



VERONA SCHOOL DISTRICT *FINAL* LGEA REPORT

PREPARED UNDER THE GUIDELINES OF THE STATE OF NEW JERSEY
LOCAL GOVERNMENT ENERGY AUDIT PROGRAM



Dome-Tech, Inc.

AUGUST 2013

510 Thornall Street, Suite 170
Edison, NJ 08837
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**VERONA SCHOOL DISTRICT
ENERGY AUDIT REPORT**

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August 22, 2013

Mr. Paul McDevitt
Director of Facilities
Verona Board of Education
121 Fairview Avenue
Verona, NJ 07044

**Re: EXECUTIVE SUMMARY FOR VERONA BOARD OF EDUCATION
STATE OF NEW JERSEY LOCAL GOVERNMENT ENERGY AUDIT - DRAFT REPORT
OUR PROJECT NUMBER D13110**

Dear Mr. McDevitt:

Dome-Tech was retained by the Verona 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 District's 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 September 2011 - August 2012, for the facilities included in this study, the District had an annual expenditure of:

- Electricity: approximately 2,095,000 kWh at a total cost of approximately \$339,000
- Natural Gas: approximately 170,500 therms at a total cost of approximately \$174,000

The following buildings were evaluated under this study:

Facility Name	Total Floor Area
Laning Avenue Elementary School	46,477
Brookdale Avenue Elementary School	37,972
F.N. Brown Elementary School	38,985
Forest Avenue Elementary School	27,750
H.B. Whitehorne Middle School	118,224
Verona High School	120,245

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 Verona's Schools:

- Total annual electrical savings: approximately 615,000 kilowatt-hours of electric consumption; 29% of baseline
- Total annual natural gas savings: approximately 15,100 therms of natural gas consumption; 9% of baseline
- Total annual cost savings: approximately \$115,000 of utility cost; 22% of baseline
- Total annual CO₂ emissions reduction: 292 tons
- Total net estimated implementation cost: approximately \$1,109,000
- Total net simple payback: 9.6 years

A summary of the projects that are recommended for implementation includes the following: piping insulation, weather stripping, replacing electric water heaters with gas, installing a computer power management system, replacing CRT screens with flat screens, lighting upgrades, and various building envelope improvements.

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

- Dome-Tech considered three (3) different types of wind turbine technologies that consisted of both building-mounted and traditional ground-mounted variety. Should the District decide to pursue a wind turbine project, Dome-Tech recommends commissioning a more detailed study.
- Roof-mounted photovoltaic systems ranging in size from 39 kW dc at F.N. Brown Elementary School to 309 kW dc at the Verona High School (681 kW dc total) could provide approximately 13% to 99% of each building's annual energy usage (36% of total energy usage for the entire district). Should the District decide to pursue a solar project, Dome-Tech recommends commissioning a more detailed study.
- CHP (Combined Heat and Power), Fuel Cells, and Micro-turbines were also considered and not recommended for any of the buildings due to a lack of significant year-round thermal loads.

The District's 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.

Regarding the procurement of utilities, Dome-Tech understands that the District's facilities in this study are served by seven (7) electric accounts behind Public Service Electric and Gas and six (6) natural gas accounts behind Public Service Electric and Gas. All electricity and natural gas accounts are served by a third-party, retail energy supplier.

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 including Paul McDevitt, Jim Lewis, and Vincent Mafucci.

