ENERGY SAVINGS PLAN

SUBMITTED BY:
DCO Energy Efficiency Division
100 Lenox Drive
Lawrenceville, NJ 08648
Rev 1
2/4/25

ENERGY SAVINGS PLAN

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SECTION 1 – PROJECT OVERVIEW

The Energy Savings Plan (ESP) is the core of the Energy Savings Improvement Program (ESIP) process. It describes the Bayonne Public Schools (BPS) 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 the BPS with the necessary information to decide which proposed ECMs to implement as part of your (ESIP) project. Working with the BPS Administration, your selected ESIP project would:

1. Self-fund a $16,932,930 project
2. Generate $932,563 in annual energy savings
3. Eligible for $729,062 in Rebates and Incentives through the PSEG Prescriptive and Custom Rebate Programs

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

ESIP MODEL - HYBRID	
ESCO	DCO Energy, LLC
ARCHITECT OF RECORD	DMR Architects
FINANCIAL ADVISOR	Phoenix Advisors, LLC
BOND COUNSEL	McManimon, Scotland & Baumann, LLC

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 J)*
- *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; (Appendix E)*
- *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 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 BPS's approval of the Energy Savings Plan to implement via the requirements of the ESIP legislation. Your time, effort, and support are appreciated.

SECTION 2 – BAYONNE PUBLIC SCHOOLS ENERGY BASELINE

Bayonne Public Schools Facilities & Utility Baseline Information

Bayonne Public School's Energy Savings Plan includes 12 facilities that consist of elementary schools, middle schools, and a high school. To develop the ESP, DCO Energy was provided with the necessary utility data (Electric & Natural Gas). DCO Energy documented this utility data and established the baseline period of September 2023 through August 2024. A listing of the buildings and the total utility consumption for the schools is detailed below.

BUILDINGS & FACILITIES					
BUILDING #	BUILDING/FACILITY NAME	ADDRESS			SQFT
		STREET	STATE	ZIP	
1	Bayonne High School & Ice Rink	669 Avenue A	NJ	07002	470,000
2	Henry Harris Community School	135 Avenue C	NJ	07002	65,000
3	Horace Mann Community School	25 W 38th St	NJ	07002	69,717
4	Lincoln Community School	208 Prospect Ave	NJ	07002	66,000
5	Philip G. Vroom Community School	18 W 26th St	NJ	07002	52,000
6	Dr. Walter F. Robinson Community School	95 West 31st Street	NJ	07002	79,800
7	Washington Community School	191 Avenue B	NJ	07002	76,613
8	William Shemin Midtown Community School	550 Avenue A	NJ	07002	136,204
9	Woodrow Wilson Community School	101 W 56th St	NJ	07002	83,000
10	John M Bailey Community School	75 West 10th Street	NJ	07002	53,000
11	Mary J Donahoe Community School	25 East 5th Street	NJ	07002	62,000
12	Nickolas Oresko Community School	33 East 24th Street	NJ	07002	82,000

Bayonne Public Schools Electric Baseline

Bayonne Public School's electric consumption totals for the baseline period of September 2023 through August 2024 is as follows:

BUILDING/FACILITY NAME	SQFT	CONSUMPTION kWh	DEMAND kW	USAGE BTU / SQFT	TOTAL COST $$
Bayonne High School & Ice Rink	470,000	4,038,602	702	29,319	$728,923
Henry Harris Community School	65,000	356,309	208	18,703	$76,794
Horace Mann Community School	69,717	304,185	322	14,887	$82,060
Lincoln Community School	66,000	438,150	165	22,651	$83,569
Philip G. Vroom Community School	52,000	244,400	330	16,036	$67,635
Dr. Walter F. Robinson Community School	79,800	981,537	299	41,967	$205,124
Washington Community School	76,613	451,046	529	20,088	$109,462
William Shemin Midtown Community School	136,204	2,102,788	656	52,676	$379,568
Woodrow Wilson Community School	83,000	780,627	277	32,090	$141,851
John M Bailey Community School	53,000	324,346	237	20,881	$72,560
Mary J Donahoe Community School	62,000	363,676	238	20,014	$87,000
Nickolas Oresko Community School	82,000	868,695	665	36,146	$194,133
TOTALS	**1,295,334**	**11,254,361**	**702**	**29,645**	**$2,228,679**

Bayonne Public Schools Natural Gas Baseline

Bayonne Public School's natural gas consumption totals for the baseline period of September 2023 through August 2024 is as follows:

BUILDING/FACILITY NAME	SQFT	USAGE THERMS	USAGE BTU / SQFT	TOTAL COST $$
Bayonne High School & Ice Rink	470,000	292,869	62,313	$329,151
Henry Harris Community School	65,000	29,169	44,875	$37,011
Horace Mann Community School	69,717	22,575	32,380	$28,118
Lincoln Community School	66,000	43,595	66,054	$54,832
Philip G. Vroom Community School	52,000	23,485	45,164	$31,318
Dr. Walter F. Robinson Community School	79,800	22,259	27,893	$28,734
Washington Community School	76,613	29,638	38,685	$37,331
William Shemin Midtown Community School	136,204	22,251	16,337	$31,333
Woodrow Wilson Community School	83,000	39,193	47,221	$45,704
John M Bailey Community School	53,000	23,881	45,058	$28,580
Mary J Donahoe Community School	62,000	20,596	33,220	$27,270
Nickolas Oresko Community School	82,000	14,369	17,523	$18,930
TOTALS	**1,295,334**	**867,804**	**66,995**	**$1,014,689**

Bayonne Public Schools Total Energy & Energy Cost

Bayonne Public School's total energy usage (BTUs) and energy costs for the baseline period of September 2023 through August 2024 is as follows:

BUILDING/FACILITY NAME	SQFT	USAGE BTUs	$$
Bayonne High School & Ice Rink	470,000	43,066,642,824	$1,192,946
Henry Harris Community School	65,000	4,132,607,408	$137,189
Horace Mann Community School	69,717	3,295,346,120	$127,484
Lincoln Community School	66,000	5,854,499,200	$175,025
Philip G. Vroom Community School	52,000	3,182,433,400	$115,487
Dr. Walter F. Robinson Community School	79,800	5,574,876,844	$274,593
Washington Community School	76,613	4,502,744,552	$163,825
William Shemin Midtown Community School	136,204	9,399,823,856	$440,012
Woodrow Wilson Community School	83,000	6,582,814,524	$211,053
John M Bailey Community School	53,000	3,494,759,652	$117,674
Mary J Donahoe Community School	62,000	3,300,481,112	$131,126
Nickolas Oresko Community School	82,000	4,400,844,340	$230,339
TOTALS	**1,295,334**	**125,180,253,832**	**$3,633,131**

Energy Savings Utility Rates

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

CALCULATED UTILITY RATES BY BUILDING				
BUILDING/FACILITY	ELECTRIC			NATURAL GAS
	$$ / kW	$$ / kWh	Blended $$ / kWh	Therms
Bayonne High School & Ice Rink	$25.85	$0.155	$0.18	$1.11
Henry Harris Community School	$14.32	$0.169	$0.22	$1.20
Horace Mann Community School	$24.24	$0.226	$0.27	$1.15
Lincoln Community School	$14.32	$0.154	$0.19	$1.21
Philip G. Vroom Community School	$7.73	$0.234	$0.28	$1.23
Dr. Walter F. Robinson Community School	$36.71	$0.179	$0.21	$1.19
Washington Community School	$14.26	$0.200	$0.24	$1.18
William Shemin Midtown Community School	$14.35	$0.152	$0.18	$1.31
Woodrow Wilson Community School	$14.33	$0.151	$0.18	$1.11
John M Bailey Community School	$7.70	$0.197	$0.22	$1.12
Mary J Donahoe Community School	$40.93	$0.197	$0.22	$1.21
Nickolas Oresko Community School	$40.93	$0.201	$0.22	$1.17

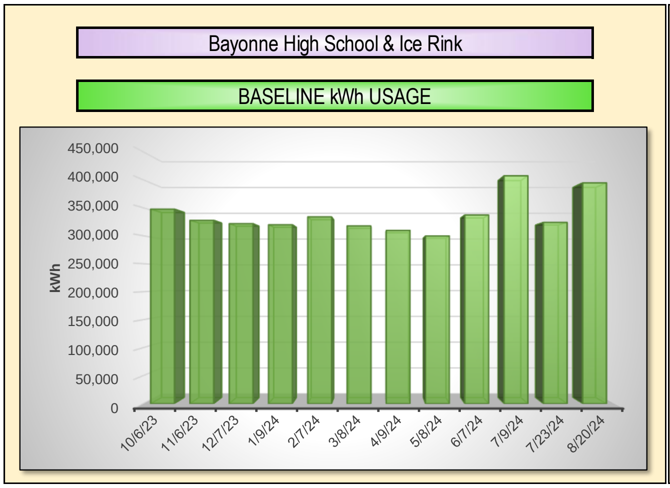
Bayonne High School & Ice Rink – Baseline Energy Consumption & Costs

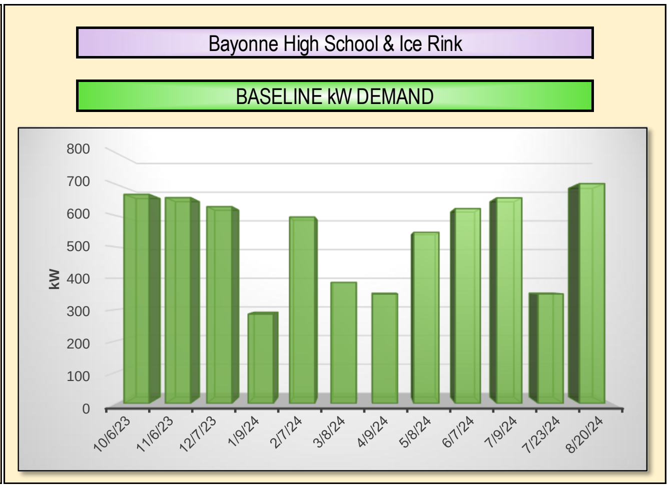
Bayonne High School & Ice Rink energy consumption and energy costs for the baseline period of September 2023 through August 2024 is shown below.

Electricity is provided by PSEG and electric commodity is provided by a 3rd party supplier, NextEra Energy Services. There are (4) Electric Accounts/Meters serving Bayonne High School & Ice Rink.

BUILDING/FACILITY	ELECTRIC (PSEG)							
	Account #	Meter #	Account #	Meter #	Account #	Meter #	Account #	Meter #
Bayonne High School & Ice Rink	4200697602	9210170	4200218208	9210171	4247150308	9213532	7339277404	LIGHTS

Bayonne High School & Ice Rink									
TOTAL ELECTRIC									
Usage kWh	**Demand kW**	**Electric Delivery Charges**	**Electric Commodity Charges**	**Electric Demand Charges**	**Fixed Customer Charges**	**Total Electric Charges**	**Cost / kW Checksum**	**Cost / kWh Checksum**	**BTU**
347,493	668	$6,498	$51,292	$8,336	$1,169	$67,296	$12.48	$0.166	1,185,646,116
327,535	657	$5,936	$47,361	$4,650	$1,169	$59,116	$7.07	$0.163	1,117,549,420
321,603	629	$5,438	$45,277	$4,259	$1,169	$56,144	$6.78	$0.158	1,097,309,436
319,639	286	$5,405	$40,888	$3,976	$1,169	$51,439	$13.93	$0.145	1,090,608,268
333,661	595	$7,119	$47,056	$4,329	$1,169	$59,674	$7.27	$0.162	1,138,451,332
317,489	386	$5,400	$41,682	$4,250	$1,169	$52,501	$11.00	$0.148	1,083,272,468
309,515	350	$5,450	$40,435	$4,367	$1,169	$51,421	$12.49	$0.148	1,056,065,180
299,558	546	$5,397	$44,141	$4,528	$1,169	$55,235	$8.29	$0.165	1,022,091,896
336,975	622	$6,149	$49,126	$11,895	$1,169	$68,339	$19.11	$0.164	1,149,758,700
407,041	657	$7,517	$56,635	$14,934	$1,169	$80,256	$22.74	$0.158	1,388,823,892
323,775	350	$6,141	$37,882	$9,046	$774	$53,843	$25.85	$0.136	1,104,720,300
394,318	702	$7,728	$51,946	$12,817	$1,169	$73,661	$18.26	$0.151	1,345,413,016
4,038,602	**702**	**$74,179**	**$553,721**	**$87,388**	**$13,636**	**$728,923**	**$25.85**	**$0.155**	**13,779,710,024**





Natural Gas Delivery and Commodity is provided by PSEG. There are (3) Natural Gas Accounts/Meters serving Bayonne High School & Ice Rink.

BUILDING/FACILITY	NATURAL GAS (PSEG)					
	Account #	Meter #	Account #	Meter #	Account #	Meter #
Bayonne High School & Ice Rink	4200697602	4846062	4200218208	COMBINED	7339276718	COMBINED

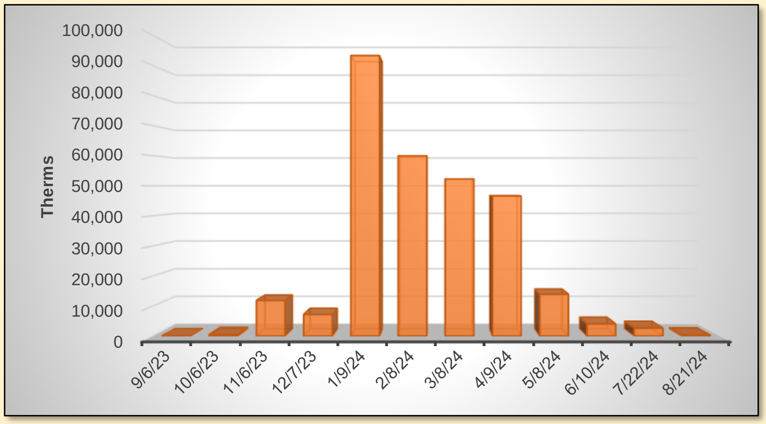
Bayonne High School & Ice Rink

TOTAL NATURAL GAS

Therms	Gas Delivery Charges	Gas Commodity Charges	Fixed Customer Charge	Gas Total Charges	Cost/Therm Checksum	BTU
89	6	48	180	233	$0.60	8,912,000
550	176	446	240	863	$1.13	54,956,500
11,864	11,049	7,250	240	18,539	$1.54	1,186,418,600
7,198	10,292	4,628	240	15,160	$2.07	719,775,800
93,290	25,820	52,710	240	78,770	$0.84	9,328,999,100
59,957	20,453	53,366	220	74,039	$1.23	5,995,748,800
52,248	19,351	46,510	240	66,101	$1.26	5,224,840,200
46,607	9,229	41,490	240	50,959	$1.09	4,660,716,500
13,933	2,989	12,406	240	15,635	$1.10	1,393,260,200
4,082	759	3,641	240	4,640	$1.08	408,168,900
2,684	525	2,392	650	3,566	$1.09	268,363,700
368	76	328	240	645	$1.10	36,772,500
292,869	**$100,724**	**$225,215**	**$3,213**	**$329,151**	**$1.11**	**29,286,932,800**

Bayonne High School & Ice Rink

BASELINE NATURAL GAS CONSUMPTION



Henry Harris Community School – Baseline Energy Consumption & Costs

Henry Harris Community School energy consumption and energy costs for the baseline period of September 2023 through August 2024 is as follows:

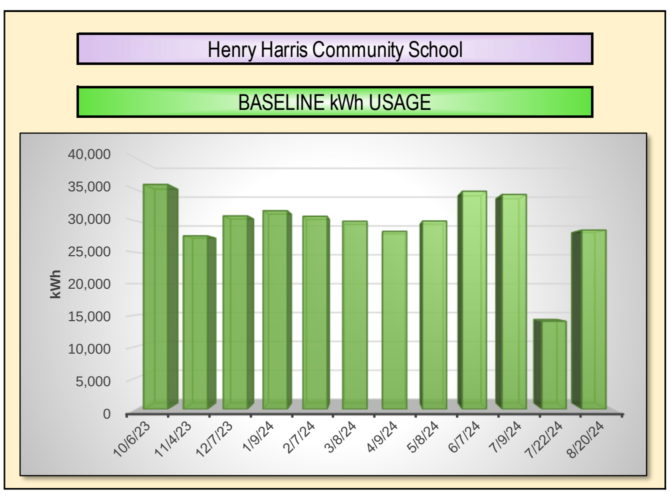
Electricity is provided by PSEG and electric commodity is provided by a 3rd party supplier, NextEra Energy Services. There is (1) Electric Account/Meter serving Henry Harris Community School.

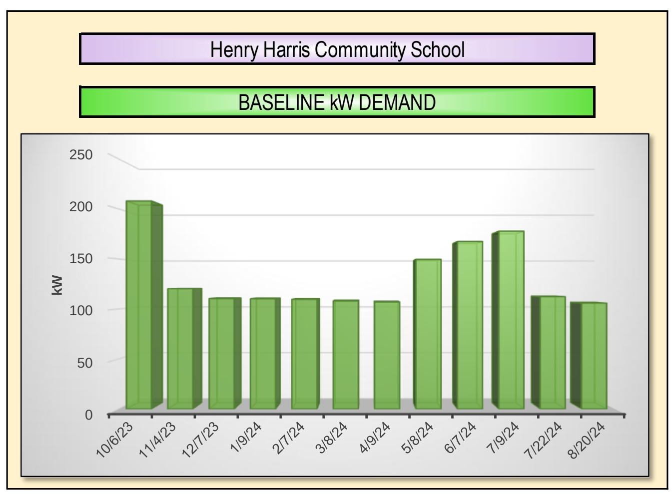
BUILDING/FACILITY	ELECTRIC (PSEG)	
	Account #	Meter #
Henry Harris Community School	4200420708	9207656

Henry Harris Community School

TOTAL ELECTRIC

Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Fixed Customer Charges	Total Electric Charges	Cost / kW Checksum	Cost / kWh Checksum	BTU
35,804	208	$664	$6,122	$1,028	$371	$8,184	$4.94	$0.190	122,163,248
27,619	120	$467	$4,138	$595	$371	$5,571	$4.95	$0.167	94,236,028
30,805	110	$520	$4,491	$548	$371	$5,930	$4.96	$0.163	105,106,660
31,622	110	$534	$4,559	$547	$371	$6,010	$4.96	$0.161	107,894,264
30,732	110	$519	$4,252	$544	$371	$5,685	$4.96	$0.155	104,857,584
29,946	108	$511	$4,215	$536	$371	$5,632	$4.96	$0.158	102,175,752
28,333	107	$501	$4,166	$530	$371	$5,568	$4.96	$0.165	96,672,196
29,973	150	$547	$4,769	$743	$371	$6,429	$4.97	$0.177	102,267,876
34,718	167	$633	$5,522	$2,382	$371	$8,908	$14.23	$0.177	118,457,816
34,209	178	$636	$5,812	$2,533	$371	$9,352	$14.26	$0.188	116,721,108
14,014	112	$275	$1,944	$694	$161	$3,073	$6.18	$0.158	47,815,768
28,534	106	$559	$4,006	$1,515	$371	$6,451	$14.32	$0.160	97,358,008
356,309	208	$6,367	$53,994	$12,193	$4,240	$76,794	$14.32	$0.169	1,215,726,308





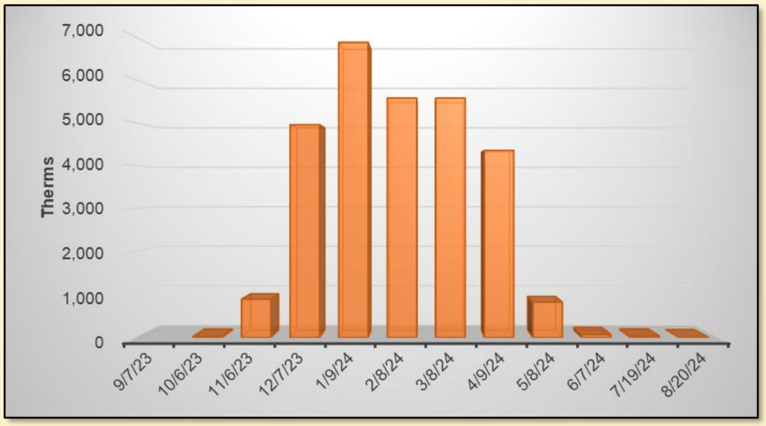
Natural Gas Delivery and Commodity is provided by PSEG. There is (1) Natural Gas Account/Meter serving Henry Harris Community School.

BUILDING/FACILITY	NATURAL GAS (PSEG)	
	Account #	Meter #
Henry Harris Community School	4200420708	3637556

Henry Harris Community School						
TOTAL NATURAL GAS						
Therms	**Gas Delivery Charges**	**Gas Commodity Charges**	**Fixed Customer Charge**	**Gas Total Charges**	**Cost/Therm Checksum**	**BTU**
0	$0	$0	$0	$0	$0.00	0
29	$2	$26	$180	$208	$0.98	2,863,400
893	$1,073	$802	$180	$2,055	$2.10	89,316,600
4,948	$1,801	$4,441	$180	$6,422	$1.26	494,787,200
6,863	$2,185	$6,161	$180	$8,525	$1.22	686,348,000
5,568	$1,437	$4,955	$180	$6,572	$1.15	556,773,600
5,568	$1,437	$4,955	$180	$6,572	$1.15	556,773,600
4,353	$812	$3,874	$180	$4,866	$1.08	435,269,600
825	$148	$734	$180	$1,061	$1.07	82,476,800
71	$6	$63	$180	$249	$0.97	7,082,600
35	$3	$31	$252	$286	$0.98	3,534,500
17	$181	$15	$0	$196	$11.83	1,655,200
29,169	**$9,085**	**$26,057**	**$1,869**	**$37,011**	**$1.20**	**2,916,881,100**

Henry Harris Community School

BASELINE NATURAL GAS CONSUMPTION



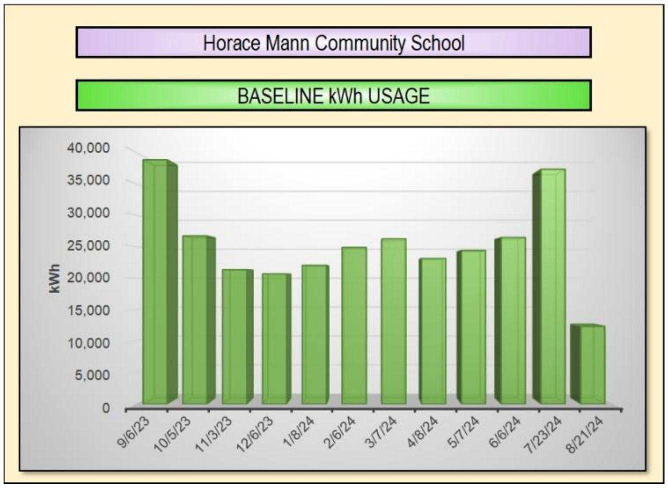
Horace Mann Community School – Baseline Energy Consumption & Costs

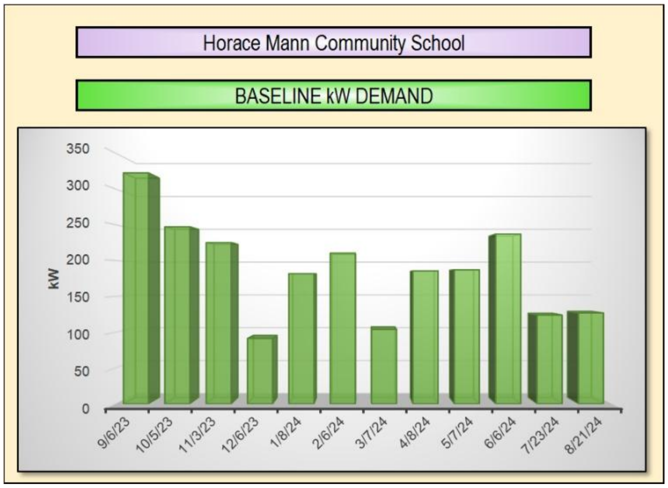
Horace Mann Community School energy consumption and energy costs for the baseline period of September 2023 through August 2024 is as follows:

Electricity is provided by PSEG and electric commodity is provided by a 3rd party supplier, NextEra Energy Services. There is (1) Electric Account/Meter serving Horace Mann Community School.

BUILDING/FACILITY	ELECTRIC (PSEG)	
	Account #	Meter #
Horace Mann Community School	7361421709	9213957

Horace Mann Community School									
TOTAL ELECTRIC									
age kWh	**Demand kW**	**Electric Delivery Charges**	**Electric Commodity Charges**	**Electric Demand Charges**	**Fixed Customer Charges**	**Total Electric Charges**	**Cost / kW Checksum**	**Cost / kWh Checksum**	**BTU**
38,794	322	$833	$8,533	$3,050	$10	$12,426	$9.46	$0.241	132,365,128
26,704	247	$701	$5,908	$655	$5	$7,269	$2.65	$0.247	91,114,048
21,341	225	$523	$5,124	$597	$5	$6,249	$2.65	$0.265	72,815,492
20,664	91	$507	$3,300	$486	$5	$4,298	$5.32	$0.184	70,505,568
22,036	182	$541	$4,917	$483	$5	$5,946	$2.66	$0.248	75,186,832
24,864	210	$610	$5,213	$559	$5	$6,387	$2.66	$0.234	84,835,968
26,232	104	$651	$3,832	$552	$5	$5,040	$5.32	$0.171	89,503,584
23,121	186	$595	$4,981	$493	$5	$6,074	$2.66	$0.241	78,888,852
24,396	187	$643	$4,834	$498	$5	$5,980	$2.66	$0.225	83,239,152
26,440	237	$562	$5,855	$1,831	$5	$8,253	$7.72	$0.243	90,213,280
37,281	124	$814	$6,148	$3,005	$8	$9,975	$24.24	$0.187	127,202,772
12,312	127	$278	$2,911	$967	$5	$4,161	$7.63	$0.259	42,008,544
304,185	**322**	**$7,258**	**$61,556**	**$13,177**	**$69**	**$82,060**	**$24.24**	**$0.226**	**1,037,879,220**





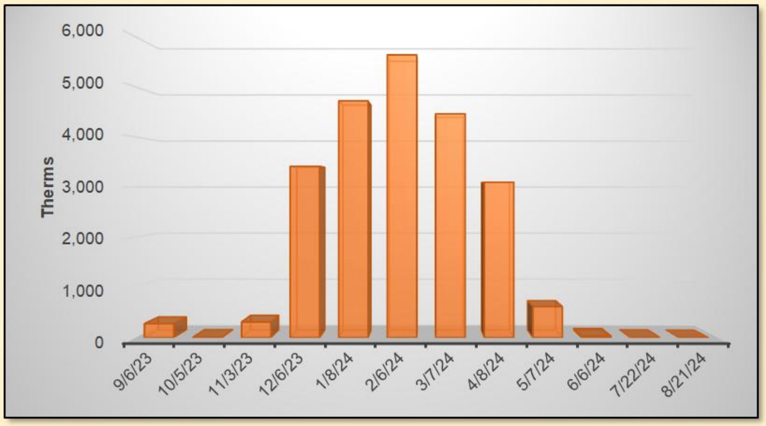
Natural Gas Delivery and Commodity is provided by PSEG. There is (1) Natural Gas Account/Meter serving Horace Mann Community School.

BUILDING/FACILITY	NATURAL GAS (PSEG)	
	Account #	Meter #
Horace Mann Community School	7361421709	3861789

Horace Mann Community School						
TOTAL NATURAL GAS						
Therms	**Gas Delivery Charges**	**Gas Commodity Charges**	**Fixed Customer Charge**	**Gas Total Charges**	**Cost/Therm Checksum**	**BTU**
278	$1	$250	$180	$430	$0.90	27,797,200
10	$1	$9	$180	$190	$0.96	1,038,200
311	$832	$178	$180	$1,190	$3.24	31,146,500
3,414	$1,403	$2,133	$180	$3,715	$1.04	341,400,000
4,716	$1,612	$2,647	$180	$4,439	$0.90	471,640,700
5,633	$1,900	$5,014	$180	$7,093	$1.23	563,333,400
4,459	$1,727	$4,136	$180	$6,043	$1.31	445,900,000
3,095	$570	$2,755	$180	$3,505	$1.07	309,546,800
618	$110	$550	$180	$840	$1.07	61,805,100
33	$3	$30	$180	$212	$0.97	3,338,400
5	$0	$5	$275	$281	$0.98	520,600
0	$0	$0	$180	$180	$0.00	0
22,575	**$8,159**	**$17,706**	**$2,252**	**$28,118**	**$1.15**	**2,257,466,900**

Horace Mann Community School

BASELINE NATURAL GAS CONSUMPTION



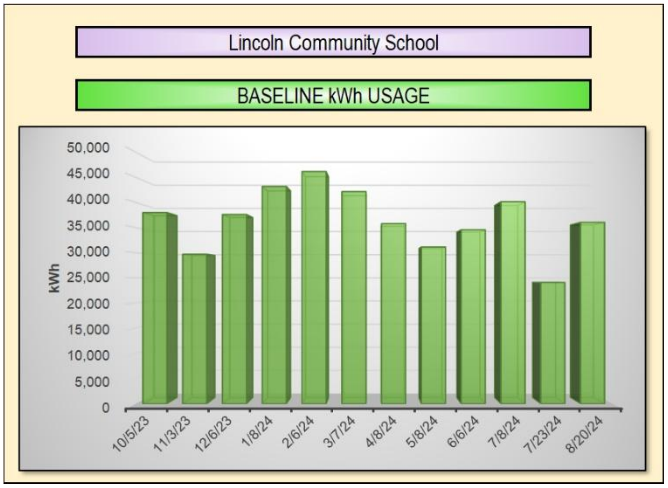
Lincoln Community School – Baseline Energy Consumption & Costs

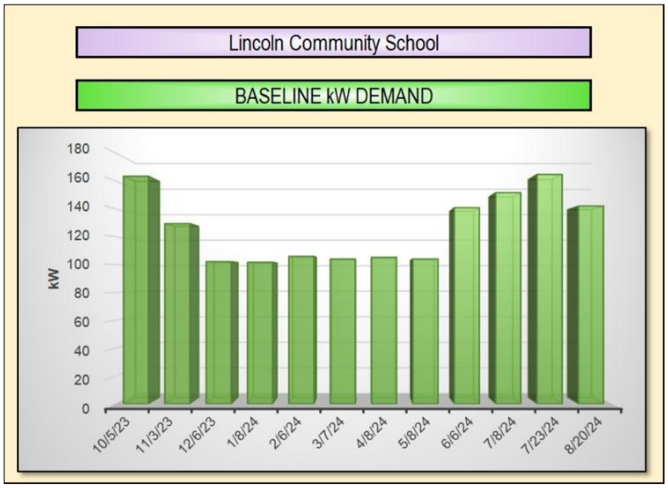
Lincoln Community School energy consumption and energy costs for the baseline period of September 2023 through August 2024 is as follows:

Electricity is provided by PSEG and electric commodity is provided by a 3rd party supplier, NextEra Energy Services. There is (1) Electric Account/Meter serving Lincoln Community School.

BUILDING/FACILITY	ELECTRIC (PSEG)	
	Account #	Meter #
Lincoln Community School	4200799502	9206393

Lincoln Community School									
TOTAL ELECTRIC									
Wh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Fixed Customer Charges	Total Electric Charges	Cost / kW Checksum	Cost / kWh Checksum	BTU
37,962	163	$708	$5,660	$808	$371	$7,546	$4.94	$0.168	129,526,344
29,685	129	$502	$4,449	$640	$371	$5,962	$4.94	$0.167	101,285,220
37,569	102	$635	$4,938	$506	$371	$6,450	$4.96	$0.148	128,185,428
43,133	102	$729	$5,412	$504	$371	$7,016	$4.96	$0.142	147,169,796
46,097	106	$779	$5,527	$526	$371	$7,202	$4.96	$0.137	157,282,964
42,122	104	$717	$5,206	$516	$371	$6,810	$4.96	$0.141	143,720,264
35,751	105	$633	$4,781	$522	$371	$6,307	$4.96	$0.151	121,982,412
31,116	104	$568	$4,255	$516	$371	$5,710	$4.96	$0.155	106,167,792
34,533	141	$630	$5,034	$2,003	$371	$8,038	$14.23	$0.164	117,826,596
40,097	152	$744	$5,901	$2,161	$371	$9,177	$14.26	$0.166	136,810,964
24,077	165	$472	$3,321	$1,174	$165	$5,132	$7.13	$0.158	82,150,724
36,008	142	$705	$5,108	$2,034	$371	$8,218	$14.32	$0.161	122,859,296
438,150	165	$7,820	$59,594	$11,911	$4,244	$83,569	$14.32	$0.154	1,494,967,800





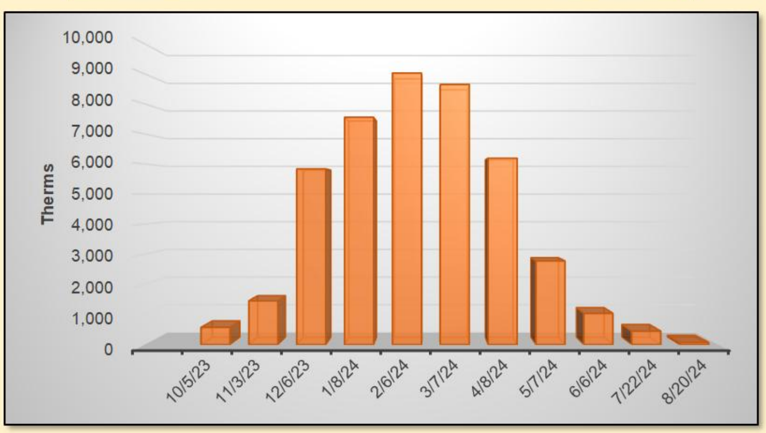
Natural Gas Delivery and Commodity is provided by PSEG. There is (1) Natural Gas Account/Meter serving Lincoln Community School.

BUILDING/FACILITY	NATURAL GAS (PSEG)	
	Account #	Meter #
Lincoln Community School	4200799502	3861803

Lincoln Community School						
TOTAL NATURAL GAS						
ıerms	**Gas Delivery Charges**	**Gas Commodity Charges**	**Fixed Customer Charge**	**Gas Total Charges**	**Cost/Therm Checksum**	**BTU**
0	$0	$0	$0	$0	$0.00	0
574	$36	$515	$180	$731	$0.96	57,378,500
1,457	$1,395	$1,308	$180	$2,883	$1.86	145,703,900
5,835	$2,172	$5,238	$180	$7,589	$1.27	583,504,700
7,548	$2,480	$6,775	$180	$9,435	$1.23	754,760,200
9,015	$2,971	$8,092	$180	$11,243	$1.23	901,495,600
8,636	$2,915	$7,751	$180	$10,847	$1.24	863,574,000
6,191	$1,072	$5,557	$180	$6,809	$1.07	619,128,700
2,779	$453	$2,495	$180	$3,128	$1.06	277,944,600
1,039	$88	$933	$180	$1,200	$0.98	103,914,900
448	$39	$403	$275	$717	$0.98	44,843,500
73	$7	$65	$180	$252	$0.99	7,282,800
43,595	**$13,628**	**$39,131**	**$2,073**	**$54,832**	**$1.21**	**4,359,531,400**

Lincoln Community School

BASELINE NATURAL GAS CONSUMPTION



Philip G. Vroom Community School – Baseline Energy Consumption & Costs

Philip G. Vroom Community School energy consumption and energy costs for the baseline period of September 2023 through August 2024 is as follows:

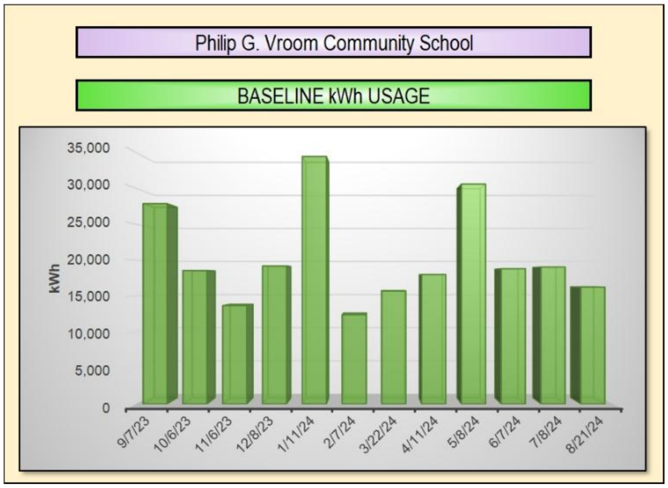
Electricity is provided by PSEG and electric commodity is provided by a 3rd party supplier, NextEra Energy Services. There is (1) Electric Account/Meter serving Philip G. Vroom Community School.

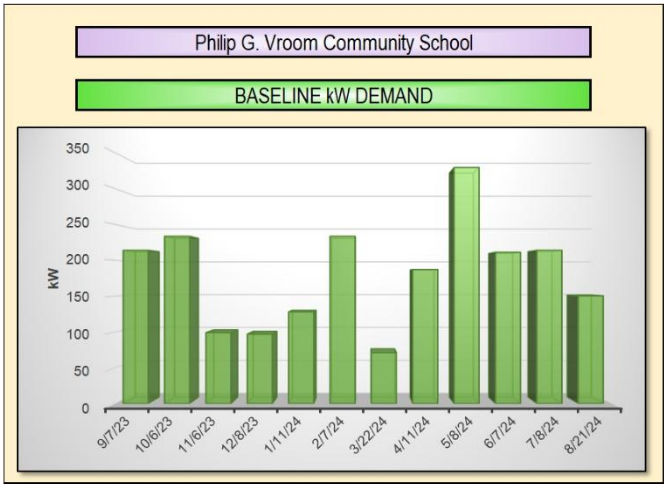
BUILDING/FACILITY	ELECTRIC (PSEG)	
	Account #	Meter #
Philip G. Vroom Community School	7361421407	309035062

Philip G. Vroom Community School

TOTAL ELECTRIC

age kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Fixed Customer Charges	Total Electric Charges	Cost / kW Checksum	Cost / kWh Checksum	BTU
27,840	214	$600	$5,737	$1,645	$5	$7,987	$7.68	$0.228	94,990,080
18,560	234	$482	$5,006	$619	$5	$6,112	$2.65	$0.296	63,326,720
13,680	99	$333	$2,726	$263	$5	$3,328	$2.65	$0.224	46,676,160
19,200	97	$492	$2,654	$451	$5	$3,602	$4.65	$0.164	65,510,400
34,400	128	$844	$5,158	$680	$10	$6,693	$5.32	$0.174	117,372,800
12,400	234	$304	$4,239	$621	$5	$5,169	$2.66	$0.366	42,308,800
15,680	71	$389	$2,928	$378	$5	$3,701	$5.32	$0.212	53,500,160
18,000	187	$465	$3,436	$498	$5	$4,403	$2.66	$0.217	61,416,000
30,560	330	$796	$7,110	$876	$10	$8,793	$2.66	$0.259	104,270,720
18,800	211	$400	$4,807	$1,632	$5	$6,843	$7.73	$0.277	64,145,600
19,040	214	$480	$2,632	$1,640	$5	$4,757	$7.66	$0.163	64,964,480
16,240	150	$367	$4,727	$1,147	$5	$6,246	$7.63	$0.314	55,410,880
244,400	**330**	**$5,953**	**$51,160**	**$10,450**	**$71**	**$67,635**	**$7.73**	**$0.234**	**833,892,800**





Natural Gas Delivery and Commodity is provided by PSEG. There is (1) Natural Gas Account/Meter serving Philip G. Vroom Community School.

