



Dunellen Public Schools

FINAL Energy Audit Report

Prepared For:

Dunellen Public Schools

Mr. Brian P. Delucia
Business Administrator
Dunellen Public Schools
High & Lehigh Streets
Dunellen, NJ, 08812

Prepared By:

Dome-Tech, Inc.

Prepared Under the
Guidelines of the State of NJ
Local Government Energy
Audit Program

April 2014



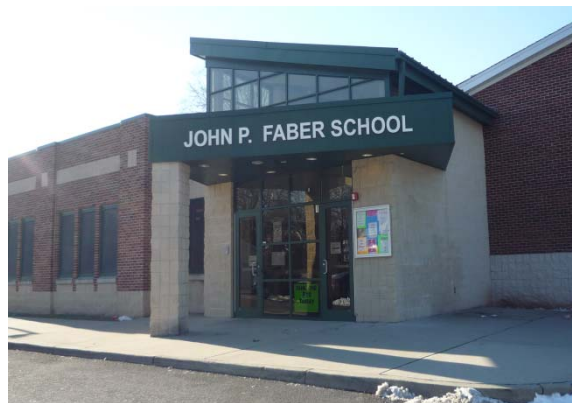
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DUNELLEN PUBLIC SCHOOLS
LGEA REPORT

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April 16th, 2014

Brian P. DeLucia
School Business Administrator
Dunellen Public Schools
High Street & Lehigh Street
Dunellen, NJ 08812

**Re: EXECUTIVE SUMMARY FOR DUNELLEN BOARD OF EDUCATION (3 BUILDINGS)
STATE OF NEW JERSEY LOCAL GOVERNMENT ENERGY AUDIT – FINAL REPORT
OUR PROJECT NUMBER D13435**

Dear Mr. DeLucia:

Dome-Tech was retained by the Dunellen Board of Education, as a pre-qualified participant in the Local Government Energy Audit Program, to perform an energy audit. The objectives of the energy audit were to evaluate the schools’ energy consumption, establish baselines for energy efficiency, and identify opportunities to reduce the amount of energy used and/or its cost.

The scope of the audit is standardized under the Program, and consisted of the following:

- Benchmarking historic energy consumption utilizing EPA Energy Star’s Portfolio Manager
- Characterizing building use, occupancy, size, and construction
- Providing a detailed equipment list including estimated service life and efficiency
- Identifying and quantifying Energy Conservation Measures (ECMs)
- Evaluating the economic viability of various renewable/distributed energy technologies
- Performing a utility tariff analysis and assessing savings potential from energy procurement strategies
- Providing the method of analyses

Based upon data received for the twelve (12) month period Jan 2013 – December 2013, the facilities included in this study had an annual expenditure of:

- Electricity: approximately 1,385,747 kWh at a total cost of approximately \$215,905
- Natural Gas: approximately 101,121therms at a total cost of approximately \$93,321

The following buildings were evaluated under this study:

Facility Name	Total Floor Area SF
Faber Elementary School	89,203
Lincoln Middle School	26,248
Dunellen High School	77,794

Please refer to Section 2 of this report for a detailed list of identified Energy Conservation Measures (ECMs), along with a summary of their preliminary economics (estimated project cost, estimated annual energy savings, applicable rebate(s), etc.). In this report, all identified ECMs are ranked and presented according to their simple payback; however, please note that the Master ECM Table can also be sorted by building, by measure type, etc.

If all identified ECMs were to be implemented, they would provide the following estimated benefits to the Dunellen Board of Education:

- Total annual electrical savings: Approximately 376,967 kilowatt-hours of electric Consumption; 27% of baseline
- Total annual natural gas savings: Approximately 18,258 Therms of natural gas consumption 18% of baseline
- Total annual cost savings: approximately \$76,418 of utility cost; 24.7% of baseline
- Total annual CO₂ emissions reduction: 232 tons
- Total net estimated implementation cost: approximately \$938,791
- Total average simple payback: 12.6 years

A summary of the projects that are recommended for implementation includes the following: Upgrading lighting and controls, CRT monitors and personal computer “plug load” controls, de-stratification fans installation and several other HVAC systems and control upgrades.

Distributed/Renewable Energy Systems were also reviewed with the following conclusions:

- Roof-mounted photovoltaic systems ranging in size from 11 kW dc to 32 kW dc (63 kW dc total) could provide approximately 4% to 9% of each building’s annual energy usage (6% of total energy usage for the 3 buildings). In spite of the relatively low utility costs and low current REC (Renewable Energy Credit) prices, solar energy appears to be a viable investment option for this school district. The Board of Education may consider engaging in a PPA (Power Purchase Agreement) with a solar energy developer in order to reduce investment risks and operational burdens. Should the school district decide to pursue a solar PPA, Dome-Tech recommends commissioning a more detailed study and market analysis.
- CHP (Combined Heat and Power), Fuel Cells, and Microturbines were also considered but not recommended due to low hours of operation at public school buildings.

The schools’ data was entered into the US EPA *ENERGY STAR’s Portfolio Manager* Database program. Buildings with scores of 75 or higher may qualify for the *ENERGY STAR* Building Label. Dunellen Public Schools scored between 13 and 62. See the report for further information.

Regarding the procurement of utilities, Dome-Tech understands that the schools’ facilities in this study are served by six (6) electric accounts behind PSE&G and three (3) natural gas accounts behind PSE&G. All major electricity and natural gas accounts were served by Direct Energy and Hess respectively, third-party retail energy suppliers, during the period analyzed in the study. It is recommended to continue evaluating third party suppliers for the lowest commodity rates.

During the development of this audit, Dome-Tech was assisted by facility personnel, who were both knowledgeable and very helpful to our efforts. We would like to acknowledge and thank those individuals especially Mr. Frank Patullo.

Sincerely,

Ersin Gercek, PE, CEM, LEED AP, CPMP
Senior Energy Engineer



DUNELLEN PUBLIC SCHOOLS
ECMs - SORTED BY PAYBACK

ECM #	Energy Conservation Measures (ECM)	Buildings	Energy Savings kWh	Demand Savings kW	Energy Savings Therms	Gross Installation Cost*	Rebates/ Incentives	Avoided Cost	Net Implimentation Costs	Annual Energy Cost Savings	Annual Oper. Cost Savings	Total Annual Cost Savings	Simple Payback	Internal Rate of Return (IRR) (Net)	Measure Life Yrs	Lifecycle Savings (NPV)	CO2 Savings Tons
1	Computer Power Management	Faber Elementary School	20,664	0	0	\$3,330	\$0	\$0	\$3,330	\$3,260	\$0	\$3,260	1.0	94%	5	\$11,184	6.9
1	Computer Power Management	Dunellen High School	13,396	0	0	\$4,620	\$0	\$0	\$4,620	\$2,081	\$0	\$2,081	2.2	35%	5	\$4,646	4.5
14	Exhaust Fan Controls	Lincoln Middle School	468	0	603	\$2,000	\$0	\$0	\$2,000	\$651	\$0	\$651	3.1	30%	10	\$3,280	3.7
14	Exhaust Fan Controls	Dunellen High School	702	0	904	\$3,000	\$0	\$0	\$3,000	\$941	\$0	\$941	3.2	29%	10	\$4,634	5.5
14	Exhaust Fan Controls	Faber Elementary School	1,170	0	1,506	\$5,000	\$0	\$0	\$5,000	\$1,558	\$0	\$1,558	3.2	29%	10	\$7,637	9.2
1	Computer Power Management	Lincoln Middle School	1,354	0	0	\$780	\$0	\$0	\$780	\$226	\$0	\$226	3.5	14%	5	\$226	0.5
13	Demand Controlled Ventilation	Lincoln Middle School	7,409	0	675	\$8,000	\$0	\$0	\$8,000	\$1,878	\$0	\$1,878	4.3	22%	15	\$12,879	6.4
3	Lighting Equipment Upgrade	Faber Elementary School	78,151	33	0	\$70,570	\$13,880	0	\$56,690	\$12,330	\$0	\$12,330	4.6	20%	15	\$80,398	26.0
3	Lighting Equipment Upgrade	Lincoln Middle School	20,801	7	0	\$22,320	\$4,340	0	\$17,980	\$3,471	\$0	\$3,471	5.2	18%	15	\$20,613	6.9
2	CRT Monitor Replacement	Faber Elementary School	4,662	1.1	0	\$4,440	\$0	\$0	\$4,440	\$736	\$0	\$736	6.0	10%	10	\$1,526	1.6
5	Lighting Controls Upgrade	Dunellen High School	13,855	0	0	\$23,090	\$10,055	0	\$13,035	\$2,153	\$0	\$2,153	6.1	14%	15	\$10,901	4.6
3	Lighting Equipment Upgrade	Dunellen High School	46,951	20	0	\$58,400	\$12,690	0	\$45,710	\$7,295	\$0	\$7,295	6.3	14%	15	\$35,401	15.6
11	Dishwasher Booster Heater	Faber Elementary School	2,724	27	-74	\$2,750	\$0	\$0	\$2,750	\$362	\$0	\$362	7.6	5%	10	\$185	0.5
11	Dishwasher Booster Heater	Dunellen High School	2,724	27	-74	\$2,750	\$0	\$0	\$2,750	\$355	\$0	\$355	7.8	5%	10	\$127	0.5
5	Lighting Controls Upgrade	Faber Elementary School	19,218	0	0	\$28,570	\$4,315	0	\$24,255	\$3,032	\$0	\$3,032	8.0	9%	15	\$9,456	6.4
13	Demand Controlled Ventilation	Dunellen High School	11,114	0	1,555	\$26,000	\$0	\$0	\$26,000	\$3,158	\$0	\$3,158	8.2	9%	15	\$9,116	12.8
5	Lighting Controls Upgrade	Lincoln Middle School	6,325	0	0	\$11,000	\$1,960	0	\$9,040	\$1,055	\$0	\$1,055	8.6	8%	15	\$2,695	2.1
4	Lighting Equipment Incremental Upgrade - LED	Dunellen High School	21,526	9	0	43,650	13,640	0	\$30,010	\$3,345	\$0	\$3,345	9.0	7%	15	\$7,177	7.2
13	Demand Controlled Ventilation	Faber Elementary School	11,577	0	1331	\$30,000	\$0	\$0	\$30,000	\$3,040	\$0	\$3,040	9.9	6%	15	\$3,796	11.6
4	Lighting Equipment Incremental Upgrade - LED	Faber Elementary School	25,116	11	0	56,245	16,380	0	\$39,865	\$3,963	\$0	\$3,963	10.1	5%	15	\$4,192	8.4
10	Kitchen Hood Controls	Dunellen High School	1,079	0	352	\$5,000	\$0	\$0	\$5,000	\$491	\$0	\$491	10.2	5%	15	\$464	2.4
10	Kitchen Hood Controls	Faber Elementary School	1,079	0	352	\$5,000	\$0	\$0	\$5,000	\$491	\$0	\$491	10.2	5%	15	\$458	2.4
4	Lighting Equipment Incremental Upgrade - LED	Lincoln Middle School	12,679	11	0	23,405	1,410	0	\$21,995	\$2,116	\$0	\$2,116	10.4	5%	15	\$1,529	4.2
9	Destratification Fans	Dunellen High School	-1,051	0	588	\$6,000	\$0	\$0	\$6,000	\$378	\$0	\$378	15.9	-8%	10	(\$2,935)	3.1
6	AC Unit Upgrades	Dunellen High School	9,183	5	54	\$25,180	\$1,288	\$0	\$23,892	\$1,477	\$0	\$1,477	16.2	-1%	15	(\$7,472)	3.4
9	Destratification Fans	Faber Elementary School	-1,489	0	921	\$10,000	\$0	\$0	\$10,000	\$604	\$0	\$604	16.5	-8%	10	(\$5,099)	4.9
6	AC Unit Upgrades	Faber Elementary School	36,173	19	594	\$111,150	\$5,306	\$0	\$105,845	\$6,248	\$0	\$6,248	16.9	-1%	15	(\$36,373)	15.5
12	Unit Ventilator Replacement	Faber Elementary School	4,032	0	1,066	\$75,000	\$0	\$0	\$75,000	\$1,608	\$0	\$1,608	46.6	-12%	15	(\$57,123)	7.6
12	Unit Ventilator Replacement	Dunellen High School	5,376	0	1,421	\$100,000	\$0	\$0	\$100,000	\$2,144	\$0	\$2,144	46.7	-12%	15	(\$76,167)	10.1
8	Domestic Water Heater Replacement	Lincoln Middle School	0	0	191	\$9,312	\$240	\$0	\$9,072	\$181	\$0	\$181	50.0	-12%	15	(\$7,055)	1.1
8	Domestic Water Heater Replacement	Dunellen High School	0	0	565	\$28,200	\$700	\$0	\$27,500	\$521	\$0	\$521	52.8	-13%	15	(\$21,712)	3.3
7	Boiler Replacement	Dunellen High School	0	0	5,082	\$180,000	\$4,000	\$0	\$176,000	\$4,679	\$2,000	\$2,679	65.7	2%	35	(\$41,189)	29.8
8	Domestic Water Heater Replacement	Faber Elementary School	0	0	648	\$45,152	\$920	\$0	\$44,232	\$591	\$0	\$591	74.8	-16%	15	(\$37,659)	3.8
Total			376,967	135	18,258	\$1,029,914	\$91,124	\$0	\$938,791	\$76,418	\$2,000	\$74,418	12.6	-	-	-	232

Notes:

1. kW - Where Zero (0) values are shown in the table there is no demand reduction for this measure.
2. Rebates- Where Zero (0) values are shown in the table we could not find any rebates of other financial incentives that are currently available for this measure.
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5. Net Implementation Cost is the Gross Installation Cost less any Rebate/Incentive and any Avoided Cost. In the case of equipment that is being replaced regardless, Net Implementation Cost represents the incremental cost incurred by upgrading to equipment that produces more energy savings.
6. Interest Rate is set to 4% for NPV calculations

DUNELLEN PUBLIC SCHOOLS
ECMs

ECM #	Energy Conservation Measures (ECM)	Buildings	Energy Savings kWh	Demand Savings kW	Energy Savings Therms	Gross Installation Cost*	Rebates/ Incentives	Avoided Cost	Net Implementation Costs	Annual Energy Cost Savings	Annual Oper. Cost Savings	Total Annual Cost Savings	Simple Payback	Internal Rate of Return (IRR) (Net)	Measure Life Yrs	Lifecycle Savings (NPV)	CO2 Savings Tons
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Energy Audit Purpose & Scope

Purpose:

- The objectives of the energy audit are to evaluate each site's energy consumption, establish baselines for energy efficiency and identify opportunities to reduce the amount of energy used and/or its cost.

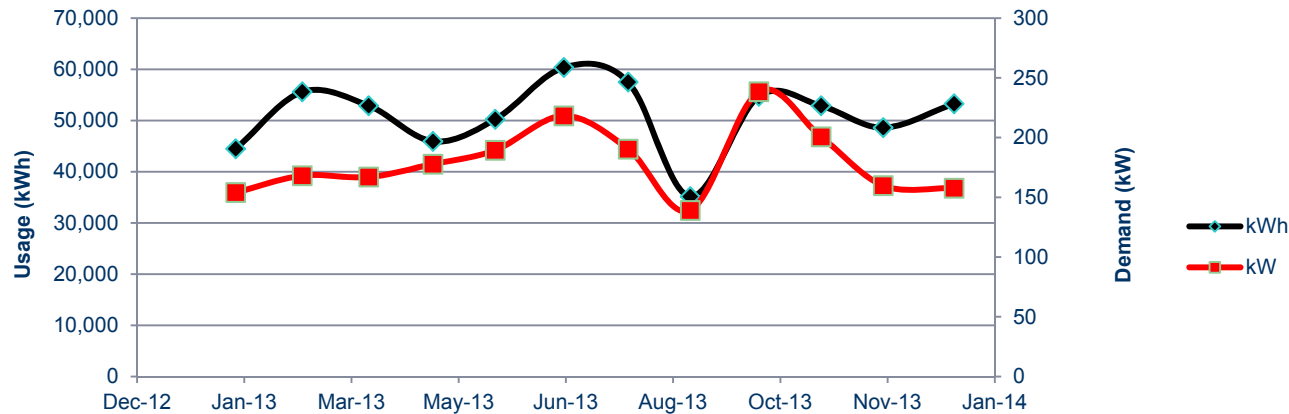
Scope:

- I. Historic Energy Consumption: Benchmark energy use using the Energy Star Portfolio Manager
- II. Facility Description: Characterize building usage, occupancy, size and construction.
- III. Equipment Inventory: Detailed equipment list including useful life and efficiency.
- IV. Energy Conservation Measures: Identify and evaluate opportunities for cost savings and economic returns.
- V. Renewable/Distributed Energy Measures: Evaluate economic viability of various renewable/distributed energy technologies.
- VI. Energy Purchasing and Procurement Strategies: Perform utility tariff analysis and assess potential for savings from energy procurement strategies.
- VII. Method of Analysis: Appendices



Historic Energy Consumption

Utility Usage and Costs Summary - Faber Elementary School - Electric (2013)



Utility Provider	Public Service Electric Gas Company (PSEG)				
Account Numbers	42 007 801 00	69 626 934 00			
Meter Numbers	778 013 891	Unmetered (Street Lighting)			
Rate	LPLS	BPL			
Third Party Supplier	Direct Energy	Account #	101 6203		
Month	Usage kWh	Demand kW	Delivery Cost	Supply Cost	Total Cost
Jan-13	44,483	154	\$2,531	\$4,208	\$6,739
Feb-13	55,591	168	\$2,911	\$4,941	\$7,852
Mar-13	52,893	167	\$2,734	\$4,957	\$7,690
Apr-13	45,930	178	\$2,573	\$4,337	\$6,910
May-13	50,228	189	\$2,735	\$4,719	\$7,455
Jun-13	60,360	218	\$5,055	\$5,621	\$10,676
Jul-13	57,513	190	\$3,764	\$5,368	\$9,131
Aug-13	35,137	139	\$3,374	\$3,376	\$6,750
Sep-13	54,727	239	\$5,161	\$5,120	\$10,280
Oct-13	52,870	201	\$2,964	\$4,955	\$7,919
Nov-13	48,617	160	\$2,696	\$4,576	\$7,272
Dec-13	53,267	158	\$2,828	\$4,990	\$7,818
Totals/Average	611,616	180	\$39,327	\$57,167	\$96,494

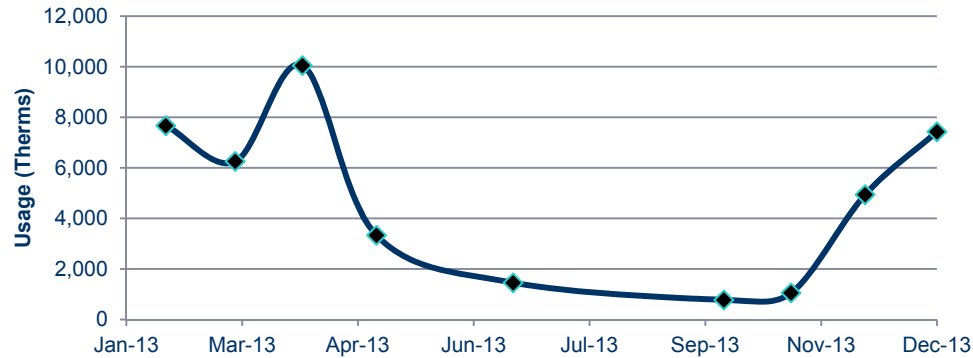
Average Delivery Rate	\$0.06 /kWh
Average Supply Rate	\$0.09 /kWh
Average Rate	\$0.16 /kWh
Annual Peak Demand	239 kW

Note: Supply rate includes fixed commodity price of \$0.089/kWh + Transmission Demand Adjustment at \$1.284/kWh.
Annual supply demand is ratcheted at 194.2 kW.



Historic Energy Consumption (cont'd)

Utility Usage and Costs Summary - Faber Elementary School – Gas (2013)



Utility Provider	Public Service Electric Gas Company (PSEG)			
Account Number	67 407 928 01	Meter #	252 30 55	
Rate	LVG			
Third Party Supplier	Hess	Account #	359 294/361 121	
Month	Usage Therms	Delivery Cost	Supply Cost	Total Cost
Jan-13	7,670	\$2,604	\$4,418	\$7,022
Feb-13	6,256	\$2,120	\$3,603	\$5,723
Mar-13	10,049	\$3,385	\$5,788	\$9,173
Apr-13	3,331	\$493	\$1,919	\$2,412
Jun-13	1,455	\$415	\$838	\$1,253
Sep-13	777	\$424	\$448	\$872
Oct-13	1,051	\$248	\$606	\$854
Nov-13	4,940	\$2,100	\$2,845	\$4,945
Dec-13	7,429	\$2,633	\$4,279	\$6,912
Totals/Average	42,959	\$14,421	\$24,744	\$39,166

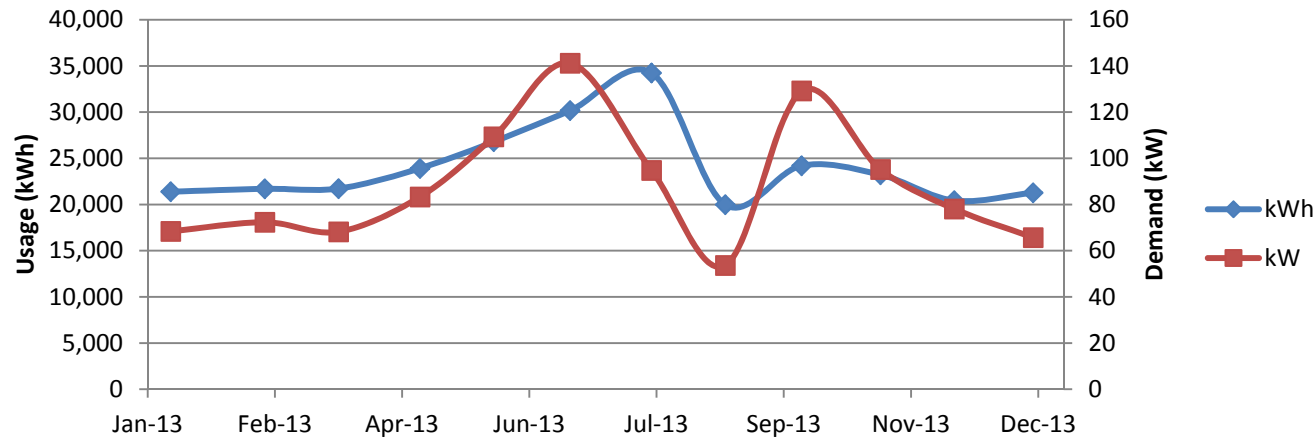
Average Delivery Rate	\$0.34 /Therm
Average Supply Rate	\$0.58 /Therm
Average Rate	\$0.91 /Therm

Note:
 June bill includes May – June
 September bill includes July - September



Historic Energy Consumption (cont'd)

Utility Usage and Costs Summary - Lincoln Middle School- Electric (2013)



Utility Provider	Public Service Electric Gas Company (PSEG)				
Account Number	42 000 345 06		Meter Number	778 013 091	
Rate	LPLS				
Third Party Supplier	Direct Energy		Account #	101 6203	
Month	Usage kWh	Demand kW	Delivery Cost	Supply Cost	Total Cost
Jan-13	21,384	68	\$1,420	\$2,073	\$3,493
Feb-13	21,699	72	\$1,254	\$2,101	\$3,355
Mar-13	21,726	68	\$1,228	\$2,103	\$3,332
Apr-13	23,908	83	\$1,343	\$2,298	\$3,641
May-13	26,804	109	\$1,517	\$2,555	\$4,072
Jun-13	30,165	141	\$2,958	\$2,855	\$5,813
Jul-13	34,247	95	\$2,543	\$3,218	\$5,761
Aug-13	19,978	54	\$1,619	\$1,948	\$3,567
Sep-13	24,203	129	\$2,652	\$2,324	\$4,976
Oct-13	23,219	95	\$1,414	\$2,236	\$3,651
Nov-13	20,425	78	\$1,270	\$1,988	\$3,257
Dec-13	21,275	66	\$1,251	\$2,063	\$3,315
Totals/Average	289,033	88	\$20,470	\$27,762	\$48,232

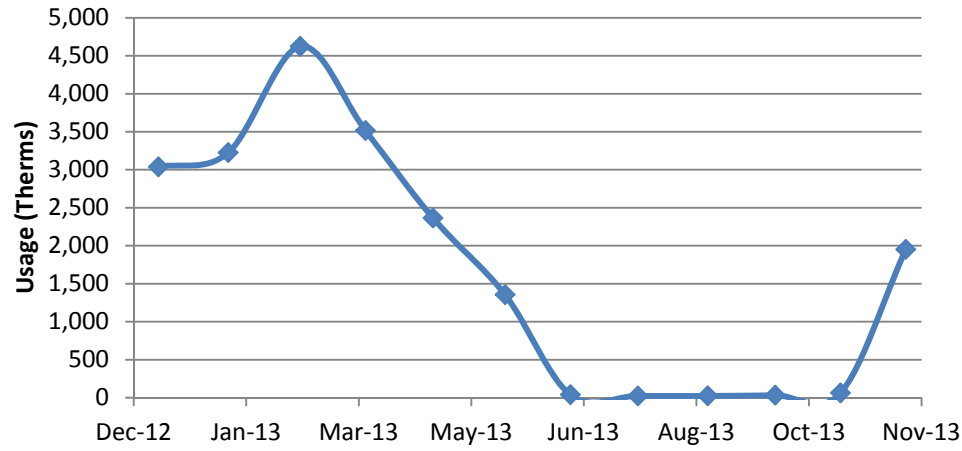
Average Delivery Rate	\$0.071 /kWh
Average Supply Rate	\$0.096 /kWh
Average Rate	\$0.167 /kWh
Annual Peak Demand	141 kW

Note: Supply rate includes fixed commodity price of \$0.089/kWh + Transmission Demand Adjustment at \$1.360/kW. Annual supply demand is ratcheted at 124.8 kW.



Historic Energy Consumption (cont'd)

Utility Usage and Costs Summary - Lincoln Middle School - Gas (2012-2013)



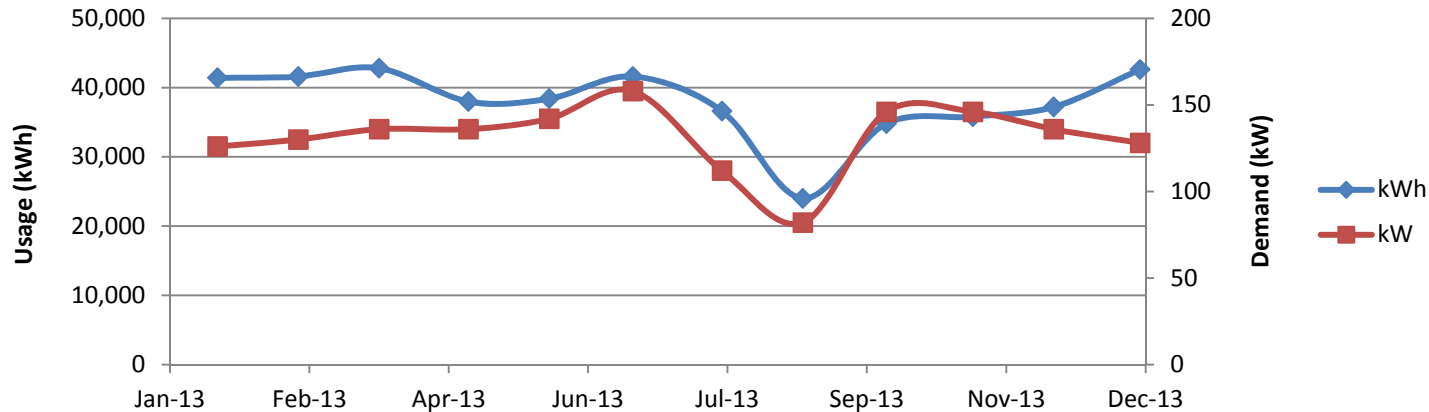
Utility Provider	Public Service Electric Gas Company (PSEG)			
Account Number	42 000 345 06	Meter Number	241 3079	
Rate	LVG			
Third Party Supplier	Hess Gas	Account #	359 294/361 121	
Month	Usage Therms	Delivery Cost	Supply Cost	Total Cost
Dec-12	3,038	\$1,210	\$1,722	\$2,932
Jan-13	3,226	\$1,202	\$1,829	\$3,031
Feb-13	4,624	\$1,671	\$2,622	\$4,293
Mar-13	3,516	\$1,434	\$1,993	\$3,427
Apr-13	2,364	\$390	\$1,340	\$1,730
May-13	1,355	\$282	\$768	\$1,050
Jun-13	39	\$110	\$22	\$132
Jul-13	23	\$108	\$13	\$121
Aug-13	23	\$108	\$13	\$121
Sep-13	33	\$109	\$19	\$128
Oct-13	61	\$113	\$35	\$148
Nov-13	1,950	\$1,038	\$1,106	\$2,144
Totals/Average	20,252	\$7,773	\$11,483	\$19,256

Average Delivery Rate	\$0.38 /Therm
Average Supply Rate	\$0.57 /Therm
Average Rate	\$0.95 /Therm



Historic Energy Consumption (cont'd)

Utility Usage and Costs Summary - Dunellen High School – Electric (2013)



Utility Provider	Public Service Electric Gas Company (PSEG)				
Account Number	42 005 427 06	69 630 576 05			
Meter Number	778 020 390	Unmetered			
Rate	LPLS	BPL			
Third Party Supplier	Direct Energy				
TPS Account #	359 294/448 244				
Month	Usage, kWh	Demand, kW	Delivery Cost	Supply Cost	Total Cost
Jan-13	41,723	126	\$2,119	\$3,882	\$6,001
Feb-13	41,925	130	\$2,089	\$3,900	\$5,989
Mar-13	43,074	136	\$2,120	\$4,003	\$6,122
Apr-13	38,234	136	\$1,983	\$3,572	\$5,555
May-13	38,631	142	\$2,015	\$3,607	\$5,622
Jun-13	41,797	158	\$3,553	\$3,889	\$7,442
Jul-13	36,811	112	\$2,876	\$3,445	\$6,321
Aug-13	24,225	82	\$2,137	\$2,325	\$4,462
Sep-13	35,083	146	\$3,232	\$3,291	\$6,523
Oct-13	36,087	146	\$2,034	\$3,381	\$5,414
Nov-13	37,557	136	\$2,045	\$3,512	\$5,556
Dec-13	42,951	128	\$2,179	\$3,992	\$6,171
Totals/Average	458,098	132	\$28,380	\$42,798	\$71,179

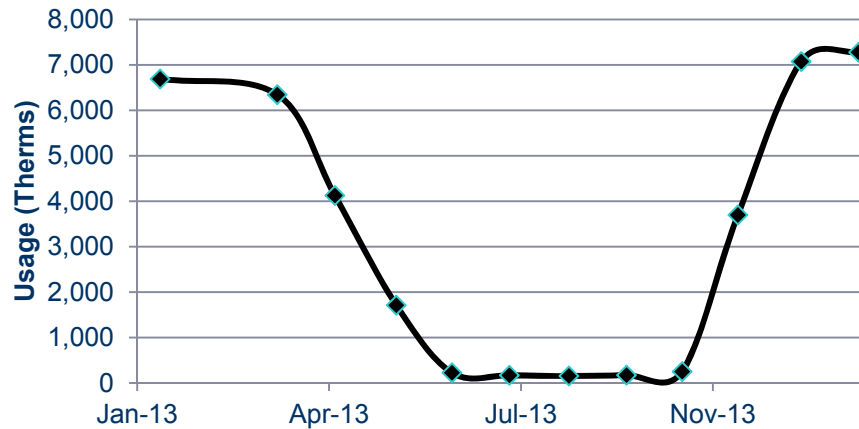
Average Delivery Rate	\$0.062 /kWh
Average Supply Rate	\$0.093 /kWh
Average Rate	\$0.155 /kWh
Annual Peak Demand	158 kW

Note: Supply rate includes fixed commodity price of \$0.089/kWh + Transmission Demand Adjustment at \$1.362/kW. Annual supply demand is ratcheted at 123.9 kW.



Historic Energy Consumption (cont'd)

Utility Usage and Costs Summary - Dunellen High School – Gas (2012-2013)



Utility Provider	Public Service Electric Gas Company (PSEG)			
Account Number	67 461 494 04	Meter #	179 23 30	
Rate	LVG			
Third Party Supplier	Hess	Account #	359 294/448 244	
Month	Usage Therms	Delivery Cost	Supply Cost	Total Cost
Jan-13	6,691	\$2,439	\$3,794	\$6,233
Mar-13	6,346	\$2,466	\$3,598	\$6,065
Apr-13	4,127	\$577	\$2,340	\$2,917
May-13	1,713	\$320	\$971	\$1,292
Jun-13	227	\$137	\$129	\$265
Jul-13	170	\$129	\$96	\$225
Aug-13	157	\$127	\$89	\$216
Sep-13	175	\$129	\$99	\$229
Oct-13	253	\$140	\$143	\$283
Nov-13	3,697	\$1,800	\$2,096	\$3,896
Dec-13	7,075	\$2,516	\$4,012	\$6,528
Jan-14	7,279	\$2,625	\$4,127	\$6,752
Totals/Average	37,910	\$13,405	\$21,495	\$34,900

Average Delivery Rate	\$0.354 /Therm
Average Supply Rate	\$0.567 /Therm
Average Rate	\$0.921 /Therm



Portfolio Manager / Energy Star

ENERGY STAR SCORES

- *Energy Star* Scores are calculated to establish a facility-specific energy intensity baseline.
- *Energy Star* can be used to compare energy consumption to other similar facilities and to gauge the success of energy conservation and cost containment efforts.
- Buildings with an *Energy Star* rating/score of 75 or above are eligible to apply for an official *Energy Star* Building label.

Facility Name	Total Floor Area (sq./ft.)	Energy Star Score	Eligible to Apply for ENERGY STAR	Current Site Energy Intensity (kBtu/sq.ft.)	Current Source Energy Intensity (kBtu/sq.ft.)	Average Site EUI by Building Type	Utility Cost (\$/sq.ft.)		
							Gas	Electric	Total
Faber Elementary School	89,203	24	NO	69.7	121.4	55.2 - Elm. School	\$0.44	\$1.08	\$1.52
Lincoln Middle School	26,248	13	NO	107.7	182.4	73.8 - Md. School	\$0.73	\$1.84	\$2.57
High School	77,794	62	NO	66.3	111.1	74.5 - High School	\$0.45	\$0.91	\$1.36

- Note that Lincoln Middle School appears to have a lower score than the high school. This may be because some of the spaces in the High School building are fed from the Middle School.
- Dome-Tech recommends a total power analysis of the Middle School and High School to establish which areas are connected to which electric meter. This effort requires tracing of the existing power wiring and it is beyond the scope of a Local Government Energy Audit.



Portfolio Manager / Energy Star (cont'd)

Portfolio Manager Sign-In

- An account has been created for Dunellen Public Schools in Portfolio Manager. You should have received an email to notify you of the generation of this account and shared access with Dome-Tech.
- Now that the report has been finalized, you have full access to use/edit the information and change/update it as necessary.
- Website link to sign-in:
- <http://www.energystar.gov/portfoliomanager>





Facility Information

Building Name:

Faber Elementary School

Address:

High and Lehigh Streets
Dunellen, NJ 08812

Gross Floor Area:

89,203 sq ft

Year Built:

1960. Additions completed in 1996 and 2006.

Occupants:

Approximately 570 students and 79 staff members

Building Usage:

Elementary school, serving Pre-Kindergarten to Fifth grade.

Classes scheduled from approximately 8AM to 3PM, Monday thru Friday, with various before and after school programs. Some weekend usage every other weekend for sports. This facility also houses the District Board of Education on the second floor of the south wing, which operates between 8 AM and 4 PM.

Facility is open between 6 AM and 11 PM for custodial and other support services.



Construction Features:

Façade:

Concrete block and face brick façade in good condition.

Roof Type:

Mostly flat built up roof with black EPDM membrane in good condition.
Pitched (attic) roof over 1996 structure and the all purpose room.

Windows:

Replaced in 2006. Operable aluminum frame windows with double pane clear glass. Covering approximately 25% of the façade. Excellent condition.

Exterior Doors:

Approximately ten (10) sets of doors, aluminum frame with double pane glass in good condition. 1960 building doors are old and have single pane windows.