Sincerely,

John Bohadel, CEM, LEED AP
Senior Energy Engineer





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ECM LIST

VERONA SCHOOL DISTRICT ECM Sorted by Payback

ECM #	Energy Conservation Measures (ECM)	Buildings	Energy Savings		Gross Installation Costs*	Rebates/ Incentive	Avoided Cost	Net Implementation Costs	Annual Energy Cost Savings	Annual Oper. Cost Savings	Total Annual Cost Savings	Measure Life Yrs	Gross Implementation Costs			Net Implementation Costs			CO2 Savings Tons
			kWh	Therms									Pay Back (Gross) Yrs	Internal Rate of Return (IRR) (Gross)	Lifecycle Savings (NPV) (Gross)	Pay Back (Net) Yrs	Rate of Return (IRR) (Net)	Lifecycle Savings (NPV) (Net)	
1	PC Power Management	Brookdale Elementary School	12,000	0	\$810	\$0	\$0	\$810	\$1,860	\$0	\$1,860	10	0.4	230%	\$15,056	0.4	230%	\$15,056	4
1	PC Power Management	FN Brown	16,500	0	\$1,080	\$0	\$0	\$1,080	\$2,840	\$0	\$2,840	10	0.4	263%	\$23,146	0.4	263%	\$23,146	5
1	PC Power Management	Forest Elementary School	18,000	0	\$1,170	\$0	\$0	\$1,170	\$2,730	\$0	\$2,730	10	0.4	233%	\$22,117	0.4	233%	\$22,117	6
1	PC Power Management	HB Whitehome Middle School	49,700	0	\$3,320	\$0	\$0	\$3,320	\$7,500	\$0	\$7,500	10	0.4	226%	\$60,657	0.4	226%	\$60,657	16
1	PC Power Management	Laning Avenue School	18,000	0	\$1,170	\$0	\$0	\$1,170	\$2,780	\$0	\$2,780	10	0.4	238%	\$22,544	0.4	238%	\$22,544	6
1	PC Power Management	Verona High School	69,300	0	\$4,660	\$0	\$0	\$4,660	\$11,800	\$0	\$11,800	10	0.4	253%	\$95,996	0.4	253%	\$95,996	23
2	Insulate Piping	FN Brown	0	170	\$230	\$0	\$0	\$230	\$180	\$0	\$180	15	1.3	78%	\$1,919	1.3	78%	\$1,919	1
2	Insulate Piping	Verona High School	0	420	\$870	\$0	\$0	\$870	\$400	\$0	\$400	15	2.2	46%	\$3,905	2.2	46%	\$3,905	2
3	Vending Machine Controls	HB Whitehome Middle School	1,960	0	\$680	\$0	\$0	\$680	\$300	\$0	\$300	10	2.3	43%	\$1,879	2.3	43%	\$1,879	0.6
3	Vending Machine Controls	Verona High School	9,810	0	\$3,400	\$0	\$0	\$3,400	\$1,670	\$0	\$1,670	10	2.0	48%	\$10,845	2.0	48%	\$10,845	3
3	Vending Machine Controls	F.N. Brown Elementary	3,920	0	\$1,360	\$0	\$0	\$1,360	\$670	\$0	\$670	10	2.0	48%	\$4,355	2.0	48%	\$4,355	1.3
4	Steam Trap Repair Program	FN Brown	0	1,180	\$3,010	\$0	\$0	\$3,010	\$1,220	\$0	\$1,220	5	2.5	29%	\$2,577	2.5	29%	\$2,577	7
4	Steam Trap Repair Program	HB Whitehome Middle School	0	2,500	\$6,620	\$0	\$0	\$6,620	\$2,610	\$0	\$2,610	5	2.5	28%	\$5,333	2.5	28%	\$5,333	15
5	Replace Elec. DHW with NatGas	Brookdale Elementary School	4,790	-260	\$2,210	\$130	\$0	\$2,080	\$430	\$0	\$430	15	5.1	18%	\$2,923	4.8	19%	\$3,053	0
5	Replace Elec. DHW with NatGas	Laning Avenue School	10,600	-610	\$2,140	\$130	\$0	\$2,010	\$980	\$0	\$980	15	2.2	46%	\$9,559	2.1	49%	\$9,689	0
6	Change CRT's to Flatscreens	Brookdale Elementary School	400	0	\$300	\$0	\$0	\$300	\$60	\$0	\$60	10	5.0	15%	\$212	5.0	15%	\$212	0.1
6	Change CRT's to Flatscreens	FN Brown	400	0	\$300	\$0	\$0	\$300	\$70	\$0	\$70	10	4.3	19%	\$297	4.3	19%	\$297	0.1
6	Change CRT's to Flatscreens	Forest Elementary School	300	0	\$230	\$0	\$0	\$230	\$50	\$0	\$50	10	4.6	17%	\$197	4.6	17%	\$197	0.1
6	Change CRT's to Flatscreens	Laning Avenue School	100	0	\$80	\$0	\$0	\$80	\$20	\$0	\$20	10	4.0	21%	\$91	4.0	21%	\$91	0.0
6	Change CRT's to Flatscreens	HB Whitehome Middle School	200	0	\$150	\$0	\$0	\$150	\$30	\$0	\$30	10	5.0	15%	\$106	5.0	15%	\$106	0.1
7	Lighting Upgrade	Brookdale Elementary School	40,600	0	\$47,400	\$5,710	\$0	\$41,600	\$6,290	\$0	\$6,290	15	7.5	10%	\$27,690	6.6	13%	\$33,490	13
7	Lighting Upgrade	FN Brown	44,900	0	\$58,400	\$6,100	\$0	\$52,300	\$7,710	\$0	\$7,710	15	7.6	10%	\$33,641	6.8	12%	\$39,741	15
7	Lighting Upgrade	Forest Elementary School	40,500	0	\$50,900	\$5,460	\$0	\$45,400	\$6,140	\$0	\$6,140	15	8.3	9%	\$22,399	7.4	10%	\$27,899	13
7	Lighting Upgrade	HB Whitehome Middle School	36,200	0	\$46,700	\$5,600	\$0	\$41,100	\$5,580	\$0	\$5,580	15	8.4	8%	\$19,914	7.4	11%	\$25,514	12
7	Lighting Upgrade	Laning Avenue School	67,600	0	\$67,800	\$8,110	\$0	\$59,700	\$10,200	\$0	\$10,200	15	6.6	12%	\$53,967	5.9	15%	\$62,067	22
7	Lighting Upgrade	Verona High School	164,000	0	\$170,000	\$20,300	\$0	\$150,000	\$27,800	\$0	\$27,800	15	6.1	14%	\$161,875	5.4	17%	\$181,875	54

