enabling our customers to work smarter from any device and any location. This Metasys user interface provides a dramatically improved experience that is accessible from any device.

Metasys UI

The *Metasys* UI is an HTML5-compliant web interface that provides device-agnostic access to *Metasys* from smartphones, tablets, and computers. The *Metasys* UI is an intuitive interface that reduces learning time, maximizes productivity of operators, and provides a seamless user experience no matter what type of client device is used to access the system. The client device does not require any additional software installation—no Java™, Microfsoft Silverlight®, or Adobe® Flash® or other software from an online app store. The *Metasys* UI is included with any *Metasys* server: ADS, ADX (unified and split), and ADS-Lite.

Figure 4: *Metasys* UI

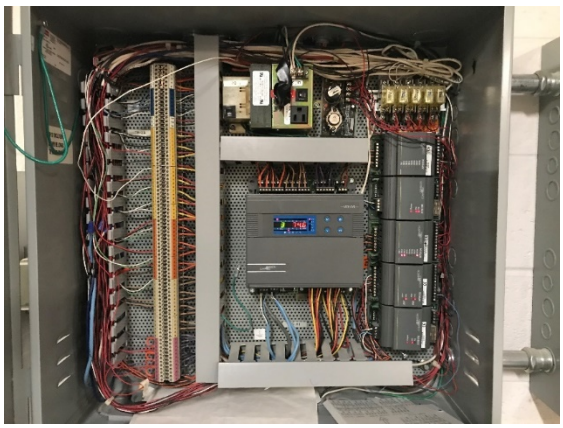
- Furnish (1) Metasys 10.0 upgrade to existing Application Data Server.
- Provide new Metasys User Interface 4.0.
    - Complete all graphics and tie in to new Metasys User Interface for remote access
- Upgrade – image all existing Metasys Engines to latest Metasys release.
- Furnish, (1) NAE5510-3 Network Automation Engine Panel for installation by owner.
- Furnish (1) Desktop workstation & 22" Monitor.
- 3 Day Metasys Operators (388) course for (3) staff members held at our Horsham Office.
- Onsite training included (40 hours).

Scope of Work – Jackson Liberty High

- Upgrade the existing Network Automation Engines to Metasys Rel. 10.0

Demand Control Ventilation

- Furnish, mount and wire space CO2 zone quality sensors, quantity (238) Johnson Controls CD-W00-00-2.
- Furnish, mount and wire space CO2 zone quality and humidity sensors, quantity (6) Vaisalla Model GMW83DRP
- Upgrade existing Graphics.
- Note: All new sensors to be wired to existing controllers. No new controllers estimated.



System Existing	System Qty	Sensor/Zone Qty	Serves	Proposed Sensors
Ceiling mounted HPs	28	28	Zone A	CO2
Make up air unit - gas fired	1	1	Zone A	CO2
Ceiling mounted HPs	31	31	Zone B1	CO2
Make up air unit - gas fired	8	8	Zone B1	CO2
Ceiling mounted HPs	27	27	Zone B2	CO2
Make up air unit - gas fired	7	7	Zone B2	CO2
Ceiling mounted HPs	34	34	Zone C1	CO2
Make up air unit - gas fired	1	1	Zone C1	CO2
Ceiling mounted HPs	28	28	Zone C2	CO2

Ceiling mounted HPs	20	20	Zone D	CO2
Make up air unit - gas fired	2	2	Zone D	CO2
Ceiling mounted HPs	16	16	Zone E	CO2
Roof top unit with HR wheel	2	2	Zone F	CO2, RH
Ceiling mounted HPs	15	15	Zone F	CO2
Roof top unit with HR wheel	4	4	Zone G	CO2, RH
Ceiling mounted HPs	8	8	Zone G	CO2
Ceiling mounted HPs	3	3	Zone H	CO2
Ceiling mounted HPs	2	2	Zone N	CO2
Make up air unit - gas fired	1	1	Zone N	CO2

Scope of Work – Jackson Memorial High School

- Upgrade the existing Network Automation Engines to Metasys Rel. 10.0

Demand Control Ventilation.

- Furnish, mount and wire space CO2 zone quality sensors, quantity (118) Johnson Controls CD-W00-00-2.
- Furnish, mount and wire space CO2 zone quality and humidity sensors, quantity (20) Vaisalla Model GMW83DRP.
  Furnish, mount and wire duct CO2 zone quality, quantity (59) Johnson Controls Model CD-P1000-00-00.
- Upgrade existing Graphics.
- Note: All new sensors to be wired to existing controllers. No new controllers estimated.

System Existing	System Qty	Sensor/Zone Qty	Serves	Proposed Sensors	Sensor Location
RTU - Gas/DX	26	26	Memorial Wing	CO2	CO2 - return duct
RTU VAV - Gas/DX	2	20	Memorial D Wing	CO2, RH	CO2 - space; RH - space
UV - HW/DX	63	63	Memorial Wing	CO2	CO2 - space
RTU - Gas/DX	19	19	Clayton Wing	CO2	CO2 - return duct
UV - HW/DX	51	51	Clayton Wing	CO2	CO2 - space
RTU - Gas/DX	14	14	Fine Arts Wing	CO2	CO2 - return duct
UV/FCU - HW/DX	4	4	Fine Arts Wing	CO2	CO2 - space

Scope of Work – Christa - McAuliffe Middle School

- Upgrade the existing Network Automation Engines to Metasys Rel. 10.0

Demand Control Ventilation.

- Furnish, mount and wire space CO2 zone quality sensors, quantity (90) Johnson Controls CD-W00-00-2.
- Upgrade existing Graphics.
- Note: All new sensors to be wired to existing controllers. No new controllers estimated.
- Furnish DDC integration for new Boiler upgrade.
    - (3) Condensing, natural gas-fired modular boilers (Bacnet MSTP provided by Manu.)
    - (6) Hot water pumps with VFDs (Bacnet MSTP provided by Manu.)
    - (1) 35 kW combined heat and power unit. (Bacnet MSTP provided by Manu.)

System Existing	System Qty	Sensor/Zone Qty	Serves	Proposed Sensor
Split System AHU (HW/DX)	3	3	Gym, locker room, Tech lab 227	CO2
Packaged Terminal AC/HP (Elec/DX)	4	4	VP 200, Principal 201, Kitchen Office A, Kitchen Office B	CO2
Aaon RTU w/ Energy Wheel (Gas/DX)	5	5	Cafeteria, gym, toilet rooms	CO2
Trane RTU (Gas/DX)	9	9	Band, vocal, music, admin, nurse, media center	CO2
Blower Coil Unit (HW/DX)	12	12	Corridors 1-9, VP 119, VP 218, SGI 130	CO2
Unit Ventilator (HW/DX)	57	57	Classrooms	CO2

Scope of Work – Elms Elementary School

- Furnish, mount and wire new Network Automation Engines to replace existing Metasys Network Control Module. (Older generation)
- Convert all existing programming to new MSEA programming.

Demand Control Ventilation.

- Furnish, mount and wire space CO2 zone quality sensors, quantity (81) Johnson Controls CD-W00-00-2.

System Existing	System Qty	Sensor/Zone Qty	Serves	Proposed Sensor	Sensor Location
1st Floor Heat Pumps (45)	45	45	1st Flr	CO2	CO2 - space
2nd Floor Heat Pumps (32)	32	32	2nd Flr	CO2	CO2 - space
HRU (13)	13		HPs	none	n/a
Rooftop HPs with Heat Recovery wheel (4)	4	4	Gym, Cafeteria	CO2	CO2 - space

- Furnish new Graphics.
- Note: All new sensors to be wired to existing controllers. No new controllers estimated.

Scope of Work – Goetz Middle School

- Furnish, mount and wire new Network Automation Engine to replace existing Metasys Network Control Module. (Older generation)
- Convert all existing programming to new MSEA programming.
- Add communication to new RTUs
- Furnish DDC integration for the following;
    - ❖ (3) Condensing, natural gas-fired modular boilers (Bacnet MSTP provided by Manu.)
    - ❖ (6) Hot water pumps with VFDs (Bacnet MSTP provided by Manu.)

- AHU-1 Serves Principals Office, Nurse, admin offices near main entrance
    - ❖ Furnish, mount and wire new DDC controls to replace existing pneumatic controls.
    - ❖ Replace existing Preheat and Cooling Valves. Installed by 'others'
    - ❖ Furnish, mount and wire the following devices, actuators valves and sensor.
    - ❖ VFDs provided by 'others'
    - ❖ Points listed below.

Designation	Description	Quantity
ZN-Q	Zone Quality	1
GEF-C,-S	General Exhaust Fan Command, Status	1
PH-O	Preheat Output	1

PH-T	Preheat Temperature	1
SF VFD	Supply Fan Variable Frequency Drive	1
DA1-P	Discharge Air Static Pressure 1	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
PANEL	Panel	1
CLG-O	Cooling Output	1
LT-A	Low Temperature Alarm	1
DAPHI-A	Discharge Air High Duct Pressure	1
DA-SD	Discharge Air Smoke Alarm	1
DA-T	Discharge Air Temperature	1
MA-Q	Mixed Air Quality	1
PFILT-S	PreFilter Status	1
RA-T,-H	Return Air Temperature, Humidity	1
SDR-1	Shut Down Relay 1	1
SF-C,-S	Supply Fan Command, Status	1

- AHU-1 VAVs (11)
  - ❖ Furnish, mount and wire new DDC controls to replace existing pneumatic controls.
  - ❖ Furnish, mount and wire the following devices, actuators valves and sensor.
  - ❖ Points listed below.

Designation	Description	Quantity
DA-T	Discharge Air Temperature	1
ZN-Q	Zone Quality	1
ZN-T	Zone Temperature, Setpoint	1
TX-1	Transformer	1
VMA	VMA Controller	1

- AHU-3 Serves 100 Wing Classrooms (9 Zone Dampers)
  - ❖ Furnish, mount and wire new DDC controls to replace existing pneumatic controls.
  - ❖ Replace existing Preheat and Cooling Valves. Installed by ‘others’
  - ❖ Furnish, mount and wire the following devices, actuators valves and sensors.
  - ❖ VFDs provided by ‘others’

- Points listed below.

Designation	Description	Quantity
SF-C,-S	Supply Fan Command, Status	1
HD-T	Hot Deck Temperature	1
SDR-2	Shut Down Relay 2	1
RF-C,-S	Return Fan Command, Status	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
ZN1D-O	Zone 1 Damper Output	1
ZN1-T,-SP	Zone 1 Temperature, Setpoint	1
ZN2D-O	Zone 2 Damper Output	1
ZN2-T,-SP	Zone 2 Temperature, Setpoint	1
ZN3D-O	Zone 3 Damper Output	1
ZN3-T,-SP	Zone 3 Temperature, Setpoint	1
ZN4D-O	Zone 4 Damper Output	1
ZN4-T,-SP	Zone 4 Temperature, Setpoint	1
ZN5D-O	Zone 5 Damper Output	1
ZN5-T,-SP	Zone 5 Temperature, Setpoint	1
ZN6D-O	Zone 6 Damper Output	1
ZN6-T,-SP	Zone 6 Temperature, Setpoint	1
ZN7D-O	Zone 7 Damper Output	1
ZN7-T,-SP	Zone 7 Temperature, Setpoint	1
ZN8D-O	Zone 8 Damper Output	1
ZN8-T,-SP	Zone 8 Temperature, Setpoint	1
ZN9D-O	Zone 9 Damper Output	1
ZN9-T,-SP	Zone 9 Temperature, Setpoint	1
CONTROLLER	System Controller	1
PANEL	Panel Item	1
CLG-O	Cooling Output	1
RH-O	Reheat Output	1
CD-T	Cold Deck Temperature	1
LT-A	Low Temperature Alarm	1
DA-SD	Discharge Air Smoke Alarm	1
MA-T	Mixed Air Temperature	1
PFILT-S	PreFilter Status	1

RA-Q	Return Air Quality	1
RA-T,-H	Return Air Temperature, Humidity	1
SDR-1	Shut Down Relay 1	1

- AHU-3 Serves 100 Wing Classrooms (11 Zone Dampers)
  - ❖ Furnish, mount and wire new DDC controls to replace existing pneumatic controls.
  - ❖ Replace existing Preheat and Cooling Valves. Installed by 'others'
  - ❖ Furnish, mount and wire the following devices, actuators valves and sensors.
  - ❖ VFDs provided by 'others'
  - ❖ Points listed below.

Designation	Description	Quantity
CLG-O	Cooling Output	1
RH-O	Reheat Output	1
CD-T	Cold Deck Temperature	1
LT-A	Low Temperature Alarm	1
DA-SD	Discharge Air Smoke Alarm	1
MA-T	Mixed Air Temperature	1
PFILT-S	PreFilter Status	1
RA-Q	Return Air Quality	1
RA-T,-H	Return Air Temperature, Humidity	1
SDR-1	Shut Down Relay 1	1
SF-C,-S	Supply Fan Command, Status	1
HD-T	Hot Deck Temperature	1
SDR-2	Shut Down Relay 2	1
RF-C,-S	Return Fan Command, Status	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
ZN1D-O	Zone 1 Damper Output	1
ZN1-T,-SP	Zone 1 Temperature, Setpoint	1
ZN2D-O	Zone 2 Damper Output	1
ZN2-T,-SP	Zone 2 Temperature, Setpoint	1
ZN3D-O	Zone 3 Damper Output	1
ZN3-T,-SP	Zone 3 Temperature, Setpoint	1

ZN4D-O	Zone 4 Damper Output	1
ZN4-T,-SP	Zone 4 Temperature, Setpoint	1
ZN5D-O	Zone 5 Damper Output	1
ZN5-T,-SP	Zone 5 Temperature, Setpoint	1
ZN6D-O	Zone 6 Damper Output	1
ZN6-T,-SP	Zone 6 Temperature, Setpoint	1
ZN7D-O	Zone 7 Damper Output	1
ZN7-T,-SP	Zone 7 Temperature, Setpoint	1
ZN8D-O	Zone 8 Damper Output	1
ZN8-T,-SP	Zone 8 Temperature, Setpoint	1
ZN9D-O	Zone 9 Damper Output	1
ZN9-T,-SP	Zone 9 Temperature, Setpoint	1
ZN10D-O	Zone10 Damper Output	1
ZN10-T,-SP	Zone 10 Temperature, Setpoint	1
ZN11D-O	Zone11 Damper Output	1

- AHU-4 Serves Classroom 500
  - ❖ Furnish, mount and wire new DDC controls to replace existing pneumatic controls.
  - ❖ Replace existing Preheat and Cooling Valves. Installed by ‘others’
  - ❖ Furnish, mount and wire the following devices, actuators valves and sensor.
  - ❖ VFDs provided by ‘others’
  - ❖ Points listed below.

Designation	Description	Quantity
ZN-Q	Zone Quality	1
GEF-C,-S	General Exhaust Fan Command, Status	1
PH-O	Preheat Output	1
PH-T	Preheat Temperature	1
SF VFD	Supply Fan Variable Frequency Drive	1
DA1-P	Discharge Air Static Pressure 1	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
PANEL	Panel	1
CLG-O	Cooling Output	1
LT-A	Low Temperature Alarm	1

DAPHI-A	Discharge Air High Duct Pressure	1
DA-SD	Discharge Air Smoke Alarm	1
DA-T	Discharge Air Temperature	1
MA-Q	Mixed Air Quality	1
PFILT-S	PreFilter Status	1
RA-T,-H	Return Air Temperature, Humidity	1
SDR-1	Shut Down Relay 1	1
SF-C,-S	Supply Fan Command, Status	1

- AHU-5 Serves Classroom 501
  - ❖ Furnish, mount and wire new DDC controls to replace existing pneumatic controls.
  - ❖ Replace existing Preheat and Cooling Valves. Installed by 'others'
  - ❖ Furnish, mount and wire the following devices, actuators valves and sensor.
  - ❖ VFDs provided by 'others'
  - ❖ Points listed below.

Designation	Description	Quantity
ZN-Q	Zone Quality	1
GEF-C,-S	General Exhaust Fan Command, Status	1
PH-O	Preheat Output	1
PH-T	Preheat Temperature	1
SF VFD	Supply Fan Variable Frequency Drive	1
DA1-P	Discharge Air Static Pressure 1	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
PANEL	Panel	1
CLG-O	Cooling Output	1
LT-A	Low Temperature Alarm	1
DAPHI-A	Discharge Air High Duct Pressure	1
DA-SD	Discharge Air Smoke Alarm	1
DA-T	Discharge Air Temperature	1
MA-Q	Mixed Air Quality	1
PFILT-S	PreFilter Status	1
RA-T,-H	Return Air Temperature, Humidity	1

SDR-1	Shut Down Relay 1	1
SF-C,-S	Supply Fan Command, Status	1

- AHU-6 Serves 200 Wing Classrooms (7 Zone Dampers)
  - ❖ Furnish, mount and wire new DDC controls to replace existing pneumatic controls.
  - ❖ Replace existing Preheat and Cooling Valves. Installed by 'others'
  - ❖ Furnish, mount and wire the following devices, actuators valves and sensors.
  - ❖ VFDs provided by 'others'
  - ❖ Points listed below.

Designation	Description	Quantity
SF-C,-S	Supply Fan Command, Status	1
HD-T	Hot Deck Temperature	1
SDR-2	Shut Down Relay 2	1
RF-C,-S	Return Fan Command, Status	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
ZN1D-O	Zone 1 Damper Output	1
ZN1-T,-SP	Zone 1 Temperature, Setpoint	1
ZN2D-O	Zone 2 Damper Output	1
ZN2-T,-SP	Zone 2 Temperature, Setpoint	1
ZN3D-O	Zone 3 Damper Output	1
ZN3-T,-SP	Zone 3 Temperature, Setpoint	1
ZN4D-O	Zone 4 Damper Output	1
ZN4-T,-SP	Zone 4 Temperature, Setpoint	1
ZN5D-O	Zone 5 Damper Output	1
ZN5-T,-SP	Zone 5 Temperature, Setpoint	1
ZN6D-O	Zone 6 Damper Output	1
ZN6-T,-SP	Zone 6 Temperature, Setpoint	1
ZN7D-O	Zone 7 Damper Output	1
ZN7-T,-SP	Zone 7 Temperature, Setpoint	1
CONTROLLER	System Controller	1
PANEL	Panel Item	1
CLG-O	Cooling Output	1
RH-O	Reheat Output	1

CD-T	Cold Deck Temperature	1
LT-A	Low Temperature Alarm	1
DA-SD	Discharge Air Smoke Alarm	1
MA-T	Mixed Air Temperature	1
PFILT-S	PreFilter Status	1
RA-Q	Return Air Quality	1
RA-T,-H	Return Air Temperature, Humidity	1
SDR-1	Shut Down Relay 1	1

- AHU-7 Serves 200 Wing Classrooms (9 Zone Dampers)
  - Furnish, mount and wire new DDC controls to replace existing pneumatic controls.
  - Replace existing Preheat and Cooling Valves. Installed by 'others'
  - Furnish, mount and wire the following devices, actuators valves and sensors.
  - VFDs provided by 'others'
  - Points listed below.

Designation	Description	Quantity
SF-C,-S	Supply Fan Command, Status	1
HD-T	Hot Deck Temperature	1
SDR-2	Shut Down Relay 2	1
RF-C,-S	Return Fan Command, Status	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
ZN1D-O	Zone 1 Damper Output	1
ZN1-T,-SP	Zone 1 Temperature, Setpoint	1
ZN2D-O	Zone 2 Damper Output	1
ZN2-T,-SP	Zone 2 Temperature, Setpoint	1
ZN3D-O	Zone 3 Damper Output	1
ZN3-T,-SP	Zone 3 Temperature, Setpoint	1
ZN4D-O	Zone 4 Damper Output	1
ZN4-T,-SP	Zone 4 Temperature, Setpoint	1
ZN5D-O	Zone 5 Damper Output	1
ZN5-T,-SP	Zone 5 Temperature, Setpoint	1
ZN6D-O	Zone 6 Damper Output	1
ZN6-T,-SP	Zone 6 Temperature, Setpoint	1

ZN7D-O	Zone 7 Damper Output	1
ZN7-T,-SP	Zone 7 Temperature, Setpoint	1
ZN8D-O	Zone 8 Damper Output	1
ZN8-T,-SP	Zone 8 Temperature, Setpoint	1
ZN9D-O	Zone 9 Damper Output	1
ZN9-T,-SP	Zone 9 Temperature, Setpoint	1
CONTROLLER	System Controller	1
PANEL	Panel Item	1
CLG-O	Cooling Output	1
RH-O	Reheat Output	1
CD-T	Cold Deck Temperature	1
LT-A	Low Temperature Alarm	1
DA-SD	Discharge Air Smoke Alarm	1
MA-T	Mixed Air Temperature	1
PFILT-S	PreFilter Status	1
RA-Q	Return Air Quality	1
RA-T,-H	Return Air Temperature, Humidity	1
SDR-1	Shut Down Relay 1	1

- AHU-8 Serves Café, VP Offices (4 Zone Dampers)
  - Furnish, mount and wire new DDC controls to replace existing pneumatic controls.
  - Replace existing Preheat and Cooling Valves. Installed by 'others'
  - Furnish, mount and wire the following devices, actuators valves and sensors.
  - VFDs provided by 'others'
  - Points listed below.

Designation	Description	Quantity
SF-C,-S	Supply Fan Command, Status	1
HD-T	Hot Deck Temperature	1
SDR-2	Shut Down Relay 2	1
RF-C,-S	Return Fan Command, Status	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
ZN1D-O	Zone 1 Damper Output	1
ZN1-T,-SP	Zone 1 Temperature, Setpoint	1

ZN2D-O	Zone 2 Damper Output	1
ZN2-T,-SP	Zone 2 Temperature, Setpoint	1
ZN3D-O	Zone 3 Damper Output	1
ZN3-T,-SP	Zone 3 Temperature, Setpoint	1
ZN4D-O	Zone 4 Damper Output	1
ZN4-T,-SP	Zone 4 Temperature, Setpoint	1
CONTROLLER	System Controller	1
PANEL	Panel Item	1
CLG-O	Cooling Output	1
RH-O	Reheat Output	1
CD-T	Cold Deck Temperature	1
LT-A	Low Temperature Alarm	1
DA-SD	Discharge Air Smoke Alarm	1
MA-T	Mixed Air Temperature	1
PFILT-S	PreFilter Status	1
RA-Q	Return Air Quality	1
RA-T,-H	Return Air Temperature, Humidity	1
SDR-1	Shut Down Relay 1	1

- AHU-9 Serves 200 Wing Corridor
  - Furnish, mount and wire new DDC controls to replace existing pneumatic controls.
  - Replace existing Preheat and Cooling Valves. Installed by 'others'
  - Furnish, mount and wire the following devices, actuators valves and sensor.
  - VFDs provided by 'others'
  - Points listed below.

Designation	Description	Quantity
ZN-Q	Zone Quality	1
GEF-C,-S	General Exhaust Fan Command, Status	1
PH-O	Preheat Output	1
PH-T	Preheat Temperature	1
SF VFD	Supply Fan Variable Frequency Drive	1
DA1-P	Discharge Air Static Pressure 1	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1

PANEL	Panel	1
CLG-O	Cooling Output	1
LT-A	Low Temperature Alarm	1
DAPHI-A	Discharge Air High Duct Pressure	1
DA-SD	Discharge Air Smoke Alarm	1
DA-T	Discharge Air Temperature	1
MA-Q	Mixed Air Quality	1
PFILT-S	PreFilter Status	1
RA-T,-H	Return Air Temperature, Humidity	1
SDR-1	Shut Down Relay 1	1
SF-C,-S	Supply Fan Command, Status	1

- AHU-10-11 Serves Gym
  - Furnish, mount and wire new DDC controls to replace existing pneumatic controls.
  - Replace existing Preheat and Cooling Valves. Installed by 'others'
  - Furnish, mount and wire the following devices, actuators valves and sensor.
  - VFDs provided by 'others'
  - Points listed below

Designation	Description	Quantity
ZN-Q	Zone Quality	1
GEF-C,-S	General Exhaust Fan Command, Status	1
PH-O	Preheat Output	1
PH-T	Preheat Temperature	1
SF VFD	Supply Fan Variable Frequency Drive	1
DA1-P	Discharge Air Static Pressure 1	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
MAD-O	Mixed Air Damper Output	1
PANEL	Panel	1
CLG-O	Cooling Output	1
LT-A	Low Temperature Alarm	1
DAPHI-A	Discharge Air High Duct Pressure	1
DA-SD	Discharge Air Smoke Alarm	1
DA-T	Discharge Air Temperature	1

MA-Q	Mixed Air Quality	1
PFILT-S	PreFilter Status	1
RA-T,-H	Return Air Temperature, Humidity	1
SDR-1	Shut Down Relay 1	1
SF-C,-S	Supply Fan Command, Status	1

- Unit Heater HW (12)
  - Furnish, mount and wire new DDC TEC Controller
  - Furnish new HW Valve. Installed by 'others'
  - Furnish, mount and wire the following devices, actuators valves and sensor.
  - Points listed below.
- Convectors HW (12)
  - Furnish, mount and wire new DDC TEC Controller
  - Furnish new HW Valve. Installed by 'others'
  - Furnish, mount and wire the following devices, actuators valves and sensor.
  - Points listed below.

Designation	Description	Quantity
CONTROLLER	Wired TEC Controller	1
TX-1	Transformer 1	1
HTG-O	Heating Valve	1
SF-C	Supply Fan Command	1

- HW Fin Tube Radiation (5)
  - Furnish, mount and wire new DDC TEC Controller
  - Furnish new HW Valve. Installed by 'others'
  - Furnish, mount and wire the following devices, actuators valves and sensor.
  - Points listed below.

Designation	Description	Quantity
CONTROLLER	Wired TEC Controller	1
TX-1	Transformer 1	1
HTG-O	Heating Valve	1
SF-C	Supply Fan Command	1

- Cabinet Unit Heater HW (11)

- ❖ Furnish, mount and wire new DDC TEC Controller
- ❖ Furnish new HW Valve. Installed by 'others'
- ❖ Furnish, mount and wire the following devices, actuators valves and sensor.
- ❖ Points listed below.

Designation	Description	Quantity
CONTROLLER	Wired TEC Controller	1
TX-1	Transformer 1	1
HTG-O	Heating Valve	1
SF-C	Supply Fan Command	1

- Wall Convector Electric (20)
  - ❖ Furnish, mount and wire new DDC TEC Controller
  - ❖ Furnish, mount and wire the following devices.
  - ❖ Points listed below.

Designation	Description	Quantity
CONTROLLER	Wired TEC Controller	1
TX-1	Transformer 1	1
SF-C	Supply Fan Command	1

- UH Electric (7)
  - ❖ Furnish, mount and wire new DDC TEC Controller
  - ❖ Furnish, mount and wire the following devices.
  - ❖ Points listed below.

Designation	Description	Quantity
CONTROLLER	Wired TEC Controller	1
TX-1	Transformer 1	1
SF-C	Supply Fan Command	1

- CUH Electric (6)
  - ❖ Furnish, mount and wire new DDC TEC Controller
  - ❖ Furnish, mount and wire the following devices.
  - ❖ Points listed below.

Designation	Description	Quantity
CONTROLLER	Wired TEC Controller	1
TX-1	Transformer 1	1
SF-C	Supply Fan Command	1

- Exhaust Fans (30)
  - ❖ Furnish, mount and wire new DDC Controllers
  - ❖ Furnish, mount and wire the following devices.
  - ❖ Points listed below.

Designation	Description	Quantity
CONTROLLER	Controller	-
TX-1	Transformer 1	1
EF-C	Exhaust Fan Command	1
EF-S	Exhaust Fan Status	1

Demand Control Ventilation

- Furnish, mount and wire space CO2 zone quality and Humidity sensors, quantity (117) Vaisalla Model GMW83DRP.

System Existing	System Qty	Zone Qty	Serves	Proposed Sensors
RTUs - HW/DX	50	50	1-10, 300, 400 Classrooms	CO2, RH
Unit Vents	12	12	300, 400, 500 Classrooms	CO2, RH
AHUs	10	55	100, 200, Common Areas	CO2, RH

Scope of Work – Crawford-Rodriguez Elementary School

- Furnish, mount and wire new Network Automation Engine to replace existing Metasys Network Control Module. (Older generation)
- Convert all existing programming to new MSEA programming.
- Furnish DDC integration for new equipment.
  - ❖ (3) Condensing, natural gas-fired modular boilers (Bacnet MSTP provided by Manu.)
  - ❖ (4) Hot water pumps with VFDs (Bacnet MSTP provided by Manu.)
  - ❖ (1) 35 kW combined heat and power unit. (Bacnet MSTP provided by Manu.)
  - ❖ (2) Chilled water pumps with VFDs. (Bacnet MSTP provided by Manu.)

- (2) Condenser water pumps with VFDs. (Bacnet MSTP provided by Manu.)
- (2) Chillers
- (1) Cooling tower

Demand Control Ventilation.

- Furnish, mount and wire space CO2 zone quality and Humidity sensors, quantity (77) Vaisalla Model GMW83DRP.

System Existing	System Qty	Sensor/Zone Qty	Serves	Proposed Sensors
Ceiling mounted FCU	36	36	A wing (on drawings/controls)	CO2, RH
Roof mounted HRU	1		A wing (on drawings/controls)	none
Ceiling mounted FCU	5	5	B wing (on drawings/controls)	CO2, RH
VAV boxes	4	4	Cafeteria, Stage	CO2, RH
Roof mounted AHUs	3	3	Gym	CO2, RH
Roof mounted AHU	1	1	Kitchen	CO2, RH
Ceiling mounted FCU	13	13	C wing (on drawings/controls)	CO2, RH
Roof mounted HRU	1		C wing (on drawings/controls)	none
VAV boxes	15	15	C wing (on drawings/controls)	CO2, RH

Scope of Work – Switlik Elementary School

- Furnish, mount and wire new Network Automation Engine to replace existing Metasys Network Module. (Older generation)
- Convert all existing programming to new MSEA programming.
- Install Graphics
- Add communication to new Airdale Units. BACnet comm card by manufacturer. (25)
- Add communication to new Boilers. BACnet comm card by manufacturer. (1)
  - (2) Condensing, natural gas-fired modular boilers (Bacnet MSTP provided by Manu.)
  - (2) Hot water pumps with VFDs (Bacnet MSTP provided by Manu.)

Demand Control Ventilation.

- Furnish, mount and wire space CO2 zone quality and Humidity sensors, quantity (40) Vaisalla Model GMW83DRP.

System Existing	System Qty	Sensor/Zone Qty	Serves	Proposed Sensor
AHU (2)	2	2		CO2, RH
RTU Gym (3)	3	3		CO2, RH
Unit Vent (10)	10	10		CO2, RH
Edpac Units (25)	25	25		CO2, RH

Scope of Work – Holman Elementary School

- Furnish, mount and wire new Network Automation Engine to replace existing Metasys Network Module. (Older generation)
- Convert all existing programming to new MSEA programming.
- Install Graphics.
- Integration to Geo Thermal Pumps
    - (2) Geothermal pumps with VFDs (Bacnet Comm board by Manu.)

Demand Control Ventilation.

- Furnish, mount and wire space CO2 zone quality and Humidity sensors, quantity (35) Vaisalla Model GMW83DRP.
- Furnish, mount and wire space CO2 zone quality and humidity sensors, quantity (2) Vaisalla Model GMW83DRP.
- Existing Systems to migrate to new Network Engine.