Facility Information (cont'd)

Major Mechanical Systems – Faber Elementary School

HVAC Systems

- Media Center (12.5 Ton) and Computer Laboratory (4 Ton) are conditioned via two (2) Carrier Rooftop Units installed in 1996.
 - *These units are 19 years old and they appear to be in fair condition. The units are at the end of their useful life as per ASHRAE.*
 - *Units are equipped with packaged DX cooling and natural gas heating coils.*
- Gymnasium area is conditioned via four (4) 12.5 Ton Carrier Rooftop Units installed in 1996.
 - *These units appear to be in acceptable condition. However, they are near the end of their useful life as per ASHRAE.*
 - *Units are equipped with packaged DX cooling and natural gas heating coils.*
- Gymnasium locker rooms are connected to a heat-only make-up air unit made by Reznor.
 - *Although it appears to be in good condition, the unit does not operate on a regular basis.*
- Board of Education Office on the second floor of the original (1960) structure was recently renovated. The space is conditioned with a split air conditioning system with two (2) remote DX condensers and indoor air handler with hot water heating coils.
 - *Total cooling capacity of the split system is 15 tons.*
 - *The system was installed in 2011.*



Facility Information (cont'd)

Major Mechanical Systems – Faber Elementary School

HVAC Systems (cont'd)

- 2006 addition houses the main entrance, main office, a conference room, several classrooms and nurses office.
 - *The main office and the classrooms are conditioned with a larger (25 Ton) Carrier VAV packaged rooftop air conditioning unit with DX cooling and natural gas heating.*
 - *Similarly, the nurses office and several additional spaces are conditioned with a 10 Ton Carrier packaged rooftop air conditioning unit with natural gas heat.*
 - *Both units are in excellent condition.*
- Some of the classrooms in the older spaces are conditioned via approximately 20 window air conditioning units.
 - *The units vary in size between 12,000 to 18,000 BTU/hr. The majority of the units are recent models with Energy Star certification*
- 1960 wing classrooms are heated and ventilated with the original unit ventilators made by Nesbitt.
 - *The units are significantly past their useful life and appear to be in poor condition.*
 - *The units are connected to the building's hot water heating loop. The units are not equipped with any cooling.*
 - *The units are connected to the original pneumatic control system*
- 1995 wing classrooms also have Nesbitt Unit Ventilators.
 - *The units are connected to the building's hot water heating loop. The units are not equipped with any cooling.*
 - *The units are connected to the digital Building Automation System.*



Facility Information (cont'd)

Major Mechanical Systems – Faber Elementary School

HVAC Systems (cont'd)

- Original All-Purpose room heating and ventilation is provided with an H&V unit suspended in the stage area ceiling.
 - *The unit is connected to the building hot water heating loop via two (2) 3/4 HP circulators.*
 - *The space also has hot water baseboard heaters which were installed approximately 15 feet off the floor.*
 - *There are temperature stratification issues in this space due to placement of the hot water radiators. There is a significant temperature difference between the floor and ceiling.*
 - *It is recommended to install de-stratification fans to eliminate temperature stratification.*



Hot Water Heating Systems

- The building is served by two separate boiler rooms located in the North and South wings.
- North boiler room (2005)
 - *There are a total of twelve (12) HydroTherm modular, 300 MBH standard efficiency, gas fired hot water boilers with a total output capacity of 2,820 MBH.*
 - *These boilers appear to be in excellent condition.*
 - *The heating hot water is circulated via a set of two (2) 3 HP lead/lag base-mount pumps.*
- South boiler room (1995)
 - *There are a total of seven (7) SlantFin (CARAVAN) modular, 375 MBH standard efficiency, gas fired hot water boilers with a total output capacity of 2,625 MBH.*
 - *These boilers appear to be in excellent condition.*
 - *The heating hot water loop is energized via a set of two (2) 3 HP lead/lag inline circulators.*

Facility Information (cont'd)

Major Mechanical Systems – Faber Elementary School

Domestic Hot Water

- There are four (4) separate domestic water heaters scattered around the facility.
- All of the water heaters are standard efficiency gas fired units
- Each unit was added as the building was renovated or expanded in 1995 and 2005.
 1. PVI water heater (Est 200 gallon) serves the lockers rooms near Gymnasium. The unit appears to be over 10 years old.
 2. AO Smith water heater (80 gallon) serves faucets and bathrooms in the 1995 addition
 3. AO Smith water heater (100 gallon) serves faucets and bathrooms in the 2005 addition
 4. AO Smith water heater (300 gallon) serves the kitchen, which was added in 2005.
- All the water heaters have small circulators which are controlled via an aqua-thermostat. Circulators vary in size between 1/6 HP and 1/4 HP.
- Kitchen dishwasher is coupled with a 27 kW electric booster heater.



Facility Information (cont'd)

Major Mechanical Systems – Faber Elementary School

Exhaust Fans

- Ventilation air is drawn into the classrooms via unit ventilators and offices via rooftop units. Then nearly equal amount of air is exhausted from the corridors and other common spaces via ~15 roof exhausters.
- Some of the exhaust fans appear to be on time clocks. Others remain off or run 24/7. The control switches of many of the roof exhausters could not be located during the survey.



Controls

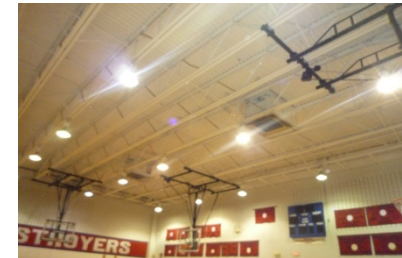
- The Faber Elementary School has a Carrier Comfort DDC Building Automation System which controls all of the major HVAC equipment in the facility except those in the 1960 wing.
- The Carrier BMS system is connected to the rooftop units, unit ventilators, boilers and pumps. The control system is capable of monitoring all the units and implementing time of day schedules.
- The BMS is connected to local thermostats in each space.
- 1960 wing HVAC equipment (unit ventilators, cabinet heaters, and All Purpose Room H&V unit) are still connected to the original pneumatic control system. The pneumatic system is robust but it has limited control features. However, it appears to have some night setback capability.
- The pneumatic system is energized via a 2 x 1 HP duplex air compressor in excellent condition.

Facility Information (cont'd)

Lighting Systems – Faber Elementary School

Interior Lighting

- Majority of the spaces in the Faber Elementary Schools is provided with fluorescent lighting fixtures with 700 series 32W T8 lamps and electronic ballasts.
- 1960 wing classrooms are lit with fluorescent fixtures with 34W T12 lamps.
- Some newly renovated spaces are lit via compact fluorescent lamps in recessed can fixtures.
- Gymnasium lighting is provided with 400W metal halide fixtures.
- All purpose room lighting is provided with 400W metal halide fixtures. Stage area has 300W incandescent fixtures.
- Library is lit with a combination of 100W metal halide and fluorescent fixtures.
- Some of the exit signs have incandescent lamps.
- The lights are controlled via local light switches.
- There are no automated lighting controls in this facility. Lights are switched off by the custodians at night.



Exterior Lights

- Exterior lighting is provided with wall-pack fixtures with 175W metal halide lamps.
- The parking lots are lit via pole lights which are owned and operated by the utility company.





Facility Information

Building Name:

Lincoln Middle School

Address:

400 Dunellen Avenue
Dunellen, NJ 08812

Gross Floor Area:

26,248 sq ft

Year Built:

1929 with several major renovations, last in 1996 and 2005.

Occupants:

Approximately 256 students and 20 staff members

Building Usage:

Middle School, serving sixth to eighth graders. Classes scheduled from approximately 8AM to 3PM, Monday to Friday, with various before and after school programs. Little weekend usage. Average occupancy: 10 hours per day.
No summer school.



Construction Features:

Façade:

Concrete blocks with painted brick façade in good condition.

Roof Type:

Built up roof, flat with black rubber cover, in good condition.

Windows:

Covering 20% of façade, operable aluminum frames, double pane glass, in good condition.

Exterior Doors:

Approximately eight (8) sets of doors, aluminum frame with double pane glass.

Facility Information (cont'd)

Major Mechanical Systems – Lincoln Middle School

HVAC Systems

- Space conditioning is provided via three (3) packaged VAV rooftop air conditioning units with DX cooling coils and natural gas heating coils.
- The units serve approximately 12 VAV boxes. The units are equipped with Variable Frequency Drives and inverter duty premium efficiency motors.
 - RTU #1 (60 Ton) serves Majority of the 2005 expansion (Main offices and faculty room).
 - RTU #2 (40 Ton) serves Cafetorium.
 - RTU #3 (35 Ton) serves 8 classrooms and the guidance office.
- The rooftop units were installed in 2005 and they appear to be in excellent condition.



Heating Systems

- There are five (5) HydroTherm modular, 300 MBH standard efficiency, gas fired hot water boilers with a total output capacity of 1,200 MBH.
 1. *The boilers were installed in 1996 and they appear to be in good condition.*
- Heating hot water from the boilers is circulated throughout the building via two (2) sets of 2 HP (est) lead/lag inline hot water circulators.
 - *Two (2) of the pumps are set up as lead/lag circulators for the new section of the building.*
 - *The other two (2) pumps serve the original section of the building.*
- Hot water is circulated through the VAV reheat coils, hot water radiators etc.
- Entrance lobbies and corridors on the perimeter are heated with hot water convectors or radiators.
- Some of the bathrooms in this building was significantly overheated due to temperature control issues.

Facility Information (cont'd)

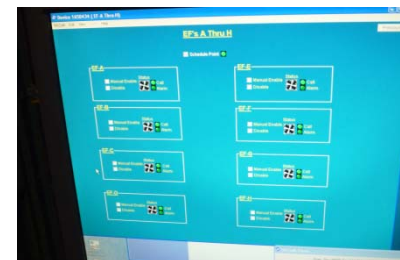
Major Mechanical Systems – Lincoln Middle School

Domestic Hot Water

- There are two (2) standard efficiency gas fired domestic water heaters in this facility.
- The water heaters have small circulators, which are controlled via an aqua-thermostat.
- In addition, there is a small electric domestic hot water heater in a mechanical closet in the second floor, which appears to be disconnected.

HVAC Controls

- The Lincoln Middle School and Dunellen High School has an Envision DDC Building Automation System, which controls all of the major HVAC equipment in both buildings.
- The automation system is based in the High School building, which is adjacent to the Middle School.
- The system is capable of monitoring and scheduling rooftop units and VAV boxes in the building, as well as boilers, pumps and exhaust fans.



Facility Information (cont'd)

Major Mechanical Systems – Lincoln Middle School

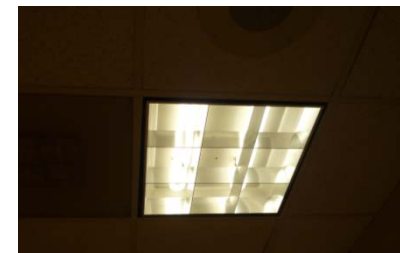
Kitchen & Cafetorium

- The kitchen is equipped with commercial reach-in refrigerators, gas stove, gas warmers and small cooking hood.
- The Cafetorium is a large multi-function space with large double pane aluminum windows and doors.
- The Cafetorium is conditioned with a dedicated rooftop unit (RTU #2).



Interior Lighting

- Original spaces have fluorescent lighting fixtures with 700 series 32W T8 lamps and electronic ballasts.
- Some of the spaces in the new section have fluorescent lighting fixtures with 800 series 31W U8 lamps and electronic ballasts.
- Main lobby and the corridor are lit via compact fluorescent lamps in recessed can fixtures.
- The lights are controlled via local light switches.
- There are no automated lighting controls in this facility. Lights are switched off by the custodians at night.



Exterior Lights

- Exterior lighting is provided with wall-pack fixtures with 175W metal halide lamps and several other fixtures with HID lamps and incandescent lamps.





Facility Information

Building Name:

Dunellen High School

Address:

411 First Street
Dunellen, NJ 08812

Gross Floor Area:

77,794 sq ft

Year Built:

1930 with several major renovations, last in 2006.

Occupants:

Approximately 333 students and 61 staff members

Building Usage:

High School, serving ninth to twelfth grades. Classes scheduled from approximately 8AM to 3PM, Monday to Friday, with various before and after school programs. Limited weekend usage. Average occupancy: 10 hours per weekday. The building is used for summer school.



Construction Features:

Façade:

Concrete blocks with painted brick façade in good condition.

Roof Type:

Built up roof, flat with black rubber cover in good condition.

Windows:

Covering 20% of façade, operable aluminum frames, double pane glass, in good condition.

Exterior Doors:

Approximately ten (10) sets of metal doors with and without glass, in good condition.

Facility Information (cont'd)

Major Mechanical Systems – Dunellen High School

HVAC Systems - Classrooms

- Heating and ventilation for the classrooms are provided by approximately forty (40) unit ventilators.
- There are several different vintages of unit ventilators including several units from the 1960s and other units from the 1980s/1990s.
- The unit ventilators are heating only with hot water heating coils.
- Condition of the outside air dampers and actuators were reported to be okay. However, this could not be verified during the survey.
- Cooling for some of the classrooms is provided window unit air conditioners.
 - *There are approximately 10 window air conditioners on this site. Some of the units were removed for the winter.*
- Two (2) classrooms have ductless split air conditioning units with wall mounted indoor units.
 - *One of the units is an older 3-ton model made by EMI.*
 - *The other unit is a high efficiency 3-ton Fujitsu unit in great condition.*
- Two (2) classrooms have ductless split air conditioning units with ceiling cassette evaporators.
 - *Both of these units are out of commission.*



Facility Information (cont'd)

Major Mechanical Systems – Dunellen High School

HVAC Systems – Packaged Rooftop Air Conditioners with Natural Gas Heat

- One (1) 5-Ton Trane RTU (2005) serves the main office. It is in excellent condition.
- One (1) 4-Ton Lennox RTU (1993) serves Special education services. Fair condition. It has past the end of its useful service life.
- One (1) 40-Ton Trane RTU (2005) serves the Auditorium Seating Area. Excellent condition.
- Two (2) 5-Ton Carrier RTUs (1999) serves the Library seating area. (Cooling only). Good condition.
- One (1) 20-Ton Trane RTU (2005) serves the Auditorium Stage. Excellent condition.



HVAC Systems – Heating and Ventilation Units

- Gymnasium heating and ventilation is provided with two (2) heating and ventilation units with hot water coils suspended in the ceiling.
- Bathrooms and entryways are heated with hot water convectors.
- Locker rooms are heated with H&V units and supplemented with unit heaters.



Facility Information (cont'd)

Major Mechanical Systems – Dunellen High School

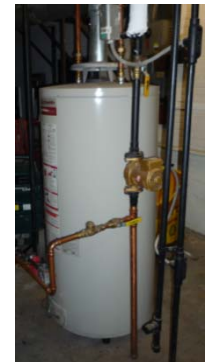
Heating Systems

- The building is served by two (2) H.B. Smith Co. boilers, located in the boiler room. Units are built in 1959 and appear to be in fair condition.
- The boilers are coupled with modulating burners by Industrial Combustion.
- The boiler and pipes have asbestos insulation.
- Heating hot water from the boilers is circulated throughout the building via two (2) sets lead/lag inline hot water circulators (4 pumps total)
 - *Two (2) of the pumps are set up as lead/lag circulators for the 1960 wing. (3 HP + 5 HP)*
 - *The other two (2) 3 HP pumps serve the west wing. Pumps appear to be in good condition.*



Domestic Hot Water

- One (1) standard efficiency, 71 Gallon AO Smith Domestic Water Heater serves the bathrooms and faucets in the laboratories.
- Another domestic water heater serves the kitchen. This water heater was not accessible during the survey.



Controls

- The Lincoln Middle School and Dunellen High School have an Envision DDC Building Automation System, which controls all of the major HVAC equipment in both buildings.
- The system is capable of monitoring and scheduling rooftop units and VAV boxes in the building, as well as boilers, pumps and exhaust fans.
- 1960 wing HVAC equipment (unit ventilators, cabinet heaters) are still connected to the original pneumatic control system. The pneumatic system is robust but has limited control features. The pneumatic system is energized via a 2 x 1 HP duplex air compressor in excellent condition.

Facility Information (cont'd)

Major Mechanical Systems – Dunellen High School

Kitchen & Cafeteria

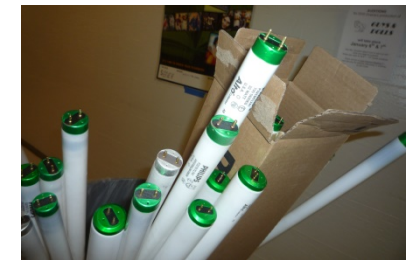
- The kitchen is equipped with commercial reach-in refrigerators, gas stove, gas warmers and a large (5x15) cooking hood.
- The facility has one walk-in refrigerator and one walk-in freezer (outdoor).
- There is a commercial dishwasher with electric booster heater.
- The gas stove has large pilot light which is ON 24/7.
- Cafeteria is reported to have asbestos ceiling tiles.

Interior Lighting

- Ceiling tiles in the West Wing are made of asbestos.
- Majority of the spaces have fluorescent lighting fixtures with 700 series 32W T8 lamps and electronic ballasts.
- 1960 wing classrooms are lit with fluorescent fixtures with 34W T12 lamps.
- Gymnasium lighting is provided with 400W metal halide fixtures.
- Auditorium lighting is provided with a combination of 400W metal halides, incandescent lamps and compact fluorescent lamps in the seating area. Stage area is lit with fluorescent T8 fixtures.
- There are a small number of incandescent exit signs in the older spaces.
- The lights are controlled via local light switches. There are no automated lighting controls in this facility. Lights are switched off by the custodians at night.

Exterior Lights

- Exterior lighting is provided with wall-pack fixtures with 175W metal halide lamps and several other fixtures with HID lamps and incandescent lamps.
- The parking lots are lit via pole lights, which are owned and operated by the utility company.



Greenhouse Gas Emission Reduction

Implementation of all identified ECMs will yield:

- 377,000 kilowatt-hours of annual avoided electric usage.
- 18,250 therms of annual avoided natural gas usage.
- This equates to the following **annual** reductions:

- 232 tons of CO₂;

-OR-

- 40 Cars removed from road;

-OR-

- 63 Acres of trees planted annually



The Energy Information Administration (EIA) estimates that power plants in the state of New Jersey emits 0.666 lbs CO₂ per kWh generated.



The Environmental Protection Agency (EPA) estimates that one car emits 11,560 lbs CO₂ per year.



The EPA estimates that reducing CO₂ emissions by 7,333 pounds is equivalent to planting an acre of trees.



Energy Conservation Measures (ECMs) Notes and Assumptions

- The average CO₂ emission rate from power plants serving the facilities within this report was obtained from the Environmental Protection Agency's (EPA) eGRID2007 report. It is stated that power plants within the state of NJ emit 0.66 lbs of CO₂ per kWh generated.
 - *The EPA estimates that burning one therm of natural gas emits 11.708 lbs CO₂.*
 - *The EPA estimates that one car emits 11,560 lbs CO₂ per year.*
 - *The EPA estimates that reducing CO₂ emissions by 7,333 pounds is equivalent to planting an acre of trees.*
- The following utility prices provided were used within this study:

School	Electric (\$/kWh)	Natural gas (\$/therm)
Elementary School	\$0.158	\$0.912
Middle School	\$0.167	\$0.951
High School	\$0.155	\$0.921



ECM #1: Computer Power Management System

	Faber Elementary School	Lincoln Middle School	High School	TOTAL
Number of Computers	111	26	154	291
Estimated Annual Savings:	\$3,260	\$226	\$2,081	\$5,568
Gross Estimated Implementation Cost ¹ :	\$3,330	\$780	\$4,620	\$8,730
Approx. NJ Smart Start Rebate ² :	\$0	\$0	\$0	\$0
Net Estimated Implementation Cost:	\$3,330	\$780	\$4,620	\$8,730
Simple Payback (years):	1.0	3.5	2.2	1.6
Annual Avoided CO ₂ Emissions (tons):	6.9	0.5	4.5	4

¹ Cost estimates based on previous vendor quote

² No prescriptive New Jersey Smart Start rebates are available for this measure

- Computer screen savers were originally developed to prevent the permanent etching of patterns on older monochrome monitors. In this mode, both the computer and monitor consume the same amount of energy as the computer in regular operation, which is approximately 225W for the computer and 75W for the monitor.
- Dome-Tech recommends installing a school district wide computer power management system (such as Verdiem's Surveyor software). This software would place the computers into a standby/sleep mode during periods of inactivity. In this mode, the computer and monitor will draw between 1 and 3 Watts each. This would significantly reduce the computers electrical energy consumption.
 - The computers will "wake up" instantaneously when the mouse or button on the keyboard is touched, causing no interruption during daytime use.
 - When the computers "wake up," all active files and programs will be available as before entering the standby/sleep mode, ensuring no data will be lost.
- This ECM is not expected to reduce the building(s)' electrical demand.

ECM #2: CRT Monitor Replacement

	Faber Elementary School
Number of Computers	37
Estimated Annual Savings:	\$736
Gross Estimated Implementation Cost ¹ :	\$4,440
Approx. NJ Smart Start Rebate ² :	\$0
Net Estimated Implementation Cost:	\$4,440
Simple Payback (years):	6.0
Annual Avoided CO ₂ Emissions (tons):	1.6



¹ Cost estimates based on previous vendor quote

² No prescriptive New Jersey Smart Start rebates are available for this measure

- There are a number of CRT monitors in one or more of these facilities. CRT monitors use significantly more energy than modern LCD or LED monitors.
- Typical CRT monitor uses approximately 75W on an average while an LED monitor uses less than 20W.
- In addition, LED monitors have a longer life span and take up less space.
- Dome-Tech recommends replacing all existing CRT monitors with LED flat panel monitors throughout the facility.
- Installation costs were neglected since this can easily be implemented by the users (teachers) or the IT staff.



ECM #3: Lighting Upgrade

Standard Upgrade	Faber Elementary School	Lincoln Middle School	Dunellen High School	TOTAL
Estimated Annual Savings:	\$12,330	\$3,471	\$7,295	\$23,096
Gross Estimated Implementation Cost ¹ :	\$70,570	\$22,320	\$58,400	\$151,290
Approx. NJ Smart Start Rebate ² :	\$13,880	\$4,340	\$12,690	\$30,910
Net Estimated Implementation Cost:	\$56,690	\$17,980	\$45,710	\$120,380
Simple Payback (years):	4.6	5.2	6.3	5.2
Annual Avoided CO ₂ Emissions (tons):	26.0	6.9	15.6	48.6

¹ Cost estimates based on actual costs of similar comprehensive lighting projects; see room-by-room surveys in Appendix for details

² See appendix for details on NJ Smartstart rebates

Dome-Tech performed a room-by-room lighting audit of all three school buildings. Audit findings are summarized below:

- Faber Elementary School
 - Majority of the spaces have fluorescent fixtures with 700 series 32W T8 lamps, CFLs. 1960 wing has older fixtures with 34W T12 lamps.
 - Gymnasium and All purpose room lighting is provided with 400W metal halide fixtures. All Purpose Room Stage area has 300W incandescent lamps. Library is lit with a combination of fluorescent fixtures and 150W recessed metal halide fixtures.
 - Some of the exit signs have incandescent lamps. Exterior lighting is provided mostly with 175W metal halide wall-pack fixtures.
- Lincoln Middle School
 - Original spaces have fluorescent lighting fixtures with 700 series 32W T8 lamps and electronic ballasts. New sections have fluorescent lighting fixtures with 800 series 31W U8 lamps and electronic ballasts. The main lobby and the corridor are lit via CFLs in recessed fixtures.
 - The lights are controlled via local light switches.
- High School
 - Spaces have fluorescent lighting fixtures with a combination of T8 and T12 lamps.
 - Gymnasium lighting is provided with 400W metal halides.
 - Auditorium lighting is provided with a combination of 400W metal halides, incandescent lamps and compact fluorescent lamps.
 - There are a small number of incandescent exit signs in the older spaces.



ECM #3: Lighting Upgrade (Cont'd)

Dome-Tech recommends the following strategies for lighting upgrade opportunities at the Dunellen Public Schools

- Re-lamp and re-ballast existing fluorescent fixtures with F28T8 fixtures and energy efficient program start ballasts.
- Replace the fixtures only if they are significantly old and deteriorated.
- Please note that other consultants needs to be hired before doing any renovation in spaces with asbestos ceilings. The cost of this measure does not include asbestos abatement efforts.
- Replace 8-ft T12 fixtures with 8ft 4 lamp fixtures fitted with F28T8 lamps.
- Replace all the incandescent lamps with either CFLs (Compact Fluorescent Lamps) or LED lamps.
- Replace metal halide high-bay fixtures with high output fluorescent fixtures with T5HO lamps, mirrored reflectors, and wire guard.
- Replace metal halide exterior fixtures with LED exterior fixtures.

ECM #4: Lighting Upgrade – LED

Incremental Analysis	Faber Elementary School	Lincoln Middle School	Dunellen High School	TOTAL
Estimated Annual Savings:	\$3,963	\$2,116	\$3,345	\$9,423
Gross Estimated Implementation Cost ¹ :	\$56,245	\$23,405	\$43,650	\$123,300
Approx. NJ Smart Start Rebate ² :	\$16,380	\$1,410	\$13,640	\$31,430
Net Estimated Implementation Cost:	\$39,865	\$21,995	\$30,010	\$91,870
Simple Payback (years):	10.1	10.4	9.0	9.7
Annual Avoided CO ₂ Emissions (tons):	8.4	4.2	7.2	19.8

¹ Cost estimates based on actual costs of similar comprehensive lighting projects; see room-by-room surveys in Appendix for details

² See appendix for details on NJ Smartstart rebates

Dome-Tech performed an incremental analysis in order to show an analysis of upgrading the existing light fixtures with LED lamps.



- Analysis is based on replacing the existing T8 or T12 tubes with LED tubes.
- LED tube lighting installation is fairly straight forward. First, the existing ballast is bypassed. Then, the fluorescent tubes are simply replaced with LED tubes.
- The analysis suggests that the incremental cost of LED tubes as compared to F28T8 tubes pays back in approximately 9 to 12 years. The variation is due to whether the existing lamps are T12s or T8s.
- Note that this ECM is based on incremental cost and savings over ECM #3. Total cost and savings associated with full LED upgrade are as follows.

LED Upgrade	Faber Elementary School (Alt)	Lincoln Middle School (Alt)	Dunellen High School (Alt)	TOTAL
Estimated Annual Savings:	\$16,292	\$5,587	\$10,640	\$32,519
Gross Estimated Implementation Cost ¹ :	\$126,815	\$45,725	\$102,050	\$274,590
Approx. NJ Smart Start Rebate ² :	\$30,260	\$5,750	\$26,330	\$62,340
Net Estimated Implementation Cost:	\$96,555	\$39,975	\$75,720	\$212,250
Simple Payback (years):	5.9	7.2	7.1	6.5
Annual Avoided CO ₂ Emissions (tons):	34.4	11.1	22.8	68.3



ECM #5: Lighting Controls Upgrade

Standard Upgrade	Faber Elementary School	Lincoln Middle School	High School	TOTAL
Estimated Annual Savings:	\$3,032	\$1,055	\$2,153	\$6,240
Gross Estimated Implementation Cost ¹ :	\$28,570	\$11,000	\$23,090	\$62,660
Approx. NJ Smart Start Rebate ² :	\$4,315	\$1,960	\$10,055	\$16,330
Net Estimated Implementation Cost:	\$24,255	\$9,040	\$13,035	\$46,330
Simple Payback (years):	8.0	8.6	6.1	7.4
Annual Avoided CO ₂ Emissions (tons):	6.4	2.1	4.6	13.1

¹ Cost estimates based on actual costs of similar comprehensive lighting projects; see room-by-room surveys in Appendix for details

² See appendix for details on NJ Smartstart rebates

Dome-Tech performed a room-by-room lighting audit of all three school buildings. Audit findings are summarized below:

- Currently, Dunellen Schools have no means of automatic controls for lighting.
- Energy savings can be achieved by installing occupancy sensors in classrooms, offices and restrooms.
- An occupancy sensor can switch off the lights when the room is not occupied.
- Dome-Tech recommends installing ceiling mount and/or wall mount occupancy sensors where applicable.
- See Investment Grade Lighting Audit Appendix for detailed calculations.





ECM #6: AC Unit Upgrades

	Faber Elementary School	Dunellen High School	TOTAL
Estimated Annual Savings:	\$6,248	\$1,477	\$7,725
Gross Estimated Implementation Cost:	\$111,150	\$25,180	\$136,330
Approx. NJ Smart Start Rebate:	\$5,306	\$1,288	\$6,594
Net Estimated Implementation Cost:	\$105,845	\$23,892	\$129,737
Simple Payback (years):	16.9	16.2	16.8
Annual Avoided CO ₂ Emissions (tons):	15.5	3.4	18.9

- Some of the packaged rooftop air conditioning units at the Dunellen Schools are past their useful life. These units are in fair or poor condition and need replacement.
- Rooftop replacement is typically a costly undertaking and it cannot always be justified solely by energy savings. This analysis quantifies the energy savings that may be achieved by replacing the older packaged rooftop units.
- The following is the list of equipment that needs to be replaced in the near future.
- Since it has a negative Net Present Value, Dome-Tech does not recommend implementing this ECM for energy savings.

Tag#	Location	Qty	Area Serving	Cooling Capacity (tons)	Cooling EER	Heating Source	Heating Capacity input - MBH	Furnace Efficiency	Flow Type	Outside Air Economizer	Year Mfd
RTU	Faber Elementary School	1	Media Center	12.5	9.5	Natural Gas	250	80%	CAV	No	1995
RTU	Faber Elementary School	1	Computer Room	4	11.2	Natural Gas	115	80%	CAV	No	1995
RTU	Faber Elementary School	4	Gymnasium	12.5	9.5	Natural Gas	250	80%	CAV	Yes	1995
RTU	Roosevelt High School	2	Library	5	9	None	0	0%	CAV	No	1999
RTU	Roosevelt High School	1	Special Education	4	10	Natural Gas	125	80%	CAV	Yes	1995

CAV: Constant Air Volume

ECM #7: Boiler Upgrade

	High School
Estimated Annual Energy Savings:	\$4,643
Estimated Annual O&M Savings:	\$2,000
Gross Estimated Implementation Cost:	\$180,000
Approx. NJ Smart Start Rebate:	\$4,000
Net Estimated Implementation Cost:	\$176,000
Simple Payback (years):	26.5
Annual Avoided CO ₂ Emissions (tons):	30



- The High School Boiler Plant includes two (2) 4,320 MBH, original HB Smith Cast Iron hot water boilers. The boilers are approximately 55 years old.
- Due to age, the boilers require frequent repairs and cause other maintenance issues.
- Cast iron boilers have limited hot water supply temperature reset capabilities due to possible thermal shock and cracking.
- Dome-Tech reviewed energy cost and savings potential for replacing the old cast iron boilers with condensing hot water boilers.
- It is recommended to resize the boiler plant for the building's current heating load.
- An aggressive hot water supply temperature reset strategy is required to achieve proposed savings.
- This ECM is not recommended for implementation as a standalone energy savings measure. However, it should be considered if a holistic energy improvement program is considered in the future (Such as NJ ESIP). See Appendix for detailed calculations.



ECM #8: Domestic Water Heater Replacement

	Faber Elementary School	Lincoln Middle School	Dunellen High School
Estimated Annual Energy Savings:	\$599	\$242	\$553
Estimated Annual O&M Savings:	\$0	\$0	\$0
Gross Estimated Implementation Cost:	\$45,152	\$9,312	\$28,200
Approx. NJ Smart Start Rebate:	\$920	\$240	\$700
Net Estimated Implementation Cost:	\$44,232	\$9,072	\$27,500
Simple Payback (years):	74	37	50
Annual Avoided CO ₂ Emissions (tons):	4	1	3



- Each school has multiple domestic water heaters serving various spaces.
- All of the domestic water heaters are standard efficiency units.
- Condensing water heaters are significantly more efficient than standard water heaters.
- Nevertheless, since there are multiple water heaters in each facility, implementation cost of this ECM is very high.
- Therefore, this ECM is reviewed but not recommended for any of these facilities.
- This ECM should be considered when existing water heaters reach their useful service life.
- See Appendix for a list of water heaters and corresponding replacement strategies.



ECM #9: De-stratification Fans

Standard Upgrade	Faber Elementary School	Dunellen High School	TOTAL
Estimated Annual Savings:	\$604	\$378	\$982
Gross Estimated Implementation Cost:	\$10,000	\$6,000	\$16,000
Approx. NJ Smart Start Rebate:	\$0	\$0	\$0
Net Estimated Implementation Cost:	\$10,000	\$6,000	\$16,000
Simple Payback (years):	16.5	15.9	16.3
Annual Avoided CO ₂ Emissions (tons):	4.9	3.1	8.0

- Stratification is a term used to describe the difference in air temperatures as you go from floor to ceiling in enclosed structures.
- De-Stratification is achieved by efficiently balancing these temperatures from floor to ceiling.
- The de-stratification fans will balance the space temperature, from floor to ceiling and wall to wall. De-stratification fans are typically compact, low-wattage, quiet fans requiring minimal power for operation.
- It is estimated that air stratification results in approximately 10 to 15°F temperature difference between the floor and ceiling of the space. This means the average temperature of the space is approximately 5 to 7.5°F above the temperature on the floor.
- This ECM results with a negative net present value. Therefore, it is not recommended as a stand-alone measure. However, it can be considered as a part of large holistic energy savings plan.
- The following spaces are suitable for this measure:

Index	Building	Space
1	Faber Elementary School	All Purpose Room
2	Faber Elementary School	Gymnasium
3	Dunellen High School	Gymnasium



ECM #10: Kitchen Hood Controls

Standard Upgrade	Faber Elementary School	Dunellen High School	TOTAL
Estimated Annual Savings:	\$491	\$491	\$982
Gross Estimated Implementation Cost:	\$5,000	\$5,000	\$10,000
Approx. NJ Smart Start Rebate:	\$0	\$0	\$0
Net Estimated Implementation Cost:	\$5,000	\$5,000	\$10,000
Simple Payback (years):	10.2	10.2	10.2
Annual Avoided CO ₂ Emissions (tons):	2.4	2.4	0.7



- The kitchen make-up air units provide conditioned air to replace all the air exhausted through the exhaust hood.
- The exhaust hoods at the facility are currently controlled via manual switches. The hoods usually run at nominal capacity during the kitchen hours of operation.
- Installing an efficient the kitchen exhaust control system will reduce the total kitchen exhaust and make-up air quantity.
- Savings will be generated during winter by reducing the amount of make-up air that needs to be conditioned to zone temperature.
- The system includes temperature and smoke sensors, which detect cooking activity and control exhaust and make-up fan accordingly.
- Implementation includes installation of a kitchen exhaust hood control panel which will be connected to the exhaust fan and the makeup air unit.
- Recommended controller is not a variable speed system, which is typically more efficient but has significantly higher implementation cost.
- Basis of design for this ECM is Greenheck Kitchen Ventilation Control/Energy Management System or equivalent.
- Dome-tech recommends implementing this measure due to its high return on investment.

ECM #11: Dishwasher Booster Heater

Standard Upgrade	Faber Elementary School	Dunellen High School	TOTAL
Estimated Annual Savings:	\$362	\$355	\$717
Gross Estimated Implementation Cost:	\$2,750	\$2,750	\$5,500
Approx. NJ Smart Start Rebate:	\$0	\$0	\$0
Net Estimated Implementation Cost:	\$2,750	\$2,750	\$5,500
Simple Payback (years):	7.6	7.8	7.7
Annual Avoided CO ₂ Emissions (tons):	0.5	0.5	1.8



- The kitchens at Faber Elementary School and Dunellen High School are equipped with electric hot water booster heaters for dishwashers.
- A booster heater provides up to 180°F hot water to be supplied to commercial dishwashers.
- Electric booster heater operation costs are significantly higher than gas fired booster heaters.
- Dome-Tech recommends replacing the existing electric booster heaters with gas fired heaters at Faber Elementary School and Dunellen High School kitchens.
- See Appendix for energy savings calculations and other details.



ECM #12: Unit Ventilator Replacement

	Faber Elementary School	Dunellen High School	TOTAL
Estimated Annual Savings:	\$1,608	\$2,144	\$3,751
Gross Estimated Implementation Cost:	\$75,000	\$100,000	\$175,000
Approx. NJ Smart Start Rebate:	\$0	\$0	\$0
Net Estimated Implementation Cost:	\$75,000	\$100,000	\$175,000
Simple Payback (years):	46.6	46.7	46.6
Annual Avoided CO ₂ Emissions (tons):	7.6	10.1	17.7



- Some of the unit ventilators at the Faber Elementary School and Dunellen High School are past their useful life. These units are in fair or poor condition and need replacing.
- There are an estimated 15 unit ventilators at the 1960 wing in Faber Elementary School
- There are an estimated 20 unit ventilators at the 1960 wing in Dunellen High School
- Unit ventilator replacement is typically a costly undertaking and it cannot always be justified solely by energy savings. This analysis quantifies the energy savings that may be achieved by replacing the older units ventilators.
- This ECM includes replacement of the existing older (1960 vintage) unit ventilators with new more efficient unit ventilator.
- The proposed unit ventilators shall be connected to the BMS and shall have demand-controlled ventilation.
- Since it has a negative Net Present Value, Dome-Tech does not recommend implementing this ECM for energy savings.