VERONA SCHOOL DISTRICT ECM Sorted by Payback

ECM #	Energy Conservation Measures (ECM)	Buildings	Energy Savings		Gross Installation Costs*	Rebates/ Incentive	Avoided Cost	Net Implementation Costs	Annual Energy Cost Savings	Annual Oper. Cost Savings	Total Annual Cost Savings	Measure Life Yrs	Gross Implementation Costs			Net Implementation Costs			CO2 Savings Tons
													Pay Back (Gross) Yrs	Internal Rate of Return (IRR) (Gross)	Lifecycle Savings (NPV) (Gross)	Pay Back (Net) Yrs	Rate of Return (IRR) (Net)	Lifecycle Savings (NPV) (Net)	
			kWh	Therms															
8	Door Weatherstripping	FN Brown	0	70	\$470	\$0	\$0	\$470	\$70	\$0	\$70	15	6.7	12%	\$366	6.7	12%	\$366	0.4
8	Door Weatherstripping	Laning Avenue School	0	20	\$240	\$0	\$0	\$240	\$20	\$0	\$20	15	12.0	3%	-\$1	12.0	3%	-\$1	0.1
8	Door Weatherstripping	Verona High School	0	0	\$80	\$0	\$0	\$80	\$0	\$0	\$4	15	18.7	-3%	-\$29	18.7	-3%	-\$29	0.0
8	Door Weatherstripping	HB Whitehome Middle School	0	70	\$470	\$0	\$0	\$470	\$70	\$0	\$70	15	6.7	12%	\$366	6.7	12%	\$366	0.4
9	Demand Controlled Ventilation	Laning Avenue School	0	800	\$13,200	\$0	\$0	\$13,200	\$820	\$0	\$820	15	16.1	-1%	-\$3,411	16.1	-1%	-\$3,411	5
9	Demand Controlled Ventilation	Brookdale Elementary School	320	300	\$10,800	\$0	\$0	\$10,800	\$360	\$0	\$360	15	30.0	-8%	-\$6,502	30.0	-8%	-\$6,502	2
9	Demand Controlled Ventilation	FN Brown	0	670	\$13,200	\$0	\$0	\$13,200	\$680	\$0	\$680	15	19.4	-3%	-\$5,082	19.4	-3%	-\$5,082	4
9	Demand Controlled Ventilation	Forest Elementary School	0	280	\$7,870	\$0	\$0	\$7,870	\$280	\$0	\$280	15	28.1	-7%	-\$4,527	28.1	-7%	-\$4,527	2
9	Demand Controlled Ventilation	HB Whitehome Middle School	0	530	\$15,000	\$0	\$0	\$15,000	\$540	\$0	\$540	15	27.8	-7%	-\$8,554	27.8	-7%	-\$8,554	3
9	Demand Controlled Ventilation	Verona High School	690	1,430	\$18,100	\$0	\$0	\$18,100	\$1,570	\$0	\$1,570	15	11.5	3%	\$643	11.5	3%	\$643	9
10	Replace Window ACs with Splits	FN Brown	520	50	\$12,500	\$120	\$0	\$12,400	\$140	\$0	\$140	15	89.3	-17%	-\$10,829	88.6	-17%	-\$10,729	0.5
10	Replace Window ACs with Splits	Forest Elementary School	3,790	20	\$11,200	\$280	\$0	\$10,900	\$680	\$0	\$680	15	16.5	-1%	-\$3,082	16.0	-1%	-\$2,782	1
10	Replace Window ACs with Splits	Laning Avenue School	250	20	\$6,870	\$80	\$0	\$6,790	\$60	\$0	\$60	15	114.5	-19%	-\$6,154	113.2	-19%	-\$6,074	0.2
11	Change to Modular Condensing Boilers	Brookdale Elementary School	0	790	\$344,000	\$10,500	\$216,000	\$118,000	\$920	\$0	\$920	25	373.9	-15%	-\$327,980	128.3	-10%	-\$101,980	5
11	Change to Modular Condensing Boilers	Forest Elementary School	0	970	\$344,000	\$10,500	\$216,000	\$118,000	\$1,100	\$0	\$1,100	25	312.7	-14%	-\$324,846	107.3	-9%	-\$98,846	6
11	Change to Modular Condensing Boilers	Laning Avenue School	0	1,830	\$344,000	\$10,500	\$247,000	\$86,500	\$1,870	\$0	\$1,870	25	184.0	-12%	-\$311,437	46.3	-4%	-\$53,937	11
11	Change to Modular Condensing Boilers	Verona High School	0	3,860	\$572,000	\$18,400	\$299,000	\$255,000	\$3,670	\$0	\$3,670	25	155.9	-11%	-\$508,094	69.5	-7%	-\$191,094	23
TOTALS			615,000	15,100	\$2,190,000	\$102,000	\$978,000	\$1,109,000	\$115,000	\$0	\$115,000	16	19.0	0.0	-\$713,328	9.6	7%	\$367,672	292

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.
3. Gross Installation Cost is the cost of installing equipment recommended by the ECM.
4. Avoided Cost is the cost of replacing equipment at end of service life with like and kind equipment.
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 s



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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 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

Time-period: Annual

Buildings	Electric - PSE&G / DIRECT ENERGY			
	Account Number(s)	Annual Consumption	Annual Cost	\$ / kWh
		kWh		
Laning Avenue Elementary School	67 228 723 00	246,840	\$37,279.66	\$0.151
Brookdale Avenue Elementary School	67 174 764 00	151,520	\$23,457.65	\$0.155
F.N. Brown Elementary School - COMBINED	66 627 422 01	232,247	\$39,900.33	\$0.172
Forest Avenue Elementary School	67 075 835 06	137,440	\$20,842.49	\$0.152
H.B. Whitehorne Middle School	42 003 725 09	528,300	\$81,501.77	\$0.154
Verona High School - COMBINED	42 005 408 00	798,601	\$135,735.74	\$0.170
	TOTAL	2,094,948	\$338,717.64	\$0.162

Buildings	Natural Gas - PSE&G / HESS CORP / COMPASS ENERGY			
	Account Number(s)	Annual Consumption	Annual Cost	\$ / Therms
		Therms		
Laning Avenue Elementary School	67 228 723 00	24,532	\$25,130.97	\$1.024
Brookdale Avenue Elementary School	67 174 764 00	10,398	\$12,162.85	\$1.170
F.N. Brown Elementary School	66 627 422 01	26,045	\$26,873.33	\$1.032
Forest Avenue Elementary School	67 075 835 06	12,523	\$14,161.65	\$1.131
H.B. Whitehorne Middle School	65 057 318 06	38,851	\$40,582.82	\$1.045
Verona High School	42 005 408 00	58,107	\$55,224.52	\$0.950
	TOTAL	170,456	\$174,136.13	\$1.022