System Existing	System Qty	Sensor/Zone Qty	Serves	Proposed Sensor
ERU (13)	13		Heat pumps	n/a
Heat Pumps (35)	35	35	Classrooms, Library, MPR, Offices	CO2, RH
RTU Gym (2)	2	2	Gym	CO2

Scope of Work – Johnson Elementary School

- Furnish, mount and wire new Network Automation Engine to replace existing Metasys Network Control Module. (Older generation)
- Convert all existing programming to new MSEA programming.
- Install Graphics.
- Integration to Geo Thermal Pumps
    - (2) Geothermal pumps with VFDs (Bacnet Comm board by Manu.)
- Existing Systems to migrate to new Network Engine

Demand Control Ventilation.

- Furnish, mount and wire space CO2 zone quality and Humidity sensors, quantity (35) Vaisalla Model GMW83DRP.

System Existing	System Qty	Sensor/Zone Qty	Serves	Proposed Sensor
ERU (13)	13		Heat pumps	n/a
Heat Pumps (35)	35	35	Classrooms, Library, MPR, Offices	CO2, RH

Scope of Work – Rosenauer Elementary School

- Install Graphics.
- Integrate to UV HW/DX (25)
- RTU Integration
    - (2) RTUs (Bacnet MSTP by Manu.)

Demand Control Ventilation.

- Furnish, mount and wire space CO2 zone quality and humidity sensors, quantity (28) Vaisalla Model GMW83DRP.

System Existing	System Qty	Sensor/Zone Qty	Controller	Serves	Proposed
Unit Vents - HW/DX	25	25	Integration	Classrooms	CO2, RH
AHU - HW/DX	1	1		Multi purpose room	CO2, RH

RTU	2	2	Library, common areas	CO2, RH

ECM Calculations

Energy Savings from the installation of a District Wide Energy Management System were modeled using eQuest. The simulation results are shown below.

ENERGY MODELING OUTPUTS

Energy Management System Savings

BUILDING	MODEL % ELECTRIC SAVINGS	kWh SAVINGS	MODEL % DEMAND SAVINGS	kW SAVINGS	MODEL % THERM SAVINGS	MAX % HEATING SAVINGS	THERM SAVINGS
Jackson Memorial High School	6.7%	280,539	-0.6%	(8)	29.3%	30.0%	14,508
Christa McAuliffe Middle School	5.7%	79,766	0.5%	3	33.2%	30.0%	17,393
Elms Elementary School	6.7%	122,208	0.3%	2	0.0%	30.0%	0
Goetz Middle School	2.2%	42,916	-0.5%	(3)	35.3%	30.0%	21,638
Crawford Rodriguez Elementary School	12.9%	221,676	5.1%	18	45.0%	30.0%	24,226
Switlik Elementary School	24.6%	298,845	-3.5%	(10)	31.1%	30.0%	4,550
Holman Elementary School	10.7%	108,112	0.6%	2	0.0%	30.0%	0
Johnson Elementary School	5.2%	34,864	0.1%	0	0.0%	30.0%	0
Rosenauer Elementary School	3.7%	9,200	-0.7%	(0)	51.3%	30.0%	6,006

Note:

- See setback temperatures and schedules below. In general, the existing temperatures were set back at 10 pm. This ECM sets the building temperature back at 6pm and sets the minimum ventilation to 5% of supply air when the spaces are unoccupied. The existing building temperature set points, setbacks and design ventilation rates are unchanged.

Schedule Name: Temperature Setback (Typical)						
	School Yr - 1/1 to 6/18, 9/3 to 12/31			Summer – 6/19 to 9/2		
	Occ Hrs	Occ Heat/Cool Setpoint	Unocc Heat/Cool Setpoint	Occ Hrs	Occ Heat/Cool Setpoint	Unocc Heat/Cool Setpoint
Monday-Thursday	6am-6pm	70F/74F	65F/79F	6am-3pm	70F/74F	65F/79F
Friday	6am-6pm	70F/74F	65F/79F	6am-3pm	70F/74F	65F/79F
Saturday	N/A	N/A	65F/79F	N/A	N/A	65F/79F
Sunday	N/A	N/A	65F/79F	N/A	N/A	65F/79F
Holiday	N/A	N/A	65F/79F	N/A	N/A	65F/79F

Schedule Name: Classroom/Library/Office Demand Control Ventilation						
	School Yr - 1/1 to 6/18, 9/3 to 12/31			Summer – 6/19 to 9/2		
	Occ Hrs	Occ OA	Unocc OA	Occ Hrs	Occ OA	Unocc OA
Monday-Thursday	7am-6pm	Design OA	5% of SA CFM	8am-3pm	Design OA	5% of SA CFM
Friday	7am-6pm	Design OA	5% of SA CFM	8am-3pm	Design OA	5% of SA CFM
Saturday	N/A	N/A	5% of SA CFM	N/A	N/A	5% of SA CFM
Sunday	N/A	N/A	5% of SA CFM	N/A	N/A	5% of SA CFM
Holiday	N/A	N/A	5% of SA CFM	N/A	N/A	5% of SA CFM

Schedule Name: Gym Demand Control Ventilation						
	School Yr - 1/1 to 6/18, 9/3 to 12/31			Summer – 6/19 to 9/2		
	Occ Hrs	Occ OA	Unocc OA	Occ Hrs	Occ OA	Unocc OA
Monday-Thursday	7am-6pm	20% of SA CFM	5% of SA CFM	8am-3pm	20% of SA CFM	5% of SA CFM
Friday	7am-6pm	Design OA	5% of SA CFM	8am-3pm	20% of SA CFM	5% of SA CFM
Saturday	7am-4pm	20% of SA CFM	5% of SA CFM	8am-3pm	20% of SA CFM	5% of SA CFM
Sunday	7am-4pm	20% of SA CFM	5% of SA CFM	8am-3pm	20% of SA CFM	5% of SA CFM
Holiday	N/A	N/A	5% of SA CFM	N/A	N/A	5% of SA CFM

Schedule Name: Auditorium Demand Control Ventilation						
	School Yr - 1/1 to 6/18, 9/3 to 12/31			Summer – 6/19 to 9/2		
	Occ Hrs	Occ OA	Unocc OA	Occ Hrs	Occ OA	Unocc OA
Monday-Thursday	7am-6pm	10% of SA CFM	5% of SA CFM	8am-3pm	10% of SA CFM	5% of SA CFM
Friday	7am-6pm	Design OA	5% of SA CFM	8am-3pm	10% of SA CFM	5% of SA CFM
Saturday	7am-4pm	10% of SA CFM	5% of SA CFM	8am-3pm	10% of SA CFM	5% of SA CFM
Sunday	7am-4pm	10% of SA CFM	5% of SA CFM	8am-3pm	10% of SA CFM	5% of SA CFM
Holiday	N/A	N/A	5% of SA CFM	N/A	N/A	5% of SA CFM

Schedule Name: Cafeteria Demand Control Ventilation						
	School Yr - 1/1 to 6/18, 9/3 to 12/31			Summer – 6/19 to 9/2		
	Occ Hrs	Occ OA	Unocc OA	Occ Hrs	Occ OA	Unocc OA
Monday-Thursday	10am-2pm	Design OA	5% of SA CFM	10am-2pm	10% of SA CFM	5% of SA CFM
Friday	10am-2pm	Design OA	5% of SA CFM	10am-2pm	10% of SA CFM	5% of SA CFM
Saturday	N/A	N/A	5% of SA CFM	N/A	N/A	5% of SA CFM
Sunday	N/A	N/A	5% of SA CFM	N/A	N/A	5% of SA CFM
Holiday	N/A	N/A	5% of SA CFM	N/A	N/A	5% of SA CFM

CALCULATED SAVINGS

EMS Savings

BUILDING	SQFT	CAPhp Cooling (tons)	CAPhp Heating (tons)	CAPrtu Cooling (tons)	CAPrtu Heating (Btu/hr)	HVACe	HVACg
Jackson Liberty High School	300,000	727	552	273	5,258,000	4,003,884	42,838

EMS Savings

BUILDING	SQFT	DCV Electric Savings	DCV Gas Savings	Cooling Energy Savings HP (kWh)	Cooling Energy Savings RTU (kWh)	Heating Energy Savings HP (kWh)	Heating Energy Savings RTU (Th)	Total Electric Savings (kWh)	Total Gas Savings (Th)
Jackson Liberty High School	300,000	200,194	2,142	13,841	5,201	8,872	1,056	228,107	3,198

Occupancy Controlled Thermostat Savings Calculation	
Th	70
Tc	73
Sh	65
Sc	80
H	143
EFLHc	381
EFLHh	900
Ph	0.03
Pc	0.06
AFUEh	0.8
EERhp	12

Cooling Energy Savings (kWh) = $(((T_c*(H+5)+S_c*(168-(H+5)))/168)$ $T_c)*(P_c*Cap_{hp}*12*EFLH_c/EER_{hp})$

Heating Energy Savings (kWh) = $(((T_h*(H+5)+S_h*(168-(H+5)))/168)-$ $T_h)*(P_h*Cap_{hp}*12*EFLH_h/EER_{hp})$

Heating Energy Savings (Therms) = $(T_h-(T_h*(H+5)+S_h*(168-$ $(H+5)))/168)*(P_h*Cap_h*EFLH_h/AFUE_h/100{,}000)$

Definition of Variables

T_h = Heating Season Facility Temp. (°F)
T_c = Cooling Season Facility Temp. (°F)
S_h = Heating Season Setback Temp. (°F)
S_c = Cooling Season Setup Temp. (°F)
H = Weekly Occupied Hours
Cap_{hp} = Connected load capacity of heat pump/AC (Tons) – Provided on Application.
Cap_h = Connected heating load capacity (Btu/hr) – Provided on Application.
$EFLH_c$ = Equivalent full load cooling hours
$EFLH_h$ = Equivalent full load heating hours
P_h = Heating season percent savings per degree setback
P_c = Cooling season percent savings per degree setup
$AFUE_h$ = Heating equipment efficiency – Provided on Application.
EER_{hp} = Heat pump/AC equipment efficiency – Provided on Application

Demand Control Ventilation Formula

Algorithms

Electric Savings (kWh) = $0.05*HVAC_E$

Gas Savings (Therms) = $0.05*HVAC_G$

Jackson Liberty High School Existing Equipment

Heat Pump	Cooling Capacity (Btu/hr)	Heating Capacity (Btu/hr)	Quantity	Cooling Total (Btu/hr)	Heating Total (Btu/hr)
1	8	6	6	45	35
2	10	8	9	86	69
3	12	9	11	127	95
4	15	12	9	133	106
5	19	15	16	296	237
6	24	18	12	288	214
7	28	20	6	168	119
8	32	25	3	96	75
9	35	25	2	70	50
10	40	29	5	198	145
11	42	30	48	2,016	1,445
12	49	37	21	1,029	771
13	60	51	28	1,680	1,417
14	66	51	1	66	51
15	71	51	11	781	560
16	96	68	3	288	205
17	123	94	11	1,353	1,032
Total HP			**202**	**8,719**	**6,624**

MAU	Cooling Capacity (Btu/hr)	Heating Capacity (Btu/hr)	Quantity	Cooling Total (Btu/hr)	Heating Total (Btu/hr)
1		200	1	0	200
2		258	1	0	258
3		300	1	0	300
4		100	1	0	100
5		300	1	0	300
6		300	1	0	300
7		200	1	0	200
Total MUA			**7**	**0**	**1,658**

RTU	Cooling Capacity (Btu/hr)	Heating Capacity (Btu/hr)	Quantity	Cooling Total (Btu/hr)	Heating Total (Btu/hr)
1	1,080	1,000	1	1,080	1,000
2	1,080	1,000	1	1,080	1,000
3	120	200	1	120	200
4	120	200	1	120	200
5	420	600	1	420	600
6	420	600	1	420	600
Total RTU			**6**	**3,240**	**3,600**

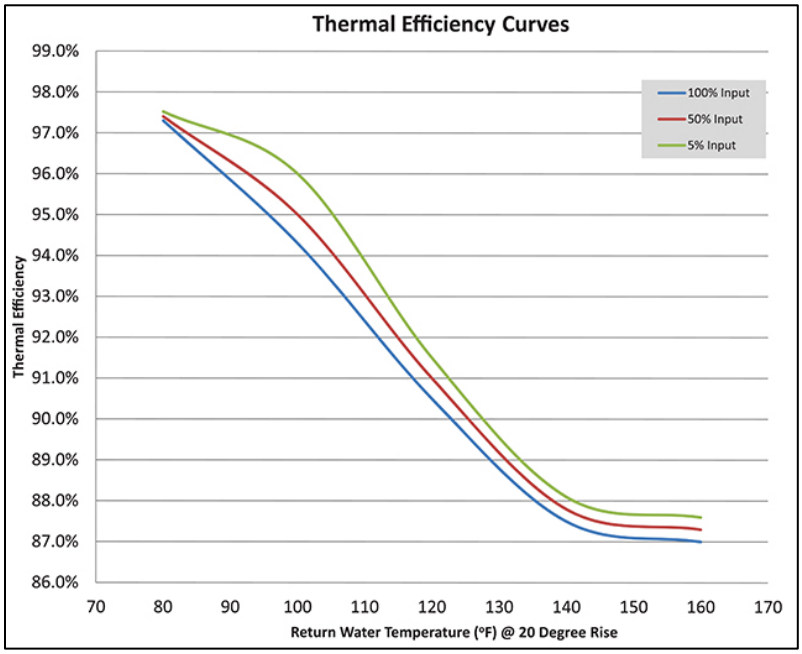
CU	Cooling Capacity (Btu/hr)	Heating Capacity (Btu/hr)	Quantity	Cooling Total (Btu/hr)	Heating Total (Btu/hr)
2	18		1	18	
4	18		1	18	
Total CU			**2**	**36**	

Total Building				**11,995**	**11,882**

ECM 3 – Boiler Replacement

Background & Existing Conditions

Old, oversized boiler systems have efficiencies in the range of 56%–75%. A condensing boiler hot water heating system can achieve efficiencies as high as 97%, converting nearly all the fuel to useful heat. The efficiency of the boiler increases at lower return water temperature. Lower return water temperatures allow more water vapor from the exiting flue gas to condense, allowing its latent heat of vaporization to be recovered.



Christa-McAuliffe Middle School has (2) 3,172 MBH HB Smith hot water boilers and (4) constant speed hot water system pumps. Existing equipment to be replaced with (3) 1,500 condensing hot water boilers and (4) variable speed hot water system pumps. (2) 2,500 MBH boilers will be considered as an alternate bid.

Crawford Rodriguez Elementary School has (2) 2,510 MBH Cleaver Brooks hot water boilers and (4) constant speed hot water system pumps. Existing equipment to be replaced with (3) 1,500 MBH condensing hot water boilers and (2) variable speed hot water system pumps. (2) 2,500 MBH boilers will be considered as an alternate bid.

Goetz Middle School has (2) 4,200 MBH Bryan hot water, fuel oil boilers and (6) constant volume hot water system pumps. Existing equipment to be replaced with (3) natural gas 2,000 MBH condensing hot water boilers and (2) variable speed hot water system pumps. Existing 15,000 fuel oil to be removed. (2) 3,000 MBH boilers will be considered as an alternate bid

Switlik Elementary School has (1) 1,491 MBH HB Smith hot water boiler and (2) constant speed hot water system pumps. Existing equipment to be replaced with (2) 750 MBH condensing hot water boilers and (2) variable speed hot water system pumps.

Transportation Building has (1) 641 MBH Weil McLain hot water boiler and (2) constant volume hot water system pumps. Existing equipment to be replaced-in-kind through the Direct Install program.

ECM Calculations

Energy Savings from the installation of higher efficiency condensing boilers were modeled using eQuest. The condensing boilers were modeled at 87% efficiency at 160F return water. The default eQuest condensing boiler efficiency curve increases efficiency as return water temperature decreases. The new control system will utilize hot water reset – 180F supply at 20F ambient to 120F supply at 55F ambient. A 15:1 turndown ratio was used to limit cycling losses. The simulation results from the higher efficiency units are shown below.

ENERGY MODELING OUTPUTS

Boiler Replacement

BUILDING	SQFT	MODEL % ELECTRIC SAVINGS	kWh SAVINGS	MODEL % THERM SAVINGS	CHP REDUCTION OF BOILER LOAD (%)	THERM SAVINGS
Christa McAuliffe Middle School	130,000	-0.5%	(6,949)	4.6%	50.8%	1,300
Goetz Middle School	126,081	-0.4%	(6,751)	11.9%		9,732
Crawford Rodriguez Elementary School	107,400	0.04%	766	6.2%	38.6%	3,071
Switlik Elementary School	72,077	-0.2%	(1,941)	8.8%		1,334
Transportation Building	6,640	0%	0	7.0%		673

CALCULATED SAVINGS							
Boiler Replacement with Conversion from Oil to Natural Gas							
BUILDING	**SQFT**	**Fuel Oil Used (Gallons)**	**Fuel Oil Saved(Gallons)**	**BTUs per Fuel Oil Gallon**	**BTU Used**	**BTU per Therm**	**Therm Used**
Goetz Middle School	126,081	58,470	58,470	140,000	8,185,758,000	100,000	81,858

Note: Goetz Middle School heating use was first converted from fuel oil to natural gas in the calculation above. McAuliffe Middle School and Crawford Rodriguez Elementary School will be receiving a 35-kW combined heat and power unit. The boiler savings were reduced to account for the heat provided by the proposed CHPs. The Transportation building has a small, 641 MBH boiler. The savings were estimated to be 7% of the existing gas use – existing boiler efficiency 76% and proposed boiler efficiency 83%.

ECM 4 – Burner Replacement

Background & Existing Conditions

An efficient boiler burner provides the proper air-to-fuel mixture throughout the full range of firing rates, without constant adjustment. Many burners with complex linkage designs do not hold their air-to-fuel settings over time. Often, they are adjusted to provide high excess air levels to compensate for inconsistencies in the burner performance.

A linkage less burner with O-trim controls allows for the burner to maintain an optimal air to fuel mix ratio during all firing rates. This is achieved by measuring the excess oxygen levels in the flue while the burner fires. The burner then varies the air to fuel mix ratio in real time, as needed, to maintain optimal combustion efficiency. This leads to reduced fuel consumption and associated costs.

In the event a complete boiler replacement is not economically feasible, a burner replacement upgrade can be recommended to improve the efficiency of the existing boilers. Installation of new linkage less burner and O-trim controls will be included. See the Boiler Replacement ECM for existing burners.

ECM Calculations

Energy Savings from the installation of high efficiency burners were modeled using eQuest. The new burners were modeled at 83% efficiency. The simulation results are shown below.

ENERGY MODELING OUTPUTS

Burner Replacement Savings

BUILDING	MODEL % THERM SAVINGS	CHP REDUCTION OF BOILER LOAD (%)	THERM SAVINGS	MODEL % FUEL OIL SAVINGS	FUEL OIL SAVINGS (GAL)
Christa McAuliffe Middle School	2.0%	50.8%	582		
Goetz Middle School				2.6%	1,497
Crawford Rodriguez Elementary School	2.0%	38.6%	1,013		
Switlik Elementary School	2.1%		313		

ECM 5 – Chiller & Cooling Tower Replacement

Background & Existing Conditions

A chiller is one of the most energy-intensive units in any facility. Technology has made leaps and bounds in the past several years in making these machines more efficient. Chiller efficiency is rated by how much electrical energy is used to produce an amount of cooling. This is expressed in kilo-watts per ton of cooling (kW/ton). An older machine may be as high as 1.5 kW/ton, whereas a new chiller may be as low as 1 kW/ton or even less. A new machine uses less electrical power to produce the same amount of cooling. The efficiency of the chiller can vary widely depending on whether the model is air-cooled, or water cooled.

High Density Polyethylene (HDPE) is the optimum material for cooling tower construction. The material is molded into a totally seamless shell, which will never leak, unlike conventional cooling towers which require many panels, joints, seams, seam gaskets, caulking and hundreds of bolts or other fasteners to maintain the integrity of the product. A HDPE structural shell will never rust, chip, crack or ever need painting or further protective coatings. The structural shell is warranted for 15 years which is much longer than other available cooling towers.


Existing chillers and cooling tower at Crawford Rodriguez Elementary School

The existing (2) 180 ton screw chillers will be replaced with (2) 180 ton centrifugal magnetic drive chillers. The existing cooling tower will be replaced with a HDPE cooling tower. The condenser water pumps will be replaced with variable speed pumps as part of the Premium Efficiency Pump ECM.

ECM Calculations

Energy Savings from the installation of new chillers and cooling tower were modeled using eQuest. The simulation results from the higher efficiency units are shown below.

ENERGY MODELING OUTPUTS						
Chiller and Cooling Tower Replacement Savings						
BUILDING	MODEL % ELECTRIC SAVINGS	kWh SAVINGS	MODEL % DEMAND SAVINGS	kW SAVINGS	MODEL % THERM SAVINGS	THERM SAVINGS
Crawford Rodriguez Elementary School	5.5%	94,698	22.2%	79	0.0%	0

ECM 6 – Premium Efficiency Pump Motors and VFDs

Background & Existing Conditions

Premium efficiency electric motors will help optimize fan and pump efficiency, reduce electrical power consumption and improve system reliability. These motors are designed to run cooler, last longer, and require less maintenance than the existing standard efficiency motors. Premium efficiency motors can be as high as 95% efficient (as opposed to standard efficiency motors of 78% to 88%) and are capable of operating at varying speeds allowing Variable Frequency Drive (VFD) installations where applicable.

McAuliffe Middle School has (4) constant speed hot water system pumps. Existing equipment to be replaced with variable speed pumps.

Crawford Rodriguez Elementary School has (2) constant speed hot water pumps, (2) condenser water pumps and (2) chilled water pumps. Existing equipment to be replaced with variable speed pumps.

Goetz Middle School has (6) constant volume hot water system pumps. Existing equipment to be replaced with (2) variable speed hot water system pumps with valves for each distribution loop.

Switlik Elementary School has (2) constant speed hot water system pumps. Existing equipment to be replaced with variable speed pumps.

Holman Elementary School has (4) constant speed geothermal system pumps. Existing equipment to be replaced with variable speed pumps.

Johnson Elementary School has (2) constant speed geothermal system pumps. Existing equipment to be replaced with variable speed pumps.

ECM Calculations

Energy Savings from the installation of variable speed pumps were modeled using eQuest. Pumps were modeled at a minimum speed of 80% to be conservative. The simulation results are shown below.

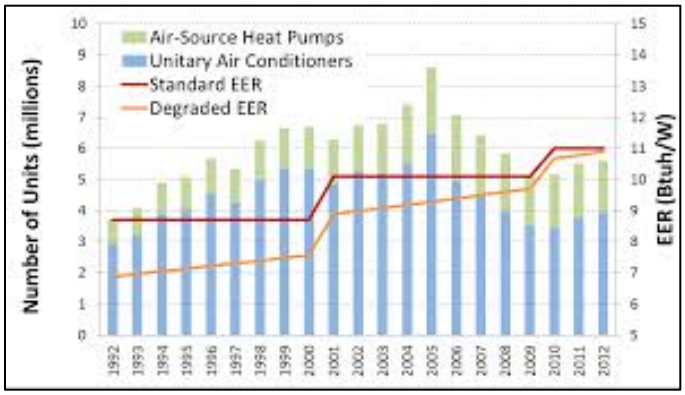
ENERGY MODELING OUTPUTS

VFD Savings

BUILDING	MODEL % ELECTRIC SAVINGS	kWh SAVINGS	MODEL % DEMAND SAVINGS	kW SAVINGS	MODEL % THERM SAVINGS	THERM SAVINGS
Christa McAuliffe Middle School	3.7%	52,059	1.1%	5	-1.6%	(903)
Goetz Middle School	6.5%	124,725	2.1%	12	-3.7%	(2,657)
Crawford Rodriguez Elementary School	3.4%	58,536	1.3%	5	-0.4%	(311)
Switlik Elementary School	0.6%	7,003	0.3%	1	-1.3%	(198)
Holman Elementary School	1.4%	14,524	0.8%	2		0
Johnson Elementary School	0.2%	1,361	0.1%	0		0

ECM 7 – Roof Top Unit Replacement

Background & Existing Conditions



Many commercial buildings are operating with older and inefficient HVAC systems. The average life expectancy of commercial HVAC RTU equipment is 10 to 15 years—which means that many commercial buildings are ready for new natural gas rooftop units. Technology improvements and demand have led to greater energy efficiency and more choices in systems. Installing new, higher efficiency units will provide energy savings as well as deliver enhanced technology and controls of the RTUs when compared to the existing units.

The following RTUs will be replaced with high efficiency units:

RTU Replacement Scope of Work				
BUILDING	**CATEGORY**	**AREA SERVED**	**Tons**	**QUANTITY**
Goetz Middle School	3 Ton DX/HW RTU	300, 400 wings, addition	3	35
	4 Ton DX/HW RTU	300, 400 wings, addition	4	5
	7.5 Ton DX/HW RTU	300, 400 wings, addition	7.5	6
	2.5 Ton DX/HW RTU	300, 400 wings, addition	2.5	1
	2 Ton DX/HW RTU	300, 400 wings, addition	2	3
	Adapter Curbs	300, 400 wings, addition		50
Switlik Elementary School	RTU - Gas/DX with Energy Recovery	Gym	21	2
	RTU - Gas/DX	Addition New Wing	4	1
Rosenauer Elementary School Administration Building	RTU-DX	Office, Common Area	5	2
	RTU - DX/Electric Heat	Offices	7.5	1

Existing roof top units at Rosenauer Elementary School

Existing roof top unit at the Administration Building

Existing roof top units at Goetz Middle School

Existing roof top units at Switlik Elementary School

ECM Calculations

Energy Savings from the installation of higher efficiency Packaged Rooftop Units were modeled using eQuest. Gas fired furnace and DX cooling efficiency were increased to comply with the minimum efficiency required for new units in the P4P Guidelines. The simulation results from the higher efficiency units are shown below.

ENERGY MODELING OUTPUTS

RTU Replacement Savings

BUILDING	SQFT	MODEL % ELECTRIC SAVINGS	kWh SAVINGS	MODEL % DEMAND SAVINGS	kW SAVINGS	MODEL % THERM SAVINGS	THERMS SAVINGS
Christa McAuliffe Middle School	130,000	3.0%	41,581	5.5%	26	-0.02%	(11)
Elms Elementary School	130,000	3.0%	54,763	6.7%	34	0.0%	0
Goetz Middle School	126,081	2.1%	39,678	7.7%	44	-0.4%	(313)
Switlik Elementary School	72,077	0.7%	8,901	0.3%	1	0.01%	1
Rosenauer Elementary School	34,128	0.4%	1,122	0.7%	0	-0.04%	(9)
Administration Building	10,200		5,604		2		

CALCULATED SAVINGS

HVAC Replacement - Cooling Savings

BUILDING	SYSTEM	Areas Served	Existing Qty	Tons Per Unit	EERb	EERq	CF	EFLH Cooling	Demand Savings (kW)	Energy Savings (kWh)
Administration Building	RTU - DX/Electric Heat	Offices	1	7.5	8	11.5	0.67	1,131	2	3,872

Electric HVAC Systems

The measurement of energy and demand savings for C/I Efficient HVAC program for Room AC, Central AC, and air cooled DX is based on algorithms. (Includes split systems, air to air heat pumps, packaged terminal systems, water source heat pumps, central DX AC systems, ground water or ground source heat pumps)

Algorithms

Air Conditioning Algorithms:

Demand Savings = (BtuH/1000) X ($1/EER_b$-$1/EER_q$) X CF

Energy Savings = (BtuH/1000) X ($1/EER_b$-$1/EER_q$) X EFLH

Definition of Variables

BtuH = Cooling capacity in Btu/Hour – This value comes from ARI/AHRI or AHAM rating or manufacturer data.

CF = Coincidence Factor – This value represents the percentage of the total load which is on during electric system's Peak Window. This value will be based on existing measured usage and determined as the average number of operating hours during the peak window period.

EFLH = Equivalent Full Load Hours – This represents a measure of energy use by season during the on-peak and off peak periods. This value will be determined by existing measured data of kWh during the period divided by kW at design conditions.

HVAC Replacement - Heating Savings										
BUILDING NAME	SYSTEM	Areas Served	Qty	Estimated Existing Efficiency (COPb)	Efficiency Units	Baseline RTU Rated Input MBH	Qualifying RTU Efficiency (COPq)	EFLH	Conversion of BTU to kWh	Annual Electric Savings (kWh)
Administration Building	RTU - DX/Electric Heat	Offices	1	2.64	COP	90	3.37	800	3,412	1,731

Energy Savings-Heating = $BtuH_h/1000 \text{ X } ((1/ (COP_b \text{ X } 3.412))-(1/ (COP_q \text{ X } 3.412))) \text{ X } EFLH_h$

Where $_c$ is for cooling and $_h$ is for heating.

HVAC Replacement - Total Savings				
BUILDING NAME	SYSTEM	Areas Served	Total Electric Savings (kWh)	Total Demand Savings (kW)
Administration Building	RTU - DX/Electric Heat	Offices	5,604	2

ECM 8 – Unit Ventilator Replacement

Background & Existing Conditions

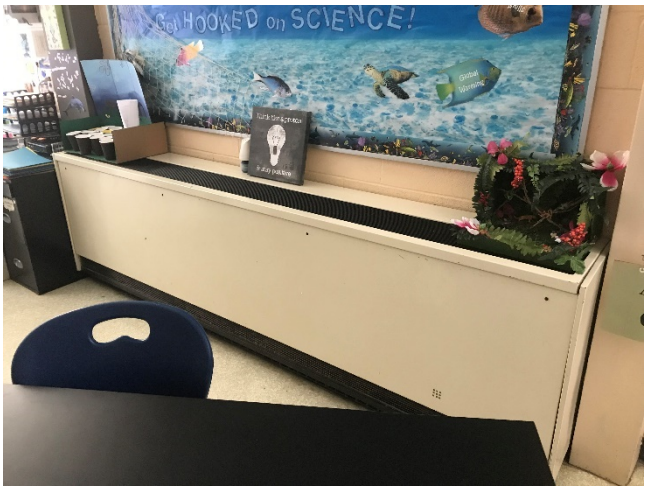
Variable Refrigerant Flow (VRF) is an air-conditioning system configuration where one outdoor condensing unit serves multiple indoor direct expansion (DX) cooling coils. Like mini-split systems, VRFs use refrigerant as the cooling medium and are conditioned by a single unit. VRF systems are larger capacity and can control the amount of refrigerant flowing to each of the cooling coils, enabling the use of many cooling coils for individual zones of differing capacities.

VRF systems typically include two to three compressors, one of which is variable speed, in each condensing unit, enabling wide capacity modulation. This approach yields high part-load efficiency, which translates into high seasonal energy efficiency, because HVAC systems typically spend most of their operating hours in the range of 40% to 80% of maximum capacity.

The following unit ventilators will be replaced with high efficiency units:

Unit Ventilator Replacement Scope of Work

BUILDING	CATEGORY	QUANTITY
Goetz Middle School	HW/DX UV	8
	Condensing Unit	8
Switlik Elementary School	Vertical Airdale HP UV	25
Rosenauer Elementary School	HW/DX UV	25
	Condensing Unit	25



Existing HW/DX unit ventilators at Goetz Middle School

Existing electric/DX unit ventilators at Switlik Elementary School


Existing HW/DX unit ventilators at Rosenauer Elementary School

ECM Calculations

Energy Savings from the installation of new unit ventilators were modeled using eQuest. The fan efficiency and cooling efficiency were increased to comply with P4P minimum required efficiencies. The simulation results are shown below.