ECM #13: Demand Controlled Ventilation

Standard Upgrade	Faber Elementary School	Lincoln Middle School	Dunellen High School	TOTAL
Estimated Annual Savings:	\$3,040	\$1,878	\$3,158	\$8,076
Gross Estimated Implementation Cost:	\$30,000	\$8,000	\$26,000	\$64,000
Approx. NJ Smart Start Rebate:	\$0	\$0	\$0	\$0
Net Estimated Implementation Cost:	\$30,000	\$8,000	\$26,000	\$64,000
Simple Payback (years):	9.9	4.3	8.2	7.9
Annual Avoided CO ₂ Emissions (tons):	11.6	6.4	12.8	30.9

- Building codes require that a minimum amount of fresh air be provided to ensure adequate air quality. To comply, ventilation systems often operate at a fixed rate based on an assumed occupancy (e.g., 20 CFM/person multiplied by the maximum design occupancy). Since maximum design occupancy is rarely achieved throughout the entire day, this results in excessive fresh air volumes, which require costly and unnecessary conditioning.
- Demand-controlled ventilation (DCV) controls the amount of outside air being supplied based upon the CO₂ levels generated by building occupants. DCV should be added to any space that is ventilated by a large quantity of outdoor air, and where occupancy varies dramatically (gymnasiums, auditorium, cafeteria and libraries).
- Because CO₂ levels correlate directly with the number of people in an occupied zone, CO₂ sensors will be used to control the ventilation rate of outside air supplied to each zone. Reducing the amount of outdoor air supplied to a zone reduces the energy required to heat and cool that air, while space conditions are kept in compliance with building codes and standards, such as the ASHRAE Indoor Air Quality Standard.
- This ECM has a positive net present value and should be considered for implementation. .

ECM #14: Exhaust Fan Controls

Standard Upgrade	Faber Elementary School	Lincoln Middle School	Dunellen High School	TOTAL
Estimated Annual Savings:	\$1,558	\$651	\$941	\$3,150
Gross Estimated Implementation Cost ¹ :	\$5,000	\$2,000	\$3,000	\$10,000
Approx. NJ Smart Start Rebate ² :	\$0	\$0	\$0	\$0
Net Estimated Implementation Cost:	\$5,000	\$2,000	\$3,000	\$10,000
Simple Payback (years):	3.2	3.1	3.2	3.2
Annual Avoided CO ₂ Emissions (tons):	9.2	3.7	5.5	18.4



- Some of the exhaust fans at each facility are not connected to a timer, running 24/7.
- Exhaust fans can be connected to existing Building Management System and scheduled to shut off during unoccupied hours for saving energy.
- Dome-Tech recommends connecting all the exhaust fans to the Building Management System.



Operational and Maintenance Issues

Faber Elementary School

- Lights in the classrooms stay on until the custodians shut them off later in the day.
- Computers were left “ON” but the monitors were left “OFF” even when they were not in use.
- The Reznor make-up air unit (serving the locker rooms) does not operate.
- A large domestic water heater (DHW-4) near the Gymnasium does not operate.
- Some of the exhaust fans do not operate.
- The Gym RTUs have control issues due to age.
- The West Entrance and Old Main Entry have single pane windows. It is recommended to replace these windows during next renovation.
- The BMS system is reported to have minor problems, which has been corrected on an ongoing effort.



Operational and Maintenance Issues (cont'd)

Lincoln Middle School

- Lights in the classrooms stay on until the custodians shut them off later in the day
- The latches on the High School bridge windows were observed to be broken causing cold air draft. It is recommended to fix or replace locks on these windows.
- A number of the Middle School's windows were observed to be open during very cold winter days.
 - Any overheating issues can be remedied by occupants by actively adjusting the thermostat.
 - Dome-Tech recommends training the teachers and staff for the energy and environmental impact of windows left open, and that a check of windows be performed in every class at the end of the day.
- 2nd floor boys and girls rooms near the High School Bridge are significantly overheated due to a failed valve. It is recommended to repair or replace the fault hot water valve

Operational and Maintenance Issues (cont'd)

Dunellen High School

- The two cassettes in the Computer Lab and Typing Room appear to be broken.
- Lights in the classrooms stay on until the custodians shut them off later in the day
- Some of the windows and their locks of the bridge connection were observed to be broken. It is recommended to fix window latches throughout the facility.
- The small split AC unit serving the typing room does not work.
- Trane RTU serving the auditorium seating area has a squeaking belt.
- One of the Carrier units serving the Library was set to cool. The unit short cycled several times during the observation.
- Several entrance corridors on the ground floor are overheated. The hot water convector serving these spaces should be checked for proper operation.
- The High school has outdated stoves with large pilot lights. This is not going to warrant enough energy savings for a replacement. However, if an equipment upgrade is considered, it is recommended to install stoves and other cooking equipment with spark igniters.



Renewable/Distributed Energy Measures

Distributed Generation & Renewable Energy

- Distributed Generation (on-site generation) generates electricity from many small energy sources. These sources can be renewable (solar/wind/ geothermal) or can be small scale power generation technologies (CHP, fuel cells, microturbines).
- Renewable energy is energy generated from natural resources (sunlight, wind, and underground geothermal heat) which are naturally replenished.
- A cogeneration or Combined Heat and Power (CHP) system is not suitable for this site due to low annual hours of operation.
- Dome-Tech performed a solar energy analysis for the Schools covered in this audit.



Renewable Energy Technologies: Solar Photovoltaic

Solar Photovoltaic

- Sunlight can be converted into electricity using photovoltaics (PV).
- A solar cell or photovoltaic cell is a device that converts sunlight directly into electricity.
- Photons in sunlight hit the solar panel and are absorbed by semiconducting materials, such as silicon. Electrons are knocked loose from their atoms, allowing them to flow through the material to produce electricity.
- Solar cells are often electrically connected and encapsulated as a module, in series, creating an additive voltage. The modules are connected in an array. The power output of an array is measured in watts or kilowatts, and typical energy needs are measured in kilowatt-hours.
- This system application can be considered for potential placement on additional buildings or areas such in parking lots, in overhead mounting and on the roofs.



Renewable Energy Technologies: Solar Photovoltaic (cont'd)

Building	Faber Elementary School	Lincoln Middle School	Dunellen High School	Total
Locations to Install Panels	Roof	Roof	Roof	
Assumptions				
System Capacity, kW-dc(maximum utilization of roof space)	20	11	32	63
Annual Electric Generation, kWhrs of AC electricity produced	27,318	14,310	42,495	84,123
Total Annual Facility Electric Use, kWhrs	611,616	289,033	485,098	1,385,747
% of Total Annual Usage	4%	5%	9%	6%
All-In Cost of Electricity Year 1	\$0.155	\$0.158	\$0.167	\$0.160
Annual Electric Cost Savings	\$4,245	\$2,258	\$7,091	\$13,594
Estimated SREC Value (Year 1)	\$100 / SREC	\$100 / SREC	\$100 / SREC	\$100 / SREC
Estimated year 1 SREC Revenue	\$2,732	\$1,431	\$4,250	\$8,412
Estimated Total Annual Revenue	\$6,977	\$3,689	\$11,341	\$22,006
Environmental Impact				
Equivalent Annual CO2 Emission Reduction (tons per year)	9.0	4.7	14.0	27.8
Equivalent Cars Removed From Road Annually	2	1	2	5
Equivalent Acres of Trees Planted Annually	2	1	4	8
Financial Results				
System Installed Cost	\$81,900	\$42,900	\$127,400	\$252,200
Simple Payback (Years)	12	12	11	11
IRR (25 Years)	6%	7%	7%	7%
Net Present Value (25 yrs, 4% discount rate)	\$56,925	\$30,483	\$98,051	\$182,865
1. Estimated CO2 Emissions Rate: 0.66 lbs/kWh 2. EPA Estimate: 11,560 CO2 per car 3. EPA Estimate: 7,333 lbs CO2 per acre of trees planted				

Solar Photo Voltaic System

Non-Financial Benefits of Solar PV

- The implementation of solar PV projects at Dunellen Public School would place your facilities at the forefront of renewable energy utilization. This allows the Dunellen School District the opportunity to not only gain experience with this energy technology, but also to win recognition as an environmentally sensitive, socially conscience institution. Additionally, these projects could be incorporated into science education and additional curriculums to raise awareness of current energy alternatives to the younger generations.





Renewable Energy Technologies: CHP/Cogeneration

- CHP (combined heat and power) or cogeneration is the use of a heat engine to simultaneously generate both electricity and useful heat.
- Fuel Cells are electrochemical conversion devices that operate by catalysis, separating the protons and the electrons of the reactant fuel, and forcing the electrons to travel through a circuit to produce electricity. The catalyst is typically a platinum group metal or alloy. Another catalytic process takes the electrons back in, combining them with the protons and oxidant, producing waste products (usually water and carbon dioxide).
- Microturbines are rotary engines that extract energy from a flow of combustion gas. They can be used with absorption chillers to provide cooling through waste heat rather than electricity. Microturbines are best suited for facilities with year-round thermal and/or cooling loads.
- Not recommended for Dunellen Public Schools due to the lack of thermal requirements in the summertime.



Utility Tariff and Rate Review: Electricity

- **Accounts and Rate Class:** Dunellen BOE has four facilities included in this study. Each facility is served by one or two electric accounts behind Public Service Electric Gas Company (PSEG) under rate classes Large Power and Lighting service (LPLS).
- **Electric Consumption and Cost:** Based on the one-year period studied, the total annual electric expenditure for the District is about \$215,905 and the total annual consumption is about 1,358,747 kilowatt-hours (kWh).
- **Average/Effective Rate per kWh:** For the one year period studied, the District's average monthly cost per kilowatt-hour ranged from \$0.155/kWh to \$0.167/kWh, inclusive of utility delivery charges. The District's overall average cost per kilowatt-hour during this period was 15.60¢/kWh.
- **Third Party Supplier:** Currently, Direct Energy is the third party supplier for the Dunellen Public Schools. A copy of the TPS contract was not available during the survey. Based on utility analysis, the TPS rate for electric commodity supply \$0.0961/kWh. Although not urgent, Dome-Tech recommends reviewing the current rate and market rate.
 - *Note that these average electric rates are “all-inclusive”; that is, they include all supply service (generation and commodity-related) charges, as well as all delivery service charges. The supply service charges typically represent the majority (60-80%) of the total monthly bill. It is the supply portion of your bill that is deregulated, which is discussed on subsequent slides in this section.*



Utility Tariff and Rate Review: Natural Gas

- **Accounts and Rate Class:** BOE has three facilities. Each facility has one natural gas account with service behind Public Service Electric Gas Company (PSEG) under Large Volume Gas (LVG) rate class with Firm Transportation.
- **Natural Gas Consumption and Cost:** Based on the one-year period studied, the total annual natural gas expenditure for the District is about \$93,321 and the total annual consumption is about 101,120 therms. Natural Gas is used largely in winter for space heating purposes.
- **Average/Effective Rate per Therm:** For the one year period studied, the District's overall, average cost is \$0.923 per therm.
- **Third Party Supplier:** Currently, HESS Energy is the third party natural gas supplier for Dunellen Public Schools. A copy of the TPS contract was not available during the survey. Based on the utility analysis, the TPS rate for natural gas commodity is \$0.567/Therm. This rate is inline with the current market rate. Dome-Tech recommends periodically reviewing the market in order to compare the current rates.
 - *Note that these average gas rates are "all-inclusive"; that is, they include all supply service (generation and commodity-related) charges, as well as all delivery service charges. The supply service charges typically represent the majority (60-80%) of the total monthly bill. It is the supply portion of your bill that is deregulated, which is discussed on subsequent slides in this section.*



Utility Tariff and Rate Review: Natural Gas

- To learn more about energy deregulation, visit the New Jersey Board of Public Utilities website: www.bpu.state.nj.us
- For more information about the retail energy supply companies that are licensed and registered to serve customers in New Jersey, visit the following website for more information: <http://www.bpu.state.nj.us/bpu/commercial/shopping.html>
- Provided below is a list of NJ BPU-licensed retail energy suppliers:

Company	Electricity	Natural Gas	Website
Hess	X	X	hess.com
Sprague	X	X	spragueenergy.com
UGI	X	X	ugienergyservices.com
South Jersey Energy	X	X	southjerseyenergy.com
Direct	X	X	directenergy.com
Global	X	X	globalp.com
Liberty	X		libertypowercorp.com
Reliant / NRG	X		reliant.com
First Energy	X		fes.com
ConEd Solutions	X		conedsolutions.com
Constellation / Exelon	X	X	newenergy.com
Glacial	X		glacialenergy.com
Integrus	X		integrusenergy.com
Suez	X		suezenergyresources.com
Sempra	X		semprasolutions.com
Woodruff		X	woodruffenergy.com
NextEra	X		mxenergy.com
Hudson		X	hudsonenergyservices.com
Great Eastern		X	greateasterngas.com

**Note: Not every Supplier serves customers in all utility territories within New Jersey. Please refer to the BPU website for current supplier list.*



Utility Deregulation in New Jersey: Background and Retail Energy Purchasing

➤ Electric Accounts:

- In August 2003, per the Electric Discount and Energy Competition Act [N.J.S.A. 48:3-49], the State of New Jersey deregulated its electric marketplace thus making it possible for customers to shop for a third-party (someone other than the utility) supplier of retail electricity.
- Per this process, every single electric account for every customer in New Jersey was placed into one of two categories: “BGS-FP” or “BGS-CIEP”. BGS-FP stands for Basic Generation Service-Fixed Price; BGS-CIEP stands for Basic Generation Service-Commercial and Industrial Energy Pricing.
- At its first pass, this categorization of accounts was based on rate class. The largest electric accounts in the State (those served under a Primary or a Transmission-level rate class) were moved into BGS-CIEP pricing. All other accounts (the vast majority of accounts in the State of New Jersey, including residential) were placed in the BGS-FP category, receiving default electric supply service from the utility.
- The New Jersey Board of Public Utilities (NJBPU) has continued to move new large energy users from the BGS-FP category into the BGS-CIEP category by lowering the demand (kW) threshold for electric accounts receiving Secondary service. Originally, this threshold started at 1,500kW; now, it has come down to 750 kW. So, if an account’s “peak load contribution” (as assigned by the utility) is less than 750 kW, then that facility/account is in the BGS-FP category. If you are unsure, you may contact Dome-Tech for assistance.



Utility Deregulation in New Jersey: Background and Retail Energy Purchasing (cont'd)

- There are at least 3 important differentiating factors to note about each rate category:
 1. The rate structure for BGS-FP accounts is different than the rate structure for BGS-CIEP accounts.
 2. The “do-nothing” option (i.e., what happens when you don’t shop for retail energy) varies.
 3. The decision about whether, and why, to shop for a retail provider varies.
- **BGS-FP: Secondary (small to medium) Electric Accounts:**
 - BGS-FP rate schedules for all utilities are set, and re-set, each year. Per the results of our State’s BGS Auction process, held each February, new utility default rates go into effect every year on June 1st. The BGS-FP rates become each customer’s default rates, and they dictate a customer’s “Price to Compare” (benchmark) for shopping purposes. To learn more about the BGS Auction process, please go to www.bgs-auction.com.
 - A customer’s decision about whether to buy energy from a retail energy supplier is, therefore, predominantly dependent upon whether a supplier can offer rates that are lower than the utility’s (default) Price to Compare.
- **BGS-CIEP: Primary (large) Electric Accounts:**
 - The BGS-CIEP category is quite different. These accounts pay an hourly market rate for energy when they do not switch to a retail provider.
 - For BGS-CIEP accounts, the process of setting forth a buying strategy can be complex, which is why many public entities seek professional assistance when shopping for energy.
 - For more information concerning hourly electric market prices for our region, please refer to www.pjm.com.



Utility Deregulation in New Jersey: Background and Retail Energy Purchasing (cont'd)

➤ **Natural Gas Accounts:**

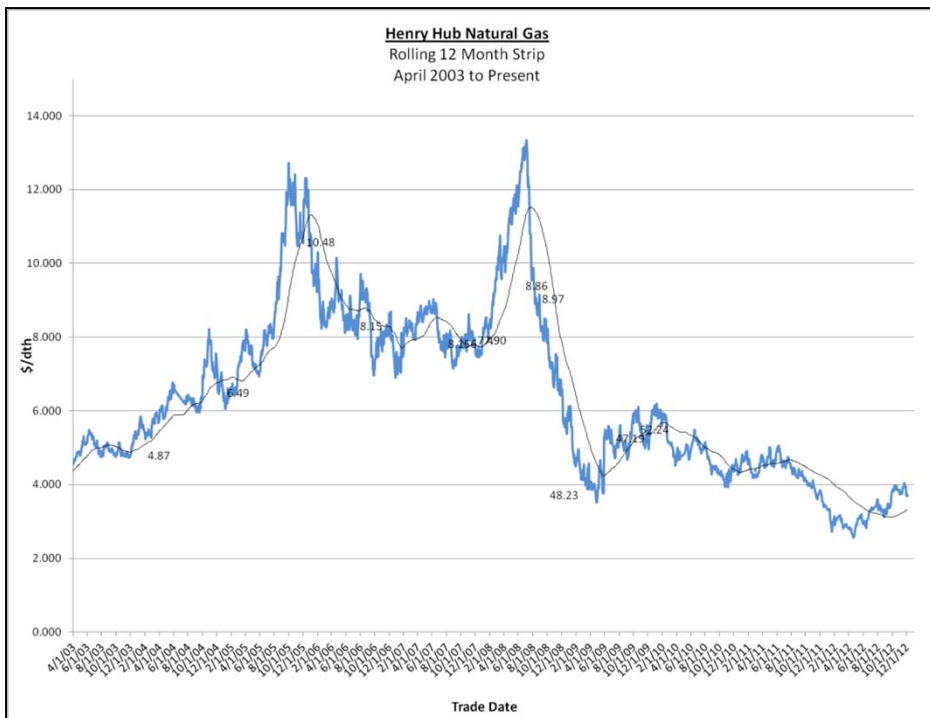
- The natural gas market in New Jersey is also deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. While natural gas is a commodity that is exceptionally volatile and that is traded minute-by-minute during open trading sessions, market rates are “settled” monthly, 3 business days prior to the subsequent month (this is called the “prompt month”). Customers that do not shop for a natural gas supplier will typically pay this monthly settlement rate to the utility, plus other costs that are necessary to bring gas from Louisiana (The “Henry Hub”) up to New Jersey (at the “City Gate”) and ultimately to your facility.
- For additional information about natural gas trading and current market futures rates for various commodities, you can refer to www.nymex.com.
- A customer’s decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by enlisting a retail natural gas supplier. Many larger natural gas customers also seek the assistance of a professional consultant to assist in their procurement process.



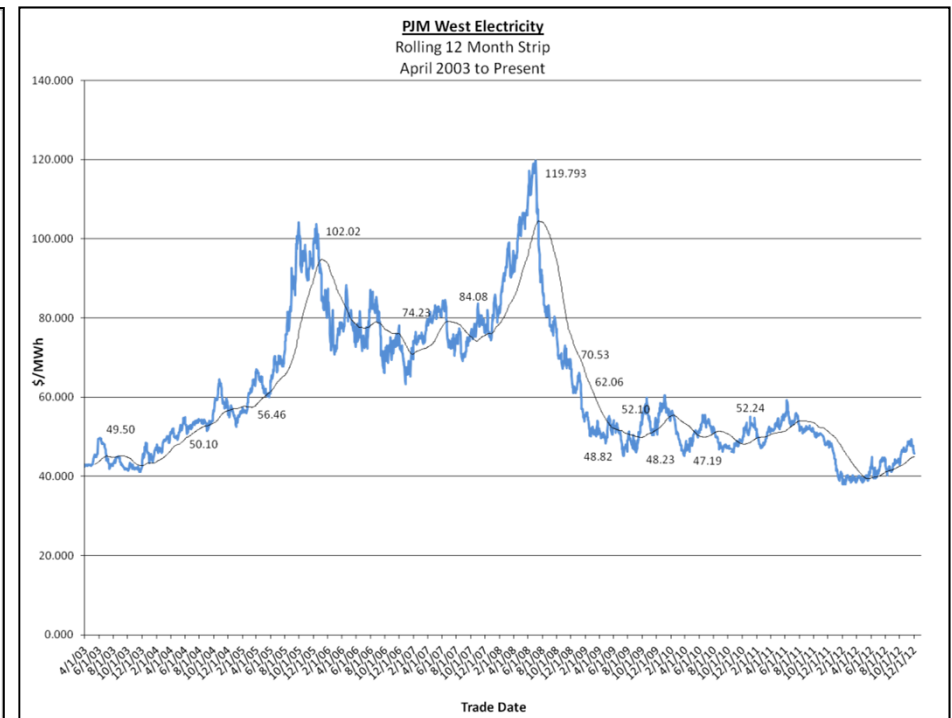
Historical Energy Futures Settlement Prices

Below please find graphs that show the last ten years' worth of market settlement prices for both natural gas and electricity. Each of these graphs shows the average closing prices of a rolling 12-month period of energy futures prices. The graphs are representative of the commodity alone; they do not include any of the additional components (capacity, transmission, ancillary services, etc.) that comprise a retail energy price. They are meant to provide an indication of the level of pricing that a particular customer might expect to see, but the graphs do not account for the specific load profile of any individual energy user.

Natural Gas



Electricity





Potential Project Funding Sources

Through the NJ Clean Energy Program, the New Jersey Board of Public Utilities currently offers a variety of subsidies or rebates for many of the project types outlined in this report. More detailed information can be found at: www.njcleanenergy.com

- **NJ Smart Start Buildings** – Equipment Rebates noted in ECMs where available.
Equipment Rebates: Water Heaters, Lighting, Lighting Controls/Sensors, Chillers, Boilers, Heat Pumps, Air Conditioners, Energy Management, Systems/Building Controls, Motor-ASDs/VSDs, Custom/Others.
<http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings>

- **Pay for Performance Program** – Performance-Based Incentives for installations. Provides incentives of up to \$0.11/ kWh and \$1.25/ therm saved; up to 25% of total project cost. A minimum reduction target of 15% compared to baseline must be achieved. Energy modeling of building and systems and energy reduction plan is required (incentives provided to pay for part of study costs).
<http://www.njcleanenergy.com/commercial-industrial/programs/pay-performance/existing-buildings>

- **Energy Savings Improvement Program (ESIP)** – Public entities can contract with energy saving companies (ESCO) in up to 20-year lease purchases enabling public entities to implement energy conservation measures at their facilities, and pay for the costs using the value of energy savings that result from the improvements. A “Do It Yourself” approach allows the public entity to contract with an engineering firm(s) to develop an Energy Savings Plan, develop plans and specs, oversee construction, commissioning, etc. (No ESCO is needed for the Do It Yourself approach).
<http://www.njcleanenergy.com/commercial-industrial/programs/energy-savings-improvement-program>



Potential Project Funding Sources (cont'd)

- **Direct Install Program** – NJ Clean Energy makes the investment in energy efficiency upgrades by initially covering 70% of the cost to install the recommended energy efficiency measures (up to \$75,000 per project). If eligible, the entity will pay ONLY 30% of the total cost to install the energy efficiency measures.

<http://www.njcleanenergy.com/commercial-industrial/programs/direct-install>

We encourage you to contact the program directly for further information

Steps to Participate for Buildings:

1. **CONTACT THE PARTICIPATING CONTRACTOR IN YOUR AREA**

Identify the contractor assigned and trained to provide Direct Install services in the county where your project is located. Using the contact information provided, call or email the Participating Contractor to discuss your project. The contractor will schedule an Energy Assessment and work with you to complete the Program Application and Participation Agreement. If you're unable to contact the Participating Contractor or have questions, you may contact us at 866-NJSMART or send an e-mail to DirectInstall@trcsolutions.com.

2. **REVIEW RESULTS**

After the Energy Assessment, the contractor will review results with you, including what measures qualify and your share of the project cost.

3. **DECIDE TO MOVE FORWARD**

You will sign a Scope of Work document to proceed with implementation of qualifying measures.

4. **ARRANGE INSTALLATION**

You and the Participating Contractor will set a convenient start date for the installation.

5. **CONFIRM INSTALLATION**

Once the Participating Contractor completes the installation, you accept the work by signing a Project Completion Form. A program representative will approve the project as complete.

6. **COMPLETE TRANSACTION**

You pay the Participating Contractor your share of the project cost and the program pays its share.



Next Steps

➤ **The following projects should be considered for implementation:**

- Address Operation and Maintenance Issues
- Computer Power Management
- CRT Monitor Replacement
- Upgrade Lighting Equipment and Controls
- Kitchen Exhaust Hood Controls
- Install De-stratification Fans
- Hot Water Booster Heater
- Demand Controlled Ventilation
- Exhaust Fan timer and controls

Note that additional “Phase 2” engineering may be required to further develop these project - to bring them to bidding and implementation.

➤ **Consider applying for a Pay-For-Performance Program or Energy Savings Improvement Program**

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PORTFOLIO MANAGER / ENERGY STAR

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ENERGY STAR® Data Verification Checklist

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ENERGY STAR®
Score¹

Faber Elementary School

Primary Function: K-12 School
Gross Floor Area (ft²): 89,203
Built: 1910

For Year Ending: 11/30/2013
Date Generated: 03/10/2014

1. The ENERGY STAR score is a 1-to-100 assessment of a building's energy efficiency as compared with similar building nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address

Faber Elementary School
High & Lehigh Streets
Dunellen, New Jersey 08812

Property ID: 3927288

Property Owner

Dunellen Public Schools
High & Lehigh Streets
Dunellen, NJ 08812
(____)____-____

Primary Contact

Brian Delucia
High & Lehigh Streets
Dunellen, NJ 08812
732 968 3226
deluciab@dunellenschools.org

1. Review of Whole Property Characteristics

Basic Property Information

1) Property Name: Faber Elementary School

Is this the official name of the property?

Yes No

If "No", please specify: _____

2) Primary Function: K-12 School

Is this an accurate description of the primary use of this property?

Yes No

3) Location:

High & Lehigh Streets
Dunellen, New Jersey 08812

Is this correct and complete?

Yes No

4) Gross Floor Area: 89,203 ft²

Yes No

Does this represent the entire property? (i.e., no part of the building/property was excluded/subtracted from the total) If "no" please specify what space has been excluded.

5) Annual Occupancy: 100

Is this occupancy accurate for the entire 12 month period being assessed?

Yes No

6) Number of Buildings: 1

Does this number accurately represent all structures?

Yes No

Notes:

Indoor Environmental Standards

1) Ventilation for Acceptable Indoor Air Quality

Does this property meet the ASHRAE Standard 62 for ventilation for acceptable indoor air quality?

Yes No

2) Acceptable Thermal Environmental Conditions

Does this property meet the ASHRAE Standard 55 for thermal comfort?

Yes No

3) Adequate Illumination

Does this property adhere to the IESNA Lighting Handbook for lighting quality?

Yes No

Notes:

2. Review of Property Use Details

K-12 School: Building Use

1) Gross Floor Area: 89,203 ft²

Is this the total size, as measured between the principal exterior surfaces of the enclosing fixed walls of the building(s)? This includes all areas inside the building(s) such as: occupied tenant areas, common areas, meeting areas, break rooms, restrooms, elevator shafts, mechanical equipment areas, and storage rooms. Gross

Yes No

Floor Area should not include interstitial plenum space between floors, which may house pipes and ventilation. Gross Floor Area is not the same as rentable, but rather includes all area inside the building(s). Leasable space would be a sub-set of Gross Floor Area. In the case where there is an atrium, you should count the Gross Floor Area at the base level only. Do not increase the size to accommodate open atrium space at higher levels. The Gross Floor Area should not include any exterior spaces such as balconies or exterior loading docks and driveways.

2) Gymnasium Floor Area: 0 ft²

Does the gymnasium floor area include all areas devoted to a gymnasium, including gymnasium/athletic areas, spectator areas, locker rooms, and other associated spaces?

Yes No

3) High School: No

Is the property a high school (teaching grades 10, 11, and/or 12)? If the property teaches to high school students at all, the user should check 'yes' to 'high school'. For example, if the school teaches to grades K-12 (elementary/middle and high school), the user should check 'yes' to 'high school'.

Yes No

4) Number of Workers on Main Shift: 79

Is this the number of workers present during the main shift? Note that this is not a total count of workers, but rather a count of workers who are present at the same time. For example, if there are two daily eight hour shifts of 100 workers each, the Number of Workers on Main Shift value is 100. Number of Workers on Main Shift may include employees of the property, sub-contractors who are onsite regularly, and volunteers who perform regular onsite tasks. Number of Workers should not include visitors to the buildings such as clients, customers, or patients.

Yes No

5) Student Seating Capacity: 650

Is this the maximum number of students for which the school was designed? This should include the seating capacity of the entire school. If portable classrooms have been added to the school, include the capacity of these classrooms, as they expand the overall capacity of the school.

Yes No

6) Months in Use: 9

Is this the total number of months that the property is open for standard activities?

Yes No

7) Weekend Operation: No

Does the property include regular activities on the weekend beyond the scope of maintenance, cleaning, and security personnel? Weekend activity could include any time when the property is used for classes, performances, or other school or community activities. The Yes selection is appropriate for any property that is open on one or both days of the weekend during one or more seasons of the year.

Yes No

8) Number of Computers: 116

Is this the total number of desktop computers, laptops, and data servers at the property? This number should not include tablet computers, such as iPads, or any other types of office equipment. The count should only reflect computers that are owned by the school. It should not include any computers that are brought onsite by students or staff.

Yes No

9) Cooking Facilities: 100% Yes

Does the property have a commercial cooking area designed to provide and serve food to occupants and/or visitors? This may include restaurants and cafeterias. If the property contains only employee break room kitchens, this field should be marked No.

Yes No

10) Number of Walk-in Refrigeration/Freezer Units: 1

Is this the total count of walk-in units at the property? Walk-in Refrigeration/Freezers are typically very large units located in storage areas or commercial kitchens that would not be accessible to all building occupants. This count should only include large storage units that a person actually walks into in order to store or retrieve perishable goods.

Yes No

11) Percent That Can Be Heated: 90

Is this the total percentage of the property that can be heated by mechanical equipment?

Yes No

12) Percent That Can Be Cooled: 20

Is this the total percentage of the property that can be cooled by mechanical equipment? This includes all types of cooling from central air to individual window units.

Yes No

13) School District: Dunellen School District

Is this the administrative school district in which the property is located?

Yes No

Notes:

3. Review of Energy Consumption

Data Overview

Site Energy Use Summary

Electric - Grid (kBtu)	2,058,311.5 (33%)
Natural Gas (kBtu)	4,157,319.7 (67%)
Total Energy (kBtu)	6,215,631.1

Energy Intensity

Site (kBtu/ft ²)	69.7
Source (kBtu/ft ²)	121.4

National Median Comparison

National Median Site EUI (kBtu/ft ²)	55.2
National Median Source EUI (kBtu/ft ²)	96.1
% Diff from National Median Source EUI	26.33%

Emissions (based on site energy use)
Greenhouse Gas Emissions (MtCO_{2e}) 481.3

Power Generation Plant or Distribution Utility:
Public Service Electric & Gas Co

Note: All values are annualized to a 12-month period. Source Energy includes energy used in generation and transmission to enable an equitable assessment.

Summary of All Associated Meters

The following meters are associated with the property, meaning that they are added together to get the total energy use for the property. Please see additional tables in this checklist for the exact meter consumption values.

Meter Name	Fuel Type	Start Date	End Date	Associated With
Natural Gas - 2523055	Natural Gas	01/01/2012	In Use	Faber Elementary School

Meter Name	Fuel Type	Start Date	End Date	Associated With
Electric Grid Meter #778012113	Electric	01/01/2012	In Use	Faber Elementary School
Electric Meter (Area lighting)	Electric	01/01/2012	In Use	Faber Elementary School

Total Energy Use

Yes No

Do the meters shown above account for the total energy use of this property during the reporting period of this application?

Additional Fuels

Yes No

Do the meters above include all fuel *types* at the property? That is, no additional fuels such as district steam, generator fuel oil have been excluded.

On-Site Solar and Wind Energy

Yes No

Are all on-site solar and wind installations reported in this list (if present)? All on-site systems must be reported.

Notes:

Natural Gas Meter: Natural Gas - 2523055 (therms)

Associated With: Faber Elementary School

Start Date	End Date	Usage
11/27/2012	12/27/2012	5,592
12/27/2012	01/28/2013	7,670
01/28/2013	02/27/2013	6,256
02/27/2013	03/28/2013	10,049
03/28/2013	04/29/2013	3,331
04/29/2013	05/28/2013	700
05/28/2013	06/27/2013	755
06/27/2013	07/27/2013	200
07/27/2013	08/28/2013	210
08/28/2013	09/26/2013	367

Start Date	End Date	Usage
09/26/2013	10/25/2013	1,051
10/25/2013	11/26/2013	4,939.57
11/26/2013	12/27/2013	7,429
Total Consumption (therms):		48,549.57
Total Consumption (kBtu (thousand Btu)):		4,854,957

Total Energy Consumption for this Meter

Yes No

Do the fuel consumption totals shown above include consumption of all energy tracked through this meter that affect energy calculations for the reporting period of this application (i.e., do the entries match the utility bills received by the property)?

Notes:

Electric Meter: Electric Grid Meter #778012113 (kWh (thousand Watt-hours))

Associated With: Faber Elementary School

Start Date	End Date	Usage	Green Power?
11/20/2012	12/21/2012	44,200	No
12/21/2012	01/22/2013	42,400	No
01/23/2013	02/22/2013	50,615	No
02/22/2013	03/25/2013	51,121	No
03/25/2013	04/24/2013	44,415	No
04/24/2013	05/23/2013	48,736	No
05/23/2013	06/24/2013	59,091	No
06/24/2013	07/24/2013	56,152	No
07/24/2013	08/22/2013	33,682	No
08/22/2013	09/23/2013	52,904	No
09/23/2013	10/22/2013	51,020	No
10/22/2013	11/20/2013	46,309	No
11/20/2013	12/23/2013	50,971	No
Total Consumption (kWh (thousand Watt-hours)):			631,616
Total Consumption (kBtu (thousand Btu)):			2,155,073.8

Total Energy Consumption for this Meter

Yes No

Do the fuel consumption totals shown above include consumption of all energy tracked through this meter that affect energy calculations for the reporting period of this application (i.e., do the entries match the utility bills received by the property)?

Notes:

Electric Meter: Electric Meter (Area lighting) (kWh (thousand Watt-hours))

Associated With: Faber Elementary School

Start Date	End Date	Usage	Green Power?
12/01/2012	01/02/2013	2,415	No
01/03/2013	01/31/2013	2,083	No
02/01/2013	03/04/2013	2,102	No
03/05/2013	04/03/2013	1,772	No
04/04/2013	05/02/2013	1,515	No
05/03/2013	06/03/2013	1,492	No
06/04/2013	07/02/2013	1,269	No
07/03/2013	08/01/2013	1,361	No
08/02/2013	08/30/2013	1,455	No
08/31/2013	10/01/2013	1,823	No
10/02/2013	10/30/2013	1,850	No
10/31/2013	12/02/2013	2,308	No
Total Consumption (kWh (thousand Watt-hours)):			21,445
Total Consumption (kBtu (thousand Btu)):			73,170.3

Total Energy Consumption for this Meter

Yes No

Do the fuel consumption totals shown above include consumption of all energy tracked through this meter that affect energy calculations for the reporting period of this application (i.e., do the entries match the utility bills received by the property)?

Notes:

4. Signature & Stamp of Verifying Licensed Professional

_____ (Name) visited this site on _____ (Date). Based on the conditions observed at the time of the visit to this property, I verify that the information contained within this application is accurate and in accordance with the Licensed Professional Guide.

Signature: _____ Date: _____

Licensed Professional

,
(____)____-____



NOTE: When applying for the ENERGY STAR, the signature of the Verifying Professional must match the stamp.

Professional Engineer Stamp
(if applicable)



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ENERGY STAR® Progress & Goals Report

24

ENERGY STAR®
Score¹

Faber Elementary School

Primary Property Function: K-12 School
Gross Floor Area (ft²): 89,203
Built: 1910

Property Address:
Faber Elementary School
High & Lehigh Streets
Dunellen, New Jersey 08812

For Year Ending: November 30, 2013
Date Generated: March 10, 2014

Property ID: 3927288

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Performance Comparison

	Progress			Performance Goals		
	Year Ending 10/31/2013 (Baseline)	Year Ending 11/30/2013 (Selected)	% Change	Property's Target	National Median	ENERGY STAR Score of 75
ENERGY STAR Score	26	24	-8	Not Set	50	75

Energy

Site EUI (kBtu/ft²)	68.1	69.7	-2.3	Not Set	55.2	43.1
Source EUI (kBtu/ft²)	119.3	121.4	-1.73	Not Set	96.1	75.1
\$	0	0	N/A	Not Set	0	0
\$/ft²	0	0	N/A	Not Set	0	0

Greenhouse Gas Emissions

MtCO2e/year	472.3	481.3	1.91	Not Set	381.3	297.6
kgCO2e/ ft2/year	5.3	5.4	1.91	Not Set	4.3	3.3

Water

All Water Consumption (kgal)	N/A	N/A	N/A	*	*	*
Indoor Water Consumption (kgal)	N/A	N/A	N/A	*	*	*
Indoor Water Consumption (kgal/ft²)	N/A	N/A	N/A	*	*	*
\$	N/A	N/A	N/A	*	*	*

*Setting and managing water targets is not yet available in Portfolio Manager.