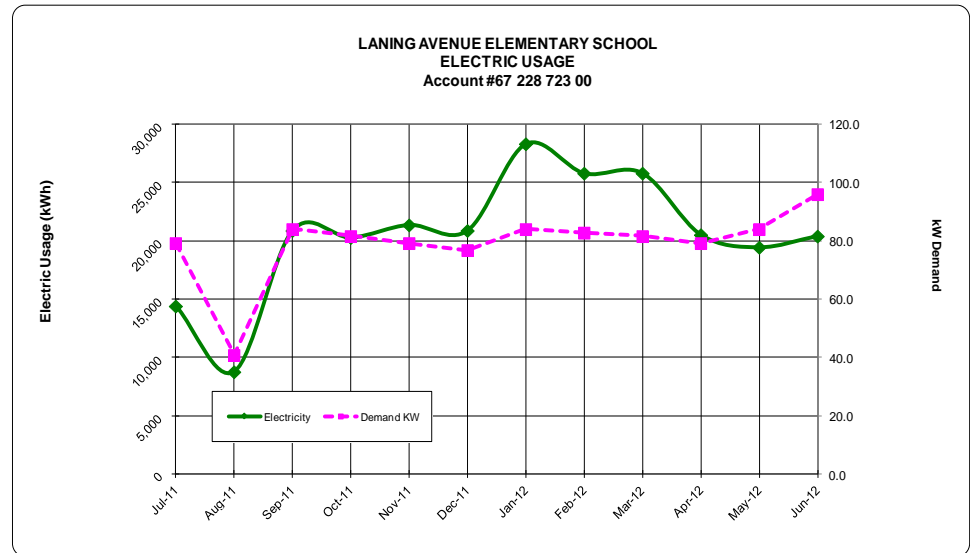
Historic Energy Consumption (cont'd)

Dome-Tech, Inc.

Utility Usage and Costs Summary

Time-period: Jun. 2011 – May. 2012

Facility Name Laning Avenue Elementary School
 Address 18 Laning Road
 Verona, NJ
 Account# 67 228 723 00 - PSE&G
 1113218 - Direct Energy
 Meter# 9193787 PoD ID: 000009784430245193



Energy Type	Energy Unit	Start Date	End Date	Demand KW	KWH	PSE&G		\$/kWh
						Delivery Cost	Supplier Cost	
Electricity	kWh	6/27/2011	7/27/2011	79.2	14,400	\$1,485.24	\$1,819.93	\$0.23
Electricity	kWh	7/27/2011	8/25/2011	40.8	8,760	\$827.29	\$1,006.98	\$0.21
Electricity	kWh	8/25/2011	9/27/2011	84.0	20,880	\$1,805.54	\$2,038.32	\$0.18
Electricity	kWh	9/27/2011	10/25/2011	81.6	20,280	\$981.49	\$1,847.03	\$0.14
Electricity	kWh	10/25/2011	11/22/2011	79.2	21,360	\$1,013.96	\$1,952.44	\$0.14
Electricity	kWh	11/23/2011	12/27/2011	76.8	20,880	\$990.87	\$1,586.26	\$0.12
Electricity	kWh	12/27/2011	1/26/2012	84.0	28,320	\$1,266.77	\$2,492.16	\$0.13
Electricity	kWh	1/26/2012	2/27/2012	82.8	25,800	\$1,182.36	\$2,270.40	\$0.13
Electricity	kWh	2/27/2012	3/28/2012	81.6	25,800	\$1,177.27	\$2,270.40	\$0.13
Electricity	kWh	3/28/2012	4/27/2012	79.2	20,520	\$997.83	\$1,805.76	\$0.14
Electricity	kWh	4/27/2012	5/26/2012	84.0	19,440	\$983.53	\$1,710.72	\$0.14
Electricity	kWh	5/26/2012	6/26/2012	96.0	20,400	\$1,971.91	\$1,795.20	\$0.18
TOTALS/AVERAGE				79.1	246,840	\$14,684.06	\$22,595.60	\$0.151



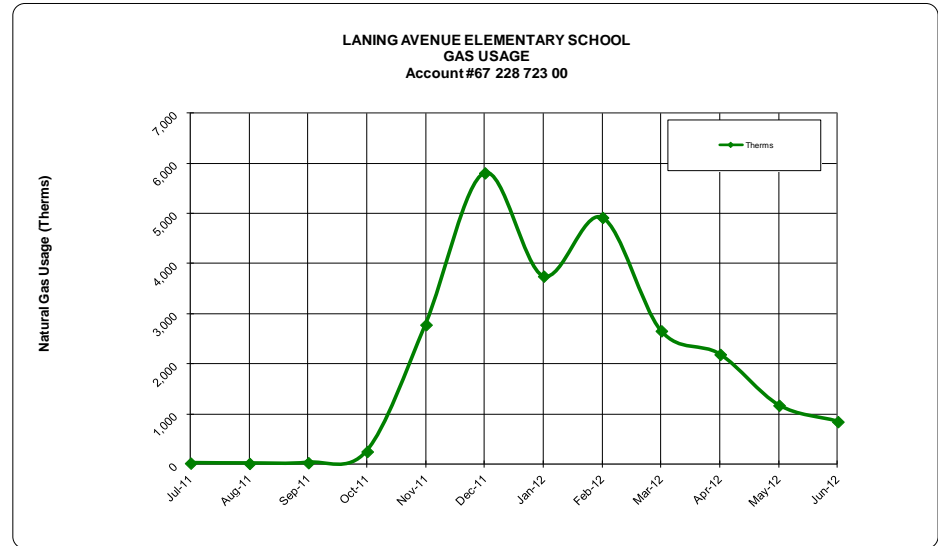
Historic Energy Consumption (cont'd)

Dome-Tech, Inc.