ENERGY MODELING OUTPUTS

Unit Ventilator Replacement Savings

BUILDING	MODEL % ELECTRIC SAVINGS	kWh SAVINGS	MODEL % DEMAND SAVINGS	kW SAVINGS	MODEL % THERM SAVINGS	THERMS SAVINGS
Goetz Middle School	0.04%	691	0.0%	0	0.0%	(12)
Switlik Elementary School	4.2%	50,506	0.0%	0	0.0%	0
Rosenauer Elementary School	0.9%	2,308	0.0%	0	-0.24%	(48)

ECM 9 – Split System AC Replacement

Background & Existing Conditions

Variable speed condensing systems give you precise comfort by running at the exact speed needed to keep your home comfortable. This allows the variable speed compressor, outdoor fan, and indoor fan to vary operating speed and BTU as the temperature outside changes, slowing down or speeding up gradually in as little as 1/10 of 1% increments to keep comfort within 1/2° of the thermostat setting.

The following split system units will be replaced with high efficiency units:

Split System AC Replacement Scope of Work			
BUILDING	**CATEGORY**	**Tons**	**QUANTITY**
Crawford Rodriguez Elementary School	3 Ton Split System - ACCU	3	1
Switlik Elementary School	7.5 Ton Split System - Cafeteria	7.5	1
	10 Ton Split System - Cafeteria	10	1
Administration Building	6 Ton Split System	6	1
Transportation Building	5-Ton Split System	5	1

Jackson Township Board of Education has requested the addition of cooling to the gym at Goetz Middle School. The scope of work includes adding (2) 15 ton split condensing units and DX coils to the exiting heating and ventilation units serving the gym.

Split System Gym Cooling Scope of Work				
BUILDING	**CATEGORY**	**AREA SERVED**	**Tons**	**QUANTITY**
Goetz Middle School	15 Ton Split System CU	Gym	15	2
	Add DX Coil to existing HW HVs	Gym	15	2

Existing split system AC at Crawford Rodriguez Elementary School

Existing split system AC units at Switlik Elementary School

Existing split system heating and cooling unit at the Administration Building

Existing split system AC at the Transportation Building

ECM Calculations

Energy Savings from the installation of new split system units were modeled using eQuest. The cooling efficiency was increased to comply with P4P minimum required efficiencies. The simulation results are shown below.

ENERGY MODELING OUTPUTS

Split System Replacement Savings

BUILDING	SQFT	MODEL % ELECTRIC SAVINGS	kWh SAVINGS	MODEL % DEMAND SAVINGS	kW SAVINGS	MODEL % THERM SAVINGS	THERMS SAVINGS
Christa McAuliffe Middle School	130,000	1.3%	18,375	5.8%	28	0%	0
Crawford Rodriguez Elementary School	107,400	0.03%	477	0.19%	1	0%	0
Switlik Elementary School	72,077	0.13%	1,620	0.0%	0	0%	0
Rosenauer Elementary School	34,128	3.5%	8,648	13.0%	9	0%	0
Administration Building	10,200		3,693		1		
Transportation Building	6,640		3,785		2		

CALCULATED SAVINGS

Split System Replacement - Cooling Savings

BUILDING	SYSTEM	Existing Qty	Tons Per Unit	EERb	EERq	CF	EFLH Cooling	Demand Savings (kW)	Energy Savings (kWh)
Administration Building	6 Ton Split System	1	6	9.5	13	0.67	1,131	1	2,308
		0				0.67	1,131	0	0
Transportation Building	5.0 Split System	1	5	8	13	0.67	1,131	2	3,785
	0					0.67	1,131	0	0

Electric HVAC Systems

The measurement of energy and demand savings for C/I Efficient HVAC program for Room AC, Central AC, and air cooled DX is based on algorithms. (Includes split systems, air to air heat pumps, packaged terminal systems, water source heat pumps, central DX AC systems, ground water or ground source heat pumps)

Algorithms

Air Conditioning Algorithms:

Demand Savings = (BtuH/1000) X ($1/EER_b$-$1/EER_q$) X CF

Energy Savings = (BtuH/1000) X ($1/EER_b$-$1/EER_q$) X EFLH

Definition of Variables

BtuH = Cooling capacity in Btu/Hour – This value comes from ARI/AHRI or AHAM rating or manufacturer data.

CF = Coincidence Factor – This value represents the percentage of the total load which is on during electric system's Peak Window. This value will be based on existing measured usage and determined as the average number of operating hours during the peak window period.

EFLH = Equivalent Full Load Hours – This represents a measure of energy use by season during the on-peak and off peak periods. This value will be determined by existing measured data of kWh during the period divided by kW at design conditions.

Split System Replacement - Heating Savings									
BUILDING NAME	SYSTEM	Qty	Estimated Existing Efficiency (COPb)	Efficiency Units	Baseline RTU Rated Input MBH	Qualifying Efficiency (COPq)	EFLH	Conversion of BTU to kWh (Hcfuel)	Annual Electric Savings (kWh)
Administration Building	Split System DX/ Electric Heat	1	2.64	COP	72	3.37	800	3,412	1,385
								3,412	-

Energy Savings-Heating = $BtuH_h/1000 \times ((1/(COP_b \times 3.412))-(1/(COP_q \times 3.412))) \times EFLH_h$

Where $_c$ is for cooling and $_h$ is for heating.

Split System Replacement - Total Savings			
BUILDING NAME	SYSTEM	Total Electric Savings (kWh)	Total Demand Savings (kW)
Administration Building	Split System DX/ Electric Heat 0	3,693	1
Transportation Building	5.0 Split System 0	3,785	2

Jackson Township Board of Education has requested the addition of cooling to the gym at Goetz Middle School. The energy increase from the installation of (2) 15-ton split system units was modeled using eQuest. The cooling was added after the controls and demand control ventilation ECM resulting in a more efficient HVAC operating schedule. The cooling efficiency was modeled to comply with P4P minimum required efficiencies. The simulation results are shown below.

ENERGY MODELING OUTPUTS

Split System Gym Cooling Energy Use

BUILDING	MODEL % ELECTRIC SAVINGS	kWh SAVINGS	MODEL % DEMAND SAVINGS	kW SAVINGS	MODEL % THERM SAVINGS	THERMS SAVINGS
Goetz Middle School	-0.7%	(13,914)	-4.1%	(23)	0.2%	117

ECM 10 – Destratification Fans

Background & Existing Conditions

Large indoor spaces with high ceilings such as a gymnasium are prone to a condition called stratification. Stratification is a common property of air to separate due to temperature difference. Typically, a layer of warm air will sit on top of a layer of cold air. The lower cold air causes discomfort for occupants of the space as well as increased energy usage of air handling systems to overcome this condition. Destratification fans provide the turbulence in the space necessary for warm and cold air to mix. The result is a blended comfortable air temperature with less usage of the rooms HVAC systems.

Existing gymnasium at McAuliffe Middle School

Existing gymnasium at Elms Elementary School

Install destratification fans in the following gyms:

Destratification Fan Scope of Work			
BUILDING	**CATEGORY**	**NOTES**	**QUANTITY**
Jackson Liberty High School	Air Pear 25	Gym 1	8
	Air Pear 25	Gym 2	4
Jackson Memorial High School	Air Pear 25	Gym C + M	12
Christa McAuliffe Middle School	Air Pear 25	Gym 1	6
Elms Elementary School	Air Pear 25	Gym 1	6
Goetz Middle School	Air Pear 25	Gym 1	6
Crawford Rodriguez Elementary School	Air Pear 25	Gym 1	6
Switlik Elementary School	Air Pear 25	Gym 1	6
Holman Elementary School	Air Pear 25	Gym 1	6

ECM Calculations

De-strat fans are estimated to save 19.8% to 26.3% of gym HVAC energy. Gym HVAC energy was extracted from the eQuest models. De-strat fans are conservatively estimated to run 8,760 hours per year.

CALCULATED SAVINGS

Destratification Fan Savings

BUILDING	Area	Space SQFT	HVAC % of Building Gas Use	Large Space Heating / Cooling Multiplier	Estimated Space Heating (Therm)	HVAC Heating % of Building Electric Use (kWh)	Estimated Space Heating (kWh)	Fan Data for Energy Use Calc.	Estimated Space Fan Use (kWh)
Jackson Liberty High School	Gym 1	16,000	95%	2	4,341	0%	0	(2) 20 HP fans	130,699
Jackson Liberty High School	Gym 2	6,000	95%	2	1,883	0%	0	(2) 3 HP fans	19,605
Jackson Liberty High School								4,380 heating hrs	
Jackson Memorial High School	Gym C + M	18,000	95%	2	5,540	n/a	0	(2) 20 HP fans	130,699
Jackson Memorial High School			(from model)		(from model)		(from model)		
Jackson Memorial High School								4,380 heating hrs	
Christa McAuliffe Middle School	Gym 1	10,170	n/a		1,311	n/a	0	n/a	70,442
Christa McAuliffe Middle School			(from model)		(from model)		(from model)		(from model)
Christa McAuliffe Middle School									
Elms Elementary School	Gym 1	8,112	n/a		0	n/a	20,568	(2) 7.5 HP fans	49,012
Elms Elementary School			(from model)		(from model)		(from model)	4,380 heating hrs	
Elms Elementary School									
Goetz Middle School	Gym 1	7,600	n/a		4,348	n/a	0	n/a	18,734
Goetz Middle School			(from model)		(from model)		(from model)		(from model)
Goetz Middle School									
Crawford Rodriguez Elementary School	Gym 1	7,233	n/a		3,607	n/a	0	n/a	30,932
Crawford Rodriguez Elementary School			(from model)		(from model)		(from model)		(from model)
Crawford Rodriguez Elementary School									
Switlik Elementary School	Gym 1	10,305	n/a		3,000	n/a	0	n/a	51,637
Switlik Elementary School			(from model)		(from model)		(from model)		(from model)
Switlik Elementary School									
Holman Elementary School	Gym 1	8,004	n/a		0	n/a	6,337	n/a	66,471
Holman Elementary School			(from model)		(from model)		(from model)		(from model)
Holman Elementary School									

Destratification Fan Savings

BUILDING	Ceiling Height (ft)	Floor to Ceiling deltaT (F)	HVAC Energy Savings (%)	Total DeStrat Fans (#)	DeStrat Fan Power (W)	DeStrat Fan Run Hours (hrs)	DeStrat Fan Energy (kWh)	Energy Savings (kWh)	Energy Savings (Therm)
Jackson Liberty High School	33	14.4	26.3%	8	30	8,760	2,102	32,271	1,142
Jackson Liberty High School	26	14.4	23.3%	4	30	8,760	1,051	3,517	439
Jackson Liberty High School									
Jackson Memorial High School	26	14.4	23.3%	12	30	8,760	3,154	27,299	1,291
Jackson Memorial High School									
Jackson Memorial High School									
Christa McAuliffe Middle School	24	14.4	23.3%	6	30	8,760	1,577	14,836	305
Christa McAuliffe Middle School									
Christa McAuliffe Middle School									
Elms Elementary School	25	14.4	23.3%	6	30	8,760	1,577	14,635	0
Elms Elementary School									
Elms Elementary School									
Goetz Middle School	22	14.4	19.8%	6	30	8,760	1,577	2,132	861
Goetz Middle School									
Goetz Middle School									
Crawford Rodriguez Elementary School	18	14.4	19.8%	6	30	8,760	1,577	4,548	714
Crawford Rodriguez Elementary School									
Crawford Rodriguez Elementary School									
Switlik Elementary School	20	14.4	19.8%	6	30	8,760	1,577	8,647	594
Switlik Elementary School									
Switlik Elementary School									
Holman Elementary School	25	14.4	23.3%	6	30	8,760	1,577	15,387	0
Holman Elementary School									
Holman Elementary School									

REDUCING THE COST OF STRATIFICATION

ΔT in ° F	5.4 °	7.2 °	9 °	10.8 °	12.6 °	14.4 °	16.2 °	18 °	19.8 °
20 ft. ceiling	12.7%	14.7	16.2	17.5	18.7	19.8	21	22	23
26 ft. ceiling	15.8%	17.6	19	20.8	22.1	23.3	24.4	26	27
33 ft. ceiling	18%	20	21.8	23.2	24.8	26.3	27.3	28.8	30.5
40 ft. ceiling	20%	22	23.6	25.6	27	28.4	30	31.8	33.2

% of Energy Costs

EXAMPLE: According to a study by the Building Scientific Research Information Association, if you have a 33 ft. ceiling with a floor-to-ceiling temperature differential of 14.4 °F, then you could potentially reclaim up to 26.3% of lost heat energy with a destratification system.

ECM 11 – Building Envelope Improvements

Background & Existing Conditions

An on-site survey of the existing air barrier continuity was conducted at all 10 Jackson Township BOE schools. During the on-site inspection, several areas of the facilities were inspected for effective air barriers at the building envelope. Temperature, relative humidity, CO2 levels, smoke pencil testing and Infrared imaging was used to determine areas of uncontrolled air leakage into and out of the buildings.

Each of these facilities had varying degrees of uncontrolled air leakage into and out of the buildings. Typically, the exterior doors were found to have failed, missing or worn weather-seals and in some cases the exterior caulking had failed. Many of the facilities had insulation materials installed at the exterior roof/wall intersections. This can increase thermal values, however, the air leakage around the insulation and through the roof/wall joint was significant and results in increased energy costs.

Jackson Memorial High School has a soffit around the building which is passively vented. This soffit is not isolated from the conditioned spaces. The amount of air flow that can occur at these soffits can greatly reduce occupancy comfort levels and increase energy consumption. Blocking off and sealing the soffits is required to reduce air leakage.

Scope of Work

The scope of work for Jackson Township BOE includes weather-stripping and sealing the following building components, which have failed to varying degrees.

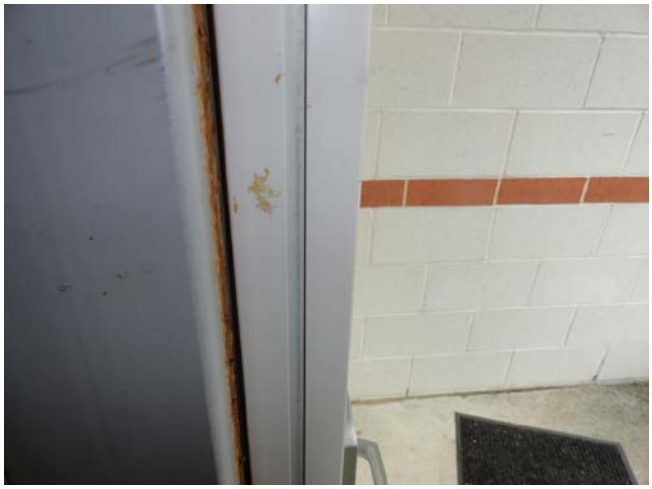
- Exterior Doors
- Roof/Wall Intersections
- Soffits
- Boiler Room

BUILDING NAME	SQ. FT. LEAKAGE AREA
Crawford-Rodriguez Elementary School	3.78
Elms Elementary School	4.69
Howard C. Johnson Elementary School	15.46
Lucy N. Holman Elementary School	15.88
Switlik Elementary School	2.71
Sylvia Rosenauer Elementary	2.15
Carl W. Goetz Middle School	7.77
Christa McAuliffe Middle School	3.85
Jackson Liberty High School	3.53
Jackson Memorial High School	21.20
TOTAL:	**81.02**

The implementation of the above recommended measures would greatly benefit the energy efficiency of the facility, improve the comfort levels of the occupants and can reduce premature building component failures of the structure. All the deficiencies are calculated to determine an effective hole area at the building envelope. The effective combined hole area for the entire district is over 81 square feet. This hole area is used to run energy models of the facility to arrive at forecasted energy loss and potential dollar savings after implementation of the recommended measures.

Scope of Work – Jackson Liberty High School

JACKSON LIBERTY HIGH SCHOOL		
Component	**Existing Condition**	**Recommendation**
Exterior Doors	Exterior door weather-seals have failed, resulting in air leakage.	Install new high quality vinyl clad compression gaskets and door bottom sweeps.



Scope of Work – Jackson Memorial High School

JACKSON MEMORIAL HIGH SCHOOL		
Component	**Existing Condition**	**Recommendation**
Roof/Wall Intersections	The roof/wall in the two wings of the building showed visible signs of air in/ ex-filtration of air.	Seal the roof/wall intersection in the two wings with spray applied polyurethane foam.
Soffits	Soffited areas of the school are vented and allowing for air to in/ex-filtrate uncontrollably. This is inefficient and can result in comfort related complaints as well as increased energy consumption.	Install Thermax rigid insulation board and seal all perimeters at the soffited areas.
Exterior Doors	Exterior door weather-seals have failed, resulting in air leakage. A small number of doors only had air leakage occurring at the failed door bottom sweeps.	Install new high quality vinyl clad compression gaskets and door bottom sweeps. Some doors only require new vinyl inset door bottom sweeps to be installed.

Scope of Work – Christa McAuliffe Middle School

CHRISTA MCAULIFFE MIDDLE SCHOOL		
Component	**Existing Condition**	**Recommendation**
Exterior Doors	Exterior door weather-seals have failed, resulting in air leakage.	Install new high quality vinyl clad compression gaskets and door bottom sweeps.

Scope of Work –Elms Elementary School

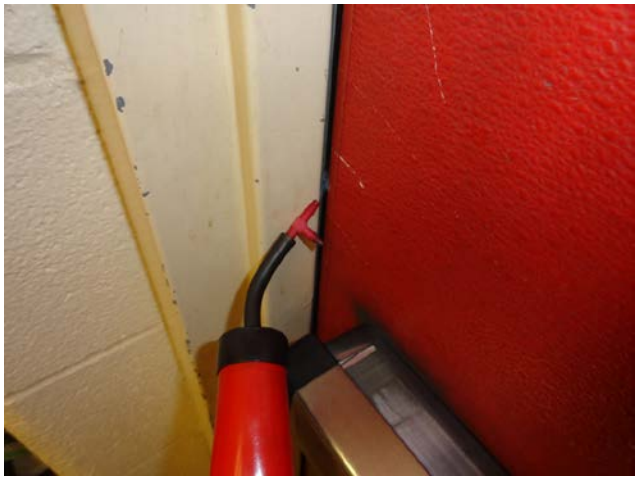
ELMS ELEMENTARY SCHOOL		
Component	**Existing Condition**	**Recommendation**
Exterior Doors	Exterior door weather-seals have failed resulting in air leakage. Exterior sealants have also failed at many doors and require replacement.	Install new high quality vinyl clad compression gaskets and door bottom sweeps. Replace failed exterior sealants with urethane exterior grade caulking.

Scope of Work – Goetz Middle School

CARL W. GOETZ MIDDLE SCHOOL		
Component	**Existing Condition**	**Recommendation**
Exterior Doors	Exterior door weather-seals have failed, resulting in air leakage.	Install new high quality vinyl clad compression gaskets and door bottom sweeps.

Scope of Work –Crawford Rodriguez Elementary School

CRAWFORD-RODRIGUEZ ELEMENTARY SCHOOL		
Component	**Existing Condition**	**Recommendation**
Exterior Doors	Exterior door weather-seals have failed resulting in air leakage.	Install new high quality vinyl clad compression gaskets and door bottom sweeps.



Scope of Work – Switlik Elementary School

SWITLIK ELEMENTARY SCHOOL		
Component	**Existing Condition**	**Recommendation**
Exterior Doors	Exterior door weather-seals have failed, resulting in air leakage.	Install new high quality vinyl clad compression gaskets and door bottom sweeps.

Scope of Work –Holman Elementary School

LUCY N. HOLMAN ELEMENTARY SCHOOL		
Component	**Existing Condition**	**Recommendation**
Roof/Wall Intersection	The rigid insulation installed at the roof/ wall intersection is not effectively sealed allowing for uncontrolled air leakage into and out of the building.	Seal perimeters of all rigid insulation board installed at exterior roof/wall intersections using spray-applied polyurethane foam.
Exterior Doors	Exterior door weather-seals have failed, resulting in air leakage.	Install new high quality vinyl clad compression gaskets and door bottom sweeps.

Scope of Work – Johnson Elementary School

HOWARD C. JOHNSON ELEMENTARY SCHOOL		
Component	**Existing Condition**	**Recommendation**
Roof/Wall Intersection	The roof/wall intersection showed visible signs of air leakage and requires sealing to reduce air leakage and energy losses.	Install spray-applied polyurethane foam to exterior roof/ wall intersections.
Exterior Doors	Exterior door weather-seals have failed resulting in air leakage.	Install new high quality vinyl clad compression gaskets and door bottom sweeps.

Scope of Work – Rosenauer Elementary School

SYLVIA ROSENAUER ELEMENTARY		
Component	**Existing Condition**	**Recommendation**
Roof/Wall Intersection	The roof/wall intersection showed visible signs of air leakage and requires sealing to reduce air leakage and energy losses.	Install spray-applied polyurethane foam to exterior roof/ wall intersections.
Boiler Room	The vented Boiler Room is allowing for air changes to be made between the Boiler Room and the conditioned spaces (school).	Seal miscellaneous penetrations in common wall, seal roof/wall at common walls and weather-strip the Boiler Room door to school. Fire rated materials required.
Exterior Doors	Exterior door weather-seals have failed, resulting in air leakage.	Install new high quality vinyl clad compression gaskets and door bottom sweeps.

ECM Calculations

Energy Savings from the installation of Building Envelope Improvements were modeled using eQuest. Infiltration rate reduction and simulation results are shown below.

ENERGY MODELING OUTPUTS

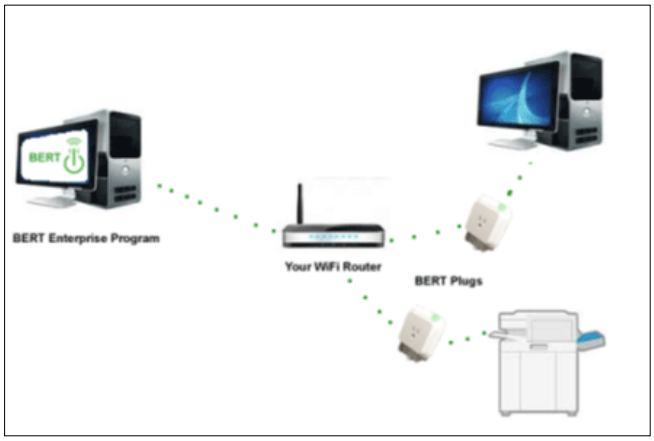
Building Envelope Savings

BUILDING	INFILTRATION REDUCTION (CFM)	MODEL % ELECTRIC SAVINGS	kWh SAVINGS	MODEL % DEMAND SAVINGS	kW SAVINGS	MODEL % THERM SAVINGS	THERMS SAVINGS
Jackson Liberty High School	606		13,923		0		0
Jackson Memorial High School	3,641	0.5%	22,524	0.9%	13	6.6%	3,287
Christa McAuliffe Middle School	661	0.1%	2,049	0.2%	1	1.5%	848
Elms Elementary School	805	0.8%	13,807	0.7%	3	0.0%	0
Goetz Middle School	1,067	0.4%	8,241	0.3%	2	1.2%	890
Crawford Rodriguez Elementary School	649	0.1%	1,689	0.2%	1	1.0%	802
Switlik Elementary School	372	0.5%	6,471	1.2%	3	1.8%	278
Holman Elementary School	2,181	6.0%	60,556	4.7%	13	0.0%	0
Johnson Elementary School	2,123	7.3%	49,267	4.3%	10	0.0%	0
Rosenauer Elementary School	295	0.1%	171	0.0%	0	2.0%	393

ECM 12 – Plug Load Controllers

Background & Existing Conditions

Plug load controllers are smart devices communicating on a wireless network that can be controlled via any web-enabled device. The system allows scheduling of individual, groups, or all pug load controllers to eliminate unnecessary energy use.



Office spaces having numerous copier/printers with standard operating hours are ideal locations for plug controllers. For example, consider an office building that is open weekdays from 7 am to 6 pm and closed on the weekends. A plug load management system can automatically shut off power to devices like computer monitors, printers and vending machines when the office building is not open, reducing energy use by over 60%.

Scope of Work

- Plug load controllers will be installed on viable electronic equipment.
- Connect plug load controllers via the existing WiFi network in each school

ECM Calculations

Energy savings from the installation of plug load controllers were calculated using existing standby power draw and the number of hours the plug load controller will turn the equipment completely off. The plug load controller will turn the equipment off using a user programmed schedule, saving the energy from the standby power draw. Savings calculations and scope of work can be seen below.

CALCULATED SAVINGS

Plug Load Controller Savings

BUILDING NAME	Device Type	Plug Load Type	Quantity	Standby Power Draw (W)	Baseline Hours Scheduled ON per Year	Controller Hours Scheduled ON per Year	Controller Hours Scheduled OFF per Year	Annual Energy Savings (kWh)	Total Annual Energy Savings (kWh)
Jackson Liberty High School	Projector	Bert 110X	83	8	8,760	2,926	5,834	3,874	
Jackson Liberty High School	Charging Cart	Bert 110X	12	35	8,760	2,926	5,834	2,450	
Jackson Liberty High School	Printer	Bert 110X	6	15	8,760	2,926	5,834	525	18,284
Jackson Liberty High School	Large Copy Machine	Bert 110X	5	40	8,760	2,926	5,834	1,167	
Jackson Liberty High School	Snack Vending	Bert 110X	4	40	8,760	2,926	5,834	933	
Jackson Liberty High School	Soda Vending	Bert 110X	5	320	8,760	2,926	5,834	9,334	
Jackson Memorial High School	Projector	Bert 110X	114	8	8,760	2,926	5,834	5,321	
Jackson Memorial High School	Amp	Bert 110X	1	13	8,760	2,926	5,834	76	
Jackson Memorial High School	Charging Cart	Bert 110X	32	35	8,760	2,926	5,834	6,534	
Jackson Memorial High School	Printer	Bert 110X	17	15	8,760	2,926	5,834	1,488	23,033
Jackson Memorial High School	Large Copy Machine	Bert 110X	8	40	8,760	2,926	5,834	1,867	
Jackson Memorial High School	TV	Bert 110X	1	8	8,760	2,926	5,834	47	
Jackson Memorial High School	Snack Vending	Bert 110X	1	40	8,760	2,926	5,834	233	
Jackson Memorial High School	Soda Vending	Bert 110X	4	320	8,760	2,926	5,834	7,468	
Christa McAuliffe Middle School	Projector	Bert 110X	10	8	8,760	2,508	6,252	500	
Christa McAuliffe Middle School	Smartboard TV	Bert 110X	31	6	8,760	2,508	6,252	1,163	
Christa McAuliffe Middle School	Projector/Smartboard	Bert 110X	9	10	8,760	2,508	6,252	563	
Christa McAuliffe Middle School	Charging Cart	Bert 110X	18	35	8,760	2,508	6,252	3,939	
Christa McAuliffe Middle School	Printer	Bert 110X	6	15	8,760	2,508	6,252	563	17,631
Christa McAuliffe Middle School	Large Copy Machine	Bert 110X	2	40	8,760	2,508	6,252	500	
Christa McAuliffe Middle School	TV	Bert 110X	1	8	8,760	2,508	6,252	50	
Christa McAuliffe Middle School	Snack Vending	Bert 110X	1	40	8,760	2,508	6,252	250	
Christa McAuliffe Middle School	Soda Vending	Bert 110X	5	320	8,760	2,508	6,252	10,003	
Christa McAuliffe Middle School	AC - 110V (20A)	Bert 240I Inline	2	8	8,760	2,508	6,252	100	
Elms Elementary School	Projector	Bert 110X	3	8	8,760	2,299	6,461	155	
Elms Elementary School	Smartboard TV	Bert 110X	27	6	8,760	2,299	6,461	1,047	
Elms Elementary School	Printer	Bert 110X	6	15	8,760	2,299	6,461	581	4,109
Elms Elementary School	Large Copy Machine	Bert 110X	1	40	8,760	2,299	6,461	258	
Elms Elementary School	Soda Vending	Bert 110X	1	320	8,760	2,299	6,461	2,068	
Goetz Middle School	Projector	Bert 110X	10	8	8,760	2,508	6,252	500	
Goetz Middle School	Smartboard TV	Bert 110X	19	6	8,760	2,508	6,252	713	
Goetz Middle School	Projector/Smartboard	Bert 110X	2	10	8,760	2,508	6,252	125	
Goetz Middle School	Charging Cart	Bert 110X	3	35	8,760	2,508	6,252	656	
Goetz Middle School	Printer	Bert 110X	8	15	8,760	2,508	6,252	750	
Goetz Middle School	Large Copy Machine	Bert 110X	1	40	8,760	2,508	6,252	250	10,397
Goetz Middle School	TV	Bert 110X	8	8	8,760	2,508	6,252	400	
Goetz Middle School	Snack Vending	Bert 110X	1	40	8,760	2,508	6,252	250	
Goetz Middle School	Soda Vending	Bert 110X	3	320	8,760	2,508	6,252	6,002	
Goetz Middle School	Exhaust Fan - 110V	Bert 110X	1	120	8,760	2,508	6,252	750	
Crawford Rodriguez Elementary School	Projector	Bert 110X	5	8	8,760	2,299	6,461	258	
Crawford Rodriguez Elementary School	Smartboard TV	Bert 110X	29	6	8,760	2,299	6,461	1,124	
Crawford Rodriguez Elementary School	Projector/Smartboard	Bert 110X	1	10	8,760	2,299	6,461	65	
Crawford Rodriguez Elementary School	Charging Cart	Bert 110X	3	35	8,760	2,299	6,461	678	
Crawford Rodriguez Elementary School	Large Copy Machine	Bert 110X	2	40	8,760	2,299	6,461	517	9,104
Crawford Rodriguez Elementary School	Snack Vending	Bert 110X	2	40	8,760	2,299	6,461	517	
Crawford Rodriguez Elementary School	Soda Vending	Bert 110X	2	320	8,760	2,299	6,461	4,135	
Crawford Rodriguez Elementary School	Exhaust Fan - 220V	Bert 240I Inline	2	140	8,760	2,299	6,461	1,809	

CALCULATED SAVINGS

Plug Load Controller Savings

BUILDING NAME	Device Type	Plug Load Type	Quantity	Standby Power Draw (W)	Baseline Hours Scheduled ON per Year	Controller Hours Scheduled ON per Year	Controller Hours Scheduled OFF per Year	Annual Energy Savings (kWh)	Total Annual Energy Savings (kWh)
Switlik Elementary School	Projector	Bert 110X	3	8	8,760	2,299	6,461	155	
Switlik Elementary School	Smartboard TV	Bert 110X	9	6	8,760	2,299	6,461	349	
Switlik Elementary School	Charging Cart	Bert 110X	2	35	8,760	2,299	6,461	452	
Switlik Elementary School	Printer	Bert 110X	4	15	8,760	2,299	6,461	388	4,652
Switlik Elementary School	Large Copy Machine	Bert 110X	3	40	8,760	2,299	6,461	775	
Switlik Elementary School	TV	Bert 110X	4	8	8,760	2,299	6,461	207	
Switlik Elementary School	Snack Vending	Bert 110X	1	40	8,760	2,299	6,461	258	
Switlik Elementary School	Soda Vending	Bert 110X	1	320	8,760	2,299	6,461	2,068	
Holman Elementary School	Projector	Bert 110X	4	8	8,760	2,299	6,461	207	
Holman Elementary School	Smartboard TV	Bert 110X	21	6	8,760	2,299	6,461	814	
Holman Elementary School	Projector/Smartboard	Bert 110X	1	10	8,760	2,299	6,461	65	
Holman Elementary School	Charging Cart	Bert 110X	4	35	8,760	2,299	6,461	905	
Holman Elementary School	Printer	Bert 110X	2	15	8,760	2,299	6,461	194	9,007
Holman Elementary School	Large Copy Machine	Bert 110X	2	40	8,760	2,299	6,461	517	
Holman Elementary School	TV	Bert 110X	1	8	8,760	2,299	6,461	52	
Holman Elementary School	Soda Vending	Bert 110X	1	320	8,760	2,299	6,461	2,068	
Holman Elementary School	AC - 220V (< 20A)	Bert 240I Inline	1	8	8,760	2,299	6,461	52	
Holman Elementary School	Elec. Water Heater	Bert 240I Inline	4	160	8,760	2,299	6,461	4,135	
Johnson Elementary School	Projector	Bert 110X	4	8	8,760	2,299	6,461	207	
Johnson Elementary School	Smartboard TV	Bert 110X	24	6	8,760	2,299	6,461	930	
Johnson Elementary School	Projector/Smartboard	Bert 110X	2	10	8,760	2,299	6,461	129	
Johnson Elementary School	Charging Cart	Bert 110X	8	35	8,760	2,299	6,461	1,809	
Johnson Elementary School	Printer	Bert 110X	4	15	8,760	2,299	6,461	388	19,616
Johnson Elementary School	Large Copy Machine	Bert 110X	3	40	8,760	2,299	6,461	775	
Johnson Elementary School	Snack Vending	Bert 110X	1	40	8,760	2,299	6,461	258	
Johnson Elementary School	Soda Vending	Bert 110X	1	320	8,760	2,299	6,461	2,068	
Johnson Elementary School	Elec. Water Heater	Bert 240I Inline	3	160	8,760	2,299	6,461	3,101	
Johnson Elementary School	Exhaust Fan - 220V	Bert 240I Inline	11	140	8,760	2,299	6,461	9,950	
Rosenauer Elementary School	Projector	Bert 110X	5	8	8,760	2,299	6,461	258	
Rosenauer Elementary School	Smartboard TV	Bert 110X	9	6	8,760	2,299	6,461	349	
Rosenauer Elementary School	Charging Cart	Bert 110X	1	35	8,760	2,299	6,461	226	
Rosenauer Elementary School	Printer	Bert 110X	1	15	8,760	2,299	6,461	97	3,256
Rosenauer Elementary School	Large Copy Machine	Bert 110X	1	40	8,760	2,299	6,461	258	
Rosenauer Elementary School	Soda Vending	Bert 110X	1	320	8,760	2,299	6,461	2,068	
Administration Building	Projector	Bert 110X	2	8	8,760	4,176	4,584	73	
Administration Building	Printer	Bert 110X	3	15	8,760	4,176	4,584	206	
Administration Building	Large Copy Machine	Bert 110X	6	40	8,760	4,176	4,584	1,100	
Administration Building	TV	Bert 110X	1	8	8,760	4,176	4,584	37	
Administration Building	Soda Vending	Bert 110X	1	320	8,760	4,176	4,584	1,467	
Administration Building	Large Coffee	Bert 110X	1	56	8,760	4,176	4,584	257	3,828
Administration Building	H/C Water Disp.	Bert 110X	1	62	8,760	4,176	4,584	284	
Administration Building	AC - 110V (15A)	Bert 110X	4	8	8,760	4,176	4,584	147	
Administration Building	AC - 110V (20A)	Bert 240I Inline	1	8	8,760	4,176	4,584	37	
Administration Building	AC - 220V (< 20A)	Bert 240I Inline	6	8	8,760	4,176	4,584	220	
Transportation Building	Printer	Bert 110X	1	15	8,760	4,176	4,584	69	
Transportation Building	Large Copy Machine	Bert 110X	1	40	8,760	4,176	4,584	183	
Transportation Building	Snack Vending	Bert 110X	1	40	8,760	4,176	4,584	183	1,041
Transportation Building	H/C Water Disp.	Bert 110X	2	62	8,760	4,176	4,584	568	
Transportation Building	AC - 110V (20A)	Bert 240I Inline	1	8	8,760	4,176	4,584	37	
Maintenance Garage	H/C Water Disp.	Bert 110X	1	62	8,760	4,176	4,584	284	358
Maintenance Garage	AC - 110V (15A)	Bert 110X	2	8	8,760	4,176	4,584	73	

ECM 13 – High Efficiency Transformers

Background & Existing Conditions

High efficiency transformers are designed to improve power quality and reduce electricity waste. Optimized for lowest life cycle cost, the high efficiency transformer reduces waste by as much as 74% while treating power system harmonics in the electrical current that can disrupt equipment operation. They also enhance equipment reliability; lower operating costs and facilitate compliance with IEEE-519 in commercial and industrial facilities.