BUILDING/FACILITY	NATURAL GAS (PSEG)	
	Account #	Meter #
Philip G. Vroom Community School	7361421407	1785519

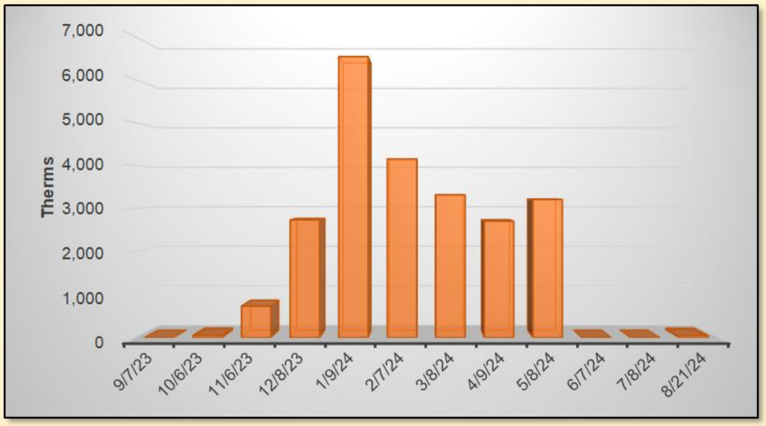
Philip G. Vroom Community School

TOTAL NATURAL GAS

Therms	Gas Delivery Charges	Gas Commodity Charges	Fixed Customer Charge	Gas Total Charges	Cost/Therm Checksum	BTU
1	$0	$1	$180	$181	$0.95	103,700
52	$8	$47	$180	$235	$1.06	5,191,100
733	$819	$432	$180	$1,431	$1.71	73,298,100
2,737	$1,088	$3,968	$180	$5,236	$1.85	273,650,600
6,531	$2,589	$3,910	$359	$6,858	$1.00	653,100,000
4,154	$1,458	$3,853	$180	$5,491	$1.28	415,400,000
3,314	$1,279	$2,950	$180	$4,409	$1.28	331,433,900
2,705	$498	$2,407	$180	$3,085	$1.07	270,462,600
3,210	$590	$2,857	$359	$3,807	$1.07	321,011,500
0	$0	$0	$180	$180	$0.00	0
0	$0	$0	$180	$180	$0.00	0
49	$4	$44	$180	$228	$0.98	4,889,100
23,485	**$8,335**	**$20,468**	**$2,516**	**$31,318**	**$1.23**	**2,348,540,600**

Philip G. Vroom Community School

BASELINE NATURAL GAS CONSUMPTION



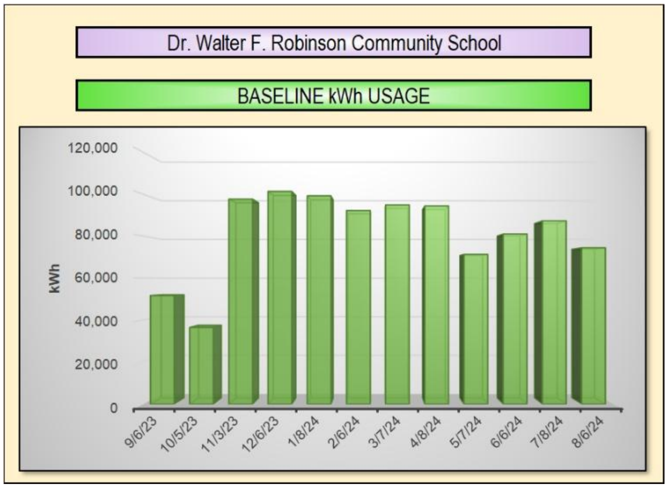
Dr. Walter F. Robinson Community School – Baseline Energy Consumption & Costs

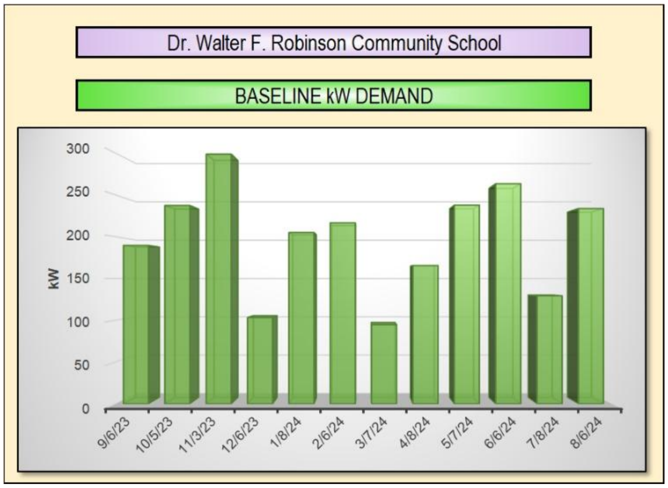
Dr. Water F. Robinson Community School energy consumption and energy costs for the baseline period of September 2023 through August 2024 is as follows:

Electricity is provided by PSEG and electric commodity is provided by a 3rd party supplier, NextEra Energy Services. There are (3) Electric Accounts/Meters serving Dr. Water F. Robinson Community School.

BUILDING/FACILITY	ELECTRIC (PSEG)					
	Account #	Meter #	Account #	Meter #	Account #	Meter #
Dr. Walter F. Robinson Community School	4247150200	9213652	7339276807	309026937	7361422403	9214629

Dr. Walter F. Robinson Community School									
TOTAL ELECTRIC									
ȷe kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Fixed Customer Charges	Total Electric Charges	Cost / kW Checksum	Cost / kWh Checksum	BTU
51,695	190	$1,051	$9,917	$3,001	$381	$14,349	$15.83	$0.212	176,383,340
36,484	237	$680	$6,610	$587	$371	$8,248	$2.47	$0.200	124,483,408
97,595	299	$2,096	$17,464	$1,922	$386	$21,868	$6.43	$0.200	332,994,140
101,282	103	$2,128	$12,972	$1,317	$381	$16,799	$12.75	$0.149	345,574,184
99,162	205	$2,089	$17,072	$1,314	$381	$20,855	$6.41	$0.193	338,340,744
92,170	217	$1,939	$13,079	$895	$381	$16,294	$4.13	$0.163	314,484,040
94,853	95	$2,026	$11,953	$1,292	$381	$15,652	$13.64	$0.147	323,638,436
94,323	166	$1,991	$13,320	$1,238	$381	$16,930	$7.47	$0.162	321,830,076
71,290	238	$1,572	$13,521	$1,302	$381	$16,775	$5.47	$0.212	243,241,480
81,003	263	$1,573	$14,939	$3,910	$381	$20,803	$14.85	$0.204	276,382,236
87,248	129	$1,731	$12,489	$4,747	$384	$19,351	$36.71	$0.163	297,690,176
74,432	234	$1,539	$12,309	$2,971	$381	$17,200	$12.72	$0.186	253,961,984
981,537	**299**	**$20,416**	**$155,644**	**$24,494**	**$4,570**	**$205,124**	**$36.71**	**$0.179**	**3,349,004,244**





Natural Gas Delivery and Commodity is provided by PSEG. There is (1) Natural Gas Account/Meter serving Dr. Water F. Robinson Community School.

BUILDING/FACILITY	NATURAL GAS (PSEG)	
	Account #	Meter #
Dr. Walter F. Robinson Community School	7339276807	2600253

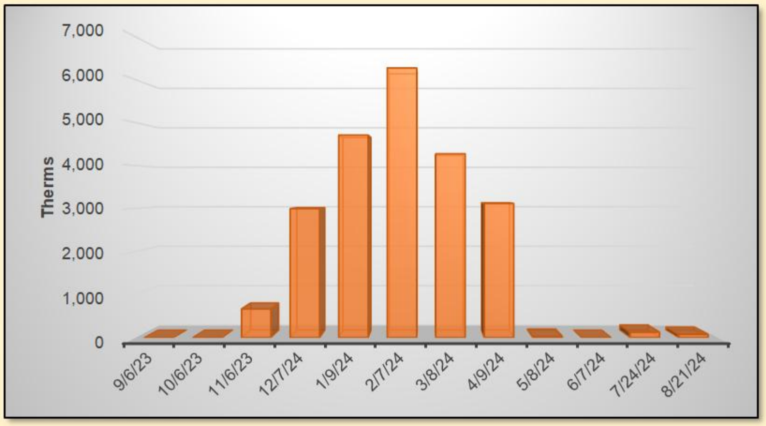
Dr. Walter F. Robinson Community School

TOTAL NATURAL GAS

ms	Gas Delivery Charges	Gas Commodity Charges	Fixed Customer Charge	Gas Total Charges	Cost/Therm Checksum	BTU
0	$0	$0	$180	$180	$0.00	0
0	$0	$0	$180	$180	$0.00	0
666	$1,041	$392	$180	$1,612	$2.15	66,629,500
2,998	$1,454	$1,793	$180	$3,427	$1.08	299,807,500
4,709	$1,762	$2,640	$180	$4,582	$0.94	470,856,400
6,268	$2,118	$5,578	$180	$7,876	$1.23	626,757,300
4,272	$1,846	$4,204	$180	$6,230	$1.42	427,200,000
3,117	$646	$2,774	$180	$3,599	$1.10	311,665,000
27	$5	$24	$180	$208	$1.07	2,653,400
0	$0	$0	$180	$180	$0.00	0
127	$11	$113	$281	$405	$0.98	12,689,700
76	$7	$68	$180	$254	$0.98	7,613,800
22,259	**$8,890**	**$17,586**	**$2,258**	**$28,734**	**$1.19**	**2,225,872,600**

Dr. Walter F. Robinson Community School

BASELINE NATURAL GAS CONSUMPTION



Washington Community School – Baseline Energy Consumption & Costs

Washington Community School energy consumption and energy costs for the baseline period of September 2023 through August 2024 is as follows:

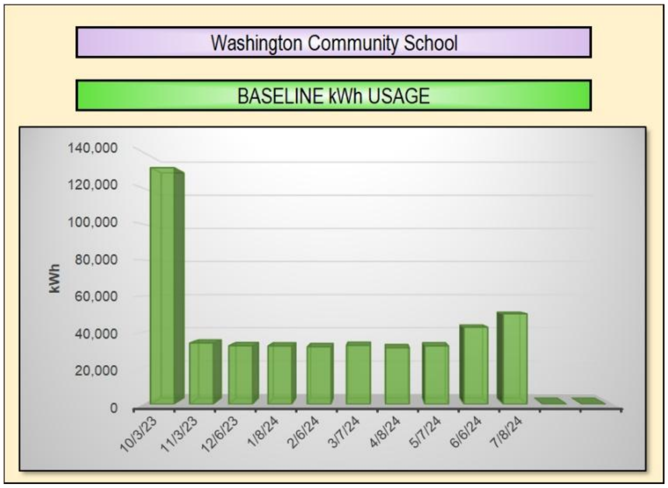
Electricity is provided by PSEG and electric commodity is provided by a 3rd party supplier, NextEra Energy Services. There is (1) Electric Account/Meter serving Washington Community School. Anomalies seen below is the result of a multi-month bill.

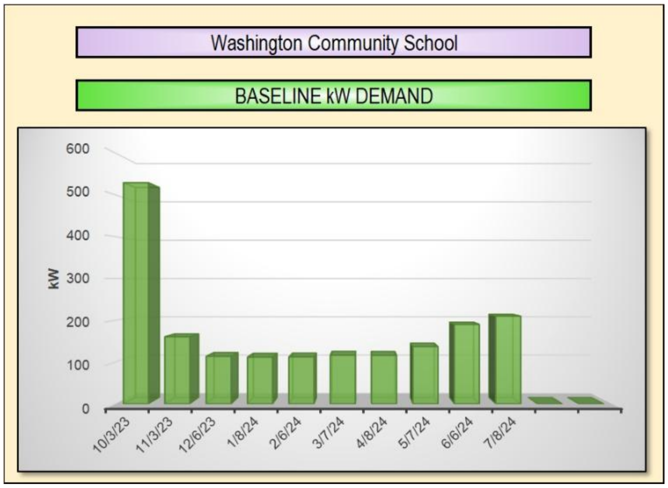
BUILDING/FACILITY	ELECTRIC (PSEG)	
	Account #	Meter #
Washington Community School	4200280701	9214633

Washington Community School

TOTAL ELECTRIC

Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Fixed Customer Charges	Total Electric Charges	Cost / kW Checksum	Cost / kWh Checksum	BTU
131,348	529	$2,474	$34,738	$5,551	$371	$43,133	$10.49	$0.283	448,159,376
33,962	161	$574	$5,435	$794	$371	$7,174	$4.94	$0.177	115,878,344
32,445	114	$548	$4,689	$564	$371	$6,173	$4.96	$0.161	110,702,340
32,295	112	$546	$4,643	$554	$371	$6,114	$4.96	$0.161	110,190,540
31,862	112	$539	$4,389	$557	$371	$5,855	$4.96	$0.155	108,713,144
32,641	117	$556	$4,576	$578	$371	$6,080	$4.96	$0.157	111,371,092
31,296	116	$573	$4,570	$576	$371	$6,089	$4.96	$0.164	106,781,952
32,361	137	$590	$4,791	$680	$371	$6,433	$4.96	$0.166	110,415,732
42,685	190	$782	$6,552	$2,705	$371	$10,410	$14.23	$0.172	145,641,220
50,151	210	$931	$7,706	$2,992	$371	$12,001	$14.26	$0.172	171,115,212
0	0	$0	$0	$0	$0	$0	$0.00	$0.00	0
0	0	$0	$0	$0	$0	$0	$0.00	$0.00	0
451,046	529	$8,112	$82,089	$15,552	$3,708	$109,462	$14.26	$0.200	1,538,968,952

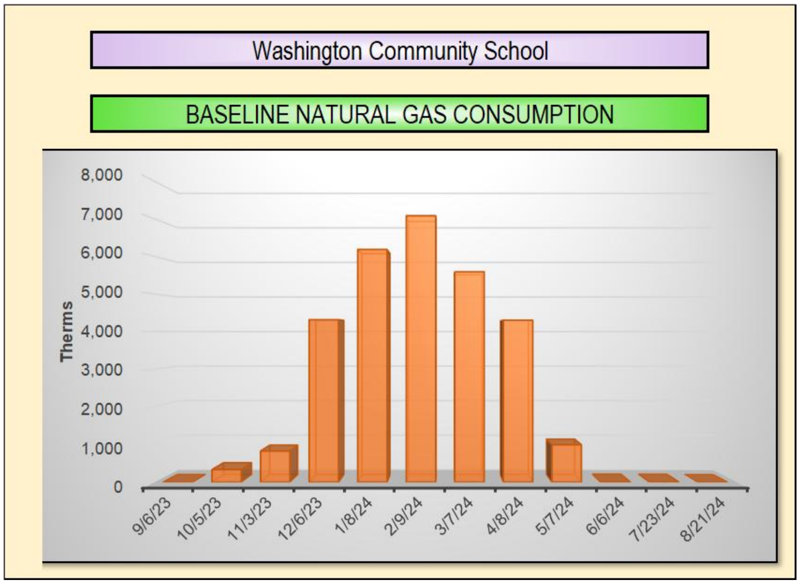




Natural Gas Delivery and Commodity is provided by PSEG. There are (2) Natural Gas Accounts/Meters serving Washington Community School.

BUILDING/FACILITY	NATURAL GAS (PSEG)			
	Account #	Meter #	Account #	Meter #
Washington Community School	4200280701	2916418	7339276904	3765340

Washington Community School						
TOTAL NATURAL GAS						
ms	Gas Delivery Charges	Gas Commodity Charges	Fixed Customer Charge	Gas Total Charges	Cost/Therm Checksum	BTU
2	$0	$2	$180	$182	$0.96	220,000
334	$52	$300	$241	$592	$1.05	33,369,800
825	$920	$571	$200	$1,691	$1.81	82,471,600
4,315	$1,783	$2,909	$200	$4,891	$1.09	431,468,800
6,180	$2,209	$3,927	$200	$6,336	$0.99	617,964,200
7,075	$2,627	$6,297	$200	$9,124	$1.26	707,544,100
5,587	$2,286	$4,972	$200	$7,458	$1.30	558,679,200
4,303	$1,096	$3,830	$200	$5,126	$1.14	430,319,600
994	$291	$885	$200	$1,375	$1.18	99,416,200
13	$1	$12	$200	$213	$0.97	1,328,000
10	$1	$9	$313	$323	$0.98	994,100
0	$0	$0	$20	$20	$0.00	0
29,638	$11,265	$23,713	$2,353	$37,331	$1.18	2,963,775,600



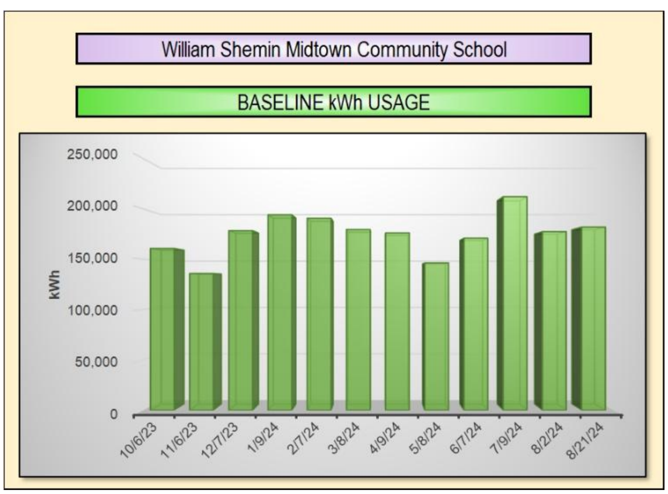
William Shemin Midtown Community School – Baseline Energy Consumption & Costs

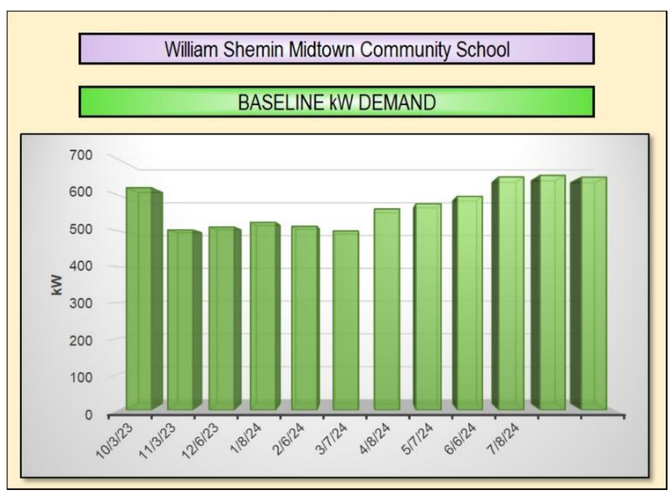
William Shemin Midtown Community School energy consumption and energy costs for the baseline period of September 2023 through August 2024 is as follows:

Electricity is provided by PSEG and electric commodity is provided by a 3rd party supplier, NextEra Energy Services. There is (1) Electric Account/Meter serving William Shemin Midtown Community School.

BUILDING/FACILITY	ELECTRIC (PSEG)	
	Account #	Meter #
William Shemin Midtown Community School	4200085909	9214632

William Shemin Midtown Community School									
TOTAL ELECTRIC									
Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Fixed Customer Charges	Total Electric Charges	Cost / kW Checksum	Cost / kWh Checksum	BTU
160,621	621	$2,979	$23,234	$3,070	$371	$29,654	$4.94	$0.163	548,038,852
135,714	503	$2,293	$19,556	$2,487	$371	$24,706	$4.95	$0.161	463,056,168
178,282	511	$3,012	$23,363	$2,535	$371	$29,281	$4.96	$0.148	608,298,184
193,999	524	$3,278	$25,450	$2,600	$371	$31,698	$4.96	$0.148	661,924,588
190,673	513	$3,221	$23,952	$2,546	$371	$30,090	$4.96	$0.143	650,576,276
179,349	500	$3,058	$23,029	$2,480	$371	$28,938	$4.96	$0.145	611,938,788
176,040	562	$3,118	$24,236	$2,785	$371	$30,510	$4.96	$0.155	600,648,480
146,275	576	$2,668	$21,028	$2,864	$371	$26,930	$4.97	$0.162	499,090,300
170,754	597	$3,114	$23,747	$8,494	$371	$35,726	$14.23	$0.157	582,612,648
211,987	651	$3,961	$28,777	$9,279	$371	$42,387	$14.26	$0.154	723,299,644
177,292	656	$3,474	$23,220	$7,481	$297	$34,472	$11.41	$0.151	604,920,304
181,802	650	$3,562	$21,912	$9,331	$371	$35,176	$14.35	$0.140	620,308,424
2,102,788	**656**	**$37,738**	**$281,503**	**$55,952**	**$4,376**	**$379,568**	**$14.35**	**$0.152**	**7,174,712,656**





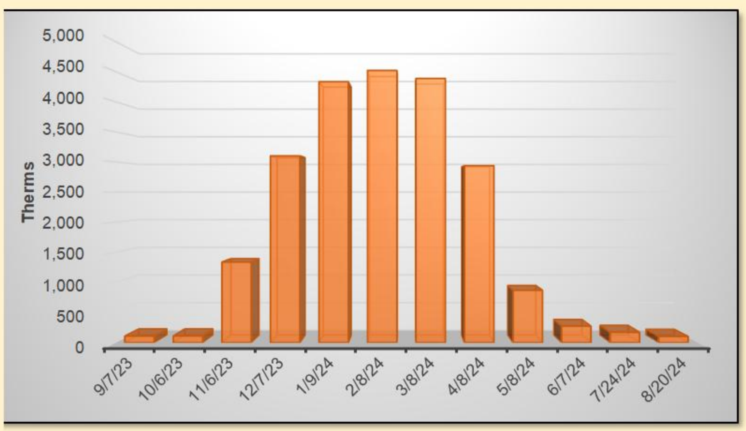
Natural Gas Delivery and Commodity is provided by PSEG. There is (1) Natural Gas Account/Meter serving William Shemin Midtown Community School.

BUILDING/FACILITY	NATURAL GAS (PSEG)	
	Account #	Meter #
William Shemin Midtown Community School	4200085909	2523664

William Shemin Midtown Community School						
TOTAL NATURAL GAS						
ıs	Gas Delivery Charges	Gas Commodity Charges	Fixed Customer Charge	Gas Total Charges	Cost/Therm Checksum	BTU
110	$7	$51	$180	$238	$0.53	10,989,900
111	$7	$100	$180	$286	$0.96	11,085,900
1,338	$937	$1,201	$180	$2,318	$1.60	133,776,800
3,100	$1,255	$2,783	$180	$4,217	$1.30	310,045,800
4,332	$1,475	$3,888	$180	$5,543	$1.24	433,180,100
4,518	$1,528	$6,551	$180	$8,259	$1.79	451,798,600
4,386	$719	$3,937	$180	$4,835	$1.06	438,628,500
2,938	$532	$2,638	$180	$3,349	$1.08	293,845,800
869	$147	$780	$180	$1,107	$1.07	86,891,000
274	$23	$246	$180	$449	$0.98	27,420,700
172	$15	$154	$281	$451	$0.98	17,195,100
103	$9	$92	$180	$281	$0.99	10,253,000
22,251	**$6,655**	**$22,421**	**$2,258**	**$31,333**	**$1.31**	**2,225,111,200**

William Shemin Midtown Community School

BASELINE NATURAL GAS CONSUMPTION



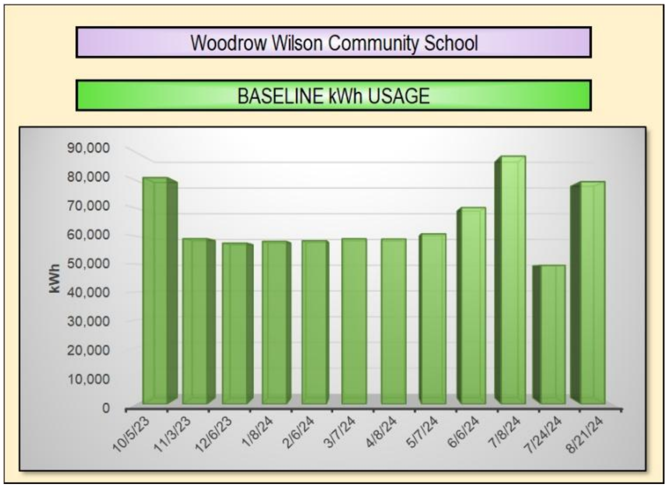
Woodrow Wilson Community School – Baseline Energy Consumption & Costs

Woodrow Wilson Community School energy consumption and energy costs for the baseline period of September 2023 through August 2024 is as follows:

Electricity is provided by PSEG and electric commodity is provided by a 3rd party supplier, NextEra Energy Services. There is (1) Electric Account/Meter serving Woodrow Wilson Community School.

BUILDING/FACILITY	ELECTRIC (PSEG)	
	Account #	Meter #
Woodrow Wilson Community School	4200633809	9214604

Woodrow Wilson Community School									
TOTAL ELECTRIC									
Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Fixed Customer Charges	Total Electric Charges	Cost / kW Checksum	Cost / kWh Checksum	BTU
80,908	277	$1,511	$11,169	$1,371	$371	$14,421	$4.94	$0.157	276,058,096
59,102	217	$999	$8,264	$1,072	$371	$10,705	$4.94	$0.157	201,656,024
57,515	183	$972	$7,994	$905	$371	$10,242	$4.96	$0.156	196,241,180
58,153	165	$982	$7,762	$819	$371	$9,935	$4.96	$0.150	198,418,036
58,374	155	$986	$7,301	$768	$371	$9,426	$4.96	$0.142	199,172,088
59,041	175	$1,006	$7,738	$868	$371	$9,983	$4.96	$0.148	201,447,892
58,966	178	$1,042	$7,959	$884	$371	$10,255	$4.96	$0.153	201,191,992
60,824	188	$1,109	$7,996	$934	$371	$10,411	$4.96	$0.150	207,531,488
70,163	237	$1,300	$9,625	$3,365	$371	$14,661	$14.23	$0.156	239,396,156
88,548	249	$1,644	$11,651	$3,548	$371	$17,214	$14.26	$0.150	302,125,776
49,588	239	$972	$6,205	$1,817	$198	$9,191	$7.60	$0.145	169,194,256
79,445	233	$1,556	$10,141	$3,338	$371	$15,406	$14.33	$0.147	271,066,340
780,627	277	$14,079	$103,805	$19,690	$4,277	$141,851	$14.33	$0.151	2,663,499,324



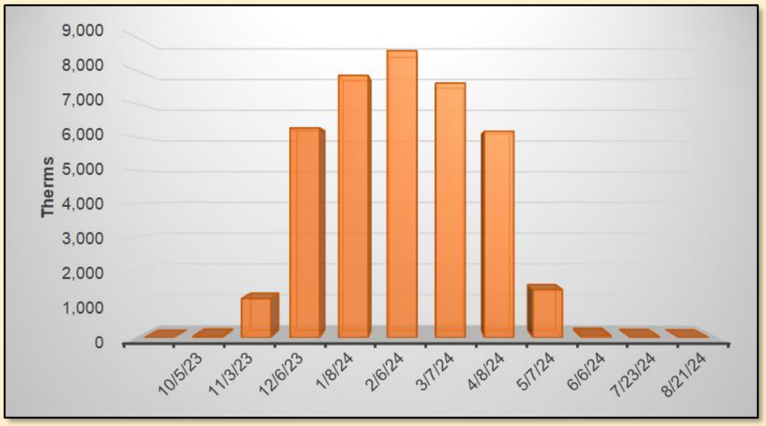
Natural Gas Delivery and Commodity is provided by PSEG. There is (1) Natural Gas Account/Meter serving Woodrow Wilson Community School.

BUILDING/FACILITY	NATURAL GAS (PSEG)	
	Account #	Meter #
Woodrow Wilson Community School	4200633809	2600162

Woodrow Wilson Community School						
TOTAL NATURAL GAS						
Therms	**Gas Delivery Charges**	**Gas Commodity Charges**	**Fixed Customer Charge**	**Gas Total Charges**	**Cost/Therm Checksum**	**BTU**
0	$0	$0	$0	$0	$0.00	0
39	$4	$21	$180	$204	$0.64	3,854,600
1,165	$1,438	$665	$180	$2,282	$1.80	116,519,000
6,266	$2,356	$3,768	$180	$6,303	$0.98	626,649,600
7,840	$2,639	$4,406	$180	$7,224	$0.90	784,001,700
8,574	$2,902	$7,631	$180	$10,712	$1.23	857,382,700
7,606	$2,741	$6,770	$180	$9,691	$1.25	760,643,900
6,166	$1,157	$5,488	$180	$6,824	$1.08	616,585,900
1,433	$266	$1,275	$180	$1,721	$1.08	143,284,100
64	$5	$57	$180	$242	$0.97	6,418,600
28	$2	$25	$281	$308	$0.98	2,761,300
12	$1	$11	$180	$192	$0.98	1,213,800
39,193	**$13,511**	**$30,115**	**$2,078**	**$45,704**	**$1.11**	**3,919,315,200**

Woodrow Wilson Community School

BASELINE NATURAL GAS CONSUMPTION



John M. Bailey Community School – Baseline Energy Consumption & Costs

John M. Bailey Community School energy consumption and energy costs for the baseline period of September 2023 through August 2024 is as follows:

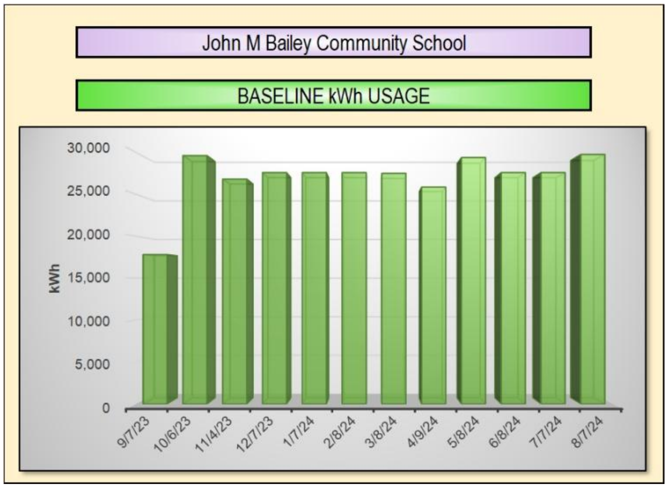
Electricity is provided by PSEG and electric commodity is provided by a 3rd party supplier, NextEra Energy Services. There is (1) Electric Account/Meter serving John M. Bailey Community School.

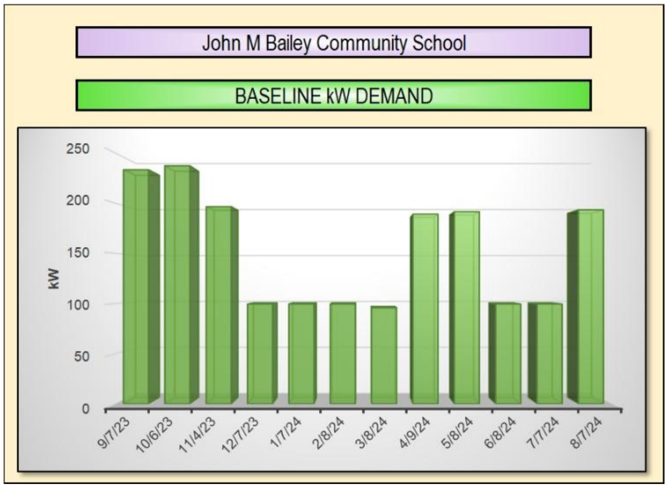
BUILDING/FACILITY	ELECTRIC (PSEG)	
	Account #	Meter #
John M Bailey Community School	7361422004	9213536

John M Bailey Community School

TOTAL ELECTRIC

Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Fixed Customer Charges	Total Electric Charges	Cost / kW Checksum	Cost / kWh Checksum	BTU
17,801	233	$384	$5,055	$1,790	$5	$7,234	$7.67	$0.306	60,737,012
29,587	237	$774	$6,014	$629	$5	$7,423	$2.65	$0.229	100,950,844
26,784	197	$677	$5,178	$521	$5	$6,381	$2.65	$0.219	91,387,008
27,560	100	$676	$4,030	$529	$5	$5,240	$5.32	$0.171	94,034,720
27,560	100	$676	$3,930	$529	$5	$5,141	$5.32	$0.167	94,034,720
27,560	100	$676	$3,980	$529	$5	$5,191	$5.32	$0.169	94,034,720
27,471	96	$683	$3,767	$509	$5	$4,964	$5.32	$0.162	93,731,052
25,832	189	$666	$5,273	$503	$5	$6,446	$2.66	$0.230	88,138,784
29,349	192	$773	$5,326	$510	$5	$6,614	$2.66	$0.208	100,138,788
27,560	100	$676	$3,930	$529	$5	$5,141	$5.32	$0.167	94,034,720
27,560	100	$676	$3,830	$529	$5	$5,041	$5.32	$0.164	94,034,720
29,722	193	$672	$5,579	$1,489	$5	$7,745	$7.70	$0.210	101,411,464
324,346	**237**	**$8,009**	**$55,894**	**$8,596**	**$61**	**$72,560**	**$7.70**	**$0.197**	**1,106,668,552**





Natural Gas Delivery and Commodity is provided by PSEG. There is (1) Natural Gas Account/Meter serving John M. Bailey Community School.

BUILDING/FACILITY	NATURAL GAS (PSEG)	
	Account #	Meter #
John M Bailey Community School	7361422004	3765415

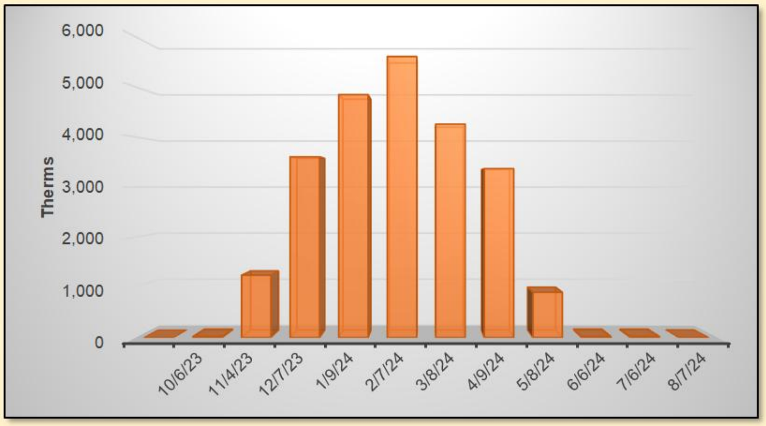
John M Bailey Community School

TOTAL NATURAL GAS

Therms	Gas Delivery Charges	Gas Commodity Charges	Fixed Customer Charge	Gas Total Charges	Cost/Therm Checksum	BTU
0	$0	$0	$0	$0	$0.00	0
23	$2	$21	$180	$202	$0.98	2,295,400
1,243	$969	$763	$180	$1,912	$1.39	124,300,000
3,602	$1,414	$2,252	$180	$3,846	$1.02	360,200,000
4,840	$1,607	$2,714	$180	$4,501	$0.89	483,963,700
5,601	$1,889	$4,984	$180	$7,053	$1.23	560,055,500
4,254	$1,652	$3,786	$180	$5,617	$1.28	425,357,300
3,366	$623	$2,996	$180	$3,799	$1.08	336,640,800
903	$162	$804	$180	$1,146	$1.07	90,287,600
23	$2	$21	$180	$202	$0.98	2,295,400
23	$2	$21	$180	$202	$0.98	2,295,400
4	$0	$4	$96	$100	$1.03	400,000
23,881	**$8,323**	**$18,365**	**$1,893**	**$28,580**	**$1.12**	**2,388,091,100**

John M Bailey Community School

BASELINE NATURAL GAS CONSUMPTION



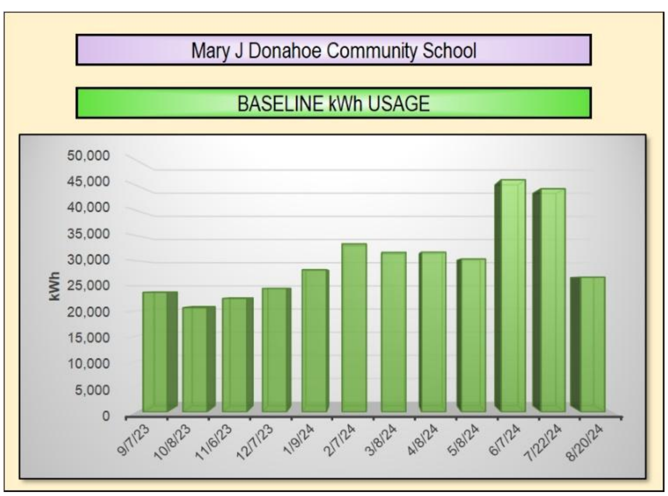
Mary J. Donahoe Community School – Baseline Energy Consumption & Costs

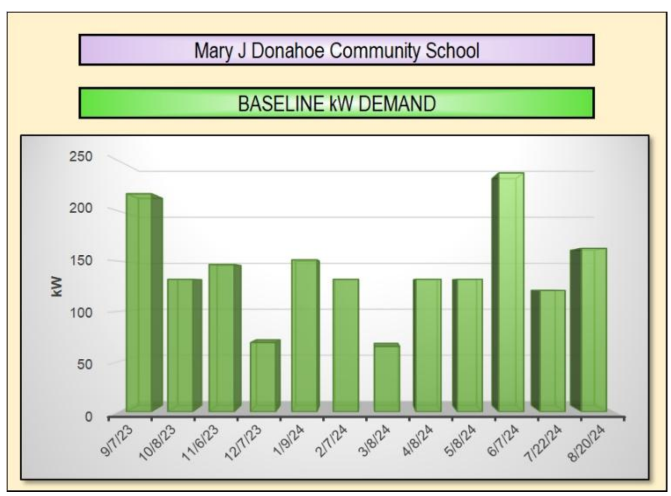
Mary J. Donahoe Community School energy consumption and energy costs for the baseline period of September 2023 through August 2024 is as follows:

Electricity is provided by PSEG and electric commodity is provided by a 3rd party supplier, NextEra Energy Services. There are (4) Electric Accounts/Meters serving Mary J. Donahoe Community School.