Utility Usage and Costs Summary

Time-period: June 2011 - May 2012

Facility Name Laning Avenue Elementary School
 Address 18 Laning Road
 Verona, NJ
 Account# 67 228 723 00 - PSE&G
 356872 /356956 - HESS
 Meter# 3164433 PoD ID: PG000009784429445193



Energy Type	Energy Unit	Start Date	End Date	Therms	PSE&G	HESS CORP / COMPASS ENERGY*	\$/Therm
					Delivery Cost	Supply Cost	
Natural Gas	Therms	6/27/2011	7/27/2011	29	\$101.82	\$21.70	\$4.199
Natural Gas	Therms	7/27/2011	8/25/2011	23	\$102.84	\$16.95	\$5.225
Natural Gas	Therms	8/25/2011	9/27/2011	37	\$104.91	\$23.59	\$3.459
Natural Gas	Therms	9/27/2011	10/25/2011	261	\$137.59	\$163.71	\$1.153
Natural Gas	Therms	10/25/2011	11/22/2011	2,788	\$1,350.92	\$1,893.22	\$1.164
Natural Gas	Therms	11/23/2011	12/27/2011	5,813	\$1,926.39	\$3,949.17	\$1.011
Natural Gas	Therms	12/27/2011	1/26/2012	3,755	\$1,524.80	\$2,551.71	\$1.086
Natural Gas	Therms	1/26/2012	2/27/2012	4,925	\$1,742.49	\$3,346.27	\$1.033
Natural Gas	Therms	2/27/2012	3/28/2012	2,665	\$1,207.85	\$1,811.32	\$1.133
Natural Gas	Therms	3/28/2012	4/27/2012	2,197	\$356.64	\$1,010.12	\$0.622
Natural Gas	Therms	4/27/2012	5/26/2012	1,182	\$258.77	\$648.27	\$0.768
Natural Gas	Therms	5/26/2012	6/26/2012	856	\$220.80	\$659.12	\$1.028
TOTALS/AVERAGE				24,532	\$9,035.82	\$16,095.15	\$1.024

* Supply company changed in September 2011



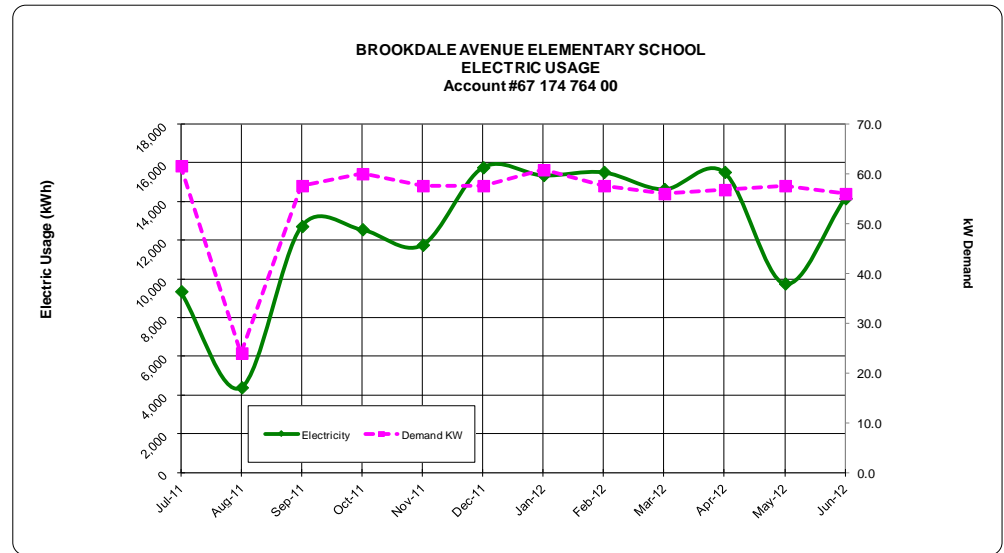
Historic Energy Consumption (cont'd)

Dome-Tech, Inc.

Utility Usage and Costs Summary

Time-period: June 2011 - May 2012

Facility Name Brookdale Avenue Elementary School
 Address 14 Brookdale Court
 Verona, NJ
 Account# 67 174 764 00 - PSE&G
 1113220 - Direct Energy
 Meter# 9193164 PoD ID: PE000010271298145193