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ENERGY STAR[®] Scorecard

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ENERGY STAR[®]
Score

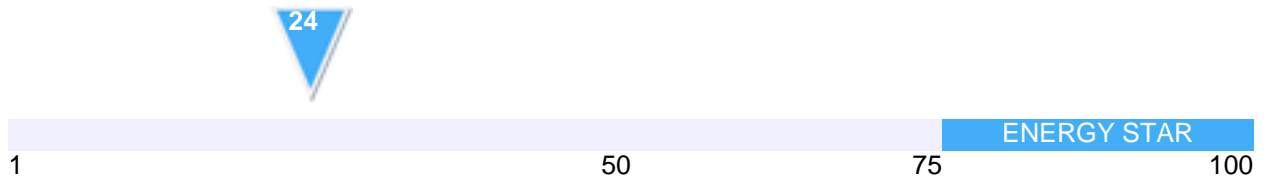
Faber Elementary School

Primary Function: K-12 School
Gross Floor Area (ft²): 89,203
Built: 1910

Property Address:
Faber Elementary School
High & Lehigh Streets
Dunellen, New Jersey 08812

For Year Ending: November 30, 2013
Date Generated: March 10, 2014

For the year ending in November 2013, this building used 121.4 (kBtu/ft²) on a source energy basis. The Environmental Protection Agency's (EPA's) ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.



Buildings with a score of 75 or higher may qualify for EPA's ENERGY STAR.

Signature of Verifying Professional

I _____ (Name) verify that the information regarding energy use and property use details is true and correct to the best of my knowledge.

Signature: _____ Date: _____



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ENERGY STAR[®] Statement of Energy Performance

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ENERGY STAR[®]
Score¹

Faber Elementary School

Primary Property Function: K-12 School
Gross Floor Area (ft²): 89,203
Built: 1910

For Year Ending: November 30, 2013
Date Generated: March 10, 2014

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address

Faber Elementary School
High & Lehigh Streets
Dunellen, New Jersey 08812

Property Owner

Dunellen Public Schools
High & Lehigh Streets
Dunellen, NJ 08812
() -

Primary Contact

Brian Delucia
High & Lehigh Streets
Dunellen, NJ 08812
732 968 3226
deluciab@dunellenschools.org

Property ID: 3927288

Energy Consumption and Energy Use Intensity (EUI)

Site EUI

69.7 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	2,058,312 (33%)
Natural Gas (kBtu)	4,157,320 (67%)

National Median Comparison

National Median Site EUI (kBtu/ft ²)	55.2
National Median Source EUI (kBtu/ft ²)	96.1
% Diff from National Median Source EUI	26%

Source EUI

121.4 kBtu/ft²

Annual Emissions

Greenhouse Gas Emissions (MtCO ₂ e/year)	481
---	-----

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____ Date: _____

Licensed Professional

,
() -



Professional Engineer Stamp
(if applicable)



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ENERGY STAR® Data Verification Checklist

13

ENERGY STAR®
Score¹

Lincoln Middle School

Primary Function: K-12 School
Gross Floor Area (ft²): 26,248
Built: 1960

For Year Ending: 10/31/2013
Date Generated: 03/10/2014

1. The ENERGY STAR score is a 1-to-100 assessment of a building's energy efficiency as compared with similar building nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address

Lincoln Middle School
400 Dunellen Avenue
Dunellen, New Jersey 08812

Property ID: 3927290

Property Owner

Dunellen Public Schools
High & Lehigh Streets
Dunellen, NJ 08812
(____)____-____

Primary Contact

Brian Delucia
High & Lehigh Streets
Dunellen, NJ 08812
732 968 3226
deluciab@dunellenschools.org

1. Review of Whole Property Characteristics

Basic Property Information

1) Property Name: Lincoln Middle School

Is this the official name of the property?

Yes No

If "No", please specify: _____

2) Primary Function: K-12 School

Is this an accurate description of the primary use of this property?

Yes No

3) Location:

400 Dunellen Avenue
Dunellen, New Jersey 08812

Is this correct and complete?

Yes No

4) Gross Floor Area: 26,248 ft²

Yes No

Does this represent the entire property? (i.e., no part of the building/property was excluded/subtracted from the total) If "no" please specify what space has been excluded.

5) Annual Occupancy: 100

Is this occupancy accurate for the entire 12 month period being assessed?

Yes No

6) Number of Buildings: 1

Does this number accurately represent all structures?

Yes No

Notes:

Indoor Environmental Standards

1) Ventilation for Acceptable Indoor Air Quality

Does this property meet the ASHRAE Standard 62 for ventilation for acceptable indoor air quality?

Yes No

2) Acceptable Thermal Environmental Conditions

Does this property meet the ASHRAE Standard 55 for thermal comfort?

Yes No

3) Adequate Illumination

Does this property adhere to the IESNA Lighting Handbook for lighting quality?

Yes No

Notes:

2. Review of Property Use Details

K-12 School: Building Use

1) Gross Floor Area: 26,248 ft²

Is this the total size, as measured between the principal exterior surfaces of the enclosing fixed walls of the building(s)? This includes all areas inside the building(s) such as: occupied tenant areas, common areas, meeting areas, break rooms, restrooms, elevator shafts, mechanical equipment areas, and storage rooms. Gross

Yes No

Floor Area should not include interstitial plenum space between floors, which may house pipes and ventilation. Gross Floor Area is not the same as rentable, but rather includes all area inside the building(s). Leasable space would be a sub-set of Gross Floor Area. In the case where there is an atrium, you should count the Gross Floor Area at the base level only. Do not increase the size to accommodate open atrium space at higher levels. The Gross Floor Area should not include any exterior spaces such as balconies or exterior loading docks and driveways.

2) Gymnasium Floor Area: 0 ft²

Does the gymnasium floor area include all areas devoted to a gymnasium, including gymnasium/athletic areas, spectator areas, locker rooms, and other associated spaces?

Yes No

3) High School: No

Is the property a high school (teaching grades 10, 11, and/or 12)? If the property teaches to high school students at all, the user should check 'yes' to 'high school'. For example, if the school teaches to grades K-12 (elementary/middle and high school), the user should check 'yes' to 'high school'.

Yes No

4) Number of Workers on Main Shift: 20

Is this the number of workers present during the main shift? Note that this is not a total count of workers, but rather a count of workers who are present at the same time. For example, if there are two daily eight hour shifts of 100 workers each, the Number of Workers on Main Shift value is 100. Number of Workers on Main Shift may include employees of the property, sub-contractors who are onsite regularly, and volunteers who perform regular onsite tasks. Number of Workers should not include visitors to the buildings such as clients, customers, or patients.

Yes No

5) Student Seating Capacity: 262.48

Is this the maximum number of students for which the school was designed? This should include the seating capacity of the entire school. If portable classrooms have been added to the school, include the capacity of these classrooms, as they expand the overall capacity of the school.

Yes No

6) Months in Use: 9

Is this the total number of months that the property is open for standard activities?

Yes No

7) Weekend Operation: No

Does the property include regular activities on the weekend beyond the scope of maintenance, cleaning, and security personnel? Weekend activity could include any time when the property is used for classes, performances, or other school or community activities. The Yes selection is appropriate for any property that is open on one or both days of the weekend during one or more seasons of the year.

Yes No

8) Number of Computers: 26

Is this the total number of desktop computers, laptops, and data servers at the property? This number should not include tablet computers, such as iPads, or any other types of office equipment. The count should only reflect computers that are owned by the school. It should not include any computers that are brought onsite by students or staff.

Yes No

9) Cooking Facilities: 100% Yes

Does the property have a commercial cooking area designed to provide and serve food to occupants and/or visitors? This may include restaurants and cafeterias. If the property contains only employee break room kitchens, this field should be marked No.

Yes No

10) Number of Walk-in Refrigeration/Freezer Units: 1

Is this the total count of walk-in units at the property? Walk-in Refrigeration/Freezers are typically very large units located in storage areas or commercial kitchens that would not be accessible to all building occupants. This count should only include large storage units that a person actually walks into in order to store or retrieve perishable goods.

Yes No

11) Percent That Can Be Heated: 90

Is this the total percentage of the property that can be heated by mechanical equipment?

Yes No

12) Percent That Can Be Cooled: 10

Is this the total percentage of the property that can be cooled by mechanical equipment? This includes all types of cooling from central air to individual window units.

Yes No

13) School District: Not entered

Is this the administrative school district in which the property is located?

Yes No

Notes:

3. Review of Energy Consumption

Data Overview

Site Energy Use Summary

Electric - Grid (kBtu)	870,334.4 (31%)
Natural Gas (kBtu)	1,956,917.3 (69%)
Total Energy (kBtu)	2,827,251.7

Energy Intensity

Site (kBtu/ft ²)	107.7
Source (kBtu/ft ²)	182.4

National Median Comparison

National Median Site EUI (kBtu/ft ²)	73.8
National Median Source EUI (kBtu/ft ²)	125
% Diff from National Median Source EUI	45.92%

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO _{2e})	214.1
--	-------

Power Generation Plant or Distribution Utility:

Public Service Electric & Gas Co

Note: All values are annualized to a 12-month period. Source Energy includes energy used in generation and transmission to enable an equitable assessment.

Summary of All Associated Meters

The following meters are associated with the property, meaning that they are added together to get the total energy use for the property. Please see additional tables in this checklist for the exact meter consumption values.

Meter Name	Fuel Type	Start Date	End Date	Associated With
Natural Gas - 2413079	Natural Gas	09/25/2012	In Use	Lincoln Middle School

Meter Name	Fuel Type	Start Date	End Date	Associated With
Electric Grid Meter - 778013091	Electric	12/20/2012	In Use	Lincoln Middle School

Total Energy Use

Yes No

Do the meters shown above account for the total energy use of this property during the reporting period of this application?

Additional Fuels

Yes No

Do the meters above include all fuel *types* at the property? That is, no additional fuels such as district steam, generator fuel oil have been excluded.

On-Site Solar and Wind Energy

Yes No

Are all on-site solar and wind installations reported in this list (if present)? All on-site systems must be reported.

Notes:

Natural Gas Meter: Natural Gas - 2413079 (therms)

Associated With: Lincoln Middle School

Start Date	End Date	Usage
10/25/2012	11/15/2012	2,280.6
11/16/2012	12/18/2012	1,665.2
12/19/2012	01/18/2013	3,241.9
01/19/2013	02/19/2013	4,647.4
02/20/2013	03/20/2013	3,533.2
03/21/2013	04/19/2013	2,375.5
04/20/2013	05/21/2013	1,361.4
05/22/2013	06/19/2013	39.2
06/20/2013	07/19/2013	23.4
07/20/2013	08/19/2013	23.5
08/20/2013	09/18/2013	33.2
09/19/2013	10/17/2013	61.7

Start Date	End Date	Usage
10/17/2013	11/15/2013	1,950
Total Consumption (therms):		21,236.2
Total Consumption (kBtu (thousand Btu)):		2,123,620

Total Energy Consumption for this Meter

Yes No

Do the fuel consumption totals shown above include consumption of all energy tracked through this meter that affect energy calculations for the reporting period of this application (i.e., do the entries match the utility bills received by the property)?

Notes:

Electric Meter: Electric Grid Meter - 778013091 (kWh (thousand Watt-hours))

Associated With: Lincoln Middle School

Start Date	End Date	Usage	Green Power?
12/20/2012	01/15/2013	21,384	No
01/15/2013	02/21/2013	21,699	No
02/21/2013	03/22/2013	21,726	No
03/22/2013	04/23/2013	23,908	No
04/23/2013	05/22/2013	26,804	No
05/22/2013	06/21/2013	30,165	No
06/21/2013	07/23/2013	34,247	No
07/23/2013	08/21/2013	19,978	No
08/21/2013	09/20/2013	24,203	No
09/20/2013	10/21/2013	23,219	No
10/21/2013	11/19/2013	20,425	No
Total Consumption (kWh (thousand Watt-hours)):			267,758
Total Consumption (kBtu (thousand Btu)):			913,590.3

Total Energy Consumption for this Meter

Yes No

Do the fuel consumption totals shown above include consumption of all energy tracked through this meter that affect energy calculations for the reporting period of this application (i.e., do the entries match the utility bills received by the property)?

Notes:

4. Signature & Stamp of Verifying Licensed Professional

_____ (Name) visited this site on _____ (Date). Based on the conditions observed at the time of the visit to this property, I verify that the information contained within this application is accurate and in accordance with the Licensed Professional Guide.

Signature: _____ Date: _____

Licensed Professional

,
(____)____-____



NOTE: When applying for the ENERGY STAR, the signature of the Verifying Professional must match the stamp.

Professional Engineer Stamp
(if applicable)



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ENERGY STAR® Progress & Goals Report

13

ENERGY STAR®
Score¹

Lincoln Middle School

Primary Property Function: K-12 School
Gross Floor Area (ft²): 26,248
Built: 1960

Property Address:
Lincoln Middle School
400 Dunellen Avenue
Dunellen, New Jersey 08812

For Year Ending: October 31, 2013
Date Generated: March 10, 2014

Property ID: 3927290

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Performance Comparison

	Progress			Performance Goals		
	Year Ending 9/30/2013 (Baseline)	Year Ending 10/31/2013 (Selected)	% Change	Property's Target	National Median	ENERGY STAR Score of 75
ENERGY STAR Score	17	13	-31	50	50	75
Energy						
Site EUI (kBtu/ft²)	103.7	107.7	-3.71	73.8	73.8	57.7
Source EUI (kBtu/ft²)	172	182.4	-5.7	125	125	97.7
\$	0	0	N/A	0	0	0
\$/ft²	0	0	N/A	0	0	0
Greenhouse Gas Emissions						
MtCO2e/year	202.8	214.1	5.57	146.7	146.7	114.7
kgCO2e/ ft2/year	7.7	8.2	5.57	5.6	5.6	4.4
Water						
All Water Consumption (kgal)	N/A	N/A	N/A	*	*	*
Indoor Water Consumption (kgal)	N/A	N/A	N/A	*	*	*
Indoor Water Consumption (kgal/ft²)	N/A	N/A	N/A	*	*	*
\$	N/A	N/A	N/A	*	*	*

*Setting and managing water targets is not yet available in Portfolio Manager.



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ENERGY STAR[®] Scorecard

13

ENERGY STAR[®]
Score

Lincoln Middle School

Primary Function: K-12 School

Gross Floor Area (ft²): 26,248

Built: 1960

For Year Ending: October 31, 2013

Date Generated: March 10, 2014

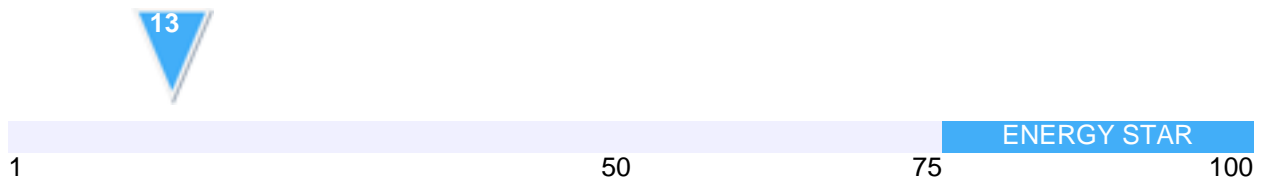
Property Address:

Lincoln Middle School

400 Dunellen Avenue

Dunellen, New Jersey 08812

For the year ending in October 2013, this building used 182.4 (kBtu/ft²) on a source energy basis. The Environmental Protection Agency's (EPA's) ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.



Buildings with a score of 75 or higher may qualify for EPA's ENERGY STAR.

Signature of Verifying Professional

I _____ (Name) verify that the information regarding energy use and property use details is true and correct to the best of my knowledge.

Signature: _____ Date: _____



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ENERGY STAR[®] Statement of Energy Performance

13

ENERGY STAR[®]
Score¹

Lincoln Middle School

Primary Property Function: K-12 School
Gross Floor Area (ft²): 26,248
Built: 1960

For Year Ending: October 31, 2013
Date Generated: March 10, 2014

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address

Lincoln Middle School
400 Dunellen Avenue
Dunellen, New Jersey 08812

Property Owner

Dunellen Public Schools
High & Lehigh Streets
Dunellen, NJ 08812
() -

Primary Contact

Brian Delucia
High & Lehigh Streets
Dunellen, NJ 08812
732 968 3226
deluciab@dunellenschools.org

Property ID: 3927290

Energy Consumption and Energy Use Intensity (EUI)

Site EUI	Annual Energy by Fuel	National Median Comparison	
107.7 kBtu/ft ²	Electric - Grid (kBtu) 870,334 (31%)	National Median Site EUI (kBtu/ft ²)	73.8
	Natural Gas (kBtu) 1,956,917 (69%)	National Median Source EUI (kBtu/ft ²)	125
		% Diff from National Median Source EUI	46%
Source EUI	Annual Emissions		
182.4 kBtu/ft ²	Greenhouse Gas Emissions (MtCO ₂ e/year)	214	

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____ Date: _____

Licensed Professional

,
() -



Professional Engineer Stamp
(if applicable)



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ENERGY STAR® Data Verification Checklist

62

ENERGY STAR®
Score¹

Dunellen High School

Primary Function: K-12 School
Gross Floor Area (ft²): 77,794
Built: 1930

For Year Ending: 10/31/2013
Date Generated: 03/10/2014

1. The ENERGY STAR score is a 1-to-100 assessment of a building's energy efficiency as compared with similar building nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address

Dunellen High School
411 First Street
Dunellen, New Jersey 08812

Property ID: 3927291

Property Owner

Dunellen Public Schools
High & Lehigh Streets
Dunellen, NJ 08812
(____)____-____

Primary Contact

Brian Delucia
High & Lehigh Streets
Dunellen, NJ 08812
732 968 3226
deluciab@dunellenschools.org

1. Review of Whole Property Characteristics

Basic Property Information

1) Property Name: Dunellen High School

Is this the official name of the property?

Yes No

If "No", please specify: _____

2) Primary Function: K-12 School

Is this an accurate description of the primary use of this property?

Yes No

3) Location:

411 First Street
Dunellen, New Jersey 08812

Is this correct and complete?

Yes No

4) Gross Floor Area: 77,794 ft²

Yes No

Does this represent the entire property? (i.e., no part of the building/property was excluded/subtracted from the total) If "no" please specify what space has been excluded.

5) Annual Occupancy: 100

Is this occupancy accurate for the entire 12 month period being assessed?

Yes No

6) Number of Buildings: 1

Does this number accurately represent all structures?

Yes No

Notes:

Indoor Environmental Standards

1) Ventilation for Acceptable Indoor Air Quality

Does this property meet the ASHRAE Standard 62 for ventilation for acceptable indoor air quality?

Yes No

2) Acceptable Thermal Environmental Conditions

Does this property meet the ASHRAE Standard 55 for thermal comfort?

Yes No

3) Adequate Illumination

Does this property adhere to the IESNA Lighting Handbook for lighting quality?

Yes No

Notes:

2. Review of Property Use Details

K-12 School: Building Use

1) Gross Floor Area: 77,794 ft²

Is this the total size, as measured between the principal exterior surfaces of the enclosing fixed walls of the building(s)? This includes all areas inside the building(s) such as: occupied tenant areas, common areas, meeting areas, break rooms, restrooms, elevator shafts, mechanical equipment areas, and storage rooms. Gross

Yes No

Floor Area should not include interstitial plenum space between floors, which may house pipes and ventilation. Gross Floor Area is not the same as rentable, but rather includes all area inside the building(s). Leasable space would be a sub-set of Gross Floor Area. In the case where there is an atrium, you should count the Gross Floor Area at the base level only. Do not increase the size to accommodate open atrium space at higher levels. The Gross Floor Area should not include any exterior spaces such as balconies or exterior loading docks and driveways.

2) Gymnasium Floor Area: 0 ft²

Does the gymnasium floor area include all areas devoted to a gymnasium, including gymnasium/athletic areas, spectator areas, locker rooms, and other associated spaces?

Yes No

3) High School: 100% Yes

Is the property a high school (teaching grades 10, 11, and/or 12)? If the property teaches to high school students at all, the user should check 'yes' to 'high school'. For example, if the school teaches to grades K-12 (elementary/middle and high school), the user should check 'yes' to 'high school'.

Yes No

4) Number of Workers on Main Shift: 61

Is this the number of workers present during the main shift? Note that this is not a total count of workers, but rather a count of workers who are present at the same time. For example, if there are two daily eight hour shifts of 100 workers each, the Number of Workers on Main Shift value is 100. Number of Workers on Main Shift may include employees of the property, sub-contractors who are onsite regularly, and volunteers who perform regular onsite tasks. Number of Workers should not include visitors to the buildings such as clients, customers, or patients.

Yes No

5) Student Seating Capacity: 350

Is this the maximum number of students for which the school was designed? This should include the seating capacity of the entire school. If portable classrooms have been added to the school, include the capacity of these classrooms, as they expand the overall capacity of the school.

Yes No

6) Months in Use: 9

Is this the total number of months that the property is open for standard activities?

Yes No

7) Weekend Operation: No

Does the property include regular activities on the weekend beyond the scope of maintenance, cleaning, and security personnel? Weekend activity could include any time when the property is used for classes, performances, or other school or community activities. The Yes selection is appropriate for any property that is open on one or both days of the weekend during one or more seasons of the year.

Yes No

8) Number of Computers: 154

Is this the total number of desktop computers, laptops, and data servers at the property? This number should not include tablet computers, such as iPads, or any other types of office equipment. The count should only reflect computers that are owned by the school. It should not include any computers that are brought onsite by students or staff.

Yes No

9) Cooking Facilities: 100% Yes

Does the property have a commercial cooking area designed to provide and serve food to occupants and/or visitors? This may include restaurants and cafeterias. If the property contains only employee break room kitchens, this field should be marked No.

Yes No

10) Number of Walk-in Refrigeration/Freezer Units: 0.78

Is this the total count of walk-in units at the property? Walk-in Refrigeration/Freezers are typically very large units located in storage areas or commercial kitchens that would not be accessible to all building occupants. This count should only include large storage units that a person actually walks into in order to store or retrieve perishable goods.

Yes No

11) Percent That Can Be Heated: 90

Is this the total percentage of the property that can be heated by mechanical equipment?

Yes No

12) Percent That Can Be Cooled: 10

Is this the total percentage of the property that can be cooled by mechanical equipment? This includes all types of cooling from central air to individual window units.

Yes No

13) School District: Dunellen School District

Is this the administrative school district in which the property is located?

Yes No

Notes:**3. Review of Energy Consumption****Data Overview****Site Energy Use Summary**

Electric - Grid (kBtu)	1,543,479.7 (30%)
Natural Gas (kBtu)	3,614,660 (70%)
Total Energy (kBtu)	5,158,139.7

Energy Intensity

Site (kBtu/ft ²)	66.3
Source (kBtu/ft ²)	111.1

National Median Comparison

National Median Site EUI (kBtu/ft ²)	74.5
National Median Source EUI (kBtu/ft ²)	124.9
% Diff from National Median Source EUI	-11.05%

Emissions (based on site energy use)	
Greenhouse Gas Emissions (MtCO _{2e})	387.3

Power Generation Plant or Distribution Utility:

Public Service Electric & Gas Co

Note: All values are annualized to a 12-month period. Source Energy includes energy used in generation and transmission to enable an equitable assessment.

Summary of All Associated Meters

The following meters are associated with the property, meaning that they are added together to get the total energy use for the property. Please see additional tables in this checklist for the exact meter consumption values.

Meter Name	Fuel Type	Start Date	End Date	Associated With
Electric Meter (Site lighting)	Electric	01/01/2012	In Use	Dunellen High School

Meter Name	Fuel Type	Start Date	End Date	Associated With
Natural Gas Meter - 179 23 30	Natural Gas	01/01/2012	In Use	Dunellen High School
Electric Meter - 778 020 390	Electric	01/01/2012	In Use	Dunellen High School

Total Energy Use

Yes No

Do the meters shown above account for the total energy use of this property during the reporting period of this application?

Additional Fuels

Yes No

Do the meters above include all fuel *types* at the property? That is, no additional fuels such as district steam, generator fuel oil have been excluded.

On-Site Solar and Wind Energy

Yes No

Are all on-site solar and wind installations reported in this list (if present)? All on-site systems must be reported.

Notes:

Electric Meter: Electric Meter (Site lighting) (kWh (thousand Watt-hours))

Associated With: Dunellen High School

Start Date	End Date	Usage	Green Power?
10/31/2012	11/30/2012	334	No
11/30/2012	01/02/2013	374	No
01/03/2013	01/31/2013	323	No
02/01/2013	03/04/2013	325	No
03/05/2013	04/03/2013	274	No
04/04/2013	05/02/2013	234	No
05/03/2013	06/03/2013	231	No
06/04/2013	07/02/2013	197	No
07/03/2013	08/01/2013	211	No
08/02/2013	08/30/2013	225	No

Start Date	End Date	Usage	Green Power?
08/31/2013	10/01/2013	283	No
10/02/2013	10/30/2013	287	No
10/31/2013	12/02/2013	357	No
Total Consumption (kWh (thousand Watt-hours)):			3,655
Total Consumption (kBtu (thousand Btu)):			12,470.9

Total Energy Consumption for this Meter

Yes No

Do the fuel consumption totals shown above include consumption of all energy tracked through this meter that affect energy calculations for the reporting period of this application (i.e., do the entries match the utility bills received by the property)?

Notes:

Natural Gas Meter: Natural Gas Meter - 179 23 30 (therms)

Associated With: Dunellen High School

Start Date	End Date	Usage
10/25/2012	11/30/2012	2,026
11/30/2012	12/18/2012	6,326
12/18/2012	01/18/2013	6,691
01/18/2013	02/19/2013	6,423
02/19/2013	03/20/2013	6,346
03/20/2013	04/19/2013	4,127
04/19/2013	05/21/2013	1,713
05/21/2013	06/19/2013	227.7
06/19/2013	07/19/2013	170.6
07/19/2013	08/19/2013	150
08/19/2013	09/18/2013	175
09/18/2013	10/17/2013	253
10/17/2013	11/15/2013	3,697
Total Consumption (therms):		38,325.3
Total Consumption (kBtu (thousand Btu)):		3,832,530

Total Energy Consumption for this Meter Yes No

Do the fuel consumption totals shown above include consumption of all energy tracked through this meter that affect energy calculations for the reporting period of this application (i.e., do the entries match the utility bills received by the property)?

Notes:**Electric Meter: Electric Meter - 778 020 390 (kWh (thousand Watt-hours))****Associated With:** Dunellen High School

Start Date	End Date	Usage	Green Power?
10/20/2012	11/19/2012	27,600	No
11/19/2012	12/20/2012	43,400	No
12/20/2012	01/23/2013	41,400	No
01/23/2013	02/21/2013	41,600	No
02/21/2013	03/22/2013	42,800	No
03/22/2013	04/23/2013	38,000	No
04/23/2013	05/22/2013	38,400	No
05/22/2013	06/21/2013	41,600	No
06/21/2013	07/23/2013	36,600	No
07/23/2013	08/21/2013	24,000	No
08/21/2013	09/20/2013	34,800	No
09/20/2013	10/21/2013	35,800	No
10/21/2013	11/19/2013	37,200	No
Total Consumption (kWh (thousand Watt-hours)):			483,200
Total Consumption (kBtu (thousand Btu)):			1,648,678.4

Total Energy Consumption for this Meter Yes No

Do the fuel consumption totals shown above include consumption of all energy tracked through this meter that affect energy calculations for the reporting period of this application (i.e., do the entries match the utility bills received by the property)?

Notes:

4. Signature & Stamp of Verifying Licensed Professional

_____ (Name) visited this site on _____ (Date). Based on the conditions observed at the time of the visit to this property, I verify that the information contained within this application is accurate and in accordance with the Licensed Professional Guide.

Signature: _____ Date: _____

Licensed Professional

,
(____)____-____



NOTE: When applying for the ENERGY STAR, the signature of the Verifying Professional must match the stamp.

Professional Engineer Stamp
(if applicable)



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ENERGY STAR® Progress & Goals Report

62

ENERGY STAR®
Score¹

Dunellen High School

Primary Property Function: K-12 School
Gross Floor Area (ft²): 77,794
Built: 1930

For Year Ending: October 31, 2013
Date Generated: March 10, 2014

Property Address:
Dunellen High School
411 First Street
Dunellen, New Jersey 08812

Property ID: 3927291

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Performance Comparison

	Progress			Performance Goals		
	Year Ending 10/31/2013 (Baseline)	Year Ending 10/31/2013 (Selected)	% Change	Property's Target	National Median	ENERGY STAR Score of 75
ENERGY STAR Score	62	62	0	50	50	75
Energy						
Site EUI (kBtu/ft²)	66.3	66.3	0	74.5	74.5	58.3
Source EUI (kBtu/ft²)	111.1	111.1	0	124.9	124.9	97.7
\$	0	0	N/A	0	0	0
\$/ft²	0	0	N/A	0	0	0
Greenhouse Gas Emissions						
MtCO2e/year	387.3	387.3	0	435.2	435.2	340.6
kgCO2e/ ft2/year	5	5	0	5.6	5.6	4.4
Water						
All Water Consumption (kgal)	N/A	N/A	N/A	*	*	*
Indoor Water Consumption (kgal)	N/A	N/A	N/A	*	*	*
Indoor Water Consumption (kgal/ft²)	N/A	N/A	N/A	*	*	*
\$	N/A	N/A	N/A	*	*	*

*Setting and managing water targets is not yet available in Portfolio Manager.



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ENERGY STAR[®] Scorecard

62

ENERGY STAR[®]
Score

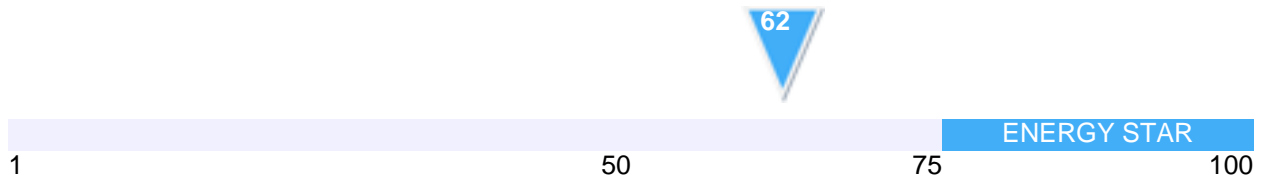
Dunellen High School

Primary Function: K-12 School
Gross Floor Area (ft²): 77,794
Built: 1930

Property Address:
Dunellen High School
411 First Street
Dunellen, New Jersey 08812

For Year Ending: October 31, 2013
Date Generated: March 10, 2014

For the year ending in October 2013, this building used 111.1 (kBtu/ft²) on a source energy basis. The Environmental Protection Agency's (EPA's) ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.



Buildings with a score of 75 or higher may qualify for EPA's ENERGY STAR.

Signature of Verifying Professional

I _____ (Name) verify that the information regarding energy use and property use details is true and correct to the best of my knowledge.

Signature: _____ Date: _____



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ENERGY STAR[®] Statement of Energy Performance

62

ENERGY STAR[®]
Score¹

Dunellen High School

Primary Property Function: K-12 School
Gross Floor Area (ft²): 77,794
Built: 1930

For Year Ending: October 31, 2013
Date Generated: March 10, 2014

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address

Dunellen High School
411 First Street
Dunellen, New Jersey 08812

Property Owner

Dunellen Public Schools
High & Lehigh Streets
Dunellen, NJ 08812
() -

Primary Contact

Brian Delucia
High & Lehigh Streets
Dunellen, NJ 08812
732 968 3226
deluciab@dunellenschools.org

Property ID: 3927291

Energy Consumption and Energy Use Intensity (EUI)

Site EUI

66.3 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu) 1,543,480 (30%)
Natural Gas (kBtu) 3,614,660 (70%)

National Median Comparison

National Median Site EUI (kBtu/ft²) 74.5
National Median Source EUI (kBtu/ft²) 124.9
% Diff from National Median Source EUI -11%

Source EUI

111.1 kBtu/ft²

Annual Emissions

Greenhouse Gas Emissions (MtCO₂e/year) 387

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____ Date: _____

Licensed Professional

,
() -



Professional Engineer Stamp
(if applicable)



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EQUIPMENT INVENTORY LISTS

FABER ELEMENTARY SCHOOL				
PACKAGED ROOFTOP UNITS				
Tag#	RTU	RTU	RTU	MUA
Location	Roof	Roof	Roof	Roof
Quantity	1	1	4	1
Area Serving	Media Center	Computer Room	Gymnasium	Locker Rooms
Mfg.	Carrier	Carrier	Carrier	Reznor
Model	48HJE014---531	48HJE005---531	48HJE014---531	HRGB350-8-SMVJ
Serial Number	4295G30601	2995G20845	4495G30588	EAUJ66KIN78916/MV3
Cooling Source	Packaged DX	Packaged DX	Packaged DX	None
Cooling Capacity (tons)	12.5	4	12.5	-
Cooling EER	9.5	11.2 EER 13 SEER	9.5	-
Heating Source	Natural Gas	Natural Gas	Natural Gas	Natural Gas
Heating Capacity input - MBH	250	115	250	200 (Est)
Furnace Efficiency	80%	80%	80%	80% (Est)
Supply Fan Motor HP	7.5 (est)	3 (Est)	7.5 (est)	2
Motor Efcy	-	-	-	-
Other Fan Motor HP	N/A	N/A	N/A	N/A
Motor Efcy	-	-	-	-
Flow Type	Constant Volume	Constant Volume	Constant Volume	Constant Volume
Outside Air Economizer	No	No	100%	N/A
Year Manufactured	1995	1995	1995	1995
Age	19	19	19	19
Estimated Service Life	15	15	15	15
Remaining Life	-4	-4	-4	-4
Notes	Fair Condition	Fair Condition	Serial Numbers	3820 CFM Total Flow
			4495G30588, 4295G30602,	The unit does not operate
			Fair Condition	

FABER ELEMENTARY SCHOOL

PACKAGED ROOFTOP UNITS

Tag#	RTU	RTU		
Location	Roof	Roof		
Quantity	1	1		
Area Serving	Main Office	Classrooms		
Mfg.	Carrier	Carrier		
Model Number	48AKM025-DT511HV	48HJS012-ME571HY		
Serial Number	4705U08553	4305G40838		
Cooling Source	Packaged DX	Packaged DX		
Cooling Capacity (tons)	25	10		
Cooling EER	9.5	11		
Heating Source	Natural Gas	Natural Gas		
Heating Capacity input - MBH	350	120		
Furnace Efficiency	81%	82%		
Supply Fan Motor HP	15	7.5		
Motor Efcy	87.50%	-		
Other Fan Motor HP	3	5		
Motor Efcy	-	-		
Flow Type	VAV	Constant Volume		
100% Outside Air Economizer	100%	100%		
Year Manufactured	2005	2005		
Age	9	9		
Estimated Service Life	15	15		
Remaining Life	6	6		
Notes	Good Condition	Good Condition		

FABER ELEMENTARY SCHOOL

AIR HANDLING UNITS

Tag#	Split AC	All Purpose Room HV		
Location	Board office storage	Suspended Above Stage		
Quantity	1	1		
Area Serving	Board office	All Purpose Room		
Mfg.	Carrier	Nesbitt		
Air Handler Model	40RM008-B500HC	-		
Serial Number	2095F48210	-		
Cooling Source	Split DX Condensers	None		
Condenser Make	Thermal Zone	None		
Model Number	TZAL-090C	None		
Serial Number	7753F501003485	None		
Cooling Capacity (tons)	2 x 7.5 = 15	None		
Cooling EER	10	None		
Heating Source	Hot Water	Hot Water		
Heating Capacity input - MBH	150 (Est)	-		
Fan HP	3	-		
Year Manufactured	1995	1960		
Age	19	54		
Estimated Service Life	15	15		
Remaining Life	-4	-39		
Notes				

FABER ELEMENTARY SCHOOL

	UNIT VENTILATORS		WINDOW AC UNITS	
Tag#	UV	UV	AC	
Location	1960 Wing	1995 Wing	Classrooms	
Quantity	15 (Est)	12 (Est)	20 (Est)	
Area Serving	Classrooms	Classrooms	Classrooms	
Mfg.	Nesbitt	Nesbitt	Electrolux	
Model	-	-	-	
Serial Number	-	-	-	
Cooling Source	None	None	Packaged DX	
Cooling Capacity (tons)	-	-	12,000 to 18,000 BTU/hr	
Cooling EER	-	-	10 (Ave)	
Heating Source	Hot Water	Hot Water	None	
Heating Capacity input - MBH	15 (Est)	15 (Est)	-	
Fan HP	Fractional	Fractional	Fractional	
Year Manufactured	1960	1993	2000-2010	
Age	54	21	5-10 Yes	
Estimated Service Life	15	15	10	
Remaining Life	-39	-6	0 - 5	
Notes	Old in poor condition	Old in fair condition		
	Pneumatic Controls	Digital Controls		

FABER ELEMENTARY SCHOOL

HOT WATER BOILERS

Tag#	Boilers	Boilers		
Location	North Boiler Room	South Boiler Room		
Quantity	12	7		
Area Serving	Classrooms	Classrooms		
Mfg.	HydroTherm	SlantFin Galaxy, Modular		
Model	Modular	GG-375 EC		
Serial Number	MR-1800BPV	608796		
Type of Boiler	Modular, Atmospheric	Modular, Atmospheric		
Fuel	Natural Gas	Natural Gas		
Capacity per Module, MBH	300	375		
Total Heating Capacity, Input, MBH	3600	2625		
Efficiency	80%	80%		
Year Manufactured	2005	1995		
Age	9	19		
Estimated Service Life	25	25		
Remaining Life	16	6		
Notes	Boiler is good condition	Boiler is good condition		