Quiet operation is ensured through the combination of imbedded structural and acoustic treatments. High efficiency transformers generate lower losses, they reduce power drawn from generating stations resulting in less smog and lower greenhouse gas emissions.

Existing transformer at Elms Elementary School

Existing transformer at Jackson Memorial High School

ECM Calculations

Typically, transformers are rated at 35% loading. The savings were calculated using 20% loading during the day and 8% loading at night to be conservative. Estimated baseline efficiency was assumed to be 5% less than NEMA TP1 2002 rating at low load conditions. The new, harmonic mitigating transformers are designed to perform at low load conditions. Harmonic mitigation has been proven to save an additional 70% of the calculated savings from efficiency improvement. The harmonic mitigation savings were capped at 60% for the savings estimates below.

DCO Energy Efficiency Division
100 Lenox Drive
Lawrenceville, NJ 08648

CALCULATED SAVINGS

High Efficiency Transformer Savings

BUILDING	TRANSFORMER ID	EXISTING kVA	% DAY LOAD	ANNUAL DAY HOURS	% NIGHT / WEEKEND LOAD	REMAINING HOURS	TP1 EXISTING EFFICIENCY	ESTIMATED BASELINE EFFICIENCY	PROPOSED EFFICIENCY	BASELINE ELECTRIC USE (kWh)	PROPOSED ELECTRIC USE (kWh)	CALCULATED ENERGY SAVINGS (kWh)	HARMONIC MITIGATING SAVINGS (%)	HARMONIC MITIGATING SAVINGS (kWh)	AVG. BASELINE DEMAND (kW)	AVG. PROPOSED DEMAND (kW)	DEMAND SAVINGS (kW)	TOTAL ENERGY SAVINGS (kWh)
Jackson Liberty High School	T1	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Liberty High School	T2	225	20%	4,160	8%	4,600	98.50%	93.50%	98.94%	288,770	272,893	15,877	60%	9,526	32.1	30.3	1.8	25,404
Jackson Liberty High School	EC1A	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Jackson Liberty High School	T4	15	20%	4,160	8%	4,600	97.00%	92.00%	97.89%	19,565	18,388	1,177	60%	706	2.2	2.0	0.1	1,884
Jackson Liberty High School	Kiln	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Liberty High School	KPD	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Jackson Liberty High School	CPD	113	20%	4,160	8%	4,600	98.20%	93.20%	98.74%	144,850	136,723	8,127	60%	4,876	16.1	15.2	0.9	13,003
Jackson Liberty High School	PPD	225	20%	4,160	8%	4,600	98.50%	93.50%	98.94%	288,770	272,893	15,877	60%	9,526	32.1	30.3	1.8	25,404
Jackson Liberty High School	T9	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Jackson Liberty High School	EN1B	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Jackson Liberty High School	CDP	500	20%	4,160	8%	4,600	98.70%	93.70%	99.14%	640,342	605,205	35,137	60%	21,082	71.1	67.2	3.9	56,219
Jackson Liberty High School	PDP	500	20%	4,160	8%	4,600	98.70%	93.70%	99.14%	640,342	605,205	35,137	60%	21,082	71.1	67.2	3.9	56,219
Jackson Memorial High School	T1	150	20%	4,160	8%	4,600	98.30%	93.30%	98.83%	192,926	182,131	10,795	60%	6,477	21.4	20.2	1.2	17,272
Jackson Memorial High School	PK-T	15	20%	4,160	8%	4,600	97.00%	92.00%	97.89%	19,565	18,388	1,177	60%	706	2.2	2.0	0.1	1,884
Jackson Memorial High School	T3	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Jackson Memorial High School	T4	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Memorial High School	T5	45.0	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Memorial High School	T6	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Memorial High School	T7	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Jackson Memorial High School	T8	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Memorial High School	T9	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Memorial High School	T10	150.0	20%	4,160	8%	4,600	98.30%	93.30%	98.83%	192,926	182,131	10,795	60%	6,477	21.4	20.2	1.2	17,272
Jackson Memorial High School	T11	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Jackson Memorial High School	T12	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Memorial High School	T13	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Jackson Memorial High School	T14	45.0	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Memorial High School	T15	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Memorial High School	T16	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Memorial High School	T17	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Jackson Memorial High School	T18	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Jackson Memorial High School	T19	45.0	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Memorial High School	T20	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Jackson Memorial High School	T21	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Memorial High School	HC-T2	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Jackson Memorial High School	T23	15	20%	4,160	8%	4,600	97.00%	92.00%	97.89%	19,565	18,388	1,177	60%	706	2.2	2.0	0.1	1,884
Jackson Memorial High School	T24	75.0	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Jackson Memorial High School	T25	150	20%	4,160	8%	4,600	98.30%	93.30%	98.83%	192,926	182,131	10,795	60%	6,477	21.4	20.2	1.2	17,272
Jackson Memorial High School	T26	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Memorial High School	FXF-2	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Jackson Memorial High School	FXF-1	15	20%	4,160	8%	4,600	97.00%	92.00%	97.89%	19,565	18,388	1,177	60%	706	2.2	2.0	0.1	1,884
Jackson Memorial High School	HC-T1	45.0	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Memorial High School	T30	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Memorial High School	HV-T1	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Memorial High School	T32	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Memorial High School	CXF-1	15	20%	4,160	8%	4,600	97.00%	92.00%	97.89%	19,565	18,388	1,177	60%	706	2.2	2.0	0.1	1,884
Jackson Memorial High School	CXF-2	15.0	20%	4,160	8%	4,600	97.00%	92.00%	97.89%	19,565	18,388	1,177	60%	706	2.2	2.0	0.1	1,884
Jackson Memorial High School	T35	150	20%	4,160	8%	4,600	98.30%	93.30%	98.83%	192,926	182,131	10,795	60%	6,477	21.4	20.2	1.2	17,272
Jackson Memorial High School	T36	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Jackson Memorial High School	T37	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Jackson Memorial High School	T38	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Jackson Memorial High School	HV-T2	30.0	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Jackson Memorial High School	T40	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Jackson Memorial High School	T41	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Jackson Memorial High School	T42	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Memorial High School	T43	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Jackson Memorial High School	KP-T	15.0	20%	4,160	8%	4,600	97.00%	92.00%	97.89%	19,565	18,388	1,177	60%	706	2.2	2.0	0.1	1,884
Jackson Memorial High School	T45	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Jackson Memorial High School	T46	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632

DCO Energy Efficiency Division
100 Lenox Drive
Lawrenceville, NJ 08648

CALCULATED SAVINGS

High Efficiency Transformer Savings

BUILDING	TRANSFORMER ID	EXISTING kVA	% DAY LOAD	ANNUAL DAY HOURS	% NIGHT / WEEKEND LOAD	REMAINING HOURS	TP1 EXISTING EFFICIENCY	ESTIMATED BASELINE EFFICIENCY	PROPOSED EFFICIENCY	BASELINE ELECTRIC USE (kWh)	PROPOSED ELECTRIC USE (kWh)	CALCULATED ENERGY SAVINGS (kWh)	HARMONIC MITIGATING SAVINGS (%)	HARMONIC MITIGATING SAVINGS (kWh)	AVG. BASELINE DEMAND (kW)	AVG. PROPOSED DEMAND (kW)	DEMAND SAVINGS (kW)	TOTAL ENERGY SAVINGS (kWh)
Christa McAuliffe Middle School	A	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Christa McAuliffe Middle School	B	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Christa McAuliffe Middle School	C	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Christa McAuliffe Middle School	D	113	20%	4,160	8%	4,600	98.20%	93.20%	98.74%	144,850	136,723	8,127	60%	4,876	16.1	15.2	0.9	13,003
Christa McAuliffe Middle School	E	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Christa McAuliffe Middle School	F	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Christa McAuliffe Middle School	G	300	20%	4,160	8%	4,600	98.60%	93.60%	99.02%	384,615	363,563	21,052	60%	12,631	42.7	40.4	2.3	33,684
Christa McAuliffe Middle School	H	75.0	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Christa McAuliffe Middle School	EA	15	20%	4,160	8%	4,600	97.00%	92.00%	97.89%	19,565	18,388	1,177	60%	706	2.2	2.0	0.1	1,884
Christa McAuliffe Middle School	EB	15	20%	4,160	8%	4,600	97.00%	92.00%	97.89%	19,565	18,388	1,177	60%	706	2.2	2.0	0.1	1,884
Elms Elementary School	PP1C	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Elms Elementary School	PP1B	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Elms Elementary School	CP3	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Elms Elementary School	EPB	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Elms Elementary School	KP1A	75.0	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Elms Elementary School	EPA	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Elms Elementary School	HP2B	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Elms Elementary School	CP1A	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Elms Elementary School	PP1A	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Elms Elementary School	PP1	75.0	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Elms Elementary School	CP2A	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Elms Elementary School	PP2A	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Elms Elementary School	CP1	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Elms Elementary School	EP1A	15	20%	4,160	8%	4,600	97.00%	92.00%	97.89%	19,565	18,388	1,177	60%	706	2.2	2.0	0.1	1,884
Elms Elementary School	PP2	75.0	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Elms Elementary School	CP2	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Elms Elementary School	EP2A	15	20%	4,160	8%	4,600	97.00%	92.00%	97.89%	19,565	18,388	1,177	60%	706	2.2	2.0	0.1	1,884
Goetz Middle School	150T3H	150	20%	4,160	8%	4,600	98.30%	93.30%	98.83%	192,926	182,131	10,795	60%	6,477	21.4	20.2	1.2	17,272
Goetz Middle School	75T3H	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Goetz Middle School	30T3H	30.0	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Goetz Middle School	5SIF	5	20%	4,160	8%	4,600	96.00%	91.00%	97.39%	6,593	6,161	433	60%	260	0.7	0.7	0.0	692
Goetz Middle School	75T3H	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Crawford Rodriguez Elementary School	T2	150	20%	4,160	8%	4,600	98.30%	93.30%	98.83%	192,926	182,131	10,795	60%	6,477	21.4	20.2	1.2	17,272
Crawford Rodriguez Elementary School	T3	113	20%	4,160	8%	4,600	98.20%	93.20%	98.74%	144,850	136,723	8,127	60%	4,876	16.1	15.2	0.9	13,003
Crawford Rodriguez Elementary School	T4	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Crawford Rodriguez Elementary School	T5	45	20%	4,160	8%	4,600	97.70%	92.70%	98.40%	58,252	54,878	3,374	60%	2,025	6.5	6.1	0.4	5,399
Crawford Rodriguez Elementary School	T6	30	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Crawford Rodriguez Elementary School	T7	15	20%	4,160	8%	4,600	97.00%	92.00%	97.89%	19,565	18,388	1,177	60%	706	2.2	2.0	0.1	1,884
Crawford Rodriguez Elementary School	T8	9	20%	4,160	8%	4,600	96.50%	91.50%	97.64%	11,803	11,061	742	60%	445	1.3	1.2	0.1	1,188
Crawford Rodriguez Elementary School	T9	6.0	20%	4,160	8%	4,600	96.00%	91.00%	97.39%	7,912	7,393	519	60%	311	0.9	0.8	0.1	831
Crawford Rodriguez Elementary School	T10	3	20%	4,160	8%	4,600	95.50%	90.50%	97.14%	3,978	3,706	272	60%	163	0.4	0.4	0.0	435
Swiftik Elementary School	T1	300	20%	4,160	8%	4,600	98.60%	93.60%	99.02%	384,615	363,563	21,052	60%	12,631	42.7	40.4	2.3	33,684
Swiftik Elementary School	T2	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Holman Elementary School	T1	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Holman Elementary School	T2	15	20%	4,160	8%	4,600	97.00%	92.00%	97.89%	19,565	18,388	1,177	60%	706	2.2	2.0	0.1	1,884
Holman Elementary School	T3	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Johnson Elementary School	T1	75	20%	4,160	8%	4,600	98.00%	93.00%	98.60%	96,774	91,278	5,496	60%	3,298	10.8	10.1	0.6	8,794
Johnson Elementary School	T3	30.0	20%	4,160	8%	4,600	97.50%	92.50%	98.23%	38,919	36,649	2,270	60%	1,362	4.3	4.1	0.3	3,632
Johnson Elementary School	T4	30.0	20%	4,160	8%	4,600	98.50%	93.50%	98.23%	38,503	36,649	1,854	60%	1,112	4.3	4.1	0.2	2,966
Administration Building	T1	75	20%	4,160	8%	4,600	98.30%	93.30%	99.10%	96,463	90,817	5,646	60%	3,387	10.7	10.1	0.6	9,033

Required vs. PQI Energy Efficiencies [1]

kVA Rating CSA C802.2	NEMA TP 1 2002 [2]	NEMA Premium [2]	DOE 2016 [3]	PQI Z3 exceeds CSL 3 [4]	PQI Z3+	PQI Z4 exceeds CSL 4 [4]
15	97.00	97.90	97.89	97.97	98.25	98.43
30	97.50	98.25	98.23	98.29	98.52	98.68
45	97.70	98.39	98.40	98.45	98.66	98.81
75	98.00	98.60	98.60	98.64	98.82	98.95
112.5	98.20	98.74	98.74	98.77	98.93	99.05
150	98.30	98.81	98.83	98.86	99.01	99.12
225	98.50	98.95	98.94	98.97	99.10	99.20
300	98.60	99.02	99.02	99.04	99.16	99.26
500	98.70	99.09	99.14	99.16	99.26	99.35
750	98.80	99.16	99.23	99.24	99.33	99.41
1000	98.90	99.23	99.28	99.29	99.38	99.45

Notes:

[1] Efficiency values are measured at 35% of nameplate rating.

[2] The efficiency of transformers manufactured after January 1, 2007, but before January 1, 2016 must meet the efficiency requirements of NEMA TP 1-2002 (US) or CSA C802.2-12 (Canada).

[3] The efficiency of transformers manufactured after January 1, 2016 must meet the US DOE 2016 efficiency requirements.

[4] PQI Z3 & Z4 efficiencies exceed the requirements of DOE Candidate Standard Level 3 & 4 (CSL 3 & CSL 4) respectively.

ECM 14 – Solar PPA

Background & Existing Conditions

A Solar Power Purchase Agreement (SPPA) is a financial arrangement in which a third-party developer owns, operates, and maintains the photovoltaic (PV) system, and a host customer agrees to site the system on its roof or elsewhere on its property and purchases the system's electric output from the solar services provider for a predetermined period. This financial arrangement allows the host customer to receive stable, and sometimes lower cost electricity, while the solar services provider or another party acquires valuable financial benefits such as tax credits and income generated from the sale of electricity to the host customer.

With this business model, the host customer buys the services produced by the PV system rather than the PV system itself. This framework is referred to as the "solar services" model, and the developers who offer SPPAs are known as solar services providers. SPPA arrangements enable the host customer to avoid many of the traditional barriers to adoption for organizations looking to install solar systems: high up-front capital costs; system performance risk; and complex design and permitting processes. In addition, SPPA arrangements can be cash flow positive for the host customer from the day the system is commissioned.

- No upfront capital cost.
- Predictable energy pricing.
- No system performance or operating risk.
- Projects can be cash flow positive from day one.
- Visibly demonstrable environmental commitment.
- Potential reduction in carbon footprint

Scope of Work

- Savings estimates are calculated from proposals received during the Jackson Township BOE Solar PPA RFP process
- Installation of the Solar PV System shall be in accordance with NFPA 70. NEC 2011. ARTICLE 690.Solar Photovoltaic (PV) Systems.
- PPA Firm will receive any incentives available

ECM Calculations

The energy savings shown below are a result of the reduced electrical cost from the PPA for the kWh generated by the solar panels. Actual rates and solar generation estimates were taken from the proposals received during the Jackson Township BOE Solar PPA RFP process. A comparison was done to ensure the generated kWh did not exceed the post-project estimated energy consumption. In cases where the generated kWh exceeded the post-project electrical consumption, the generation numbers were reduced to ensure the site would not generate more electric than it consumes. The PPA term is 15 years. During years 16-20, the panels will remain in place as part of a 5-year PPA extension.

INSTALLED CAPACITY (kWdc)	REQ'D ROOFING UPGRADES	TOTAL ECM YEAR 1 SAVINGS
4,167	$7,830,962	$360,205

PPA RATE ($/kWh)	ANNUAL ESCALATION RATE	ANNUAL PANEL DERATING	PPA CONTRACT TERM (YRS)	END OF PPA REMOVAL COST
$0.0365	1.75%	0.50%	15	$0

Solar PPA - Rates & Savings

BUILDING	MOUNTING CATEGORY	INSTALL? (Y/N)	INSTALLED ARRAY (kW)	INSTALLED kWh GENERATION	$$/kWh RATES		SAVINGS	TOTAL SAVINGS
					UTILITY	SOLAR PPA		
Jackson Liberty High School	Roof	N	0	0	$0.100	$0.0365	$0	$52,750
Jackson Liberty High School	Ground	Y	605	832,343	$0.100	$0.0365	$52,750	
Jackson Memorial High School	Memorial Roof	N	0	0	$0.106	$0.0365	$0	$24,729
Jackson Memorial High School	Clayton Roof	N	0	0	$0.106	$0.0365	$0	
Jackson Memorial High School	Fine Arts Roof	Y	289	358,056	$0.106	$0.0365	$24,729	
Christa McAuliffe Middle School	Roof	Y	419	519,474	$0.106	$0.0365	$36,078	$36,078
Elms Elementary School	Roof	N	0	0	$0.102	$0.0365	$0	$0
Goetz Middle School	Roof	Y	942	1,174,533	$0.106	$0.0365	$81,991	$81,991
Crawford Rodriguez Elementary School	Roof	Y	552	658,269	$0.101	$0.0365	$42,636	$42,636
Switlik Elementary School	Roof	Y	380	469,389	$0.110	$0.0365	$34,660	$34,660
Holman Elementary School	Roof	Y	433	539,294	$0.107	$0.0365	$37,953	$37,953
Johnson Elementary School	Roof	Y	300	373,507	$0.101	$0.0365	$24,039	$24,039
Rosenauer Elementary School	Roof	Y	110	136,725	$0.107	$0.0365	$9,672	$9,672
Administration Building	Roof	Y	91	112,541	$0.135	$0.0365	$11,124	$11,124
Transportation Building	Roof	Y	38	48,469	$0.113	$0.0365	$3,688	$3,688
Maintenance Garage	Roof	Y	7	8,984	$0.135	$0.0365	$884	$884

YEAR	PPA kWh PRODUCTION	UTILITY SAVINGS	PPA COST (includes 5 year extension)	NET SOLAR SAVINGS
1	5,231,584	$551,158	($190,953)	$360,205
2	5,205,426	$560,467	($193,323)	$367,144
3	5,179,399	$569,934	($195,723)	$374,211
4	5,153,502	$579,560	($198,152)	$381,408
5	5,127,734	$589,348	($200,612)	$388,737
6	5,102,095	$599,303	($203,102)	$396,201
7	5,076,585	$609,425	($205,623)	$403,802
8	5,051,202	$619,718	($208,175)	$411,543
9	5,025,946	$630,185	($210,759)	$419,426
10	5,000,816	$640,829	($213,375)	$427,454
11	4,975,812	$651,652	($216,024)	$435,629
12	4,950,933	$662,659	($218,705)	$443,954
13	4,926,178	$673,851	($221,420)	$452,432
14	4,901,548	$685,232	($224,168)	$461,065
15	4,877,040	$696,806	($226,950)	$469,856
16	4,852,655	$708,575	($229,767)	$478,808
17	4,828,391	$720,543	($232,619)	$487,923
18	4,804,249	$732,713	($235,507)	$497,206
19	4,780,228	$745,088	($238,430)	$506,658
20	4,756,327	$757,673	($241,390)	$516,283

Jackson Liberty High School							
YEAR	$$/kWh RATES			SOLAR kWh	UTILITY SAVINGS	PPA COST	SAVINGS
	UTILITY	SOLAR PPA	MAINT. ($/W(dc))				
1	$0.100	$0.0365	$0	832,343	$83,130	($30,381)	$52,750
2	$0.102	$0.0371	$0	828,181	$84,534	($30,758)	$53,777
3	$0.104	$0.0378	$0	824,040	$85,962	($31,139)	$54,823
4	$0.107	$0.0384	$0	819,920	$87,414	($31,526)	$55,888
5	$0.109	$0.0391	$0	815,820	$88,890	($31,917)	$56,973
6	$0.111	$0.0398	$0	811,741	$90,392	($32,313)	$58,078
7	$0.114	$0.0405	$0	807,682	$91,918	($32,714)	$59,204
8	$0.116	$0.0412	$0	803,644	$93,471	($33,121)	$60,350
9	$0.119	$0.0419	$0	799,626	$95,050	($33,532)	$61,518
10	$0.121	$0.0427	$0	795,628	$96,655	($33,948)	$62,707
11	$0.124	$0.0434	$0	791,649	$98,288	($34,369)	$63,918
12	$0.127	$0.0442	$0	787,691	$99,948	($34,796)	$65,152
13	$0.130	$0.0449	$0	783,753	$101,636	($35,228)	$66,408
14	$0.133	$0.0457	$0	779,834	$103,352	($35,665)	$67,687
15	$0.135	$0.0465	$0	775,935	$105,098	($36,108)	$68,990
16	$0.138	$0.0473	$0	772,055	$106,873	($36,556)	$70,317
17	$0.141	$0.0482	$0	768,195	$108,678	($37,010)	$71,669
18	$0.145	$0.0490	$0	764,354	$110,514	($37,469)	$73,045
19	$0.148	$0.0499	$0	760,532	$112,380	($37,934)	$74,446
20	$0.151	$0.0508	$0	756,729	$114,279	($38,405)	$75,874

Jackson Memorial High School							
YEAR	$$/kWh RATES			SOLAR kWh	UTILITY SAVINGS	PPA COST	SAVINGS
	UTILITY	SOLAR PPA	MAINT. ($/W(dc))				
1	$0.106	$0.0365	$0	358,056	$37,798	($13,069)	$24,729
2	$0.108	$0.0371	$0	356,266	$38,436	($13,231)	$25,205
3	$0.110	$0.0378	$0	354,484	$39,085	($13,395)	$25,690
4	$0.113	$0.0384	$0	352,712	$39,746	($13,562)	$26,184
5	$0.115	$0.0391	$0	350,948	$40,417	($13,730)	$26,687
6	$0.118	$0.0398	$0	349,194	$41,100	($13,901)	$27,199
7	$0.120	$0.0405	$0	347,448	$41,794	($14,073)	$27,721
8	$0.123	$0.0412	$0	345,710	$42,500	($14,248)	$28,252
9	$0.126	$0.0419	$0	343,982	$43,217	($14,425)	$28,793
10	$0.128	$0.0427	$0	342,262	$43,947	($14,604)	$29,344
11	$0.131	$0.0434	$0	340,551	$44,690	($14,785)	$29,905
12	$0.134	$0.0442	$0	338,848	$45,444	($14,968)	$30,476
13	$0.137	$0.0449	$0	337,154	$46,212	($15,154)	$31,058
14	$0.140	$0.0457	$0	335,468	$46,993	($15,342)	$31,650
15	$0.143	$0.0465	$0	333,791	$47,786	($15,533)	$32,253
16	$0.146	$0.0473	$0	332,122	$48,593	($15,726)	$32,868
17	$0.150	$0.0482	$0	330,461	$49,414	($15,921)	$33,493
18	$0.153	$0.0490	$0	328,809	$50,249	($16,118)	$34,130
19	$0.156	$0.0499	$0	327,165	$51,097	($16,318)	$34,779
20	$0.160	$0.0508	$0	325,529	$51,960	($16,521)	$35,439

Christa McAuliffe Middle School							
YEAR	$$/kWh RATES			SOLAR kWh	UTILITY SAVINGS	PPA COST	SAVINGS
	UTILITY	SOLAR PPA	MAINT. ($/W(dc))				
1	$0.106	$0.0365	$0	519,474	$55,039	($18,961)	$36,078
2	$0.108	$0.0371	$0	516,877	$55,969	($19,196)	$36,773
3	$0.111	$0.0378	$0	514,292	$56,914	($19,434)	$37,480
4	$0.113	$0.0384	$0	511,721	$57,876	($19,676)	$38,200
5	$0.116	$0.0391	$0	509,162	$58,853	($19,920)	$38,933
6	$0.118	$0.0398	$0	506,616	$59,847	($20,167)	$39,680
7	$0.121	$0.0405	$0	504,083	$60,858	($20,417)	$40,440
8	$0.123	$0.0412	$0	501,563	$61,886	($20,671)	$41,215
9	$0.126	$0.0419	$0	499,055	$62,931	($20,927)	$42,004
10	$0.129	$0.0427	$0	496,560	$63,994	($21,187)	$42,807
11	$0.132	$0.0434	$0	494,077	$65,075	($21,450)	$43,625
12	$0.135	$0.0442	$0	491,607	$66,174	($21,716)	$44,457
13	$0.138	$0.0449	$0	489,149	$67,292	($21,986)	$45,306
14	$0.141	$0.0457	$0	486,703	$68,428	($22,259)	$46,169
15	$0.144	$0.0465	$0	484,269	$69,584	($22,535)	$47,049
16	$0.147	$0.0473	$0	481,848	$70,759	($22,815)	$47,944
17	$0.150	$0.0482	$0	479,439	$71,954	($23,098)	$48,856
18	$0.153	$0.0490	$0	477,042	$73,170	($23,385)	$49,785
19	$0.157	$0.0499	$0	474,656	$74,405	($23,675)	$50,730
20	$0.160	$0.0508	$0	472,283	$75,662	($23,969)	$51,693

Goetz Middle School							
YEAR	$/kWh RATES			SOLAR kWh	UTILITY SAVINGS	PPA COST	SAVINGS
	UTILITY	SOLAR PPA	MAINT. ($/W(dc))				
1	$0.106	$0.0365	$0	1,174,533	$124,861	($42,870)	$81,991
2	$0.109	$0.0371	$0	1,168,660	$126,970	($43,403)	$83,568
3	$0.111	$0.0378	$0	1,162,817	$129,115	($43,941)	$85,174
4	$0.113	$0.0384	$0	1,157,003	$131,296	($44,487)	$86,809
5	$0.116	$0.0391	$0	1,151,218	$133,513	($45,039)	$88,474
6	$0.119	$0.0398	$0	1,145,462	$135,768	($45,598)	$90,170
7	$0.121	$0.0405	$0	1,139,735	$138,061	($46,164)	$91,897
8	$0.124	$0.0412	$0	1,134,036	$140,393	($46,737)	$93,656
9	$0.127	$0.0419	$0	1,128,366	$142,765	($47,317)	$95,447
10	$0.129	$0.0427	$0	1,122,724	$145,176	($47,904)	$97,271
11	$0.132	$0.0434	$0	1,117,110	$147,628	($48,499)	$99,129
12	$0.135	$0.0442	$0	1,111,525	$150,121	($49,101)	$101,020
13	$0.138	$0.0449	$0	1,105,967	$152,657	($49,710)	$102,946
14	$0.141	$0.0457	$0	1,100,437	$155,235	($50,328)	$104,908
15	$0.144	$0.0465	$0	1,094,935	$157,857	($50,952)	$106,905
16	$0.147	$0.0473	$0	1,089,460	$160,523	($51,585)	$108,939
17	$0.151	$0.0482	$0	1,084,013	$163,235	($52,225)	$111,010
18	$0.154	$0.0490	$0	1,078,593	$165,992	($52,873)	$113,118
19	$0.157	$0.0499	$0	1,073,200	$168,795	($53,529)	$115,266
20	$0.161	$0.0508	$0	1,067,834	$171,646	($54,194)	$117,452