Energy Type	Energy Unit	Start Date	End Date	Demand KW	KWH	PSE&G		DIRECT ENERGY	
						Delivery Cost	Supplier Cost	Supplier Cost	\$/kWh
Electricity	kWh	6/27/2011	7/27/2011	61.6	9,360	\$1,087.48	\$1,185.04	\$0.24	
Electricity	kWh	7/27/2011	8/25/2011	24.0	4,400	\$460.14	\$539.83	\$0.23	
Electricity	kWh	8/25/2011	9/26/2011	57.6	12,720	\$1,179.40	\$1,256.31	\$0.19	
Electricity	kWh	9/26/2011	10/25/2011	60.0	12,560	\$649.63	\$1,176.27	\$0.15	
Electricity	kWh	10/25/2011	11/23/2011	57.6	11,760	\$619.49	\$1,110.93	\$0.15	
Electricity	kWh	11/23/2011	12/27/2011	57.6	15,760	\$747.40	\$1,194.38	\$0.12	
Electricity	kWh	12/27/2011	1/26/2012	60.8	15,360	\$753.63	\$1,351.68	\$0.14	
Electricity	kWh	1/26/2012	2/27/2012	57.6	15,520	\$746.01	\$1,365.76	\$0.14	
Electricity	kWh	2/27/2012	3/28/2012	56.0	14,640	\$711.02	\$1,288.32	\$0.14	
Electricity	kWh	3/27/2012	4/26/2012	56.8	15,520	\$742.61	\$1,385.08	\$0.14	
Electricity	kWh	4/26/2012	5/25/2012	57.6	9,760	\$561.32	\$858.88	\$0.15	
Electricity	kWh	5/25/2012	6/26/2012	56.0	14,160	\$1,240.96	\$1,246.08	\$0.18	
TOTALS/AVERAGE				55.3	151,520	\$9,499.09	\$13,958.56	\$0.155	



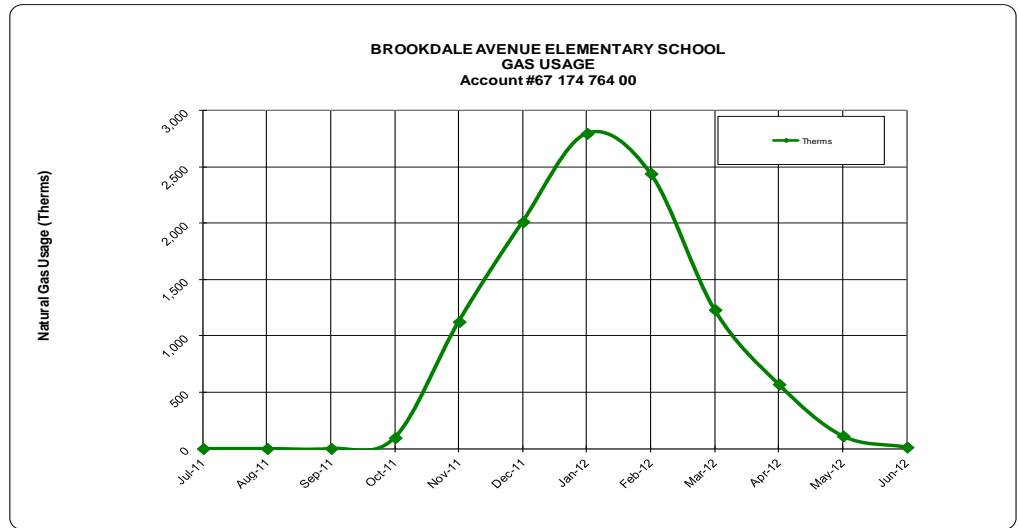
Historic Energy Consumption (cont'd)

Dome-Tech, Inc.

Utility Usage and Costs Summary

Time-period: June 2011 - May 2012

Facility Name Brookdale Avenue Elementary School
 Address 14 Brookdale Court
 Verona, NJ
 Account# 67 174 764 00 - PSE&G
 356872 /
 494200 - HESS
 Meter# 3274994 PoD ID: PG000010271297345193



Energy Type	Energy Unit	Start Date	End Date	Therms	PSE&G	HESS CORP / COMPASS ENERGY*	\$/Therm
					Delivery Cost	Supply Cost	
Natural Gas	Therms	6/27/2011	7/27/2011	0	\$97.59	\$0.00	\$0.000
Natural Gas	Therms	7/27/2011	8/25/2011	0	\$99.50	\$0.00	\$0.000
Natural Gas	Therms	8/25/2011	9/26/2011	1	\$99.65	\$0.67	\$94.820
Natural Gas	Therms	9/26/2011	10/25/2011	96	\$113.54	\$60.33	\$1.805
Natural Gas	Therms	10/25/2011	11/23/2011	1,125	\$745.69	\$764.17	\$1.342
Natural Gas	Therms	11/23/2011	12/27/2011	2,012	\$914.58	\$1,367.24	\$1.134
Natural Gas	Therms	12/27/2011	1/26/2012	2,796	\$1,030.25	\$1,899.77	\$1.048
Natural Gas	Therms	1/26/2012	2/27/2012	2,440	\$962.32	\$1,657.76	\$1.074
Natural Gas	Therms	2/27/2012	3/28/2012	1,231	\$735.55	\$836.74	\$1.277
Natural Gas	Therms	3/27/2012	4/26/2012	571	\$180.41	\$260.53	\$0.772
Natural Gas	Therms	4/26/2012	5/25/2012	112	\$115.40	\$59.92	\$1.563
Natural Gas	Therms	5/25/2012	6/26/2012	13	\$101.32	\$59.92	\$12.606
TOTALS/AVERAGE				10,398	\$5,195.80	\$6,967.05	\$1.170

* Supply company changed in September 2011
 Verona School District FINAL LGEA Report, August 2013