FABER ELEMENTARY SCHOOL				
PUMPS				
Tag#	P1, P2	P1, P2	P1, P2	
Location	North Boiler Room	South Boiler Room	All Purpose Room	
Quantity	2	2	2	
Area Serving	North Wing Hot Water Loop	South Wing Hot Water Loop	All Purpose Room HV Unit HW Circulator	
Mfg.	Taco	Taco	B&G	
Model	-	-	-	
Serial Number	-	-	-	
Type	Base mounted circulator	in-line circulator	in-line circulator	
Flow, GPM	150 (Est)	150 (Est)	20 (Est)	
Head, Ft	-	-	-	
Power, HP	3	3	3/4	
Motor Efcy	86.5%	84%	80% (Est)	
RPM	1725	1725	1725	
Year Manufactured	2005	2005	2005 (est)	
Age	9	9	9	
Estimated Service Life	10	10	20	
Remaining Life	1	1	11	
Notes	Pumps are in good condition	Pumps are in good condition	Good condition	

DUNELLEN HIGH SCHOOL				
PACKAGED ROOFTOP UNITS				
Tag#	RTU	RTU	RTU-2	RTU
Location	New Roof	New Roof	New Roof	New Roof
Quantity	1	1	1	2
Area Serving	Main Office	Special Education	Auditorium Seating Area	Library
Mfg.	Trane	Lennox	Trane	Carrier
Model	YSC060 A3RHA1 ZH2000 00000 B	GCS16-513-125-5Y	YCH480 AEHR2A 7LE400 0000000000000	50TJ-005--311GA
Serial Number	526100039L	-	C05C02645	2499G21734
Cooling Source	Packaged DX	Packaged DX	Packaged DX	Packaged DX
Cooling Capacity (tons)	5	4	40	5
Cooling EER	10.2 SEER	10 SEER	9.5 EER	9 EER
Heating Source	Natural Gas	Natural Gas	Natural Gas	None
Heating Capacity input - MBH	130	125	800	-
Furnace Efficiency	83%	80%	81%	-
Supply Fan Motor HP	1	3/4	15	2 HP (Est)
Motor Efcy	-	-	-	-
Other Fan Motor HP	0.33	0.25	4 x 1.1 (Condenser)	1 (Condenser)
Motor Efcy	-	-	-	-
Flow Type	Constant Volume	Constant Volume	VAV wih VFD	Constant Volume
Outside Air Economizer	100%	100%	100%	No
Year Manufactured	2005	1995 (Est)	2005	1999
Age	9	19	9	15
Estimated Service Life	15	15	15	15
Remaining Life	6	-4	6	0
Notes	Good Condition	Fair condition	Good condition	Fair Condition
				This unit was enabled during survey.
				Unit was short cycling

DUNELLEN HIGH SCHOOL				
PACKAGED ROOFTOP UNITS				
Tag#	RTU-1			
Location	New Roof			
Quantity	1			
Area Serving	Auditorium Stage			
Mfg.	Trane			
Model Number	YCH240 B3H0JB			
Serial Number	514100981D			
Cooling Source	Packaged DX			
Cooling Capacity (tons)	20			
Cooling EER	9.5 EER			
Heating Source	Natural Gas			
Heating Capacity input - MBH	400			
Furnace Efficiency	81%			
Supply Fan Motor HP	7.5			
Motor Efcy	-			
Other Fan Motor HP	2 x 1 HP (Condenser)			
Motor Efcy	-			
Flow Type	Constant Volume			
100% Outside Air Economizer	None			
Year Manufactured	2005			
Age	9			
Estimated Service Life	15			
Remaining Life	6			
Notes	Good condition			

DUNELLEN HIGH SCHOOL				
AIR HANDLING UNITS				
Tag#	Ductless Split	Ductless Split	Ductless Split Ceiling Cassettes	H&V
Location	Classroom 203	Classroom X	Typing Rooms	Gym MER
Quantity	1	1	2	2
Area Serving	Classroom 203	Classroom	Typing Rooms	Gymnasium
Mfg.	EMI	Fujitsu	York	-
Air Handler Model	-	-	-	-
Serial Number	-	-	-	-
Cooling Source	Remote Condenser	Remote Condenser	Remote Condenser	None
Condenser Make	EMI	Fujitsu	York	None
Model Number	SCC36DE0000AA0A	AOU36CLX	HABA-F048SD	None
Serial Number	-1-97-a-7280-5	EBN 017443	WCHP212770	None
Cooling Capacity (tons)	3	3	4	None
Cooling EER	~10 SEER	~16 SEER	~10 SEER	None
Heating Source	None	None	None	Hot Water
Heating Capacity input - MBH	-	-	-	-
Fan HP	-	-	-	-
Year Manufactured	1997	2010 (Est)	1999	1960
Age	17	4	15	54
Estimated Service Life	15	15	15	15
Remaining Life	-2	11	0	-39
Notes	Unit is old and inefficient	Good condition	Decommissioned	Fair condition
			2 cassettes connected to one condenser	

DUNELLEN HIGH SCHOOL				
HOT WATER BOILERS				
Tag#	B1 - B2			
Location	Boiler Room			
Quantity	2			
Area Serving	Hot water coils			
Mfg.	HB Smith			
Model	-			
Serial Number	HSB-03467			
Type of Boiler	Cast Iron			
Fuel	Natural Gas			
Capacity per Module, MBH	4320			
Total Heating Capacity, Input, MBH	8640			
Efficiency	70%			
Year Manufactured	1959			
Age	55			
Estimated Service Life	35			
Remaining Life	-20			
Notes	Boiler is very old but appear to be in fair condition			
	Asbestos insulation			
	Fitted with Industrial combustion burners			
	Burners are single speed with high gas modulation			
			-	
			-	
			-	
			-	

DUNELLEN HIGH SCHOOL				
DOMESTIC WATER HEATERS				
Tag#	Water Heater	Water Heater		
Location	Boiler room	Storage Outside Kitchen		
Quantity	1	1		
Area Serving	Bathrooms	Kitchen		
Mfg.	AO Smith	-		
Model	FCG 75 300	-		
Serial Number	9200472000	-		
Capacity, Gal	70	-		
Fuel	Natural Gas	Natural Gas		
Type	Tank Type Standard Efficiency	Tank Type Standard Efficiency		
Heating Capacity, MBH (Input)	75	-		
Recovery Rate, GPH	73	-		
Efficiency	80%	80%		
Year Manufactured	2005 (Est)	-		
Age	9	-		
Estimated Service Life	10	-		
Remaining Life	1	-		
Hot Water Circulator	Small inline cartridge	This unit was not accesible during the survey		
Notes	Unit is in good condition			

DUNELLEN HIGH SCHOOL				
AIR COMPRESSOR				
Tag#	AC #1			
Location	Boiler Room			
Quantity	1			
Area Serving	Pneumatic Thermostats			
Mfg.	Quincy			
Model	-			
Serial Number	-			
Capacity, Gal	80 (Est)			
Type	Duplex recip, belt driven			
Number of Compressors	2			
Number of Motors	2			
Motor HP	2 x 1			
Year Manufactured	2010 (Est)			
Age	4			
Estimated Service Life	20			
Remaining Life	16			
Notes	Good condition			

LINCOLN MIDDLE SCHOOL				
PACKAGED ROOFTOP UNITS				
Tag#	RTU-1	RTU-2	RTU-3	
Location	Roof	Roof	Roof	
Quantity	1	1	1	
Area Serving	2005 expansion	Cafeterium	8 classrooms Guidance office	
Mfg.	Trane	Trane	Trane	
Model	SFHFC6 0EH7D7 A89D7F 0100C0 000K00 0RT00800	YCH480 AEHR2A 7LE400 00000000000	YCH480 AEHR2A 7LE500 00000000000	
Serial Number	C05C02703	C05C02647	C05C02647	
Cooling Source	Packaged DX	Packaged DX	Packaged DX	
Cooling Capacity (tons)	60	40	35	
Cooling EER	9.5 EER 12.8 IPLV	9.5 EER	9.5 EER	
Heating Source	Natural Gas	Natural Gas	Natural Gas	
Heating Capacity input - MBH	600	800	600	
Furnace Efficiency	81%	81%	81%	
Supply Fan Motor HP	15	15	15	
Motor Efcy	Premium	Premium	Premium	
Other Fan Motor HP	1 x 7.5 (Exhaust) 6 x 1 (Condenser)	2 x 1 (Exhaust) 4 x 1.1 (Condenser)	2 x 1 (Exhaust) 3 x 1.1 (Condenser)	
Motor Efcy	Premium	Premium	Premium	
Flow Type	VAV wih VFD	VAV wih VFD	VAV wih VFD	
Outside Air Economizer	100%	100%	100%	
Year Manufactured	2005	2005	2005	
Age	9	9	9	
Estimated Service Life	15	15	15	
Remaining Life	6	6	6	
Notes	Good condition	Good condition	Good condition	

LINCOLN MIDDLE SCHOOL

AIR HANDLING UNITS

Tag#	AHU			
Location	2nd Floor Closet			
Quantity	1			
Area Serving	Heating and Ventilation for Bathrooms			
Mfg.	Magic Aire			
Air Handler Model	90-BVW/BVX-A			
Serial Number	951044145			
Cooling Source	None			
Condenser Make	-			
Model Number	-			
Serial Number	-			
Cooling Capacity (tons)	-			
Cooling EER	-			
Heating Source	Hot Water			
Heating Capacity input - MBH	N/A			
Fan HP	N/A			
Year Manufactured	1995			
Age	19			
Estimated Service Life	15			
Remaining Life	-4			
Notes	Unit does not operate			

LINCOLN MIDDLE SCHOOL				
HOT WATER BOILERS				
Tag#				
Location	Lincoln Basement			
Quantity	5			
Area Serving	Middle School Classrooms			
Mfg.	Hydro Therm			
Model	MR-1500B-PV			
Serial Number	MSK-1733			
Type of Boiler	Modular, atmospheric burner			
Fuel	Natural Gas			
Capacity per Module, MBH	300			
Total Heating Capacity, Input, MBH	1500			
Efficiency	80%			
Year Manufactured	1996			
Age	18			
Estimated Service Life	25			
Remaining Life	7			
Notes	Good condition			
			-	
			-	
			-	
			-	

LINCOLN MIDDLE SCHOOL

PUMPS

Tag#	P1, P2	P3, P4		
Location	Basement - Boiler Room	Basement - Boiler Room		
Quantity	2	2		
Area Serving	Original Building	New Section		
Mfg.	Taco	Taco		
Model	-	-		
Serial Number	-	-		
Type	in-line circulator	in-line circulator		
Flow, GPM	50 (Est)	50 (Est)		
Head, Ft	-	-		
Power, HP	3	3		
Motor Efcy	-	-		
RPM	1725	1725		
Year Manufactured	2005	2005		
Age	9	9		
Estimated Service Life	10	10		
Remaining Life	1	1		
Notes	Pumps are in good condition	Pumps are in good condition		

LINCOLN MIDDLE SCHOOL

DOMESTIC WATER HEATERS

Tag#	WH-1, 2	WH-3		
Location	Basement	2nd Floor		
Quantity	2	1		
Area Serving	Faucets in the bathrooms and classroomss	Faucets in the bathrooms and classroomss		
Mfg.	AO Smith	AO Smith		
Model	BTR 120-110	-		
Serial Number	9280725002	9280725002		
Capacity, Gal	71	71		
Fuel	Natural Gas	Electric		
Type	Tank Type Standard Efficiency	Tank Type		
Heating Capacity, MBH (Input)	120	N/A		
Recovery Rate, GPH	116.36	N/A		
Efficiency	80%	100%		
Year Manufactured	2004	N/A		
Age	10	N/A		
Estimated Service Life	10	10		
Remaining Life	0	N/A		
Hot Water Circulator	Inline cartridge type circulator	None		
Notes	Units are in good condition	Good condition		



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ECM LIST

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ECM #1:

COMPUTER POWER MANAGEMENT

Network Computer Power Management System

School	Number of Laptops	Number of Computers with Flat Panel	Number of Computers with CRT	Number of Computers	Electric Savings, kWh	Cost of Electricity \$/kWh	Savings, \$	Cost, \$
Faber Elementary School		72	39	111	20,664	\$0.158	\$3,260	\$3,330
Lincoln Middle School	26			26	1,354	\$0.167	\$226	\$780
Roosevelt High School	104	50		154	13,396	\$0.155	\$2,081	\$4,620
Total	130	122	39	291	35,414		\$5,568	\$8,730

	Power	Used	Not used		Energy Savings
	(Watt)	Hrs ¹	Hrs Awake ²	Hrs Off ³	kWh/Yr
Average Power Laptop	31	840	3360	4560	104
Average Power Desktop (Panel)	95	840	3360	4560	319
Average Power Desktop (CRT)	140	840	3360	4560	470
Diversity Factor	50%				

- (1): Computers in session (35weeks/yr, 4 days/week, 6 hrs/day)
 - (2): Computers ON but not used (35weeks/yr, 5 days/week, 24/hr/day except computer hours in session)
 - (3): Computers shut off Any other time (Weekends, winter/summer breaks)
- Cost of software \$30 / Unit
- Computer power requirements estimated based on ASHRAE Fundamentals 2013, Section 18, Table 8



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ECM #2:

CRT MONITOR REPLACEMENT

CRT Monitor Replacement

School	Number of Computers with CRT	Demand Savings, kW	Electric Savings, kWh	Cost of Electricity \$/kWh	Savings, \$	Cost, \$
Faber Elementary School	37	1.1	4,662	\$0.158	\$736	\$4,440
Lincoln Middle School	0	0.0	0	\$0.167	\$0	\$0
High School	0	0.0	0	\$0.155	\$0	\$0
Total	37	1.1	4,662	-	\$736	\$4,440

	Power (Watt)	Used Hrs ¹	Not used Hrs Awake ²	Hrs Off ³	Energy Savings kWh/Yr
Average Power LED Panel	18	840	3360	4560	60
Average Power CRT	75	840	3360	4560	252
Diversity Factor	50%				

(1): Computers in session (35weeks/yr, 4 days/week, 6 hrs/day)

(2): Computers ON monitor OFF (35weeks/yr, 5 days/week, 24/hr/day except computer hours in session)

(3): Computers OFF Any other time (Weekends, winter/summer breaks)

Cost of 19" Monitor \$120 / Unit

Monitor power requirements estimated based on ASHRAE Fundamentals 2013, Section 18, Table 8



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ECM #3:

LIGHTING EQUIPMENT UPGRADE



LIGHTING RETROFIT SUMMARY FOR: John P. Faber School High&Lehigh Streets, Dunellen, NJ 08812

BUILDING INFORMATION		EXISTING FIXTURES				PROPOSED FIXTURES				SAVINGS							FINANCIAL						
BUILDING	SQ. FT.	PRE TOTAL FIXT. QTY	PRE TOTAL FIXT. WATTS	PRE ANNUAL KWH CONSUMPTION	PRE WATTS / SQ. FT	POST TOTAL FIXT. QTY	POST TOTAL FIXT. WATTS	POST ANNUAL KWH CONSUMPTION	POST WATTS / SQ. FT	WATTS SAVED	ANNUAL KWH SAVED WITH FIXTURES	ANNUAL KWH SAVED WITH SENSORS	TOTAL ANNUAL KWH SAVED	ANNUAL SAVINGS \$ FIXT.	ANNUAL SAVINGS \$ SENSORS	ANNUAL SAVINGS \$ TOTAL	CO2 REDUCTION (TONS)	NJ Smart Start FIXTURE REBATE \$	NJ Smart Start SENSOR REBATE \$	FIXTURES TOTAL (INSTALLED) COST \$	SENSORS TOTAL (INSTALLED) COST \$	MATERIAL TOTAL (INSTALLED) COST \$	SIMPLE PAYBACK AFTER REBATE (YEARS)
John P. Faber School	89,203	996	107,390	254,685	1.20	996	74,062	176,534	0.83	33,328	78,151	19,218	97,369	\$12,330	\$3,032	\$15,362	25.8	\$13,880	\$4,315	\$70,570	\$28,570	\$99,140	5.3

4%	PERCENTAGE OF REBATES IN TOTAL INSTALLED COST
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69%	PERCENTAGE OF CONSUMPTION COMPARE TO EXISTING STATE
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42%	EXISTING PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING
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29%	PROPOSED PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING
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**LIGHTING UPGRADE PROJECT
LINE x LINE DETAIL**

CUSTOMER: Dunellen Public Schools
FACILITY: John P. Faber School

FACILITY SQ. FT.
89,203

DATE OF AUDIT:
12/12/2013

SPACE DESCRIPTION			EXISTING FIXTURES						REPLACEMENT FIXTURES										ENERGY ANALYSIS						COST ANALYSIS		
LINE	FLOOR	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS	PRE ANNUAL KWH	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL \$ SAVINGS / LINE (INCLUDING SENSORS)	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES
							910																	\$0.158			
137	First Floor	Room 55 Examiner	2'x4' Recessed Troffer, Prismatic Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	2	62	124	2,200	273	Relamp & Reballast w/ (2) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	2	48	300	Ceiling	1	96	1,900	211	182	14	28	300	62	29	\$14	\$100	\$250	\$295
138	First Floor	Classroom 54	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	14	86	1,204	2,200	2,649	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	14	72	300	Ceiling	1	1,008	1,900	2,218	1,915	14	196	300	431	302	\$116	\$770	\$250	\$845
139	First Floor	Classroom 53	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	15	86	1,290	2,200	2,838	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	15	72	300	Ceiling	1	1,080	1,900	2,376	2,052	14	210	300	462	324	\$124	\$825	\$250	\$890
140	First Floor	Classroom 50	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	15	86	1,290	2,200	2,838	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	15	72	300	Ceiling	1	1,080	1,900	2,376	2,052	14	210	300	462	324	\$124	\$825	\$250	\$890
141	First Floor	Classroom 51	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	15	86	1,290	2,200	2,838	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	15	72	300	Ceiling	1	1,080	1,900	2,376	2,052	14	210	300	462	324	\$124	\$825	\$250	\$890
142	First Floor	Classroom 8	2'x4' Recessed Troffer, No Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	4	86	345	2,200	759	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	4	72	300	Ceiling	1	288	1,900	634	547	14	57	300	125	86	\$33	\$220	\$250	\$395
143	First Floor	Sprinkler Room	4' Fluorescent Strip with (2) F32T8 & (1) Electronic Ballast, Surface Mount, Prismatic Lens	1	68	68	500	34	Relamp & Reballast w/ (2) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	1	49	0	Ceiling	0	49	500	25	25	19	19	0	10	0	\$2	\$50	\$0	\$40
142	First Floor	Hallway	2'x4' Recessed Troffer, No Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	3	86	259	5,000	1,293	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	3	72	300	Ceiling	1	216	4,700	1,080	1,015	14	43	300	213	65	\$44	\$165	\$250	\$350
143	First Floor	Hallway	4' Fluorescent Strip with (1) F32T8 & (1) Electronic Ballast, Recessed, No Lens	48	35	1,680	5,000	8,400	Relamp & Reballast w/ (1) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	48	25	300	Ceiling	1	1,200	4,700	6,000	5,640	10	480	300	2,400	360	\$435	\$2,160	\$250	\$1,895
142	First Floor	Hallway	2'x2' Recessed Troffer, No Lens, w/ (2) FBO31T8/835, 32w 800 U-Lamps & (1) Electronic Ballast	6	64	382	5,000	1,908	None	6	64	300	Ceiling	1	382	4,700	1,908	1,794	0	0	300	0	114	\$18	\$0	\$250	\$215
143	First Floor	Old to New Corridor	2'x2' Recessed Troffer, No Lens, w/ (2) FBO31T8/835, 32w 800 U-Lamps & (1) Electronic Ballast	5	64	318	5,000	1,590	None	5	64	0	Ceiling	0	318	5,000	1,590	1,590	0	0	0	0	0	\$0	\$0	\$0	\$0
144	Second Floor	Stairwell BOE	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	5	86	430	8,760	3,767	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	5	72	0	Ceiling	0	360	8,760	3,154	3,154	14	70	0	613	0	\$97	\$275	\$0	\$225
145	Second Floor	Stairwell Gym	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	5	86	430	8,760	3,767	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	5	72	0	Ceiling	0	360	8,760	3,154	3,154	14	70	0	613	0	\$97	\$275	\$0	\$225
146	-	Exit Signs	Exit Sign - 20W incandescent	14	20	280	8,760	2,453	5W LED Exit Sign	14	5	0	Ceiling	0	70	8,760	613	613	15	210	0	1,840	0	\$290	\$700	\$0	\$700
				996		107,390		254,685		996				120	74,062		176,534	157,316				78,151	19,218	15,362	70,570	28,570	80,945



LIGHTING RETROFIT SUMMARY FOR: Lincoln Middle School 411 1st Street, Dunellen, NJ 08812

BUILDING INFORMATION		EXISTING FIXTURES				PROPOSED FIXTURES				SAVINGS							FINANCIAL						
BUILDING	SQ. FT.	PRE TOTAL FIXT. QTY	PRE TOTAL FIXT. WATTS	PRE ANNUAL KWH CONSUMPTION	PRE WATTS / SQ. FT	POST TOTAL FIXT. QTY	POST TOTAL FIXT. WATTS	POST ANNUAL KWH CONSUMPTION	POST WATTS / SQ. FT	WATTS SAVED	ANNUAL KWH SAVED WITH FIXTURES	ANNUAL KWH SAVED WITH SENSORS	TOTAL ANNUAL KWH SAVED	ANNUAL SAVINGS \$ FIXT.	ANNUAL SAVINGS \$ SENSORS	ANNUAL SAVINGS \$ TOTAL	CO2 REDUCTION (TONS)	NJ Smart Start FIXTURE REBATE \$	NJ Smart Start SENSOR REBATE \$	FIXTURES TOTAL (INSTALLED) COST \$	SENSORS TOTAL (INSTALLED) COST \$	MATERIAL TOTAL (INSTALLED) COST \$	SIMPLE PAYBACK AFTER REBATE (YEARS)
Lincoln Middle School	26,248	458	33,373	102,536	1.27	456	26,450	81,735	1.01	6,923	20,801	6,325	27,125	\$3,245	\$987	\$4,232	6.9	\$4,340	\$1,960	\$22,320	\$11,000	\$33,320	6.4

6%	PERCENTAGE OF REBATES IN TOTAL INSTALLED COST
80%	PERCENTAGE OF CONSUMPTION COMPARE TO EXISTING STATE
38%	EXISTING PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING
30%	PROPOSED PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING



**LIGHTING UPGRADE PROJECT
LINE x LINE DETAIL**

CUSTOMER: Dunellen Public Schools
FACILITY: Lincoln Middle School

FACILITY SQ. FT.
26,248

DATE OF AUDIT:
1/1/2013

SPACE DESCRIPTION			REPLACEMENT FIXTURES						ENERGY ANALYSIS						COST ANALYSIS												
LINE	FLOOR	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS	PRE ANNUAL KWH	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL \$ SAVINGS / LINE (INCLUDING SENSORS)	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES
							910									910								\$0.156			
69	Second Floor	Classroom L10	2'x4' Recessed Troffer, No Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	12	86	1,034	2,200	2,276	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	12	72	300	Ceiling	1	864	1,900	1,901	1,642	14	170	300	375	259	\$99	\$660	\$250	\$755
70	Second Floor	Classroom L9	2'x4' Recessed Troffer, No Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	14	86	1,207	2,200	2,655	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	14	72	300	Ceiling	1	1,008	1,900	2,218	1,915	14	199	300	437	302	\$115	\$770	\$250	\$845
71	Second Floor	Closet	Recessed round fixture, No lens w/ (1) 32W Compact Fluorescent Lamp (CFL)	1	32	32	500	16	None	1	32	0	Ceiling	0	32	500	16	16	0	0	0	0	0	\$0	\$0	\$0	\$0
72	Second Floor	Closet	2'x4' Recessed Troffer, Prismatic Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	1	62	62	500	31	Relamp & Reballast w/ (2) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	1	49	0	Ceiling	0	49	500	25	25	13	13	0	7	0	\$1	\$50	\$0	\$40
73	Second Floor	Classroom L8	Recessed canopy lighting - 75 incandescent	1	75	75	2,200	165	Relamp 20 Watt LED Screw-in	1	20	300	Ceiling	1	20	1,900	44	38	55	55	300	121	6	\$20	\$20	\$250	\$235
74	Second Floor	Classroom L8	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	1	86	86	2,200	189	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	1	72	300	Ceiling	1	72	1,900	158	137	14	14	300	31	22	\$8	\$55	\$250	\$260
75	Second Floor	Classroom L8	75W incandescent	5	75	375	2,200	825	23W CFL	5	23	300	Ceiling	1	115	1,900	253	219	52	260	300	572	35	\$95	\$25	\$250	\$240
76	Second Floor	Classroom L7	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	15	86	1,290	2,200	2,838	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	15	72	300	Ceiling	1	1,080	1,900	2,376	2,052	14	210	300	462	324	\$123	\$825	\$250	\$890
77	Second Floor	Classroom L14	2'x4' Recessed Troffer, Prismatic Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	19	62	1,178	2,200	2,592	Relamp & Reballast w/ (2) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	19	49	300	Ceiling	1	931	1,900	2,048	1,769	13	247	300	543	279	\$128	\$950	\$250	\$975
78	Second Floor	Classroom L15	2'x4' Recessed Troffer, Prismatic Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	3	62	186	2,200	409	Relamp & Reballast w/ (2) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	3	49	300	Ceiling	1	147	1,900	323	279	13	39	300	86	44	\$20	\$150	\$250	\$335
79	Second Floor	Restroom	2'x4' Recessed Troffer, Prismatic Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	1	62	62	2,200	136	Relamp & Reballast w/ (2) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	1	49	300	Ceiling	1	49	1,900	108	93	13	13	300	29	15	\$7	\$50	\$250	\$255
80	Second Floor	Stairwell	2'x4' Recessed Troffer, Prismatic Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	3	62	186	8,760	1,629	Relamp & Reballast w/ (2) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	3	49	0	Ceiling	0	147	8,760	1,288	1,288	13	39	0	342	0	\$53	\$150	\$0	\$120
81	First Floor	Stairwell	2'x4' Recessed Troffer, Prismatic Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	4	62	248	8,760	2,172	Relamp & Reballast w/ (2) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	4	49	0	Ceiling	0	196	8,760	1,717	1,717	13	52	0	456	0	\$71	\$200	\$0	\$160
82	Second Floor	Classroom L16	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	15	86	1,290	2,200	2,838	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	15	72	300	Ceiling	1	1,080	1,900	2,376	2,052	14	210	300	462	324	\$123	\$825	\$250	\$890
83	Second Floor	Classroom L17	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	6	86	516	2,200	1,135	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	6	72	300	Ceiling	1	432	1,900	950	821	14	84	300	185	130	\$49	\$330	\$250	\$485
84	Second Floor	Classroom L18	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	15	86	1,290	2,200	2,838	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	15	72	300	Ceiling	1	1,080	1,900	2,376	2,052	14	210	300	462	324	\$123	\$825	\$250	\$890
85	Second Floor	Classroom L19	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	18	86	1,548	2,200	3,406	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	18	72	300	Ceiling	1	1,296	1,900	2,851	2,462	14	252	300	554	389	\$147	\$990	\$250	\$1,025
86	Second Floor	Janitor's Closet	1'x4' Wall Mount, Prismatic Lens with w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast, Wireguard	1	62	62	500	31	Relamp & Reballast w/ (2) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	1	49	0	Ceiling	0	49	500	25	25	13	13	0	7	0	\$1	\$50	\$0	\$40
				458		33,373		102,536		456	4,796	17,400	0	44	26,450		81,735	75,411	0	6,635		20,657	6,325	\$4,209	\$22,320	\$11,000	\$27,020

PRE FIXTURE DESCRIPTION	PRE WATTS / FIXT.	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES
4	6	11	12	13	27	28	29



LIGHTING RETROFIT SUMMARY FOR: High School 411 1st Street, Dunellen, NJ 08812

BUILDING INFORMATION		EXISTING FIXTURES				PROPOSED FIXTURES				SAVINGS							FINANCIAL						
BUILDING	SQ. FT.	PRE TOTAL FIXT. QTY	PRE TOTAL FIXT. WATTS	PRE ANNUAL KWH CONSUMPTION	PRE WATTS / SQ. FT	POST TOTAL FIXT. QTY	POST TOTAL FIXT. WATTS	POST ANNUAL KWH CONSUMPTION	POST WATTS / SQ. FT	WATTS SAVED	ANNUAL KWH SAVED WITH FIXTURES	ANNUAL KWH SAVED WITH SENSORS	TOTAL ANNUAL KWH SAVED	ANNUAL SAVINGS \$ FIXT.	ANNUAL SAVINGS \$ SENSORS	ANNUAL SAVINGS \$ TOTAL	CO2 REDUCTION (TONS)	NJ Smart Start FIXTURE REBATE \$	NJ Smart Start SENSOR REBATE \$	FIXTURES TOTAL (INSTALLED) COST \$	SENSORS TOTAL (INSTALLED) COST \$	MATERIAL TOTAL (INSTALLED) COST \$	SIMPLE PAYBACK AFTER REBATE (YEARS)
High School	77,794	0	80,803	196,585	1.04	805	60,482	149,634	0.78	20,321	46,951	13,855	60,807	\$7,295	\$2,153	\$9,448	15.5	12,690	10,055	\$58,400	\$23,090	\$81,490	6.2

12%	PERCENTAGE OF REBATES IN TOTAL INSTALLED COST
76%	PERCENTAGE OF CONSUMPTION COMPARE TO EXISTING STATE
43%	EXISTING PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING
33%	PROPOSED PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING



**LIGHTING UPGRADE PROJECT
LINE x LINE DETAIL**

CUSTOMER: Dunellen Public Schools
FACILITY: High School

FACILITY SQ. FT.
77,794

DATE OF AUDIT:
12/31/2013

SPACE DESCRIPTION			REPLACEMENT FIXTURES						ENERGY ANALYSIS						COST ANALYSIS														
LINE	FLOOR	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS	PRE ANNUAL KWH	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL \$ SAVINGS / LINE (INCLUDING SENSORS)	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES		
							910								910											\$0.155			
103	First Floor	Closet	4ft Wall Mounted, Prismatic Lens, w/ (2) F32T8/32w Lamps & (1) Electronic Ballast	1	68	68	500	34	Relamp & Reballast w/ (2) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	1	49	0	Ceiling	0	49	500	25	25	19	19	0	10	0	\$1	\$50	\$0	\$40		
104	First Floor	Girls Locker Room Entry	4' Fluorescent Strip with (2) F32T8 & (1) Electronic Ballast, Pendant, No Lens	1	68	68	2,200	150	Relamp & Reballast w/ (2) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	1	49	300	Ceiling	1	49	1,900	108	93	19	19	300	42	15	\$9	\$50	\$250	\$255		
105	First Floor	Girls Locker Room	8' Pendant Mount, No Lens, w/ (2) F96T12/75w Lamps & (1) Magnetic Ballast	2	142	283	2,200	623	New 8-ft Strip fixture w / (4) 4ft F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	2	98	300	Ceiling	1	196	1,900	431	372	44	87	300	191	59	\$39	\$200	\$250	\$395		
106	First Floor	Girls Locker Room	60W incandescent	2	60	120	2,200	264	23W Screw in CFL	2	18	300	Ceiling	1	36	1,900	79	68	42	84	300	185	11	\$30	\$10	\$250	\$225		
107	First Floor	Girls Locker Room	4' Fluorescent Strip with (1) F32T8 & (1) Electronic Ballast, Wall Mounted, No Lens	2	35	70	2,200	154	Relamp & Reballast w/ (1) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	2	25	300	Ceiling	1	50	1,900	110	95	10	20	300	44	15	\$9	\$90	\$250	\$285		
108	First Floor	Hallway	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	2	86	172	5,000	860	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	2	72	0	Ceiling	0	144	5,000	720	720	14	28	0	140	0	\$22	\$110	\$0	\$90		
109	First Floor	Room 1	2'x4' Recessed Troffer, No Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	8	86	690	2,200	1,517	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	8	72	300	Wall	1	576	1,900	1,267	1,094	14	114	300	250	173	\$66	\$440	\$120	\$460		
110	First Floor	Room 2	2'x4' Recessed Troffer, Prismatic Lens, w/ (4) F32T8/32w 700 Lamps & (1) Electronic Ballast	12	107	1,280	2,200	2,817	Relamp & Reballast w/ (4) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	12	98	300	Wall	1	1,176	1,900	2,587	2,234	9	104	300	230	353	\$91	\$720	\$120	\$700		
111	First Floor	Boys Room	2'x4' Recessed Troffer, Prismatic Lens, w/ (4) F32T8/32w 700 Lamps & (1) Electronic Ballast	3	107	320	2,200	704	Relamp & Reballast w/ (4) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	3	98	300	Ceiling	1	294	1,900	647	559	9	26	300	57	88	\$23	\$180	\$250	\$365		
112	First Floor	Room	2'x4' Pendant, Prismatic Lens, w/ (4) F32T8/32w 700 Lamps & (1) Electronic Ballast	2	107	213	2,200	469	Relamp & Reballast w/ (4) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	2	98	300	Wall	1	196	1,900	431	372	9	17	300	38	59	\$15	\$120	\$120	\$200		
113	First Floor	Boiler Room	4' Fluorescent Strip with (2) F32T8 & (1) Electronic Ballast, Pendant, No Lens	11	68	750	8,760	6,572	Relamp & Reballast w/ (2) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	11	49	0	Ceiling	0	539	8,760	4,722	4,722	19	211	0	1,850	0	\$287	\$550	\$0	\$440		
114	First Floor	Boiler Room	60W incandescent	2	60	120	8,760	1,051	23W Screw in CFL	2	18	0	Ceiling	0	36	8,760	315	315	42	84	0	736	0	\$114	\$10	\$0	\$10		
115	First Floor	Nurse Entry	2'x2' Recessed Troffer, Prismatic Lens, w/ (2) F30T8/835, 32w 800 Lamps & (1) Electronic Ballast	2	62	124	2,200	273	New 2'x2' Recessed Troffer, silver reflectors, no Lens, w/ (2) F17T8,17w 800 Lamps & (1) Electronic Ballast	2	33	300	Ceiling	1	66	1,900	145	125	29	58	300	128	20	\$23	\$100	\$250	\$295		
116	First Floor	Nurse Office	1'x4' Surface Fixture, No Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	6	62	372	2,200	818	Relamp & Reballast w/ (2) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	6	49	300	Wall	1	294	1,900	647	559	13	78	300	172	88	\$40	\$300	\$120	\$340		
117	First Floor	Patient Room	2'x4' Recessed Troffer, Prismatic Lens, w/ (4) F32T8/32w 700 Lamps & (1) Electronic Ballast	1	107	107	2,200	235	Relamp & Reballast w/ (4) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	1	98	300	Wall	1	98	1,900	216	186	9	9	300	19	29	\$8	\$60	\$120	\$150		
118	First Floor	Bathroom	60W incandescent	3	60	180	2,200	396	23W Screw in CFL	3	18	300	Ceiling	1	54	1,900	119	103	42	126	300	277	16	\$46	\$15	\$250	\$230		
119	First Floor	Hallway	2'x4' Recessed Troffer, Prismatic Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	6	62	372	5,000	1,860	Relamp & Reballast w/ (2) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	6	49	0	Ceiling	0	294	5,000	1,470	1,470	13	78	0	390	0	\$61	\$300	\$0	\$240		
120	First Floor	Chemistry Hallway	2'x4' Recessed Troffer, Prismatic Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	4	62	248	5,000	1,240	Relamp & Reballast w/ (2) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	4	49	0	Ceiling	0	196	5,000	980	980	13	52	0	260	0	\$40	\$200	\$0	\$160		
121	First Floor	Classroom 7 Chemistry	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	20	86	1,720	2,200	3,784	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/28 Elec. Low-Power High Efficiency Ballast	20	72	300	Ceiling	2	1,440	1,900	3,168	2,736	14	280	300	616	432	\$163	\$1,100	\$500	\$1,120		
122	First Floor	Classroom 8 General Science	2'x4' Recessed Troffer, Prismatic Lens, w/ (4) F32T8/32w 700 Lamps & (1) Electronic Ballast	8	107	854	2,200	1,878	Relamp & Reballast w/ (4) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	8	98	300	Ceiling	2	784	1,900	1,725	1,490	9	70	300	153	235	\$60	\$480	\$500	\$620		
123	First Floor	Classroom 9	2'x4' Recessed Troffer, Prismatic Lens, w/ (4) F32T8/32w 700 Lamps & (1) Electronic Ballast	9	107	960	2,200	2,113	Relamp & Reballast w/ (4) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	9	98	300	Ceiling	2	882	1,900	1,940	1,676	9	78	300	172	265	\$68	\$540	\$500	\$670		
124	First Floor	Classroom 7 Chemistry	1'x4' Pendant strip, No Lens, w/ (2) F40T12/34w Lamps & (1) Energy Saving Magnetic Ballast	4	66	264	2,200	581	Relamp & Reballast w/ (2) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	4	49	300	Ceiling	2	196	1,900	431	372	17	68	300	150	59	\$32	\$200	\$500	\$380		
125	First Floor	Classroom 8 General Science	1'x4' Surface Fixture, No Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	4	62	248	2,200	546	Relamp & Reballast w/ (2) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	4	49	300	Ceiling	2	196	1,900	431	372	13	52	300	114	59	\$27	\$200	\$500	\$380		
126	First Floor	Classroom 9	60W incandescent	2	60	120	2,200	264	23W Screw in CFL	2	18	0	Ceiling	0	36	2,200	79	79	42	84	0	185	0	\$29	\$10	\$0	\$10		
127	First Floor	Hallway	2'x4' Recessed Troffer, Prismatic Lens, w/ (4) F32T8/32w 700 Lamps & (1) Electronic Ballast	6	107	640	5,000	3,201	Relamp & Reballast w/ (4) F28T8 Lamps & (1) Elec. Low-Power High Efficiency Ballast	6	98	0	Ceiling	0	588	5,000	2,940	2,940	9	52	0	261	0	\$41	\$360	\$0	\$300		
127	-	Exterior	150 W Metal Halide Wall Pack	12	185	2,220	3,650	8,103	45 Watt LED Wall Mount	12	45	0	Ceiling	0	540	3,650	1,971	1,971	140	1,680	0	6,132	0	\$953	\$4,800	\$0	\$3,600		
128	-	Exterior	Wall Mounted Shoebox - 100W incandescent	18	100	1,800	3,650	6,570	40 Watt LED Wall Mount	18	40	0	Ceiling	0	720	3,650	2,628	2,628	60	1,080	0	3,942	0	\$613	\$4,230	\$0	\$2,430		
129	-	Exterior	Light Poles - 400W HID (Utility Owned)	4	460	1,840	3,650	6,716	None	4	460	0	Ceiling	0	1,840	3,650	6,716	6,716	0	0	0	0	0	\$0	\$0	\$0	\$0		
					12,134	80,803		196,585			805				109	60,482		149,634	135,779	0			46,951	13,855	9,448	0	58,400	23,090	58,745