Crawford Rodriguez Elementary School							
YEAR	$/kWh RATES			SOLAR kWh	UTILITY SAVINGS	PPA COST	SAVINGS
	UTILITY	SOLAR PPA	MAINT. ($/W(dc))				
1	$0.101	$0.0365	$0	658,269	$66,662	($24,027)	$42,636
2	$0.103	$0.0371	$0	654,977	$67,788	($24,325)	$43,463
3	$0.106	$0.0378	$0	651,703	$68,933	($24,627)	$44,306
4	$0.108	$0.0384	$0	648,444	$70,098	($24,933)	$45,165
5	$0.110	$0.0391	$0	645,202	$71,282	($25,242)	$46,039
6	$0.113	$0.0398	$0	641,976	$72,486	($25,555)	$46,930
7	$0.115	$0.0405	$0	638,766	$73,710	($25,873)	$47,837
8	$0.118	$0.0412	$0	635,572	$74,955	($26,194)	$48,761
9	$0.121	$0.0419	$0	632,394	$76,221	($26,519)	$49,702
10	$0.123	$0.0427	$0	629,232	$77,508	($26,848)	$50,660
11	$0.126	$0.0434	$0	626,086	$78,817	($27,181)	$51,636
12	$0.129	$0.0442	$0	622,956	$80,148	($27,519)	$52,630
13	$0.131	$0.0449	$0	619,841	$81,502	($27,860)	$53,642
14	$0.134	$0.0457	$0	616,742	$82,879	($28,206)	$54,673
15	$0.137	$0.0465	$0	613,658	$84,279	($28,556)	$55,722
16	$0.140	$0.0473	$0	610,590	$85,702	($28,911)	$56,791
17	$0.143	$0.0482	$0	607,537	$87,150	($29,270)	$57,880
18	$0.147	$0.0490	$0	604,499	$88,621	($29,633)	$58,989
19	$0.150	$0.0499	$0	601,477	$90,118	($30,001)	$60,118
20	$0.153	$0.0508	$0	598,469	$91,640	($30,373)	$61,267

Switlik Elementary School							
YEAR	$$/kWh RATES			SOLAR kWh	UTILITY SAVINGS	PPA COST	SAVINGS
	UTILITY	SOLAR PPA	MAINT. ($/W(dc))				
1	$0.110	$0.0365	$0	469,389	$51,793	($17,133)	$34,660
2	$0.113	$0.0371	$0	467,042	$52,668	($17,345)	$35,323
3	$0.115	$0.0378	$0	464,707	$53,557	($17,561)	$35,997
4	$0.118	$0.0384	$0	462,383	$54,462	($17,779)	$36,683
5	$0.120	$0.0391	$0	460,071	$55,382	($17,999)	$37,383
6	$0.123	$0.0398	$0	457,771	$56,317	($18,223)	$38,095
7	$0.126	$0.0405	$0	455,482	$57,268	($18,449)	$38,820
8	$0.128	$0.0412	$0	453,205	$58,236	($18,678)	$39,558
9	$0.131	$0.0419	$0	450,939	$59,219	($18,910)	$40,310
10	$0.134	$0.0427	$0	448,684	$60,220	($19,144)	$41,075
11	$0.137	$0.0434	$0	446,441	$61,237	($19,382)	$41,855
12	$0.140	$0.0442	$0	444,208	$62,271	($19,623)	$42,648
13	$0.143	$0.0449	$0	441,987	$63,323	($19,866)	$43,456
14	$0.146	$0.0457	$0	439,777	$64,392	($20,113)	$44,279
15	$0.150	$0.0465	$0	437,579	$65,480	($20,362)	$45,117
16	$0.153	$0.0473	$0	435,391	$66,586	($20,615)	$45,971
17	$0.156	$0.0482	$0	433,214	$67,710	($20,871)	$46,839
18	$0.160	$0.0490	$0	431,048	$68,854	($21,130)	$47,724
19	$0.163	$0.0499	$0	428,892	$70,017	($21,392)	$48,625
20	$0.167	$0.0508	$0	426,748	$71,200	($21,658)	$49,542

Holman Elementary School							
YEAR	$$/kWh RATES			SOLAR kWh	UTILITY SAVINGS	PPA COST	SAVINGS
	UTILITY	SOLAR PPA	MAINT. ($/W(dc))				
1	$0.107	$0.0365	$0	539,294	$57,638	($19,684)	$37,953
2	$0.109	$0.0371	$0	536,598	$58,611	($19,929)	$38,683
3	$0.112	$0.0378	$0	533,915	$59,601	($20,176)	$39,425
4	$0.114	$0.0384	$0	531,245	$60,608	($20,426)	$40,181
5	$0.117	$0.0391	$0	528,589	$61,631	($20,680)	$40,952
6	$0.119	$0.0398	$0	525,946	$62,672	($20,937)	$41,736
7	$0.122	$0.0405	$0	523,316	$63,731	($21,196)	$42,534
8	$0.124	$0.0412	$0	520,699	$64,807	($21,460)	$43,348
9	$0.127	$0.0419	$0	518,096	$65,902	($21,726)	$44,176
10	$0.130	$0.0427	$0	515,506	$67,015	($21,996)	$45,019
11	$0.133	$0.0434	$0	512,928	$68,147	($22,269)	$45,878
12	$0.136	$0.0442	$0	510,363	$69,298	($22,545)	$46,753
13	$0.139	$0.0449	$0	507,812	$70,468	($22,825)	$47,643
14	$0.142	$0.0457	$0	505,272	$71,659	($23,108)	$48,550
15	$0.145	$0.0465	$0	502,746	$72,869	($23,395)	$49,474
16	$0.148	$0.0473	$0	500,232	$74,100	($23,685)	$50,414
17	$0.151	$0.0482	$0	497,731	$75,351	($23,979)	$51,372
18	$0.155	$0.0490	$0	495,243	$76,624	($24,277)	$52,347
19	$0.158	$0.0499	$0	492,766	$77,918	($24,578)	$53,340
20	$0.162	$0.0508	$0	490,303	$79,234	($24,883)	$54,351

Johnson Elementary School							
YEAR	$$/kWh RATES			SOLAR kWh	UTILITY SAVINGS	PPA COST	SAVINGS
	UTILITY	SOLAR PPA	MAINT. ($/W(dc))				
1	$0.101	$0.0365	$0	373,507	$37,672	($13,633)	$24,039
2	$0.103	$0.0371	$0	371,640	$38,308	($13,802)	$24,506
3	$0.105	$0.0378	$0	369,781	$38,955	($13,974)	$24,982
4	$0.108	$0.0384	$0	367,933	$39,613	($14,147)	$25,466
5	$0.110	$0.0391	$0	366,093	$40,283	($14,323)	$25,960
6	$0.112	$0.0398	$0	364,262	$40,963	($14,500)	$26,463
7	$0.115	$0.0405	$0	362,441	$41,655	($14,680)	$26,974
8	$0.117	$0.0412	$0	360,629	$42,358	($14,863)	$27,496
9	$0.120	$0.0419	$0	358,826	$43,074	($15,047)	$28,027
10	$0.123	$0.0427	$0	357,032	$43,801	($15,234)	$28,567
11	$0.125	$0.0434	$0	355,246	$44,541	($15,423)	$29,118
12	$0.128	$0.0442	$0	353,470	$45,293	($15,614)	$29,679
13	$0.131	$0.0449	$0	351,703	$46,058	($15,808)	$30,250
14	$0.134	$0.0457	$0	349,944	$46,836	($16,004)	$30,832
15	$0.137	$0.0465	$0	348,195	$47,627	($16,203)	$31,424
16	$0.140	$0.0473	$0	346,454	$48,432	($16,404)	$32,028
17	$0.143	$0.0482	$0	344,721	$49,250	($16,608)	$32,642
18	$0.146	$0.0490	$0	342,998	$50,082	($16,814)	$33,268
19	$0.149	$0.0499	$0	341,283	$50,927	($17,023)	$33,905
20	$0.153	$0.0508	$0	339,576	$51,788	($17,234)	$34,554

Rosenauer Elementary School							
YEAR	$$/kWh RATES			SOLAR kWh	UTILITY SAVINGS	PPA COST	SAVINGS
	UTILITY	SOLAR PPA	MAINT.				
1	$0.107	$0.0365	$0	136,725	$14,663	($4,990)	$9,672
2	$0.110	$0.0371	$0	136,041	$14,910	($5,052)	$9,858
3	$0.112	$0.0378	$0	135,361	$15,162	($5,115)	$10,047
4	$0.114	$0.0384	$0	134,684	$15,418	($5,179)	$10,240
5	$0.117	$0.0391	$0	134,011	$15,679	($5,243)	$10,436
6	$0.120	$0.0398	$0	133,341	$15,944	($5,308)	$10,636
7	$0.122	$0.0405	$0	132,674	$16,213	($5,374)	$10,839
8	$0.125	$0.0412	$0	132,011	$16,487	($5,441)	$11,046
9	$0.128	$0.0419	$0	131,351	$16,765	($5,508)	$11,257
10	$0.130	$0.0427	$0	130,694	$17,048	($5,576)	$11,472
11	$0.133	$0.0434	$0	130,040	$17,336	($5,646)	$11,691
12	$0.136	$0.0442	$0	129,390	$17,629	($5,716)	$11,913
13	$0.139	$0.0449	$0	128,743	$17,927	($5,787)	$12,140
14	$0.142	$0.0457	$0	128,100	$18,230	($5,859)	$12,371
15	$0.145	$0.0465	$0	127,459	$18,538	($5,931)	$12,606
16	$0.149	$0.0473	$0	126,822	$18,851	($6,005)	$12,846
17	$0.152	$0.0482	$0	126,188	$19,169	($6,079)	$13,090
18	$0.155	$0.0490	$0	125,557	$19,493	($6,155)	$13,338
19	$0.159	$0.0499	$0	124,929	$19,822	($6,231)	$13,591
20	$0.162	$0.0508	$0	124,304	$20,157	($6,309)	$13,848

Administration Building							
YEAR	$$/kWh RATES			SOLAR kWh	UTILITY SAVINGS	PPA COST	SAVINGS
	UTILITY	SOLAR PPA	MAINT.				
1	$0.135	$0.0365	$0	112,541	$15,232	($4,108)	$11,124
2	$0.138	$0.0371	$0	111,978	$15,489	($4,159)	$11,330
3	$0.141	$0.0378	$0	111,418	$15,751	($4,210)	$11,540
4	$0.144	$0.0384	$0	110,861	$16,017	($4,263)	$11,754
5	$0.148	$0.0391	$0	110,307	$16,287	($4,316)	$11,972
6	$0.151	$0.0398	$0	109,755	$16,562	($4,369)	$12,193
7	$0.154	$0.0405	$0	109,207	$16,842	($4,423)	$12,419
8	$0.158	$0.0412	$0	108,661	$17,127	($4,478)	$12,648
9	$0.161	$0.0419	$0	108,117	$17,416	($4,534)	$12,882
10	$0.165	$0.0427	$0	107,577	$17,710	($4,590)	$13,120
11	$0.168	$0.0434	$0	107,039	$18,009	($4,647)	$13,362
12	$0.172	$0.0442	$0	106,504	$18,313	($4,705)	$13,609
13	$0.176	$0.0449	$0	105,971	$18,623	($4,763)	$13,859
14	$0.180	$0.0457	$0	105,441	$18,937	($4,822)	$14,115
15	$0.184	$0.0465	$0	104,914	$19,257	($4,882)	$14,375
16	$0.188	$0.0473	$0	104,390	$19,582	($4,943)	$14,640
17	$0.192	$0.0482	$0	103,868	$19,913	($5,004)	$14,909
18	$0.196	$0.0490	$0	103,348	$20,249	($5,066)	$15,183
19	$0.200	$0.0499	$0	102,832	$20,591	($5,129)	$15,462
20	$0.205	$0.0508	$0	102,317	$20,939	($5,193)	$15,746

Transportation Building							
YEAR	$$/kWh RATES			SOLAR kWh	UTILITY SAVINGS	PPA COST	SAVINGS
	UTILITY	SOLAR PPA	MAINT.				
1	$0.113	$0.0365	$0	48,469	$5,457	($1,769)	$3,688
2	$0.115	$0.0371	$0	48,227	$5,549	($1,791)	$3,758
3	$0.118	$0.0378	$0	47,986	$5,643	($1,813)	$3,829
4	$0.120	$0.0384	$0	47,746	$5,738	($1,836)	$3,902
5	$0.123	$0.0391	$0	47,507	$5,835	($1,859)	$3,976
6	$0.126	$0.0398	$0	47,270	$5,934	($1,882)	$4,052
7	$0.128	$0.0405	$0	47,033	$6,034	($1,905)	$4,129
8	$0.131	$0.0412	$0	46,798	$6,136	($1,929)	$4,207
9	$0.134	$0.0419	$0	46,564	$6,239	($1,953)	$4,287
10	$0.137	$0.0427	$0	46,331	$6,345	($1,977)	$4,368
11	$0.140	$0.0434	$0	46,100	$6,452	($2,001)	$4,450
12	$0.143	$0.0442	$0	45,869	$6,561	($2,026)	$4,535
13	$0.146	$0.0449	$0	45,640	$6,672	($2,051)	$4,620
14	$0.149	$0.0457	$0	45,412	$6,784	($2,077)	$4,707
15	$0.153	$0.0465	$0	45,185	$6,899	($2,103)	$4,796
16	$0.156	$0.0473	$0	44,959	$7,015	($2,129)	$4,887
17	$0.159	$0.0482	$0	44,734	$7,134	($2,155)	$4,979
18	$0.163	$0.0490	$0	44,510	$7,254	($2,182)	$5,073
19	$0.167	$0.0499	$0	44,288	$7,377	($2,209)	$5,168
20	$0.170	$0.0508	$0	44,066	$7,502	($2,236)	$5,265

Maintenance Garage							
YEAR	$$/kWh RATES			SOLAR kWh	UTILITY SAVINGS	PPA COST	SAVINGS
	UTILITY	SOLAR PPA	MAINT.				
1	$0.135	$0.0365	$0	8,984	$1,212	($328)	$884
2	$0.138	$0.0371	$0	8,939	$1,233	($332)	$901
3	$0.141	$0.0378	$0	8,894	$1,254	($336)	$918
4	$0.144	$0.0384	$0	8,850	$1,275	($340)	$935
5	$0.147	$0.0391	$0	8,805	$1,296	($344)	$952
6	$0.150	$0.0398	$0	8,761	$1,318	($349)	$969
7	$0.154	$0.0405	$0	8,718	$1,340	($353)	$987
8	$0.157	$0.0412	$0	8,674	$1,363	($357)	$1,006
9	$0.161	$0.0419	$0	8,631	$1,386	($362)	$1,024
10	$0.164	$0.0427	$0	8,588	$1,410	($366)	$1,043
11	$0.168	$0.0434	$0	8,545	$1,433	($371)	$1,062
12	$0.171	$0.0442	$0	8,502	$1,458	($376)	$1,082
13	$0.175	$0.0449	$0	8,459	$1,482	($380)	$1,102
14	$0.179	$0.0457	$0	8,417	$1,507	($385)	$1,122
15	$0.183	$0.0465	$0	8,375	$1,533	($390)	$1,143
16	$0.187	$0.0473	$0	8,333	$1,559	($395)	$1,164
17	$0.191	$0.0482	$0	8,291	$1,585	($399)	$1,185
18	$0.195	$0.0490	$0	8,250	$1,612	($404)	$1,207
19	$0.200	$0.0499	$0	8,209	$1,639	($409)	$1,229
20	$0.204	$0.0508	$0	8,168	$1,667	($415)	$1,252

ECM 15 – Combined Heat & Power

Background & Existing Conditions

CHP offers energy and environmental benefits over electric-only and thermal-only systems in both central and distributed power generation applications. CHP systems have the potential for a wide range of applications and the higher efficiencies result in lower emissions than separate heat and power generation.

The simultaneous production of useful thermal and electrical energy in CHP systems lead to increased fuel efficiency. CHP units can be strategically located at the point of energy use. Such onsite generation avoids the transmission and distribution losses associated with electricity purchased via the grid from central stations. CHP is versatile and can be coupled with existing and planned technologies for many different applications in the industrial, commercial, and residential sectors.

The CHP will act as supplemental heating for the hot water boiler plant and domestic hot water loop. McAuliffe Middle School and Crawford Rodriguez Elementary School both run their boilers over the summer for dehumidification re-heat. The proposed building automation system will not re-heat the buildings when they are unoccupied. The CHPs will run at full load for over 6,000. The CHPs will shut off when there isn't adequate heating load for combined heating and power. If necessary, heat can be rejected through a radiator when the full heating load is not required - approximately 2,000 hours per year during May-October.

ECM Calculations

McAuliffe Middle School

Assumptions		
2 weeks w/o natural gas	0	hrs in December & January
% Maintenance downtime	5%	
Downtime for maintenance	438	hrs spread throughout year

CHP Input Data		
Number of units	1	
Electrical output	35	kW
Thermal output	204,040	BTU/hr
Gas input (HHV)	407,144	Btu/hr
Overall efficiency	79.4%	

Runtime Analysis	
Run hours	6,234
Full load heat and electric hours	6,234
% Boiler load displaced by CHP	46%
% Heat dump	25%
Run CHP 24/7 with Heat Dump?	N

		Fuel Usage Without CHP				
Month	Days	Total Gas - Post ECMs (Re-heat Load reduced by 50% May-Sept)	Proposed Boiler Efficiency	Non-Displaceable RTU Gas Therms	Displaceable Gas Therms	Displaceable Heat Therms
May	31	571	87%	131	440	383
Jun	30	928	87%	73	855	744
Jul	31	925	87%	76	849	739
Aug	31	916	87%	81	835	726
Sep	30	967	87%	81	885	770
Oct	31	1,240	87%	162	1,078	938
Nov	30	2,697	87%	417	2,280	1,983
Dec	31	6,313	87%	979	5,334	4,641
Jan	31	8,207	87%	1,273	6,934	6,032
Feb	28	6,600	87%	1,017	5,583	4,857
Mar	31	4,922	87%	762	4,160	3,619
Apr	30	2,970	87%	448	2,522	2,194
Total:	**365**	**37,255**		**5,500**	**31,755**	**27,627**

		35 kW Cogen Plant Thermal Operation									
Month	Days	Combined Cogen Run Hours	Max Daily Run Hours w/ Heat Dump	Cogen Dump Hours	Total Cogen Hours w/ Heat Dump	Utilized Cogen Heat Therms	Dumped Cogen Heat Therms	Max Cogen Heat Therms	Avoided Boiler Gas Therms	Full Load Run Hours	System Operating Efficiency
May	31	188	22.8	519	707	383	1,059	1,442	440	188	79%
Jun	30	364	22.8	320	684	744	652	1,396	855	364	79%
Jul	31	362	22.8	345	707	739	703	1,442	849	362	79%
Aug	31	356	22.8	351	707	726	716	1,442	835	356	79%
Sep	30	377	22.8	307	684	770	626	1,396	885	377	79%
Oct	31	460	22.8	247	707	938	504	1,442	1,078	460	79%
Nov	30	684	22.8	0	684	1,396	0	1,396	1,604	684	79%
Dec	31	707	22.8	0	707	1,442	0	1,442	1,658	707	79%
Jan	31	707	22.8	0	707	1,442	0	1,442	1,658	707	79%
Feb	28	638	22.8	0	638	1,303	0	1,303	1,497	638	79%
Mar	31	707	22.8	0	707	1,442	0	1,442	1,658	707	79%
Apr	30	684	22.8	0	684	1,396	0	1,396	1,604	684	79%
Total:	365	6,234		2,088	8,322	12,720	4,260	16,980	14,621	6,234	79%

		Fuel Usage With CHP			Electric Savings With CHP			
Month	Days	Supplemental Boiler Gas Therms	Cogen Gas Therms	Total Gas	Run Hours	Avg Cogen Plant kW Output	kW Demand Savings	Cogen Electric Generation kWh
May	31	0	764	895	188	35	35	6,567
Jun	30	0	1,484	1,556	364	35	35	12,754
Jul	31	0	1,474	1,550	362	35	35	12,674
Aug	31	0	1,450	1,531	356	35	35	12,462
Sep	30	0	1,537	1,618	377	35	35	13,210
Oct	31	0	1,872	2,034	460	35	35	16,092
Nov	30	676	2,785	3,878	684	35	35	23,940
Dec	31	3,676	2,878	7,533	707	35	35	24,738
Jan	31	5,276	2,878	9,427	707	35	35	24,738
Feb	28	4,086	2,599	7,702	638	35	35	22,344
Mar	31	2,503	2,878	6,142	707	35	35	24,738
Apr	30	918	2,785	4,151	684	35	35	23,940
Total:	365	17,134	25,382	48,016	6,234		35	218,196

Crawford Rodriguez Elementary School

Assumptions		
2 weeks w/o natural gas	0	hrs in December & January
% Maintenance downtime	5%	
Downtime for maintenance	438	hrs spread throughout year

CHP Input Data		
Number of units	1	
Electrical output	35	kW
Thermal output	204,040	BTU/hr
Gas input (HHV)	407,144	BTU/hr
Overall efficiency	79.4%	

Runtime Analysis	
Run hours	6,419
Full load heat and electric hours	6,419
% Boiler load displaced by CHP	36%
% Heat dump w/ 24/7 Operation	23%
Run CHP 24/7 with Heat Dump?	N

		Fuel Usage Without CHP				
Month	Days	Total Gas - Post ECMs (Re-heat Load reduced by 50% May-Sept)	Proposed Boiler Efficiency	Non-Displaceable RTU Gas Therms	Displaceable Gas Therms	Displaceable Heat Therms
May	31	1,379	87%	28	1,351	1,175
Jun	30	671	87%	13	657	572
Jul	31	604	87%	12	592	515
Aug	31	571	87%	11	559	486
Sep	30	571	87%	11	560	487
Oct	31	2,245	87%	45	2,200	1,914
Nov	30	4,194	87%	84	4,110	3,576
Dec	31	6,782	87%	136	6,646	5,782
Jan	31	7,957	87%	159	7,798	6,784
Feb	28	6,879	87%	138	6,741	5,865
Mar	31	6,325	87%	127	6,199	5,393
Apr	30	4,703	87%	94	4,609	4,010
Total:	**365**	**42,880**		**858**	**42,022**	**36,559**

		35 kW Cogen Plant Thermal Operation									
Month	Days	Combined Cogen Run Hours	Max Daily Run Hours w/ Heat Dump	Cogen Dump Hours	Total Cogen Hours w/ Heat Dump	Utilized Cogen Heat Therms	Dumped Cogen Heat Therms	Max Cogen Heat Therms	Avoided Boiler Gas Therms	Full Load Run Hours	System Operating Efficiency
May	31	576	22.8	131	707	1,175	267	1,442	1,351	576	79%
Jun	30	280	22.8	404	684	572	824	1,396	657	280	79%
Jul	31	252	22.8	454	707	515	927	1,442	592	252	79%
Aug	31	238	22.8	468	707	486	956	1,442	559	238	79%
Sep	30	239	22.8	445	684	487	909	1,396	560	239	79%
Oct	31	707	22.8	0	707	1,442	0	1,442	1,658	707	79%
Nov	30	684	22.8	0	684	1,396	0	1,396	1,604	684	79%
Dec	31	707	22.8	0	707	1,442	0	1,442	1,658	707	79%
Jan	31	707	22.8	0	707	1,442	0	1,442	1,658	707	79%
Feb	28	638	22.8	0	638	1,303	0	1,303	1,497	638	79%
Mar	31	707	22.8	0	707	1,442	0	1,442	1,658	707	79%
Apr	30	684	22.8	0	684	1,396	0	1,396	1,604	684	79%
Total:	365	6,419		1,903	8,322	13,098	3,883	16,980	15,055	6,419	79%

		Fuel Usage With CHP			Electric Savings With CHP			
Month	Days	Supplemental Boiler Gas Therms	Cogen Gas Therms	Total Gas	Run Hours	Avg Cogen Plant kW Output	kW Demand Savings	Cogen Electric Generation kWh
May	31	0	2,345	2,373	576	35	35	20,161
Jun	30	0	1,141	1,154	280	35	35	9,806
Jul	31	0	1,028	1,040	252	35	35	8,834
Aug	31	0	971	982	238	35	35	8,344
Sep	30	0	971	983	239	35	35	8,351
Oct	31	542	2,878	3,465	707	35	35	24,738
Nov	30	2,506	2,785	5,375	684	35	35	23,940
Dec	31	4,989	2,878	8,002	707	35	35	24,738
Jan	31	6,140	2,878	9,177	707	35	35	24,738
Feb	28	5,244	2,599	7,981	638	35	35	22,344
Mar	31	4,541	2,878	7,545	707	35	35	24,738
Apr	30	3,005	2,785	5,884	684	35	35	23,940
Total:	365	26,967	26,135	53,960	6,419		35	224,671

ECM 16 – Energy Education

Since the inception of Energy Performance Contracting (EPC) and the Energy Savings Improvement Program (ESIP), school districts and other organizations have seen the need to not only educate faculty and staff but to educate students as well.

Since every school district's energy educational requirements differ, DCO Energy will work with the District to develop the educational criteria. DCO Energy has partnered with a number of organizations to achieve this goal. For example:

- The National Energy Foundation (NEF) - provides a comprehensive and results based energy efficiency program called THINK! ENERGY. Typically targeted at grades 2-8, this program gives students the knowledge and tools necessary to make a significant difference in electricity, natural gas and water usage in both their home, school and community. The NEF also provides informational material for energy conservation to all school districts during the year.
- Energy Action in Schools (EAIS), a member of the THINK! ENERGY family of programs, is designed to teach students how to save energy throughout their school. With the help of principals, teachers, custodians and other school administrators, students implement Energy Action Patrols that empower the students to monitor energy use in classrooms, and help educate others on energy-efficient behaviors.

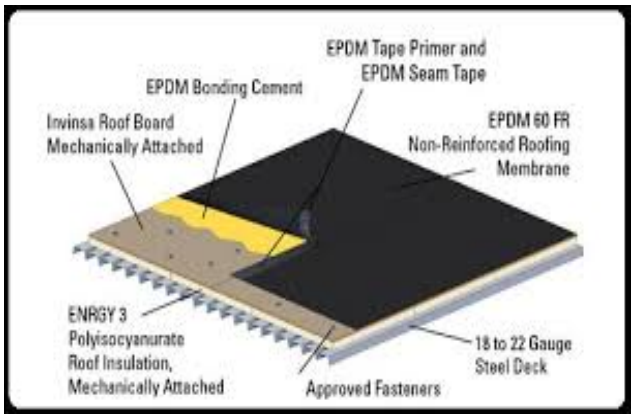
Funding for one year of energy education has been included in the project.

ECM 17 – Roof Replacement & Repairs

Background & Existing Conditions

Roof repairs are being evaluated in the ESIP project only where the existing roof systems do not have 15 years of warranty remaining and are being targeted for Solar PPA installation. By not including the roof repairs in the Solar PPA, the district will be assured the lowest possible PPA Rate.

EPDM is a synthetic rubber that covers the entirety of your roof, forming a durable membrane that keeps the elements on the outside where they belong. However, while there's no questioning its strength, you don't have to worry that an EPDM roofing system is going to add a dangerous amount of weight onto your structure. EPDM generally weighs about 1/3 a pound per square foot. Just about any building out there is a candidate for EPDM, thanks to how lightweight it is.



Scope of Work

See the following chart for the roofing scope of work. Roof sections and areas were identified using drawings provided by Tremco Roofing. The scope of work identifies the location of proposed solar. The District has requested that the entire roof section be replaced, regardless of whether only individual sections will have solar. Jackson Memorial High School has three distinct wings: Clayton, Fine Arts and Memorial. The current scope of work has solar and roof replacement for the Fine Arts wing only.