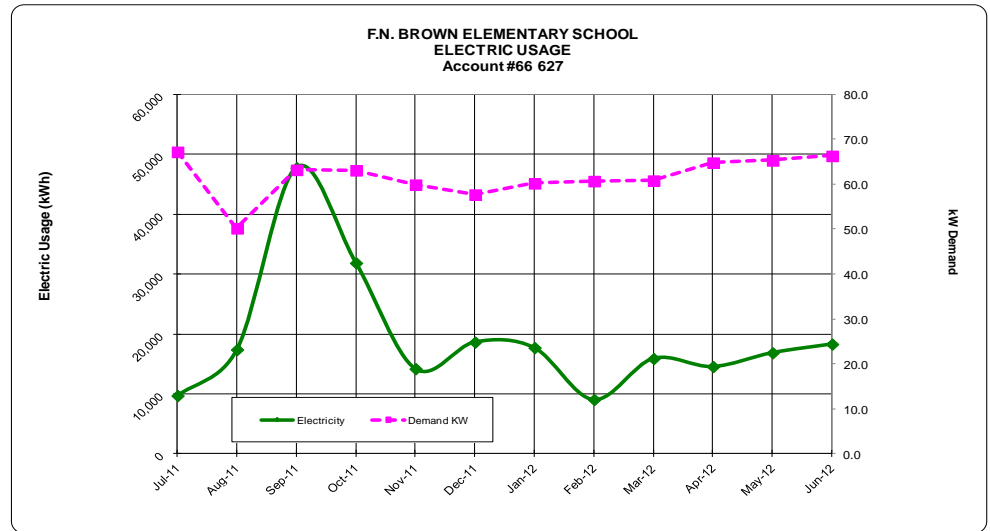
Historic Energy Consumption (cont'd)

Dome-Tech, Inc.

Utility Usage and Costs Summary

Time-period: June 2011 – May 2012

Facility Name F.N. Brown Elementary School
 Address 125 Grove Avenue
 Verona, NJ
 Account# 66 627 422 01 - PSE&G
 1113216 - Direct Energy
 Meter# 614000456 PoD ID: PE000008822094245193



Energy Type	Energy Unit	Start Date	End Date	Demand KW	KWH	PSE&G		DIRECT ENERGY	
						Delivery Cost	Supplier Cost	Supplier Cost	\$/kWh
Electricity	kWh	6/28/2011	7/28/2011	67.2	9,748	\$1,173.55	\$1,385.10		\$0.26
Electricity	kWh	7/28/2011	8/26/2011	50.2	17,437	\$1,271.56	\$2,152.38		\$0.20
Electricity	kWh	8/26/2011	9/27/2011	63.2	47,753	\$2,568.33	\$4,758.40		\$0.15
Electricity	kWh	9/27/2011	10/26/2011	63.1	31,875	\$2,148.59	\$3,695.94		\$0.18
Electricity	kWh	10/26/2011	11/28/2011	59.9	14,227	\$711.87	\$1,615.45		\$0.16
Electricity	kWh	11/28/2011	12/28/2011	57.7	18,667	\$844.26	\$1,959.35		\$0.15
Electricity	kWh	12/28/2011	1/17/2012	60.2	17,737	\$831.74	\$1,963.00		\$0.16
Electricity	kWh	1/27/2012	2/28/2012	60.7	9,083	\$557.14	\$1,289.61		\$0.20
Electricity	kWh	2/28/2012	3/28/2012	60.8	15,921	\$776.80	\$1,763.48		\$0.16
Electricity	kWh	3/28/2012	4/27/2012	64.8	14,588	\$750.99	\$1,660.18		\$0.17
Electricity	kWh	4/27/2012	5/29/2012	65.3	16,879	\$826.58	\$1,836.46		\$0.16
Electricity	kWh	5/29/2012	6/27/2012	66.3	18,332	\$1,537.42	\$1,822.15		\$0.18
TOTALS/AVERAGE				61.6	232,247	\$13,998.83	\$25,901.50		\$0.172



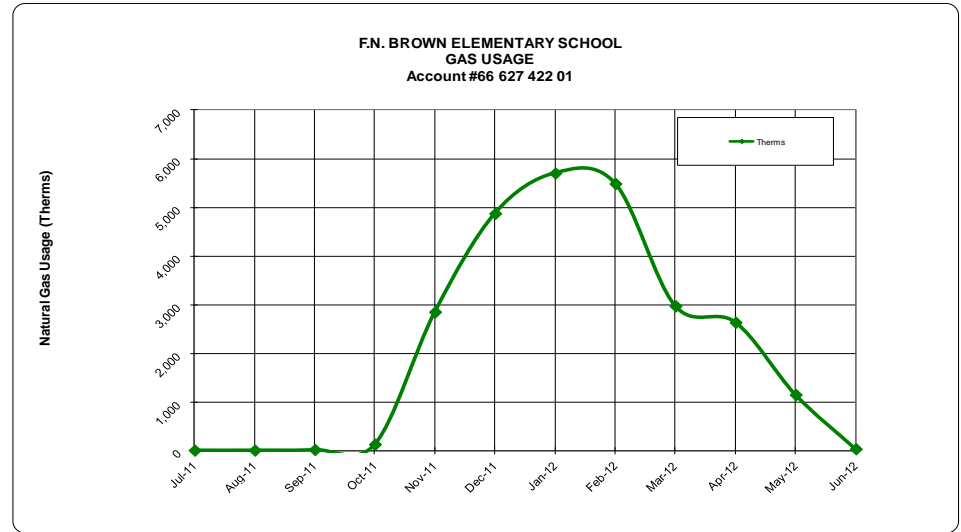
Historic Energy Consumption (cont'd)

Dome-Tech, Inc.