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ECM #4:

LIGHTING EQUIPMENT UPGRADE – LED



LIGHTING RETROFIT SUMMARY FOR: John P. Faber School High&Lehigh Streets, Dunellen, NJ 08812

BUILDING INFORMATION		EXISTING FIXTURES				PROPOSED FIXTURES				SAVINGS							FINANCIAL						
BUILDING	SQ. FT.	PRE TOTAL FIXT. QTY	PRE TOTAL FIXT. WATTS	PRE ANNUAL KWH CONSUMPTION	PRE WATTS / SQ. FT	POST TOTAL FIXT. QTY	POST TOTAL FIXT. WATTS	POST ANNUAL KWH CONSUMPTION	POST WATTS / SQ. FT	WATTS SAVED	ANNUAL KWH SAVED WITH FIXTURES	ANNUAL KWH SAVED WITH SENSORS	TOTAL ANNUAL KWH SAVED	ANNUAL SAVINGS \$ FIXT.	ANNUAL SAVINGS \$ SENSORS	ANNUAL SAVINGS \$ TOTAL	CO2 REDUCTION (TONS)	NJ Smart Start FIXTURE REBATE \$	NJ Smart Start SENSOR REBATE \$	FIXTURES TOTAL (INSTALLED) COST \$	SENSORS TOTAL (INSTALLED) COST \$	MATERIAL TOTAL (INSTALLED) COST \$	SIMPLE PAYBACK AFTER REBATE (YEARS)
John P. Faber School	89,203	996	107,390	254,685	1.20	996	63,543	151,418	0.71	43,847	103,267	17,607	120,874	\$16,292	\$2,778	\$19,070	34.1	\$30,260	\$3,930	\$126,815	\$27,820	\$154,635	6.3

3%	PERCENTAGE OF REBATES IN TOTAL INSTALLED COST
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59%	PERCENTAGE OF CONSUMPTION COMPARE TO EXISTING STATE
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42%	EXISTING PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING
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25%	PROPOSED PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING
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**LIGHTING UPGRADE PROJECT
LINE x LINE DETAIL**

CUSTOMER: Dunellen Public Schools
FACILITY: John P. Faber School

FACILITY SQ. FT.
89,203

DATE OF AUDIT:
12/12/2013

SPACE DESCRIPTION			REPLACEMENT FIXTURES						ENERGY ANALYSIS						COST ANALYSIS												
LINE	FLOOR	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS	PRE ANNUAL KWH	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL \$ SAVINGS / LINE (INCLUDING SENSORS)	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES
							910									910								\$0.158			
137	First Floor	Room 55 Examiner	2'x4' Recessed Troffer, Prismatic Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	2	62	124	2,200	273	Retrofit fixture with (2) LED Tubes	2	40	300	Ceiling	1	80	1,900	176	152	22	44	300	97	24	\$19	\$180	\$250	\$355
138	First Floor	Classroom 54	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	14	86	1,204	2,200	2,649	Retrofit fixture with (3) LED Tubes	14	60	300	Ceiling	1	840	1,900	1,848	1,596	26	364	300	801	252	\$166	\$1,680	\$250	\$1,475
139	First Floor	Classroom 53	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	15	86	1,290	2,200	2,838	Retrofit fixture with (3) LED Tubes	15	60	300	Ceiling	1	900	1,900	1,980	1,710	26	390	300	858	270	\$178	\$1,800	\$250	\$1,565
140	First Floor	Classroom 50	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	15	86	1,290	2,200	2,838	Retrofit fixture with (3) LED Tubes	15	60	300	Ceiling	1	900	1,900	1,980	1,710	26	390	300	858	270	\$178	\$1,800	\$250	\$1,565
141	First Floor	Classroom 51	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	15	86	1,290	2,200	2,838	Retrofit fixture with (3) LED Tubes	15	60	300	Ceiling	1	900	1,900	1,980	1,710	26	390	300	858	270	\$178	\$1,800	\$250	\$1,565
142	First Floor	Classroom 8	2'x4' Recessed Troffer, No Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	4	86	345	2,200	759	Retrofit fixture with (3) LED Tubes	4	60	300	Ceiling	1	240	1,900	528	456	26	105	300	231	72	\$48	\$480	\$250	\$575
143	First Floor	Sprinkler Room	4' Fluorescent Strip with (2) F32T8 & (1) Electronic Ballast, Surface Mount, Prismatic Lens	1	68	68	500	34	Retrofit fixture with (2) LED Tubes	1	40	0	Ceiling	0	40	500	20	20	28	28	0	14	0	\$2	\$90	\$0	\$70
142	First Floor	Hallway	2'x4' Recessed Troffer, No Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	3	86	259	5,000	1,293	Retrofit fixture with (3) LED Tubes	3	60	300	Ceiling	1	180	4,700	900	846	26	79	300	393	54	\$71	\$360	\$250	\$485
143	First Floor	Hallway	4' Fluorescent Strip with (1) F32T8 & (1) Electronic Ballast, Recessed, No Lens	48	35	1,680	5,000	8,400	Retrofit fixture with (1) LED Tube	48	20	300	Ceiling	1	960	4,700	4,800	4,512	15	720	300	3,600	288	\$613	\$2,880	\$250	\$2,615
142	First Floor	Hallway	2'x2' Recessed Troffer, No Lens, w/ (2) FBO31T8/835, 32w 800 U-Lamps & (1) Electronic Ballast	6	64	382	5,000	1,908	Retrofit fixture with (2) LED U-Tubes	6	52	300	Ceiling	1	312	4,700	1,560	1,466	12	70	300	348	94	\$70	\$900	\$250	\$995
143	First Floor	Old to New Corridor	2'x2' Recessed Troffer, No Lens, w/ (2) FBO31T8/835, 32w 800 U-Lamps & (1) Electronic Ballast	5	64	318	5,000	1,590	Retrofit fixture with (2) LED U-Tubes	5	52	0	Ceiling	0	260	5,000	1,300	1,300	12	58	0	290	0	\$46	\$750	\$0	\$650
144	Second Floor	Stairwell BOE	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	5	86	430	8,760	3,767	Retrofit fixture with (3) LED Tubes	5	60	0	Ceiling	0	300	8,760	2,628	2,628	26	130	0	1,139	0	\$180	\$600	\$0	\$450
145	Second Floor	Stairwell Gym	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	5	86	430	8,760	3,767	Retrofit fixture with (3) LED Tubes	5	60	0	Ceiling	0	300	8,760	2,628	2,628	26	130	0	1,139	0	\$180	\$600	\$0	\$450
146	-	Exit Signs	Exit Sign - 20W incandescent	14	20	280	8,760	2,453	5W LED Exit Sign	14	5	0	Ceiling	0	70	8,760	613	613	15	210	0	1,840	0	\$290	\$700	\$0	\$700
				996		107,390		254,685		996				117	63,543		151,418	133,812				103,267	17,607	19,070	126,815	27,820	119,745



LIGHTING RETROFIT SUMMARY FOR: Lincoln Middle School 411 1st Street, Dunellen, NJ 08812

BUILDING INFORMATION		EXISTING FIXTURES				PROPOSED FIXTURES				SAVINGS							FINANCIAL						
BUILDING	SQ. FT.	PRE TOTAL FIXT. QTY	PRE TOTAL FIXT. WATTS	PRE ANNUAL KWH CONSUMPTION	PRE WATTS / SQ. FT	POST TOTAL FIXT. QTY	POST TOTAL FIXT. WATTS	POST ANNUAL KWH CONSUMPTION	POST WATTS / SQ. FT	WATTS SAVED	ANNUAL KWH SAVED WITH FIXTURES	ANNUAL KWH SAVED WITH SENSORS	TOTAL ANNUAL KWH SAVED	ANNUAL SAVINGS \$ FIXT.	ANNUAL SAVINGS \$ SENSORS	ANNUAL SAVINGS \$ TOTAL	CO2 REDUCTION (TONS)	NJ Smart Start FIXTURE REBATE \$	NJ Smart Start SENSOR REBATE \$	FIXTURES TOTAL (INSTALLED) COST \$	SENSORS TOTAL (INSTALLED) COST \$	MATERIAL TOTAL (INSTALLED) COST \$	SIMPLE PAYBACK AFTER REBATE (YEARS)
Lincoln Middle School	26,248	458	33,373	102,536	1.27	456	22,107	69,057	0.84	11,266	33,479	5,324	38,803	\$5,223	\$830	\$6,053	11.1	\$5,750	\$1,960	\$45,725	\$11,000	\$56,725	8.1

3%	PERCENTAGE OF REBATES IN TOTAL INSTALLED COST
67%	PERCENTAGE OF CONSUMPTION COMPARE TO EXISTING STATE
38%	EXISTING PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING
26%	PROPOSED PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING



**LIGHTING UPGRADE PROJECT
LINE x LINE DETAIL**

CUSTOMER: Dunellen Public Schools
FACILITY: Lincoln Middle School

FACILITY SQ. FT.
26,248

DATE OF AUDIT:
1/1/2013

SPACE DESCRIPTION			REPLACEMENT FIXTURES						ENERGY ANALYSIS						COST ANALYSIS												
LINE	FLOOR	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS	PRE ANNUAL KWH	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL \$ SAVINGS / LINE (INCLUDING SENSORS)	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES
							910									910								\$0.156			
69	Second Floor	Classroom L10	2'x4' Recessed Troffer, No Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	12	86	1,034	2,200	2,276	Retrofit fixture with (3) LED Tubes	12	60	300	Ceiling	1	720	1,900	1,584	1,368	26	314	300	692	216	\$142	\$1,440	\$250	\$1,295
70	Second Floor	Classroom L9	2'x4' Recessed Troffer, No Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	14	86	1,207	2,200	2,655	Retrofit fixture with (3) LED Tubes	14	60	300	Ceiling	1	840	1,900	1,848	1,596	26	367	300	807	252	\$165	\$1,680	\$250	\$1,475
71	Second Floor	Closet	Recessed round fixture, No lens w/ (1) 32W Compact Fluorescent Lamp (CFL)	1	32	32	500	16	None	1	32	0	Ceiling	0	32	500	16	16	0	0	0	0	0	\$0	\$0	\$0	\$0
72	Second Floor	Closet	2'x4' Recessed Troffer, Prismatic Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	1	62	62	500	31	Retrofit fixture with (2) LED Tubes	1	40	0	Ceiling	0	40	500	20	20	22	22	0	11	0	\$2	\$90	\$0	\$70
73	Second Floor	Classroom L8	Recessed canopy lighting - 75 incandescent	1	75	75	2,200	165	Relamp 20 Watt LED Screw-in	1	20	300	Ceiling	1	20	1,900	44	38	55	55	300	121	6	\$20	\$20	\$250	\$235
74	Second Floor	Classroom L8	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	1	86	86	2,200	189	Retrofit fixture with (3) LED Tubes	1	60	300	Ceiling	1	60	1,900	132	114	26	26	300	57	18	\$12	\$120	\$250	\$305
75	Second Floor	Classroom L8	75W incandescent	5	75	375	2,200	825	23W CFL	5	23	300	Ceiling	1	115	1,900	253	219	52	260	300	572	35	\$95	\$25	\$250	\$240
76	Second Floor	Classroom L7	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	15	86	1,290	2,200	2,838	Retrofit fixture with (3) LED Tubes	15	60	300	Ceiling	1	900	1,900	1,980	1,710	26	390	300	858	270	\$176	\$1,800	\$250	\$1,565
77	Second Floor	Classroom L14	2'x4' Recessed Troffer, Prismatic Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	19	62	1,178	2,200	2,592	Retrofit fixture with (2) LED Tubes	19	40	300	Ceiling	1	760	1,900	1,672	1,444	22	418	300	920	228	\$179	\$1,710	\$250	\$1,545
78	Second Floor	Classroom L15	2'x4' Recessed Troffer, Prismatic Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	3	62	186	2,200	409	Retrofit fixture with (2) LED Tubes	3	40	300	Ceiling	1	120	1,900	264	228	22	66	300	145	36	\$28	\$270	\$250	\$425
79	Second Floor	Restroom	2'x4' Recessed Troffer, Prismatic Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	1	62	62	2,200	136	Retrofit fixture with (2) LED Tubes	1	40	300	Ceiling	1	40	1,900	88	76	22	22	300	48	12	\$9	\$90	\$250	\$285
80	Second Floor	Stairwell	2'x4' Recessed Troffer, Prismatic Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	3	62	186	8,760	1,629	Retrofit fixture with (2) LED Tubes	3	40	0	Ceiling	0	120	8,760	1,051	1,051	22	66	0	578	0	\$90	\$270	\$0	\$210
81	First Floor	Stairwell	2'x4' Recessed Troffer, Prismatic Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	4	62	248	8,760	2,172	Retrofit fixture with (2) LED Tubes	4	40	0	Ceiling	0	160	8,760	1,402	1,402	22	88	0	771	0	\$120	\$360	\$0	\$280
82	Second Floor	Classroom L16	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	15	86	1,290	2,200	2,838	Retrofit fixture with (3) LED Tubes	15	60	300	Ceiling	1	900	1,900	1,980	1,710	26	390	300	858	270	\$176	\$1,800	\$250	\$1,565
83	Second Floor	Classroom L17	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	6	86	516	2,200	1,135	Retrofit fixture with (3) LED Tubes	6	60	300	Ceiling	1	360	1,900	792	684	26	156	300	343	108	\$70	\$720	\$250	\$755
84	Second Floor	Classroom L18	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	15	86	1,290	2,200	2,838	Retrofit fixture with (3) LED Tubes	15	60	300	Ceiling	1	900	1,900	1,980	1,710	26	390	300	858	270	\$176	\$1,800	\$250	\$1,565
85	Second Floor	Classroom L19	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	18	86	1,548	2,200	3,406	Retrofit fixture with (3) LED Tubes	18	60	300	Ceiling	1	1,080	1,900	2,376	2,052	26	468	300	1,030	324	\$211	\$2,160	\$250	\$1,835
86	Second Floor	Janitor's Closet	1'x4' Wall Mount, Prismatic Lens with w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast, Wireguard	1	62	62	500	31	Retrofit fixture with (2) LED Tubes	1	40	0	Ceiling	0	40	500	20	20	22	22	0	11	0	\$2	\$90	\$0	\$80
				458		33,373		102,536		456				44	22,107		69,057	63,733		10,978		33,335	5,324	6,031	45,725	11,000	49,015



LIGHTING RETROFIT SUMMARY FOR: Dunellen High School 411 1st Street, Dunellen, NJ 08812

BUILDING INFORMATION		EXISTING FIXTURES				PROPOSED FIXTURES				SAVINGS							FINANCIAL						
BUILDING	SQ. FT.	PRE TOTAL FIXT. QTY	PRE TOTAL FIXT. WATTS	PRE ANNUAL KWH CONSUMPTION	PRE WATTS / SQ. FT	POST TOTAL FIXT. QTY	POST TOTAL FIXT. WATTS	POST ANNUAL KWH CONSUMPTION	POST WATTS / SQ. FT	WATTS SAVED	ANNUAL KWH SAVED WITH FIXTURES	ANNUAL KWH SAVED WITH SENSORS	TOTAL ANNUAL KWH SAVED	ANNUAL SAVINGS \$ FIXT.	ANNUAL SAVINGS \$ SENSORS	ANNUAL SAVINGS \$ TOTAL	CO2 REDUCTION (TONS)	NJ Smart Start FIXTURE REBATE \$	NJ Smart Start SENSOR REBATE \$	FIXTURES TOTAL (INSTALLED) COST \$	SENSORS TOTAL (INSTALLED) COST \$	MATERIAL TOTAL (INSTALLED) COST \$	SIMPLE PAYBACK AFTER REBATE (YEARS)
Dunellen High School	77,794	0	80,803	196,585	1.04	805	51,922	128,108	0.67	28,881	68,477	11,905	80,382	\$10,640	\$1,850	\$12,490	22.6	\$26,330	\$4,945	\$102,050	\$23,090	\$125,140	7.5

4%	PERCENTAGE OF REBATES IN TOTAL INSTALLED COST
65%	PERCENTAGE OF CONSUMPTION COMPARE TO EXISTING STATE
43%	EXISTING PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING
28%	PROPOSED PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING

**LIGHTING UPGRADE PROJECT
LINE x LINE DETAIL****CUSTOMER:** Dunellen Public Schools
FACILITY: Dunellen High School**FACILITY SQ. FT.**
77,794**DATE OF AUDIT:**
12/31/2013

SPACE DESCRIPTION			REPLACEMENT FIXTURES						ENERGY ANALYSIS						COST ANALYSIS							
LINE	FLOOR	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS	PRE ANNUAL KWH	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	TOTAL ANNUAL \$ SAVINGS / LINE (INCLUDING SENSORS)	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES
							910									910						
103	First Floor	Closet	4ft Wall Mounted, Prismatic Lens, w/ (2) F32T8/32w Lamps & (1) Electronic Ballast	1	68	68	500	34	Retrofit fixture with (2) T8 LED Tubes	1	40	0	Ceiling	0	40	500	20	20	\$2	\$90	\$0	\$70
104	First Floor	Girls Locker Room Entry	4' Fluorescent Strip with (2) F32T8 & (1) Electronic Ballast, Pendant, No Lens	1	68	68	2,200	150	Retrofit fixture with (2) T8 LED Tubes	1	40	300	Ceiling	1	40	1,900	88	76	\$12	\$90	\$250	\$285
105	First Floor	Girls Locker Room	8' Pendant Mount, No Lens, w/ (2) F96T12/75w Lamps & (1) Magnetic Ballast	2	142	283	2,200	623	Retrofit fixture with (2) T8 LED Tubes	2	40	300	Ceiling	1	80	1,900	176	152	\$73	\$180	\$250	\$355
106	First Floor	Girls Locker Room	60W incandescent	2	60	120	2,200	264	23W Screw-in CFL	2	18	300	Ceiling	1	36	1,900	79	68	\$30	\$10	\$250	\$225
107	First Floor	Girls Locker Room	4' Fluorescent Strip with (1) F32T8 & (1) Electronic Ballast, Wall Mounted, No Lens	2	35	70	2,200	154	Retrofit fixture with (1) T8 LED Tubes	2	20	300	Ceiling	1	40	1,900	88	76	\$12	\$120	\$250	\$315
108	First Floor	Hallway	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	2	86	172	5,000	860	Retrofit fixture with (3) T8 LED Tubes	2	60	0	Ceiling	0	120	5,000	600	600	\$40	\$240	\$0	\$180
109	First Floor	Room 1	2'x4' Recessed Troffer, No Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	8	86	690	2,200	1,517	Retrofit fixture with (3) T8 LED Tubes	8	60	300	Wall	1	480	1,900	1,056	912	\$94	\$960	\$120	\$820
110	First Floor	Room 2	2'x4' Recessed Troffer, Prismatic Lens, w/ (4) F32T8/32w 700 Lamps & (1) Electronic Ballast	12	107	1,280	2,200	2,817	Retrofit fixture with (4) T8 LED Tubes	12	80	300	Wall	1	960	1,900	2,112	1,824	\$154	\$1,800	\$120	\$1,420
111	First Floor	Boys Room	2'x4' Recessed Troffer, Prismatic Lens, w/ (4) F32T8/32w 700 Lamps & (1) Electronic Ballast	3	107	320	2,200	704	Retrofit fixture with (4) T8 LED Tubes	3	80	300	Ceiling	1	240	1,900	528	456	\$39	\$450	\$250	\$545
112	First Floor	Room	2'x4' Pendant, Prismatic Lens, w/ (4) F32T8/32w 700 Lamps & (1) Electronic Ballast	2	107	213	2,200	469	Retrofit fixture with (4) T8 LED Tubes	2	80	300	Wall	1	160	1,900	352	304	\$26	\$300	\$120	\$320
113	First Floor	Boiler Room	4' Fluorescent Strip with (2) F32T8 & (1) Electronic Ballast, Pendant, No Lens	11	68	750	8,760	6,572	Retrofit fixture with (2) T8 LED Tubes	11	40	0	Ceiling	0	440	8,760	3,854	3,854	\$422	\$990	\$0	\$770
114	First Floor	Boiler Room	60W incandescent	2	60	120	8,760	1,051	23W Screw-in CFL	2	18	0	Ceiling	0	36	8,760	315	315	\$114	\$10	\$0	\$10
115	First Floor	Nurse Entry	2'x2' Recessed Troffer, Prismatic Lens, w/ (2) F30T8/835, 32w Lamps & (1) Electronic Ballast	2	62	124	2,200	273	Retrofit fixture with (2) T8 LED Tubes	2	40	300	Ceiling	1	80	1,900	176	152	\$19	\$180	\$250	\$355
116	First Floor	Nurse Office	1'x4' Surface Fixture, No Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	6	62	372	2,200	818	Retrofit fixture with (2) T8 LED Tubes	6	40	300	Wall	1	240	1,900	528	456	\$56	\$540	\$120	\$520
117	First Floor	Patient Room	2'x4' Recessed Troffer, Prismatic Lens, w/ (4) F32T8/32w 700 Lamps & (1) Electronic Ballast	1	107	107	2,200	235	Retrofit fixture with (4) T8 LED Tubes	1	80	300	Wall	1	80	1,900	176	152	\$13	\$150	\$120	\$210
118	First Floor	Bathroom	60W incandescent	3	60	180	2,200	396	23W Screw-in CFL	3	18	300	Ceiling	1	54	1,900	119	103	\$46	\$15	\$250	\$230
119	First Floor	Hallway	2'x4' Recessed Troffer, Prismatic Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	6	62	372	5,000	1,860	Retrofit fixture with (2) T8 LED Tubes	6	40	0	Ceiling	0	240	5,000	1,200	1,200	\$103	\$540	\$0	\$420
120	First Floor	Chemistry Hallway	2'x4' Recessed Troffer, Prismatic Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	4	62	248	5,000	1,240	Retrofit fixture with (2) T8 LED Tubes	4	40	0	Ceiling	0	160	5,000	800	800	\$68	\$360	\$0	\$280
121	First Floor	Classroom 7 Chemistry	2'x4' Recessed Troffer w/ Prismatic Lens, w/ (3) F32T8/32w 700 Lamps & (1) Electronic Ballast	20	86	1,720	2,200	3,784	Retrofit fixture with (3) T8 LED Tubes	20	60	300	Ceiling	2	1,200	1,900	2,640	2,280	\$234	\$2,400	\$500	\$2,160
122	First Floor	Classroom 8 General Science	2'x4' Recessed Troffer, Prismatic Lens, w/ (4) F32T8/32w 700 Lamps & (1) Electronic Ballast	8	107	854	2,200	1,878	Retrofit fixture with (4) T8 LED Tubes	8	80	300	Ceiling	2	640	1,900	1,408	1,216	\$103	\$1,200	\$500	\$1,240
123	First Floor	Classroom 9	2'x4' Recessed Troffer, Prismatic Lens, w/ (4) F32T8/32w 700 Lamps & (1) Electronic Ballast	9	107	960	2,200	2,113	Retrofit fixture with (4) T8 LED Tubes	9	80	300	Ceiling	2	720	1,900	1,584	1,368	\$116	\$1,350	\$500	\$1,350
124	First Floor	Classroom 7 Chemistry	1'x4' Pendant strip, No Lens, w/ (2) F40T12/34w Lamps & (1) Energy Saving Magnetic Ballast	4	66	264	2,200	581	Retrofit fixture with (2) T8 LED Tubes	4	40	300	Ceiling	2	160	1,900	352	304	\$43	\$360	\$500	\$640
125	First Floor	Classroom 8 General Science	1'x4' Surface Fixture, No Lens, w/ (2) F32T8/32w 700 Lamps & (1) Electronic Ballast	4	62	248	2,200	546	Retrofit fixture with (2) T8 LED Tubes	4	40	300	Ceiling	2	160	1,900	352	304	\$38	\$360	\$500	\$640
126	First Floor	Classroom 9	60W incandescent	2	60	120	2,200	264	23W Screw-in CFL	2	18	0	Ceiling	0	36	2,200	79	79	\$29	\$10	\$0	\$10
127	First Floor	Hallway	2'x4' Recessed Troffer, Prismatic Lens, w/ (4) F32T8/32w 700 Lamps & (1) Electronic Ballast	6	107	640	5,000	3,201	Retrofit fixture with (4) T8 LED Tubes	6	80	0	Ceiling	0	480	5,000	2,400	2,400	\$124	\$900	\$0	\$660
127	-	Exterior	150 W Metal Halide Wall Pack	12	185	2,220	3,650	8,103	45 Watt LED Wall Mount	12	45	0	Ceiling	0	540	3,650	1,971	1,971	\$953	\$4,800	\$0	\$3,600
128	-	Exterior	Wall Mounted Shoebox - 100W incandescent	18	100	1,800	3,650	6,570	40 Watt LED Wall Mount	18	40	0	Ceiling	0	720	3,650	2,628	2,628	\$613	\$4,230	\$0	\$2,430
129	-	Exterior	Light Poles - 400W HID (Utility Owned)	4	460	1,840	3,650	6,716	None	4	460	0	Ceiling	0	1,840	3,650	6,716	6,716	\$0	\$0	\$0	\$0
				12,134	80,803			196,585		805				109	51,922		128,108	116,203	0	102,050	23,090	93,865



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ECM #6:

HVAC UNIT UPGRADES

Rooftop AC Unit Replacement - Energy Savings Calculations

Index	Tag#	Location	Qty	Area Serving	Existing System							Proposed System			Total Cost	Total Rebate	Electric Savings, kWh	Demand Savings, kW	Gas Savings, Therms
					Cooling Capacity (tons)	Existing EER	Existing SEER	Heating Source	Heating Capacity input - MBH	Furnace Efficiency	Outside Air Economizer	Cooling EER	Cooling SEER	Furnace Efficiency					
1	RTU	Faber Elementary School	1	Media Center	12.5	9.5	11	Natural Gas	250	80%	No	12.5	19.1	82%	\$21,400	\$988	10124	3.8	109
2	RTU	Faber Elementary School	1	Computer Room	4	11.2	13	Natural Gas	115	80%	No	12	17.5	82%	\$8,350	\$368	2103	0.3	50
3	RTU	Faber Elementary School	4	Gymnasium	12.5	9.5	11	Natural Gas	250	80%	Yes	12.5	19.1	82%	\$81,400	\$3,950	23946	15.2	435
4	RTU	Dunellen High School	2	Library	5	9	11	None	0		No	12	17.5	82%	\$16,830	\$920	7505	3.3	0
5	RTU	Dunellen High School	1	Special Education	4	9	11	Natural Gas	125	80%	Yes	12	17.5	82%	\$8,350	\$368	1678	1.3	54

Equipment Basis for Design:

- 3-25 Ton Units: Carrier WeatherExpert or Equivalent
- 30-75 Ton Units: Carrier WeatherMaker or Equivalent
- 80-150 Ton Units: Carrier WeatherExpert or Equivalent

	Total Cost	Total Rebate	Electric Savings, kWh	Demand Savings, kW	Gas Savings, Therms
Faber Total	\$111,150	\$5,306	36173	19	594
High School Total	\$25,180	\$1,288	9183	5	54
Total	\$136,330	\$6,594	45356	24	648

Rooftop AC Unit Replacement

Faber Elementary School - Media Center

Total Cooling Capacity	12.5	Unoccupied Setback	4	°F (Heating)
Total Heating Capacity	250	Unoccupied Load	88%	of design (3% per degree)
Economizer	No			
Estimated Cooling Load	80%	of total capacity		
Estimated Heating Load	80%	of total capacity		

				At design conditions			
Existing EER=		9.5		New EER=		12.5	
Existing SEER (Est)=		11.0		New SEER=		19.1	
Existing AFUE=		80%		New AFUE=		82%	

Indoor Temp Cooling (db)	75		
Indoor Temp Heating (db)	70	Indoor Temp (wb)	63

Total Cooling Load (Tons)	10.0
Heating Capacity (MBH)	200.0

COOLING ENERGY SAVINGS

Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)	Occupied	Unoccupied	Total Bin Hours During Occupied Hours	Occupied Tons	Un-occupied Tons	Ton-Hrs/Yr	Existing SEER (Estimated)	Proposed SEER	Existing Unit kWh	New Unit kWh	Energy Savings (kWh)
<i>Cooling</i>															
100-105	102.5	n/a	n/a	n/a	0.0	1.0	1	10.0	4.0	10	11.0	19.1	10.91	6.28	4.63
95-100	97.5	72.6	80.73	30.34%	0.0	21.0	21	10.0	4.0	210	11.0	19.1	229.09	131.94	97.15
90-95	92.5	74.1	97.45	42.55%	22.0	35.0	57	10.0	5.0	460	11.0	19.1	501.82	289.01	212.81
85-90	87.5	71.8	91.95	47.08%	113.0	116.0	229	8.6	4.3	1,479	11.0	19.1	1,612.99	928.95	684.04
80-85	82.5	69.4	86.88	52.20%	188.0	299.0	487	7.1	3.6	2,807	11.0	19.1	3,062.34	1,763.65	1,298.69
75-80	77.5	67.4	84.27	59.74%	182.0	539.0	721	5.7	2.9	3,600	11.0	19.1	3,927.27	2,261.78	1,665.49
70-75	72.5	64.6	77.48	64.93%	172.0	460.0	632	4.3	2.1	2,340	11.0	19.1	2,552.73	1,470.16	1,082.57
65-70	67.5	61.1	70.03	69.81%	210.0	607.0	817	2.9	1.4	2,034	11.0	19.1	2,219.22	1,278.09	941.14
60-65	62.5	56.5	58.40	69.39%	226.0	541.0	767	2.9	1.4	1,869	11.0	19.1	2,038.44		2,038.44
55-60	57.5	50.2	42.08	60.04%	277.0	535.0	812	2.9	1.4	1,924	11.0	19.1	2,099.22		2,099.22
4,544												18,254	8,130	10,124	

HEATING ENERGY SAVINGS

Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)	Occupied	Unoccupied	Total Bin Hours During Occupied Hours	Occupied Heating MBH	Unoccupied Heating MBH	Therms/Yr	Existing AFUE	Proposed AFUE	Existing Unit Therms	New Unit Therms	Energy Savings Therms
50-55	52.5	46.3	36.51	62.51%	237.0	516.0	753	22	20	161	80%	82%	201.27	196.36	4.91
45-50	47.5	41.5	28.95	59.88%	136.0	334.0	470	44	39	202	80%	82%	252.04	245.90	6.15
40-45	42.5	38.0	26.44	66.11%	196.0	452.0	648	67	59	416	80%	82%	520.40	507.71	12.69
35-40	37.5	33.9	22.77	69.31%	203.0	532.0	735	89	78	632	80%	82%	789.60	770.34	19.26
30-35	32.5	29.3	18.58	68.99%	213.0	436.0	649	111	98	693	80%	82%	865.89	844.77	21.12
25-30	27.5	24.6			123.0	226.0	349	133	117	446	80%	82%	557.07	543.48	13.59
20-25	22.5	19.4			65.0	249.0	314	156	137	476	80%	82%	595.39	580.87	14.52
15-20	17.5	15.4			45.0	136.0	181	178	156	312	80%	82%	390.22	380.70	9.52
10-15	12.5	9.8			11.0	65.0	76	200	176	149	80%	82%	186.70	182.15	4.55
5-10	7.5	4.1			6.0	25.0	31	200	176	61	80%	82%	75.70	73.85	1.85
0-5	2.5	1.3			2.0	4.0	6	200	176	12	80%	82%	14.40	14.05	0.35
-5-0	-2.5	0.0			2.0	2.0	4	200	176	8	80%	82%	9.40	9.17	0.23
1,600												4,458	4,349	109	
												Therms	Therms	Therms	

Rooftop AC Unit Replacement

Faber Elementary School - Computer Room

Total Cooling Capacity	4	Unoccupied Setback	4	°F (Heating)
Total Heating Capacity	115	Unoccupied Load	88%	of design (3% per degree)
Economizer	No			
Estimated Cooling Load	80%	of total capacity		
Estimated Heating Load	80%	of total capacity		

At design conditions			
Existing EER=	11.2	New EER=	12.0
Existing SEER (Est)=	13.0	New SEER=	17.5
Existing AFUE=	80%	New AFUE=	82%

Indoor Temp Cooling (db)	75				Total Cooling Load (Tons)	3.2
Indoor Temp Heating (db)	70	Indoor Temp (wb)	63		Heating Capacity (MBH)	92.0

COOLING ENERGY SAVINGS

Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)	Occupied	Unoccupied	Total Bin Hours During Occupied Hours	Occupied Tons	Un-occupied Tons	Ton-Hrs/Yr	Existing SEER (Estimated)	Proposed SEER	Existing Unit kWh	New Unit kWh	Energy Savings (kWh)
<i>Cooling</i>															
100-105	102.5	n/a	n/a	n/a	0.0	1.0	1	3.2	1.3	3	13.0	17.5	2.95	2.19	0.76
95-100	97.5	72.6	80.73	30.34%	0.0	21.0	21	3.2	1.3	67	13.0	17.5	62.03	46.08	15.95
90-95	92.5	74.1	97.45	42.55%	22.0	35.0	57	3.2	1.6	147	13.0	17.5	135.88	100.94	34.94
85-90	87.5	71.8	91.95	47.08%	113.0	116.0	229	2.7	1.4	473	13.0	17.5	436.75	324.44	112.31
80-85	82.5	69.4	86.88	52.20%	188.0	299.0	487	2.3	1.1	898	13.0	17.5	829.19	615.97	213.22
75-80	77.5	67.4	84.27	59.74%	182.0	539.0	721	1.8	0.9	1,152	13.0	17.5	1,063.38	789.94	273.44
70-75	72.5	64.6	77.48	64.93%	172.0	460.0	632	1.4	0.7	749	13.0	17.5	691.20	513.46	177.74
65-70	67.5	61.1	70.03	69.81%	210.0	607.0	817	0.9	0.5	651	13.0	17.5	600.90	446.38	154.52
60-65	62.5	56.5	58.40	69.39%	226.0	541.0	767	0.9	0.5	598	13.0	17.5	551.95		551.95
55-60	57.5	50.2	42.08	60.04%	277.0	535.0	812	0.9	0.5	616	13.0	17.5	568.40		568.40
4,544													4,943	2,839	2,103

HEATING ENERGY SAVINGS

Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)	Occupied	Unoccupied	Total Bin Hours During Occupied Hours	Occupied Heating MBH	Unoccupied Heating MBH	Therms/Yr	Existing AFUE	Proposed AFUE	Existing Unit Therms	New Unit Therms	Energy Savings Therms
50-55	52.5	46.3	36.51	62.51%	237.0	516.0	753	10	9	74	80%	82%	92.58	90.32	2.26
45-50	47.5	41.5	28.95	59.88%	136.0	334.0	470	20	18	93	80%	82%	115.94	113.11	2.83
40-45	42.5	38.0	26.44	66.11%	196.0	452.0	648	31	27	192	80%	82%	239.38	233.55	5.84
35-40	37.5	33.9	22.77	69.31%	203.0	532.0	735	41	36	291	80%	82%	363.22	354.36	8.86
30-35	32.5	29.3	18.58	68.99%	213.0	436.0	649	51	45	319	80%	82%	398.31	388.59	9.71
25-30	27.5	24.6			123.0	226.0	349	61	54	205	80%	82%	256.25	250.00	6.25
20-25	22.5	19.4			65.0	249.0	314	72	63	219	80%	82%	273.88	267.20	6.68
15-20	17.5	15.4			45.0	136.0	181	82	72	144	80%	82%	179.50	175.12	4.38
10-15	12.5	9.8			11.0	65.0	76	92	81	69	80%	82%	85.88	83.79	2.09
5-10	7.5	4.1			6.0	25.0	31	92	81	28	80%	82%	34.82	33.97	0.85
0-5	2.5	1.3			2.0	4.0	6	92	81	5	80%	82%	6.62	6.46	0.16
-5-0	-2.5	0.0			2.0	2.0	4	92	81	3	80%	82%	4.32	4.22	0.11
736													2,051	2,001	50
													Therms	Therms	Therms