Roof Replacement Scope of Work

BUILDING	REPLACE? (Y/N)	CATEGORY	NOTES	QUANTITY (SF)
Jackson Memorial High School	N	Memorial - Section 1	Restoration	12,371
Jackson Memorial High School	N	Memorial - Section 2	Restoration	13,572
Jackson Memorial High School	N	Memorial - Section 3	Restoration	6,358
Jackson Memorial High School	N	Memorial - Section 4	Restoration	3,589
Jackson Memorial High School	N	Memorial - Section 5	Restoration	3,112
Jackson Memorial High School	N	Memorial - Section 6-New Solar	Restoration	1,313
Jackson Memorial High School	N	Memorial - Section 6-No Solar	Restoration	3,938
Jackson Memorial High School	N	Memorial - Section 7	Restoration	747
Jackson Memorial High School	N	Memorial - Section 8	Restoration	10,144
Jackson Memorial High School	N	Memorial - Section 9	Restoration	5,426
Jackson Memorial High School	N	Memorial - Section 10	Restoration	961
Jackson Memorial High School	N	Memorial - Section 11	Restoration	15,239
Jackson Memorial High School	N	Memorial - Section 12	Restoration	15,044
Jackson Memorial High School	N	Memorial - Section 13	Restoration	8,963
Jackson Memorial High School	N	Memorial - Section 14	Restoration	3,097
Jackson Memorial High School	N	Memorial - Section 15-New Solar	Restoration	829
Jackson Memorial High School	N	Memorial - Section 15-No Solar	Restoration	7,463
Jackson Memorial High School	Y	Fine Arts - Section 16	Restoration	18,491
Jackson Memorial High School	Y	Fine Arts - Section 17	Restoration	18,530
Jackson Memorial High School	Y	Fine Arts - Section 18	Restoration	3,405
Jackson Memorial High School	Y	Fine Arts - Section 19	Restoration	12,770
Jackson Memorial High School	Y	Fine Arts - Section 20	Restoration	7,360
Jackson Memorial High School	N	Clayton - Section 21	Restoration	3,589
Jackson Memorial High School	N	Clayton - Section 22	Restoration	20,191
Jackson Memorial High School	N	Clayton - Section 23	Restoration	9,557
Jackson Memorial High School	N	Clayton - Section 24-New Solar	Restoration	4,452
Jackson Memorial High School	N	Clayton - Section 24-No Solar	Restoration	4,451
Jackson Memorial High School	N	Clayton - Section 25	Restoration	2,108
Jackson Memorial High School	N	Clayton - Section 26-New Solar	Restoration	865
Jackson Memorial High School	N	Clayton - Section 26-No Solar	Restoration	7,788
Jackson Memorial High School	N	Clayton - Section 27	Restoration	4,526
Jackson Memorial High School	N	Clayton - Section 28- New Solar	Restoration	1,042
Jackson Memorial High School	N	Clayton - Section 28 - No Solar	Restoration	2,084
Jackson Memorial High School	N	Clayton - Section 29	Restoration	5,488
Jackson Memorial High School	N	Clayton - Section 30 - New Solar	Restoration	1,101
Jackson Memorial High School	N	Clayton - Section 30 - No Solar	Restoration	2,202
Jackson Memorial High School	N	Clayton - Section 31	Restoration	14,282
Jackson Memorial High School	N	Clayton - Section 32	Restoration	14,847
Jackson Memorial High School	N	Clayton - Section 33	Restoration	13,840
Jackson Memorial High School	N	Clayton - Section 34	Restoration	401
Christa McAuliffe Middle School	Y	Section 1	Restoration	328
Christa McAuliffe Middle School	Y	Section 2	Restoration	328
Christa McAuliffe Middle School	Y	Section 3	Restoration	7,721
Christa McAuliffe Middle School	Y	Section 4	Restoration	13,557
Christa McAuliffe Middle School	Y	Section 5	Restoration	615
Christa McAuliffe Middle School	Y	Section 6	Restoration	615
Christa McAuliffe Middle School	Y	Section 7	Restoration	307
Christa McAuliffe Middle School	Y	Section 8	Restoration	307
Christa McAuliffe Middle School	Y	Section 9	Restoration	7,746
Christa McAuliffe Middle School	Y	Section 10	Restoration	5,080
Christa McAuliffe Middle School	Y	Section 11	Restoration	555
Christa McAuliffe Middle School	Y	Section 12	Restoration	555
Christa McAuliffe Middle School	Y	Section 13	Restoration	15,586
Christa McAuliffe Middle School	Y	Section 14	Restoration	13,034
Christa McAuliffe Middle School	Y	Section 15	Restoration	4,695
Christa McAuliffe Middle School	Y	Section 16- New Solar	Restoration	1,520
Christa McAuliffe Middle School	Y	Section 16 - No Solar	Restoration	4,561
Christa McAuliffe Middle School	Y	Section 17	Restoration	5,430

Roof Replacement Scope of Work

BUILDING	REPLACE? (Y/N)	CATEGORY	NOTES	QUANTITY (SF)
Goetz Middle School	Y	Section 1	Retrofit	3,429
Goetz Middle School	Y	Section 2	Retrofit	4,092
Goetz Middle School	Y	Section 3	Retrofit	1,838
Goetz Middle School	Y	Section 4	Retrofit	3,716
Goetz Middle School	Y	Section 5	Retrofit	8,677
Goetz Middle School	Y	Section 6	Retrofit	2,091
Goetz Middle School	Y	Section 7	Retrofit	17,133
Goetz Middle School	Y	Section 8	Retrofit	1,529
Goetz Middle School	Y	Section 9	Retrofit	24,982
Goetz Middle School	Y	Section 10	Retrofit	2,021
Goetz Middle School	Y	Section 11	Retrofit	27,308
Goetz Middle School	Y	Section 12	Retrofit	7,395
Goetz Middle School	Y	Section 13	Retrofit	900
Goetz Middle School	Y	Section 14	Retrofit	3,586
Goetz Middle School	Y	Section 15	Retrofit	5,218
Goetz Middle School	Y	Section 16	Retrofit	4,323
Goetz Middle School	Y	Section 17	Retrofit	1,042
Goetz Middle School	Y	Section 18	Retrofit	5,430
Goetz Middle School	Y	Section 19	Retrofit	812
Goetz Middle School	Y	Section 20	Retrofit	2,199
Crawford Rodriguez Elementary School	Y	Section 1	Retrofit	8,787
Crawford Rodriguez Elementary School	Y	Section 2	Re-shingle	5,055
Crawford Rodriguez Elementary School	Y	Section 3	Re-shingle	1,466
Crawford Rodriguez Elementary School	Y	Section 4	Re-shingle	5,052
Crawford Rodriguez Elementary School	Y	Section 5	Re-shingle	392
Crawford Rodriguez Elementary School	Y	Section 6	Re-shingle	392
Crawford Rodriguez Elementary School	Y	Section 7	Re-shingle	3,359
Crawford Rodriguez Elementary School	Y	Section 8	Re-shingle	528
Crawford Rodriguez Elementary School	Y	Section 9	Re-shingle	2,458
Crawford Rodriguez Elementary School	Y	Section 10	Re-shingle	4,225
Crawford Rodriguez Elementary School	Y	Section 11	Re-shingle	5,818
Crawford Rodriguez Elementary School	Y	Section 12	Re-shingle	4,079
Crawford Rodriguez Elementary School	Y	Section 13	Re-shingle	3,351
Crawford Rodriguez Elementary School	Y	Section 14	Re-shingle	3,264
Crawford Rodriguez Elementary School	Y	Section 15	Re-shingle	2,659
Crawford Rodriguez Elementary School	Y	Section 16	Re-shingle	1,999
Crawford Rodriguez Elementary School	Y	Section 17	Re-shingle	4,313
Crawford Rodriguez Elementary School	Y	Section 18	Re-shingle	3,315
Crawford Rodriguez Elementary School	Y	Section 19	Re-shingle	1,727
Crawford Rodriguez Elementary School	Y	Section 20	Re-shingle	6,987
Crawford Rodriguez Elementary School	Y	Section 21	Re-shingle	4,659
Crawford Rodriguez Elementary School	Y	Section 22	Re-shingle	3,730
Crawford Rodriguez Elementary School	Y	Section 23	Re-shingle	1,821
Switlik Elementary School	Y	Section 1	Restoration	8,115
Switlik Elementary School	Y	Section 2	Restoration	2,106
Switlik Elementary School	Y	Section 3	Restoration	2,539
Switlik Elementary School	Y	Section 4	Restoration	9,594
Switlik Elementary School	Y	Section 5	Restoration	2,628
Switlik Elementary School	Y	Section 6	Restoration	20,389
Switlik Elementary School	Y	Section 7	Restoration	1,239
Switlik Elementary School	Y	Section 8	Restoration	5,143
Switlik Elementary School	Y	Section 9	Restoration	2,329
Switlik Elementary School	Y	Section 10	Restoration	2,329
Switlik Elementary School	Y	Section 11	Restoration	612
Switlik Elementary School	Y	Section 12	Restoration	664
Switlik Elementary School	Y	Section 13	Restoration	6,171
Switlik Elementary School	Y	Section 14	Restoration	2,252
Switlik Elementary School	Y	Section 15	Restoration	2,252

Roof Replacement Scope of Work

BUILDING	REPLACE? (Y/N)	CATEGORY	NOTES	QUANTITY (SF)
Holman Elementary School	Y	Section 1	Retrofit	7,316
Holman Elementary School	Y	Section 2	Retrofit	9,756
Holman Elementary School	Y	Section 3	Retrofit	1,959
Holman Elementary School	Y	Section 4	Retrofit	848
Holman Elementary School	Y	Section 5	Retrofit	663
Holman Elementary School	Y	Section 6	Retrofit	557
Holman Elementary School	Y	Section 7	Retrofit	615
Holman Elementary School	Y	Section 8	Retrofit	700
Holman Elementary School	Y	Section 9	Retrofit	700
Holman Elementary School	Y	Section 10	Retrofit	700
Holman Elementary School	Y	Section 11	Retrofit	2,123
Holman Elementary School	Y	Section 12	Retrofit	3,660
Holman Elementary School	Y	Section 13	Retrofit	3,046
Holman Elementary School	Y	Section 14	Retrofit	795
Holman Elementary School	Y	Section 15	Retrofit	1,988
Holman Elementary School	Y	Section 16	Retrofit	8,836
Holman Elementary School	Y	Section 17	Retrofit	7,429
Holman Elementary School	Y	Section 18	Retrofit	845
Holman Elementary School	Y	Section 19	Retrofit	2,214
Holman Elementary School	Y	Section 20	Retrofit	7,949
Holman Elementary School	Y	Section 21	Retrofit	1,080
Johnson Elementary School	Y	Section 1	Retrofit	1,934
Johnson Elementary School	Y	Section 2 - New Solar	Retrofit	6,851
Johnson Elementary School	Y	Section 2 - No Solar	Retrofit	6,850
Johnson Elementary School	Y	Section 3	Retrofit	9,752
Johnson Elementary School	Y	Section 4	Retrofit	795
Johnson Elementary School	Y	Section 5	Retrofit	765
Johnson Elementary School	Y	Section 6	Retrofit	702
Johnson Elementary School	Y	Section 7	Retrofit	868
Johnson Elementary School	Y	Section 8	Retrofit	5,684
Johnson Elementary School	Y	Section 9	Retrofit	2,794
Johnson Elementary School	Y	Section 10	Retrofit	3,329
Johnson Elementary School	Y	Section 11	Retrofit	2,501
Johnson Elementary School	Y	Section 12	Retrofit	802
Johnson Elementary School	Y	Section 13	Retrofit	10,739
Rosenauer Elementary School	Y	Section 1 - New Solar	Restoration	12,470
Rosenauer Elementary School	Y	Section 1 - No Solar	Restoration	12,471
Rosenauer Elementary School	Y	Section 2	Restoration	2,343
Rosenauer Elementary School	Y	Section 3	Restoration	1,783
Rosenauer Elementary School	Y	Section 4	Restoration	1,783
Rosenauer Elementary School	Y	Section 5	Restoration	1,444
Rosenauer Elementary School	Y	Section 6	Restoration	321
Rosenauer Elementary School	Y	Section 7	Restoration	321
Rosenauer Elementary School	Y	Section 8	Restoration	952
Rosenauer Elementary School	Y	Section 9	Restoration	952
Administration Building	Y	All Sections - 2000	Coating	10,200

ECM Calculations

Energy savings from roof restoration were modeled using eQuest. Wet insulation will be replaced as part of the roofing restoration. The roof R value was increased by 5 in the eQuest models to account for the new insulation. The entire roof was modeled with this improved R value. The savings below only account for the percentage of roof being replaced.

ENERGY MODELING OUTPUTS

Roof Restoration Savings

BUILDING	SQFT	MODEL % ELECTRIC SAVINGS	% ROOF AREA REPLACED	kWh SAVINGS	MODEL % DEMAND SAVINGS	kW SAVINGS	MODEL % THERM SAVINGS	THERM SAVINGS
Jackson Liberty High School	300,000		82%	48,251		0		802
Jackson Memorial High School	306,000	0.4%	21%	3,595	0.6%	8	6.3%	660
Christa McAuliffe Middle School	130,000	0.4%	100%	5,774	0.5%	3	3.1%	1,800
Elms Elementary School	130,000	1.3%	100%	24,026	0.8%	4	0.0%	0
Goetz Middle School	126,081	0.8%	100%	15,222	1.2%	7	3.0%	2,161
Crawford Rodriguez Elementary School	107,400	0.03%	100%	443	0	0	2.0%	1,608
Switlik Elementary School	72,077	1.3%	100%	15,451	3.5%	10	4.1%	628
Holman Elementary School	56,280	2.6%	100%	26,025	2.5%	7	0.0%	0
Johnson Elementary School	55,452	3.0%	100%	20,449	2.3%	5	0.0%	0
Rosenauer Elementary School	34,128	0.2%	100%	513	0	0	2.6%	517
Administration Building	10,200		100%	3,137				0

DCO Energy Efficiency Division
100 Lenox Drive
Lawrenceville, NJ 08648

CALCULATED SAVINGS

Roof Refurbishment Savings

BUILDING	ROOF DESCRIPTION / AGE (20 Year Warranty)	ROOF SQFT	R VALUE (BEFORE)	U VALUE (BEFORE)	R VALUE (AFTER)	U VALUE (AFTER)	ANNUAL HEATING DEGREE DAYS	AVERAGE ANNUAL HEATING DELTA T	Q BEFORE (BTUH)	Q AFTER (BTUH)	BTUH SAVINGS	ANNUAL HEATING SAVINGS (BTU)	GAS HEATING EFFICIENCY (%AFUE)	TOTAL HEATING SAVINGS (Therms)	ELECTRIC HEATING EFFICIENCY (COP)	TOTAL HEATING SAVINGS (kWh)
Jackson Liberty High School	Section 1- Without Panels	18,448	15	0.067	20	0.050	2,783	12.6	15,527	11,645	3,882	34,003,354			3.50	2,847
Jackson Liberty High School	Section 2	1,042	15	0.067	20	0.050	2,783	12.6	877	658	219	1,920,614			3.50	161
Jackson Liberty High School	Section 3	3,024	15	0.067	20	0.050	2,783	12.6	2,545	1,909	636	5,573,837			3.50	467
Jackson Liberty High School	Section 4	4,660	15	0.067	20	0.050	2,783	12.6	3,922	2,942	981	8,589,312			3.50	719
Jackson Liberty High School	Section 5	1,042	15	0.067	20	0.050	2,783	12.6	877	658	219	1,920,614			3.50	161
Jackson Liberty High School	Section 6-Without Panels	1,544	15	0.067	20	0.050	2,783	12.6	1,299	975	325	2,845,901			3.50	238
Jackson Liberty High School	Section 7	2,414	15	0.067	20	0.050	2,783	12.6	2,032	1,524	508	4,449,485			3.50	373
Jackson Liberty High School	Section 8	32,045	15	0.067	20	0.050	2,783	12.6	26,970	20,228	6,743	59,065,344			3.50	4,946
Jackson Liberty High School	Section 9	6,555	15	0.067	20	0.050	2,783	12.6	5,517	4,138	1,379	12,082,176			3.50	1,012
Jackson Liberty High School	Section 10	2,819	15	0.067	20	0.050	2,783	12.6	2,373	1,779	593	5,195,981			3.50	435
Jackson Liberty High School	Section 11	874	15	0.067	20	0.050	2,783	12.6	736	552	184	1,610,957			3.50	135
Jackson Liberty High School	Section 12-New Solar	2,582	15	0.067	20	0.050	2,783	12.6	2,173	1,630	543	4,759,142			3.50	399
Jackson Liberty High School	Section 12- No Solar	7,746	15	0.067	20	0.050	2,783	12.6	6,519	4,890	1,630	14,277,427			3.50	1,196
Jackson Liberty High School	Section 13	15,526	15	0.067	20	0.050	2,783	12.6	13,067	9,801	3,267	28,617,523			3.50	2,396
Jackson Liberty High School	Section 14	24,793	15	0.067	20	0.050	2,783	12.6	20,867	15,650	5,217	45,698,458			3.50	3,827
Jackson Liberty High School	Section 15	2,642	15	0.067	20	0.050	2,783	12.6	2,224	1,668	556	4,869,734			3.50	408
Jackson Liberty High School	Section 16	678	15	0.067	20	0.050	2,783	12.6	571	428	143	1,249,690			3.50	105
Jackson Liberty High School	Section 17	9,154	15	0.067	20	0.050	2,783	12.6	7,704	5,778	1,926	16,872,653	80%	211		
Jackson Liberty High School	Section 18	4,617	15	0.067	20	0.050	2,783	12.6	3,886	2,914	971	8,510,054			3.50	713
Jackson Liberty High School	Section 19	4,182	15	0.067	20	0.050	2,783	12.6	3,520	2,640	880	7,708,262			3.50	645
Jackson Liberty High School	Section 20	8,753	15	0.067	20	0.050	2,783	12.6	7,367	5,525	1,842	16,133,530			3.50	1,351
Jackson Liberty High School	Section 21	17,485	15	0.067	20	0.050	2,783	12.6	14,716	11,037	3,679	32,228,352	80%	403		
Jackson Liberty High School	Section 22	8,175	15	0.067	20	0.050	2,783	12.6	6,880	5,160	1,720	15,068,160	80%	188		
Jackson Liberty High School	Section 23	435	15	0.067	20	0.050	2,783	12.6	366	275	92	801,792			3.50	67
Jackson Liberty High School	Section 24	4,284	15	0.067	20	0.050	2,783	12.6	3,606	2,704	901	7,896,269			3.50	661
Jackson Liberty High School	Section 25	13,620	15	0.067	20	0.050	2,783	12.6	11,463	8,597	2,866	25,104,384			3.50	2,102
Administration Building	All Sections - 2000	10,200	15	0.067	20	0.050	2,783	12.6	8,585	6,439	2,146	18,800,640		0	3.50	1,574

BUILDING	ROOF DESCRIPTION / AGE (20 Year Warranty)	ANNUAL COOLING DEGREE DAYS	AVERAGE ANNUAL COOLING DELTA T	Q BEFORE (BTUH)	Q AFTER (BTUH)	BTUH COOLING SAVINGS	ANNUAL COOLING SAVINGS (BTU)	COOLING EFFICIENCY (EER - BTU/Wh)	COOLING SAVINGS (kWh)	HOURS	TOTAL ELECTRIC SAVINGS (kWh)	TOTAL GAS SAVINGS (THERMS)
Jackson Liberty High School	Section 1- Without Panels	893	9.4	11,618	8,714	2,905	25,443,482	12.0	2,120	8,760	4,968	0
Jackson Liberty High School	Section 2	893	9.4	656	492	164	1,437,126	12.0	120	8,760	281	0
Jackson Liberty High School	Section 3	893	9.4	1,904	1,428	476	4,170,701	12.0	348	8,760	814	0
Jackson Liberty High School	Section 4	893	9.4	2,935	2,201	734	6,427,072	12.0	536	8,760	1,255	0
Jackson Liberty High School	Section 5	893	9.4	656	492	164	1,437,126	12.0	120	8,760	281	0
Jackson Liberty High School	Section 6-Without Panels	893	9.4	972	729	243	2,129,485	12.0	177	8,760	416	0
Jackson Liberty High School	Section 7	893	9.4	1,520	1,140	380	3,329,389	12.0	277	8,760	650	0
Jackson Liberty High School	Section 8	893	9.4	20,181	15,136	5,045	44,196,464	12.0	3,683	8,760	8,629	0
Jackson Liberty High School	Section 9	893	9.4	4,128	3,096	1,032	9,040,656	12.0	753	8,760	1,765	0
Jackson Liberty High School	Section 10	893	9.4	1,775	1,331	444	3,887,965	12.0	324	8,760	759	0
Jackson Liberty High School	Section 11	893	9.4	550	413	138	1,205,421	12.0	100	8,760	235	0
Jackson Liberty High School	Section 12-New Solar	893	9.4	1,626	1,220	407	3,561,094	12.0	297	8,760	695	0
Jackson Liberty High School	Section 12- No Solar	893	9.4	4,878	3,659	1,220	10,683,283	12.0	890	8,760	2,086	0
Jackson Liberty High School	Section 13	893	9.4	9,778	7,333	2,444	21,413,459	12.0	1,784	8,760	4,181	0
Jackson Liberty High School	Section 14	893	9.4	15,614	11,710	3,903	34,194,506	12.0	2,850	8,760	6,676	0
Jackson Liberty High School	Section 15	893	9.4	1,664	1,248	416	3,643,846	12.0	304	8,760	711	0
Jackson Liberty High School	Section 16	893	9.4	427	320	107	935,098	12.0	78	8,760	183	0
Jackson Liberty High School	Section 17	893	9.4	5,765	4,324	1,441	12,625,197	12.0	1,052	8,760	1,052	211
Jackson Liberty High School	Section 18	893	9.4	2,908	2,181	727	6,367,766	12.0	531	8,760	1,243	0
Jackson Liberty High School	Section 19	893	9.4	2,634	1,975	658	5,767,814	12.0	481	8,760	1,126	0
Jackson Liberty High School	Section 20	893	9.4	5,512	4,134	1,378	12,072,138	12.0	1,006	8,760	2,357	0
Jackson Liberty High School	Section 21	893	9.4	11,012	8,259	2,753	24,115,312	12.0	2,010	8,760	2,010	403
Jackson Liberty High School	Section 22	893	9.4	5,148	3,861	1,287	11,274,960	12.0	940	8,760	940	188
Jackson Liberty High School	Section 23	893	9.4	274	205	68	599,952	12.0	50	8,760	117	0
Jackson Liberty High School	Section 24	893	9.4	2,698	2,023	674	5,908,493	12.0	492	8,760	1,154	0
Jackson Liberty High School	Section 25	893	9.4	8,577	6,433	2,144	18,784,704	12.0	1,565	8,760	3,668	0
Administration Building	All Sections - 2000	893	9.4	6,424	4,818	1,606	14,067,840	9.0	1,563	8,760	3,137	0

$$q_{bd} = U \times A \times \Delta t_{bd} \text{ (Btu/h)}$$

ECM 18 – Window Replacement

Background & Existing Conditions

A study performed by the Building Science Corporation estimates energy savings up to 10% by improving windows. The seals around windows fail over time allowing infiltration of unconditioned outside air or unwanted release of indoor air which increases the heating and cooling load. This measure calls for the replacement of all exterior weathering stripping and air seals.

Windows can be a significant source of air leakage and heat loss as they account for 18% of wall area in most buildings. The linear footage of gap and wind speed is used to estimate the infiltration rate, which is then multiplied by the BIN weather data and the equipment efficiencies to determine the annual energy savings.

The following windows will be replaced with high efficiency windows:

Window Replacement Scope of Work

BUILDING	CATEGORY	NOTES	QUANTITY
Goetz Middle School	Exterior	36"x72"	157
Holman Elementary School	Exterior	36"x72"	148
Johnson Elementary School	Exterior	36"x72"	134

Existing windows at Goetz Middle School

ECM Calculations

Energy savings from window replacement were modeled using eQuest. The new windows were modeled as double pane with window tinting.

ENERGY MODELING OUTPUTS

Window Replacement Savings

BUILDING	MODEL % ELECTRIC SAVINGS	kWh SAVINGS	MODEL % DEMAND SAVINGS	kW SAVINGS	MODEL % THERM SAVINGS	THERMS SAVINGS
Goetz Middle School	0.22%	4,229	0.5%	3	-0.1%	(73)
Holman Elementary School	2.7%	27,417	4.4%	12	0.0%	0
Johnson Elementary School	3.8%	25,478	5.1%	12	0.0%	0

Optional ECMs 19 - 22

ECM-19 Paving Upgrade

A paving upgrade was identified by Jackson Township Board of Education for specific locations across the district. One specific location includes the student access road at Jackson Memorial High School.

Buildings Evaluated

Jackson Memorial High School, Christa McAuliffe Middle School, Goetz Middle School and Rosenauer Elementary School

ECM-20 Intercom System Upgrade

An intercom system upgrade was identified by Jackson Township Board of Education for specific locations across the district.

Buildings Evaluated

Christa McAuliffe Middle School, Goetz Middle School, Switlik Elementary School, Holman Elementary School and Rosenauer Elementary School

ECM-21 Tennis Court Upgrade

A tennis court upgrade was identified by Jackson Township Board of Education for one specific location across the district.

Buildings Evaluated

Jackson Memorial High School

ECM-22 Running Track Upgrade

A running track upgrade was identified by Jackson Township Board of Education for one specific location across the district.

Buildings Evaluated

Jackson Liberty High School

ENERGY SAVINGS PLAN

SECTION 4 – FINANCIAL ANALYSIS

Form V – ESCO Construction and Service Fees

FORM V		
ESCO's ENERGY SAVINGS PLAN (ESP): ESCOs PROPOSED FINAL PROJECT COST FORM JACKSON TOWNSHIP BOARD OF EDUCATION ENERGY SAVING IMPROVEMENT PROGRAM		
ESCO Name: DCO Energy PROPOSED CONSTRUCTION FEES:		
Fee Category	**Fees [1] Dollar ($) Value**	**Percentage of Hard Costs**
Estimated Value of Hard Costs [2]	$ 20,265,083	N/A
ECM Contingency (5%)	$ 1,013,254	
Total Value of Hard Costs	$ 21,278,337	
Project Service Fees		
Investment Grade Energy Audit	$ 319,175	1.50%
Design Engineering Fees	$ 1,276,700	6.00%
Construction Management & Project Administration	$ 1,442,671	6.78%
System Commissioning	$ 212,783	1.00%
Equipment Initial Training Fees	$ 63,835	0.30%
ESCO Overhead	$ 638,350	3.00%
ESCO Profit	$ 851,133	4.00%
Project Service Fees Sub Total	$ 3,315,165	15.58%
TOTAL FINANCED PROJECT COSTS:	$ 26,082,986	22.58%
PROPOSED ANNUAL SERVICE FEES		
First Year Annual Service Fees	**Fees [1] Dollar ($) Value**	**Percentage of Hard Costs**
SAVINGS GUARANTEE *(OPTION)*	$0	0.00%
Measurement & Verification *(Associated w/ Savings Guarantee Option)*	$80,858	0.38%
ENERGY STAR Services *(optional)*	$0	0.00%
Post Construction Services *(if applicable)*	$0	0.00%
Performance Monitoring	w/ M&V	0.00%
On-going Training Services	w/ M&V	0.00%
Verification Reports	w/ M&V	0.00%
TOTAL FIRST YEAR ANNUAL SERVICES	$0	0.00%

NOTES:
(1) Fees should include all mark-ups, overhead, and profit. Figures stated as a range will NOT be accepted.
(2) The total value of Hard Costs is defined in accordance with standard AIA definitions that include: Labor Costs, Subcontractor Costs, Cost of Materials and Equipment, Temporary Facilities and Related Items, and Miscellaneous Costs such as Permits, Bonds Taxes, Insurance, Mark-ups, Overhead and Profit, etc.

DCO Energy Efficiency Division
100 Lenox Drive
Lawrenceville, NJ 08648

Form VI – Project Cash Flow Analysis

FORM VI

ESCO's ENERGY SAVINGS PLAN (ESP):
ESCO's ANNUAL CASH FLOW ANALYSIS FORM
JACKSON TOWNSHIP BOARD OF EDUCATION - ENERGY SAVING IMPROVEMENT PROGRAM

ESCO Name: DCO Energy

Note: Respondents must use the following assumptions in all financial calculations:
(a) The cost of all types of energy should be assumed to inflate at **2.4% gas, 2.2%** electric per year and
1. Term of Agreement: 20 years
2. Construction Period [2] (months): 12 Months
3. Cash Flow Analysis Format:

Additional Fees	
Cost of Issuance	$40,000
3rd Party Review	$200,000
Consultant	$8,000
Total	$248,000

Project Cost[1]:	**$26,082,986**
Direct Install Incentive Payment:	**-$111,844**
Additional Fees:	**$248,000**
Financed Amount:	**$26,219,142**

Interest Rate: **2.20%**

Year	Annual Energy Savings	Solar PPA Savings	Annual Operational Savings	Energy Rebates / Incentives	Total Annual Savings	Annual Project Costs	Board Costs	Annual Service Costs[3]	Net Cash-Flow to Client	Cumulative Cash Flow
Installation										
Year 1	$ 1,107,823	$ 180,103	$ 33,306	$ 689,459	$ 2,010,691	$ (1,810,818)			$ 199,873	$ 199,873
Year 2	$ 934,622	$ 369,961	$ 34,072	$ 582,440	$ 1,921,095	$ (1,819,670)			$ 101,425	$ 301,298
Year 3	$ 955,448	$ 379,953	$ 34,856	$ -	$ 1,370,257	$ (1,356,730)			$ 13,527	$ 314,825
Year 4	$ 976,738	$ 390,189	$ 35,657	$ -	$ 1,402,584	$ (1,388,360)			$ 14,224	$ 329,049
Year 5	$ 998,503	$ 400,673	$ 36,477		$ 1,435,653	$ (1,418,890)			$ 16,763	$ 345,812
Year 6	$ 1,020,753	$ 411,411			$ 1,432,164	$ (1,418,320)			$ 13,844	$ 359,656
Year 7	$ 1,043,500	$ 422,409			$ 1,465,909	$ (1,452,310)			$ 13,599	$ 373,254
Year 8	$ 1,066,754	$ 433,673			$ 1,500,427	$ (1,485,090)			$ 15,337	$ 388,591
Year 9	$ 1,090,526	$ 445,210			$ 1,535,736	$ (1,521,660)			$ 14,076	$ 402,668
Year 10	$ 1,114,829	$ 457,025			$ 1,571,855	$ (1,556,910)			$ 14,945	$ 417,612
Year 11	$ 1,139,674	$ 469,126			$ 1,608,800	$ (1,595,840)			$ 12,960	$ 430,572
Year 12	$ 1,165,074	$ 481,518			$ 1,646,591	$ (1,633,340)			$ 13,251	$ 443,824
Year 13	$ 1,191,040	$ 494,208			$ 1,685,247	$ (1,669,410)			$ 15,837	$ 459,661
Year 14	$ 1,217,585	$ 507,203			$ 1,724,788	$ (1,709,050)			$ 15,738	$ 475,399
Year 15	$ 1,244,722	$ 520,511			$ 1,765,233	$ (1,752,150)			$ 13,083	$ 488,483
Year 16	$ 1,272,465	$ 534,138			$ 1,806,603	$ (1,793,600)			$ 13,003	$ 501,486
Year 17	$ 1,300,827	$ 548,092			$ 1,848,919	$ (1,833,400)			$ 15,519	$ 517,005
Year 18	$ 1,329,822	$ 562,380			$ 1,892,202	$ (1,881,550)			$ 10,652	$ 527,657
Year 19	$ 1,359,463	$ 577,011			$ 1,936,474	$ (1,922,830)			$ 13,644	$ 541,301
Year 20	$ 1,389,766	$ 591,991			$ 1,981,757	$ (1,967,350)			$ 14,407	$ 555,708
Totals	$ 22,919,934	$ 9,176,784	$ 174,369	$ 1,271,899	$ 33,542,986	$ (32,987,278)	$ -	$ -	$ 555,708	

NOTES:
(1) Includes: Hard costs and project service fees defined in ESCO's PROPOSED "FORM V"
(2) No payments are made by Jackson Township Board of Education during the construction period.
(3) This figure should equal the value indicated on the ESCO's PROPOSED "FORM V". DO NOT include in the Financed Project Cost.

Utility Inflation Details

Per Form VI, the annual inflation rate for electric is 2.2%, natural gas and fuel oil is 2.4% and 1.75% for solar per PPA bid results.

Utility Inflation Worksheet					
Year	NET ANNUAL ELECTRIC COST SAVINGS (EXCLUDING SOLAR PPA SAVINGS)	ANNUAL NATURAL GAS COST SAVINGS	ANNUAL Fuel Oil #2 (Gal) COST SAVINGS	Net Solar Savings	Total
2	$802,741.03	($1,929.45)	$133,810.91	$369,960.63	$1,304,583.13
3	$820,401.33	($1,975.76)	$137,022.38	$379,953.25	$1,335,401.20
4	$838,450.16	($2,023.18)	$140,310.91	$390,188.71	$1,366,926.61
5	$856,896.07	($2,071.73)	$143,678.37	$400,672.65	$1,399,175.35
6	$875,747.78	($2,121.45)	$147,126.66	$411,410.81	$1,432,163.79
7	$895,014.23	($2,172.37)	$150,657.69	$422,409.08	$1,465,908.64
8	$914,704.54	($2,224.50)	$154,273.48	$433,673.49	$1,500,427.01
9	$934,828.04	($2,277.89)	$157,976.04	$445,210.19	$1,535,736.38
10	$955,394.26	($2,332.56)	$161,767.47	$457,025.46	$1,571,854.63
11	$976,412.93	($2,388.54)	$165,649.89	$469,125.75	$1,608,800.03
12	$997,894.02	($2,445.87)	$169,625.48	$481,517.65	$1,646,591.28
13	$1,019,847.69	($2,504.57)	$173,696.50	$494,207.87	$1,685,247.48
14	$1,042,284.34	($2,564.68)	$177,865.21	$507,203.30	$1,724,788.17
15	$1,065,214.59	($2,626.23)	$182,133.98	$520,510.98	$1,765,233.32
16	$1,088,649.31	($2,689.26)	$186,505.19	$534,138.11	$1,806,603.36
17	$1,112,599.60	($2,753.80)	$190,981.32	$548,092.05	$1,848,919.16
18	$1,137,076.79	($2,819.89)	$195,564.87	$562,380.31	$1,892,202.07
19	$1,162,092.48	($2,887.57)	$200,258.43	$577,010.60	$1,936,473.93
20	$1,187,658.51	($2,956.87)	$205,064.63	$591,990.78	$1,981,757.05

ENERGY SAVINGS PLAN

SECTION 5 – RISK, DESIGN, & COMPLIANCE

Assessment of Risks, Design & Compliance Issues

Moving from a conceptual design to engineered documents DCO has identified areas of the project that could change during the detailed design. The table below represents potential conceptual areas of concern that will need to be investigated further with a corresponding party responsible for the compliance of each item.