BUILDING/FACILITY	ELECTRIC (PSEG)							
	Account #	Meter #	Account #	Meter #	Account #	Meter #	Account #	Meter #
Mary J Donahoe Community School	7361423604	9213962	7339277102	626028670	7339277218	LIGHTS	7339277501	LIGHTS

Mary J Donahoe Community School TOTAL ELECTRIC									
Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Fixed Customer Charges	Total Electric Charges	Cost / kW Checksum	Cost / kWh Checksum	BTU
23,728	217	$512	$5,409	$1,706	$10	$7,631	$7.85	$0.250	80,959,936
20,682	132	$510	$3,914	$373	$262	$5,054	$2.83	$0.214	70,566,984
22,500	147	$553	$4,144	$412	$262	$5,366	$2.81	$0.209	76,770,000
24,493	69	$603	$3,203	$389	$262	$4,451	$5.64	$0.155	83,570,116
28,213	151	$694	$5,272	$524	$262	$6,747	$3.46	$0.211	96,262,756
33,346	132	$820	$5,432	$475	$262	$6,983	$3.60	$0.187	113,776,552
31,644	65	$784	$4,384	$469	$262	$5,894	$7.21	$0.163	107,969,328
31,690	132	$785	$5,176	$470	$262	$6,688	$3.56	$0.188	108,126,280
30,349	132	$761	$5,282	$472	$262	$6,771	$3.58	$0.199	103,550,788
46,041	238	$727	$11,121	$1,758	$262	$13,863	$7.39	$0.257	157,091,892
44,257	121	$979	$6,585	$2,852	$269	$10,678	$23.61	$0.171	151,004,884
26,733	163	$603	$4,733	$1,279	$262	$6,873	$7.86	$0.200	91,212,996
363,676	238	$8,330	$64,654	$11,179	$2,899	$87,000	$47.00	$0.201	1,240,862,512





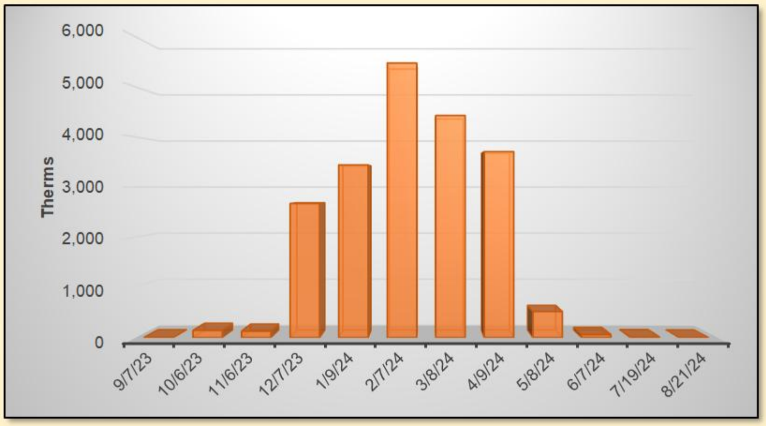
Natural Gas Delivery and Commodity is provided by PSEG. There are (2) Natural Gas Accounts/Meters serving Mary J. Donahoe Harris Community School.

BUILDING/FACILITY	NATURAL GAS (PSEG)			
	Account #	Meter #	Account #	Meter #
Mary J Donahoe Community School	7361423604	4950346	7361423604	4950848

Mary J Donahoe Community School						
TOTAL NATURAL GAS						
Therms	Gas Delivery Charges	Gas Commodity Charges	Fixed Customer Charge	Gas Total Charges	Cost/Therm Checksum	BTU
10	$1	$9	$200	$209	$0.96	990,200
145	$17	$130	$200	$347	$1.01	14,537,300
128	$66	$83	$20	$170	$1.17	12,800,000
2,672	$1,428	$1,729	$200	$3,357	$1.18	267,224,300
3,442	$1,621	$2,090	$200	$3,911	$1.08	344,157,800
5,470	$2,047	$4,869	$200	$7,115	$1.26	547,044,400
4,426	$1,848	$3,939	$200	$5,987	$1.31	442,566,500
3,706	$1,100	$3,298	$200	$4,598	$1.19	370,592,800
520	$165	$462	$200	$828	$1.21	51,962,600
60	$5	$53	$200	$258	$0.97	5,975,900
13	$1	$12	$272	$285	$0.98	1,325,400
4	$0	$4	$200	$204	$0.98	441,400
20,596	**$8,300**	**$16,679**	**$2,291**	**$27,270**	**$1.21**	**2,059,618,600**

Mary J Donahoe Community School

BASELINE NATURAL GAS CONSUMPTION



Nickolas Oresko Community School – Baseline Energy Consumption & Costs

Nickolas Oresko Community School energy consumption and energy costs for the baseline period of September 2023 through August 2024 is as follows:

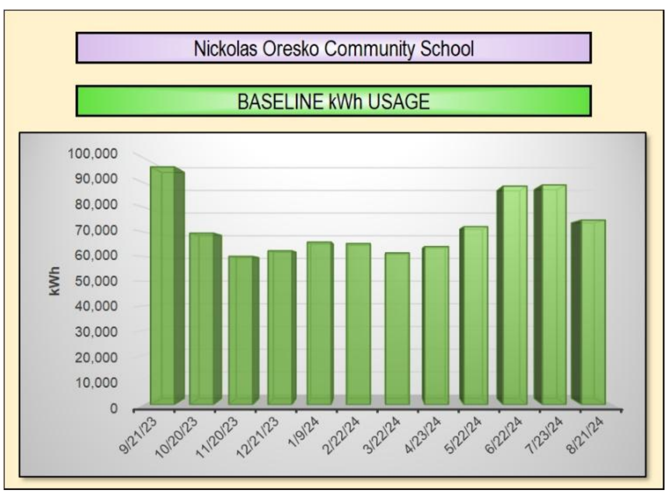
Electricity is provided by PSEG and electric commodity is provided by a 3rd party supplier, NextEra Energy Services. There are (2) Electric Accounts/Meters serving Nickolas Oresko Community School.

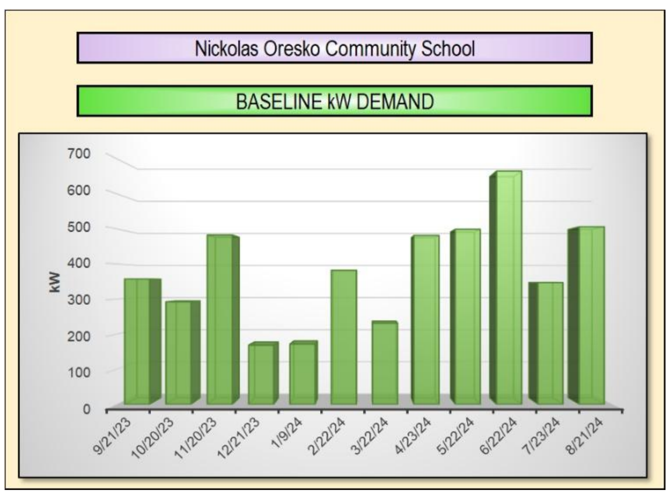
BUILDING/FACILITY	ELECTRIC (PSEG)			
	Account #	Meter #	Account #	Meter #
Nickolas Oresko Community School	4247150405	9214624	7339277005	NONE

Nickolas Oresko Community School

TOTAL ELECTRIC

Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Fixed Customer Charges	Total Electric Charges	Cost / kW Checksum	Cost / kWh Checksum	BTU
96,279	357	$1,834	$13,695	$5,035	$409	$20,973	$14.09	$0.161	328,503,948
69,458	292	$1,221	$10,246	$1,444	$409	$13,319	$4.94	$0.165	236,990,696
60,039	483	$1,017	$12,694	$1,196	$409	$15,316	$2.48	$0.228	204,853,068
62,289	169	$1,056	$7,998	$837	$409	$10,299	$4.96	$0.145	212,530,068
65,822	172	$1,116	$7,315	$852	$409	$9,692	$4.96	$0.128	224,584,664
65,222	382	$1,105	$14,077	$948	$409	$16,539	$2.48	$0.233	222,537,464
61,416	231	$1,069	$8,668	$1,147	$409	$11,293	$4.96	$0.159	209,551,392
63,999	481	$1,158	$13,263	$1,194	$409	$16,023	$2.48	$0.225	218,364,588
72,054	499	$1,316	$13,488	$1,241	$409	$16,454	$2.49	$0.205	245,848,248
88,449	665	$1,615	$17,987	$4,734	$409	$24,744	$7.12	$0.222	301,787,988
88,933	347	$1,716	$13,085	$4,948	$409	$20,158	$14.26	$0.166	303,439,396
74,735	506	$1,466	$13,824	$3,624	$409	$19,323	$7.16	$0.205	254,995,820
868,695	665	$15,692	$146,339	$27,200	$4,902	$194,133	$40.93	$0.187	2,963,987,340





Natural Gas Delivery and Commodity is provided by PSEG. There is (1) Natural Gas Account/Meter serving Nickolas Oresko Community School.

BUILDING/FACILITY	NATURAL GAS (PSEG)	
	Account #	Meter #
Nickolas Oresko Community School	7339277307	2643297

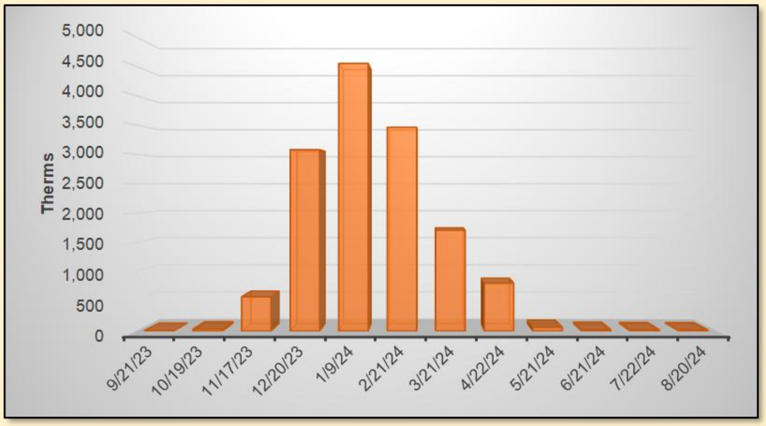
Nickolas Oresko Community School

TOTAL NATURAL GAS

Therms	Gas Delivery Charges	Gas Commodity Charges	Fixed Customer Charge	Gas Total Charges	Cost/Therm Checksum	BTU
10	$1	$9	$180	$189	$0.96	991,200
36	$4	$204	$180	$388	$5.72	3,634,300
583	$405	$352	$180	$936	$1.30	58,316,000
3,078	$969	$2,943	$180	$4,091	$1.27	307,752,400
4,541	$1,420	$2,524	$180	$4,124	$0.87	454,067,700
3,457	$1,225	$3,077	$180	$4,482	$1.24	345,717,100
1,713	$953	$1,686	$180	$2,818	$1.54	171,300,000
814	$141	$724	$180	$1,045	$1.06	81,371,200
65	$10	$58	$180	$248	$1.04	6,529,300
28	$2	$25	$180	$207	$0.97	2,764,000
23	$2	$21	$180	$202	$0.98	2,317,200
21	$2	$19	$180	$200	$0.98	2,096,600
14,369	**$5,134**	**$11,640**	**$2,156**	**$18,930**	**$1.17**	**1,436,857,000**

Nickolas Oresko Community School

BASELINE NATURAL GAS CONSUMPTION



Energy Conservation Measure Breakdown

The matrix below details which Energy Consevation Measures (ECM) were evaluated and included in the project by school.

BAYONNE PUBLIC SCHOOLS ECM MATRIX

ECM #	ECM DESCRIPTION	Bayonne High School & Ice Rink	Henry Harris Community School	Horace Mann Community School	Lincoln Community School	Philip G. Vroom Community School	Dr. Walter F. Robinson Community School	Washington Community School	William Shemin Midtown Community School	Woodrow Wilson Community School	John M Bailey Community School	Mary J Donahoe Community School	Nickolas Oresko Community School
1	LED Bulb Replacement	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
2	LED Flat Panel Replacement	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
3	Lighting Controls	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
4	District Wide Energy Management System - Tier 1	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5	District Wide Energy Management System - Tier 2	✔		✔	✔	✔			✔	✔			
6	Boiler Replacement	✔		✔	✔	✔			✔	✔	✔		
7	Chiller Replacement						✔			✔			✔
8	Ice Rink Chiller Replacement	✔											
9	Rooftop Unit Replacement	✔	✔			✔		✔	✔			✔	
10	Steam Trap Replacement	✔	✔	✔		✔		✔		✔	✔	✔	
11	Plug Load Controls	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
12	Building Envelope Improvements	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
13	Destratification Fans	✔	✔		✔		✔	✔	✔	✔		✔	✔
14	Refrigeration Controls	✔							✔				
15	Combined Heating & Power				✔								

	DCO ECM was evaluated
	ECM included in the project

ECM Breakdown by Cost & Savings

ECM #	BAYONNE PUBLIC SCHOOLS — ENERGY CONSERVATION MEASURE	INSTALLED COST ($)	ANNUAL ELECTRIC COST SAVINGS ($)	ANNUAL NATURAL GAS COST SAVINGS ($)	ANNUAL ENERGY COST SAVINGS ($)
1	LED Bulb Replacement	$0	$0	$0	$0
2	LED Flat Panel Replacement	$3,418,912	$604,072	($6,265)	$597,807
3	Lighting Controls	$512,544	$57,396	($58)	$57,338
4	District Wide Energy Management System - Tier 1	$1,312,093	$0	$15,185	$15,185
5	District Wide Energy Management System - Tier 2	$457,600	$0	$0	$0
6	Boiler Replacement	$1,109,500	$0	$51,705	$51,705
7	Chiller Replacement	$1,611,020	$27,015	$0	$27,015
8	Ice Rink Chiller Replacement	$0	$0	$0	$0
9	Rooftop Unit Replacement	$2,238,880	$19,684	$0	$19,684
10	Steam Trap Replacement	$366,966	$0	$39,663	$39,663
11	Plug Load Controls	$425,950	$69,897	$0	$69,897
12	Building Envelope Improvements	$273,320	$8,915	$27,378	$36,293
13	Destratification Fans	$226,948	($1,467)	$13,950	$12,484
14	Refrigeration Controls	$36,822	$3,054	$0	$3,054
15	Combined Heating & Power	$250,000	$3,770	($1,331)	$2,439
	TOTALS	$12,240,554	$792,337	$140,226	$932,563

ECM #	BAYONNE PUBLIC SCHOOLS — ENERGY CONSERVATION MEASURE	ELECTRIC CONSUMPTION SAVINGS (kWh)	ELECTRIC DEMAND SAVINGS (kW)	NATURAL GAS SAVINGS (THERMS)
1	LED Bulb Replacement	0	0	0
2	LED Flat Panel Replacement	2,564,588	604	(5,362)
3	Lighting Controls	238,066	60	(50)
4	District Wide Energy Management System - Tier 1	0	0	13,182
5	District Wide Energy Management System - Tier 2	0	0	0
6	Boiler Replacement	0	0	43,217
7	Chiller Replacement	39,655	57	0
8	Ice Rink Chiller Replacement	0	0	0
9	Rooftop Unit Replacement	89,951	17	0
10	Steam Trap Replacement	0	0	34,884
11	Plug Load Controls	385,565	0	0
12	Building Envelope Improvements	51,997	0	23,469
13	Destratification Fans	(8,792)	0	11,925
14	Refrigeration Controls	19,790	0	0
15	Combined Heating & Power	20,023	4	(1,100)
	TOTALS	3,400,842	743	120,165

ECM Breakdown by Greenhouse Gas Reduction

BAYONNE PUBLIC SCHOOLS		Reduction of CO_2	Reduction of NO_x	Reduction of SO_2	Reduction of Hg
ECM #	ENERGY CONSERVATION MEASURE	LBS	LBS	LBS	LBS
1	LED Bulb Replacement	0	0	0	0.0
2	LED Flat Panel Replacement	3,835,435	7,132	16,670	0.9
3	Lighting Controls	361,278	666	1,547	0.1
4	District Wide Energy Management System - Tier 1	154,230	121	0	0.0
5	District Wide Energy Management System - Tier 2	0	0	0	0.0
6	Boiler Replacement	505,638	398	0	0.0
7	Chiller Replacement	60,275	111	258	0.0
8	Ice Rink Chiller Replacement	0	0	0	0.0
9	Rooftop Unit Replacement	136,725	252	585	0.0
10	Steam Trap Replacement	408,144	321	0	0.0
11	Plug Load Controls	586,058	1,080	2,506	0.1
12	Building Envelope Improvements	353,623	362	338	0.0
13	Destratification Fans	126,159	85	-57	0.0
14	Refrigeration Controls	30,081	55	129	0.0
15	Combined Heating & Power	17,565	46	130	0.0
TOTALS		6,575,210.5	10,627.9	22,105.5	1.2

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

- ***CO2 = (1.292*kWh Savings) + (11.7*Therm Savings)***
- ***NOx = (0.0083*kWh Savings) + (0.0092*Therm Savings)***
- ***SO2 = (0.0067*kWh Savings)***
- ***Hg = (0.0000000243* kWh Savings)***

ECM Breakdown by School

BAYONNE PUBLIC SCHOOLS			INCLUDED IN PROJECT	INSTALLED COST	ANNUAL ELECTRIC COST SAVINGS	ANNUAL NATURAL GAS COST SAVINGS	ANNUAL ENERGY COST SAVINGS
ECM #	BUILDING/FACILITY	ENERGY CONSERVATION MEASURE	"Y" OR "N"	$	$	$	$
1	Bayonne High School & Ice Rink	LED Bulb Replacement	N	$0	$0	$0	$0
2	Bayonne High School & Ice Rink	LED Flat Panel Replacement	Y	$1,036,515	$222,381	($2,291)	$220,090
3	Bayonne High School & Ice Rink	Lighting Controls	Y	$150,564	$19,624	($20)	$19,604
4	Bayonne High School & Ice Rink	District Wide Energy Management System - Tier 1	Y	$123,887	$0	$457	$457
5	Bayonne High School & Ice Rink	District Wide Energy Management System - Tier 2	N	$0	$0	$0	$0
6	Bayonne High School & Ice Rink	Boiler Replacement	Y	$1,109,500	$0	$7,869	$7,869
8	Bayonne High School & Ice Rink	Ice Rink Chiller Replacement	N	$0	$0	$0	$0
9	Bayonne High School & Ice Rink	Rooftop Unit Replacement	Y	$473,648	$2,080	$0	$2,080
10	Bayonne High School & Ice Rink	Steam Trap Replacement	Y	$153,329	$0	$18,313	$18,313
11	Bayonne High School & Ice Rink	Plug Load Controls	Y	$87,789	$15,643	$0	$15,643
12	Bayonne High School & Ice Rink	Building Envelope Improvements	Y	$91,255	$2,853	$9,040	$11,893
13	Bayonne High School & Ice Rink	Destratification Fans	Y	$50,839	($567)	$5,046	$4,479
14	Bayonne High School & Ice Rink	Refrigeration Controls	Y	$23,455	$2,097	$0	$2,097
1	Henry Harris Community School	LED Bulb Replacement	N	$0	$0	$0	$0
2	Henry Harris Community School	LED Flat Panel Replacement	Y	$202,934	$13,641	($161)	$13,480
3	Henry Harris Community School	Lighting Controls	Y	$10,067	$778	($1)	$777
4	Henry Harris Community School	District Wide Energy Management System - Tier 1	Y	$82,555	$0	$137	$137
9	Henry Harris Community School	Rooftop Unit Replacement	Y	$257,600	$3,147	$0	$3,147
10	Henry Harris Community School	Steam Trap Replacement	Y	$19,696	$0	$1,892	$1,892
11	Henry Harris Community School	Plug Load Controls	Y	$49,926	$10,062	$0	$10,062
12	Henry Harris Community School	Building Envelope Improvements	Y	$30,383	$924	$3,116	$4,040
13	Henry Harris Community School	Destratification Fans	Y	$7,942	($41)	$469	$428
1	Horace Mann Community School	LED Bulb Replacement	N	$0	$0	$0	$0
2	Horace Mann Community School	LED Flat Panel Replacement	Y	$155,740	$30,495	($248)	$30,248
3	Horace Mann Community School	Lighting Controls	Y	$37,715	$4,372	($3)	$4,369
4	Horace Mann Community School	District Wide Energy Management System - Tier 1	Y	$72,836	$0	$319	$319
5	Horace Mann Community School	District Wide Energy Management System - Tier 2	Y	$42,250	$0	$0	$0
6	Horace Mann Community School	Boiler Replacement	Y	$0	$0	$10,974	$10,974
10	Horace Mann Community School	Steam Trap Replacement	Y	$46,045	$0	$3,778	$3,778
11	Horace Mann Community School	Plug Load Controls	Y	$28,323	$6,965	$0	$6,965
12	Horace Mann Community School	Building Envelope Improvements	Y	$8,909	$402	$902	$1,304
1	Lincoln Community School	LED Bulb Replacement	N	$0	$0	$0	$0
2	Lincoln Community School	LED Flat Panel Replacement	Y	$135,227	$14,840	($193)	$14,646
3	Lincoln Community School	Lighting Controls	Y	$16,831	$1,248	($2)	$1,246
4	Lincoln Community School	District Wide Energy Management System - Tier 1	Y	$62,135	$0	$865	$865
5	Lincoln Community School	District Wide Energy Management System - Tier 2	Y	$42,900	$0	$0	$0
6	Lincoln Community School	Boiler Replacement	Y	$0	$0	$14,890	$14,890
11	Lincoln Community School	Plug Load Controls	Y	$24,910	$4,151	$0	$4,151
12	Lincoln Community School	Building Envelope Improvements	Y	$28,111	$809	$2,816	$3,625
13	Lincoln Community School	Destratification Fans	Y	$8,569	($94)	$1,208	$1,114
15	Lincoln Community School	Combined Heating & Power	Y	$250,000	$3,770	($1,331)	$2,439

BAYONNE PUBLIC SCHOOLS			INCLUDED IN PROJECT	INSTALLED COST	ANNUAL ELECTRIC COST SAVINGS	ANNUAL NATURAL GAS COST SAVINGS	ANNUAL ENERGY COST SAVINGS
ECM #	BUILDING/FACILITY	ENERGY CONSERVATION MEASURE	"Y" OR "N"	$	$	$	$
1	Philip G. Vroom Community School	LED Bulb Replacement	N	$0	$0	$0	$0
2	Philip G. Vroom Community School	LED Flat Panel Replacement	Y	$124,478	$16,208	($162)	$16,046
3	Philip G. Vroom Community School	Lighting Controls	Y	$26,892	$2,712	($3)	$2,709
4	Philip G. Vroom Community School	District Wide Energy Management System - Tier 1	Y	$64,046	$0	$592	$592
5	Philip G. Vroom Community School	District Wide Energy Management System - Tier 2	Y	$14,300	$0	$0	$0
6	Philip G. Vroom Community School	Boiler Replacement	Y	$0	$0	$10,199	$10,199
9	Philip G. Vroom Community School	Rooftop Unit Replacement	Y	$334,432	$1,158	$0	$1,158
10	Philip G. Vroom Community School	Steam Trap Replacement	Y	$16,244	$0	$2,025	$2,025
11	Philip G. Vroom Community School	Plug Load Controls	Y	$31,440	$8,512	$0	$8,512
12	Philip G. Vroom Community School	Building Envelope Improvements	Y	$11,495	$460	$1,069	$1,530
1	Dr. Walter F. Robinson Community School	LED Bulb Replacement	N	$0	$0	$0	$0
2	Dr. Walter F. Robinson Community School	LED Flat Panel Replacement	Y	$287,780	$61,749	($549)	$61,200
3	Dr. Walter F. Robinson Community School	Lighting Controls	Y	$44,927	$5,599	($5)	$5,594
4	Dr. Walter F. Robinson Community School	District Wide Energy Management System - Tier 1	Y	$143,653	$0	$268	$268
7	Dr. Walter F. Robinson Community School	Chiller Replacement	Y	$880,860	$22,005	$0	$22,005
11	Dr. Walter F. Robinson Community School	Plug Load Controls	Y	$37,248	$6,135	$0	$6,135
12	Dr. Walter F. Robinson Community School	Building Envelope Improvements	Y	$10,502	$336	$987	$1,324
13	Dr. Walter F. Robinson Community School	Destratification Fans	Y	$8,543	($109)	$1,120	$1,011
1	Washington Community School	LED Bulb Replacement	N	$0	$0	$0	$0
2	Washington Community School	LED Flat Panel Replacement	Y	$201,310	$36,798	($373)	$36,425
3	Washington Community School	Lighting Controls	Y	$37,238	$3,328	($3)	$3,324
4	Washington Community School	District Wide Energy Management System - Tier 1	Y	$138,684	$0	$195	$195
9	Washington Community School	Rooftop Unit Replacement	Y	$399,616	$4,640	$0	$4,640
10	Washington Community School	Steam Trap Replacement	Y	$33,903	$0	$3,406	$3,406
11	Washington Community School	Plug Load Controls	Y	$44,605	$7,275	$0	$7,275
12	Washington Community School	Building Envelope Improvements	Y	$12,331	$458	$1,196	$1,653
13	Washington Community School	Destratification Fans	Y	$8,334	($122)	$762	$641
1	William Shemin Midtown Community School	LED Bulb Replacement	N	$0	$0	$0	$0
2	William Shemin Midtown Community School	LED Flat Panel Replacement	Y	$493,968	$71,950	($1,005)	$70,945
3	William Shemin Midtown Community School	Lighting Controls	Y	$57,896	$6,854	($10)	$6,844
4	William Shemin Midtown Community School	District Wide Energy Management System - Tier 1	Y	$86,650	$0	$2,076	$2,076
5	William Shemin Midtown Community School	District Wide Energy Management System - Tier 2	Y	$304,200	$0	$0	$0
6	William Shemin Midtown Community School	Boiler Replacement	Y	$0	$0	$7,772	$7,772
9	William Shemin Midtown Community School	Rooftop Unit Replacement	Y	$506,352	$5,188	$0	$5,188
11	William Shemin Midtown Community School	Plug Load Controls	Y	$36,379	$1,616	$0	$1,616
12	William Shemin Midtown Community School	Building Envelope Improvements	Y	$19,385	$537	$2,190	$2,727
13	William Shemin Midtown Community School	Destratification Fans	Y	$23,826	($109)	$1,729	$1,619
14	William Shemin Midtown Community School	Refrigeration Controls	Y	$13,367	$957	$0	$957
1	Woodrow Wilson Community School	LED Bulb Replacement	N	$0	$0	$0	$0
2	Woodrow Wilson Community School	LED Flat Panel Replacement	Y	$248,830	$33,121	($397)	$32,723
3	Woodrow Wilson Community School	Lighting Controls	Y	$43,720	$3,196	($4)	$3,192
4	Woodrow Wilson Community School	District Wide Energy Management System - Tier 1	Y	$229,866	$0	$8,543	$8,543
5	Woodrow Wilson Community School	District Wide Energy Management System - Tier 2	Y	$53,950	$0	$0	$0
6	Woodrow Wilson Community School	Boiler Replacement	N	$0	$0	$0	$0
7	Woodrow Wilson Community School	Chiller Replacement	Y	$730,160	$5,010	$0	$5,010
10	Woodrow Wilson Community School	Steam Trap Replacement	Y	$36,918	$0	$4,009	$4,009
11	Woodrow Wilson Community School	Plug Load Controls	Y	$22,387	$1,171	$0	$1,171
12	Woodrow Wilson Community School	Building Envelope Improvements	Y	$15,335	$436	$1,524	$1,960
13	Woodrow Wilson Community School	Destratification Fans	Y	$12,514	($138)	$982	$844

BAYONNE PUBLIC SCHOOLS			INCLUDED IN PROJECT	INSTALLED COST	ANNUAL ELECTRIC COST SAVINGS	ANNUAL NATURAL GAS COST SAVINGS	ANNUAL ENERGY COST SAVINGS
ECM #	BUILDING/FACILITY	ENERGY CONSERVATION MEASURE	"Y" OR "N"	$	$	$	$
1	John M Bailey Community School	LED Bulb Replacement	N	$0	$0	$0	$0
2	John M Bailey Community School	LED Flat Panel Replacement	Y	$157,457	$21,991	($236)	$21,755
3	John M Bailey Community School	Lighting Controls	Y	$37,235	$2,954	($3)	$2,951
4	John M Bailey Community School	District Wide Energy Management System - Tier 1	Y	$115,588	$0	$1,253	$1,253
6	John M Bailey Community School	Boiler Replacement	N	$0	$0	$0	$0
10	John M Bailey Community School	Steam Trap Replacement	Y	$35,633	$0	$3,946	$3,946
11	John M Bailey Community School	Plug Load Controls	Y	$23,744	$2,984	$0	$2,984
12	John M Bailey Community School	Building Envelope Improvements	Y	$17,425	$633	$1,701	$2,333
1	Mary J Donahoe Community School	LED Bulb Replacement	N	$0	$0	$0	$0
2	Mary J Donahoe Community School	LED Flat Panel Replacement	Y	$158,399	$36,149	($299)	$35,850
3	Mary J Donahoe Community School	Lighting Controls	Y	$22,813	$2,935	($2)	$2,933
4	Mary J Donahoe Community School	District Wide Energy Management System - Tier 1	Y	$153,972	$0	$137	$137
9	Mary J Donahoe Community School	Rooftop Unit Replacement	Y	$267,232	$3,472	$0	$3,472
10	Mary J Donahoe Community School	Steam Trap Replacement	Y	$25,198	$0	$2,294	$2,294
11	Mary J Donahoe Community School	Plug Load Controls	Y	$24,274	$4,480	$0	$4,480
12	Mary J Donahoe Community School	Building Envelope Improvements	Y	$20,796	$794	$2,085	$2,879
13	Mary J Donahoe Community School	Destratification Fans	Y	$86,500	($167)	$1,430	$1,263
1	Nickolas Oresko Community School	LED Bulb Replacement	N	$0	$0	$0	$0
2	Nickolas Oresko Community School	LED Flat Panel Replacement	Y	$216,273	$44,750	($352)	$44,398
3	Nickolas Oresko Community School	Lighting Controls	Y	$26,646	$3,797	($3)	$3,795
4	Nickolas Oresko Community School	District Wide Energy Management System - Tier 1	Y	$38,220	$0	$343	$343
7	Nickolas Oresko Community School	Chiller Replacement	N	$0	$0	$0	$0
11	Nickolas Oresko Community School	Plug Load Controls	Y	$14,925	$903	$0	$903
12	Nickolas Oresko Community School	Building Envelope Improvements	Y	$7,393	$273	$753	$1,026
13	Nickolas Oresko Community School	Destratification Fans	Y	$19,881	($120)	$1,205	$1,084
		TOTALS		$12,240,554	$792,337	$140,226	$932,563

BAYONNE PUBLIC SCHOOLS			INCLUDED IN PROJECT	ELECTRIC CONSUMPTION SAVINGS	ELECTRIC DEMAND SAVINGS	NATURAL GAS SAVINGS
ECM #	BUILDING/FACILITY	ENERGY CONSERVATION MEASURE	"Y" OR "N"	kWh	kW	THERMS
1	Bayonne High School & Ice Rink	LED Bulb Replacement	N	0	0	0
2	Bayonne High School & Ice Rink	LED Flat Panel Replacement	Y	984,525	223	(2,059)
3	Bayonne High School & Ice Rink	Lighting Controls	Y	84,467	21	(18)
4	Bayonne High School & Ice Rink	District Wide Energy Management System - Tier 1	Y	0	0	411
5	Bayonne High School & Ice Rink	District Wide Energy Management System - Tier 2	N	0	0	0
6	Bayonne High School & Ice Rink	Boiler Replacement	Y	0	0	7,071
8	Bayonne High School & Ice Rink	Ice Rink Chiller Replacement	N	0	0	0
9	Bayonne High School & Ice Rink	Rooftop Unit Replacement	Y	12,007	1	0
10	Bayonne High School & Ice Rink	Steam Trap Replacement	Y	0	0	16,455
11	Bayonne High School & Ice Rink	Plug Load Controls	Y	100,613	0	0
12	Bayonne High School & Ice Rink	Building Envelope Improvements	Y	18,348	0	8,123
13	Bayonne High School & Ice Rink	Destratification Fans	Y	(3,648)	0	4,534
14	Bayonne High School & Ice Rink	Refrigeration Controls	Y	13,485	0	0
1	Henry Harris Community School	LED Bulb Replacement	N	0	0	0
2	Henry Harris Community School	LED Flat Panel Replacement	Y	64,015	16	(134)
3	Henry Harris Community School	Lighting Controls	Y	3,653	1	(1)
4	Henry Harris Community School	District Wide Energy Management System - Tier 1	Y	0	0	113
9	Henry Harris Community School	Rooftop Unit Replacement	Y	14,286	4	0
10	Henry Harris Community School	Steam Trap Replacement	Y	0	0	1,571
11	Henry Harris Community School	Plug Load Controls	Y	59,397	0	0
12	Henry Harris Community School	Building Envelope Improvements	Y	5,456	0	2,586
13	Henry Harris Community School	Destratification Fans	Y	(240)	0	389
1	Horace Mann Community School	LED Bulb Replacement	N	0	0	0
2	Horace Mann Community School	LED Flat Panel Replacement	Y	103,319	24	(216)
3	Horace Mann Community School	Lighting Controls	Y	14,566	4	(3)
4	Horace Mann Community School	District Wide Energy Management System - Tier 1	Y	0	0	278
5	Horace Mann Community School	District Wide Energy Management System - Tier 2	Y	0	0	0
6	Horace Mann Community School	Boiler Replacement	Y	0	0	9,578
10	Horace Mann Community School	Steam Trap Replacement	Y	0	0	3,297
11	Horace Mann Community School	Plug Load Controls	Y	30,788	0	0
12	Horace Mann Community School	Building Envelope Improvements	Y	1,777	0	787
1	Lincoln Community School	LED Bulb Replacement	N	0	0	0
2	Lincoln Community School	LED Flat Panel Replacement	Y	76,427	18	(160)
3	Lincoln Community School	Lighting Controls	Y	6,318	2	(1)
4	Lincoln Community School	District Wide Energy Management System - Tier 1	Y	0	0	714
5	Lincoln Community School	District Wide Energy Management System - Tier 2	Y	0	0	0
6	Lincoln Community School	Boiler Replacement	Y	0	0	12,304
11	Lincoln Community School	Plug Load Controls	Y	26,982	0	0
12	Lincoln Community School	Building Envelope Improvements	Y	5,257	0	2,327
13	Lincoln Community School	Destratification Fans	Y	(608)	0	998
15	Lincoln Community School	Combined Heating & Power	Y	20,023	4	(1,100)

BAYONNE PUBLIC SCHOOLS			INCLUDED IN PROJECT	ELECTRIC CONSUMPTION SAVINGS	ELECTRIC DEMAND SAVINGS	NATURAL GAS SAVINGS
ECM #	BUILDING/FACILITY	ENERGY CONSERVATION MEASURE	"Y" OR "N"	kWh	kW	THERMS
1	Philip G. Vroom Community School	LED Bulb Replacement	N	0	0	0
2	Philip G. Vroom Community School	LED Flat Panel Replacement	Y	63,137	16	(132)
3	Philip G. Vroom Community School	Lighting Controls	Y	10,541	3	(2)
4	Philip G. Vroom Community School	District Wide Energy Management System - Tier 1	Y	0	0	483
5	Philip G. Vroom Community School	District Wide Energy Management System - Tier 2	Y	0	0	0
6	Philip G. Vroom Community School	Boiler Replacement	Y	0	0	8,316
9	Philip G. Vroom Community School	Rooftop Unit Replacement	Y	4,569	1	0
10	Philip G. Vroom Community School	Steam Trap Replacement	Y	0	0	1,651
11	Philip G. Vroom Community School	Plug Load Controls	Y	36,426	0	0
12	Philip G. Vroom Community School	Building Envelope Improvements	Y	1,969	0	872
1	Dr. Walter F. Robinson Community School	LED Bulb Replacement	N	0	0	0
2	Dr. Walter F. Robinson Community School	LED Flat Panel Replacement	Y	220,755	50	(462)
3	Dr. Walter F. Robinson Community School	Lighting Controls	Y	19,216	5	(4)
4	Dr. Walter F. Robinson Community School	District Wide Energy Management System - Tier 1	Y	0	0	225
7	Dr. Walter F. Robinson Community School	Chiller Replacement	Y	27,075	39	0
11	Dr. Walter F. Robinson Community School	Plug Load Controls	Y	34,204	0	0
12	Dr. Walter F. Robinson Community School	Building Envelope Improvements	Y	1,875	0	830
13	Dr. Walter F. Robinson Community School	Destratification Fans	Y	(608)	0	942
1	Washington Community School	LED Bulb Replacement	N	0	0	0
2	Washington Community School	LED Flat Panel Replacement	Y	151,142	38	(316)
3	Washington Community School	Lighting Controls	Y	13,669	3	(3)
4	Washington Community School	District Wide Energy Management System - Tier 1	Y	0	0	165
9	Washington Community School	Rooftop Unit Replacement	Y	19,580	4	0
10	Washington Community School	Steam Trap Replacement	Y	0	0	2,886
11	Washington Community School	Plug Load Controls	Y	36,376	0	0
12	Washington Community School	Building Envelope Improvements	Y	2,288	0	1,013
13	Washington Community School	Destratification Fans	Y	(608)	0	646
1	William Shemin Midtown Community School	LED Bulb Replacement	N	0	0	0
2	William Shemin Midtown Community School	LED Flat Panel Replacement	Y	367,857	94	(769)
3	William Shemin Midtown Community School	Lighting Controls	Y	35,041	9	(7)
4	William Shemin Midtown Community School	District Wide Energy Management System - Tier 1	Y	0	0	1,589
5	William Shemin Midtown Community School	District Wide Energy Management System - Tier 2	Y	0	0	0
6	William Shemin Midtown Community School	Boiler Replacement	Y	0	0	5,948
9	William Shemin Midtown Community School	Rooftop Unit Replacement	Y	29,370	4	0
11	William Shemin Midtown Community School	Plug Load Controls	Y	10,644	0	0
12	William Shemin Midtown Community School	Building Envelope Improvements	Y	3,536	0	1,676
13	William Shemin Midtown Community School	Destratification Fans	Y	(720)	0	1,323
14	William Shemin Midtown Community School	Refrigeration Controls	Y	6,305	0	0
1	Woodrow Wilson Community School	LED Bulb Replacement	N	0	0	0
2	Woodrow Wilson Community School	LED Flat Panel Replacement	Y	170,714	43	(357)
3	Woodrow Wilson Community School	Lighting Controls	Y	16,415	4	(3)
4	Woodrow Wilson Community School	District Wide Energy Management System - Tier 1	Y	0	0	7,675
5	Woodrow Wilson Community School	District Wide Energy Management System - Tier 2	Y	0	0	0
6	Woodrow Wilson Community School	Boiler Replacement	N	0	0	0
7	Woodrow Wilson Community School	Chiller Replacement	Y	12,580	18	0
10	Woodrow Wilson Community School	Steam Trap Replacement	Y	0	0	3,601
11	Woodrow Wilson Community School	Plug Load Controls	Y	7,751	0	0
12	Woodrow Wilson Community School	Building Envelope Improvements	Y	2,889	0	1,369
13	Woodrow Wilson Community School	Destratification Fans	Y	(912)	0	882

BAYONNE PUBLIC SCHOOLS			INCLUDED IN PROJECT	ELECTRIC CONSUMPTION SAVINGS	ELECTRIC DEMAND SAVINGS	NATURAL GAS SAVINGS
ECM #	BUILDING/FACILITY	ENERGY CONSERVATION MEASURE	"Y" OR "N"	kWh	kW	THERMS
1	John M Bailey Community School	LED Bulb Replacement	N	0	0	0
2	John M Bailey Community School	LED Flat Panel Replacement	Y	100,863	23	(211)
3	John M Bailey Community School	Lighting Controls	Y	13,397	3	(3)
4	John M Bailey Community School	District Wide Energy Management System - Tier 1	Y	0	0	1,121
6	John M Bailey Community School	Boiler Replacement	N	0	0	0
10	John M Bailey Community School	Steam Trap Replacement	Y	0	0	3,531
11	John M Bailey Community School	Plug Load Controls	Y	15,145	0	0
12	John M Bailey Community School	Building Envelope Improvements	Y	3,211	0	1,522
1	Mary J Donahoe Community School	LED Bulb Replacement	N	0	0	0
2	Mary J Donahoe Community School	LED Flat Panel Replacement	Y	117,806	26	(246)
3	Mary J Donahoe Community School	Lighting Controls	Y	9,118	2	(2)
4	Mary J Donahoe Community School	District Wide Energy Management System - Tier 1	Y	0	0	113
9	Mary J Donahoe Community School	Rooftop Unit Replacement	Y	10,139	3	0
10	Mary J Donahoe Community School	Steam Trap Replacement	Y	0	0	1,892
11	Mary J Donahoe Community School	Plug Load Controls	Y	22,738	0	0
12	Mary J Donahoe Community School	Building Envelope Improvements	Y	4,029	0	1,719
13	Mary J Donahoe Community School	Destratification Fans	Y	(848)	0	1,179
1	Nickolas Oresko Community School	LED Bulb Replacement	N	0	0	0
2	Nickolas Oresko Community School	LED Flat Panel Replacement	Y	144,028	32	(301)
3	Nickolas Oresko Community School	Lighting Controls	Y	11,665	3	(2)
4	Nickolas Oresko Community School	District Wide Energy Management System - Tier 1	Y	0	0	294
7	Nickolas Oresko Community School	Chiller Replacement	N	0	0	0
11	Nickolas Oresko Community School	Plug Load Controls	Y	4,502	0	0
12	Nickolas Oresko Community School	Building Envelope Improvements	Y	1,362	0	645
13	Nickolas Oresko Community School	Destratification Fans	Y	(600)	0	1,032
		TOTALS		3,400,842	223.4	120,165

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.