Rooftop AC Unit Replacement

Faber Elementary School - Gymnasium

Total Cooling Capacity	12.5	Unoccupied Setback	4	°F (Heating)
Total Heating Capacity	250	Unoccupied Load	88%	of design (3% per degree)
Economizer	Yes			
Estimated Cooling Load	80%	of total capacity		
Estimated Heating Load	80%	of total capacity		

				At design conditions					
		Existing EER=		9.5		New EER=		12.5	
		Existing SEER (Est)=		11.0		New SEER=		19.1	
		Existing AFUE=		80%		New AFUE=		82%	

Indoor Temp Cooling (db)	75		
Indoor Temp Heating (db)	70	Indoor Temp (wb)	63

Total Cooling Load (Tons)	10.0
Heating Capacity (MBH)	200.0

COOLING ENERGY SAVINGS																	
Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)	Occupied	Unoccupied	Total Bin Hours During Occupied Hours	Occupied Tons	Un-occupied Tons	Ton-Hrs/Yr	Existing SEER (Estimated)	Proposed SEER	Existing Unit kWh	New Unit kWh	Energy Savings (kWh)		
<i>Cooling</i>																	
100-105	102.5	n/a	n/a	n/a	0.0	1.0	1	10.0	4.0	10	11.0	19.1	10.91	6.28	4.63		
95-100	97.5	72.6	80.73	30.34%	0.0	21.0	21	10.0	4.0	210	11.0	19.1	229.09	131.94	97.15		
90-95	92.5	74.1	97.45	42.55%	22.0	35.0	57	10.0	5.0	460	11.0	19.1	501.82	289.01	212.81		
85-90	87.5	71.8	91.95	47.08%	113.0	116.0	229	8.6	4.3	1,479	11.0	19.1	1,612.99	928.95	684.04		
80-85	82.5	69.4	86.88	52.20%	188.0	299.0	487	7.1	3.6	2,807	11.0	19.1	3,062.34	1,763.65	1,298.69		
75-80	77.5	67.4	84.27	59.74%	182.0	539.0	721	5.7	2.9	3,600	11.0	19.1	3,927.27	2,261.78	1,665.49		
70-75	72.5	64.6	77.48	64.93%	172.0	460.0	632	4.3	2.1	2,340	11.0	19.1	2,552.73	1,470.16	1,082.57		
65-70	67.5	61.1	70.03	69.81%	210.0	607.0	817	2.9	1.4	2,034	11.0	19.1	2,219.22	1,278.09	941.14		
60-65	62.5	56.5	58.40	69.39%	226.0	541.0	767	2.9	1.4	1,869	11.0	19.1	0.00		0.00		
55-60	57.5	50.2	42.08	60.04%	277.0	535.0	812	2.9	1.4	1,924	11.0	19.1	0.00		0.00		
4,544												14,116		8,130		5,987	

HEATING ENERGY SAVINGS																	
Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)	Occupied	Unoccupied	Total Bin Hours During Occupied Hours	Occupied Heating MBH	Unoccupied Heating MBH	Therms/Yr	Existing AFUE	Proposed AFUE	Existing Unit Therms	New Unit Therms	Energy Savings Therms		
50-55	52.5	46.3	36.51	62.51%	237.0	516.0	753	22	20	161	80%	82%	201.27	196.36	4.91		
45-50	47.5	41.5	28.95	59.88%	136.0	334.0	470	44	39	202	80%	82%	252.04	245.90	6.15		
40-45	42.5	38.0	26.44	66.11%	196.0	452.0	648	67	59	416	80%	82%	520.40	507.71	12.69		
35-40	37.5	33.9	22.77	69.31%	203.0	532.0	735	89	78	632	80%	82%	789.60	770.34	19.26		
30-35	32.5	29.3	18.58	68.99%	213.0	436.0	649	111	98	693	80%	82%	865.89	844.77	21.12		
25-30	27.5	24.6			123.0	226.0	349	133	117	446	80%	82%	557.07	543.48	13.59		
20-25	22.5	19.4			65.0	249.0	314	156	137	476	80%	82%	595.39	580.87	14.52		
15-20	17.5	15.4			45.0	136.0	181	178	156	312	80%	82%	390.22	380.70	9.52		
10-15	12.5	9.8			11.0	65.0	76	200	176	149	80%	82%	186.70	182.15	4.55		
5-10	7.5	4.1			6.0	25.0	31	200	176	61	80%	82%	75.70	73.85	1.85		
0-5	2.5	1.3			2.0	4.0	6	200	176	12	80%	82%	14.40	14.05	0.35		
-5-0	-2.5	0.0			2.0	2.0	4	200	176	8	80%	82%	9.40	9.17	0.23		
1,600												4,458		4,349		109	
												Therms		Therms		Therms	

Rooftop AC Unit Replacement

Dunellen High School - Library

Total Cooling Capacity	5	Unoccupied Setback	4	°F (Heating)
Total Heating Capacity	0	Unoccupied Load	88%	of design (3% per degree)
Economizer	No			
Estimated Cooling Load	80%	of total capacity		
Estimated Heating Load	80%	of total capacity		

				At design conditions					
		Existing EER=		9.0		New EER=		12.0	
		Existing SEER (Est)=		11.0		New SEER=		17.5	
		Existing AFUE=		0%		New AFUE=		82%	

Indoor Temp Cooling (db)	75		
Indoor Temp Heating (db)	70	Indoor Temp (wb)	63

Total Cooling Load (Tons)	4.0
Heating Capacity (MBH)	0.0

COOLING ENERGY SAVINGS

Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)	Occupied	Unoccupied	Total Bin Hours During Occupied Hours	Occupied Tons	Un-occupied Tons	Ton-Hrs/Yr	Existing SEER (Estimated)	Proposed SEER	Existing Unit kWh	New Unit kWh	Energy Savings (kWh)
<i>Cooling</i>															
100-105	102.5	n/a	n/a	n/a	0.0	1.0	1	4.0	1.6	4	11.0	17.5	4.36	2.74	1.62
95-100	97.5	72.6	80.73	30.34%	0.0	21.0	21	4.0	1.6	84	11.0	17.5	91.64	57.60	34.04
90-95	92.5	74.1	97.45	42.55%	22.0	35.0	57	4.0	2.0	184	11.0	17.5	200.73	126.17	74.56
85-90	87.5	71.8	91.95	47.08%	113.0	116.0	229	3.4	1.7	591	11.0	17.5	645.19	405.55	239.64
80-85	82.5	69.4	86.88	52.20%	188.0	299.0	487	2.9	1.4	1,123	11.0	17.5	1,224.94	769.96	454.98
75-80	77.5	67.4	84.27	59.74%	182.0	539.0	721	2.3	1.1	1,440	11.0	17.5	1,570.91	987.43	583.48
70-75	72.5	64.6	77.48	64.93%	172.0	460.0	632	1.7	0.9	936	11.0	17.5	1,021.09	641.83	379.26
65-70	67.5	61.1	70.03	69.81%	210.0	607.0	817	1.1	0.6	814	11.0	17.5	887.69	557.98	329.71
60-65	62.5	56.5	58.40	69.39%	226.0	541.0	767	1.1	0.6	747	11.0	17.5	815.38		815.38
55-60	57.5	50.2	42.08	60.04%	277.0	535.0	812	1.1	0.6	770	11.0	17.5	839.69		839.69
4,544												7,302	3,549	3,752	

Rooftop AC Unit Replacement

Dunellen High School - Special Education

Total Cooling Capacity	4	Unoccupied Setback	4	°F (Heating)
Total Heating Capacity	125	Unoccupied Load	88%	of design (3% per degree)
Economizer	Yes			
Estimated Cooling Load	80%	of total capacity		
Estimated Heating Load	80%	of total capacity		

At design conditions			
Existing EER=	9.0	New EER=	12.0
Existing SEER (Est)=	11.0	New SEER=	17.5
Existing AFUE=	80%	New AFUE=	82%

Indoor Temp Cooling (db)	75				Total Cooling Load (Tons)	3.2
Indoor Temp Heating (db)	70	Indoor Temp (wb)	63		Heating Capacity (MBH)	100.0

COOLING ENERGY SAVINGS

Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)	Occupied	Unoccupied	Total Bin Hours During Occupied Hours	Occupied Tons	Un-occupied Tons	Ton-Hrs/Yr	Existing SEER (Estimated)	Proposed SEER	Existing Unit kWh	New Unit kWh	Energy Savings (kWh)
<i>Cooling</i>															
100-105	102.5	n/a	n/a	n/a	0.0	1.0	1	3.2	1.3	3	11.0	17.5	3.49	2.19	1.30
95-100	97.5	72.6	80.73	30.34%	0.0	21.0	21	3.2	1.3	67	11.0	17.5	73.31	46.08	27.23
90-95	92.5	74.1	97.45	42.55%	22.0	35.0	57	3.2	1.6	147	11.0	17.5	160.58	100.94	59.64
85-90	87.5	71.8	91.95	47.08%	113.0	116.0	229	2.7	1.4	473	11.0	17.5	516.16	324.44	191.72
80-85	82.5	69.4	86.88	52.20%	188.0	299.0	487	2.3	1.1	898	11.0	17.5	979.95	615.97	363.98
75-80	77.5	67.4	84.27	59.74%	182.0	539.0	721	1.8	0.9	1,152	11.0	17.5	1,256.73	789.94	466.78
70-75	72.5	64.6	77.48	64.93%	172.0	460.0	632	1.4	0.7	749	11.0	17.5	816.87	513.46	303.41
65-70	67.5	61.1	70.03	69.81%	210.0	607.0	817	0.9	0.5	651	11.0	17.5	710.15	446.38	263.77
60-65	62.5	56.5	58.40	69.39%	226.0	541.0	767	0.9	0.5	598	11.0	17.5	0.00		0.00
55-60	57.5	50.2	42.08	60.04%	277.0	535.0	812	0.9	0.5	616	11.0	17.5	0.00		0.00
4,544													4,517	2,839	1,678

HEATING ENERGY SAVINGS

Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)	Occupied	Unoccupied	Total Bin Hours During Occupied Hours	Occupied Heating MBH	Unoccupied Heating MBH	Therms/Yr	Existing AFUE	Proposed AFUE	Existing Unit Therms	New Unit Therms	Energy Savings Therms
50-55	52.5	46.3	36.51	62.51%	237.0	516.0	753	11	10	81	80%	82%	100.63	98.18	2.45
45-50	47.5	41.5	28.95	59.88%	136.0	334.0	470	22	20	101	80%	82%	126.02	122.95	3.07
40-45	42.5	38.0	26.44	66.11%	196.0	452.0	648	33	29	208	80%	82%	260.20	253.85	6.35
35-40	37.5	33.9	22.77	69.31%	203.0	532.0	735	44	39	316	80%	82%	394.80	385.17	9.63
30-35	32.5	29.3	18.58	68.99%	213.0	436.0	649	56	49	346	80%	82%	432.94	422.38	10.56
25-30	27.5	24.6			123.0	226.0	349	67	59	223	80%	82%	278.53	271.74	6.79
20-25	22.5	19.4			65.0	249.0	314	78	68	238	80%	82%	297.69	290.43	7.26
15-20	17.5	15.4			45.0	136.0	181	89	78	156	80%	82%	195.11	190.35	4.76
10-15	12.5	9.8			11.0	65.0	76	100	88	75	80%	82%	93.35	91.07	2.28
5-10	7.5	4.1			6.0	25.0	31	100	88	30	80%	82%	37.85	36.93	0.92
0-5	2.5	1.3			2.0	4.0	6	100	88	6	80%	82%	7.20	7.02	0.18
-5-0	-2.5	0.0			2.0	2.0	4	100	88	4	80%	82%	4.70	4.59	0.11
800													2,229	2,175	54
													Therms	Therms	Therms



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ECM #7:

BOILER REPLACEMENT

Boiler Replacement - Dunellen High School

Natural Heating Capacity at the High School		
RTUs	1455 MBH	25%
Boiler Rm.	4320 MBH	75%
Total	5775 MBH	

It is assumed that the total gas consumption of the boilers is proportional to equipment capacity.

Therefore, it is assumed that **75%** of the natural gas is used at the boiler plant.

Annual natural gas consumption for domestic hot water is estimated based on usage during June and October.

High School										
Month	Total Natural Gas Therms	Domestic Hot Water, Therms	Net Natural Gas for Heating, Therms	Boiler Consumption, Therms	Total Cost	\$/Therm	Est. Existing Boiler Efcy	Proposed Boiler Efcy	Proposed Natural Gas Therms	Energy Savings, Therms
Jan-13	6,691	438	6,254	4,678	\$4,358	\$0.93	70%	87%	3,764	914
Mar-13	6,346	438	5,909	4,420	\$4,224	\$0.96	70%	87%	3,556	864
Apr-13	4,127	438	3,689	2,759	\$1,951	\$0.71	70%	88%	2,195	564
May-13	1,713	438	1,276	954	\$720	\$0.75	70%	89%	751	204
Jun-13	227	227	0	0	\$0	-	-	-	-	-
Jul-13	170	170	0	0	\$0	-	-	-	-	-
Aug-13	157	157	0	0	\$0	-	-	-	-	-
Sep-13	175	175	0	0	\$0	-	-	-	-	-
Oct-13	253	253	0	0	\$0	-	-	-	-	-
Nov-13	3,697	438	3,260	2,438	\$2,570	\$1.05	70%	89%	1,918	521
Dec-13	7,075	438	6,637	4,965	\$4,581	\$0.92	70%	88%	3,950	1,016
Jan-14	7,279	438	6,841	5,118	\$4,747	\$0.93	70%	87%	4,118	1,000
	37,910	4,045	33,865	25,333	\$23,149	\$0.91			20,251	5,082

Existing Conditions and Assumptions

- 1- The H.B. Smith boiler estimated efficiency = 70 %
- 2- One (1) boiler is sufficient to handle entire heating load. Second boiler provides 100% redundancy.
- 3-Boilers are insulated with asbestos. Asbestos remediation is not included in the cost of this ECM.
- 4-Domestic Water Usage Estimated based DOE statistical information (5.2 kBtu/SF/Year) for education facilities

Proposed Changes

- 1 - Replace HB Smith Boilers with high efficiency condensing hot water boilers.

Total Cost	Material	\$80,000
	Installation	\$100,000
	Total	\$180,000

Boiler Replacement - Design Basis

Boiler	# of Units	Capacity, MBH	Action	Proposed
HB Smith	2	4,320	Replace boilers	2 x Aerco BMK 2.0 or similar



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ECM #8:

**DOMESTIC HOT WATER HEATER
REPLACEMENT**

Domestic Water Heater Replacement Savings

Index	Location	Qty	Area Serving	Storage Capacity, Gals	Fuel	Heating Capacity, MBH	Efficiency, %	Action	Proposed Unit	Efficiency, %	Project Cost	Savings, Therms	Cost Savings
1	Faber Elementary School	1	Bathrooms, Classrooms	200	Natural Gas	250	80%	Replace and resize.	AO Smith Cyclone BTH-120A	95%	\$14,182	648	\$599
2		1	Bathrooms, Classrooms	80	Natural Gas	60	80%	Replace unit.	AO Smith Cyclone BTX-100	95%	\$7,475		
3		1	Bathrooms, Classrooms	100	Natural Gas	75	80%	Replace unit.	AO Smith Cyclone BTH-120	95%	\$9,312		
4		1	Kitchen	300	Natural Gas	600	80%	Install condensing unit in parallel	AO Smith Cyclone BTH-120A	95%	\$14,182		
5	Lincoln Middle School	1	Bathrooms, Classrooms	71	Natural Gas	120	0%	Replace unit.	AO Smith Cyclone BTH-120	95%	\$9,312	191	\$242
6		1	Bathrooms, Classrooms	20	Electric	-	80%	Existing to remain (1)	-	-			
7	Dunellen High School	1	Bathrooms, Classrooms	70	Natural Gas	75	0%	Replace unit.	AO Smith Cyclone BTX-100	95%	\$7,475	565	\$553
8		1	Kitchen	-	Natural Gas	-	80%	Replace unit.	AO Smith Cyclone BTH-250A	95%	\$20,725		

(-) Information Not Available During Survey

1 - Small unit serving one bathroom

	Total Cost	Savings	Payback
Faber Elementary School	\$45,152	\$599	75
Lincoln Middle School	\$9,312	\$242	38
Dunellen High School	\$28,200	\$553	51

Domestic Water Heater Replacement Savings - Faber Elementary School

Domestic Hot Water Savings									
Month	Total Natural Gas Therms	Domestic Hot Water, Therms	Total Cost	\$/Therm	Est. Existing Boiler Efcy	Proposed Boiler Efcy	Proposed Natural Gas Therms	Energy Savings, Therms	Cost Savings
Jan-13	7,670	483	\$442	\$0.92	80%	93%	415	67	\$62
Feb-13	6,256	483	\$442	\$0.91	80%	93%	415	67	\$62
Mar-13	10,049	483	\$441	\$0.91	80%	93%	415	67	\$62
Apr-13	3,331	483	\$349	\$0.72	80%	93%	415	67	\$49
Jun-13	1,455	483	\$416	\$0.86	80%	93%	415	67	\$58
Sep-13	777	777	\$872	\$1.12	80%	93%	669	109	\$122
Oct-13	1,051	483	\$392	\$0.81	80%	93%	415	67	\$55
Nov-13	4,940	483	\$483	\$1.00	80%	93%	415	67	\$68
Dec-13	7,429	483	\$449	\$0.93	80%	93%	415	67	\$63
	42,959	4,639	\$4,285	\$0.92			3,991	648	\$599

Sep-13 bill includes usage during July, August, September.

Annual domestic hot water usage is estimated based DOE statistical information (5.2 kBtu/SF/Year) for education facilities

Area 89,203 SF
 DHW Usage 4639 Therms

Domestic Water Heater Replacement Savings - Lincoln Middle School

Domestic Hot Water Savings									
Month	Total Natural Gas Therms	Domestic Hot Water, Therms	Total Cost	\$/Therm	Est. Existing Boiler Efcy	Proposed Boiler Efcy	Proposed Natural Gas Therms	Energy Savings, Therms	Cost Savings
Dec-12	3,038	169	\$163	\$0.97	80%	93%	146	24	\$23
Jan-13	3,226	169	\$159	\$0.94	80%	93%	146	24	\$22
Feb-13	4,624	169	\$157	\$0.93	80%	93%	146	24	\$22
Mar-13	3,516	169	\$165	\$0.97	80%	93%	146	24	\$23
Apr-13	2,364	169	\$124	\$0.73	80%	93%	146	24	\$17
May-13	1,355	169	\$131	\$0.78	80%	93%	146	24	\$18
Jun-13	39	39	\$132	\$3.38	80%	93%	34	5	\$18
Jul-13	23	23	\$121	\$5.18	80%	93%	20	3	\$17
Aug-13	23	23	\$121	\$5.17	80%	93%	20	3	\$17
Sep-13	33	33	\$128	\$3.87	80%	93%	28	5	\$18
Oct-13	61	61	\$148	\$2.41	80%	93%	53	9	\$21
Nov-13	1,950	169	\$186	\$1.10	80%	93%	146	24	\$26
	20,252	1,365	\$1,735				1,174	191	\$242

Annual domestic hot water usage is estimated based DOE statistical information (5.2 kBtu/SF/Year) for education facilities

Area 26,248 SF
 DHW Usage 1365 Therms

Domestic Water Heater Replacement Savings - Dunellen High School

Domestic Hot Water Savings									
Month	Total Natural Gas Therms	Domestic Hot Water, Therms	Total Cost	\$/Therm	Est. Existing Boiler Efcy	Proposed Boiler Efcy	Proposed Natural Gas Therms	Energy Savings, Therms	Cost Savings
Jan-13	6,691	438	\$408	\$0.93	80%	93%	377	61	\$57
Mar-13	6,346	438	\$418	\$0.96	80%	93%	377	61	\$58
Apr-13	4,127	438	\$309	\$0.71	80%	93%	377	61	\$43
May-13	1,713	438	\$330	\$0.75	80%	93%	377	61	\$46
Jun-13	227	227	\$265	\$1.17	80%	93%	195	32	\$37
Jul-13	170	170	\$225	\$1.32	80%	93%	146	24	\$31
Aug-13	157	157	\$216	\$1.38	80%	93%	135	22	\$30
Sep-13	175	175	\$229	\$1.31	80%	93%	151	24	\$32
Oct-13	253	253	\$283	\$1.12	80%	93%	217	35	\$40
Nov-13	3,697	438	\$461	\$1.05	80%	93%	377	61	\$64
Dec-13	7,075	438	\$404	\$0.92	80%	93%	377	61	\$56
Jan-14	7,279	438	\$406	\$0.93	80%	93%	377	61	\$57
	37,910	4,045	\$3,954	\$0.98			3,480	565	\$553

Annual domestic hot water usage is estimated based DOE statistical information (5.2 kBtu/SF/Year) for education facilities

Area 77,794 SF
 DHW Usage 4045 Therms



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ECM #9:

DESTRATIFICATION FANS

De-stratification Fans

Index	Building	Space	Heating System Efficiency	Total Facility Floor Area SF	Subject Space Floor Area SF	Estimated Heating Load, MBH	Total Heating Energy Cons. Therms	Subject Space Heating Energy Cons. Therms*	Estimated Stratification °F	Resultant Overheating* °F	Existing Unoccupied Setback °F	Est. Energy Savings, Therms	Est. Energy Savings, kWh
1	Faber Elementary School	All Purpose Room	80%	89,203	4050	82	38,320	1740	15	7.5	2	392	-438
2	Faber Elementary School	Gymnasium	80%	89,203	8200	141	38,320	3523	10	5	2	529	-1051
3	Dunellen High School	Gymnasium	70%	77,794	9000	161	33,865	3918	10	5	2	588	-1051

* Calculated based on the area of the space, total area of the building and total heating energy consumption

Cost Estimate

1,000 per fan (installed)

Index	Building	Space	# of Fans	Total Cost
1	Faber Elementary School	All Purpose Room	4	\$4,000
2	Faber Elementary School	Gymnasium	6	\$6,000
3	Dunellen High School	Gymnasium	6	\$6,000

De-stratification Fans: Faber Elementary School - All Purpose Room

Total Facility Floor Area	89,203	
Areas w/ Radiators (est)	4,050	
Net area affected (est)	12%	
Est. Heating Energy Cons.	1,740	Therms

Unoccupied Setback	2 °F
Net heating Load when set back	94% of design
Stratification	15 °F (Temperature difference between ceiling and floor)
Average Overheating due to Stratification	8 °F

Indoor Temp Cooling (db)		Indoor Temp (wb)		Heating Load (MBH)	82 MBH	Exist AFUE=	80%	New AFUE=	
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All Purpose Room with 15°F Temperature Stratification													
Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)	Occupied	Occupied Set-back	Total Bin Hours During Occupy Hours	Heating Load without setback, MBH	Heating Load with setback, MBH	Therms/Yr	Existing AFUE	Existing Usage Therms	Existing Usage Therms
50-55	52.5	-	-	-	237	753	990	7	6	64	80%		81
45-50	47.5	-	-	-	136	470	606	14	13	79	80%		99
40-45	42.5	-	-	-	196	648	844	20	19	165	80%		206
35-40	37.5	-	-	-	203	735	938	27	26	244	80%		305
30-35	32.5	-	-	-	213	649	862	34	32	281	80%		351
25-30	27.5	-	-	-	123	349	472	41	38	185	80%		231
20-25	22.5	-	-	-	65	314	379	48	45	172	80%		215
15-20	17.5	-	-	-	45	181	226	55	51	117	80%		147
10-15	12.5	-	-	-	11	76	87	61	58	51	80%		63
5-10	7.5	-	-	-	6	31	37	68	64	24	80%		30
0-5	2.5	-	-	-	2	6	8	75	71	6	80%		7
-5-0	-2.5	-	-	-	2	4	6	75	71	4	80%		5
5,455													1,740

Fuel Type Natural Gas
 Fuel HHV 100 kbtu/Therm
 Fuel Unit Therms

Therms

De-stratification Fans: Faber Elementary School - All Purpose Room

Stratification °F
 Average Overheating due to Stratification °F

Indoor Temp Cooling (db)		Indoor Temp (wb)		Net Heating Load (MBH)	63	MBH	Exist AFUE=	80%	New AFUE=	
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All Purpose Room with Minimal Temperature Stratification													
Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)	Occupied	Occupied Set-back	Total Bin Hours During Occupy Hours	Heating Load without setback, MBH	Heating Load with setback, MBH	Therms/Yr	Existing AFUE	Existing Usage Therms	Existing Usage Gallons
50-55	52.5	-	-	-	237	753	990	5	5	50	80%		62
45-50	47.5	-	-	-	136	470	606	11	10	61	80%		76
40-45	42.5	-	-	-	196	648	844	16	15	128	80%		160
35-40	37.5	-	-	-	203	735	938	21	20	189	80%		236
30-35	32.5	-	-	-	213	649	862	26	25	218	80%		272
25-30	27.5	-	-	-	123	349	472	32	30	143	80%		179
20-25	22.5	-	-	-	65	314	379	37	35	133	80%		167
15-20	17.5	-	-	-	45	181	226	42	40	91	80%		114
10-15	12.5	-	-	-	11	76	87	48	45	39	80%		49
5-10	7.5	-	-	-	6	31	37	53	50	19	80%		23
0-5	2.5	-	-	-	2	6	8	58	55	4	80%		6
-5-0	-2.5	-	-	-	2	4	6	58	55	3	80%		4
5,455													
													1,349
													Therms

Fan Energy Consumption 4380 Hours (52 weeks, 12 hours per day)
 # of Fans 4
 Fan Power 25 Watts each
 Total Energy Consumption 438 kWh

Energy Savings 392
 Therms

De-stratification Fans: Faber Elementary School - Gymnasium

Total Facility Floor Area	89,203	
Areas w/ Radiators (est)	8,200	
Net area affected (est)	12%	
Est. Heating Energy Cons.	3,523	Therms

Unoccupied Setback	2 °F
Net heating Load when set back	94% of design
Stratification	10 °F (Temperature difference between ceiling and floor)
Average Overheating due to Stratification	5 °F

Indoor Temp Cooling (db)		Indoor Temp (wb)		Heating Load (MBH)	166 MBH	Exist AFUE=	80%	New AFUE=	
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All Purpose Room with 10°F Temperature Stratification													
Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)	Occupied	Occupied Set-back	Total Bin Hours During Occupy Hours	Heating Load without setback, MBH	Heating Load with setback, MBH	Therms/Yr	Existing AFUE	Existing Usage Therms	Existing Usage Therms
50-55	52.5	-	-	-	237	753	990	14	13	131	80%		163
45-50	47.5	-	-	-	136	470	606	28	26	160	80%		200
40-45	42.5	-	-	-	196	648	844	42	39	334	80%		418
35-40	37.5	-	-	-	203	735	938	55	52	495	80%		618
30-35	32.5	-	-	-	213	649	862	69	65	569	80%		712
25-30	27.5	-	-	-	123	349	472	83	78	374	80%		468
20-25	22.5	-	-	-	65	314	379	97	91	349	80%		436
15-20	17.5	-	-	-	45	181	226	111	104	238	80%		298
10-15	12.5	-	-	-	11	76	87	125	117	103	80%		128
5-10	7.5	-	-	-	6	31	37	138	130	49	80%		61
0-5	2.5	-	-	-	2	6	8	152	143	12	80%		15
-5-0	-2.5	-	-	-	2	4	6	152	143	9	80%		11
5,455													3,527

Fuel Type Natural Gas
 Fuel HHV 100 kbtu/Therm
 Fuel Unit Therms

Therms

De-stratification Fans: Faber Elementary School - Gymnasium

Stratification °F
 Average Overheating due to Stratification °F

Indoor Temp Cooling (db)		Indoor Temp (wb)		Net Heating Load (MBH)	141	MBH	Exist AFUE=	80%	New AFUE=	
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All Purpose Room with Minimal Temperature Stratification													
Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)	Occupied	Occupied Set-back	Total Bin Hours During Occupy Hours	Heating Load without setback, MBH	Heating Load with setback, MBH	Therms/Yr	Existing AFUE	Existing Usage Therms	Existing Usage Gallons
50-55	52.5	-	-	-	237	753	990	12	11	111	80%		139
45-50	47.5	-	-	-	136	470	606	24	22	136	80%		170
40-45	42.5	-	-	-	196	648	844	35	33	284	80%		355
35-40	37.5	-	-	-	203	735	938	47	44	420	80%		526
30-35	32.5	-	-	-	213	649	862	59	55	484	80%		605
25-30	27.5	-	-	-	123	349	472	71	66	318	80%		398
20-25	22.5	-	-	-	65	314	379	82	77	296	80%		371
15-20	17.5	-	-	-	45	181	226	94	88	202	80%		253
10-15	12.5	-	-	-	11	76	87	106	99	87	80%		109
5-10	7.5	-	-	-	6	31	37	118	111	41	80%		52
0-5	2.5	-	-	-	2	6	8	129	122	10	80%		12
-5-0	-2.5	-	-	-	2	4	6	129	122	7	80%		9
5,455													
													2,998
													Therms

Fan Energy Consumption 4380 Hours (52 weeks, 12 hours per day)
 # of Fans 6
 Fan Power 40 Watts each
 Total Energy Consumption 1051.2 kWh

Energy Savings 529
 Therms

De-stratification Fans: Dunellen High School - Gymnasium

Total Facility Floor Area	77,794	
Areas w/ Radiators (est)	9,000	
Net area affected (est)	12%	
Est. Heating Energy Cons.	3,918	Therms

Unoccupied Setback	2 °F
Net heating Load when set back	94% of design
Stratification	10 °F (Temperature difference between ceiling and floor)
Average Overheating due to Stratification	5 °F

Indoor Temp Cooling (db)		Indoor Temp (wb)		Heating Load (MBH)	161	MBH	Exist AFUE=	70%	New AFUE=	
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All Purpose Room with 10°F Temperature Stratification													
Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)	Occupied	Occupied Set-back	Total Bin Hours During Occupy Hours	Heating Load without setback, MBH	Heating Load with setback, MBH	Therms/Yr	Existing AFUE	Existing Usage Therms	Existing Usage Therms
50-55	52.5	-	-	-	237	753	990	13	13	127	70%		182
45-50	47.5	-	-	-	136	470	606	27	25	155	70%		222
40-45	42.5	-	-	-	196	648	844	40	38	325	70%		464
35-40	37.5	-	-	-	203	735	938	54	51	481	70%		687
30-35	32.5	-	-	-	213	649	862	67	63	554	70%		791
25-30	27.5	-	-	-	123	349	472	81	76	364	70%		520
20-25	22.5	-	-	-	65	314	379	94	89	339	70%		484
15-20	17.5	-	-	-	45	181	226	108	101	231	70%		331
10-15	12.5	-	-	-	11	76	87	121	114	100	70%		143
5-10	7.5	-	-	-	6	31	37	135	126	47	70%		68
0-5	2.5	-	-	-	2	6	8	148	139	11	70%		16
-5-0	-2.5	-	-	-	2	4	6	148	139	9	70%		12
5,455													3,919

Fuel Type Natural Gas

Therms

Fuel HHV 100 kbtu/Therm

Fuel Unit Therms

De-stratification Fans: Dunellen High School - Gymnasium

Stratification °F
 Average Overheating due to Stratification °F

Indoor Temp Cooling (db)		Indoor Temp (wb)		Net Heating Load (MBH)	137	MBH	Exist AFUE=	70%	New AFUE=	
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All Purpose Room with Minimal Temperature Stratification													
Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)	Occupied	Occupied Set-back	Total Bin Hours During Occupy Hours	Heating Load without setback, MBH	Heating Load with setback, MBH	Therms/Yr	Existing AFUE	Existing Usage Therms	Existing Usage Gallons
50-55	52.5	-	-	-	237	753	990	11	11	108	70%		154
45-50	47.5	-	-	-	136	470	606	23	21	132	70%		189
40-45	42.5	-	-	-	196	648	844	34	32	276	70%		394
35-40	37.5	-	-	-	203	735	938	46	43	409	70%		584
30-35	32.5	-	-	-	213	649	862	57	54	470	70%		672
25-30	27.5	-	-	-	123	349	472	69	64	309	70%		442
20-25	22.5	-	-	-	65	314	379	80	75	288	70%		412
15-20	17.5	-	-	-	45	181	226	91	86	197	70%		281
10-15	12.5	-	-	-	11	76	87	103	97	85	70%		121
5-10	7.5	-	-	-	6	31	37	114	107	40	70%		57
0-5	2.5	-	-	-	2	6	8	126	118	10	70%		14
-5-0	-2.5	-	-	-	2	4	6	126	118	7	70%		10
5,455													
													3,331
													Therms

Fan Energy Consumption 4380 Hours (52 weeks, 12 hours per day)
 # of Fans 6
 Fan Power 40 Watts each
 Total Energy Consumption 1051.2 kWh

Energy Savings 588
 Therms



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ECM #10:

KITCHEN HOOD CONTROLS

Kitchen Hood Controls

Index	Building	Space	# of Hoods	Hood Width	Hood Height	Flow CFM/LF	Estimated Savings Hrs/Day	Est. Energy Savings, Therms	Est. Energy Savings, kWh
1	Faber Elementary School	Kitchen	1	15	5	200	4	352	1079
2	Dunellen High School	Kitchen	1	15	5	200	4	352	1079

* Calculated based on hourly operation savings by automatically shutting off the units when there is no temperature or smoke activity.

Basis of Design

Greenheck Kitchen Hood Energy Management Panel

Cost Estimate

\$5,000 per controller (installed)

Kitchen Hood Controls - Faber Elementary School

	# of hoods	Depth	Width	CFM/Linear Length	Total CFM
Hood Sizes	1	5	15	200	3000

Run Hour Savings 4
 Daily hours of operation 7
 Fan HP (est based on 2" static) 1.3
 Fan run hours 800
 Total Electricity Savings 1079 kWh
 Maximum Heat Load 162.75 MBH

Energy Consumption - Occupied - No Setback

Ambient Bin Deg F	Total Bin Hours During Occupy Hours	MBH	Therms /Yr	Existing AFUE	Existing Unit Therms
50 to 55	85	18	15	80%	19.21
45 to 50	48	36	17	80%	21.70
40 to 45	65	54	35	80%	44.08
35 to 40	69	72	50	80%	62.39
30 to 35	82	90	74	80%	92.68
25 to 30	43	109	47	80%	58.32
20 to 25	17	127	22	80%	26.90
15 to 20	9	145	13	80%	16.28
10 to 15	3	163	5	80%	6.10
5 to 10	1	163	2	80%	2.03
0 to 5	1	163	2	80%	2.03
	423				
					352

Therms

The screenshot shows a software interface for configuring a system. The main window title is "Selected Location: NEWARK INTERNATIONAL ARPT NJ USAF # 725020". The interface is divided into several sections:

- Select Location(s):** A globe icon and a text field containing the location name.
- Select Hours:** A calendar grid showing days of the week (SUN to SAT) and hours (01 to 24). A "# Hours Selected" box shows "780".
- Select Procedure:** A key icon and a text field.
- Months:** A list of months from JAN to DEC with checkboxes. The "All" button is selected.
- Time/Date Profiles:** A section with a "New Profile" button and a "Print Hours Selection" button.
- City, State, USAF #, Latitude, Longitude, Elevation:** A data entry section with fields for "NEWARK INTERNATIONAL ARPT", "NJ", "725020", "40.717", "-74.183", and "3 m / 10 ft".
- Bin Now and Exit:** Two buttons at the bottom right, one with a bin icon and one with a stop sign.