Issue	Category	Responsible Party
Alteration of expected Maintenance and Operational Savings	Risk	Jackson Township Board of Education
Disposition of Abandoned Equipment (Steam Piping, Condensate Piping, Oil Tanks, etc.)	Risk	Jackson Township Board of Education
New Natural Gas Distribution	Risk	Jackson Township Board of Education
Integrity of re-used Infrastructure	Risk	Jackson Township Board of Education
Life Safety System Coordination	Risk	Jackson Township Board of Education
Coordination with Jackson Township Board of Education Information Technology Department	Risk	Jackson Township Board of Education
Ventilation Compliance with Code	Compliance	Consulting Engineer
Temperature, Humidity and Air Change Compliance with Code	Compliance	Consulting Engineer
Boiler Capacity and Turndown	Design	Consulting Engineer
Natural Gas Regulator Compliance with Code	Compliance	Consulting Engineer
Undocumented Underground Utilities	Risk	Consulting Engineer
Code Compliance of Existing Electrical Infrastructure	Compliance	Consulting Engineer

Lighting Levels	Compliance	Consulting Engineer
Design Light Consortium rating for bulbs	Compliance	Consulting Engineer
Underwriters Laboratory Testing for retrofitted LED Lighting Systems	Compliance	Consulting Engineer
Lighting Retrofits within hard ceilings for fixtures and occupancy sensors	Risk	Consulting Engineer
Street/Parking Lot Pole Structural Integrity	Risk	Consulting Engineer
Unrealized Energy Savings 1. Energy Modeling 2. Performance Monitoring 3. Capacity of Equipment 4. Efficiency of Equipment 5. Run Hours of Equipment	Risk	DCO/ Consulting Engineer 1. DCO 2. DCO 3. Consulting Engineer / Basis of Design Vendor 4. Consulting Engineer / Basis of Design Vendor 5. Jackson Township Board of Education
Existing Plumbing Infrastructure with New Low Flow Devices	Design	Consulting Engineer
Adaptation to New RTUs (Curb, Electric, Ductwork, Condensate)	Design	Consulting Engineer / Basis of Design Manufacture
Structural Loads for Rooftop Equipment Replacement	Design	Consulting Engineer
Transformer Loading	Risk	Consulting Engineer
Site Work for Equipment	Design	Consulting Engineer
Condition of Roof Under Units	Risk	Consulting Engineer
Adequate Crane Lifts & Clearances	Design	Consulting Engineer / Rigger

Physical Space Constraints and Clearance for Equipment Replacement	Design	Consulting Engineer
Refrigerant Reclaim / Refrigerant Disposal	Compliance	Contractor
Existing Tie in Locations	Design	Consulting Engineer
Schedule Oversight	Risk	DCO Energy
Impact of Boiler Flue	Design	Consulting Engineer
Impact of Space Usage During Construction	Risk	Consulting Engineer & Jackson Township Board of Education
Scope changes relating to requests by Authorities Having Jurisdiction.	Risk	Jackson Township Board of Education (via contingency)
Department of Environmental Protection Permitting	Risk	Consulting Engineer
Modifications of Energy Saving Control Sequences and Setpoints impacting Energy Savings and Incentives	Risk	Jackson Township Board of Education
Post Construction Calibration of Sensors, Meters, & Safety Devices	Risk	Jackson Township Board of Education
Adequate time and access for bidding contractor site surveys	Risk	Jackson Township Board of Education
Utility Interconnection approval for the CHP Unit	Risk	Jackson Township Board of Education

Measurement & Verification (M&V) Plan

Our approach to M&V of energy savings aligns with the International Performance Measurement & Verification Protocol. More detailed information may be found at www.ipmvp.org. It's most cost-effective to perform M&V using the least costly option that still adequately documents system performance and permits analysis of savings. This approach lowers the total cost of the program leaving more dollars available to perform more facility improvements. Depending upon which ECMs are implemented by Jackson Township Board of Education, the M&V plan proposed by DCO would incorporate one or more of the following options which outlines the four most common approaches for M&V:

Option A – Retrofit Isolation with Key Parameter Measurement	This option is based on a combination of measured and estimated factors when variations in factors are not expected. Measurements are spot or short-term and are taken at the component or system level, both in the baseline and post-installation cases. Measurements should include the key performance parameter(s) which define the energy use of the ECM. Estimated factors are supported by historical or manufacturer's data. Savings are determined by means of engineering calculations of baseline and post-installation energy use based on measured and estimated values.	Direct measurements and estimated values, engineering calculations and/or component or system models often developed through regression analysis. Adjustments to models are not typically required.
Option B – Retrofit Isolation with Parameter Measurement	This option is based on periodic or continuous measurements of energy use taken at the component or system level when variations in factors are expected. Energy or proxies of energy use are measured continuously. Periodic spot or short-term measurements may suffice when variations in factors are not expected. Savings are determined form analysis of baseline and reporting period energy use of proxies of energy use.	Direct measurements, engineering calculations, and/or component or system models often developed through regression analysis. Adjustments to models may be required.
Option C – Utility Data Analysis	This option is based on long-term, continuous, whole-building utility meter, facility level, or sub-meter energy (or water) data. Savings are determined from analysis of baseline and reporting period energy data. Typically, regression analysis is conducted to correlate with and adjust energy use to independent variables such as weather, but simple comparisons may also be used.	Based on regression analysis of utility meter data to account for factors that drive energy use. Adjustments to models are typically required.
Option D – Calibrated	Computer simulation software is used to model energy performance of a whole-facility (or sub-facility). Models must be calibrated with actual hourly or monthly billing data from the facility. Implementation of simulation modeling requires	Based on computer simulation model calibrated with whole-building or end-use

Computer Simulation	engineering expertise. Inputs to the model include facility characteristics; performance specifications of new and existing equipment or systems; engineering estimates, spot-, short-term, or long-term measurements of system components; and long-term whole-building utility meter data. After the model has been calibrated, savings are determined by comparing a simulation of the baseline with either a simulation of the performance period or actual utility data	metered data or both. Adjustments to models are required.

Each of the options can be used for a wide array of energy efficiency upgrades and each has different costs and complexities associated with it. When selecting an M&V approach, the following general rule of thumb can be applied:

OPTION A

- When magnitude of savings is low for the entire project or a portion of the project
- The risk for not achieving savings is low

OPTION B

- For simple equipment replacement projects
- When energy savings values per individual measure are desired
- When interactive effects are to be ignored or are estimated using estimating methods that do not involve long term measurements
- When sub-meters already exist that record the energy use of subsystems under consideration

OPTION C

- For complex equipment replacement and controls projects
- When predicted energy savings are in excess of 10 to 20 percent as compared with the record energy use
- When energy savings per individual measure are not desired
- When interactive effects are to be included
- When the independent variables that affect energy, use are complex and excessively difficult or expensive

OPTION D

- When new construction projects are involved
- When energy savings values per measure are desired
- When Option C tools cannot cost effectively evaluate particular measures or their interactions with the building when complex baseline adjustments are anticipated

DCO will perform measurement and verification of the energy units savings at the conclusion of each month in the first year of the energy units guarantee. After the first year, M&V will be performed and presented within 30 days of year end. Jackson Township Board of Education will work with DCO to provide necessary information and provide access to any buildings to allow DCO to properly verify and measure energy savings. DCO's energy guarantee will be based on units of energy saved as determined from the baseline provided in the RFP, or adjusted baseline if original baseline is determined by both parties to be inaccurate.

Adjustments to the baseline and associated savings will be taken for weather, hours of operation, building usage, utility rate increases, code or statute changes, requirements listed in Table 1, and any other actions that adversely affect the savings beyond the control of DCO. Any savings discrepancies will be resolved to the satisfaction of both the Jackson Township Board of Education and DCO in a timely manner.

As part of the optional energy guarantee, DCO uses weather normalization procedures to correct for the effect of weather variance on energy savings in subsequent years. Baseline energy and weather data are used to establish an algorithm to predict how the baseline building uses energy as a function of weather. The algorithm is then applied to subsequent years to correct for the impact weather may have on future building energy use. The weather normalization procedure and algorithms will be covered in detail as part of the optional energy guarantee contract provided to Jackson Township Board of Education.

Maintenance Plan

Owner Tasks and Responsibilities:

As a general statement, Jackson Township Board of Education or its 3rd party service providers shall be responsible for providing ongoing maintenance through the duration of the M&V period. DCO will review operational procedures and schedules associated with such things as the building automation/control upgrades as well as the manufacturers' published requirements for all installed equipment be it: quarterly, semi-annually or annually. In most cases, Jackson Township Board of Education is already aware of or self-implementing similar maintenance practices on campus or has contracted a 3rd party for such services. Failure to properly maintain the equipment may cause energy savings goals to fall short.

Specific Areas of Consideration:

In order to sustain energy savings Jackson Township Board of Education's Staff will be required to implement new maintenance tasks and even modify existing policies and practices. Outlined are two examples of specific instances.

Example 1. Advanced Building Operations Programming:

Jackson Township Board of Education will be given specific training on the changes and advancements in the environmental operations and energy savings strategies. Jackson Township Board of Education will be responsible for following the agreed upon guidelines associated with programmed schedules and any use of override functions.

Example 2. Verification of Proper Operations: Mechanical Equipment

Jackson Township Board of Education will be required to assure that proper mechanical maintenance continues to be implemented on its mechanical equipment. Example: outside air dampers will require proper operation with the appropriate seals in order to maintain ECM(s) such as demand ventilation. DCO will periodically spot check system operations to verify the Owner or its 3rd party representative is implementing proper maintenance. Any deficiencies that may be identified will be brought to Jackson Township Board of Education's attention for correction.

ENERGY SAVINGS PLAN

SECTION 6 – OPERATION & MAINTENANCE

It is critical to the success of achieving continued energy savings that Jackson Township Board of Education develop and implement an Operation and Maintenance Plan. In this section are some recommendations for maintenance tasks for various pieces of equipment and systems to assist Jackson Township Board of Education and/or 3rd party maintenance contractors.

Air Handling Units

Comprehensive Annual Inspection

1. Record and report abnormal conditions, measurements taken, etc.
2. Review logs for operational problems and trends.
3. General Assembly
   a) Inspect the unit for cleanliness.
   b) Inspect the fan wheel and shaft for wear and clearance.
   c) Check the sheaves and pulleys for wear and alignment.
   d) Check the belts for tension, wear, cracks, and glazing.
   e) Verify tight bolts, set screws, and locking collars.
   f) Check dampers for wear, security and linkage adjustment.
   g) Verify clean condensate pan.
   h) Verify proper operation of the condensate drain.
   i) Verify clean air filters.
   j) Verify clean coils.
   k) Verify proper operation of the spray pump, if applicable.
   l) Verify smooth fan operation.
   m) Log operating conditions after system has stabilized.
   n) Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.
4. Lubrication
   a) Lubricate the fan shaft bearings, if applicable.
   b) Lubricate the motor bearings, if applicable.
5. Controls and Safeties
   a) Test the operation of the low temperature safety device, if applicable.
   b) Test the operation of the high static pressure safety device, if applicable.
   c) Test the operation of the low static pressure safety device, if applicable.
   d) Check the thermal cutout on electric heaters, if applicable.
   e) Check the step controller, if applicable.

f) Check and record supply air and control air pressure, if applicable.
g) Verify the operation of the control system and dampers while the fan is operating.

6. Motor and Starter
   a) Clean the starter and cabinet.
   b) Inspect the wiring and connections for tightness and signs of overheating and discoloration. This includes wiring to the electric heat, if applicable.
   c) Check the condition of the contacts for wear and pitting.
   d) Check the contactors for free and smooth operation.
   e) Meg the motor and record readings.

Heating Inspection

1. Gas Heat Option
   a) Visually inspect the heat exchanger.
   b) Inspect the combustion air blower fan, and clean, if required.
   c) Lubricate the combustion air blower fan motor, if applicable.
   d) Verify the operation of the combustion air flow-proving device.
   e) Test the operation of the high gas pressure safety device, if applicable. Calibrate, if necessary.
   f) Test the operation of the low gas pressure safety device, if applicable. Calibrate, if necessary.
   g) Verify the operation of the flame detection device.
   h) Test the operation of the high temperature limit switch.
   i) Verify the integrity of the flue system.
   j) Verify the operation of the operating controls.
   k) Verify the burner sequence of operation.
   l) Verify proper gas pressure to the unit and/or at the manifold, if applicable.
   m) Perform combustion test. Make adjustments as necessary.
2. Electric Heat Option
   a) Inspect wiring and connections for tightness and signs of overheating and discoloration.
   b) Check and calibrate operating and safety controls, if applicable.
   c) Verify the operation of the heating elements.
   d) Check voltage and amperage and compare readings with the watt rating on the heater.
3. Hot Water / Steam Heat Option
   a) Inspect control valves and traps.
   b) Check and calibrate all operating and safety controls.
   c) Verify the operation of the heating coils.
   d) Verify the operation of the unit low temperature safety device.

Scheduled Running Inspection

1. Check the general condition of the fan.
2. Verify smooth fan operation.
3. Check and record supply and control air pressure, if applicable.
4. Verify the operation of the control system.
5. Log the operating conditions after the system has stabilized.
6. Review operating procedures with operating personnel.
7. Provide a written report of completed work, operating log, and indicate uncorrected deficiencies detected.

Oil Sample/Spectrographic Analysis

1. Pull oil sample for spectrographic analysis

Refrigerant Sample/Analysis

1. Pull refrigerant sample for spectrographic analysis for contaminants (oil, water, and acid), using approved containers

Boilers

Comprehensive Annual Inspection

1. Record and report abnormal conditions, measurements taken, etc.
2. Review logs for operational problems and trends.
3. General Assembly
   a) Secure and drain the boiler.
   b) Open the fire and water side for cleaning and inspection.
   c) Check heating surfaces and water side for corrosion, pitting, scale, blisters, bulges, and soot.
   d) Inspect refractory.
   e) Clean fire inspection glass.
   f) Check blow-down valve packing, and lubricate.
   g) Check and test boiler blow-down valve.

h) Perform hydrostatic test, if required.
i) Verify proper operation of the level float.
j) Gas Train Burner Assembly
    1. Check the gas train isolation valves for leaks.
    2. Check the gas supply piping for leaks.
    3. Check the gas pilot solenoid valve for wear and leaks.
    4. Check the main gas and the pilot gas regulators for wear and leaks.
    5. Test the low gas pressure switch. Calibrate and record setting.
    6. Test the high gas pressure switch. Calibrate and record setting.
    7. Verify the operation of the burner fan air flow switch.
    8. Inspect and clean the burner assembly.
    9. Inspect and clean the pilot igniter assembly.
    10. Inspect and clean the burner fan.
    11. Run the fan and check for vibration.
    12. Inspect the flue and flue damper.
    13. Burner Control Panel:
        a) Inspect the panel for cleanliness.
        b) Inspect wiring and connections for tightness and signs of overheating and discoloration.
k) Clean burner fan wheel and air dampers. Check fan for vibration.
l) Verify tightness on linkage set screws.
m) Check gas valves for leakage (where test cocks are provided).
n) Verify proper operation of the feed water pump.
o) Verify proper operation of the feed water treating equipment.

4. Controls and Safeties
    a) Disassemble and inspect low water cutoff safety device.
    b) Reassemble boiler low water cutoff safety device with new gaskets.
    c) Clean contacts in program timer, if applicable.
    d) Check the operation of the low water cutoff safety device and feed controls.
    e) Verify the setting and test the operation of the operating and limit controls.
    f) Verify the operation of the water level control.

Startup/Checkout Procedure

1. Verify proper water level in the boiler
2. Test the safety/relief valve after startup (full pressure test).
3. Clean or replace fuel filters.

4. Clean fuel nozzles.
5. Inspect clean, and functionally test the flame scanner and flame safeguard relay.
6. Clean and adjust the ignition electrode.
7. Replace the vacuum tube in the flame safeguard control, if applicable.
8. Perform pilot turn down test.
9. Verify proper steam pressure.
10. Perform combustion test and adjust the burner for maximum efficiency.
11. Test the following items:
    a) Firing rate
    b) Fuel/air ratio
    c) CO2
    d) CO
    e) NOX
    f) Perform smoke test.
12. Review operating procedures
13. Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.

Mid-Season Running Inspection

1. Check the general condition of the unit.
2. Inspect the burner.
3. Adjust the burner controls to obtain proper combustion.
4. Check the operation of the pressure relief valve.
5. Check the operation of the low water cutoff and feed controls.
6. Check the setting and test the operation of the operating and limit controls.
7. Check the operation of the modulating motor.
8. Lift the safety/relief valves with at least 70% of rated pressure.
9. Blow down and try gauge cocks to confirm glass water level.
10. Check and test boiler blow down valve.
11. Log operating conditions after the system has stabilized.
12. Review operating procedures
13. Provide a written report of completed work, operating log, and indicate uncorrected deficiencies detected.

Seasonal Shut-down Procedure

1. Shut down boiler at boiler controls.
2. Shut off fuel lines at main valves.
3. Review operating procedures
4. Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.

Cooling Towers

Startup/Checkout Procedure

1. Fill the basin and verify the float level.
2. Verify the operation of the basin heaters
3. Verify the operation, setpoint, and sensitivity of the basin heater temperature control device.
4. Start the condenser water pumps.
5. Verify the balance of the return water through the distribution boxes.
6. Verify proper operation of the bypass valve(s), if applicable.
7. Operate fan and verify smooth operation.
8. Log operation after system has stabilized.
9. Review operating procedures
10. Provide a written report of completed work, operating log, and indicate uncorrected deficiencies detected.

Comprehensive Annual Inspection

1. Record and report abnormal conditions, measurements taken, etc.
2. Review logs for operational problems and trends.
3. General Assembly
   a) Structure
      1. Disassemble all screens and access panels for inspection.
      2. Inspect the conditions of the slats, if applicable.
      3. Inspect the condition of the tower fill.
      4. Inspect the condition of the support structure.
      5. Inspect the condition of the basins (upper and lower) and/or spray nozzles.
      6. Verify clean basins and strainer(s).

7. Verify the condition and operation of the basin fill valve system.

b) Mechanical
   1. Inspect belts for wear, cracks, and glazing.
   2. Verify correct belt tension. Adjust the tension as necessary.
   3. Inspect sheaves and pulleys for wear, condition, and alignment.
   4. Inspect fan shaft and bearings for condition.
   5. Inspect fan assembly for condition, security, and clearances. (e.g. blade tip clearance).

4. Lubrication System
   a) Lubricate motor bearings.
   b) Lubricate fan shaft bearings.
5. Motor And Starter
   a) Clean the starter and cabinet.
   b) Inspect wiring and connections for tightness and signs of overheating and discoloration.
   c) Check the condition of the contacts for wear and pitting.
   d) Check the contactor(s) for free and smooth operation.
   e) Meg the motor(s) and record readings.
   f) Check disconnect terminal block for wear, tightness and signs of overheating and discoloration.
   g) Check the condition and operation of the basin heater contactor(s).

Shut-Down Procedure

1. Check the general condition of the tower.
2. Turn off electrical power to basin heaters, tower fans, and pipe heaters as necessary.
3. Drain tower and condenser water piping.
4. Review operating procedures
5. Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.

Burners

Gas Train

1. Check the gas train isolation valves for leaks.

2. Check the gas supply piping for leaks.
3. Check the gas pilot solenoid valve for wear and leaks.
4. Check the main gas and the pilot gas regulators for wear and leaks.
5. Test the low gas pressure switch. Calibrate and record setting.
6. Test the high gas pressure switch. Calibrate and record setting.
7. Verify the operation of the burner fan air flow switch.
8. Inspect and clean the burner assembly.
9. Inspect and clean the pilot ignitor assembly.
10. Inspect and clean the burner fan.
11. Run the fan and check for vibration.
12. Inspect the flue and flue damper.
13. Burner Control Panel:
    a) Inspect the panel for cleanliness.
    b) Inspect wiring and connections for tightness and signs of overheating.
14. Clean burner fan wheel and air dampers. Check the fan for vibration.
15. Verify tightness of the linkage set screws.
16. Check the gas valves against leakage (where test cocks are provided

Oil Train

1. Check the gas train isolation valves for leaks.
2. Check the gas supply piping for leaks.
3. Check the gas pilot solenoid valve for wear and leaks.
4. Check the main gas and the pilot gas regulators for wear and leaks.
5. Test the low gas pressure switch. Calibrate and record setting.
6. Test the high gas pressure switch. Calibrate and record setting.
7. Verify the operation of the burner fan air flow switch.
8. Inspect and clean the burner assembly.
9. Inspect and clean the pilot ignitor assembly.
10. Inspect and clean the burner fan.
11. Run the fan and check for vibration.
12. Inspect the flue and flue damper.
13. Burner Control Panel:
    a) Inspect the panel for cleanliness.
    b) Inspect wiring and connections for tightness and signs of overheating.
14. Clean burner fan wheel and air dampers. Check the fan for vibration.
15. Verify tightness of the linkage set screws.

16. Check the gas valves against leakage (where test cocks are provided).

Dual Fuel Train

1. Check the gas train isolation valves for leaks.
2. Check the gas supply piping for leaks.
3. Check the gas pilot solenoid valve for wear and leaks.
4. Check the main gas and the pilot gas regulators for wear and leaks.
5. Test the low gas pressure switch. Calibrate and record setting.
6. Test the high gas pressure switch. Calibrate and record setting.
7. Verify the operation of the burner fan air flow switch.
8. Inspect and clean the burner assembly.
9. Inspect and clean the pilot ignitor assembly.
10. Inspect and clean the burner fan.
11. Run the fan and check for vibration.
12. Inspect the flue and flue damper.
13. Burner Control Panel:
    a) Inspect the panel for cleanliness.
    b) Inspect wiring and connections for tightness and signs of overheating.
14. Clean burner fan wheel and air dampers. Check the fan for vibration.
15. Verify tightness of the linkage set screws.
16. Check the gas valves against leakage (where test cocks are provided)

Energy Management System

Maintenance Inspection

1. Review reports for operational problems and trends.
2. Make a back-up copy of the BAS program.
3. Check for loose or damaged parts or wiring.
4. Check for any accumulation of dirt or moisture. Clean if required.
5. Verify proper electrical grounding.
6. Verify control panel power supplies for proper output voltages.
7. Inspect interconnecting cables and electrical connections.
8. Verify that manual override switches are in the desired positions.

9. Check the operation of all binary and analog outputs, if applicable.
10. Calibrate control devices, if applicable.
11. Verify the correct time and date.
12. Check and update the holiday schedules and daylight savings time.
13. Via terminal mode, view the event log and input/output points for any unusual status or override conditions.
14. Clean the external surfaces of the panel enclosure.
15. Review operating program and parameters.
16. Check cable connections for security.
17. Review operating procedures
18. Provide a written report of completed work, and indicate any uncorrected deficiencies detected.

Maintenance Inspection (Control Panels)

1. Control Panel
   a) Verify secure connections on all internal wiring, LAN, and communication links.
   b) Check for loose or damaged parts or wiring.
   c) Check for any accumulation of dirt or moisture. Clean if required.
   d) Remove excessive dust from heat sink surfaces
   e) Verify proper system electrical grounding.
   f) Verify proper output voltages on control panel power supplies.
   g) Check LED Indications to verify proper operation
   h) Verify LAN communications
   i) Verify that cards are seated and secured.
   j) Check wiring trunks and check for possible Error Code Indications
   k) Check voltage level of
   l) Verify the proper operation of critical control processes and points associated with this unit an make adjustments if necessary.
   m) Check Volatile memory available
   n) Cheek Non volatile memory available
   o) Check Processor idle time
   p) Clean external surfaces of the panel enclosure.
   q) Check modem operation, if applicable.
   r) View the event log and input/output points for any unusual status or override conditions.
   s) Verify correct time and date.
   t) Check and update holiday schedules, if applicable, and daylight savings time.

u) Review operating procedures with operating personnel.
v) Provide a written report of completed work, and indicate any uncorrected deficiencies detected.

Maintenance Inspection (EMS - Sequence of Operations)

Central Plant

In order to assure effective environmental conditioning while minimizing the cost to operate the equipment, technicians will review operating sequences and practices for the chiller plant. An initial survey of current equipment operating parameters will be conducted within the first 60 days of the contract term during cooling season. This survey will include:

1. Chiller(s) operation
2. Cooling tower(s) operation
3. Pump(s) operation
4. Economizer operation (where applicable)
5. Environmental safety

A detailed report of findings and recommendations for changes, if any, will be made. Agreed upon operational changes which require only adjustment of controls or programming will be made during regularly scheduled maintenance visits as part of this agreement at no additional cost. Any recommended alterations that require addition of devices or equipment will be accompanied by a guaranteed cost proposal reflecting the applicable discounts determined by this agreement.

Building Systems

In order to assure effective environmental conditioning while minimizing the cost to operate the equipment, technicians will review operating sequences and practices for covered airside systems. An initial survey of current systems operating parameters will be conducted within the first 60 days of the contract term, except seasonally operated systems, which will be surveyed during the appropriate operating season. This survey will include:

1. Time schedule(s)
2. Reset schedule(s)
3. Economizer changeover (where applicable)
4. Setpoints

5. Energy Management routines

A detailed report of findings and recommendations for changes, if any, will be made. Agreed upon operational changes which require only adjustment of controls or programming will be made during regularly scheduled maintenance visits as part of this agreement at no additional cost. Any recommended alterations that require addition of devices or equipment will be accompanied by a guaranteed cost proposal reflecting the applicable discounts determined by this agreement.

Fans

Maintenance Procedure

1. Record and report abnormal conditions, measurements taken, etc.
2. Review logs for operational problems and trends.
3. General Assembly
   a) Check the general condition of the unit.
   b) Verify tightness of the fan, fan guards, louvers, etc.
   c) Verify clean burner assembly.
   d) Check sheaves and pulleys for wear and alignment, if applicable.
   e) Check belts for tension, wear, cracks, and/or glazing.
4. Lubrication
   a) Lubricate the fan motor, if applicable.
   b) Lubricate the fan bearings as necessary.
5. Controls and Safeties
   a) Verify proper operation of the temperature control device.
   b) Verify proper operation of the high temperature control device.
   c) Verify proper operation of the fan switch.
   d) Verify proper operation of the pilot safety device, if applicable.
6. Electrical
   a) Inspect wiring and connections for tightness and signs of overheating and discoloration.
7. Startup and Checkout
   a) Start the unit.
   b) Verify proper combustion air to the burner.
   c) Verify proper gas pressure to the burner.

d) Check the flame for proper combustion.

Comprehensive Annual Inspection

1. Record and report abnormal conditions, measurements taken, etc.
2. Review logs for operational problems and trends.
3. General Assembly
   a) Disassemble all screens and panels necessary to gain access to the fan mechanism.
   b) Disassemble the control mechanism (AVPB only).
   c) Clean all accessible rotor components to include control pitch mechanism (AVPB only).
   d) Inspect blades for wear.
   e) Inspect blade arms for wear (AVPB only).
   f) Check blade tip clearance.
   g) Check for oil leak on the blade bearing housing (AVPB only).
   h) Clean motor and fan housing.
   i) Reassemble all removed screens and plates.
4. Lubrication
   a) Lubricate the motor bearings.
   b) Lubricate the shaft bearings (AVPA only).
5. Controls and Safeties
   a) Test the operation of the high static safety device. Calibrate and record setting.
   b) Test the operation of the low static safety device. Calibrate and record setting.
   c) Test the operation of the vibration safety device. Calibrate and record setting.
   d) Verify the operation of the phase monitor, if applicable.
   e) Inspect pneumatic and electrical controls for condition and calibration.
   f) Verify proper operation.
6. Motor and Starter
   a) Clean the starter and cabinet.
   b) Clean the disconnect switch and cabinet at the fan, if applicable.
   c) Inspect the wiring and connections for tightness and signs of overheating and discoloration.
   d) Check the condition of the contacts for wear and pitting.
   e) Check the contactors for free and smooth operation.
   f) Meg the motor and record readings.
7. Startup / Checkout Procedure
   a) Start the fan.
   b) Verify the operation of the starter.

c) Check and record supply and control air pressure.
d) Verify the operation of the control system while the fan is operating.
e) Log the operating conditions after the system has stabilized.
f) Review operating procedures with operating personnel.
g) Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.

Scheduled Running Inspection (fans)

1. Check the general operation of the fan.
2. Check and record supply and control air pressure.
3. Verify the operation of the control system.
4. Log the operating conditions after the system has stabilized.
5. Review operating procedures with operating personnel.
6. Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.

Comprehensive Annual Inspection (fans)

1. Record and report abnormal conditions, measurements taken, etc.
2. Review logs for operational problems and trends.
3. General Assembly
   a) Verify tight bolts, set screws, and locking collars.
   b) Inspect sheaves and pulleys for wear and alignment.
   c) Inspect belts for tension, wear, cracks, and glazing.
   d) Inspect dampers for wear, security, and clearances, if applicable.
   e) Verify clean air filters.
   f) Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.
4. Lubrication
   a) Lubricate fan bearings.
   b) Lubricate motor bearings, if applicable.
5. Controls and Safeties
   a) Verify the operation of the control system while the fan is operating.
   b) Verify the setting of the low temperature safety device, if applicable.
   c) Verify the operation of the pre-heat control device, if applicable.
   d) Verify the operation of the cooling control device, if applicable.

e) Verify the operation of the re-heat control device, if applicable.
f) Verify the operation of the humidity control device, if applicable.

6. Motor and Starter
   a) Clean the starter and cabinet.
   b) Inspect the wiring and connections for tightness and signs of overheating and discoloration.
   c) Check the condition of the contacts for wear and pitting.
   d) Check the contactors for free and smooth operation.
   e) Meg the motor and record readings.
   f) Check volts and amps of the motor.

Lubricate/Grease Bearings

1. Lubricate and/or grease bearings according to manufacturer's specifications

MEG Motor

1. Check the integrity of the insulation on the motor windings and the motor leads, using a megohm meter.

Coils

Maintenance Procedure

1. Record and report abnormal conditions.
2. Visually inspect the coil for leaks.
3. Inspect the coil for cleanliness.

Pumps

Annual Inspection

1. Record and report abnormal conditions, measurements taken, etc.

2. Review logs for operational problems and trends.
3. General Assembly
   a) Check motor shaft and pump shaft for alignment, if applicable.
   b) Inspect the coupling for wear.
   c) Verify that the shaft guard is in place and tight, if applicable.
   d) Verify water flow through the pump.

   e) Check for leaks on the mechanical pump seals, if applicable.
   f) Verify proper drip rate on the pump seal packing, if applicable.
   g) Verify smooth operation of the pump.
   h) Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.
4. Lubrication
   a) Lubricate the motor bearings as necessary.
   b) Lubricate the pump bearings as necessary.
5. Motor and Starter
   a) Clean the starter and cabinet.
   b) Inspect wiring and connections for tightness and signs of overheating and discoloration.
   c) Meg the motor.
   d) Verify tight connections on the motor terminals.
   e) Check the condition of the contacts for wear and pitting, if applicable.
   f) Check the contactors for free and smooth operation.
   g) Verify proper volts and amps.