BAYONNE PUBLIC SCHOOLS		INSTALLED COST
ECM #	ENERGY CONSERVATION MEASURE	$
1	LED Bulb Replacement	$0
2	LED Flat Panel Replacement	$3,418,912
3	Lighting Controls	$512,544
4	District Wide Energy Management System - Tier 1	$1,312,093
5	District Wide Energy Management System - Tier 2	$457,600
6	Boiler Replacement	$1,109,500
7	Chiller Replacement	$1,611,020
8	Ice Rink Chiller Replacement	$0
9	Rooftop Unit Replacement	$2,238,880
10	Steam Trap Replacement	$366,966
11	Plug Load Controls	$425,950
12	Building Envelope Improvements	$273,320
13	Destratification Fans	$226,948
14	Refrigeration Controls	$36,822
15	Combined Heating & Power	$250,000
TOTALS		$12,240,554

BAYONNE PUBLIC SCHOOLS ECM MATRIX

	DCO ECM was evaluated
(green)	ECM included in the project

ECM #	ECM DESCRIPTION	Bayonne High School & Ice Rink	Henry Harris Community School	Horace Mann Community School	Lincoln Community School	Philip G. Vroom Community School	Dr. Walter F. Robinson Community School	Washington Community School	William Shemin Midtown Community School	Woodrow Wilson Community School	John M Bailey Community School	Mary J Donahoe Community School	Nickolas Oresko Community School
1	LED Bulb Replacement	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
2	LED Flat Panel Replacement	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
3	Lighting Controls	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

Background

Lighting retrofits and fixture replacements 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.

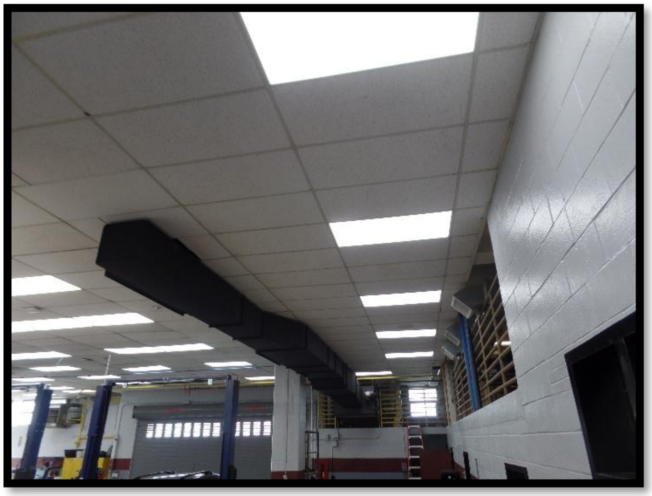
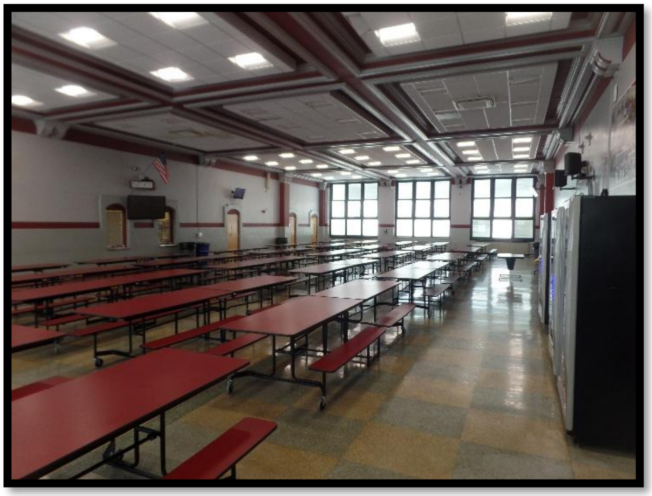
Retrofitting is typically the least expensive way to transform and upgrade the lighting in a facility. Many offices, government and school facilities utilize 2-to-4-foot tubes as primary lighting type. In these situations, specifying Type B LED Tubes may be most optimal because they have an internal LED driver which allows them to bypass the existing fluorescent ballast in a fixture and wire directly to line voltage. This results in added energy savings as LED T8 tubes that run on a ballast are less efficient. Initial installation takes more time as the ballast wiring needs to be cut out, but long-term, this will also result in maintenance savings as there is no need to replace ballasts.

Fixture Replacements are often the most expensive option, but are also typically the most efficient choice, making them the most cost-effective choice over the lifespan of all products. From simple dimming installations, all the way to sophisticated sensing that can provide real-time feedback on energy usage, occupancy rates, and even operational status, LED fixtures may be able to provide the solution. Fixture Replacements allow for variety and increased customization of specific light color, output, and other features.

Existing Conditions

There is a wide diversity of lighting fixtures and bulbs across Bayonne Public Schools. Below is just a sample of a few representative lighting areas. For a detailed listing of existing lighting fixtures/types, please refer to Appendix F – Lighting Line By Line. Existing lighting is controlled locally via manual on/off switches.



Scope of Work

The existing lighting for each of ECM #1 and ECM #2 is the same. Pre and Post Lighting Levels will be measured to assure that the retrofit results will be in compliance with lighting level code requirements and the requirements of the Ice Rink.

ECM #1 represents the scope and cost of replacing existing bulbs within fixtures with new LED bulbs. New LED tubes do not require the existing fluorescent ballasts to operate (Type B retrofit).

> **Note:** ECM #1 is *not* included in the ESIP Project

ECM #2 replaces existing fixtures mounted in hung ceiling with new, flat-panel LED fixtures. This scope applied to approximately 4,030 fixtures across the district. Where existing fixtures are not feasible to be replaced with flat panel fixtures, the existing bulbs will be replaced with new LED bulbs. New LED tubes do not require the existing fluorescent ballasts to operate (Type B retrofit).

> **Note:** ECM #2 is included in the ESIP Project

ECM #3 covers the installation of approximately 830 new vacancy sensors in various spaces, such as classrooms and offices, across the district. Occupancy controls will not be installed in the Ice Rink, Cafeterias, Gymnasiums, and other common areas

> **Note:** ECM #3 is included in the ESIP Project

For details about the proposed LED Lighting to be installed, please reference Appendix F – Lighting Line-By-Line.

ECM Savings Calculations

BPU Protocols were used to calculate LED lighting savings. A coincidence factor is applied to estimate peak demand savings. The impact on the HVAC systems is captured as well. See Appendix F for Lighting Line-by-Lines.

BUILDING	SQFT	SPACE	kW_b	LPD_b	kW_q	LPD_q	ΔkW	CF
Bayonne High School & Ice Rink	470,000	INTERIOR	472.85	1.01	162.55	0.35	310.30	0.5
		EXTERIOR	0.00	0.00	0.00	0.00	0.00	0.0
		ICE RINK	52.26	0.11	22.26	0.05	30.00	0.5
Henry Harris Community School	65,000	INTERIOR	61.00	0.94	38.40	0.59	22.60	0.5
		EXTERIOR	0.00	0.00	0.00	0.00	0.00	0.0
		SPECIAL		0.00		0.00	0.00	
Horace Mann Community School	69,717	INTERIOR	61.00	0.87	26.99	0.39	34.01	0.5
		EXTERIOR	1.78	0.03	0.33	0.00	1.45	0.0
		SPECIAL		0.00		0.00	0.00	
Lincoln Community School	66,000	INTERIOR	47.93	0.73	23.04	0.35	24.89	0.5
		EXTERIOR	1.53	0.02	0.30	0.00	1.23	0.0
		SPECIAL		0.00		0.00	0.00	
Philip G. Vroom Community School	52,000	INTERIOR	41.00	0.79	19.22	0.37	21.78	0.5
		EXTERIOR	0.35	0.01	0.05	0.00	0.30	0.0
		SPECIAL		0.00		0.00	0.00	
Dr. Walter F. Robinson Community School	79,800	INTERIOR	112.68	1.41	42.84	0.54	69.84	0.5
		EXTERIOR	6.00	0.08	1.24	0.02	4.76	0.0
		SPECIAL		0.00		0.00	0.00	
Washington Community School	76,613	INTERIOR	86.04	1.12	32.68	0.43	53.36	0.5
		EXTERIOR	0.00	0.00	0.00	0.00	0.00	0.0
		SPECIAL		0.00		0.00	0.00	
William Shemin Midtown Community School	136,204	INTERIOR	202.55	1.49	72.68	0.53	129.87	0.5
		EXTERIOR	0.00	0.00	0.00	0.00	0.00	0.0
		SPECIAL		0.00		0.00	0.00	
Woodrow Wilson Community School	83,000	INTERIOR	97.65	1.18	38.35	0.46	59.30	0.5
		EXTERIOR	0.75	0.01	0.18	0.00	0.57	0.0
		SPECIAL		0.00		0.00	0.00	
John M Bailey Community School	53,000	INTERIOR	61.00	1.15	29.15	0.55	31.85	0.5
		EXTERIOR	2.77	0.05	0.56	0.01	2.21	0.0
		SPECIAL		0.00		0.00	0.00	
Mary J Donahoe Community School	62,000	INTERIOR	57.09	0.92	20.50	0.33	36.59	0.5
		EXTERIOR	3.68	0.06	0.74	0.01	2.94	0.0
		SPECIAL		0.00		0.00	0.00	
Nickolas Oresko Community School	82,000	INTERIOR	71.74	0.87	26.93	0.33	44.81	0.5
		EXTERIOR	4.56	0.06	1.01	0.01	3.55	0.0
		SPECIAL		0.00		0.00	0.00	

BUILDING	SQFT	SPACE	Hours per Year	$HVAC_d$	$HVAC_e$	$HVAC_g$	Peak Demand Savings (kW)	Replacement Energy Savings (kWh)	Replacement Fuel Savings (Therms)
Bayonne High School & Ice Rink	470,000	INTERIOR	2,575	0.44	0.1	(0.00023)	223.42	878,924.75	(1,837.75)
		EXTERIOR	4,380	0.44	0.1	(0.00023)	0.00	0.00	0.00
		ICE RINK	3,200	0.44	0.1	(0.00023)	21.60	105,600.00	(220.80)
Henry Harris Community School	65,000	INTERIOR	2,575	0.44	0.1	(0.00023)	16.27	64,014.50	(133.85)
		EXTERIOR	4,380	0.44	0.1	(0.00023)	0.00	0.00	0.00
		SPECIAL					0.00	0.00	0.00
Horace Mann Community School	69,717	INTERIOR	2,575	0.44	0.1	(0.00023)	24.49	96,333.33	(201.42)
		EXTERIOR	4,380	0.44	0.1	(0.00023)	0.00	6,986.10	(14.61)
		SPECIAL					0.00	0.00	0.00
Lincoln Community School	66,000	INTERIOR	2,575	0.44	0.1	(0.00023)	17.92	70,500.93	(147.41)
		EXTERIOR	4,380	0.44	0.1	(0.00023)	0.00	5,926.14	(12.39)
		SPECIAL					0.00	0.00	0.00
Philip G. Vroom Community School	52,000	INTERIOR	2,575	0.44	0.1	(0.00023)	15.68	61,691.85	(128.99)
		EXTERIOR	4,380	0.44	0.1	(0.00023)	0.00	1,445.40	(3.02)
		SPECIAL					0.00	0.00	0.00
Dr. Walter F. Robinson Community School	79,800	INTERIOR	2,575	0.44	0.1	(0.00023)	50.28	197,821.80	(413.63)
		EXTERIOR	4,380	0.44	0.1	(0.00023)	0.00	22,933.68	(47.95)
		SPECIAL					0.00	0.00	0.00
Washington Community School	76,613	INTERIOR	2,575	0.44	0.1	(0.00023)	38.42	151,142.20	(316.02)
		EXTERIOR	4,380	0.44	0.1	(0.00023)	0.00	0.00	0.00
		SPECIAL					0.00	0.00	0.00
William Shemin Midtown Community School	136,204	INTERIOR	2,575	0.44	0.1	(0.00023)	93.51	367,856.78	(769.16)
		EXTERIOR	4,380	0.44	0.1	(0.00023)	0.00	0.00	0.00
		SPECIAL					0.00	0.00	0.00
Woodrow Wilson Community School	83,000	INTERIOR	2,575	0.44	0.1	(0.00023)	42.70	167,967.25	(351.20)
		EXTERIOR	4,380	0.44	0.1	(0.00023)	0.00	2,746.26	(5.74)
		SPECIAL					0.00	0.00	0.00
John M Bailey Community School	53,000	INTERIOR	2,575	0.44	0.1	(0.00023)	22.93	90,215.13	(188.63)
		EXTERIOR	4,380	0.44	0.1	(0.00023)	0.00	10,647.78	(22.26)
		SPECIAL					0.00	0.00	0.00
Mary J Donahoe Community School	62,000	INTERIOR	2,575	0.44	0.1	(0.00023)	26.34	103,641.18	(216.70)
		EXTERIOR	4,380	0.44	0.1	(0.00023)	0.00	14,164.92	(29.62)
		SPECIAL					0.00	0.00	0.00
Nickolas Oresko Community School	82,000	INTERIOR	2,575	0.44	0.1	(0.00023)	32.26	126,924.33	(265.39)
		EXTERIOR	4,380	0.44	0.1	(0.00023)	0.00	17,103.90	(35.76)
		SPECIAL					0.00	0.00	0.00

LED Lighting Replacement Savings		Total Savings		
BUILDING	**SQFT**	**Total Demand Savings (kW)**	**Total Energy Savings (kWh)**	**Total Fuel Savings (Therms)**
Bayonne High School & Ice Rink	470,000	223.42	984,524.75	(2,058.55)
Henry Harris Community School	65,000	16.27	64,014.50	(133.85)
Horace Mann Community School	69,717	24.49	103,319.43	(216.03)
Lincoln Community School	66,000	17.92	76,427.07	(159.80)
Philip G. Vroom Community School	52,000	15.68	63,137.25	(132.01)
Dr. Walter F. Robinson Community School	79,800	50.28	220,755.48	(461.58)
Washington Community School	76,613	38.42	151,142.20	(316.02)
William Shemin Midtown Community School	136,204	93.51	367,856.78	(769.16)
Woodrow Wilson Community School	83,000	42.70	170,713.51	(356.95)
John M Bailey Community School	53,000	22.93	100,862.91	(210.90)
Mary J Donahoe Community School	62,000	26.34	117,806.10	(246.32)
Nickolas Oresko Community School	82,000	32.26	144,028.23	(301.15)

Algorithms

$$\text{DkW} = (\#\,of\ replaced\ fixtures) * (Watts_b) - (\#\,of\ fixtures\ installed) * (Watts_q) = (LPD_b - LPD_q) * (\text{SF})$$

$$\text{Energy Savings}\left(\frac{\text{kWh}}{\text{yr}}\right) = (\Delta\text{kW}) * (\text{Hrs}) * (1 + HVAC_e)$$

$$\text{Peak Demand Savings (kW)} = (\Delta\text{kW}) * (\text{CF}) * (1 + HVAC_d)$$

$$\text{Fuel Savings}\left(\frac{\text{MMBtu}}{\text{yr}}\right) = (\Delta\text{kW}) * (\text{Hrs}) * (\text{HVAC}_g)$$

Definition of Variables

ΔkW	= Change in connected load from baseline to efficient lighting
$Watts_{b,q}$	= Wattage of existing baseline and qualifying equipment
LPD_b	= Baseline lighting power density in Watt per square foot of space floor area
LPD_q	= Lighting power density of qualified fixtures, equal to the sum of installed fixture wattage divided by floor area of the space where the fixtures are installed.
SF	= Space floor area, in square feet
CF	= Coincidence factor
Hrs	= Annual operating hours
$HVAC_d$	= HVAC Interactive Factor for peak demand savings
$HVAC_e$	= HVAC Interactive Factor for annual energy savings
$HVAC_g$	= HVAC Interactive Factor for annual energy savings

Summary of Inputs

Lighting Verification Performance Lighting

Component	Type	Value	Source
$Watts_{b,q}$	Variable	See NGrid Fixture Wattage Table Fixture counts and types, space type, floor area from customer application.	1
SF	Variable	From Customer Application	Application
CF	Fixed	See Table by Building Type	4
Hrs	Fixed	See Table by Building Type	4
$HVAC_d$	Fixed	See Table by Building Type	3, 5
$HVAC_e$	Fixed	See Table by Building Type	3, 5
$HVAC_g$	Fixed	See Table by Building Type	6
LPD_b	Variable	Lighting Power Density for, W/SF	2
LPD_q	Variable	Lighting Power Density, W/SF	Application

Hours of Operation and Coincidence Factor by Building Type

Building Type	Sector	CF	Hours
Grocery	Large Commercial/Industrial & Small Commercial	0.96	7,134
Medical - Clinic	Large Commercial/Industrial & Small Commercial	0.8	3,909
Medical - Hospital	Large Commercial/Industrial & Small Commercial	0.8	8,760[54]
Office	Large Commercial/Industrial	0.7	2,969
	Small Commercial	0.67	2,950
Other	Large Commercial/Industrial & Small Commercial	0.66	4,573
Retail	Large Commercial/Industrial	0.96	4,920
	Small Commercial	0.86	4,926
School	Large Commercial/Industrial & Small Commercial	0.50	2,575
Warehouse/ Industrial	Large Commercial/Industrial	0.7	4,116
	Small Commercial	0.68	3,799

- Typical exterior lighting fixtures should be modeled as lit twelve (12) hours per day on average.

Building Type	Sector	CF	Hours
Multifamily – Common Areas[55]	Multifamily	0.86	5,950
Multifamily – In-Unit[36]	Multifamily	0.59	679
Multifamily – Exterior[36]	Multifamily	0.00	3,338

HVAC Interactive Effects

Building Type	Demand Waste Heat Factor ($HVAC_d$)		Annual Energy Waste Heat Factor by Cooling/Heating Type ($HVAC_e$)			
	AC (Utility)	AC (PJM)	AC/ NonElec	AC/ ElecRes	Heat Pump	NoAC/ ElecRes
Office	0.35	0.32	0.10	-0.15	-0.06	-0.25
Retail	0.27	0.26	0.06	-0.17	-0.05	-0.23
Education	0.44	0.44	0.10	-0.19	-0.04	-0.29
Warehouse	0.22	0.23	0.02	-0.25	-0.11	-0.27
Other[56]	0.34	0.32	0.08	-0.18	-0.07	-0.26

Interactive Factor (HVACg) for Annual Fuel Savings

Project Type	Fuel Type	Impact (MMBtu/ΔkWh)
Large Retrofit (> 200 kW)	C&I Gas Heat	-0.00023
Large Retrofit (> 200 kW)	Oil	-0.00046
Small Retrofit (≤ 200 kW)	Gas Heat	-0.001075
Small Retrofit (> 200 kW)	Oil Heat	-0.000120

Sources

1. Device Codes and Rated Lighting System Wattage Table Retrofit Program, National Grid, January 13, 2015. https://www1.nationalgridus.com/files/AddedPDF/POA/RILightingRetrofit1.pdf

Lighting Control Savings

BUILDING	SQFT	SPACE	CF	Hours per Year	$HVAC_d$	$HVAC_e$	$HVAC_g$	kWc (Lighting Controls)	SVG	Lighting Control Demand Savings (kW)	Lighting Control Electric Savings (kWh)	Lighting Control Fuel Savings (Therms)
Bayonne High School & Ice Rink	470,000	INTERIOR	0.5	2,575	0.44	0.1	(0.00023)	90.81	32%	20.92	82,310.18	(17.21)
		EXTERIOR	0.5	2,575	0.44	0.1	(0.00023)	0	0%	0.00	0.00	0.00
		ICE RINK	0.5	2,575	0.44	0.1	(0.00023)	2.38	32%	0.55	2,157.23	(0.45)
Henry Harris Community School	65,000	INTERIOR	0.5	2,575	0.44	0.1	(0.00023)	4.03	32%	0.93	3,652.79	(0.76)
		EXTERIOR	0.5	2,575	0.44	0.1	(0.00023)	0	0%	0.00	0.00	0.00
		SPECIAL								0.00	0.00	0.00
Horace Mann Community School	69,717	INTERIOR	0.5	2,575	0.44	0.1	(0.00023)	16.07	32%	3.70	14,565.85	(3.05)
		EXTERIOR	0.5	2,575	0.44	0.1	(0.00023)	0	0%	0.00	0.00	0.00
		SPECIAL								0.00	0.00	0.00
Lincoln Community School	66,000	INTERIOR	0.5	2,575	0.44	0.1	(0.00023)	6.97	32%	1.61	6,317.61	(1.32)
		EXTERIOR	0.5	2,575	0.44	0.1	(0.00023)	0	0%	0.00	0.00	0.00
		SPECIAL								0.00	0.00	0.00
Philip G. Vroom Community School	52,000	INTERIOR	0.5	2,575	0.44	0.1	(0.00023)	11.63	32%	2.68	10,541.43	(2.20)
		EXTERIOR	0.5	2,575	0.44	0.1	(0.00023)	0	0%	0.00	0.00	0.00
		SPECIAL								0.00	0.00	0.00
Dr. Walter F. Robinson Community School	79,800	INTERIOR	0.5	2,575	0.44	0.1	(0.00023)	21.2	32%	4.88	19,215.68	(4.02)
		EXTERIOR	0.5	2,575	0.44	0.1	(0.00023)	0	0%	0.00	0.00	0.00
		SPECIAL								0.00	0.00	0.00
Washington Community School	76,613	INTERIOR	0.5	2,575	0.44	0.1	(0.00023)	15.08	32%	3.47	13,668.51	(2.86)
		EXTERIOR	0.5	2,575	0.44	0.1	(0.00023)	0	0%	0.00	0.00	0.00
		SPECIAL								0.00	0.00	0.00
William Shemin Midtown Community School	136,204	INTERIOR	0.5	2,575	0.44	0.1	(0.00023)	38.66	32%	8.91	35,041.42	(7.33)
		EXTERIOR	0.5	2,575	0.44	0.1	(0.00023)	0	0%	0.00	0.00	0.00
		SPECIAL								0.00	0.00	0.00
Woodrow Wilson Community School	83,000	INTERIOR	0.5	2,575	0.44	0.1	(0.00023)	18.11	32%	4.17	16,414.90	(3.43)
		EXTERIOR	0.5	2,575	0.44	0.1	(0.00023)	0	0%	0.00	0.00	0.00
		SPECIAL								0.00	0.00	0.00
John M Bailey Community School	53,000	INTERIOR	0.5	2,575	0.44	0.1	(0.00023)	14.78	32%	3.41	13,396.59	(2.80)
		EXTERIOR	0.5	2,575	0.44	0.1	(0.00023)	0	0%	0.00	0.00	0.00
		SPECIAL								0.00	0.00	0.00
Mary J Donahoe Community School	62,000	INTERIOR	0.5	2,575	0.44	0.1	(0.00023)	10.06	32%	2.32	9,118.38	(1.91)
		EXTERIOR	0.5	2,575	0.44	0.1	(0.00023)	0	0%	0.00	0.00	0.00
		SPECIAL								0.00	0.00	0.00
Nickolas Oresko Community School	82,000	INTERIOR	0.5	2,575	0.44	0.1	(0.00023)	12.87	32%	2.97	11,665.37	(2.44)
		EXTERIOR	0.5	2,575	0.44	0.1	(0.00023)	0	0%	0.00	0.00	0.00
		SPECIAL								0.00	0.00	0.00

Lighting Control Savings		Total Savings		
BUILDING	SQFT	Total Demand Savings (kW)	Total Energy Savings (kWh)	Total Fuel Savings (Therms)
Bayonne High School & Ice Rink	470,000	20.92	84,467.42	(17.66)
Henry Harris Community School	65,000	0.93	3,652.79	(0.76)
Horace Mann Community School	69,717	3.70	14,565.85	(3.05)
Lincoln Community School	66,000	1.61	6,317.61	(1.32)
Philip G. Vroom Community School	52,000	2.68	10,541.43	(2.20)
Dr. Walter F. Robinson Community School	79,800	4.88	19,215.68	(4.02)
Washington Community School	76,613	3.47	13,668.51	(2.86)
William Shemin Midtown Community School	136,204	8.91	35,041.42	(7.33)
Woodrow Wilson Community School	83,000	4.17	16,414.90	(3.43)
John M Bailey Community School	53,000	3.41	13,396.59	(2.80)
Mary J Donahoe Community School	62,000	2.32	9,118.38	(1.91)
Nickolas Oresko Community School	82,000	2.97	11,665.37	(2.44)

Lighting Controls

Lighting controls include occupancy sensors, daylight dimmer systems, and occupancy controlled hi-low controls for fluorescent, LED and HID fixtures. The measurement of energy savings is based on algorithms with key variables (i.e., coincidence factor, equivalent full load hours) provided through existing end-use metering of a sample of facilities or from other utility programs with experience with these measures (i.e., % of annual lighting energy saved by lighting control). For lighting controls, the baseline is a manual switch, based on the findings of the New Jersey Commercial Energy Efficient Construction Baseline Study.

Algorithms

$$\text{Energy Savings}\left(\frac{\text{kWh}}{\text{yr}}\right) = \text{kW}_c * \text{SVG} * \text{Hrs} * (1 + HVAC_e)$$

$$\text{Peak Demand Savings (kW)} = \text{kW}_c * \text{SVG} * \text{CF} * (1 + HVAC_d)$$

$$\text{Fuel Savings}\left(\frac{\text{MMBtu}}{\text{yr}}\right) = \text{kW}_c * \text{SVG} * (\text{Hrs}) * (\text{HVAC}_g)$$

Definition of Variables

SVG	= % of annual lighting energy saved by lighting control; refer to table by control type
kW_c	= kW lighting load connected to control
$HVAC_d$	= Interactive Factor – This applies to C&I interior lighting only. This represents the secondary demand in reduced HVAC consumption resulting from decreased indoor lighting wattage.
$HVAC_e$	= Interactive Factor – This applies to C&I interior lighting only. This represents the secondary energy savings in reduced HVAC consumption resulting from decreased indoor lighting wattage.
$HVAC_g$	= Interactive Factor – This applies to C&I interior lighting only. This represents the secondary energy savings in reduced HVAC consumption resulting from decreased indoor lighting wattage.
CF	= Coincidence factor
Hrs	= Annual hours of operation prior to installation of controls

Summary of Inputs

Lighting Controls

Component	Type	Value	Source
kW_c	Variable	Load connected to control	Application
SVG	Fixed	Occupancy Sensor, Controlled Hi-Low Fluorescent Control, LED and controlled HID = 31% Daylight Dimmer System= 40%	4, 5, 6
CF	Fixed	See Table by Building in Performance Lighting Section Above	1
Hrs	Fixed	See Table by Building in Performance Lighting Section Above	1
$HVAC_d$	Fixed	See Table by Building Type in Performance Lighting Section Above	2
$HVAC_e$	Fixed	See Table by Building Type in Performance Lighting Table Above	2
$HVAC_g$	Fixed	See Table by Building Type in Performance Lighting Table Above	3

ECM #4 & 5 – District-Wide Energy Management System

BAYONNE PUBLIC SCHOOLS ECM MATRIX

(white)	DCO ECM was evaluated
(green)	ECM included in the project

ECM #	ECM DESCRIPTION	Bayonne High School & Ice Rink	Henry Harris Community School	Horace Mann Community School	Lincoln Community School	Philip G. Vroom Community School	Dr. Walter F. Robinson Community School	Washington Community School	William Shemin Midtown Community School	Woodrow Wilson Community School	John M Bailey Community School	Mary J Donahoe Community School	Nickolas Oresko Community School
4	District Wide Energy Management System - Tier 1	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5	District Wide Energy Management System - Tier 2	✔		✔	✔	✔			✔	✔			

Background

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 Bayonne Public Schools 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 this 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.

DCO Energy uses a tiered approach to scoping the Energy Management System. Tier 1 covers the material and labor necessary to get each of the schools connected to the District-Wide System and takes control of the plant-level system, such as boiler or chillers. Tier 2 is a building specific scope that would retrofits and or integrate zone-level HVAC systems. In the scope of work detailed below, the Tier 1 and Tier 2 are detailed by building.

Existing Conditions – District-Wide

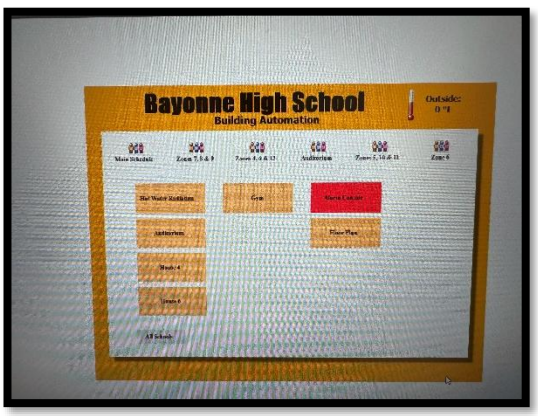
All Schools at Bayonne Public School District are connected to an existing Honeywell Network. Nickolas Oresko Community School was built with a Jonson Controls Metasys Automation System. However, the JCI Metasys System is integrated into the district-wide Honeywell system for scheduling and set point control.

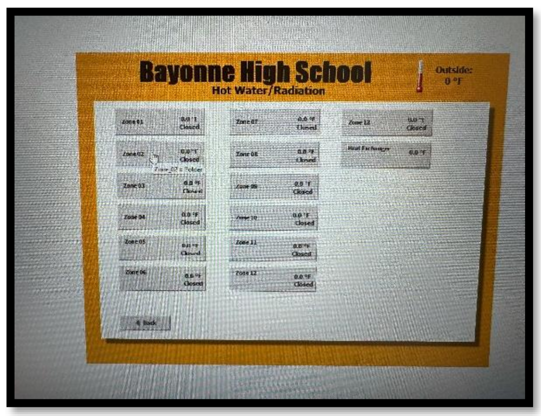
Existing Conditions – Bayonne High School & Ice Rink

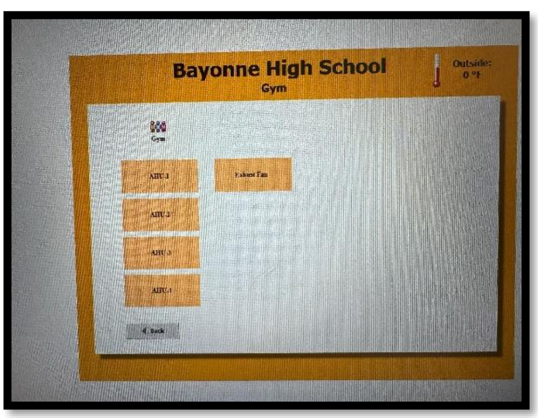
Bayonne High School has an existing Honeywell Automation System. As of the time of the site survey and system survey, the communications with the High School Honeywell System was not functional.
However, this system appears to control the following:

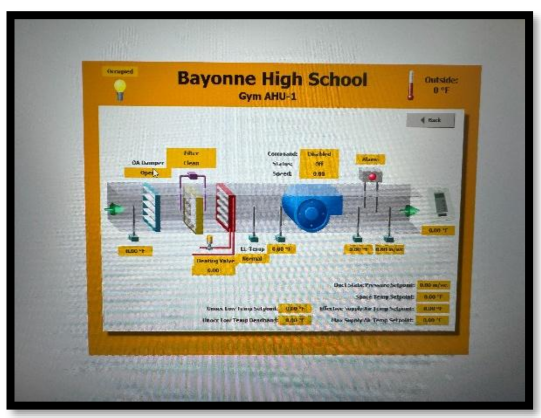
- Boiler Plant
- Steam-to-Hot Water Heat Exchanger with (2) Hot Water Pumps in the boiler room that is controlled via A DDC/pneumatic overlay, .
- (4) Air Handling Units that serve the gymnasium
- (5) Auditorium Packaged Rooftop Units
- (14) Radiation Zones
- "House 4" – (2) Unit Ventilators
- "House 6" – (20) Air Handling Units

The Ice Rink has a pneumatically controlled Steam-To-Hot Water Heat Exchanger with (2) Hot Water Pumps and (5) Air Handling Units that are also pneumatically controlled. Local documentation suggests there are 14 steam zone control valves throughout the High School.