Kitchen Hood Controls - Dunellen High School

	# of hoods	Depth	Width	CFM/Linear Length	Total CFM
Hood Sizes	1	5	15	200	3000

Run Hour Savings 4
 Daily hours of operation 7
 Fan HP (est based on 2" static) 1.3
 Fan run hours 800
 Total Electricity Savings 1079 kWh
 Maximum Heat Load 162.75 MBH

Energy Consumption - Occupied - No Setback

Ambient Bin Deg F	Total Bin Hours During Occupy Hours	MBH	Therms /Yr	Existing AFUE	Existing Unit Therms
50 to 55	85	18	15	80%	19.21
45 to 50	48	36	17	80%	21.70
40 to 45	65	54	35	80%	44.08
35 to 40	69	72	50	80%	62.39
30 to 35	82	90	74	80%	92.68
25 to 30	43	109	47	80%	58.32
20 to 25	17	127	22	80%	26.90
15 to 20	9	145	13	80%	16.28
10 to 15	3	163	5	80%	6.10
5 to 10	1	163	2	80%	2.03
0 to 5	1	163	2	80%	2.03
	423				
					352

Therms

Selected Location: NEWARK INTERNATIONAL ARPT NJ USAF # 725020

File

Select Location(s) Select Hours Select Procedure

Use LEFT Mouse Button or SPACEBAR to select/de-select highlighted item

Months: JAN JUL FEB AUG MAR SEP APR OCT MAY NOV JUN DEC

Hours Selected: 780

Time/Date Profiles

Profile Name/Description: New Profile

Print Hours Selection

Select ALL Select NONE

HOURS	SUN	MON	TUE	WED	THU	FRI	SAT
01	01	01	01	01	01	01	01
02	02	02	02	02	02	02	02
03	03	03	03	03	03	03	03
04	04	04	04	04	04	04	04
05	05	05	05	05	05	05	05
06	06	06	06	06	06	06	06
07	07	07	07	07	07	07	07
08	08	08	08	08	08	08	08
09	09	09	09	09	09	09	09
10	10	10	10	10	10	10	10
11	11	11	11	11	11	11	11
12	12	12	12	12	12	12	12
13	13	13	13	13	13	13	13
14	14	14	14	14	14	14	14
15	15	15	15	15	15	15	15
16	16	16	16	16	16	16	16
17	17	17	17	17	17	17	17
18	18	18	18	18	18	18	18
19	19	19	19	19	19	19	19
20	20	20	20	20	20	20	20
21	21	21	21	21	21	21	21
22	22	22	22	22	22	22	22
23	23	23	23	23	23	23	23
24	24	24	24	24	24	24	24

City: NEWARK INTERNATIONAL ARPT State: NJ USAF #: 725020 Latitude: 40.717 Longitude: -74.183 Elevation: 3 m / 10 ft

Bin Now Exit



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ECM #11:

DISHWASHER BOOSTER HEATER

Gas Fired Dishwasher Booster Heater

Faber Elementary School

Water Use Per Wash	40 gallons of water
Dishwasher run time	2 /day
Dishwasher usage	200 Days
Total Energy Usage	9296 kBTUs
Electricity Usage	2724 kWh
Electricity Demand	27 kW
Gas Fired Booster Efficiency	80%
Gas Consumption After Conversion	-74 Therms
Estimated Cost	\$2,750 installed

Dunellen High School

Water Use Per Wash	40 gallons of water
Dishwasher run time	2 /day
Dishwasher usage	200 Days
Total Energy Usage	9296 kBTUs
Electricity Usage	2724 kWh
Electricity Demand	27 kW
Gas Fired Booster Efficiency	80%
Gas Consumption After Conversion	-74 Therms
Estimated Cost	\$2,750 installed

Basis of Design: Vanguard Booster Heaters or equivalent



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ECM #12:

UNIT VENTILATOR UPGRADES

Unit Ventilator Replacement - Energy Savings Calculations

Index	Tag#	Location	Qty	Area Serving	Cooling Capacity (tons)	Cooling EER	Heating Fuel	Est. Heating Capacity input - MBH	Heating Efficiency	Year Mfd	Proposed System	Energy Savings, kWh	Energy Savings, Therms
1	UV	Faber Elementary School	15	Classrooms	-	-	Hot Water	15	80%	1960	New Unit Ventilators with EC	4032	1066
2	UV	Dunellen High School	20	Classrooms	-	-	Hot Water	15	80%	1960	Motors, connected to existing BMS	5376	1421
3													

Scope of Work

Replace Unit Ventilators with New Unit Ventilators

Proposed units shall be connected to the existing Buildint Management System

Proposed units shall be furnished with EC Motors

Proposed units shall have full outside air damper controls and demand controlled ventilation.

Location	Qty	Total Cost
Faber Elementary School	15	\$75,000
Dunellen High School	20	\$100,000

Unit Ventilator Energy Savings

per unit

Existing Conditions

Est. Heating Load (MBH)	15.0	Unoccupied Heating Load (MBH)	15.0
Temperature observed (F)	74	Temperature Setback (F)	0
		Temperature Setpoint (F)	74
Heating Design Day DT (F)	65	Heating Design DT (F)	65

Existing Heating Efcy	80%	Occupied Heating Load (MBH)	15
Proposed Heating Efcy		Temperature Setback (F)	0
Cost of Natural Gas / Therm		Temperature Setpoint (F)	74
		Heating Design DT (F)	65

Mon - Fri (07:00-17:00) (Except July)

Energy Consumption - Occupied - No Setback							
Ambient Bin Deg F	Total Bin Hours During Occupy Hours	MBH	Therms /Yr	Existing AFUE	Proposed AFUE	Existing Unit Therms	
50-55	237	2	4	80%	80%	4.94	
45-50	136	3	5	80%	80%	5.67	
40-45	196	5	10	80%	80%	12.25	
35-40	203	7	14	80%	80%	16.92	
30-35	213	8	18	80%	80%	22.19	
25-30	123	10	12	80%	80%	15.38	
20-25	65	12	8	80%	80%	9.48	
15-20	45	13	6	80%	80%	7.50	
10-15	11	15	2	80%	80%	2.06	
5-10	6	15	1	80%	80%	1.13	
0-5	2	15	0	80%	80%	0.38	
-5-0	2	15	0	80%	80%	0.38	
	1,239						
						98	

Therms

Mon - Fri (01-06, 22-23) Weekend (24 hrs)

Energy Consumption - Unoccupied - No Setback							
Ambient Bin Deg F	Total Bin Hours During Occupy Hours	MBH	Therms /Yr	Existing AFUE	Proposed AFUE	Existing Unit Therms	
50-55	382	2	6	80%	80%	7.96	
45-50	256	3	9	80%	80%	10.67	
40-45	362	5	18	80%	80%	22.63	
35-40	414	7	28	80%	80%	34.50	
30-35	353	8	29	80%	80%	36.77	
25-30	171	10	17	80%	80%	21.38	
20-25	202	12	24	80%	80%	29.46	
15-20	121	13	16	80%	80%	20.17	
10-15	57	15	9	80%	80%	10.69	
5-10	23	15	3	80%	80%	4.31	
0-5	4	15	1	80%	80%	0.75	
-5-0	2	15	0	80%	80%	0.38	
	2,347						
						200	

Therms

Mon - Fri (18:00-22:00)

Energy Consumption - Occupied - No Setback							
Ambient Bin Deg F	Total Bin Hours During Occupy Hours	MBH	Therms /Yr	Existing AFUE	Proposed AFUE	Existing Unit Therms	
50-55	134	2	2	80%	80%	2.79	
45-50	78	3	3	80%	80%	3.25	
40-45	90	5	5	80%	80%	5.63	
35-40	118	7	8	80%	80%	9.83	
30-35	83	8	7	80%	80%	8.65	
25-30	55	10	6	80%	80%	6.88	
20-25	47	12	5	80%	80%	6.85	
15-20	15	13	2	80%	80%	2.50	
10-15	8	15	1	80%	80%	1.50	
5-10	2	15	0	80%	80%	0.38	
0-5		15	0	80%	80%	0.00	
-5-0		15	0	80%	80%	0.00	
	630						
						48	

Therms

Mon - Fri (07:00-17:00) (July Only)

Energy Consumption - Occupied - No Setback							
Ambient Bin Deg F	Total Bin Hours During Occupy Hours	MBH	Therms /Yr	Existing AFUE	Proposed AFUE	Existing Unit Therms	
50-55		2	0	80%	80%	0.00	
45-50		3	0	80%	80%	0.00	
40-45		5	0	80%	80%	0.00	
35-40		7	0	80%	80%	0.00	
30-35		8	0	80%	80%	0.00	
25-30		10	0	80%	80%	0.00	
20-25		12	0	80%	80%	0.00	
15-20		13	0	80%	80%	0.00	
10-15		15	0	80%	80%	0.00	
5-10		15	0	80%	80%	0.00	
0-5		15	0	80%	80%	0.00	
-5-0		15	0	80%	80%	0.00	
	0						
						0	

Therms

Total	Total Bin Hours During Occupy Hours					Existing Unit Therms	
	4,216					346	

Unit Ventilator Energy Savings

per unit

Proposed Conditions			
Est. Heating Load (MBH)	15	Unoccupied Heating Load (MBH)	10.0
Temperature Setpoint (F)	72	Temperature Setback (F)	7
Temperature Setback		Temperature Setpoint (F)	65
Heating Design Day DT (F)	65	Heating Design DT (F)	58
Existing Heating Efcy	80%	Occupied Heating Load	14.5
Proposed Heating Efcy		Temperature Reset (F)	2.0
Cost of Natural Gas / Therm		Temperature Setpoint (F)	72.0
		Heating Design DT (F)	63

Mon - Fri (07:00-17:00) (Except July)

Energy Consumption - Occupied - No Setback							
Ambient Bin Deg F	Total Bin Hours During Occupy Hours	MBH	Therms /Yr	Existing AFUE	Proposed AFUE	Existing Unit Therms	Energy Savings Therms
50-55	237	1.6	4	80%	80%	4.79	4.9
45-50	136	3.2	4	80%	80%	5.49	5.7
40-45	196	4.8	9	80%	80%	11.87	12.3
35-40	203	6.5	13	80%	80%	16.40	16.9
30-35	213	8.1	17	80%	80%	21.50	22.2
25-30	123	9.7	12	80%	80%	14.90	15.4
20-25	65	11.3	7	80%	80%	9.19	9.5
15-20	45	12.9	6	80%	80%	7.27	7.5
10-15	11	14.5	2	80%	80%	2.00	2.1
5-10	6	14.5	1	80%	80%	1.09	1.1
0-5	2	14.5	0	80%	80%	0.36	0.4
-5-0	2	14.5	0	80%	80%	0.36	0.4
	1,239					95	98
						Therms	Therms

Mon - Fri (01-06, 22-23) Weekend (24 hrs)

Energy Consumption - Unoccupied - Setback							
Ambient Bin Deg F	Total Bin Hours During Occupy Hours	MBH	Therms /Yr	Existing AFUE	Proposed AFUE	Existing Unit Therms	Energy Savings Therms
50-55	382	1	4	80%	80%	5.31	8.0
45-50	256	2	6	80%	80%	7.11	10.7
40-45	362	3	12	80%	80%	15.08	22.6
35-40	414	4	18	80%	80%	23.00	34.5
30-35	353	6	20	80%	80%	24.51	36.8
25-30	171	7	11	80%	80%	14.25	21.4
20-25	202	8	16	80%	80%	19.64	29.5
15-20	121	9	11	80%	80%	13.44	20.2
10-15	57	10	6	80%	80%	7.13	10.7
5-10	23	10	2	80%	80%	2.88	4.3
0-5	4	10	0	80%	80%	0.50	0.8
-5-0	2	10	0	80%	80%	0.25	0.4
	2,347					133	200
						Therms	Therms

Mon - Fri (18:00-22:00)

Energy Consumption - Occupied - Setback								
Ambient Bin Deg F	Total Bin Hours During Occupy Hours	MBH	Therms /Yr	Existing AFUE	Proposed AFUE	Existing Unit Therms		Energy Savings Therms
50-55	134	1.6	2	80%	80%	2.71		2.8
45-50	78	3.2	3	80%	80%	3.15		3.3
40-45	90	4.8	4	80%	80%	5.45		5.6
35-40	118	6.5	8	80%	80%	9.53		9.8
30-35	83	8.1	7	80%	80%	8.38		8.6
25-30	55	9.7	5	80%	80%	6.66		6.9
20-25	47	11.3	5	80%	80%	6.64		6.9
15-20	15	12.9	2	80%	80%	2.42		2.5
10-15	8	14.5	1	80%	80%	1.45		1.5
5-10	2	14.5	0	80%	80%	0.36		0.4
0-5		14.5	0	80%	80%	0.00		0.0
-5-0		14.5	0	80%	80%	0.00		0.0
	630							
						47		48
							Therms	Therms

Mon - Fri (07:00-17:00) (July Only)

Energy Consumption - Occupied - Setback								
Ambient Bin Deg F	Total Bin Hours During Occupy Hours	MBH	Therms /Yr	Existing AFUE	Proposed AFUE	Existing Unit Therms		Energy Savings Therms
50-55		2	0	80%	80%	0.00		0.0
45-50		3	0	80%	80%	0.00		0.0
40-45		5	0	80%	80%	0.00		0.0
35-40		6	0	80%	80%	0.00		0.0
30-35		8	0	80%	80%	0.00		0.0
25-30		10	0	80%	80%	0.00		0.0
20-25		11	0	80%	80%	0.00		0.0
15-20		13	0	80%	80%	0.00		0.0
10-15		15	0	80%	80%	0.00		0.0
5-10		15	0	80%	80%	0.00		0.0
0-5		15	0	80%	80%	0.00		0.0
-5-0		15	0	80%	80%	0.00		0.0
	0							
						0		0
							Therms	Therms

Total	Total Bin Hours During Occupy Hours					Existing Unit Therms		Energy Savings Therms
	4,216					275		71

Energy Savings Summary	
Existing Energy Consumption (Therms)	346
New Energy Consumption (Therms)	275
Gas Savings (Therms)	71
Gas Savings %	20.5%

Unit Ventilator Energy Savings

per unit

Additional Savings due to New EC Motors

Number of Fan Motors	1
Existing Fan Motor Power	250 W
EC Fan Motor Power	150 W
Fan Power Savings	100 W
Fan Run Hours	1,239 (# of occupied hours when OA<55)
Total Annual Fan Run Hours	2688 Hrs
Total Fan Energy Consumption Existing	672 kWh
Total Fan Energy Consumption Proposed	403.2 kWh
Fan Energy Savings	268.8 kWh

Implementation Cost (per unit)

New Unit Ventilator	\$2,000
Network Connection	\$1,000
Installation	\$2,000
Total	\$5,000



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ECM #13:

DEMAND CONTROLLED VENTILATION

Demand Controlled Ventilation

DCV #	Building	Space	# of HVAC Units	Cooling Capacity, Tons	Est. Heating Capacity, MBH	Est. Cooling Load, Tons (60%)	Est. Heating Load, MBH (25%)	Est. Energy Savings, kWh	Est. Energy Savings, Therms	Project Cost
1	Faber Elementary School	Media Center	1	12.5	250	8	63	2,315	211	\$8,000
2	Faber Elementary School	Gymnasium	4	50	1,000	30	250	9,262	843	\$14,000
3	Faber Elementary School	All Purpose Room	1	0	82	0	82	0	277	\$8,000
4	Lincoln Middle School	Cafetorium	1	40	800	24	200	7,409	675	\$8,000
5	Dunellen High School	Auditorium Seating Area	1	40	800	24	200	7,409	675	\$8,000
6	Dunellen High School	Auditorium Stage	1	20	400	12	100	3,705	337	\$8,000
7	Dunellen High School	Gymnasium	2	0	161	0	161	0	543	\$10,000

O.A.: Outside Air

Assumptions

Estimated total cooling load is 60% of the total cooling capacity
 Estimated total heating load is 25% of the total heating capacity
 Estimated O.A. heating/cooling Load = 30% total heating/cooling load.

Based on sample calculation (See next page)

Energy Savings 309 kWh/Ton
 Energy Savings 3 Therms/MBH

Cost of Implementation

\$6,000 per space
 \$2,000 per unit

DCV #	Building	Project Cost	Savings	
			Electric	Nat. Gas
	Faber Elementary School	\$30,000	11,577	1,331
	Lincoln Middle School	\$8,000	7,409	675
	Dunellen High School	\$26,000	11,114	1,555

Sample Demand Controlled Ventilation Savings

For Net Heating Load	100 MBH	Estimated Outside Air Heating Load, RTUs	30 MBH	(30% of total)
For Net Total Cooling Load	100 Tons	Estimated Net Total Cooling Load	30 Tons	(30% of total)
		Estimated savings via DCV	40% OA overall reduction	

Hours of Operation (Based on 24 Hours)	Start:	0	Stop:	24	Total Cooling Load (Tons)	12.0	Exist EER=		New EER=	
Indoor Temp Cooling (db)	75	Indoor Temp (wb)	63	Heating Capacity (MBH)	12.0	Exist AFUE=	75%	New AFUE=	80%	
Indoor Temp Heating (db)	70									

COOLING ENERGY SAVINGS

Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)	Occupied	Unoccupied	Total Bin Hours During Occupy Hours	Un-occupied Tons	Occupied Tons	Ton-Hrs/Yr	Existing EER	Existing Unit kWh	
<i>Cooling</i>													
95-100	97.5	72.6	80.73	30.34%	0	21	21	6.00	12.00	252	7.5	403.20	
90-95	92.5	74.1	97.45	42.55%	22	57	79	6.00	12.00	816	7.5	1,305.60	
85-90	87.5	71.8	91.95	47.08%	113	229	342	5.14	10.29	2,937	8.0	4,404.86	
80-85	82.5	69.4	86.88	52.20%	188	487	675	4.29	8.57	4,980	8.0	7,470.00	
75-80	77.5	67.4	84.27	59.74%	182	721	903	3.43	6.86	5,568	8.5	7,860.71	
70-75	72.5	64.6	77.48	64.93%	172	632	804	2.57	5.14	3,693	8.5	5,213.04	
65-70	67.5	61.1	70.03	69.81%	210	817	1,027	1.71	3.43	3,161	9.0	4,214.86	
60-65	62.5	56.5	58.40	69.39%	226	767	993	Econmizer			10.0	0.00	
55-60	57.5	50.2	42.08	60.04%	277	812	1,089				10.0	0.00	
								4,844	144,000				30,872

HEATING ENERGY SAVINGS

Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)	Occupied	Unoccupied	Total Bin Hours During Occupy Hours	Unoccupied Heating MBH	Occupied Heating MBH	Therms/Yr	Existing AFUE	Existing Unit Therms
50-55	52.5	46.3	36.51	62.51%	237.0	753.0	990	0.67	1.33	12	75%	15.49
45-50	47.5	41.5	28.95	59.88%	136.0	470.0	606	1.33	2.67	14	75%	19.13
40-45	42.5	38.0	26.44	66.11%	196.0	648.0	844	2.00	4.00	30	75%	39.79
35-40	37.5	33.9	22.77	69.31%	203.0	735.0	938	2.67	5.33	45	75%	59.48
30-35	32.5	29.3	18.58	68.99%	213.0	649.0	862	3.33	6.67	50	75%	67.16
25-30	27.5	24.6			123.0	349.0	472	4.00	8.00	33	75%	43.79
20-25	22.5	19.4			65.0	314.0	379	4.67	9.33	32	75%	43.12
15-20	17.5	15.4			45.0	181.0	226	5.33	10.67	22	75%	28.94
10-15	12.5	9.8			11.0	76.0	87	6.00	12.00	10	75%	13.04
5-10	7.5	4.1			6.0	31.0	37	6.00	12.00	4	75%	5.44
0-5	2.5	1.3			2.0	6.0	8	6.00	12.00	1	75%	1.12
-5-0	-2.5	0.0			2.0	4.0	6	6.00	12.00	1	75%	0.80

5,455

Occupied: KEWR - Degree days for occupied hours: Monday - Friday, 7 AM - 6 PM (Except July)

337

Unoccupied: KEWR - Degree days for unoccupied hours (Any hours except above)

Therms



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ECM #14:

EXHAUST FAN CONTROLS

Exhaust Fan Control Savings

Tag	Building	Space	Est. # of Exhaust Fans*	Ave. Exhaust Flow, CFM	Total Exhaust Flow, CFM	Est. Fan Power Savings, kWh	Est. Cooling Savings, kWh	Est. Energy Savings, Therms	Project Cost
1	Faber Elementary School	Media Center	5	500	2,500	1,170	0	1,506	\$5,000
2	Lincoln Middle School	Cafetorium	2	500	1,000	468	0	603	\$2,000
3	Dunellen High School	Gymnasium	3	500	1,500	702	0	904	\$3,000

* Estimated number of exhaust fans not on a timer

Assumptions

Estimated total cooling load is 60% of the total cooling capacity

Estimated total heating load is 25% of the total heating capacity

Estimated O.A. heating/cooling Load = 30% total heating/cooling load.

Each fan motor is 100W and shuts off 9 hours per day, 5 days/week, 52 weeks.

Based on sample calculation (See next page)

Energy Savings 0.44 kWh/CFM

Energy Savings 0.60 Therms/CFM

Cost of Implementation

\$1,000 per unit

DCV #	Building	Project Cost	Savings	
			Electric	Nat. Gas
	Faber Elementary School	\$5,000	1,170	1,506
	Lincoln Middle School	\$2,000	468	603
	Dunellen High School	\$3,000	702	904

Sample Exhasut Fan Control Savings

Flow 1000 CFM
 Net Heating Load 55 MBH
 Net Cooling Load 2.5 Tons

Hours of Operation (Based on 24 Hours)	Start:	0	Stop:	24	Total Cooling Load (Tons)	2.5	Exist EER=		New EER=	
Indoor Temp Cooling (db)	75	Indoor Temp (wb)	63	Heating Capacity (MBH)	55.0	Exist AFUE=	80%	New AFUE=	80%	
Indoor Temp Heating (db)	70									

COOLING ENERGY SAVINGS

Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)		CDDs when Exhaust is OFF	Total Bin Hours During Occupy Hours	Un-occupied Tons	Occupied Tons	Ton-Hrs/Yr	Existing EER	Existing Unit kWh
<i>Cooling</i>												
95-100	97.5	72.6	80.73	30.34%		0	0	1.25	2.50	0	9.0	0
90-95	92.5	74.1	97.45	42.55%		0	0	1.25	2.50	0	9.0	0
85-90	87.5	71.8	91.95	47.08%		0	0	1.07	2.14	0	9.0	0
80-85	82.5	69.4	86.88	52.20%		27	27	0.89	1.79	48	9.0	64
75-80	77.5	67.4	84.27	59.74%		55	55	0.71	1.43	79	9.0	105
70-75	72.5	64.6	77.48	64.93%		97	97	0.54	1.07	104	10.0	125
65-70	67.5	61.1	70.03	69.81%		168	168	0.36	0.71	120	10.0	144
60-65	62.5	56.5	58.40	69.39%		238	238	Economizer			10.0	0
55-60	57.5	50.2	42.08	60.04%		292	292				10.0	0
585								30,000				438

HEATING ENERGY SAVINGS

Ambient Bin Deg F	Avg. Temp DB (deg F)	M.C.W.B. (deg F)	H.R. Humidity Ratio (Grain/lb)	R.H. Relative Humidity (%)		HDDs when Exhaust is OFF	Total Bin Hours During Occupy Hours	Unoccupied Heating MBH	Occupied Heating MBH	Therms/Yr	Existing AFUE	Existing Unit Therms
50-55	52.5	46.3	36.51	62.51%		298	298	3.06	6.11	18	80%	23
45-50	47.5	41.5	28.95	59.88%		206	206	6.11	12.22	25	80%	31
40-45	42.5	38.0	26.44	66.11%		303	303	9.17	18.33	56	80%	69
35-40	37.5	33.9	22.77	69.31%		335	335	12.22	24.44	82	80%	102
30-35	32.5	29.3	18.58	68.99%		292	292	15.28	30.56	89	80%	112
25-30	27.5	24.6				149	149	18.33	36.67	55	80%	68
20-25	22.5	19.4				159	159	21.39	42.78	68	80%	85
15-20	17.5	15.4				95	95	24.44	48.89	46	80%	58
10-15	12.5	9.8				50	50	27.50	55.00	28	80%	34
5-10	7.5	4.1				23	23	27.50	55.00	13	80%	16
0-5	2.5	1.3				4	4	27.50	55.00	2	80%	3
-5-0	-2.5	0.0				1	1	27.50	55.00	1	80%	1
1,915												

Exhaust Hours: KEWR - Degree days for occupied hours: Monday - Saturday, 6 AM - 9 PM (Except July-Sep)

603

No Exhaust Hours: KEWR - Degree days for unoccupied hours (Any hours except above)

Therms



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RENEWABLES CALCULATIONS

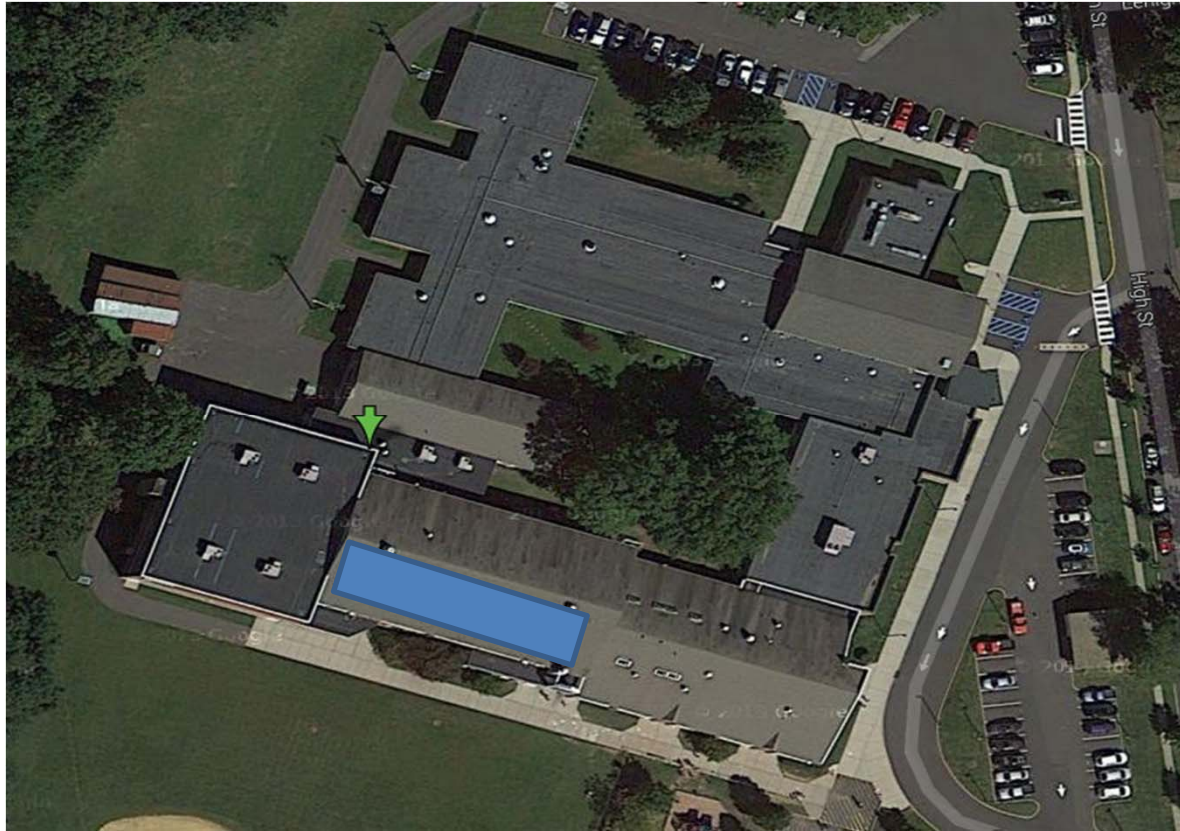
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**DUNELLEN SCHOOLS
RENEWABLE CALCULATIONS
SOLAR ENERGY**

Building	Faber Elementary School	Lincoln Middle School	Dunellen High School	Total
Locations to Install Panels	Roof	Roof	Roof	
Assumptions				
System Capacity, kW-dc(maximum utilization of roof space)	20	11	32	63
Annual Electric Generation, kWhrs of AC electricity produced	27,318	14,310	42,495	84,123
Total Annual Facility Electric Use, kWhrs	611,616	289,033	485,098	1,385,747
% of Total Annual Usage	4%	5%	9%	6%
All-In Cost of Electricity Year 1	\$0.155	\$0.158	\$0.167	\$0.160
Annaul Electric Cost Savings	\$4,245	\$2,258	\$7,091	\$13,594
Estimated SREC Value (Year 1)	\$100 / SREC	\$100 / SREC	\$100 / SREC	\$100 / SREC
Estimated year 1 SREC Revenue	\$2,732	\$1,431	\$4,250	\$8,412
Estimated Total Annual Revenue	\$6,977	\$3,689	\$11,341	\$22,006
Enviromental Impact				
Equvilant Annual CO2 Emmison Reduction (tons per year)	9.0	4.7	14.0	27.8
Equvilant Cars Removed From Road Anually	2	1	2	5
Equvilant Acres of Tress Planted Annually	2	1	4	8
Financial Results				
System Installed Cost	\$81,900	\$42,900	\$127,400	\$252,200
Simple Payback (Years)	12	12	11	11
IRR (25 Years)	6%	7%	7%	7%
Net Present Value (25 yrs, 4% discount rate)	\$56,925	\$30,483	\$98,051	\$182,865
1.Estimated CO2 Emissions Rate: 0.66 lbs/kWh 2.EPA Estimate: 11,560 CO2 per car 3.EPA Estimate:7,333 lbs CO2 per acre of trees planted				

DUNELLEN SCHOOLS - SOLAR ENERGY ANALYSIS

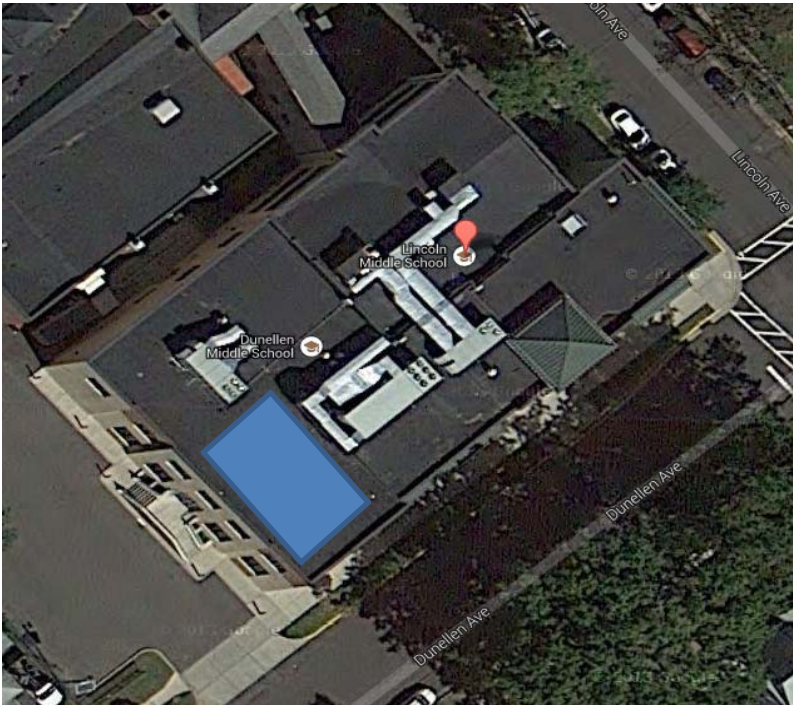
Faber Elementary School



DUNELLEN SCHOOLS - SOLAR ENERGY ANALYSIS

Lincoln Middle School

Dunellen High School



Electric Cost \$0.16
 SREC \$0.10
 Total \$0.26
 Energy Cost Annual Escalation 3%
 Capacity Loss 0.50%

Faber Elementary School

Year	Investment	Electric Generation kWh	Energy Cost Savings	Maint Cost	Net Cas Flow	Cumulative Cash Flow
0	\$81,900	0	0	0	(\$81,900)	0
1	0	27,318	\$6,977	0	\$6,977	(\$74,923)
2	0	27,182	\$7,150	0	\$7,150	(\$67,774)
3	0	27,045	\$7,327	0	\$7,327	(\$60,446)
4	0	26,909	\$7,509	0	\$7,509	(\$52,937)
5	0	26,772	\$7,695	258	\$7,695	(\$45,242)
6	0	26,635	\$7,886	257	\$7,886	(\$37,356)
7	0	26,499	\$8,080	255	\$8,080	(\$29,276)
8	0	26,362	\$8,280	254	\$8,280	(\$20,996)
9	0	26,226	\$8,484	253	\$8,484	(\$12,512)
10	0	26,089	\$8,693	251	\$8,693	(\$3,819)
11	0	25,952	\$8,907	250	\$8,907	\$5,088
12	0	25,816	\$9,126	249	\$9,126	\$14,214
13	0	25,679	\$9,350	248	\$9,350	\$23,564
14	0	25,543	\$9,579	247	\$9,579	\$33,144
15	0	25,406	\$9,814	245	\$9,814	\$42,958
16	0	25,270	\$10,054	244	\$10,054	\$53,012
17	0	25,133	\$10,300	243	\$10,300	\$63,311
18	0	24,996	\$10,551	242	\$10,551	\$73,862
19	0	24,860	\$10,808	240	\$10,808	\$84,670
20	0	24,723	\$11,071	239	\$11,071	\$95,742
21	0	24,587	\$11,340	238	\$11,340	\$107,082
22	0	24,450	\$11,616	237	\$11,616	\$118,698
23	0	24,313	\$11,897	236	\$11,897	\$130,595
24	0	24,177	\$12,185	234	\$12,185	\$142,780
25	0	24,040	\$12,480	233	\$12,480	\$155,260
					\$237,160	\$738,700

Net Present Value	\$56,925
Internal Rate of Return	6.49%

Electric Cost \$0.16
 SREC \$0.10
 Total \$0.26
 Energy Cost Annual Escalation 3%
 Capacity Loss 0.50%

Lincoln Middle School

Year	Investment	Electric Generation kWh	Energy Cost Savings	Maint Cost	Net Cas Flow	Cumulative Cash Flow
0	\$42,900	0	0	0	(\$42,900)	0
1	0	14,310	\$3,689	0	\$3,689	(\$39,211)
2	0	14,238	\$3,780	0	\$3,780	(\$35,431)
3	0	14,167	\$3,874	0	\$3,874	(\$31,557)
4	0	14,095	\$3,970	0	\$3,970	(\$27,587)
5	0	14,023	\$4,069	135	\$4,069	(\$23,518)
6	0	13,952	\$4,169	134	\$4,169	(\$19,349)
7	0	13,880	\$4,272	134	\$4,272	(\$15,077)
8	0	13,809	\$4,378	133	\$4,378	(\$10,699)
9	0	13,737	\$4,486	132	\$4,486	(\$6,214)
10	0	13,666	\$4,596	132	\$4,596	(\$1,617)
11	0	13,594	\$4,709	131	\$4,709	\$3,092
12	0	13,523	\$4,825	130	\$4,825	\$7,917
13	0	13,451	\$4,943	130	\$4,943	\$12,860
14	0	13,380	\$5,065	129	\$5,065	\$17,925
15	0	13,308	\$5,189	128	\$5,189	\$23,114
16	0	13,236	\$5,316	128	\$5,316	\$28,430
17	0	13,165	\$5,446	127	\$5,446	\$33,875
18	0	13,093	\$5,578	127	\$5,578	\$39,454
19	0	13,022	\$5,714	126	\$5,714	\$45,168
20	0	12,950	\$5,854	125	\$5,854	\$51,022
21	0	12,879	\$5,996	125	\$5,996	\$57,017
22	0	12,807	\$6,141	124	\$6,141	\$63,159
23	0	12,736	\$6,290	123	\$6,290	\$69,449
24	0	12,664	\$6,443	123	\$6,443	\$75,892
25	0	12,592	\$6,598	122	\$6,598	\$82,490
					\$125,390	\$400,602

Net Present Value	\$30,483
Internal Rate of Return	6.68%

Electric Cost \$0.17
 SREC \$0.10
 Total \$0.27
 Energy Cost Annual Escalation 3%
 Capacity Loss 0.50%

Dunellen High School

Year	Investment	Electric Generation kWh	Energy Cost Savings	Maint Cost	Net Cas Flow	Cumulative Cash Flow
0	\$127,400	0	0	0	(\$127,400)	0
1	0	42,495	\$11,341	0	\$11,341	(\$116,059)
2	0	42,283	\$11,623	0	\$11,623	(\$104,436)
3	0	42,070	\$11,911	0	\$11,911	(\$92,525)
4	0	41,858	\$12,207	0	\$12,207	(\$80,318)
5	0	41,645	\$12,509	401	\$12,509	(\$67,809)
6	0	41,433	\$12,819	399	\$12,819	(\$54,991)
7	0	41,220	\$13,135	397	\$13,135	(\$41,855)
8	0	41,008	\$13,460	395	\$13,460	(\$28,396)
9	0	40,795	\$13,792	393	\$13,792	(\$14,604)
10	0	40,583	\$14,131	391	\$14,131	(\$472)
11	0	40,371	\$14,479	389	\$14,479	\$14,007
12	0	40,158	\$14,835	387	\$14,835	\$28,842
13	0	39,946	\$15,199	385	\$15,199	\$44,041
14	0	39,733	\$15,572	383	\$15,572	\$59,613
15	0	39,521	\$15,953	382	\$15,953	\$75,567
16	0	39,308	\$16,344	380	\$16,344	\$91,910
17	0	39,096	\$16,743	378	\$16,743	\$108,653
18	0	38,883	\$17,152	376	\$17,152	\$125,805
19	0	38,671	\$17,570	374	\$17,570	\$143,374
20	0	38,458	\$17,997	372	\$17,997	\$161,372
21	0	38,246	\$18,435	370	\$18,435	\$179,806
22	0	38,033	\$18,882	368	\$18,882	\$198,689
23	0	37,821	\$19,340	367	\$19,340	\$218,029
24	0	37,608	\$19,808	365	\$19,808	\$237,837
25	0	37,396	\$20,287	363	\$20,287	\$258,124
					\$385,524	\$1,344,204

Net Present Value	\$98,051
Internal Rate of Return	7.39%