Pump Run Inspection

1. Verify smooth operation of the pump.
2. Check for leaks on the mechanical pump seals, if applicable.
3. Verify proper drip rate on the pump seal packing, if applicable.
4. Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.

Mechanical Starters with Electronic Controls

Comprehensive Annual Maintenance

1. Clean the starter and cabinet.
2. Inspect wiring and connections for tightness and signs of overheating and discoloration.
3. Check condition of the contacts for wear and pitting.
4. Check contactors for free and smooth operation.
5. Check the mechanical linkages for wear, security, and clearances.
6. Verify the overload settings.

VFD Starters

Comprehensive Annual Maintenance

1. Clean the starter and cabinet.
2. Inspect wiring and connections for tightness and signs of overheating and discoloration.
3. Check the tightness of the motor terminal connections.
4. Verify the operation of the cooling loop.
5. Verify proper operation of the frequency drive.

Rooftop Units

Comprehensive Annual Maintenance

1. Record and report abnormal conditions, measurements taken, etc.
2. Review logs for operational problems and trends.
3. General Assembly
   a) Inspect for leaks and report results.
   b) Calculate refrigerant loss rate and report to the customer.
   c) Repair minor leaks as required (e.g. valve packing, flare nuts).
   d) Visually inspect condenser tubes for cleanliness.
4. Controls and Safeties
   a) Inspect the control panel for cleanliness.
   b) Inspect wiring and connections for tightness and signs of overheating and discoloration.

c) Verify the working condition of all indicator/alarm lights, if applicable.
d) Test the low water temperature control device. Calibrate and record setting.
e) Test the low evaporator pressure safety device. Calibrate and record setting.
f) Test the oil pressure safety device. Calibrate and record setting, if applicable.
g) Check programmed parameters of RCM control, if applicable.

5. Lubrication System
   a) Check oil level in the compressor.
   b) Test oil for acid content and discoloration. Make recommendations to the customer based on the results of the test.
   c) Verify the operation of the oil heater. Measure amps and compare reading with the watt rating of the heater.

6. Motor and Starter
   a) Clean the starter and cabinet.
   b) Inspect wiring and connections for tightness and signs of overheating and discoloration.
   c) Check condition of the contacts for wear and pitting.
   d) Check the contactors for free and smooth operation.
   e) Check the tightness of the motor terminal connections.
   f) Meg the motor and record readings.
   g) Verify the operation of the electrical interlocks.
   h) Measure voltage and record. Voltage should be nominal voltage ± 10%.

Comprehensive Maintenance Inspection (RTU Heating Cycle)

1. Perform heating inspection/maintenance applicable to the unit (steam/hot water, gas, electric).
2. Verify smooth operation of the fans.
3. Check the belts for tension, wear, cracks, and glazing.
4. Verify clean air filters.
5. Gas Heat Option
   a) Visually inspect the heat exchanger.
   b) Inspect the combustion air blower fan, and clean, if required.
   c) Lubricate the combustion air blower fan motor, if applicable.
   d) Verify the operation of the combustion air flow-proving device.
   e) Test the operation of the high gas pressure safety device, if applicable. Calibrate, if necessary.

f) Test the operation of the low gas pressure safety device, if applicable. Calibrate, if necessary.
g) Verify the operation of the flame detection device.
h) Test the operation of the high temperature limit switch. i.. Verify the integrity of the flue system.
i) Verify the operation of the operating controls.
j) Verify the burner sequence of operation.
k) Verify proper gas pressure to the unit and/or at the manifold, if applicable.
l) Perform combustion test. Make adjustments as necessary.

6. Electric Heat Option
   a) Inspect wiring and connections for tightness and signs of overheating and discoloration.
   b) Check and calibrate operating and safety controls, if applicable. c. Verify the operation of the heating elements. d. Check voltage and amperage and compare readings with the watt rating on the heater.

7. Hot Water / Steam Heat Option
   a) Inspect control valves and traps.
   b) Check and calibrate all operating and safety controls.
   c) Verify the operation of the heating coils.
   d) Verify the operation of the unit low temperature safety device.

Mid-Season Cooling Inspection (RTU)

1. Check the general condition of the unit.
2. Log the operating condition after system has stabilized.
3. Verify the operation of the control circuits.
4. Analyze the recorded data. Compare the data to the original design conditions.
5. Review operating procedures with operating personnel.
6. Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.

Comprehensive Maintenance Inspection (RTU - Cooling Cycle)

1. Record and report abnormal conditions, measurements taken, etc.
2. Review logs for operational problems and trends.
3. General Assembly
   a) Inspect for leaks and report results.

b) Calculate refrigerant loss rate and report to the customer.
c) Repair minor leaks as required (e.g. valve packing, flare nuts).
d) Check pulleys and sheaves for wear and alignment.
e) Check belts for tension, wear, cracks, and glazing.
f) Verify clean evaporator coil, blower wheel, and condensate pan.
g) Verify clean air filters.
h) Verify proper operation of the condensate drain.
i) Verify proper operation of the dampers and/or inlet guide vanes, if applicable.

4. Controls and Safeties
   a) Inspect the control panel for cleanliness.
   b) Inspect wiring and connections for tightness and signs of overheating and discoloration.
   c) Verify the working condition of all indicator/alarm lights, if applicable.
   d) Test the low evaporator pressure safety device. Calibrate and record setting, if applicable.
   e) Test the high condenser pressure safety device. Calibrate and record setting, applicable.
   f) Test the oil pressure safety device, if applicable. Calibrate and record setting.
   g) Test the high static pressure safety device, if applicable. Calibrate and record setting.
   h) Verify the operation of the static pressure control device, if applicable.
5. Lubrication
   a) Verify the operation of the oil heater, if applicable.
   b) Lubricate the fan bearings as required.
   c) Lubricate the fan motor bearings as required.
   d) Lubricate the damper bearings, if applicable.
6. Motor and Starter
   a) Clean the starter and cabinet.
   b) Inspect wiring and connections for tightness and signs of overheating and discoloration.
   c) Check the condition of the contacts for wear and pitting.
   d) Check the contactors for free and smooth operation.
7. Startup /Checkout Procedure
   a) Verify the operation of the oil heater.
   b) Verify full water system, including the cooling tower and the condenser.
   c) Verify clean cooling tower and strainers.
   d) Test all flow-proving devices on the condenser water circuit.
   e) Start the condenser water pump and the cooling tower fan(s).
   f) Verify flow rate through the condenser.
   g) Start the unit.

h) Verify smooth operation of the compressor(s) and fan(s).
i) Check the setpoint and sensitivity of the temperature control device.
j) Verify the operation of the condenser water temperature control device.
k) Verify clean condenser using pressure and temperature.
l) Check operation and setup of the Unit Control Module.
m) Check the superheat and subcooling on the refrigeration circuit(s).
n) Log the operating conditions after the system has stabilized.
o) Review operating procedures with operating personnel.
p) Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.

ENERGY SAVINGS PLAN

SECTION 7 – OPTIONAL ENERGY GUARANTEE

OPTIONAL ENERGY GUARANTEE OVERVIEW

NOTE: *The following is meant only to serve as a description of an optional energy guarantee and does not constitute any contractual obligations between the Jackson Township Board of Education and DCO. If Jackson Township Board of Education chooses to implement an energy guarantee contract, a separate document will be used based on mutual agreement and acceptance of all parties of its terms and conditions.*

A successful energy project consists of a partnership between an ESCO and Owner. Both parties have defined roles and accept their individual responsibilities as well as support any joint initiatives of the program as defined in the RFP and this document. Both DCO and the Jackson Township Board of Education will have a role in ongoing maintenance and operations as defined in the agreed-upon energy guarantee contractual documents. Both parties will be required to meet their obligations for the guaranteed energy units savings (referred to as "guarantee or savings") to be achieved and to ensure the guarantee stays intact.

DCO will guarantee Jackson Township Board of Education will achieve 100% of the total energy units savings per the provisions of the agreed-upon energy guarantee contractual documents based on the final selection of ECMs and their associated energy savings as measured and verified by the Owner's third-party, independent firm. The energy savings will be in energy units, not dollars as DCO has no control over the costs of utilities. The energy units guarantee contract shall commence thirty (30) days after the start-up and commissioning of the last Energy Conservation Measure (ECM) and be enforced for a period of one (1) year or until terminated by Jackson Township Board of Education. The one (1) Year Guarantee is provided by DCO for a cost of $0. The Measurement & Verification required by ESIP Legislation in association with the acceptance of an Energy Savings Guarantee will be provided by DCO Energy at a cost of 0.38% of the Hard Costs of the ECMs as outlined in Form V of the RFP Response (also shown Section 4 of this document).

SAVINGS VERIFICATION

There are events that cause energy savings to change. Jackson Township Board of Education and DCO will agree to baseline energy consumption that represents the facility's energy use and cost prior to the date of any Agreement (the "Base Year") and parameters, which affect the energy usage and cost of the facility, including but not limited to, utility rates, local weather profile, facility square footage, environmental conditions, schedules (e.g., lighting, HVAC) and

an inventory of equipment in the facility. Energy savings are determined by comparing measured energy use or demand before and after implementation of an energy savings program.

ECM ENERGY SAVINGS = BASELINE ENERGY USE – POST INSTALLATION ENERGY USE +/- ADJUSTMENTS

Changes in estimated energy savings fall into two categories. These categories are Routine Adjustments and Non-Routine Adjustments. Routine Adjustments are expected changes during the savings reporting period to energy governing factors (e.g. weather). DCO uses IPMVP approved mathematical techniques to determine adjustments. Non-Routine Adjustments include energy-governing factors which are not usually expected to change, such as the facility size, the design and operation of installed equipment, occupancy and the type of occupants or any physical changes to the building or equipment that impact the facilities' utility use. These factors will be monitored for change throughout the reporting period.

DCO will perform monthly utility bill analysis and audit reports which compare the current year with base year energy consumption and costs. DCO will perform periodic on-site analysis to determine whether mechanical and electrical systems are operating at optimal efficiency and to assess the occupancy and operational schedules of the buildings.

As part of the optional energy guarantee, DCO uses weather normalization procedures to correct for the effect of weather variance on energy savings in subsequent years. Baseline energy and weather data are used to establish an algorithm to predict how the baseline building uses energy as a function of weather. The algorithm is then applied to subsequent years to correct for the impact weather may have on future building energy use. The weather normalization procedure and algorithms will be covered in detail as part of the optional energy guarantee contract provided to Jackson Township Board of Education.

ENERGY SAVINGS PLAN

APPENDICIES

APPENDIX LIST	
APPENDIX A	Construction Contingency Allowance
APPENDIX B	Design Bid Build Procedures
APPENDIX C	Operations & Maintenance Savings
APPENDIX D	Project Changes in Financing
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ENERGY SAVINGS PLAN

APPENDIX A – CONSTRUCTION CONTINGENCY ALLOWANCE

Appendix A – Construction Contingency Allowance

Experience shows that during the construction phase there are four major categories of potential change of scope issues that benefit from having an appropriate Construction Contingency Allowance (CCA).

- Unknown conditions
- Building inspector's modifications
- Project owner requested changes
- Design clarifications or modifications

Unknown Conditions

Renovations to older facilities have greater potential for revealing unknown. Missing or inaccurate Blueprints, deviations from the original blue prints by the original builder and unknown or undocumented modifications during the life of the facility.

Areas such as behind a wall/roof/equipment or under the slab can bring unforeseen conditions which can delay the new construction and change the anticipated scope of the work. Therefore, it is advisable to dedicate a CCA that is higher than that for new construction.

Building Inspection Modifications

A plan review for the local building jurisdiction reviews the construction documents prior to issuing a building permit. However, there remains the likelihood that the building inspector will request modifications to the plans based upon experience and their interpretation of the applicable building code.

While we can ask for code review and documentation, if you hope to get a Certificate of Occupancy under a tight schedule from this same inspector requested modifications will need to be implemented as successfully appeals take time.

Whether it is adding an extra exit sign, smoke detector or fire extinguisher, or whether it is something more significant, it may require more work from the contractor, thus added expense. The CCA is intended to be the source of funds necessary for these requested modifications.

Project Owner Requested Changes

It is nearly impossible to express your every desire during the design phase. You will always see something during construction that you would like to change.

There is nothing necessarily wrong with that.

The CCA is intended to be the source of funds necessary for these requested changes.

Design Clarifications or Modifications

No designer has ever developed the perfect set of construction documents.

There are always items that can be detailed better or more clearly. The design intent should be adequately reflected in the drawings and specifications so that the contractor can bid and build the ECM to meet the design intent.

However, there will be times during construction when the builder will not be readily able to identify the exact intent of particular details or systems. At that time the builder will submit a Request for Information (RFI) to the designer for clarification or more information. The designer will issue clarifications or directives so that the builder can continue to meet the design intent.

On occasion, the RFI will reveal that something more than was shown in the construction documents is necessary to fulfill the design intent. The clarification or modification may impact the scope of the work to a degree that additional construction costs become necessary.

As long as the design omission is not negligent, the CCA is intended to be the source of funds necessary for these design clarifications or modifications.

Allowance Method

Detailed plans, schematics and specifications for Jackson Township Board of Education were not available to deliver a cost estimate for each ECM. The budgetary costs carried in the project are based on good faith estimates, contractor supplied budgets for similar ECMs on other recent projects and a database of actual installed costs for various ECMs.

a. Allowance Amount (10% of Hard Costs)

BID PACKAGE ALLOWANCE SCHEDULE	
ECM	CONTINGENCY AMOUNT
Solar PPA	$0
LED Lighting Replacement with Controls	$214,087
Roof Refurbishment	$391,548
Upgrade/Install Metasys Control System	$100,530
High Efficiency Transformers	$62,875
Boiler Replacement	$74,743
Unit Ventilator Replacement	$58,011
Combined Heat & Power Unit	$26,981
Rooftop Unit Replacement	$34,325
Building Envelope Weatherization	$14,317
Premium Efficiency Pump Motors and VFDs	$12,020
Destratification Fans	$9,000
Add Split System Cooling to Gym AHUs	$5,500
Plug Load Controls	$4,068
Split System AC Replacement	$2,747
Energy Education	$2,500
TOTAL	**$1,013,254**

Project total construction contingency allowance amount is 5% of estimated hard costs and is agreed upon.

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ENERGY SAVINGS PLAN

APPENDIX B – DESIGN BID BUILD

Appendix B – Design Bid Build Procedures

Design–bid–build (or **design/bid/build**, and abbreviated **D–B–B** or **D/B/B** accordingly), also known as **Design–tender** (or "design/tender") **traditional method** or **hard bid** is the method of delivery for this project.

Design–bid–build is the traditional method for project delivery and differs in several substantial aspects from design–build.

There are three main sequential phases to the design–bid–build delivery method:

- The design phase
- The bidding (or tender) phase
- The construction phase

Design Phase

In this phase DCO will design and produce bid documents, including construction drawings and technical specifications, on which various contractors will in turn bid to construct the project.

The Energy Savings Plan (ESP) is intended to document owner's project requirements and provide a conceptual and/or schematic design and good faith estimates.

With the ESP DCO will bring in other design professionals including mechanical, electrical, and plumbing engineers (MEP specifications engineers), a fire protection engineer, structural engineer, sometimes a civil engineer and a landscape architect to help complete the construction drawings and technical.

The design document should reflect the intent of the energy savings plan for scope, price, savings, operations & maintenance savings, incentive and schedule.

The finished bid documents are coordinated by the DCO and owner for issuance to contractors during the bid phase.

Bid (or tender) phase

Bidding is according to NJ Public Bid Law and is "open", in which any qualified bidder may participate.

The various contractors bidding obtain bid documents, and then put them out to multiple subcontractors for bids on sub-components of the project.

Questions may arise during the bid period, and DCO will issue clarifications or corrections to the bid documents in the form of addenda.

From these elements, the contractor compiles a complete bid for submission by the established closing date and time bid date.

Bids are to be based on a base bid lump sum plus alternates, bid requirements and alternates are elucidated within the bid documents.

Once bids are received, DCO reviews the bids, seeks any clarifications required of the bidders, investigates contractor qualifications, ensures all documentation is in order (including bonding if required), and advises the owner as to the ranking of the bids.

If the bids fall in a range acceptable to the owner, the project is awarded to the contractor with the lowest reasonable bid.

In the event that all of the bids do not satisfy the needs of the owner the following options become available to DCO:

- Re-bid the construction of the project on a future when monies become available and/or construction costs go down.
- Revise the design of that ECM (at no cost to the client) so as to make the project smaller or reduce features or elements of the project to bring the cost down. The revised bid documents can then be issued again for bid.
    - DCO will provide guidance on energy savings, operation and maintenance savings and incentives to ensure the project is self-funding.
- Revise the design of future ECM(s) (at no cost to the client) so as to make the project smaller or reduce features or elements of the project to bring the cost down. The current bid package can then be contracted
    - DCO will provide guidance on energy savings, operation and maintenance savings and incentives to ensure the project is self-funding.

Construction phase

Once the construction of the project has been awarded to the contractor, the bid documents (e.g., approved construction drawings and technical specifications) may not be altered.

The necessary permits (for example, a building permit) must be achieved from all jurisdictional authorities in order for the construction process to begin.

Should design changes be necessary during construction, whether initiated by the contractor, owner, or as discovered by the architect, DCO will issue sketches or written clarifications and handle the project through allowance (See Appendix A).

The contractor may be required to document "as built" conditions to the owner.

Bidding Method

1. To achieve energy savings and fund debt service payments as rapidly as possible the bid packages will be bid in the following order:

BID METHOD SCHEDULE		
ECM	COST + ALLOWANC	SAVINGS
Solar PPA	$0	$360,205
LED Lighting Replacement with Controls	$4,495,833	$387,144
Roof Refurbishment	$8,222,510	$16,482
Upgrade/Install Metasys Control System	$2,111,130	$227,824
High Efficiency Transformers	$1,320,380	$94,259
Boiler Replacement	$1,569,613	$66,195
Unit Ventilator Replacement	$1,218,227	$7,419
Combined Heat & Power Unit	$566,608	$30,177
Rooftop Unit Replacement	$720,825	$6,939
Building Envelope Weatherization	$300,654	$22,362
Premium Efficiency Pump Motors and VFDs	$252,428	$24,937
Destratification Fans	$189,000	$18,043
Add Split System Cooling to Gym AHUs	$115,500	-$1,885
Plug Load Controls	$85,435	$13,057
Split System AC Replacement	$57,695	$1,299
Energy Education	$52,500	$0
TOTAL	$21,278,337	$1,274,457

2. Bids in group 1 (Green) are within 15% of budget value they will be awarded.
3. Bids in group 2 (Yellow) may be value engineered from the project to meet budget
    a. DCO will provide the impact of ECMs value engineered:
        i. Energy Savings
        ii. Operations and Maintenance Savings
        iii. Incentive
4. Bids in group 3 (Red) may be value engineered **or removed** from the project to meet budget
    a. DCO will provide the impact of ECMs value engineered or removed:
        i. Energy Savings
        ii. Operations and Maintenance Savings
        iii. Incentive
5. As per ESIP law DCO fee will be applied to the ECM hard cost.
    a. DCO will receive no compensation for bids that are under budget
    b. DCO will receive no penalty for bids that are over budget
6. If the budget overruns make savings unachievable at the current budget, DCO will provide additional ECMs above the budget to meet the required energy savings

Project bidding strategy is agreed upon.

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ENERGY SAVINGS PLAN

APPENDIX C – OPERATIONS AND MAINTENANCE SAVINGS

Appendix C – Operation & Maintenance Savings

Operations and Maintenance and other non-energy-related cost savings are allowable in NJ ESIPs, and are defined as reduction in expenses (other than energy cost savings) related to energy and water consuming equipment:

Energy-related cost savings can result from avoided expenditures for operations, maintenance, equipment repair, or equipment replacement due to the ESIP project.

Sources of O&M savings include:

- Termination of service personnel
- Lower maintenance service contract costs
- Decrease in repair costs
    - Avoided repair and replacement costs as a result of replacing old and unreliable equipment
    - Material savings due to new equipment warranties
    - Material savings due to the longer life items not needing replacement
        - In particular, reduction in florescent bulbs due to LED

Termination of service personnel

As a result of the ESIP, a number of the client's maintenance staff members may no longer be required. If there will be a reduction in the government's maintenance staff, O&M savings can be claimed.

A problem could arise if the maintenance staff is not reduced. Then it would be necessary to determine what new O&M responsibilities the facility has taken on, or savings should not be claimed. For example, it could be that a new building was constructed. During the performance period, it is important to establish that any increased maintenance was not due to the equipment installed under the ESIP

Lower maintenance service contract costs

Prior to the implementation of the ESIP mechanical and electrical equipment was maintained by a third party under a maintenance contract. The ESIP replaces the aging equipment with newer, more efficient equipment, which can reduce the service costs to the client.

Decrease in repair costs

The client is responsible for maintenance both before and after the equipment installation. Although there is no reduction in staff for which to claim labor savings, there will be cost savings on replacement materials.

Material-related savings frequently result from lighting and lighting controls projects.

For this project, lighting maintenance savings will result from the following:

1. Reduced material requirements (e.g., lamps)
2. Reduced operating time — Control measures increase equipment life by reducing the burn time of lamps and ballasts
3. Warranty-related savings — newly installed lamps, and fixtures come with a manufacturer warranty of 10 years.

O&M Savings

Project total O&M savings to fund debt service amount: $174,369 in lighting material costs

Project O&M Savings strategy is agreed upon.

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ENERGY SAVINGS PLAN

APPENDIX D – PROJECT CHANGES IN FINANCING

Appendix D – Project Changes in Financing

The Energy savings plan has been approved using:

Interest rate of: 2.20%
Term: ..... 20 Years
Construction Term ..... 1 Year
Construction Interest Only Payment of ..... TBD by JTBOE financial advisor
Annual Surplus of no less than $10,652

During financing DCO will provide assistance but does not guarantee the timing of savings or incentives.

While beneficial to the client financing changes are the responsibility of the client, bond counsel and/or financial advisor. DCO represents in no way advice on these financial items

Financial items may include but are not limited to:

- Timing of payments
- Splitting payments into bi-annual, tri-annual, etc.
- Coordination with the client's fiscal year
- Local finance board material, forms and presentations
- Multiple tiered interest rates

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ENERGY SAVINGS PLAN

APPENDIX E – INCENTIVES IN DEBT SERVICE

Appendix E – Incentives in Debt Service

Estimated incentive values were calculated in accordance with the New Jersey Clean Energy Program Guidelines The total incentive amount was calculated to be $2,767,486 in rebates and incentives - 50%, $1,383,743, has been applied to the project financial analysis (See Section 4). Please see below and Appendix F for building-by-building details.

Incentive Totals

BUILDING	INCENTIVE TYPE	QUANTITY	UNITS	INCENTIVE $/UNIT	INSTALL INCENTIVE	YEAR 1 INCENTIVE	YEAR 2 INCENTIVE	SUBTOTAL	TOTAL
JACKSON TOWNSHIP BOARD OF EDUCATION	P4P 2&3 (electric)	4,168,379	kWh	$0.44	$0	$917,043	$917,043	$1,834,087	$2,767,486
	P4P 2&3 (natural gas)	87,935	therms	$5.00	$0	$219,837	$219,837	$439,674	
	Direct Install	$303,501	hard cost	74%	$223,687	$0	$0	$223,687	
	SmartStart	Various	Various	Various	$0	$130,038	$0	$130,038	
	Combined Heat & Power	70	kW	$2,000	$42,000	$70,000	$28,000	$140,000	
				TOTALS	$265,687	$1,336,918	$1,164,880	$2,767,486	

Incentive Data

BUILDING	INCENTIVE TYPE	QUANTITY	UNITS	INCENTIVE $/UNIT	INSTALL INCENTIVE	YEAR 1 INCENTIVE	YEAR 2 INCENTIVE	SUBTOTAL	TOTAL
Jackson Liberty High School	SmartStart	Various	Various	Various		$129,748		$129,748	$129,748
Jackson Memorial High School	P4P 2&3 (electric)	1,062,040	kWh	$0.44		$233,649	$233,649	$467,298	$539,507
Jackson Memorial High School	P4P 2&3 (natural gas)	14,442	therms	$5.00		$36,105	$36,105	$72,209	
Christa McAuliffe Middle School	P4P 2&3 (electric)	480,601	kWh	$0.44		$105,732	$105,732	$211,464	
Christa McAuliffe Middle School	P4P 2&3 (natural gas)	15,113	therms	$5.00		$37,782	$37,782	$75,563	$357,027
Christa McAuliffe Middle School	Combined Heat & Power	35	kW	$2,000	$21,000	$35,000	$14,000	$70,000	
Elms Elementary School	P4P 2&3 (electric)	473,005	kWh	$0.44		$104,061	$104,061	$208,122	$208,122
Goetz Middle School	P4P 2&3 (electric)	536,451	kWh	$0.44		$118,019	$118,019	$236,039	$372,574
Goetz Middle School	P4P 2&3 (natural gas)	27,307	therms	$5.00		$68,268	$68,268	$136,535	
Crawford Rodriguez Elementary School	P4P 2&3 (electric)	599,198	kWh	$0.44		$131,824	$131,824	$263,647	
Crawford Rodriguez Elementary School	P4P 2&3 (natural gas)	25,207	therms	$5.00		$63,019	$63,019	$126,037	$459,684
Crawford Rodriguez Elementary School	Combined Heat & Power	35	kW	$2,000	$21,000	$35,000	$14,000	$70,000	
Switlik Elementary School	P4P 2&3 (electric)	561,150	kWh	$0.44		$123,453	$123,453	$246,906	$276,235
Switlik Elementary School	P4P 2&3 (natural gas)	5,866	therms	$5.00		$14,665	$14,665	$29,329	
Holman Elementary School	P4P 2&3 (electric)	274,516	kWh	$0.44		$60,393	$60,393	$120,787	$120,787
Johnson Elementary School	P4P 2&3 (electric)	181,417	kWh	$0.44		$39,912	$39,912	$79,824	$79,824
Rosenauer Elementary School	Direct Install	$146,014	hard cost	80%	$116,811			$116,811	$116,811
Administration Building	Direct Install	$57,145	hard cost	61%	$34,846			$34,846	$34,846
Transportation Building	Direct Install	$100,342	hard cost	72%	$72,030			$72,030	$72,030
Maintenance Garage	SmartStart	Various	Various	Various		$290		$290	$290

No implied and/or written guarantee is being made with respective to the receipt of incentives. All incentives estimates carry inherent risks that may jeopardize the receipt of them. Therefore, the client acknowledges and accepts that any project proposed should not rely on the receipt of incentives as a reason to implement it.

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ENERGY SAVINGS PLAN

APPENDIX F – ECM BREAKDOWN BY BUILDING

JACKSON TOWNSHIP BOARD OF EDUCATION % SAVINGS BY BUILDING (T.O.R.)

JACKSON TOWNSHIP BOARD OF EDUCATION BUILDINGS/FACILITIES		UTILITY ELECTRIC CONSUMPTION SAVINGS	ELECTRIC DEMAND SAVINGS	ONSITE ELECTRIC SAVINGS	NATURAL GAS SAVINGS	ONSITE NATURAL GAS SAVINGS	Fuel Oil #2 (Gal) SAVINGS	Solar PPA (kWh) SAVINGS	Water & Sewer (Gal) SAVINGS
BUILDING/FACILITY NAME	SQFT	kWh	kW	kWh	THERMS	THERMS	Fuel Oil #2 (Gal)	Solar PPA (kWh)	Water & Sewer (Gal)
Jackson Liberty High School	300,000	88.5%	18.3%	32.2%	11.0%	11.0%	-		0.0%
Jackson Memorial High School	306,000	41.0%	11.3%	32.4%	27.7%	27.7%	-	-	0.0%
Christa McAuliffe Middle School	130,000	95.5%	19.9%	42.7%	9.0%	27.7%	-	-	0.0%
Elms Elementary School	130,000	78.3%	11.6%	32.5%	-	-	-		-
Goetz Middle School	126,081	92.7%	16.9%	31.2%	-	-	100.0%	-	0.0%
Crawford Rodriguez Elementary School	107,400	90.0%	24.5%	38.6%	18.4%	32.0%	-	-	0.0%
Switlik Elementary School	72,077	89.4%	7.6%	50.8%	40.5%	40.5%	-	-	0.0%
Holman Elementary School	56,280	87.5%	18.3%	34.4%	-	-	-	-	0.0%
Johnson Elementary School	55,452	93.3%	18.2%	37.7%	-	-	-	-	0.0%
Rosenauer Elementary School	34,128	93.3%	26.7%	38.6%	29.3%	29.3%	-	-	0.0%
Administration Building	10,200	70.0%	12.0%	26.5%	-	-	-	-	0.0%
Transportation Building	6,640	94.4%	33.9%	48.4%	7.0%	7.0%	-	-	0.0%
Maintenance Garage	4,800	95.3%	0	54.9%	0.0%	0.0%	-	-	-
TOTALS	**1,339,058**	**76.9%**	**15.7%**	**35.2%**	**-0.4%**	**7.2%**	**100.0%**	**-**	**0.0%**

JACKSON TOWNSHIP BOARD OF EDUCATION SAVINGS BY BUILDING BY UTILITY FROM SMART SELECT

JACKSON TOWNSHIP BOARD OF EDUCATION BUILDINGS/FACILITIES		ELECTRIC CONSUMPTION SAVINGS	ELECTRIC DEMAND SAVINGS	ONSITE ELECTRIC SAVINGS	NATURAL GAS SAVINGS	ONSITE NATURAL GAS SAVINGS	Fuel Oil #2 (Gal) SAVINGS	Solar PPA (kWh) SAVINGS	Water & Sewer (Gal) SAVINGS
BUILDING/FACILITY NAME	SQFT	kWh	kW	kWh	THERMS	THERMS	Fuel Oil #2 (Gal)	Solar PPA (kWh)	Water & Sewer (Gal)
Jackson Liberty High School	300,000	2,121,955	166	1,289,612	5,049	5,049	0	(832,343)	0
Jackson Memorial High School	306,000	1,706,731	156	1,348,675	14,442	14,442	0	(358,056)	0
Christa McAuliffe Middle School	130,000	1,332,613	94	594,942	5,194	15,955	0	(519,474)	0
Elms Elementary School	130,000	595,679	60	595,679	0	0	0	0	0
Goetz Middle School	126,081	1,769,498	96	594,965	(53,661)	(53,661)	58,470	(1,174,533)	0
Crawford Rodriguez Elementary School	107,400	1,545,366	87	662,427	14,934	26,014	0	(658,269)	0
Switlik Elementary School	72,077	1,085,760	22	616,371	6,144	6,144	0	(469,389)	0
Holman Elementary School	56,280	888,498	51	349,204	0	0	0	(539,294)	0
Johnson Elementary School	55,452	626,947	42	253,440	0	0	0	(373,507)	0
Rosenauer Elementary School	34,128	232,932	18	96,207	5,925	5,925	0	(136,725)	0
Administration Building	10,200	181,217	12	68,676	0	0	0	(112,541)	0
Transportation Building	6,640	99,380	10	50,911	686	686	0	(48,469)	0
Maintenance Garage	4,800	21,222	2	12,238	0	0	0	(8,984)	0
TOTALS	**1,339,058**	**12,207,798**	**816**	**6,533,347**	**(1,287)**	**20,554**	**58,470**	**(5,231,584)**	**0**

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ENERGY SAVINGS PLAN

APPENDIX G – LOCAL GOVERNMENT ENERGY AUDITS