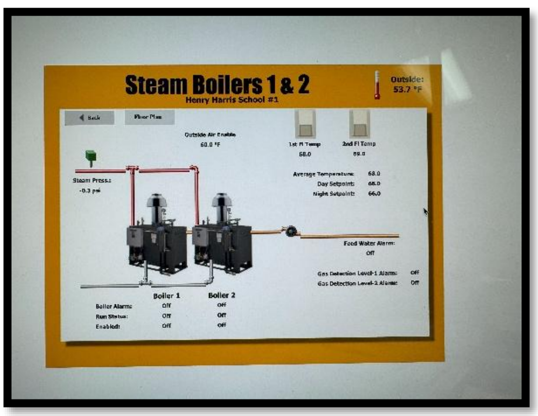


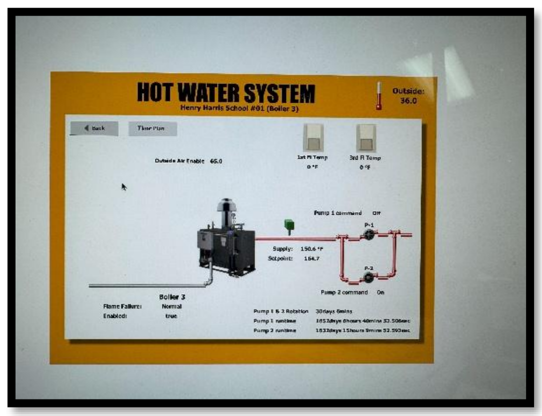
Existing Conditions – Henry Harris Community School

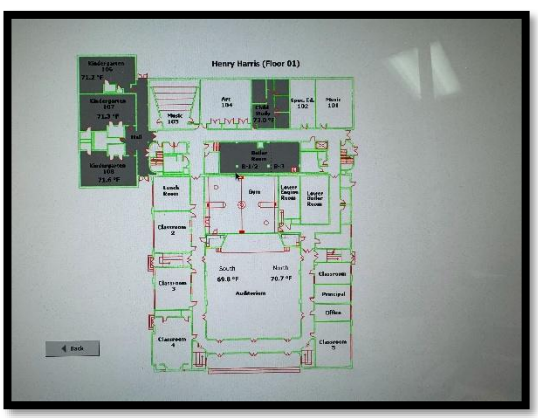
Henry Harris Community School has an existing Honeywell Automation System. This system appears to control the following: The boiler plant consists of (2) Steam Boilers and (2) Condensing Hot Water Boilers w/ a pair of hot water pumps. The original section of the school has mostly steam radiators for heating and window air conditioners for cooling. The school addition hot water/DX unit ventilators.

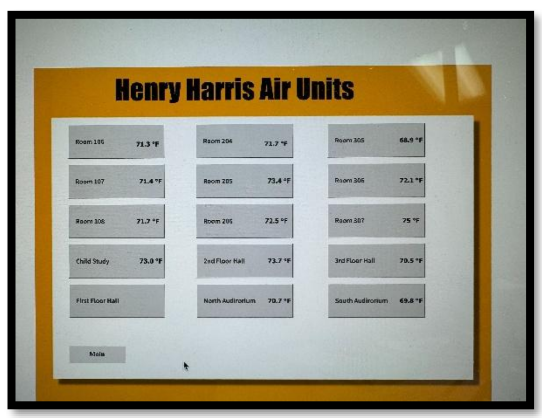
- Boiler plant consists of (2) Steam Boilers and (2) Condensing Hot Water Boilers w/ a pair of hot water pumps.
- (3) Fan Coil Units
- (9) Hot Water/DX unit ventilators
- (1) Aerdale Air Handling Unit
- (2) Packaged Rooftop Units

The original section of the school has mostly steam radiators for heating and window air conditioners for cooling. The school addition hot water/DX unit ventilators.





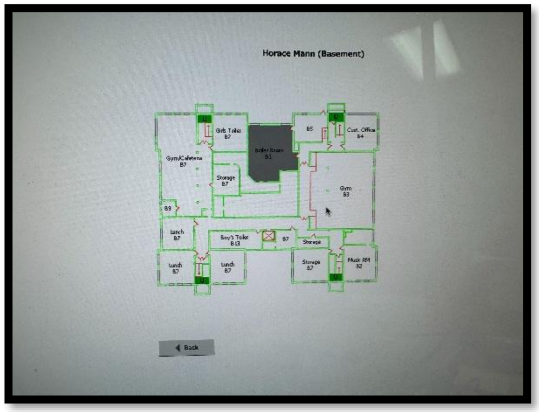


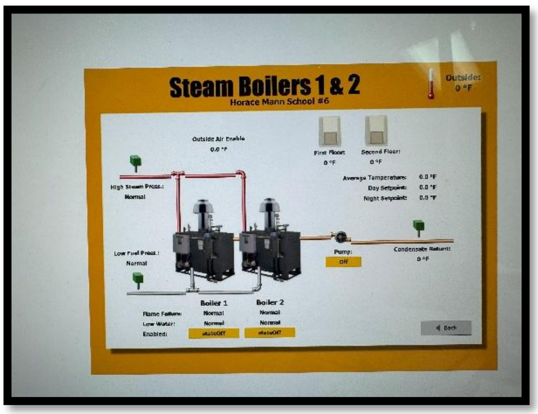


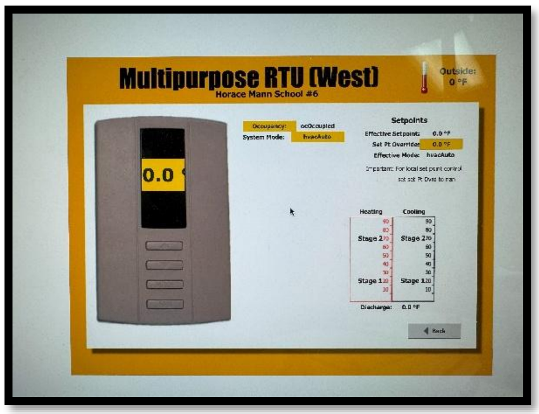
Existing Conditions – Horace Mann Community School

Horace Mann Community School installed a new steam Boiler Plant with new Honeywell Controls. The school is heated largely with steam radiators and cooled with a VRF System. There is a small Aaon air handling unit that serves the basement gymnasium. Horace Mann Community School has an existing Honeywell Automation System that appears to control the following:

- Steam Boiler Plant
- (2) Packaged Rooftop Units



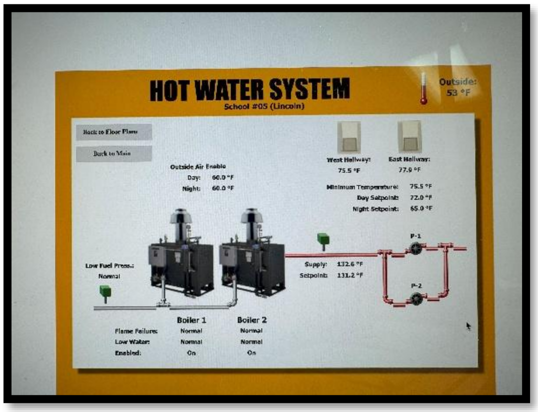


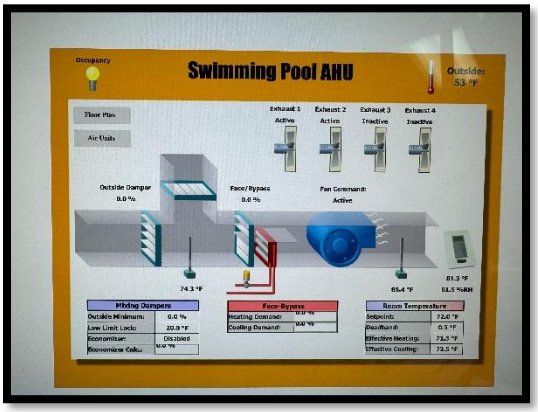


Existing Conditions – Lincoln Community School

Lincoln Community School has an existing Honeywell Automation System. This system appears to control only the hot water boiler plant. The original section of the school has radiators for heating and window air conditioners for cooling. Lincoln Community School has a functioning Pool with diving pit. The Pool Heater is located in the boiler room. The existing system appears to control the following:

- Hot Water Boiler Plant
- (2) Air Handling Units
- (2) Multi-Zone Air Handling Units – 3 Zones Each
- (12) Exhaust Fans

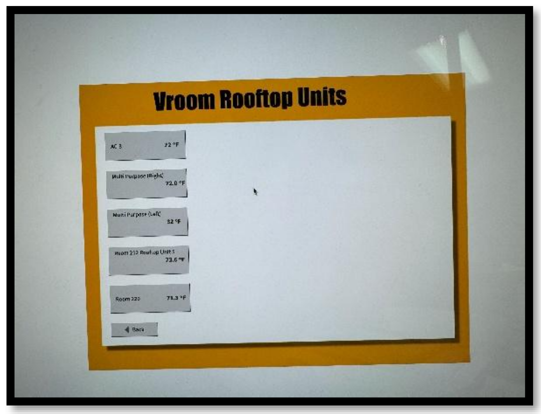


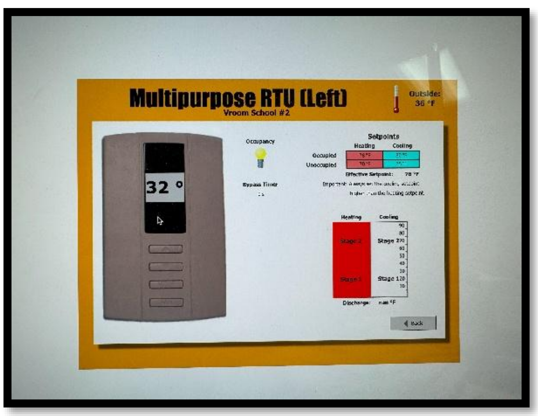


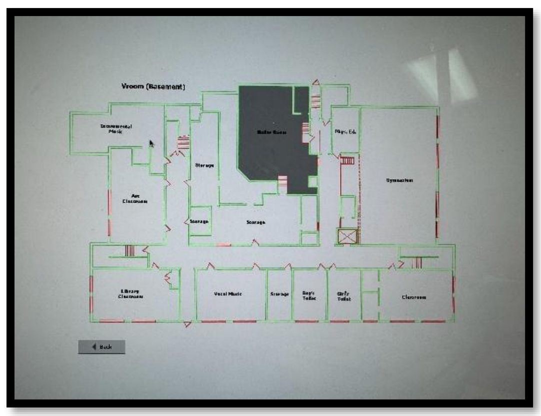
Existing Conditions – Philip G. Vroom Community School

Vroom Community School has an existing Honeywell Automation System. The school has mostly steam radiators for heating and window air conditioners for cooling. There is also (6) packaged rooftop units on the lower roof. The existing system appears to control the following:

- Steam Boiler Plant
- (5) Packaged Rooftop Units
- (2) Multi-Zone Air Handling Units – 3 Zones Each
- (12) Exhaust Fans



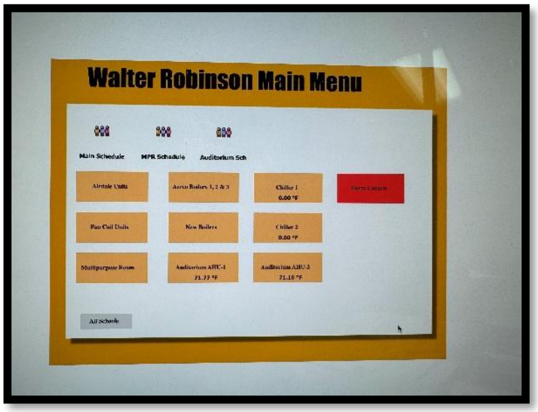


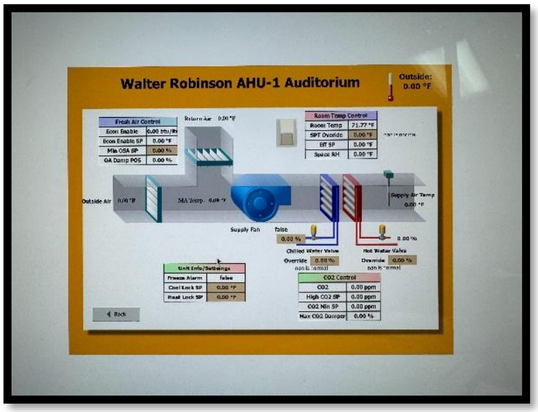


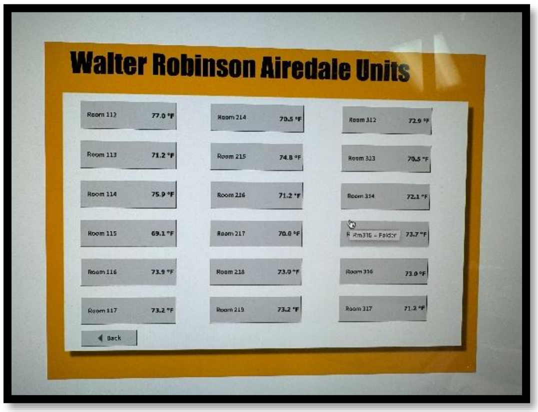
Existing Conditions – Dr. Walter F. Robinson Community School

Dr. Walter F Robinson Community School has an existing Honeywell Automation System. The boiler plant consists of (2) Steam Boilers and (2) Condensing Hot Water Boilers w/ a pair of hot water pumps. The chiller plant has (2) Air Cooled Chillers w/ a pair of chilled water pumps located in the basement mechanical room. The original section of the school has mostly steam radiators for heating and window air conditioners for cooling. The school addition has approximately (18) chilled water/hot water classroom unit ventilators. The existing system appears to control the following:

- Steam Boiler Plant
- Chiller Plant
- (2) Air Handling Units
- (18) Airedale Unit Ventilators
- (3) Fan Coil Units



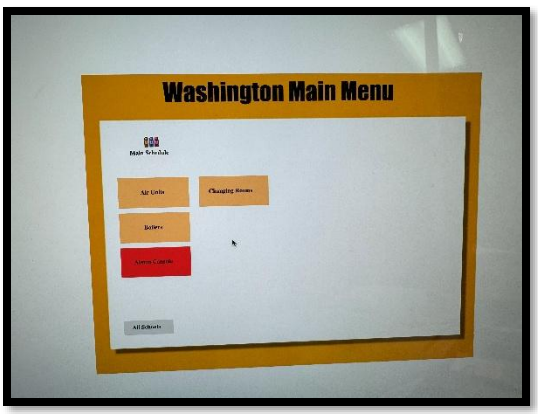


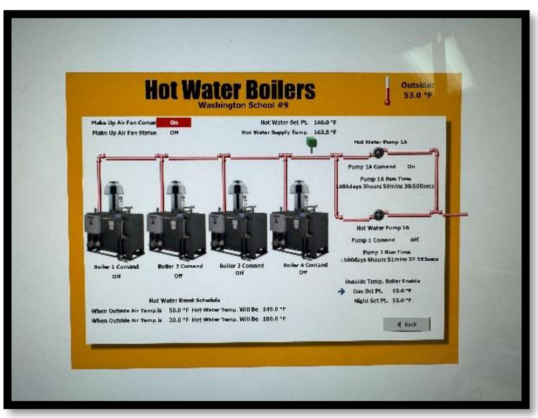


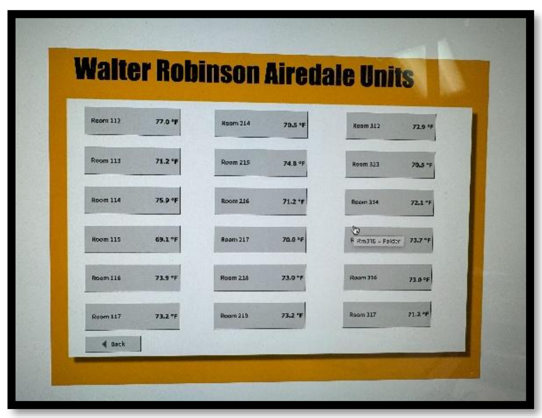
Existing Conditions – Washington Community School

Washington Community School has an existing Honeywell Automation System. The boiler plant consists of (4) Steam Boilers and (4) Hot Water Boilers w/ a pair of hot water pumps. The original section of the school has mostly steam radiators for heating and window air conditioners for cooling. The school addition has approximately (8) DX/hot water classroom unit ventilators and there are (4) Packaged Rooftop Units.
The existing system appears to control the following:

- Steam Boiler Plant
- Hot Water Boiler Plant
- (4) Packaged Rooftop Units
- (2) Baseboard Zones
- (8) Unit Ventilators
- (6) Fan Coil Units



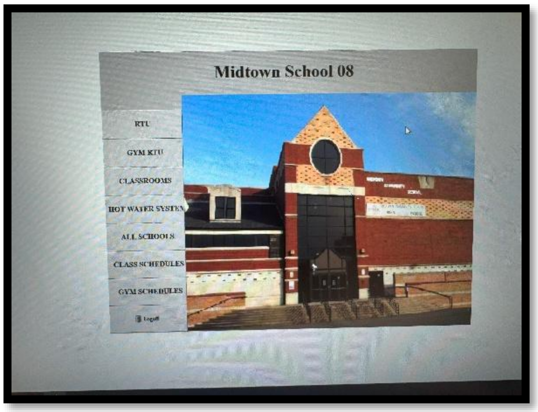


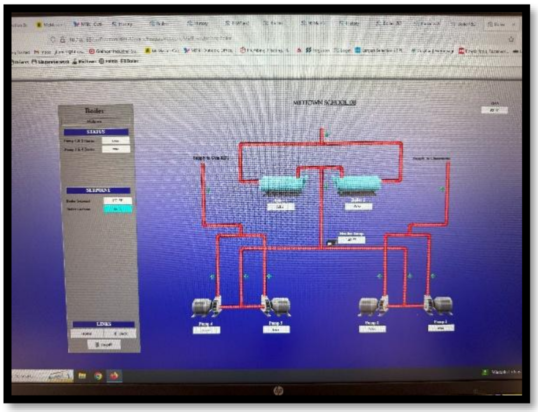
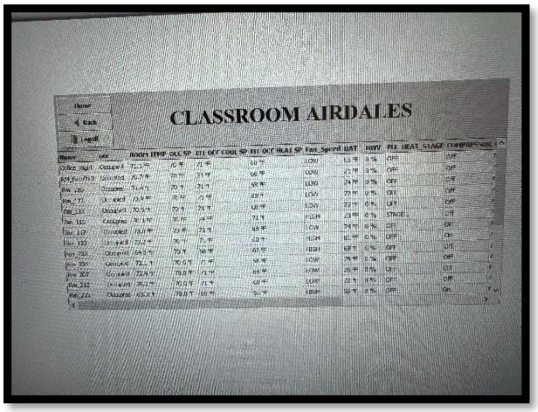


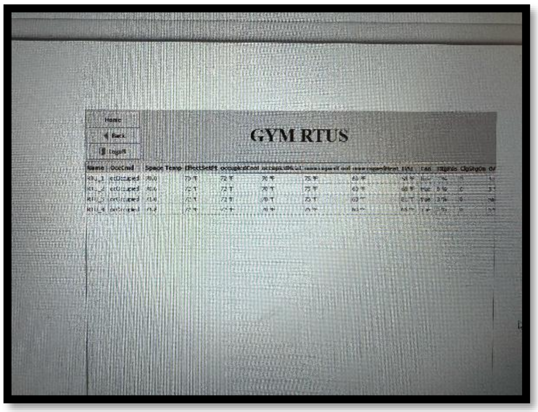
Existing Conditions – William Shemin Midtown Community School

William Shemin Midtown Community School has an existing Honeywell Automation System. This system appears to control the boiler plant, (4) Seasons 4 packaged rooftop units and select classroom unit ventilators. The original (49) classroom unit ventilators were provided with proprietary controls by the manufacturer. Over the last few years these units have been retrofitted one at a time leaving some of the units on the Honeywell system and others operating standalone. The existing system appears to control the following:

- Hot Water Boiler Plant
- (4) Seasons-4 Packaged Rooftop Units
- (21) Airedale Unit Ventilators



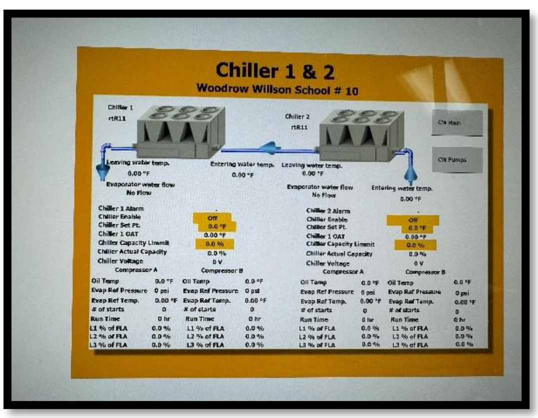



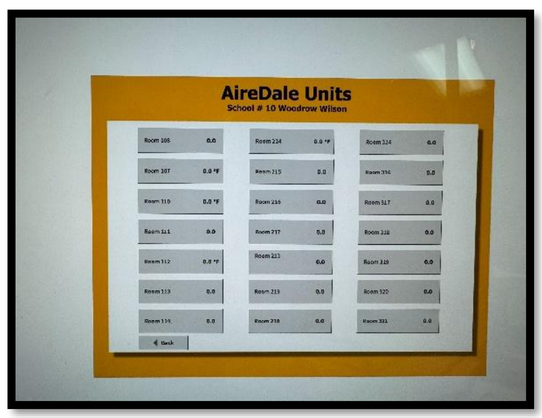


Existing Conditions – Woodrow Wilson Community School

Woodrow Wilson Community School has an existing Honeywell Automation System. The boiler plant consists of (2) Steam Boilers and (2) Condensing Hot Water Boilers w/ a pair of hot water pumps. The chiller plant has (2) Air Cooled Chillers w/ a pair of chilled water pumps located in the basement mechanical room. The original section of the school has mostly steam radiators for heating and a recently installed VRF System for cooling. The school addition has approximately (21) chilled water/hot water classroom unit ventilators. The existing system appears to control the following:

- Hot Water Boiler Plant
- Stam Boiler Plant
- Chilled Water Plant
- (21) Airedale Unit Ventilators
- (7) Fan Coil Units
- (6) Air Handling Units

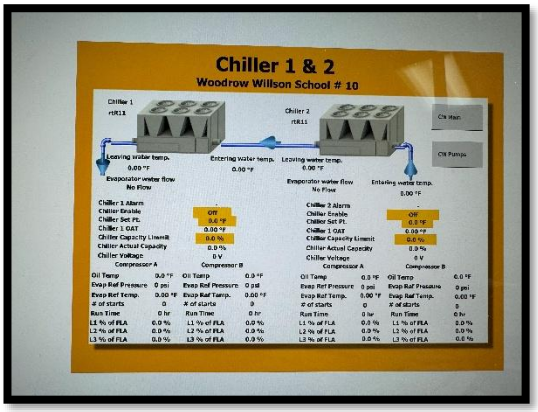


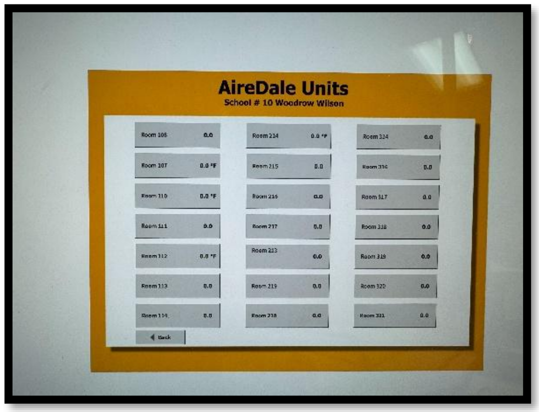


Existing Conditions – John M. Bailey Community School

John M. Bailey Community School has an existing Honeywell Automation System. The boiler plant consists of (2) Steam Boilers and (1) Hot Water Boiler w/ a pair of hot water pumps. The original section of the school has mostly steam radiators for heating and window air conditioners for cooling. The school addition has approximately (21) DX/hot water classroom unit ventilators. The existing system appears to control the following:

- Hot Water Boiler Plant
- Stam Boiler Plant
- (21) Unit Ventilators

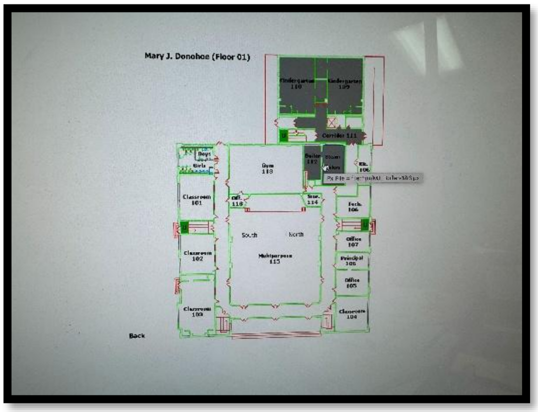


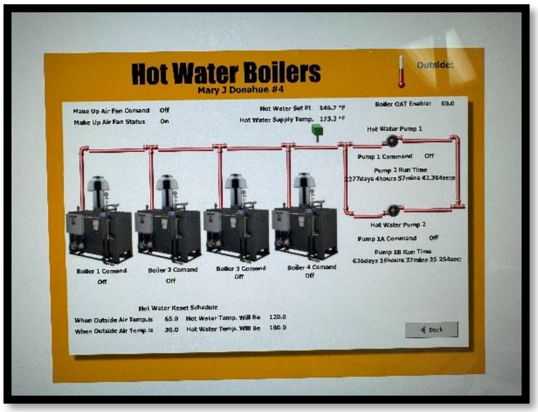


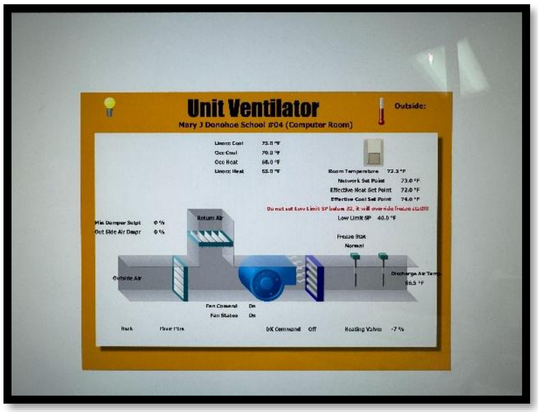
Existing Conditions – Mary J. Donahoe Community School

Mary J. Donahoe Community School has an existing Honeywell Automation System. boiler plant consists of (3) Steam Boilers and (4) Hot Water Boiler w/ a pair of hot water pumps. The original section of the school has mostly steam radiators for heating and window air conditioners for cooling. The school addition has approximately (12) DX/hot water classroom unit ventilators. The existing system appears to control the following:

- Hot Water Boiler Plant
- Stam Boiler Plant
- (12) Unit Ventilators

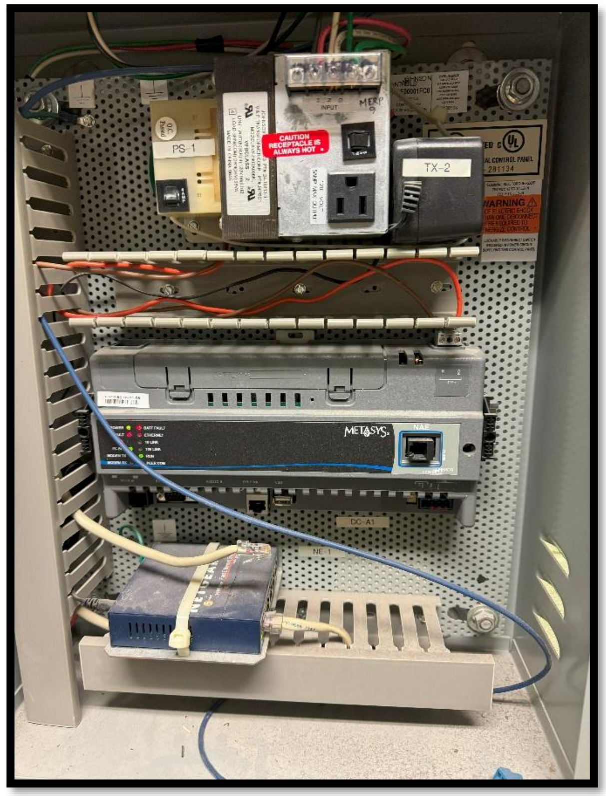


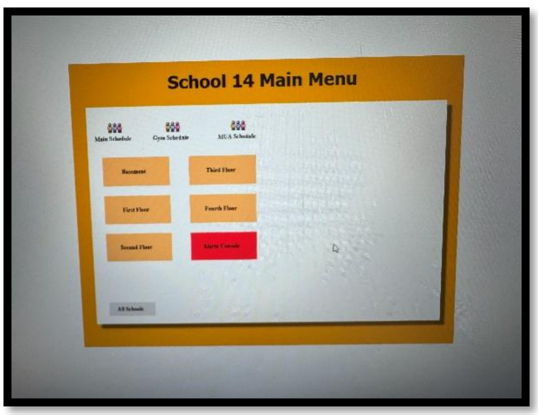


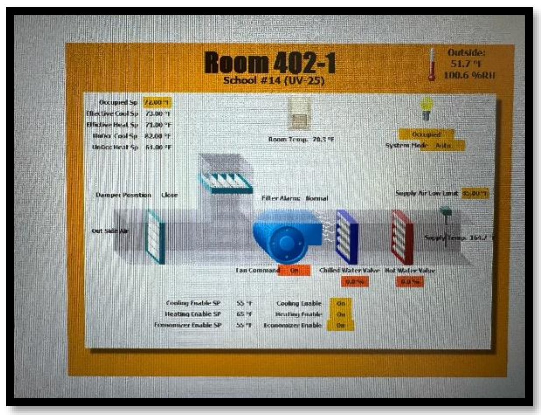


Existing Conditions – Nickolas Oresko Community School

Nickolas Oresko Community School has an existing JCI Metasys System. This system appears to control the entire school's mechanical systems including the Boiler Plant, Chiller Plant, and entire HVAC System all the way down to the zone level classroom units.





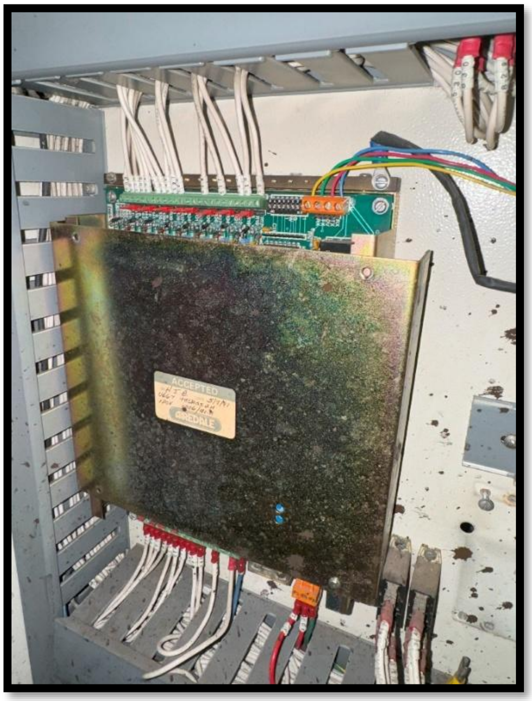


Scope of Work – ECM #4 District-Wide EMS - Tier 1

Tier 1 will upgrade the entire Honeywell Network with the latest generation of building controllers and the latest generation of software. Change the "Smart" controllers at various boiler plants with new Honeywell Controllers, upgrade all of the system graphics to high quality 3-D graphical standards, set up trend logs for available system control points, and provide training for all appropriate Bayonne Staff on the operation and programming of the upgraded system.

Scope of Work – ECM #4 District-Wide EMS - Tier 2

Tier 2 scope is to retrofit existing HVAC Equipment currently not connected to the Honeywell system at the High School, Mann, Vroom, Lincoln, Midtown, and Woodrow Wilson Community Schools. The Tier 2 Scope of work included in the ESIP project is the integration of the new VRF Installed at Horace Mann Community School, retrofit of (3) units at Lincoln Community School, retrofit of (1) unit at Philip Vroom Community School, integration of the new VRF Installed at Woodrow Wilson Community School, and retrofit of the remaining Airedale units at Midtown Community School.



ECM Savings Calculations

Energy savings from the Tier 1 district Energy Management System were calculated using the BPU protocols. The upgraded system will have improved and precise occupied/unoccupied scheduling capabilities programed through user interface at a central computer dashboard. The existing system maintains relatively good occupied/unoccupied schedules and setpoints. The upgraded system will enhance those schedules and setpoints where possible. No savings are contemplated for the Tier 2 scope of work at Midtown Community School/

Algorithms

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

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

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

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

12	= Conversion factor from Tons to kBtu/hr to acquire consumption in kWh.
168	= Hours per week.
7	= Assumed weekly hours for setback/setup adjustment period (based on 1 setback/setup per day, 7 days per week).

Summary of Inputs

Occupancy Controlled Thermostats

Component	Type	Value	Source
T_h	Variable		Application
T_c	Variable		Application
S_h	Fixed	T_h-5°	
S_c	Fixed	T_c+5°	
H	Variable		Application; Default of 84 hrs/week
Cap_{hp}	Variable		Application
Cap_h	Variable		Application
$EFLH_{c,h}$	Variable	See Table Below	1
P_h	Fixed	3%	2
P_c	Fixed	6%	2
$AFUE_h$	Variable		Application
EER_{hp}	Variable		Application

EFLH Table

Facility Type	Heating $EFLH_h$	Cooling $EFLH_c$
Assembly	603	669
Auto repair	1910	426
Dormitory	465	800
Hospital	3366	1424
Light industrial	714	549
Lodging – Hotel	1077	2918
Lodging – Motel	619	1233
Office – large	2034	720
Office – small	431	955
Other	681	736
Religious worship	722	279
Restaurant – fast food	813	645
Restaurant – full service	821	574

Facility Type	Heating $EFLH_h$	Cooling $EFLH_c$
Retail – big box	191	1279
Retail – Grocery	191	1279
Retail – small	545	882
Retail – large	2101	1068
School – Community college	1431	846
School – postsecondary	1191	1208
School – primary	840	394
School – secondary	901	466
Warehouse	452	400

Multi-family EFLH by Vintage

Facility Type	Prior to 1979	From 1979 to 2006	From 2007 through Present
Low-rise, Cooling	507	550	562
Low-rise, Heating	757	723	503
High-rise, Cooling	793	843	954
High-rise, Heating	526	395	219

BUILDING	SQFT	Existing Weekly Occupied Heat Hours [H]	Proposed Weekly Occupied Heat Hours [H]	Existing Weekly Occupied Cool Hours [H]	Proposed Weekly Occupied Cool Hours [H]	Boiler Heating (Btu/hr) [CAPboiler]	Boiler Heating Efficiency (%) [AFUEh]
Bayonne High School & Ice Rink	470,000	80.0	75.0	80.0	75.0	23,874,000	75
Henry Harris Community School	65,000	72.5	70.0	72.5	70.0	4,393,000	75
Horace Mann Community School	69,717	72.5	70.0	72.5	70.0	10,780,000	75
Lincoln Community School	66,000	80.0	75.0	80.0	75.0	13,848,000	75
Philip G. Vroom Community School	52,000	60.0	55.0	60.0	55.0	9,360,000	75
Dr. Walter F. Robinson Community School	79,800	70.0	65.0	70.0	65.0	4,359,000	75
Washington Community School	76,613	55.0	50.0	55.0	50.0	3,205,000	75
William Shemin Midtown Community School	136,204	98.0	75.0	98.0	75.0	6,694,000	75
Woodrow Wilson Community School	83,000	168.0	120.0	168.0	75.0	15,496,000	75
John M Bailey Community School	53,000	90.0	75.0	90.0	75.0	7,241,000	75
Mary J Donahoe Community School	62,000	72.5	70.0	72.5	70.0	4,393,000	75
Nickolas Oresko Community School	82,000	70.0	65.0	70.0	65.0	5,700,000	75

BUILDING	SQFT	ELFHc	ELFHh	Th (F)	Tc (F)	Sh (F)	Sc (F)	Ph (%)	Pc (%)
Bayonne High School & Ice Rink	470,000	840	394	71	71	60	80	3	6
Henry Harris Community School	65,000	840	394	71	71	60	80	3	6
Horace Mann Community School	69,717	840	394	71	71	60	80	3	6
Lincoln Community School	66,000	840	394	71	71	60	80	3	6
Philip G. Vroom Community School	52,000	840	394	71	71	60	80	3	6
Dr. Walter F. Robinson Community School	79,800	840	394	71	71	60	80	3	6
Washington Community School	76,613	840	394	71	71	60	80	3	6
William Shemin Midtown Community School	136,204	840	394	71	71	60	80	3	6
Woodrow Wilson Community School	83,000	840	394	71	71	60	80	3	6
John M Bailey Community School	53,000	840	394	71	71	60	80	3	6
Mary J Donahoe Community School	62,000	840	394	71	71	60	80	3	6
Nickolas Oresko Community School	82,000	840	394	71	71	60	80	3	6

EMS Savings						
BUILDING	SQFT	Boiler Heating Energy Savings (Therms)	Total Electric Savings (kWh)	Total Gas Savings (Therms)	Total Electric Savings (kWh)	Total Gas Savings (Therms)
Bayonne High School & Ice Rink	470,000	1,232	0	1,232	0	1,232
Henry Harris Community School	65,000	113	0	113	0	113
Horace Mann Community School	69,717	278	0	278	0	278
Lincoln Community School	66,000	714	0	714	0	714
Philip G. Vroom Community School	52,000	483	0	483	0	483
Dr. Walter F. Robinson Community School	79,800	225	0	225	0	225
Washington Community School	76,613	165	0	165	0	165
William Shemin Midtown Community School	136,204	1,589	0	1,589	0	1,589
Woodrow Wilson Community School	83,000	7,675	0	7,675	0	7,675
John M Bailey Community School	53,000	1,121	0	1,121	0	1,121
Mary J Donahoe Community School	62,000	113	0	113	0	113
Nickolas Oresko Community School	82,000	294	0	294	0	294

BAYONNE PUBLIC SCHOOLS ECM MATRIX

(white)	DCO ECM was evaluated
(green)	ECM included in the project

ECM #	ECM DESCRIPTION	Bayonne High School & Ice Rink	Henry Harris Community School	Horace Mann Community School	Lincoln Community School	Philip G. Vroom Community School	Dr. Walter F. Robinson Community School	Washington Community School	William Shemin Midtown Community School	Woodrow Wilson Community School	John M Bailey Community School	Mary J Donahoe Community School	Nickolas Oresko Community School
6	Boiler Replacement	✔		✔	✔	✔			✔	✔	✔		

Note:
BPS is using current capital to fund the replacement of the existing boilers at Horace Mann Community School, Lincoln Community School, Philip G. Vroom Community School, and William Shemin Midtown Community School. No costs for these replacements are being carried in the ESIP. However, the savings associated with these projects are carried in the ESIP.

Existing Conditions – Bayonne High School & Ice Rink

Bayonne High School has a central steam boiler plant with (3) HB Smith 7,958 MBH forced draft steam boilers with non-modulating burners. There are (3) 20 HP draft fans, feedwater system, and vacuum condensate system.

Existing Conditions – Horace Mann Community School

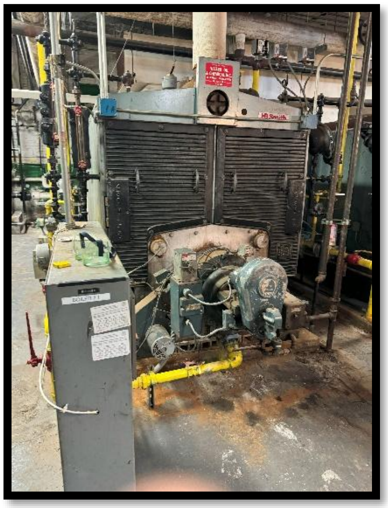
Horace Mann Community School has a central steam boiler plant with (2) HB Smith 5,390 MBH and (1) Weil-McLain 250 MBH forced draft steam boilers with non-modulating burners

Existing Conditions – Lincoln Community School

Lincoln Community School has a central hot water boiler plant with (2) HB Smith 6,924 MBH hot water boilers with non-modulating burners. There are (2) 7.5 HP constant volume hot water pumps.

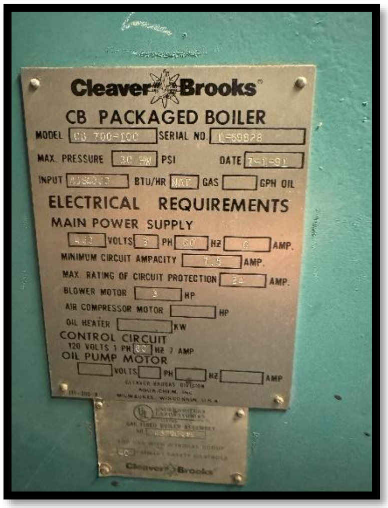
Existing Conditions – Philip G. Vroom Community School

Philip G Vroom Community School has a central steam boiler plant with (2) HB Smith 4,680 MBH forced draft steam boilers with non-modulating burners. There are (3) 20 HP draft fans, feedwater system, and vacuum condensate system.



Existing Conditions – William Shemin Midtown Community School

William Shemin Midtown Community School has a central hot water boiler plant with (2) Cleaver Brooks 3,347 MBH hot water boilers with non-modulating burners. There are (3) 15 HP Hot Water Pumps and (2) 3 HP Hot Water Pumps.

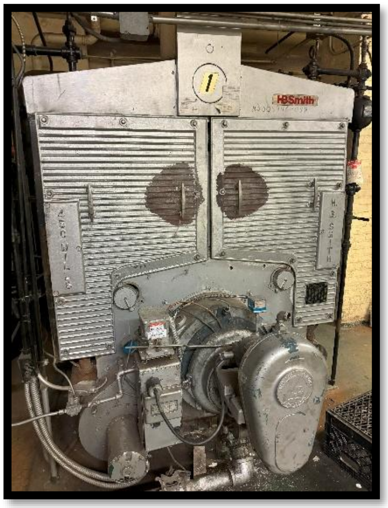
Existing Conditions – Woodrow Wilson Community School

Woodrow Wilson Community School has a central steam boiler plant with (2) Weil-McLain 6,390 MBH forced draft steam boilers with non-modulating burners that serve the existing school. There are also (2) 1,358 MBH Weil-McLain hot water boilers that serve the school addition with (2) 7.5 HP hot water pumps.



Existing Conditions – John M. Bailey Community School

John M. Bailey Community School has a central steam boiler plant with (2) HB Smith 3,800 MBH forced draft steam boilers with non-modulating burners that serve the existing school. There is also (1) 2,000 MBH Weil-McLain hot water boilers that serve the school addition with (2) 5 HP hot water pumps.




Scope of Work – Bayonne High School & Ice Rink

While a full replacement of the central boiler plant at Bayonne High School was not financially viable within the ESIP project, Bayonne Public Schools chose to replace (1) of the existing boilers while leaving the remaining (2) boilers and all other services in place. This scope would demo the existing boiler, install a new boiler, and connect the new boiler to the existing system. The district would then use this boiler as the primary operating boiler for the high school until the other (2) boilers can be replaced in future projects.

BPS is using current capital to fund the replacement of the existing boilers at Horace Mann Community School, Lincoln Community School, Philip G. Vroom Community School, and William Shemin Midtown Community School. No costs for these replacements are being carried in the ESIP. However, the savings associated with these projects are carried in the ESIP.

ECM Savings Calculations

BPU Protocols were used to calculate the boiler replacement savings.

Boiler Replacement Savings

BUILDING	SQFT	Baseline Plant Rated Input MBH (CAPYbi)	Estimated Existing Efficiency (EFFb)	Qualifying Boiler Plant Capacity (CAPYqi)	Qualifying Boiler Efficiency (EFFq)	Adjusted Heating Degree Days (HDDmod)	Delta T	Conversion of BTU to therms (Hcfuel)	OF	Infrared Compensation Factor (ICF)	Calculated Annual Fuel Savings (Th)
Bayonne High School & Ice Rink	470,000	7,958	79%	7,958	87%	2,783	70	100,000	0.8	1.0	7,071
Horace Mann Community School	69,717	10,780	79%	10,780	87%	2,783	70	100,000	0.8	1.0	9,578
Lincoln Community School	66,000	13,848	79%	13,848	87%	2,783	70	100,000	0.8	1.0	12,304
Philip G. Vroom Community School	52,000	9,360	79%	9,360	87%	2,783	70	100,000	0.8	1.0	8,316
William Shemin Midtown Community School	136,204	6,694	79%	6,694	87%	2,783	70	100,000	0.8	1.0	5,948
Woodrow Wilson Community School	83,000	12,780	79%	12,780	87%	2,783	70	100,000	0.8	1.0	11,355
		2,716	79%	2,716	87%	2,783	70	100,000	0.8	1.0	2,413
John M Bailey Community School	53,000	5,822	79%	5,822	87%	2,783	70	100,000	0.8	1.0	5,173
		1,419	79%	1,419	87%	2,783	70	100,000	0.8	1.0	1,261

Algorithms

Fuel Savings (MMBtu/yr) = Cap_{in} * $EFLH_h$ * ((Eff_q/Eff_b)-1) / 1000 kBtu/MMBtu

Definition of Variables

Cap_{in} = Input capacity of qualifying unit in kBtu/hr

$EFLH_h$ = The Equivalent Full Load Hours of operation for the average unit during the heating season in hours

Eff_b = Boiler Baseline Efficiency

Eff_q = Boiler Proposed Efficiency

1000 = Conversion from kBtu to MMBtu

Summary of Inputs

Prescriptive Boilers

Component	Type	Value	Source
Cap_{in}	Variable		Application
$EFLH_h$	Fixed	See Table Below	1
Eff_b	Variable	See Table Below	2
Eff_q	Variable		Application

$EFLH_h$ Table

Facility Type	Heating EFLH
Assembly	603
Auto repair	1910
Dormitory	465
Hospital	3366
Light industrial	714
Lodging – Hotel	1077
Lodging – Motel	619
Office – large	2034
Office – small	431
Other	681
Religious worship	722

Multi-family EFLH by Vintage

Facility Type	Prior to 1979	From 1979 to 2006	From 2007 through Present
Low-rise, Heating	757	723	503
High-rise, Heating	526	395	219

Facility Type	Heating EFLH
Restaurant – fast food	813
Restaurant – full service	821
Retail – big box	191
Retail – Grocery	191
Retail – small	545
Retail – large	2101
School – Community college	1431
School – postsecondary	1191
School – primary	840
School – secondary	901
Warehouse	452

ECM #7 – Chiller Replacement

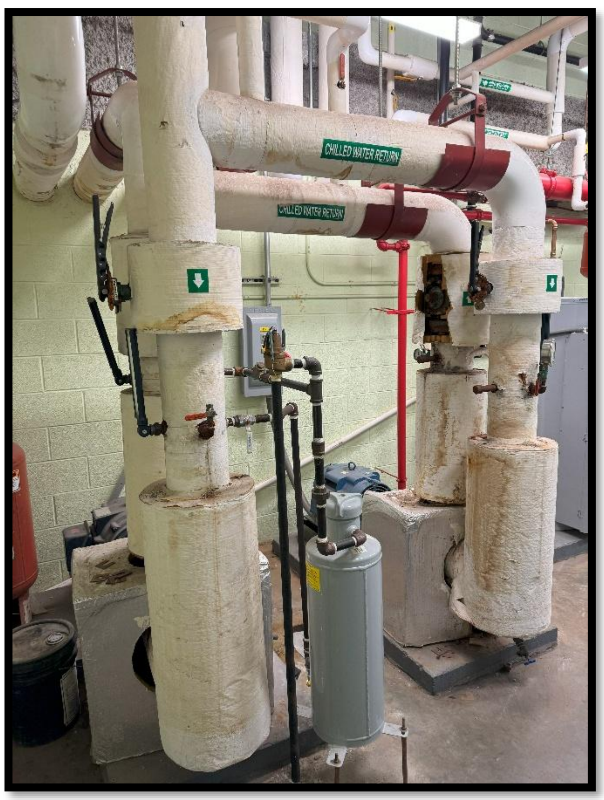
BAYONNE PUBLIC SCHOOLS
ECM MATRIX

	DCO ECM was evaluated
	ECM included in the project

ECM #	ECM DESCRIPTION	Bayonne High School & Ice Rink	Henry Harris Community School	Horace Mann Community School	Lincoln Community School	Philip G. Vroom Community School	Dr. Walter F. Robinson Community School	Washington Community School	William Shemin Midtown Community School	Woodrow Wilson Community School	John M Bailey Community School	Mary J Donahoe Community School	Nickolas Oresko Community School
7	Chiller Replacement						✔			✔			✔

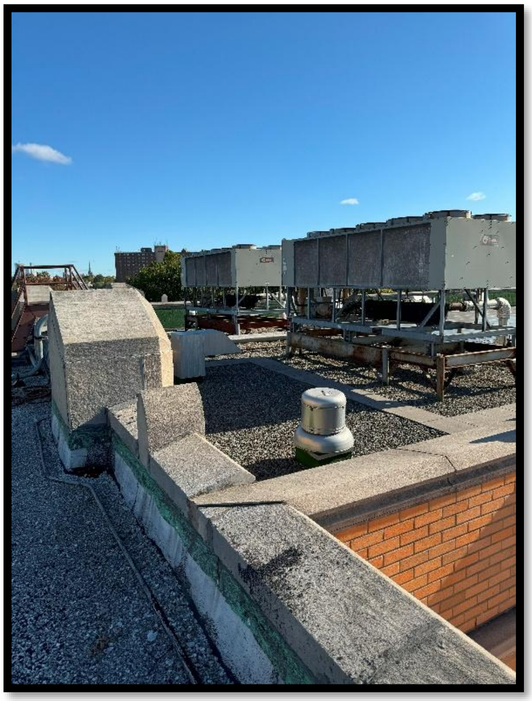
Existing Conditions – Dr. Walter F. Robinson Community School

Dr. Walter F. Robinson Community School has (2) 150 Ton York model YCAS0150EC45 air cooled chillers. There are (2) 30 HP chilled water pumps.



Existing Conditions – Woodrow Wilson Community School

Dr. Walter F. Robinson Community School has (2) 100 Ton Trane model RTAA1004YR01A3D1GRBF air cooled chillers. There are (2) 25 HP chilled water pumps.



Existing Conditions – Nickolas Oresko Community School

Nickolas Oresko Community School has (2) 150 Ton York model YCAV01507VA46VABBXT air cooled chillers. There are (3) 15 HP chilled water pumps.

Scope of Work

A like-for-like replacement of the existing chillers. New chillers will connect to the existing chilled water pumps. New chillers were physically sized and selected to fit on the existing dunnage and to assure that no new electric services will be required for larger electric loads.

ECM Savings Calculations

BPU Protocols were used to calculate the boiler replacement savings.

Chiller Replacement Savings									
BUILDING	SQFT	Qty	Capacity (Tons)	EFLH	FLV_b (kW/ton)	FLV_q (kW/ton)	PDC	FLV Energy Savings (kWh)	FLV Peak Demand Savings (kW)
Dr. Walter F. Robinson Community School	79,800	2	150	466	1.237	1.043	67%	27,075	39
Woodrow Wilson Community School	83,000	2	100	466	1.237	1.102	67%	12,580	18
Nickolas Oresko Community School	82,000	2	150	466	1.237	1.043	67%	27,075	39

Electric Chillers

The measurement of energy and demand savings for C&I chillers is based on algorithms with key variables.

This measure applies to new construction, replacement of failed equipment, or end of useful life. The baseline unit is a code compliant unit with an efficiency as required by ASHRAE Std. 90.1 – 2016, which is the current code adopted by the state of New Jersey.

Algorithms

For IPLV:

Energy Savings (kWh/yr) = $N * Tons * EFLH * (IPLV_b - IPLV_q)$

Peak Demand Savings (kW) = $N * Tons * PDC * (IPLV_b - IPLV_q)$

For FLV:

Energy Savings (kWh/yr) = $N * Tons * EFLH * (FLV_b - FLV_q)$

Peak Demand Savings (kW) = $N * Tons * PDC * (FLV_b - FLV_q)$

Definition of Variables

N = Number of units

Tons = Rated capacity of coolling equipment.

EFLH = Equivalent Full Load Hours – This represents a measure of energy use by season during the on-peak and off peak periods.

PDC = Peak Duty Cycle: fraction of time the compressor runs during peak hours

$IPLV_b$ = Integrated Part Load Value of baseline equipment, kW/Ton. The efficiency of the chiller under partial-load conditions.

$IPLV_q$ = Integrated Part Load Value of qualifying equipment, kW/Ton. The efficiency of the chiller under partial-load conditions.

FLV_b = Full Load Value of baseline equipment, kW/Ton. The efficiency of the chiller under full-load conditions.

FLV_q = Full Load Value of qualifying equipment, kW/Ton. The efficiency of the chiller under full-load conditions.

Summary of Inputs

Electric Chiller Assumptions

Electric Chillers Component	Type	Situation	Value	Source
Tons	Rated Capacity, Tons	All	Varies	From Application
$IPLV_b$ (kW/ton)	Variable	See table below	Varies	1

Electric Chillers Component	Type	Situation	Value	Source
$IPLV_q$ (kW/ton)	Variable	All	Varies	From Application (per AHRI Std. 550/590)
FLV_b (kW/ton)	Variable	See table below	Varies	1
FLV_q (kW/ton)	Variable	All	Varies	From Application (per AHRI Std. 550/590)
PDC	Fixed	All	67%	Engineering Estimate
EFLH	Variable	All	See Table Below	2

Electric Chillers – New Construction

Type	Capacity	ASHRAE 90.1 2016 Table 6.8.1-3)			
		Path A		Path B	
		Full Load kW/ton	IPLV kW/ton	Full Load kW/ton	IPLV kW/ton
Air Cooled	tons < 150	*10.1* 1.188	*13.7* 0.876	*9.7* 1.237	*15.8* 0.759
	tons ≥ 150	*10.1* 1.188	*14.0* 0.857	*9.7* 1.237	*16.1* 0.745
Water Cooled Positive Displacement (rotary screw and scroll)	tons < 75	0.750	0.600	0.780	0.500
	75 ≤ tons < 150	0.720	0.560	0.750	0.490
	150 ≤ tons < 300	0.660	0.540	0.680	0.440
	300 ≤ tons < 600	0.610	0.520	0.625	0.410
	tons ≥ 600	0.560	0.500	0.585	0.380
Water Cooled Centrifugal	tons < 150	0.610	0.550	0.695	0.440
	150 ≤ tons < 300	0.610	0.550	0.635	0.400
	300 ≤ tons < 400	0.560	0.520	0.595	0.390
	400 ≤ tons < 600	0.560	0.500	0.585	0.380
	tons ≥ 600	0.560	0.500	0.585	0.380

a – Values in italics are EERs.

EFLH Table

Facility Type	Cooling EFLH
Assembly	669
Auto repair	426
Dormitory	800
Hospital	1424
Light industrial	549
Lodging – Hotel	2918
Lodging – Motel	1233
Office – large	720
Office – small	955
Other	736
Religious worship	279
Restaurant – fast food	645
Restaurant – full service	574
Retail – big box	1279
Retail – Grocery	1279
Retail – small	882
Retail – large	1068
School – Community college	846
School – postsecondary	1208
School – primary	394
School – secondary	466
Warehouse	400

Multi-family EFLH by Vintage

Facility Type	Prior to 1979	From 1979 to 2006	From 2007 through Present
Low-rise, Cooling	507	550	562
High-rise, Cooling	793	843	954

Sources

1. ASHRAE Standards 90.1-2016. *Energy Standard for Buildings Except Low Rise Residential Buildings*. https://www.ashrae.org/standards-research--technology/standards--guidelines. Table 6.8.1-3
2. New York State Joint Utilities, *New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs*, V7, April 2019. Appendix G –

BAYONNE PUBLIC SCHOOLS ECM MATRIX

	DCO ECM was evaluated
(green)	ECM included in the project

ECM #	ECM DESCRIPTION	Bayonne High School & Ice Rink	Henry Harris Community School	Horace Mann Community School	Lincoln Community School	Philip G. Vroom Community School	Dr. Walter F. Robinson Community School	Washington Community School	William Shemin Midtown Community School	Woodrow Wilson Community School	John M Bailey Community School	Mary J Donahoe Community School	Nickolas Oresko Community School
9	Rooftop Unit Replacement	✓	✓			✓		✓	✓			✓	

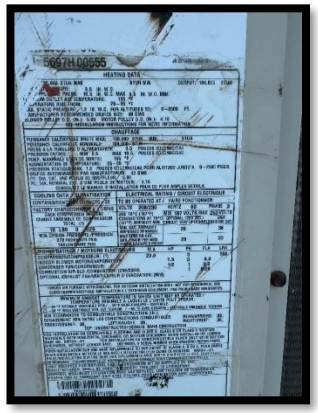
Existing Conditions – Bayonne High School & Ice Rink

EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	Auditorium #1
MANUFACTURER	Lennox
MODEL #	GCS24-813-130-2Y
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	6 Tons (estimate)
HEAT TYPE	Natural Gas
REFRIGERANT	R22
APPROXIMATE AGE	25+ Yrs

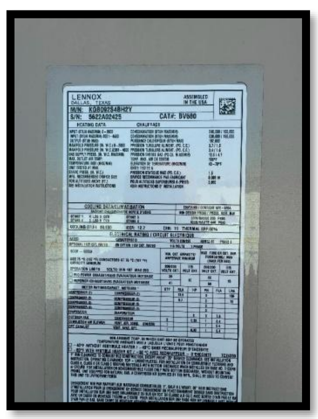
EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	Auditorium #2
MANUFACTURER	Lennox
MODEL #	GCS24-813-130-2Y
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	6 Tons (estimate)
HEAT TYPE	Natural Gas
REFRIGERANT	R22
APPROXIMATE AGE	25+ Yrs

EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	RTU-4
MANUFACTURER	Lennox
MODEL #	GCS24-813-130-2Y
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	6 Tons (estimate)
HEAT TYPE	Natural Gas
REFRIGERANT	R22
APPROXIMATE AGE	25+ Yrs

EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	RTU-3
MANUFACTURER	Lennox
MODEL #	GCS24-813-130-2Y (estimate)
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	6 Tons (estimate)
HEAT TYPE	Natural Gas
REFRIGERANT	R22
APPROXIMATE AGE	25+ Yrs

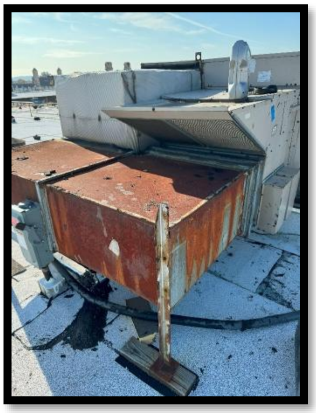



EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	RTU-5
MANUFACTURER	Lennox
MODEL #	KGB092S4BH2Y
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	7.5 Tons (estimate)
HEAT TYPE	Natural Gas
REFRIGERANT	410A
APPROXIMATE AGE	25+ Yrs

EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	RTU-6
MANUFACTURER	Lennox
MODEL #	LGA120HS1Y
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	10 Ton (estimate)
HEAT TYPE	Natural Gas
REFRIGERANT	R22
APPROXIMATE AGE	25+ Yrs

EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	RTU-7
MANUFACTURER	Lennox
MODEL #	GCS16-120-270-2Y
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	10 Tons (estimate)
HEAT TYPE	Natural Gas
REFRIGERANT	R22
APPROXIMATE AGE	25+ Yrs



EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	RTU-8
MANUFACTURER	Trane
MODEL #	(illegible)
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	10 Tons (estimate)
HEAT TYPE	Natural Gas
REFRIGERANT	410A
APPROXIMATE AGE	15-20 Yrs

EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	RTU-9
MANUFACTURER	Lennox
MODEL #	GCS24-953-200-1Y
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	7.5 Tons (estimate)
HEAT TYPE	Natural Gas
REFRIGERANT	R22
APPROXIMATE AGE	25+ Yrs

Existing Conditions – Henry Harris Community School

EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	RT-1 & RT-2
QUANTITY	2
MANUFACTURER	Aaon
MODEL #	(illegible)
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	25 Tons (estimate)
HEAT TYPE	Natural Gas
REFRIGERANT	R22 (estimate)
APPROXIMATE AGE	15-20 Yrs

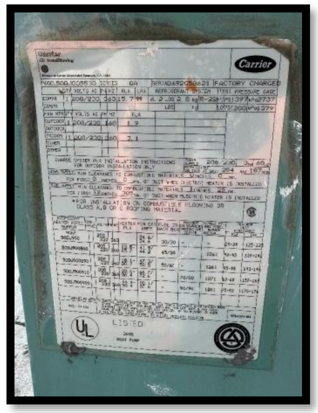

Existing Conditions – Philip G. Vroom Community School

EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	AC-1 & AC-2
QUANTITY	2
MANUFACTURER	Trane
MODEL #	(illegible)
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	10 Tons (estimate)
HEAT TYPE	Natural Gas
REFRIGERANT	R22 (estimate)
APPROXIMATE AGE	25+ Yrs


EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	AC-5
QUANTITY	1
MANUFACTURER	Carrier
MODEL #	(illegible)
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	5 Tons (estimate)
HEAT TYPE	Heat Pump
REFRIGERANT	R22
APPROXIMATE AGE	25+ Yrs


EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	RTU-3
QUANTITY	1
MANUFACTURER	Trane
MODEL #	YCH120C3MBAC
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	10 Tons (estimate)
HEAT TYPE	Natural Gas
REFRIGERANT	R22
APPROXIMATE AGE	25+ Yrs

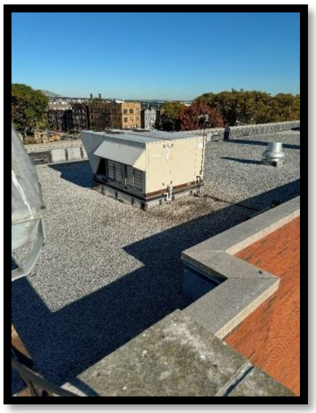

EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	AC-4
QUANTITY	1
MANUFACTURER	Carrier
MODEL #	50QJ005530
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	5 Tons (estimate)
HEAT TYPE	Heat Pump
REFRIGERANT	R22
APPROXIMATE AGE	25+ Yrs



Existing Conditions – Washington Community School

EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	RT-1 & RT-2
QUANTITY	2
MANUFACTURER	Aaon
MODEL #	Rm-025-8-0-AB02-369
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	25 Tons (estimate)
HEAT TYPE	Natural Gas
REFRIGERANT	R22
APPROXIMATE AGE	25+ Yrs

EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	RTU-A & RTU-B
QUANTITY	2
MANUFACTURER	Lennox
MODEL #	(illegible)
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	15 Tons (estimate)
HEAT TYPE	Natural Gas
REFRIGERANT	R22 (estimate)
APPROXIMATE AGE	15-20 Yrs



Existing Conditions – William Shemin Midtown Community School

EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	RTU-5, RTU-6, & RTU-7
QUANTITY	3
MANUFACTURER	Carrier
MODEL #	(illegible)
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	25 Tons (estimate)
HEAT TYPE	Heat Pump/Electric
REFRIGERANT	R22
APPROXIMATE AGE	15-20 Yrs

EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	RHP-2 & RHP-3
QUANTITY	2
MANUFACTURER	Carrier
MODEL #	(illegible)
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	15 Tons (estimate)
HEAT TYPE	Heat Pump/Electric
REFRIGERANT	R22
APPROXIMATE AGE	15-20 Yrs


EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	RHP-1
QUANTITY	1
MANUFACTURER	Carrier
MODEL #	(illegible)
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	15 Tons (estimate)
HEAT TYPE	Heat Pump/Electric
REFRIGERANT	R22
APPROXIMATE AGE	15-20 Yrs


Existing Conditions – Mary J. Donahoe Community School

EQUIPMENT INVENTORY AND SYSTEM DESCRIPTION	
UNIT TAG	RT-1 & RT-2
QUANTITY	2
MANUFACTURER	Aaon
MODEL #	Rm-018-8-0-AB02-369
EQUIPMENT TYPE	Packaged Rooftop Unit
CAPACITY	18 Tons (estimate)
HEAT TYPE	Natural Gas
REFRIGERANT	R22
APPROXIMATE AGE	15-20 Yrs


Scope of Work

A like-for-like replacement of the existing rooftop unit. New RTUs will connect to the existing ductwork, electrical service and natural gas service. Adapter curbs will be provided where necessary to assure new units will fit into the existing curbs. Unit selections used for the replacement scope of work are provided in Appendix K.

ECM Savings Calculations

BPU Protocols were used to calculate the packaged rooftop unit replacement savings.

Packaged Rooftop Unit Replacement Savings

BUILDING	SQFT	QUANTITY	UNIT TAG	TONS	IEERb	IEERq	CF	EFLH	Demand Savings (kW)	Energy Savings (kWh)
Bayonne High School & Ice Rink	470,000	1	RTU-1	6	12.7	15.5	67%	1,131	0.69	1,158
		1	RTU-2	6	12.7	15.5	67%	1,131	0.69	1,158
		1	RTU-3	6	12.7	15.5	67%	1,131	0.69	1,158
		1	RTU-4	6	12.7	15.5	67%	1,131	0.69	1,158
		1	RTU-5	7.5	12.7	15	67%	1,131	0.73	1,229
		1	RTU-6	10	12.7	15	67%	1,131	0.97	1,639
		1	RTU-7	10	12.7	15	67%	1,131	0.97	1,639
		1	RTU-8	10	12.7	15	67%	1,131	0.97	1,639
		1	RTU-9	7.5	12.7	15	67%	1,131	0.73	1,229
Henry Harris Community School	65,000	1	RTU-1	25	11.4	15	67%	1,131	4.23	7,143
		1	RTU-2	25	11.4	15	67%	1,131	4.23	7,143
Philip G. Vroom Community School	52,000	1	AC-1	10	12.7	15	67%	1,131	0.97	1,639
		1	AC-2	10	12.7	15	67%	1,131	0.97	1,639
		1	AC-3	10	12.7	15	67%	1,131	0.97	1,639
		1	AC-4	4	14	13.4	67%	1,131	(0.10)	(174)
		1	AC-5	4	14	13.4	67%	1,131	(0.10)	(174)
Washington Community School	76,613	1	RTU-1	25	11.4	15	67%	1,131	4.23	7,143
		1	RTU-2	25	11.4	15	67%	1,131	4.23	7,143
		1	RTU-A	15	12.2	14.5	67%	1,131	1.57	2,647
		1	RTU-B	15	12.2	14.5	67%	1,131	1.57	2,647
William Shemin Midtown Community School	136,204	1	RHP-1	15	12.2	14.5	67%	1,131	1.57	2,647
		1	RHP-2	15	12.2	14.5	67%	1,131	1.57	2,647
		1	RHP-3	15	12.2	14.5	67%	1,131	1.57	2,647
		1	RTU-5	25	11.4	15	67%	1,131	4.23	7,143
		1	RTU-6	25	11.4	15	67%	1,131	4.23	7,143
		1	RTU-7	25	11.4	15	67%	1,131	4.23	7,143
Mary J Donahoe Community School	62,000	1	RTU-1	20	12.2	15.8	67%	1,131	3.00	5,069
		1	RTU-2	20	12.2	15.8	67%	1,131	3.00	5,069

Electric HVAC Systems

This measure provides energy and demand savings algorithms for C&I Electric HVAC systems. The type of systems included in this measure are: split systems, single package systems, air to air cooled heat pumps, packaged terminal systems (PTAC and PTHP), single package vertical systems (SPVAC and SPVHP), central DX AC systems, water source heat pumps, ground water source heat pumps, and/or ground source heat pumps.

This measure applies to new construction, replacement of failed equipment, or end of useful life. The baseline unit is a code compliant unit with an efficiency as required by ASHRAE Std. 90.1 – 2016, which is the current code adopted by the state of New Jersey.

<u>Algorithms</u>

Air Conditioning Algorithms:

Energy Savings (kWh/yr) = N * Tons * 12 kBtuh/Ton * ($1/EER_b$-$1/EER_q$) * $EFLH_c$

Peak Demand Savings (kW) = N * Tons * 12 kBtuh/Ton * ($1/EER_b$-$1/EER_q$) * CF

Heat Pump Algorithms:

Cooling Energy Savings (kWh/yr) = N * Tons * 12 kBtuh/Ton * ($1/EER_b$-$1/EER_q$) * $EFLH_c$

Heating Energy Savings (Btu/yr) = N * Tons * 12 kBtuh/Ton * ((1/ (COP_b * 3.412))-(1/ (COP_q * 3.412)) * $EFLH_h$

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

<u>Definition of Variables</u>

N = Number of units

Tons = Rated cooling capacity of unit.This value comes from ARI/AHRI or AHAM rating or manufacturer data.

EER_b = Energy Efficiency Ratio of the baseline unit. This data is found in the HVAC and Heat Pumps table below. For units < 65,000 BtuH (5.4 tons), SEER should be used in place of EER.

COP_b = Coefficient of Performance of the baseline unit. This data is found in the HVAC and Heat Pumps table below. For units < 65,000 BtuH (5.4 tons), SEER and HSPF/3.412 should be used in place of COP * 3.412 for cooling and heating savings, respectively.

EER_q = Energy Efficiency Ratio of the high efficiency unit. This value comes from the ARI/AHRI or AHAM directories or manufacturer data. For units < 65,000 (5.4 tons) BtuH, SEER should be used in place of EER.

COP_q = Coefficient of Performance of the high efficiency unit. This value comes from the ARI/AHRI or AHAM directories or manufacturer data. For units < 65,000 BtuH

(5.4 tons), SEER and HSPF/3.412 should be used in place of COP * 3.412 for cooling and heating savings, respectively.

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

$EFLH_{c\ or\ h}$ = Equivalent Full Load Hours – This represents a measure of energy use by season during the on-peak and off-peak periods.

Summary of Inputs

HVAC and Heat Pumps

Component	Type	Value	Source
Tons	Variable	Rated Capacity, Tons	Application
EER_b	Variable	See Table below	1
EER_q	Variable	ARI/AHRI or AHAM Values	Application
CF	Fixed	50%	2
$EFLH_{(c\ or\ h)}$	Variable	See Tables below	3

HVAC Baseline Efficiencies Table – New Construction/EUL/RoF

Equipment Type	Baseline = ASHRAE Std. 90.1 – 2016
Unitary HVAC/Split Systems and Single Package, Air Cooled	
<=5.4 tons, split	14 SEER
<=5.4 tons, single	14 SEER
>5.4 to 11.25 tons	11.0 EER, 12.7 IEER
>11.25 to 20 tons	10.8 EER, 12.2 IEER
> 21 to 63 tons	9.8 EER, 11.4 IEER
>63 Tons	9.5 EER, 11.0 IEER
Air Cooled Heat Pump Systems, Split System and Single Package	
<=5.4 tons, split	14 SEER, 8.2 HSPF
<=5.4 tons, single	14 SEER, 8.0 HSPF
>5.4 to 11.25 tons	10.8 EER, 12 IEER, 3.3 heating COP
>11.25 to 20 tons	10.4 EER, 11.4 IEER, 3.2 heating COP
>= 21	9.3 EER, 10.4 IEER, 3.2 heating COP

Equipment Type	Baseline = ASHRAE Std. 90.1 – 2016
Water Source Heat Pumps (water to air, water loop)	
<=1.4 tons	12.2 EER, 4.3 heating COP
>1.4 to 5.4 tons	13.0 EER, 4.3 heating COP
>5.4 to 11.25 tons	13.0 EER, 4.3 heating COP
Ground Water Source Heat Pumps <=11.25 tons	18.0 EER, 3.7 heating COP
Ground Source Heat Pumps (brine to air, ground loop) <=11.25 tons	14.1 EER, 3.2 heating COP
Package Terminal Air Conditioners[57]	14.0 – (0.300 * Cap/1,000), EER
Package Terminal Heat Pumps	14.0 – (0.300 * Cap/1,000), EER 3.7 – (0.052 * Cap/1,000), heating COP
Single Package Vertical Air Conditioners	
<=5.4 tons	10.0 EER
>5.4 to 11.25 tons	10.0 EER
>11.25 to 20 tons	10.0 EER
Single Package Vertical Heat Pumps	
<=5.4 tons	10.0 EER, 3.0 heating COP
>5.4 to 11.25 tons	10.0 EER, 3.0 heating COP
>11.25 to 20 tons	10.0 EER, 3.0 heating COP

EFLH Table

Facility Type	Heating $EFLH_h$	Cooling $EFLH_c$
Assembly	603	669
Auto repair	1910	426
Dormitory	465	800
Hospital	3366	1424
Light industrial	714	549
Lodging – Hotel	1077	2918
Lodging – Motel	619	1233
Office – large	2034	720
Office – small	431	955

Facility Type	Heating $EFLH_h$	Cooling $EFLH_c$
Other	681	736
Religious worship	722	279
Restaurant – fast food	813	645
Restaurant – full service	821	574
Retail – big box	191	1279
Retail – Grocery	191	1279
Retail – small	545	882
Retail – large	2101	1068
School – Community college	1431	846
School – postsecondary	1191	1208
School – primary	840	394
School – secondary	901	466
Warehouse	452	400

Multi-family EFLH by Vintage

Facility Type	Prior to 1979	From 1979 to 2006	From 2007 through Present
Low-rise, Cooling	507	550	562
Low-rise, Heating	757	723	503
High-rise, Cooling	793	843	954
High-rise, Heating	526	395	219

Sources

1. ASHRAE Standards 90.1-2016, *Energy Standard for Buildings Except Low Rise Residential Buildings*; available at: https://www.ashrae.org/standards-research--technology/standards--guidelines.
2. C&I Unitary HVAC Load Shape Project Final Report. August 2011, v.1.1, p. 12, Table O-5. The CF reported here is a center point for NJ chosen between the CF for urban NY and for the Mid-Atlantic region in the PJM peak periods. Available at: http://www.neep.org/sites/default/files/resources/NEEP_HVAC_Load_Shape_Report_Final_August2_0.pdf.
3. New York State Joint Utilities, *New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs*, V7, April 2019. Appendix G – Equivalent

ECM #10 –Steam Trap Replacement

BAYONNE PUBLIC SCHOOLS
ECM MATRIX

	DCO ECM was evaluated
(green)	ECM included in the project

ECM #	ECM DESCRIPTION	Bayonne High School & Ice Rink	Henry Harris Community School	Horace Mann Community School	Lincoln Community School	Philip G. Vroom Community School	Dr. Walter F. Robinson Community School	Washington Community School	William Shemin Midtown Community School	Woodrow Wilson Community School	John M Bailey Community School	Mary J Donahoe Community School	Nickolas Oresko Community School
10	Steam Trap Replacement	✓	✓	✓		✓		✓		✓	✓	✓	

Background

Steam traps are automatic valves that are used to remove condensate and other non-condensable gases from steam heating systems. They work by using temperature, pressure, or mechanical means to sense the presence of condensate and then open to discharge it. Steam traps are crucial components of steam heating systems because they prevent the buildup of condensate, which can cause corrosion and reduce the efficiency of the system. By removing condensate, steam traps also help to maintain the desired steam pressure and temperature, ensuring that the heating system operates at maximum efficiency. There are several potential problems that can arise when steam traps fail in a steam heating system:

- **Reduced efficiency:** When steam traps fail to discharge condensate, it can accumulate in the system, reducing the overall efficiency of the heating system. This can lead to decreased heat transfer and reduced system performance.

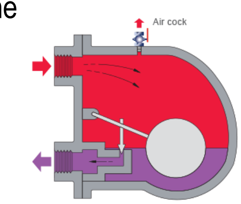


Fig. 11.3.1 Float trap with air cock

- **Increased energy costs:** When the system becomes less efficient due to failed steam traps, it requires more energy to maintain the desired steam pressure and temperature, leading to higher energy costs.

- **Corrosion:** Condensate that accumulates in the system can cause corrosion, which can lead to damage to pipes, valves, and other components. Over time, this can cause leaks, which can be expensive to repair.

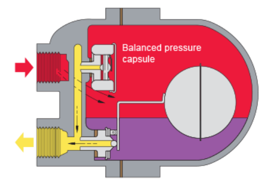


Fig. 11.3.2 Float trap with thermostatic air vent

- **Water hammer:** When condensate accumulates in the system, it can cause water hammer, a condition where water and steam are forced to change direction suddenly, leading to stress on pipes and components. This can result in damage to the system, reducing its efficiency and increasing the risk of leaks.

- **Poor heating:** When steam traps fail, it can result in poor heating performance, reducing the overall comfort of the building. This can lead to complaints from occupants and can also result in increased energy costs as the heating system struggles to maintain the desired temperature.

Scope of Work

A complete Steam Trap Survey was conducted and identified 1,391 steam traps that were defective and needed to be replaced. Please refer to Appendix G for a complete Steam Trap Line-By-Line.

- **Steam Trap Replacement:** Remove and properly dispose of existing steam trap. Provide and install new stream trap that is properly sized for the system.

Steam Trap Line-By-Line & Savings

LI	Building	Floor	Room Description	Room Type	Trap Location	New Tag #	Existing Qty.	Retro/ Replace Qty.	Application	Line Pressure (psig)	Temp in	Temp out	Diff Temp	Diff Temp	Manufacturer	Model	Trap Pressure Rating	Trap Type	Pipe Size	Height from Standing	Isolation Valves	Strainer	Hours Active	Survey Note	Retrofit	Orifice Size	Loss Factor	Boiler eff.	Baseline Loss (lb/hr)	Baseline Loss (Mbtu/hr)	Baseline (MMBtu/yr)	Post Retrofit Losses (MMBtu/yr)	Annual Thermal Savings (Therm/yr)
1	Bayonne High School & Ice Rink	3RD FLOOR	300	Classroom		NT	1	1	Radiator	5	70	70			Hoffman	17C-R		TS	0.5	1	n	n	1,154.33	(L)	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
2	Bayonne High School & Ice Rink	3RD FLOOR	300	Classroom		NT	1	1	Radiator	5	70	70			Hoffman	17C-R		TS	0.5	1	n	n	1,154.33	(R)	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
3	Bayonne High School & Ice Rink	3RD FLOOR	HALL	Hall	AT BOYS ROOM	NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-R		TS	0.5	1	n	n	1,154.33	BUILT IN Estimated Covered	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
5	Bayonne High School & Ice Rink	3RD FLOOR	301	Classroom		NT	1	1	Radiator	5	70	70			Hoffman	17C-R		TS	0.5	1	n	n	1,154.33		Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
7	Bayonne High School & Ice Rink	3RD FLOOR	302	Classroom		NT	1	1	Radiator	5	70	70			Hoffman	17C-R		TS	0.5	1	n	n	1,154.33		Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
9	Bayonne High School & Ice Rink	3RD FLOOR	TECH	Classroom	TEACHERS ROOM	NT	1	1	Radiator	5	70	70			Hoffman	17C-A		TS	0.5	1	n	n	1,154.33		Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
10	Bayonne High School & Ice Rink	3RD FLOOR	303	Classroom		NT	1	1	Radiator	5	70	70			Hoffman	17C-R		TS	0.5	1	n	n	1,154.33	(R)	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
11	Bayonne High School & Ice Rink	3RD FLOOR	303	Classroom	(M) COVERED	NT	1	1	univent	5	70	70	N/A		Hoffman	17C-R		TS	0.5	1	n	n	1,154.33	UNIVENT - Covered estimate	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
13	Bayonne High School & Ice Rink	3RD FLOOR	HALL	Hall	AT HOUSE (3) OFF	NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-R		TS	0.5	1	n	n	1,154.33	BUILT IN Estimated Covered	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
14	Bayonne High School & Ice Rink	3RD FLOOR	H30	Classroom	HOUSE (3) OFF	NT	1	1	Radiator	5	70	70			Hoffman	17C-L		TS	0.5	1	n	n	1,154.33		Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
15	Bayonne High School & Ice Rink	3RD FLOOR	304	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-L		TS	0.5	1	n	n	1,154.33	(L) BUILT IN Estimated Coverd	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
16	Bayonne High School & Ice Rink	3RD FLOOR	304	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-L		TS	0.5	1	n	n	1,154.33	(M) BUILT IN Estimated covered	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
17	Bayonne High School & Ice Rink	3RD FLOOR	304	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-L		TS	0.5	1	n	n	1,154.33	(R) BUILT IN Estimated Covered	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
18	Bayonne High School & Ice Rink	3RD FLOOR	HALL	Hall	NEXT TO WOMEN	NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-L		TS	0.5	1	n	n	1,154.33	Estimated (Covered)	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
19	Bayonne High School & Ice Rink	3RD FLOOR	DENT.	Multi-purpose	DENTIST OFFICE	NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-L		TS	0.5	1	n	n	1,154.33	(L) BUILT IN Estimated Coverd	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
20	Bayonne High School & Ice Rink	3RD FLOOR	DENT.	Multi-purpose	DENTIST OFFICE	NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-L		TS	0.5	1	n	n	1,154.33	(M) BUILT IN Estimated covered	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
21	Bayonne High School & Ice Rink	3RD FLOOR	DENT.	Multi-purpose	DENTIST OFFICE	NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-L		TS	0.5	1	n	n	1,154.33	(R) BUILT IN Estimated Covered	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
22	Bayonne High School & Ice Rink	3RD FLOOR	W.R.	Bathroom	WOMENS ROOM	NT	1	1	Radiator	5	70	70			Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	ACROSS/DENTIST Estimated covered	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
23	Bayonne High School & Ice Rink	3RD FLOOR	W.R.	Bathroom	WOMENS ROOM	NT	1	1	Radiator	5	70	70			Hoffman	17C-A		TS	0.5	1	n	n	1,154.33		Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
24	Bayonne High School & Ice Rink	3RD FLOOR	305	Classroom	RM 305	NT	1	1	Radiator	5	70	70	N.A.		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	NO ACCESS - LOCKED Estimated	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
25	Bayonne High School & Ice Rink	3RD FLOOR	306	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	(L) BUILT IN Estimated Coverd	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
26	Bayonne High School & Ice Rink	3RD FLOOR	306	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	(M) BUILT IN Estimated covered	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
27	Bayonne High School & Ice Rink	3RD FLOOR	306	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	(R) BUILT IN Estimated Covered	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
28	Bayonne High School & Ice Rink	3RD FLOOR	307	Classroom		NT	1	1	Radiator	5	70	70			Hoffman	17C-L		TS	0.5	1	n	n	1,154.33	(L)	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
29	Bayonne High School & Ice Rink	3RD FLOOR	307	Classroom		NT	1	1	univent	5	70	70	COVERED		Hoffman	17C-L		TS	0.5	1	n	n	1,154.33	UNIVENT - Covered estimate	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
30	Bayonne High School & Ice Rink	3RD FLOOR	307	Classroom		NT	1	1	univent	5	70	70			Hoffman	17C-L		TS	0.5	1	n	n	1,154.33	(M)	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
31	Bayonne High School & Ice Rink	3RD FLOOR	307	Classroom		NT	1	1	univent	5	70	70			Hoffman	17C-L		TS	0.5	1	n	n	1,154.33	(R)	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
32	Bayonne High School & Ice Rink	3RD FLOOR	HALL	Hall	HALLWAY	NT	1	1	univent	5	70	70			Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	AT LOCKER #3192	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
33	Bayonne High School & Ice Rink	3RD FLOOR	307	Classroom	ROOM 307	NT	1	1		5	70	70			Hoffman	17C-L		TS	0.5	1	n	n	1,731.50	2ND ENTER	Replace	0.25	0.08	0.85	1.45	1.71	2.95	0.00	29.53
34	Bayonne High School & Ice Rink	3RD FLOOR	308	Classroom		NT	1	1	univent	5	70	70			Hoffman	17C-R		TS	0.5	1	n	n	1,154.33	(L)	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
35	Bayonne High School & Ice Rink	3RD FLOOR	308	Classroom		NT	1	1	univent	5	70	70			Hoffman	17C-R		TS	0.5	1	n	n	1,154.33	UNIVENT	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
36	Bayonne High School & Ice Rink	3RD FLOOR	308	Classroom		NT	1	1	Radiator	5	70	70			Hoffman	17C-R		TS	0.5	1	n	n	1,154.33	(M)	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
37	Bayonne High School & Ice Rink	3RD FLOOR	308	Classroom		NT	1	1	Radiator	5	70	70			Hoffman	17C-R		TS	0.5	1	n	n	1,154.33	(R)	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
38	Bayonne High School & Ice Rink	3RD FLOOR	HALL	Hall	HALLWAY	NT	1	1	Radiator	5	70	70			Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	AT LOCKER #3802	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
39	Bayonne High School & Ice Rink	3RD FLOOR	308A	Classroom	DIR OF NURSING	NT	1	1	Radiator	5	70	70			Hoffman	17C-L		TS	0.5	1	n	n	1,154.33	ANG-DROP OFFSET	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
40	Bayonne High School & Ice Rink	3RD FLOOR	309	Classroom		NT	1	1	Radiator	5	70	70			Hoffman	17C-L		TS	0.5	1	n	n	1,154.33	(L)	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
41	Bayonne High School & Ice Rink	3RD FLOOR	309	Classroom		NT	1	1	Radiator	5	70	70			Hoffman	17C-R		TS	0.5	1	n	n	1,154.33	(M)	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
42	Bayonne High School & Ice Rink	3RD FLOOR	309	Classroom		NT	1	1	univent	5	70	70	COVERED		Hoffman	17C-R		TS	0.5	1	n	n	1,154.33	UNIVENT Estimated Covered	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
43	Bayonne High School & Ice Rink	3RD FLOOR	309	Classroom		NT	1	1	Radiator	5	70	70			Hoffman	17C-R		TS	0.5	1	n	n	1,154.33	(R)	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
44	Bayonne High School & Ice Rink	3RD FLOOR	HALL	Hall	AT ROOM #309	NT	1	1	Radiator	5	70	70			Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	HALLWAY	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
45	Bayonne High School & Ice Rink	3RD FLOOR	S.R.	Storage	STORE ROOM LOCKED	NT	1	1	Radiator	5	70	70	N/A		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	AT LOCKER #3249	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
46	Bayonne High School & Ice Rink	3RD FLOOR	310	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	(L) BUILT IN	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
47	Bayonne High School & Ice Rink	3RD FLOOR	310	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	(M) BUILT IN	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
48	Bayonne High School & Ice Rink	3RD FLOOR	310	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	(R) BUILT IN	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
49	Bayonne High School & Ice Rink	3RD FLOOR	311	Classroom	EA. UNIT	NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	(L) PHIL SCREWS	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
50	Bayonne High School & Ice Rink	3RD FLOOR	311	Classroom	EA. UNIT	NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	(R) PHIL SCREWS	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
51	Bayonne High School & Ice Rink	3RD FLOOR	F.S.	Multi-purpose	FOOD SERVICE OFFICE	NT	1	1	Radiator	5	70	70			Hoffman	17C-A		TS	0.5	1	n	n	1,154.33		Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
52	Bayonne High School & Ice Rink	3RD FLOOR	312H	Bathroom	BOYS ROOM @ 312	NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	HALLWAY	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
53	Bayonne High School & Ice Rink	3RD FLOOR	312H	Bathroom	BOYS ROOM @ 312	NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	HALLWAY	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
54	Bayonne High School & Ice Rink	3RD FLOOR	HALL	Hall	AT BOYS ROOM	NT	1	1	Radiator	5	70	70			Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	HALLWAY	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
55	Bayonne High School & Ice Rink	3RD FLOOR	312	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	(L) BUILT IN	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
56	Bayonne High School & Ice Rink	3RD FLOOR	312	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	(M) BUILT IN	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
57	Bayonne High School & Ice Rink	3RD FLOOR	312	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	(R) BUILT IN	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
58	Bayonne High School & Ice Rink	3RD FLOOR	HALL	Hall	HALLWAY @ 313	NT	1	1	Radiator	5	70	70			Hoffman	17C-A		TS	0.5	1	n	n	1,154.33		Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
59	Bayonne High School & Ice Rink	3RD FLOOR	313	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	(L) BUILT IN	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
60	Bayonne High School & Ice Rink	3RD FLOOR	313	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	(M) BUILT IN	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
61	Bayonne High School & Ice Rink	3RD FLOOR	313	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	(R) BUILT IN	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
62	Bayonne High School & Ice Rink	3RD FLOOR	TECH	Classroom	TEACHERS ROOM	NT	1	1	Radiator	5	70	70			Hoffman	17C-A		TS	0.5	1	n	n	1,154.33		Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
63	Bayonne High School & Ice Rink	3RD FLOOR	STORE	Multi-purpose	SCHOOL STORE	NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33		Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
64	Bayonne High School & Ice Rink	3RD FLOOR	STORE	Multi-purpose	SCHOOL STORE	NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33		Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
65	Bayonne High School & Ice Rink	3RD FLOOR	314	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	(L) BUILT IN	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
66	Bayonne High School & Ice Rink	3RD FLOOR	314	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	(L) M BUILT IN	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
67	Bayonne High School & Ice Rink	3RD FLOOR	314	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	(R) M BUILT IN	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
68	Bayonne High School & Ice Rink	3RD FLOOR	314	Classroom		NT	1	1	Radiator	5	70	70	COVERED		Hoffman	17C-A		TS	0.5	1	n	n	1,154.33	(R) BUILT IN	Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69
69	Bayonne High School & Ice Rink	3RD FLOOR	HALL	Hall	AT ROOM #314	NT	1	1	Radiator	5	70	70			Hoffman	17C-A		TS	0.5	1	n	n	1,154.33		Replace	0.25	0.08	0.85	1.45	1.71	1.97	0.00	19.69

ECM Savings Calculations

The detailed calculations for the Steam Trap Savings are provided in Appendix G in the Steam Trap Line-By-Line. Below is a summary of the Natural Gas savings by school.

Steam Trap Savings

BUILDING	SQFT	THERMS SAVINGS
Bayonne High School & Ice Rink	470,000	16,455
Henry Harris Community School	65,000	1,571
Horace Mann Community School	69,717	3,297
Philip G. Vroom Community School	52,000	1,651
Washington Community School	76,613	2,886
Woodrow Wilson Community School	83,000	3,601
John M Bailey Community School	53,000	3,531
Mary J Donahoe Community School	62,000	1,892

BAYONNE PUBLIC SCHOOLS ECM MATRIX		Bayonne High School & Ice Rink	Henry Harris Community School	Horace Mann Community School	Lincoln Community School	Philip G. Vroom Community School	Dr. Walter F. Robinson Community School	Washington Community School	William Shemin Midtown Community School	Woodrow Wilson Community School	John M Bailey Community School	Mary J Donahoe Community School	Nickolas Oresko Community School
	DCO ECM was evaluated												
	ECM included in the project												
ECM #	ECM DESCRIPTION												
11	Plug Load Controls	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

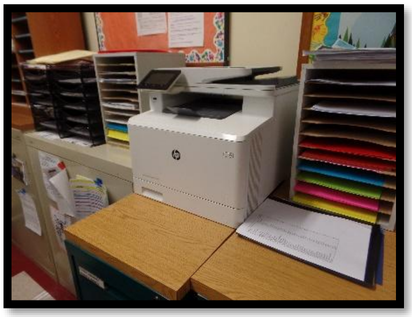
Background

Plug loads in a building typically refer to the electrical devices that are plugged into wall outlets, such as computers, printers, chargers, and televisions. However, when a device is turned off or in standby mode, it may still draw a small amount of power, known as standby power or vampire power.

This occurs because many electronic devices have power supplies or transformers that are designed to convert the incoming electrical power to a lower voltage suitable for the device's use. These power supplies typically consume a small amount of power even when the device is not in use, to maintain the circuitry needed for the device to turn on quickly when the user wants to use it.

For example, when a television is turned off, it may still consume power to maintain the settings and to power the remote control sensor. Some televisions may also consume power to download updates or to maintain a network connection. Similarly, chargers for devices like phones and laptops may continue to consume power even when the device is fully charged.

According to the U.S. Department of Energy, standby power can account for up to 10% of a building's total electricity use. To reduce standby power consumption, it is important to use energy-efficient devices, unplug devices when they are not in use, or use power strips that can be turned off when not in use.



ECM Scope of Work & Savings

Hours per year scheduled “On” is the available hours of operation that the BOSS Controls will be programmed to enable the plugged in equipment to operate. Hours per year scheduled “OFF” is the amount of parasitic load that will be saved. The table below indicates the estimated parasitic load of each piece of equipment.

Plug Load Controls Savings									
BUILDING	SQFT	DEVICE TYPE	QUANTITY	WATTS PER UNIT (PARASITIC LOAD)	HOURS PER YEAR PLUGGED IN	HOUR PER YEAR SCHEDULED "ON"	HOUR PER YEAR SCHEDULED "OFF"	ELECTRIC SAVINGS (kWh)	TOTAL ELECTRIC SAVINGS (kWh)
Bayonne High School & Ice Rink	470,000	Printer/Copier	12	40	8,760	2,860	5,900	2,832	100,613
		Air Scrubber	5	43	8,760	2,860	5,900	1,269	
		Water Fountain	2	40	8,760	2,860	5,900	472	
		Vending	4	50	8,760	2,860	5,900	1,180	
		SmartBoard	0	50	8,760	2,860	5,900	0	
		Window A/C (110V)	21	750	3,360	2,000	1,360	21,420	
		Window A/C (220V)	45	1200	3,360	2,000	1,360	73,440	
Henry Harris Community School	65,000	Printer/Copier	1	40	8,760	2,860	5,900	236	59,397
		Air Scrubber	6	43	8,760	2,860	5,900	1,522	
		Water Fountain	2	40	8,760	2,860	5,900	472	
		Vending	0	50	8,760	2,860	5,900	0	
		SmartBoard	5	50	8,760	2,860	5,900	1,475	
		Window A/C (110V)	5	750	3,360	2,000	1,360	5,100	
		Window A/C (220V)	31	1200	3,360	2,000	1,360	50,592	
Horace Mann Community School	69,717	Printer/Copier	1	40	8,760	2,860	5,900	236	30,788
		Air Scrubber	1	43	8,760	2,860	5,900	254	
		Water Fountain	4	40	8,760	2,860	5,900	944	
		Vending	0	50	8,760	2,860	5,900	0	
		SmartBoard	2	50	8,760	2,860	5,900	590	
		Window A/C (110V)	9	750	3,360	2,000	1,360	9,180	
		Window A/C (220V)	12	1200	3,360	2,000	1,360	19,584	
Lincoln Community School	66,000	Printer/Copier	1	40	8,760	2,860	5,900	236	26,982
		Air Scrubber	8	43	8,760	2,860	5,900	2,030	
		Water Fountain	1	40	8,760	2,860	5,900	236	
		Vending	0	50	8,760	2,860	5,900	0	
		SmartBoard	0	50	8,760	2,860	5,900	0	
		Window A/C (110V)	0	750	3,360	2,000	1,360	0	
		Window A/C (220V)	15	1200	3,360	2,000	1,360	24,480	
Philip G. Vroom Community School	52,000	Printer/Copier	2	40	8,760	2,860	5,900	472	36,426
		Air Scrubber	2	43	8,760	2,860	5,900	507	
		Water Fountain	2	40	8,760	2,860	5,900	472	
		Vending	0	50	8,760	2,860	5,900	0	
		SmartBoard	1	50	8,760	2,860	5,900	295	
		Window A/C (110V)	10	750	3,360	2,000	1,360	10,200	
		Window A/C (220V)	15	1200	3,360	2,000	1,360	24,480	
Dr. Walter F. Robinson Community School	79,800	Printer/Copier	5	40	8,760	2,860	5,900	1,180	34,204
		Air Scrubber	4	43	8,760	2,860	5,900	1,015	
		Water Fountain	0	40	8,760	2,860	5,900	0	
		Vending	0	50	8,760	2,860	5,900	0	
		SmartBoard	11	50	8,760	2,860	5,900	3,245	
		Window A/C (110V)	1	750	3,360	2,000	1,360	1,020	
		Window A/C (220V)	17	1200	3,360	2,000	1,360	27,744	
Washington Community School	76,613	Printer/Copier	4	40	8,760	2,860	5,900	944	36,376
		Air Scrubber	7	43	8,760	2,860	5,900	1,776	
		Water Fountain	4	40	8,760	2,860	5,900	944	
		Vending	0	50	8,760	2,860	5,900	0	
		SmartBoard	12	50	8,760	2,860	5,900	3,540	
		Window A/C (110V)	3	750	3,360	2,000	1,360	3,060	
		Window A/C (220V)	16	1200	3,360	2,000	1,360	26,112	
William Shemin Midtown Community School	136,204	Printer/Copier	5	40	8,760	2,860	5,900	1,180	10,644
		Air Scrubber	8	43	8,760	2,860	5,900	2,030	
		Water Fountain	4	40	8,760	2,860	5,900	944	
		Vending	2	50	8,760	2,860	5,900	590	
		SmartBoard	20	50	8,760	2,860	5,900	5,900	
		Window A/C (110V)	0	750	3,360	2,000	1,360	0	
		Window A/C (220V)	0	1200	3,360	2,000	1,360	0	
Woodrow Wilson Community School	136,204	Printer/Copier	1	40	8,760	2,860	5,900	236	7,751
		Air Scrubber	16	43	8,760	2,860	5,900	4,059	
		Water Fountain	1	40	8,760	2,860	5,900	236	
		Vending	0	50	8,760	2,860	5,900	0	
		SmartBoard	4	50	8,760	2,860	5,900	1,180	
		Window A/C (110V)	2	750	3,360	2,000	1,360	2,040	
		Window A/C (220V)	0	1200	3,360	2,000	1,360	0	
John M Bailey Community School	53,000	Printer/Copier	4	40	8,760	2,860	5,900	944	15,145
		Air Scrubber	3	43	8,760	2,860	5,900	761	
		Water Fountain	2	40	8,760	2,860	5,900	472	
		Vending	0	50	8,760	2,860	5,900	0	
		SmartBoard	8	50	8,760	2,860	5,900	2,360	
		Window A/C (110V)	4	750	3,360	2,000	1,360	4,080	
		Window A/C (220V)	4	1200	3,360	2,000	1,360	6,528	
Mary J Donahoe Community School	62,000	Printer/Copier	2	40	8,760	2,860	5,900	472	22,738
		Air Scrubber	0	43	8,760	2,860	5,900	0	
		Water Fountain	3	40	8,760	2,860	5,900	708	
		Vending	1	50	8,760	2,860	5,900	295	
		SmartBoard	5	50	8,760	2,860	5,900	1,475	
		Window A/C (110V)	5	750	3,360	2,000	1,360	5,100	
		Window A/C (220V)	9	1200	3,360	2,000	1,360	14,688	
Nickolas Oresko Community School	82,000	Printer/Copier	3	40	8,760	2,860	5,900	708	4,502
		Air Scrubber	1	43	8,760	2,860	5,900	254	
		Water Fountain	0	40	8,760	2,860	5,900	0	
		Vending	0	50	8,760	2,860	5,900	0	
		SmartBoard	12	50	8,760	2,860	5,900	3,540	
		Window A/C (110V)	0	750	3,360	2,000	1,360	0	
		Window A/C (220V)	0	1200	3,360	2,000	1,360	0	

ECM #12 – Building Envelope

BAYONNE PUBLIC SCHOOLS ECM MATRIX		Bayonne High School & Ice Rink	Henry Harris Community School	Horace Mann Community School	Lincoln Community School	Philip G. Vroom Community School	Dr. Walter F. Robinson Community School	Washington Community School	William Shemin Midtown Community School	Woodrow Wilson Community School	John M Bailey Community School	Mary J Donahoe Community School	Nickolas Oresko Community School
ECM #	ECM DESCRIPTION												
12	Building Envelope Improvements	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

Legend:

(white)	DCO ECM was evaluated
(green)	ECM included in the project

Existing Conditions & Scope of Work – Bayonne High School & Ice Rink

TYPE OF MEASURES:	Building Level	quantity or distance
Ext. Door(s) to be weather-stripped & sealed. BLDG A	All Levels	31 Doors
Over-head Door(s) to be sealed on 3 sides. R/U BLDG A	Basement	1 OHDoors
Pipe Penetrations to be sealed with 1 or 2 part foam. BLDG A	Basement	4 Penetrations
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W BLDG A and B	All Levels	171 AirConCovers
Ext. Door(s) to be weather-stripped & sealed. BLDG B	1st, 2nd, & 3rd	38 Doors
Over-head Door(s) to be sealed on 3 sides. R/U BLDG B	Basement	3 OHDoors
Over-head Door(s) to be sealed on 4 sides. BLDG B	Basement	1 OHDoors
Ext. Door(s) to be weather-stripped & sealed. BLDG C	All Levels	32 Doors
Int. Door(s) to be weather-stripped & sealed for isolation. BLDG C	All Levels	26 Doors
Over-head Door(s) to be sealed on 4 sides. BLDG C	First	2 OHDoors

AIR LEAKAGE:	feet	inches	
Doors	620	3/32	4.84 sq ft
OHDoors	29	3/16	0.45 sq ft
Penetrations	2	3/8	0.05 sq ft
AirConditionerCovers	1197	3/32	9.35 sq ft
Doors	760	3/32	5.94 sq ft
OHDoors	92	3/16	1.44 sq ft
OHDoors	68	3/16	1.06 sq ft
Doors	640	3/32	5.00 sq ft
Doors	520	3/32	4.06 sq ft
OHDoors	88	3/16	1.38 sq ft
Totals	-		33.57 sq ft
			3.12 sq meter


ASSUMPTIONS & CALCULATIONS:

Power Rate			$0.180	per Kwh
Heating Fuel	100%	Natural Gas	$1.110	perTherm

Building K 120

Example Calculation

$$\frac{\text{(leakage x bldg "K") x (wind P factor) x (HDD x 24 x 60) x (.075) x (.243)}}{\text{100,000 x System Efficiency\%}}$$


Existing Conditions & Scope of Work – Henry Harris Community School

TYPE OF MEASURES:	Building Level	quantity or distance
Ext. Door(s) to be weather-stripped & sealed.	First	24 Doors
Int. Door(s) to be weather-stripped & sealed for isolation.	First	2 Doors
Seal of air-conditioner w/ weather-strip, & flexible cover up to 20"H x 28"W	First	7 AirConCovers
Ext. Door(s) to be weather-stripped & sealed.	Second	1 Doors
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	Second	14 AirConCovers
Ext. Door(s) to be weather-stripped & sealed.	Third	2 Doors
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	Third	11 AirConCovers
Roof / Wall Joint to be Sealed with 2 part foam.	Third	430 Feet

AIR LEAKAGE:	feet	inches		
Doors	480	3/32	3.75	sq ft
Doors	40	3/32	0.31	sq ft
AirConditionerCovers	56	1/8	0.58	sq ft
Doors	20	3/32	0.16	sq ft
AirConditionerCovers	98	1/8	1.02	sq ft
Doors	40	3/32	0.31	sq ft
AirConditionerCovers	77	1/8	0.80	sq ft
RoofWall	430	1/16	2.24	sq ft
Totals	-		9.18	sq ft
			0.85	sq meter

ASSUMPTIONS & CALCULATIONS:

Power Rate		$0.220	per Kwh
Heating Fuel	100% Natural Gas	$1.200	perTherm
Building K	130		

Example Calculation

$$\frac{(\text{leakage x bldg "K"}) \times (\text{wind P factor}) \times (\text{HDD} \times 24 \times 60) \times (.075) \times (.243)}{100{,}000 \times \text{System Efficiency\%}}$$

Existing Conditions & Scope of Work – Horace Mann Community School

TYPE OF MEASURES:	Building Level	quantity or distance
Ext. Door(s) to be weather-stripped & sealed.	Basement	1 Doors
Int. Door(s) to be weather-stripped & sealed for isolation.	Basement	1 Doors
Ext. Door(s) to be weather-stripped & sealed.	First	11 Doors
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	First	9 AirConCovers
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	Second	8 AirConCovers
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	Third	4 AirConCovers

AIR LEAKAGE:	feet	inches		
Doors	20	3/32	0.16	sq ft
Doors	20	3/32	0.16	sq ft
Doors	220	3/32	1.72	sq ft
AirConditionerCovers	63	3/32	0.49	sq ft
AirConditionerCovers	56	3/32	0.44	sq ft
AirConditionerCovers	28	1/8	0.29	sq ft
Totals	-		3.25	sq ft
			0.30	sq meter

ASSUMPTIONS & CALCULATIONS:

Power Rate		$0.270	per Kwh
Heating Fuel	100% Natural Gas	$1.150	perTherm
Building K	120		

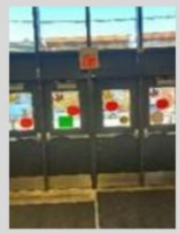
Example Calculation

$$\frac{(\text{leakage} \times \text{bldg "K"}) \times (\text{wind P factor}) \times (\text{HDD} \times 24 \times 60) \times (.075) \times (.243)}{100{,}000 \times \text{System Efficiency\%}}$$

Existing Conditions & Scope of Work – Lincoln Community School

TYPE OF MEASURES:	Building Level	quantity or distance
Ext. Door(s) to be weather-stripped & sealed.	First	30 Doors
Int. Door(s) to be weather-stripped & sealed for isolation.	First	1 Doors
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	First	20 AirConCovers
Wall Crack(s) to be sealed. (10) 19' expansion joints to be sealed	First	190 Penetrations
Roof / Wall Joint to be Sealed with 2 part foam.	First	225 Feet
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	Second	11 AirConCovers
Ext. Door(s) to be weather-stripped & sealed.	Third	2 Doors
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	Third	5 AirConCovers

AIR LEAKAGE:	feet	inches		
Doors	600	3/32	4.69	sq ft
Doors	20	3/32	0.16	sq ft
AirConditionerCovers	140	1/16	0.73	sq ft
Penetrations	190	1/8	1.98	sq ft
RoofWall	225	1/16	1.17	sq ft
AirConditionerCovers	77	1/16	0.40	sq ft
Doors	40	3/32	0.31	sq ft
AirConditionerCovers	35	1/16	0.18	sq ft
Totals	-		9.62	sq ft
			0.89	sq meter



ASSUMPTIONS & CALCULATIONS:

Power Rate		$0.190	per Kwh
Heating Fuel	100% Natural Gas	$1.210	perTherm
Building K	120		

Example Calculation

$$\frac{\text{(leakage x bldg "K") x (wind P factor) x (HDD x 24 x 60) x (.075) x (.243)}}{\text{100,000 x System Efficiency\%}}$$

Existing Conditions & Scope of Work – Philip G. Vroom Community School

TYPE OF MEASURES:	Building Level	quantity or distance
Ext. Door(s) to be weather-stripped & sealed.	All Levels	15 Doors
Int. Door(s) to be weather-stripped & sealed for isolation. (Ground level print)	All Levels	2 Doors
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	All Levels	26 AirConCovers

AIR LEAKAGE:	feet	inches		
Doors	300	3/32	2.34	sq ft
Doors	40	3/32	0.31	sq ft
AirConditionerCovers	182	1/16	0.95	sq ft
Totals	-		3.60	sq ft
			0.33	sq meter

ASSUMPTIONS & CALCULATIONS:

Power Rate		$0.280	per Kwh
Heating Fuel	100% Natural Gas	$1.230	perTherm
Building K	120		

Example Calculation

$$\frac{(\text{leakage} \times \text{bldg "K"}) \times (\text{wind P factor}) \times (\text{HDD} \times 24 \times 60) \times (.075) \times (.243)}{100{,}000 \times \text{System Efficiency\%}}$$

Existing Conditions & Scope of Work – Dr. Walter F. Robinson Community School

TYPE OF MEASURES:	Building Level	quantity or distance
Ext. Door(s) to be weather-stripped & sealed.	Basement	4 Doors
Int. Door(s) to be weather-stripped & sealed for isolation.	Basement	2 Doors
Ext. Door(s) to be weather-stripped & sealed.	First	7 Doors
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	First	7 AirConCovers
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	Second	5 AirConCovers
Ext. Door(s) to be weather-stripped & sealed.	Third	1 Doors
Int. Door(s) to be weather-stripped & sealed for isolation. (Attic Doors in room 400 & 401)	Third	2 Doors
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	Third	9 AirConCovers

AIR LEAKAGE:	feet	inches		
Doors	80	1/16	0.42	sq ft
Doors	40	1/8	0.42	sq ft
Doors	140	3/32	1.09	sq ft
AirConditionerCovers	49	3/32	0.38	sq ft
AirConditionerCovers	35	3/32	0.27	sq ft
Doors	20	1/16	0.10	sq ft
Doors	40	1/8	0.42	sq ft
AirConditionerCovers	63	1/16	0.33	sq ft
Totals	-		3.43	sq ft
			0.32	sq meter

ASSUMPTIONS & CALCULATIONS:

Power Rate		$0.210	per Kwh
Heating Fuel	100% Natural Gas	$1.190	perTherm
Building K	120		

Example Calculation

$$\frac{(\text{leakage} \times \text{bldg "K"}) \times (\text{wind P factor}) \times (\text{HDD} \times 24 \times 60) \times (.075) \times (.243)}{100{,}000 \times \text{System Efficiency\%}}$$

Existing Conditions & Scope of Work – Washington Community School

TYPE OF MEASURES:	Building Level	quantity or distance
Ext. Door(s) to be weather-stripped & sealed.	First	20 Doors
Int. Door(s) to be weather-stripped & sealed for isolation. Boiler room and stairwell to basement	First	2 Doors
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	First	9 AirConCovers
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	Second	6 AirConCovers
Ext. Door(s) to be weather-stripped & sealed. (roof access door)	Third	1 Doors
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	Third	12 AirConCovers

AIR LEAKAGE:	feet	inches		
Doors	400	1/16	2.08	sq ft
Doors	40	1/8	0.42	sq ft
AirConditionerCovers	63	1/8	0.66	sq ft
AirConditionerCovers	42	1/8	0.44	sq ft
Doors	20	3/32	0.16	sq ft
AirConditionerCovers	84	1/16	0.44	sq ft
Totals	-		4.19	sq ft
			0.39	sq meter

ASSUMPTIONS & CALCULATIONS:

Power Rate		$0.240	per Kwh
Heating Fuel	100% Natural Gas	$1.180	perTherm
Building K	120		

Example Calculation

$$\frac{(\text{leakage} \times \text{bldg "K"}) \times (\text{wind P factor}) \times (\text{HDD} \times 24 \times 60) \times (.075) \times (.243)}{100{,}000 \times \text{System Efficiency\%}}$$

Existing Conditions & Scope of Work – William Shemin Midtown Community School

TYPE OF MEASURES:	Building Level	quantity or distance
Ext. Door(s) to be weather-stripped & sealed.	Basement	13 Doors
Int. Door(s) to be weather-stripped & sealed for isolation. (Generator room door)	Basement	1 Doors
Over-head Door(s) to be sealed on 4 sides.	Basement	2 OHDoors
Ext. Door(s) to be weather-stripped & sealed.	First	9 Doors
Int. Door(s) to be weather-stripped & sealed for isolation. (Basement stairwell door)	First	1 Doors
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	First	5 AirConCovers
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	Second	5 AirConCovers
Ext. Door(s) to be weather-stripped & sealed. (roof access doors)	Third	2 Doors
Int. Door(s) to be weather-stripped & sealed for isolation. (Green House door)	Third	1 Doors

AIR LEAKAGE:	feet	inches		
Doors	260	3/32	2.03	sq ft
Doors	20	3/32	0.16	sq ft
OHDoors	96	1/8	1.00	sq ft
Doors	180	3/32	1.41	sq ft
Doors	20	3/32	0.16	sq ft
AirConditionerCovers	35	1/8	0.36	sq ft
AirConditionerCovers	35	1/8	0.36	sq ft
Doors	40	3/32	0.31	sq ft
Doors	20	3/32	0.16	sq ft
Totals	-		5.95	sq ft
			0.55	sq meter

ASSUMPTIONS & CALCULATIONS:

Power Rate		$0.180	per Kwh
Heating Fuel	100% Natural Gas	$1.310	perTherm
Building K	130		

Example Calculation

(leakage x bldg "K") x (wind P factor) x (HDD x 24 x 60) x (.075) x (.243)

100,000 x System Efficiency%

Existing Conditions & Scope of Work – Woodrow Wilson Community School

TYPE OF MEASURES:	Building Level	quantity or distance
Ext. Door(s) to be weather-stripped & sealed.	Basement	4 Doors
Int. Door(s) to be weather-stripped & sealed for isolation. (Boiler room door)	Basement	1 Doors
Ext. Door(s) to be weather-stripped & sealed.	First	18 Doors
Int. Door(s) to be weather-stripped & sealed for isolation. (Stairwell to basement)	First	1 Doors
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	First	10 AirConCovers
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	Second	10 AirConCovers
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	Third	6 AirConCovers
Window(s) to be sealed, at sill plate only (1 line).	Second & Third	7 Windows

AIR LEAKAGE:	feet	inches		
Doors	80	1/16	0.42	sq ft
Doors	20	1/8	0.21	sq ft
Doors	360	1/16	1.88	sq ft
Doors	20	1/8	0.21	sq ft
AirConditionerCovers	70	1/8	0.73	sq ft
AirConditionerCovers	70	1/8	0.73	sq ft
AirConditionerCovers	42	3/16	0.66	sq ft
Windows	28	1/64	0.04	sq ft
Totals	-		4.86 sq ft	
			0.45 sq meter	

ASSUMPTIONS & CALCULATIONS:

Power Rate		$0.180	per Kwh
Heating Fuel	100% Natural Gas	$1.110	perTherm
Building K	130		

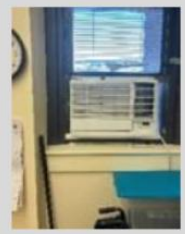
Example Calculation

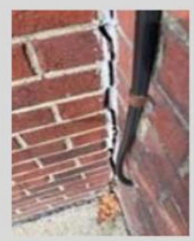
$$\frac{(\text{leakage} \times \text{bldg "K"}) \times (\text{wind P factor}) \times (\text{HDD} \times 24 \times 60) \times (.075) \times (.243)}{100{,}000 \times \text{System Efficiency\%}}$$

Existing Conditions & Scope of Work – John M. Bailey Community School

TYPE OF MEASURES:	Building Level	quantity or distance
Ext. Door(s) to be weather-stripped & sealed.	Basement	18 Doors
Int. Door(s) to be weather-stripped & sealed for isolation. (Boiler room doors)	Basement	3 Doors
Misc. holes in side wall to be sealed with foam &/or caulk.	Basement	7 Holes
Wall Crack(s) to be sealed.	Basement	15 Penetrations
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	Basement	5 AirConCovers
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	First	3 AirConCovers
Roof / Wall Joint to be Sealed with 2 part foam.	Second	190 Feet

AIR LEAKAGE:	feet		inches		
Doors	360		3/32	2.81	sq ft
Doors	60		3/32	0.47	sq ft
Holes	1	1/2	1/4	0.03	sq ft
Penetrations	15		1/4	0.31	sq ft
AirConditionerCovers	35		1/16	0.18	sq ft
AirConditionerCovers	21		1/16	0.11	sq ft
RoofWall	190		3/32	1.48	sq ft
Totals	-			5.40	sq ft
				0.50	sq meter





ASSUMPTIONS & CALCULATIONS:

Power Rate		$0.220	per Kwh
Heating Fuel	100% Natural Gas	$1.120	perTherm
Building K	130		

Example Calculation

$$\frac{(\text{leakage} \times \text{bldg "K"}) \times (\text{wind P factor}) \times (\text{HDD} \times 24 \times 60) \times (.075) \times (.243)}{100{,}000 \times \text{System Efficiency\%}}$$

Existing Conditions & Scope of Work – Mary J. Donahoe Community School

TYPE OF MEASURES:	Building Level	quantity or distance
Ext. Door(s) to be weather-stripped & sealed.	Basement	1 Doors
Int. Door(s) to be weather-stripped & sealed for isolation. (stairwell doors)	Basement	2 Doors
Ext. Door(s) to be weather-stripped & sealed.	First	22 Doors
Int. Door(s) to be weather-stripped & sealed for isolation. (Boiler room door)	First	1 Doors
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	First	5 AirConCovers
Seal air-conditioner w/ weather-strip, & flexible cover up to 17"H x 25"W	Second	4 AirConCovers
Ext. Door(s) to be weather-stripped & sealed. (Roof access doors)	Third	2 Doors
Roof / Wall Joint to be Sealed with 2 part foam.	Third	185 Feet

AIR LEAKAGE:	feet	inches		
Doors	20	1/16	0.10	sq ft
Doors	40	1/8	0.42	sq ft
Doors	440	3/32	3.44	sq ft
Doors	20	1/8	0.21	sq ft
AirConditionerCovers	35	1/8	0.36	sq ft
AirConditionerCovers	28	1/8	0.29	sq ft
Doors	40	3/32	0.31	sq ft
RoofWall	185	1/16	0.96	sq ft
Totals	-		6.10	sq ft
			0.57	sq meter

ASSUMPTIONS & CALCULATIONS:

Power Rate		$0.220	per Kwh
Heating Fuel	100% Natural Gas	$1.210	perTherm
Building K	130		

Example Calculation

$$\frac{(\text{leakage} \times \text{bldg "K"}) \times (\text{wind P factor}) \times (\text{HDD} \times 24 \times 60) \times (.075) \times (.243)}{100{,}000 \times \text{System Efficiency\%}}$$

Existing Conditions & Scope of Work – Nickolas Oresko Community School

TYPE OF MEASURES:	Building Level	quantity or distance
Ext. Door(s) to be weather-stripped & sealed.	First	9 Doors
Int. Door(s) to be weather-stripped & sealed for isolation. (Boiler room doors)	Third	2 Doors
Ext. Door(s) to be weather-stripped & sealed. (Roof access doors)	Fourth	3 Doors

AIR LEAKAGE:	feet	inches		
Doors	180	3/32	1.41	sq ft
Doors	40	1/8	0.42	sq ft
Doors	60	3/32	0.47	sq ft
Totals	-		2.29	sq ft
			0.21	sq meter

ASSUMPTIONS & CALCULATIONS:

Power Rate		$0.220	per Kwh
Heating Fuel	100% Natural Gas	$1.170	perTherm
Building K	130		

Example Calculation

$$\frac{(\text{leakage} \times \text{bldg "K"}) \times (\text{wind P factor}) \times (\text{HDD} \times 24 \times 60) \times (.075) \times (.243)}{100{,}000 \times \text{System Efficiency\%}}$$

ECM Savings

Detailed infiltration calculations can be found in Appendix H - Building Envelope Details & Savings Calculations. A summary of those calculation is shown below:

Building Envelope Savings			
BUILDING	**SQFT**	**kWh SAVINGS**	**THERMS SAVINGS**
Bayonne High School & Ice Rink	470,000	18,348	8,123
Henry Harris Community School	65,000	5,456	2,586
Horace Mann Community School	69,717	1,777	787
Lincoln Community School	66,000	5,257	2,327
Philip G. Vroom Community School	52,000	1,969	872
Dr. Walter F. Robinson Community School	79,800	1,875	830
Washington Community School	76,613	2,288	1,013
William Shemin Midtown Community School	136,204	3,536	1,676
Woodrow Wilson Community School	83,000	2,889	1,369
John M Bailey Community School	53,000	3,211	1,522
Mary J Donahoe Community School	62,000	4,029	1,719
Nickolas Oresko Community School	82,000	1,362	645

ECM #13 – Destratification Fans

BAYONNE PUBLIC SCHOOLS ECM MATRIX		Bayonne High School & Ice Rink	Henry Harris Community School	Horace Mann Community School	Lincoln Community School	Philip G. Vroom Community School	Dr. Walter F. Robinson Community School	Washington Community School	William Shemin Midtown Community School	Woodrow Wilson Community School	John M Bailey Community School	Mary J Donahoe Community School	Nickolas Oresko Community School
(blank)	DCO ECM was evaluated												
(green)	ECM included in the project												
ECM #	ECM DESCRIPTION												
13	Destratification Fans	✓	✓		✓		✓	✓	✓	✓		✓	✓

Background

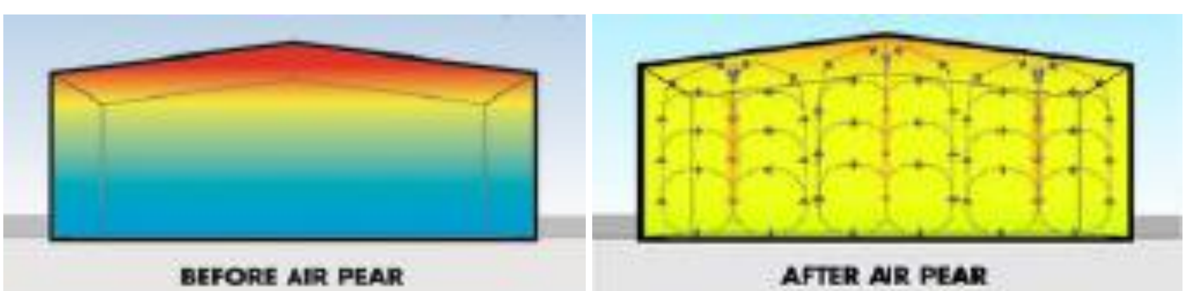
In high ceiling areas, this produces layers of stratified air. Thermal Destratification is the process of mixing the internal air to eliminate stratified layers and achieve temperature equalization throughout the building envelope.

The design of the Air Pear will address the issue of temperature differences in high ceiling areas by efficiently moving hot air to the ground and homogenizing the air throughout the space.

When air has little opportunity to move, dramatic temperature differences occur. Hot air rises pushing cooler air near the floor. This temperature difference can be as much as one degree per foot of height. Items such as lighting and ventilation ducts can increase this effect. Since people and thermostats are located near the floor it is imperative to even out this temperature difference. Air Pear fans get air moving. Their energy efficient motors operate quietly to eliminate hot and cold spots throughout a space. After installation, there is significant energy reduction. The result is a more comfortable space with reduced utility and maintenance costs.

Scope of Work

Install Air Pear in select gymnasiums in the district. List of gymnasiums is below.



ECM Savings Calculations

Savings Table

Temp Differential (°F)

Ceiling Height (ft.)	5.4	7.2	9	10.8	18	19.8
20	12.7	14.7	16.2	17.5	22	23
26	15.8	17.6	19	20.8	26	27
33	18	20	21.8	23.2	28.8	30.5
40	20	22	23.6	25.6	31.8	33.2

% savings

Source: Building Scientific Research Information Association, UK, 1997. Computational Fluid Dynamics for a 100' x 165' x 26' building with a 100kW gas heater at 3,600cfm. Insulation and lighting remain constant.

Building	Area in Building	Ceiling Height (ft.)	Area (sq.ft.)	Gas Usage Assumed (therms)	Temp Differential (°F)	Savings in therms
Bayonne High School & Ice Rink	Gym BLDG A	22	9,600	11,520	10	1,866
Bayonne High School & Ice Rink	Gym BLDG B	27	3,375	4,050	12	842
Bayonne High School & Ice Rink	Gym Ice Rink BLDG	24	1,862	2,234	11	391
Bayonne High School & Ice Rink	Gym Ice Rink BLDG	24	6,831	8,197	11	1,435
Henry E. Harris Community School	Gym	23	1,850	2,220	11	389
Lincoln Community School	Gym	26	4,000	4,800	12	998
Dr. Walter F. Robinson Comm. School	Gym	26	3,773	4,528	12	942
Washington Community School	Gym	26	2,590	3,108	12	646
William Shemin Midtown Comm. School	Gym	24	6,300	7,560	11	1,323
Woodrow Wilson Community School	Gym	24	4,200	5,040	11	882
Mary J. Donohoe Community School	Gym	22	1,850	2,220	10	360
Mary J. Donohoe Community School	Commons	23	3,900	4,680	11	819
Nickolas Oresko Community School	Gym	22	5,307	6,368	10	1,032

Yearly Fan Operating Hours	Fan Type	QTY	Power Draw
4000	E-ONYX-P4-STD-120-X	5	0.076
4000	E-ONYX-P4-STD-120-X	2	0.076
4000	E-ONYX-P4-STD-120-X	1	0.076
4000	E-ONYX-P4-STD-120-X	4	0.076
4000	ESC-125EC	2	0.030
4000	E-ONYX-P4-STD-120-X	2	0.076
4000	E-ONYX-P4-STD-120-X	2	0.076
4000	E-ONYX-P4-STD-120-X	2	0.076
4000	ESC-125EC	6	0.030
4000	E-ONYX-P4-STD-120-X	3	0.076
4000	ESC-125EC	2	0.030
4000	E-ONYX-P4-STD-120-X	2	0.076
4000	ESC-125EC	5	0.030

BAYONNE PUBLIC SCHOOLS
ECM MATRIX

(white)	DCO ECM was evaluated
(green)	ECM included in the project

ECM #	ECM DESCRIPTION	Bayonne High School & Ice Rink	Henry Harris Community School	Horace Mann Community School	Lincoln Community School	Philip G. Vroom Community School	Dr. Walter F. Robinson Community School	Washington Community School	William Shemin Midtown Community School	Woodrow Wilson Community School	John M Bailey Community School	Mary J Donahoe Community School	Nickolas Oresko Community School
14	Refrigeration Controls	✔							✔				

Background

ECM 14 will install motor controls on BPS Walk-In Freezers. Existing walk-in freezers have basic control systems that simply measure and maintain a single temperature. These systems can cause excessive cycling, frost, and degrade the system reliability.

Scope of Work

ArtikControl™ WIC & WIF is a state of the art Intelligent Energy Saving Refrigeration Controller for the retro-fit of Walk-In Coolers & Freezers. A configurable energy saving Refrigeration Controller for the retrofit of walk-in cooler and freezers with: web-based scheduling and set-point optimization; integrated evaporator controls; adaptive defrost controls; failure alarming; predictive diagnostics and ready for demand-side-management (DSM) program integration and, all while offering remote monitoring and control from anywhere via a SmartPhone, Tablet or Laptop.

- Controls Evaporator Fans; Room Temperature; Compressor/Liquid Line Solenoid; Defrost Heaters while providing Multiple Alarms.
- Energy Savings Verified by Third Party Administrators & Engineers
- Quantifiable System Savings between 50-75% over antiquated Motors and Mechanical Controls.
- Maximizes energy efficiency with less compressor run times resulting from shorter defrost cycles.
- Eliminates ice formation on floors and ceilings associated with defrost times and cycles.
- Reduction in excessive temperature that occur with mechanical defrost units.
- Use of Latent Energy in the box reducing compressor run times.

ECM Savings Calculations

Detailed infiltration calculations can be found in Appendix I – Refrigeration Controls Savings Calculations. A summary of those calculation is shown below:

Refrigeration Controls Savings		
BUILDING	SQFT	kWh SAVINGS
Bayonne High School & Ice Rink	470,000	13,485
William Shemin Midtown Community School	136,204	6,305

Building	Type	QTY	Total # Fans per WI	Motor HP	Motor Power (V)	Existing Motor Type
Bayonne High School & Ice Rink	Walk in Cooler	1.00	4.00	1/20 hp	115	Shaded Pole
Bayonne High School & Ice Rink	Walk in Freezer	1.00	3.00	1/15 hp	208	Shaded Pole
William Shemin Midtown Comm. School	Walk in Freezer	1.00	3.00	1/20 hp	208	Shaded Pole

Fan Replacement Energy Savings Calculations:

Assumptions:

- Shaded Pole Motor (1/15th HP, 115V): 154W
- EC Motor (High Speed) 1/15th HP, 115V: 50W
- EC Motor (Low Speed) 1/15th HP, 115V: 9W
- Shaded Pole Motor (1/15th HP, 230V): 242W
- EC Motor (High Speed) 1/15th HP, 230V: 18W
- EC Motor (Low Speed) 1/15th HP, 230V: 3W
- Shaded Pole Motor (1/47th HP, 115V): 72W
- EC Motor (High Speed) 1/47th HP, 115V: 47W
- EC Motor (Low Speed) 1/47th HP, 115V: 5W
- Shaded Pole Motor (1/47th HP, 230V): 64W
- EC Motor (High Speed) 1/47th HP, 230V: 42W
- EC Motor (Low Speed) 1/47th HP, 230V: 4.4W
- EC Motor at High Speed (Cooler): 55% of the Time
- EC Motor at Low Speed (Cooler): 45% of the Time
- EC Motor at High Speed (Freezer): 51% of the Time
- EC Motor at Low Speed (Freezer): 42% of the Time

- **Shaded Pole Motor Energy Usage (kWh) 115V**
  - **(# of motors) x ((154W x 24hrs x 365 days)/1,000)**
  - **6 x (1,349,040/1,000)**
  - **8,094.24 kWh**
- **EC Motor Energy Usage (kWh) 115V**
  - **(# of motors) x (((50W x 0.55) + (9W x 0.45)) x 24 x 365)/1,000**
  - **6 x ((27.5 + 4.05) x 8,760)/1,000**
  - **6 x (31.55 x 8,760)/1,000**
  - **6 x 276,378/1,000**
  - **1,658.27 kWh**
- **Fan Motor Replacement Energy Savings**
  - **Shaded Pole Motor Usage – EC Motor Energy Usage**
  - **8,094.24 – 1,658.27 = 6,435.97 kWh**

Defrost Controls Energy Savings Calculations:

Assumptions:

- Defrost Controls Energy Reduction: 45%
- Defrost Average Power Consumed: 1,100W per fan
- Daily Defrost Time (per Time Clock): 3 hrs. per day (4 times a Day for 45 minutes each time)
- **(# of Fans) x (((1,100W x 3hr/day x 365) x 0.45)/1,000)**
- **6 x ((1,204,500 x 0.45)/1,000)**
- **6 x (542,025/1,000)**
- **6 x 542.025 = 3,252.15 kWh**

Heat (Load) Reduction:

Assumptions:

- 1W = 3.412 BTU/hr
- 6.2 EER Compressor Efficiency
- 10:1 Compressor: Condenser Ratio
- Average Power Consumed during Defrost: 1,100W per fan
- Daily Defrost Time, per Time Clock: 3 hours
- Defrost controls Energy Reduction: 45%

Fan Heat Load Reduction:

- (# of fans) x ((((Shaded pole Watts – Average ECM Watts) x 3.412)/6.2) x 24 x 365)/1,000
- 6 x ((((154 – 29.5) x 3.412) / 6.2) x 24 x 365) / 1,000
- 6 x (124.5 x 3.412 / 6.2 x 24 x 365 / 1,000)
- 3,601.16 kWh

Compressor Load Reduction:

- (Fan Heat Load Reduction) / (Compressor:Condenser Ratio)
- 3,601.16 / 10
- 360.116 kWh

Defrost Heat Load Reduction:

- (# of Motors) x (((1,100W x 3.412) / 6.2) + (((1,100W x 3.412) / 6.2) / 10))
- 6 x ((3,753.2 / 6.2) + ((3,753.2 / 6.2) / 10))
- 6 x (605.35 + 60.54)
- 6 x ((665.89 x 3 hr/day x 365 x 0.45) / 1,000)
- 6 x 328.12
- 1,968.70 kWh

Total Energy Save = **Fan Replacement Energy Reduction +**

Defrost Controls Energy Reduction +

Heat (Load) Reduction

Number	Motor Type Code	EC Motor Run Time	Walk in Cooler	Walk in Freezer	Source
1.0	SP	Shaded Pole	100%	100%	Historical measurement data
2.0	EC1S	EC Single Speed	100%	100%	Historical measurement data
3.0	EC2S	EC High Speed	55%	51%	Historical measurement data
4.0	EC2S	EC Low Speed	45%	42%	Historical measurement data

Number	Defrost Operation		Source
1.0	Cycles per Day	4.00	Assumption based on historical data
2.0	Defrost Time (Min)	45.00	Assumption based on historical data
3.0	Heater Wattage	1,100.00	Assumption based on historical data

BAYONNE PUBLIC SCHOOLS ECM MATRIX (DCO ECM was evaluated; ECM included in the project)		Bayonne High School & Ice Rink	Henry Harris Community School	Horace Mann Community School	Lincoln Community School	Philip G. Vroom Community School	Dr. Walter F. Robinson Community School	Washington Community School	William Shemin Midtown Community School	Woodrow Wilson Community School	John M Bailey Community School	Mary J Donahoe Community School	Nickolas Oresko Community School
ECM #	ECM DESCRIPTION												
15	Combined Heating & Power				✔								

Background

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 leads 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.

Scope of Work

- Provide engineered and stamped drawings including shop drawings, submittals and as-builts.
- Apply for the Interconnection application.
- Furnish and install new equipment housekeeping pad for CHP inside Lincoln Community School boiler room
- Furnish new 4.4 KW CHP and secure on the new pad.
- Furnish and install new thermal load module to interface with buildings space heating.
- Furnish and install all piping for the CHP, load module, tie in to heating loop, and make up water piping.
- Furnish and install gas piping to the new CHP.
- Insulate all newly installed piping.
- Furnish and install all electrical power and control wiring.
- Furnish and install exhaust for the CHP (To the roof)

- Provide startup of the CHP
- Provide certified balancing report.

The following will be installed at Lincoln Community School

- One (1) 4.4kW micro CHP Including:
  - 4.4kW, 208 V, 60 Hz, Single Phase
  - Industrial Natural Gas Engine, EPA Certified
  - Open Protocol Interface

TECHNICAL DATA

Fuel	natural gas: minimum methane number 59 propane: minimum octane number MOZ 92 (EN 589)
Electrical Power	natural gas: 1.2 - 4.4 kW modulating propane: 1.2 - 4.4 kW modulating
Thermal Output	natural gas: 4.0 - 12.5 kW modulating propane: 4.5 - 13.8 kW modulating
Total Input Power	natural gas: 5.9 - 19.0 kW propane: 6.5 - 20.0 kW
Fuel Consumption	natural gas: .21 - .65 therms/hr propane: 0.26 - 0.78 gal/hr
Overall Efficiency	93%
Exhaust Gas Emissions	on-site settings: <250 ppm CO, <30 ppm NOx
Noise Pressure Level	approx. 55 dB (A), in 3.3 ft distance

EXHAUST DATA

Exhaust Gas Temperature	operation: < 180°F (82°C)
Exhaust Gas Pipe	unit can be vented with 3 in. CPVC (schedule 80) pipe max. length: 65 ft. with max. of six 90 degree bends inner diam. 2.76 in (70 mm) outer diam. 2.85 in (75 mm) total drag 0.2 wci (0.5 mbar) max. high pressure (back pressure) 1.2 w.c.i. (3.0 mbar) with wind impact

ELECTRICAL DATA

Voltage/Frequency/Power	230V nominal / 60 Hz / 0.98 - 1.00 power factor ecopower® adapts to the grid phase sequence
Phase Sequence	corresponds to the grid phase sequence

GENERATOR AND INVERTER

Generator	brushless, permanent magnet generator directly flanged to the engine, with water cooling system
Inverter	three-phase inverter with integrated safety monitoring, microcontroller control (singe phase output for North America)

HEATING SYSTEM DATA

Heating Return Temperature	min. 95°F (35°C), max. 140°F (60°C)
Heating Supply Temp. Max.	167°F (75°C)
Pressure Drop at the Plate Heat Exchanger	1.0 psi (0.07 bar) at a flow rate of 211 gal/hour (800 L/h)
Temperature Sensor	standard NTC sensor outdoor, room, supply, return, and storage temperature, depending on the operating mode
Hot Water	adjustable: 41 - 158°F (5 - 70°C) (the factory setting of 140°F (60°C) is recommended

ENGINE DATA

Engine	water-cooled, single cylinder, four stroke piston gas combustion engine, designed for long running time; displacement 16.6 in³ (272cm³)
Speed Range	1,200 - 3,600 RPM (factory max. setting: 3,400 RPM)
Coolant Temperature	operation: 167 - 176°F (75 - 80°C) short-term: 194°F (90°C)
Engine Electronics	control of the gas - air ratio (λ = 1 - control) and monitoring the engine operation, accomplished by microcontroller

ECM Calculations

The CHP will act as the first stage of heating for Lincoln Community School Pool. The CHP is estimated to run at full load for over 4,993 hours per year. The installed CHP will be available year-round and will operate when adequate heating load exists. If necessary, heat can be rejected through a radiator when the full heating load is not required.

CHP Proposed System		
Manufacturer		
Model		
Fuel	Natural Gas	
Generator Type	Gas Internal Combustion Engine	
Gross Power Output	4.4	kW
Net Power Output	4.0	kW
Quantity	1	
Engine Electrical Efficiency (LHV)	31.5%	
Availability	57%	
Annual Full Load Run Hours	4,993	hrs
Parasitic Load	9%	
Fuel Input (LHV)	65.0	MBH
Fuel Input (HHV)	72.0	MBH
Exhaust Heat Recovery	0.0%	
Engine Jacket Heat Recovery	80.0%	
Thermal Efficiency	80.0%	
Total Heat Recovery (LHV)	57.3	MBH

CHP Calculations

Building Loads	Annual Total	Monthly Average	
Peak Power Demand	165		
Average Monthly Peak Power Demand		126	kW
Power Usage	438,150	36,513	kWh
Load Factor		40%	
On-Site CHP			
Gas Input (HHV)	3,246	270	Therm
Total Power Provided	20,023	1,669	kWh
Total HR Available (LHV)	286	24	MMBTU
Heat Recovery Utilized by Pool Heating Load		100%	
HW Displaced by CHP	0	0	MMBTU
Heat Recovery Utilized by DHW Load		0%	
DHW Displaced by CHP	0	0	MMBTU
CHP Natural Gas Cost	$3,928	$327	
CHP Maintenance Cost	$0	$0	
Existing Pool Heater Efficiency	75%		
Proposed Pool Heater Efficiency	75%		
Existing DHW Steam HX Efficiency	N/A		
Remaining Load			

Due to high cost, poor payback and BPS priorities, this ECM is not included in the ESIP Project

BAYONNE PUBLIC SCHOOLS ECM MATRIX

	DCO ECM was evaluated
(green)	ECM included in the project

ECM #	ECM DESCRIPTION	Bayonne High School & Ice Rink	Henry Harris Community School	Horace Mann Community School	Lincoln Community School	Philip G. Vroom Community School	Dr. Walter F. Robinson Community School	Washington Community School	William Shemin Midtown Community School	Woodrow Wilson Community School	John M Bailey Community School	Mary J Donahoe Community School	Nickolas Oresko Community School
8	Ice Rink Chiller Replacement	✔											

Form V – ESCO Construction & Service Fees

FORM V		
ESCO's PRELIMINARY ENERGY SAVINGS PLAN (ESP): ESCOs PROPOSED FINAL PROJECT COST FORM BAYONNE PUBLIC SCHOOLS 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)	$ 12,240,554	N/A
Contingency	$ 612,028	
Estimated Value of Hard Costs (2)	$ 12,852,582	
Project Service Fees		
Investment Grade Energy Audit	$ 218,494	1.70%
Design Engineering Fees	$ 899,681	7.00%
Construction Management & Project Administration	$ 976,796	7.60%
System Commissioning	$ 83,542	0.65%
Equipment Initial Training Fees	$ 128,526	1.00%
ESCO Overhead	$ 385,577	3.00%
ESCO Profit	$ 514,103	4.00%
Project Service Fees Sub Total	$ 2,307,038	17.95%
TOTAL FINANCED PROJECT COSTS:	$ 16,059,301	24.95%
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)*	$75,000	FLAT FEE
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%

Form VI – Project Cash Flow Analysis

FORM VI

ESCO's PRELIMINARY ENERGY SAVINGS PLAN (ESP):
ESCO's PRELIMINARY ANNUAL CASH FLOW ANALYSIS FORM
BAYONNE PUBLIC SCHOOLS - 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): 24 Months
3. Cash Flow Analysis Format:

Miscellaneous Costs Financed:	
Cost of Issuance	$231,000
DMR Fee	$642,629
Total	$873,629

Project Cost[1]: **$16,059,301**
Misc Costs Financed: **$873,629**
Financed Amount: **$16,932,930**

Interest Rate: **4.00%**

Year	Annual Energy 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	$ 725,042			$ 725,042	$ (677,317)			$ 47,725	$ 47,725
2026	$ 974,621	$ 70,707	$ 560,196	$ 1,605,524	$ (1,602,914)			$ 2,609	$ 50,334
2027	$ 996,357	$ 70,707	$ 168,867	$ 1,235,930	$ (1,233,321)			$ 2,609	$ 52,944
2028	$ 1,018,578	$ 60,707		$ 1,079,285	$ (1,076,675)			$ 2,609	$ 55,553
2029	$ 1,041,295	$ 60,707		$ 1,102,002	$ (1,099,392)			$ 2,609	$ 58,163
2030	$ 1,064,519	$ 60,707		$ 1,125,226	$ (1,122,617)			$ 2,609	$ 60,772
2031	$ 1,088,262			$ 1,088,262	$ (1,085,652)			$ 2,609	$ 63,382
2032	$ 1,112,535			$ 1,112,535	$ (1,109,925)			$ 2,609	$ 65,991
2033	$ 1,137,350			$ 1,137,350	$ (1,134,740)			$ 2,609	$ 68,601
2034	$ 1,162,718			$ 1,162,718	$ (1,160,109)			$ 2,609	$ 71,210
2035	$ 1,188,654			$ 1,188,654	$ (1,186,044)			$ 2,609	$ 73,820
2036	$ 1,215,168			$ 1,215,168	$ (1,212,559)			$ 2,609	$ 76,429
2037	$ 1,242,275			$ 1,242,275	$ (1,239,665)			$ 2,609	$ 79,039
2038	$ 1,269,986			$ 1,269,986	$ (1,267,377)			$ 2,609	$ 81,648
2039	$ 1,298,317			$ 1,298,317	$ (1,295,708)			$ 2,609	$ 84,258
2040	$ 1,327,280			$ 1,327,280	$ (1,324,671)			$ 2,609	$ 86,867
2041	$ 1,356,890			$ 1,356,890	$ (1,354,281)			$ 2,609	$ 89,477
2042	$ 1,387,162			$ 1,387,162	$ (1,384,552)			$ 2,609	$ 92,086
2043	$ 1,418,109			$ 1,418,109	$ (1,415,499)			$ 2,609	$ 94,696
2044	$ 1,449,747			$ 1,449,747	$ (1,447,138)			$ 2,609	$ 97,305
2045	$ 1,482,093			$ 1,482,093	$ (1,479,483)			$ 2,609	$ 99,915
Totals	$ 24,956,957	$ 323,535	$ 729,062	$ 26,009,554	$ (25,909,640)	$ -	$ -	$ 99,915	

NOTES:
(1) Includes: Hard costs and project service fees defined in ESCO's PROPOSED "FORM V"
(2) No payments are made by Bayonne Public Schools 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

Utility Inflation Worksheet			
Year	**ANNUAL ELECTRIC COST SAVINGS**	**ANNUAL NATURAL GAS COST SAVINGS**	**Total**
2	$845,789.82	$150,566.98	$996,356.80
3	$864,397.20	$154,180.58	$1,018,577.78
4	$883,413.93	$157,880.92	$1,041,294.85
5	$902,849.04	$161,670.06	$1,064,519.10
6	$922,711.72	$165,550.14	$1,088,261.86
7	$943,011.38	$169,523.34	$1,112,534.72
8	$963,757.63	$173,591.90	$1,137,349.53
9	$984,960.30	$177,758.11	$1,162,718.41
10	$1,006,629.42	$182,024.30	$1,188,653.73
11	$1,028,775.27	$186,392.89	$1,215,168.16
12	$1,051,408.33	$190,866.32	$1,242,274.64
13	$1,074,539.31	$195,447.11	$1,269,986.42
14	$1,098,179.17	$200,137.84	$1,298,317.01
15	$1,122,339.12	$204,941.15	$1,327,280.26
16	$1,147,030.58	$209,859.73	$1,356,890.31
17	$1,172,265.25	$214,896.37	$1,387,161.62
18	$1,198,055.08	$220,053.88	$1,418,108.97
19	$1,224,412.30	$225,335.17	$1,449,747.47
20	$1,251,349.37	$230,743.22	$1,482,092.58

SECTION 5 – RISK, DESIGN, & COMPLIANCE

Assessment of Risk, 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	BPS
Disposition of Abandoned Equipment (Steam Piping, Condensate Piping, Oil Tanks, etc.)	Risk	BPS
New Natural Gas Distribution	Risk	DCO
Integrity of re-used Infrastructure	Risk	BPS
Life Safety System Coordination	Risk	BPS
Coordination with BPS Information Technology Department	Risk	BPS
Ventilation Compliance with Code	Compliance	DCO
Temperature, Humidity and Air Change Compliance with Code	Compliance	DCO
Boiler Capacity and Turndown	Design	DCO
Natural Gas Regulator Compliance with Code	Compliance	DCO
Undocumented Underground Utilities	Risk	DCO
Code Compliance of Existing Electrical Infrastructure	Compliance	DCO
Lighting Levels	Compliance	DCO
Design Light Consortium rating for bulbs	Compliance	DCO
Underwriters Laboratory Testing for retrofitted LED Lighting Systems	Compliance	DCO
Lighting Retrofits within hard ceilings for fixtures and occupancy sensors	Risk	DCO
Unrealized Energy Savings 1. Energy Modeling 2. Performance Monitoring 3. Capacity of Equipment	Risk	DCO 1. DCO 2. DCO

4. Efficiency of Equipment 5. Run Hours of Equipment		3. DCO / Basis of Design Vendor 4. DCO / Basis of Design Vendor 5. BPS
Transformer Loading	Risk	DCO
Site Work for Equipment	Design	DCO
Condition of Roof Under Units	Risk	BPS
Adequate Crane Lifts & Clearances	Design	DCO / Rigger
Physical Space Constraints and Clearance for Equipment Replacement	Design	DCO
Refrigerant Reclaim / Refrigerant Disposal	Compliance	Contractor
Existing Tie in Locations	Design	DCO
Schedule Oversight	Risk	DCO
Impact of Boiler Flue	Design	DCO
Impact of Space Usage During Construction	Risk	DCO & BPS
Scope changes relating to requests by Authorities Having Jurisdiction.	Risk	BPS (via contingency)
Department of Environmental Protection Permitting	Risk	DCO
Modifications of Energy Saving Control Sequences and Setpoints impacting Energy Savings and Incentives	Risk	BPS
Post Construction Calibration of Sensors, Meters, & Safety Devices	Risk	BPS
Adequate time and access for bidding contractor site surveys	Risk	BPS
Utility Interconnection approval for the CHP Unit	Risk	DCO

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 below. 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 BPS, 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	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 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	Based on computer simulation model calibrated with whole-building or end-use 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 during the first year of the energy savings guarantee. BPS 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 ESP, 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, 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 BPS 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 BPS.

Owner Tasks and Responsibilities:

As a general statement, BPS 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, BPS 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 BPS 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:

BPS will be given specific training on the changes and advancements in the environmental operations and energy savings strategies. BPS 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

BPS 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 BPS's attention for correction.

SECTION 6 – OPERATION & MAINTENANCE

It is critical to the success of achieving continued energy savings that BPS develop and implement an Operation and Maintenance Plan. In this section are some recommendations for BPS 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) CO_2
    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.

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)

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 Bi-Annual Inspection

1. Perform following inspection and cleaning before starting the tower for the cooling season and during shutdown at end of season.
2. Record and report abnormal conditions, measurements taken, etc.
3. Review logs for operational problems and trends.
4. 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.

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.

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 BPS and DCO. If BPS 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 this document. Both DCO and the BPS 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 BPS 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 BPS.

SAVINGS VERIFICATION

There are events that cause energy savings to change. BPS 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 BPS.

SECTION 8 – 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
APPENDIX E	Project Incentives
APPENDIX F	Lighting Line-by-Line
APPENDIX G	Steam Trap Line-by-Line
APPENDIX H	Building Envelope Details & Savings Calculations
APPENDIX I	Refrigeration Controls Savings Calculations
APPENDIX J	Local Government Energy Audits
APPENDIX K	Packaged Rooftop Unit Selections

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 the unknown. Missing or inaccurate Blueprints, deviations from the original blueprints 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

BPS ESIP Project is carrying $612,028 of construction contingency. The use of Contingency by BPS or DCO Energy will be defined in the Implementation Contract.

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 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 contingency (See Appendix A).

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

Construction phase

In compliance with public bid law, some ECMs may be procured using Cooperative Purchasing. BPS is a member of several cooperative purchasing contracts. The following is a list of ECMs that will be procured through Co-Ops.

BAYONNE PUBLIC SCHOOLS			
ECM #	ENERGY CONSERVATION MEASURE	PURCHASING METHOD	CONTRACTOR
1	LED Bulb Replacement	Allied States COOP	Greentech
2	LED Flat Panel Replacement	Allied States COOP	Greentech
3	Lighting Controls	Allied States COOP	Greentech
4	District Wide Energy Management System - Tier 1	ESCNJ COOP	AME, Inc.
5	District Wide Energy Management System - Tier 2	ESCNJ COOP	AME, Inc.
6	Boiler Replacement	ESCNJ COOP	In-Line HVAC
7	Chiller Replacement	ESCNJ COOP	In-Line HVAC
8	Ice Rink Chiller Replacement	ESCNJ COOP	In-Line HVAC
9	Rooftop Unit Replacement	ESCNJ COOP	In-Line HVAC
10	Steam Trap Replacement	HCESC COOP	ECM Holdings
11	Plug Load Controls	ESCNJ COOP	AME, Inc.
12	Building Envelope Improvements	HCESC COOP	ECM Holdings
13	Pipe Insulation	HCESC COOP	ECM Holdings
13	Destratification Fans	HCESC COOP	ECM Holdings
14	Refrigeration Controls	HCESC COOP	ECM Holdings
15	Combined Heating & Power	ESCNJ COOP	In-Line HVAC

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:

- 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

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. Warranty-related savings — newly installed lamps, and fixtures come with a manufacturer warranty of 10 years.

O&M Savings

O&M Savings is being carried in the ESIP each year for the first 5 years of the financing term. This amount is related only to the LED Lighting and mechanical maintenance that BPS no longer has to purchase upon completion of the ESIP project. Per ESIP rules, the mechanical Operational Savings is carried for the first 2 years and the Lighting Operational Savings is carried for 5 years.

Bayonne Public Schools has a total annual operations budget of $18,757,556. In the budget line items, $5,197,750 is dedicated to supplies and contracts. The ESIP contemplates very conservative operational savings at 10% Supplies Savings related to the purchase of light bulbs (total supplies budget line = $675,000) and a $10,000 reduction in maintenance costs related to the installation of new boilers and chillers.

Appendix D – Project Changes in Financing

The Energy savings plan has been approved using:

Interest rate of: .... 4.00 %
Term: .... 20 Years
Construction Term .... 24 Months
Construction Interest Only Payment of .... TBD by BPS financial advisor
Annual Surplus of no less than $2,609

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

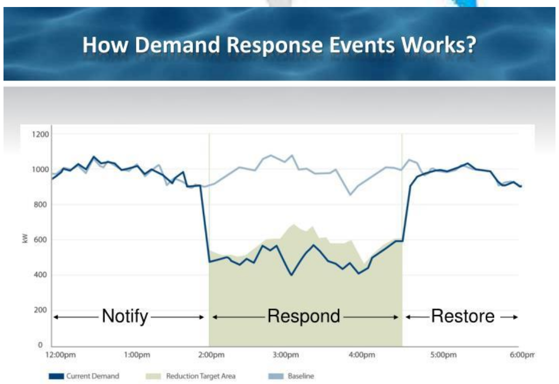
While beneficial to the client financing changes are the responsibility of the client, bond counsel and/or financial advisor. DCO represents in no way advice on these financial items

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

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.

Commercial & Industrial Prescriptive Rebate Program

Commercial and industrial facilities with a peak electric demand exceeding 200 kW, the Commercial & Industrial Prescriptive Rebate Program is the best option for maximum rebates and incentives. This program is offered through public utilities and provides the technical and financial means to help improve the energy efficiency of your buildings. The program is designed to take a comprehensive approach to energy savings while allowing you to earn incentives that are directly linked to equipment type and size. This Prescriptive rebate program is your best option for lighting and controls, heating, cooling and ventilation (HVAC), refrigeration, kitchen equipment, Electronically Commutated Motors (ECM), electric water heaters, plug load controls, or variable speed drive (VSD) upgrades and installations.

Prescriptive rebates are designed to cover up to 50 percent of the incremental measure cost for installing high-efficiency equipment. Applications for this rebate are filed through your electric and natural gas provider.

Commercial & Industrial Custom Rebate Program

Commercial and industrial facilities with a peak electric demand exceeding 200 kW which have energy conservation measures that are not covered by the Prescriptive Rebate Program, the Custom Rebate Program is the best option to maximize rebates and incentives. This program is offered through public utilities and is designed to cover energy conservation measures or projects which are more unique in nature. All custom projects required for pre-approval, engineering analyses demonstrating savings, and a pre-inspection to determine eligibility.

Incentive Calculations

Estimated incentive values were calculated in accordance with the PSEG Prescriptive and Custom Rebate programs, which is the most lucrative Incentive option available to BPS. The total incentive amount was calculated to be **$730,499** in rebates and incentives. Incentives are carried within Form VI of the BPS Energy Savings Plan.

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, BPS acknowledges and accepts that any project proposed should not rely on the receipt of incentives as a reason to implement it.

See Attached Spreadsheets and PDF Files

See Attached Spreadsheets and PDF FIles

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