Utility Usage and Costs Summary

Time-period: June 2011 – May 2012

Facility Name F.N. Brown Elementary School
 Address 125 Grove Avenue
 Verona, NJ
 Account# 66 627 422 01 - PSE&G
 356872 / 356960 - HESS CORP
 Meter# combined PoD ID: PG000008822093445193



Energy Type	Energy Unit	Start Date	End Date	Therms	PSE&G	HESS CORP / COMPASS ENERGY*	\$/Therm
					Delivery Cost	Supply Cost	
Natural Gas	Therms	6/28/2011	7/28/2011	26	\$101.37	\$18.99	\$4.664
Natural Gas	Therms	7/28/2011	8/26/2011	27	\$103.42	\$19.80	\$4.582
Natural Gas	Therms	8/26/2011	9/27/2011	38	\$105.08	\$24.33	\$3.378
Natural Gas	Therms	9/27/2011	10/26/2011	148	\$220.64	\$69.00	\$1.951
Natural Gas	Therms	10/26/2011	11/28/2011	2,864	\$1,506.64	\$1,944.94	\$1.205
Natural Gas	Therms	11/28/2011	12/28/2011	4,883	\$1,891.33	\$3,317.32	\$1.067
Natural Gas	Therms	12/28/2011	1/17/2012	5,710	\$1,931.88	\$3,879.85	\$1.018
Natural Gas	Therms	1/27/2012	2/28/2012	5,495	\$1,842.72	\$3,733.69	\$1.015
Natural Gas	Therms	2/28/2012	3/28/2012	2,985	\$1,372.09	\$2,028.78	\$1.139
Natural Gas	Therms	3/28/2012	4/27/2012	2,649	\$400.24	\$1,215.80	\$0.610
Natural Gas	Therms	4/27/2012	5/29/2012	1,166	\$364.25	\$332.31	\$0.597
Natural Gas	Therms	5/29/2012	6/27/2012	53	\$107.05	\$341.81	\$8.435
TOTALS/AVERAGE				26,045	\$9,946.71	\$16,926.62	\$1.032

* Supply company changed in September 2011



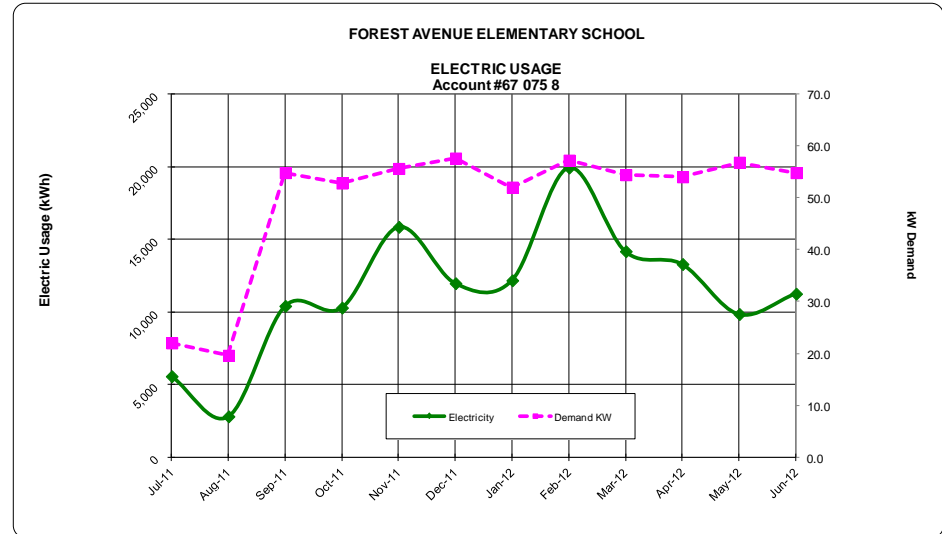
Historic Energy Consumption (cont'd)

Dome-Tech, Inc.

Utility Usage and Costs Summary

Time-period: June 2011 – May 2012

Facility Name Forest Avenue Elementary School
 Address 118 Forest Avenue
 Verona, NJ
 Account# 67 075 835 06 - PSE&G
 1113219 - Direct Energy
 Meter# 728001728 PoD ID: PE000010038745545193



Energy Type	Energy Unit	Start Date	End Date	Demand KW	KWH	PSE&G		DIRECT ENERGY	
						Delivery Cost	Supplier Cost	Supplier Cost	\$/kWh
Electricity	kWh	6/28/2011	7/28/2011	22.0	5,560	\$474.15		\$716.55	\$0.21
Electricity	kWh	7/28/2011	8/26/2011	19.6	2,800	\$346.77		\$368.67	\$0.26
Electricity	kWh	8/26/2011	9/27/2011	54.8	10,400	\$1,058.33		\$1,028.17	\$0.20
Electricity	kWh	9/27/2011	10/26/2011	52.8	10,280	\$548.13		\$963.09	\$0.15
Electricity	kWh	10/26/2011	11/28/2011	55.6	15,840	\$740.21		\$1,402.18	\$0.14
Electricity	kWh	11/28/2011	12/28/2011	57.6	11,960	\$627.08		\$921.00	\$0.13
Electricity	kWh	12/28/2011	1/17/2012	52.0	12,160	\$614.07		\$1,070.08	\$0.14
Electricity	kWh	1/27/2012	2/28/2012	57.2	19,920	\$885.37		\$1,769.01	\$0.13
Electricity	kWh	2/28/2012	3/28/2012	54.4	14,160	\$688.85		\$1,246.08	\$0.14
Electricity	kWh	3/28/2012	4/27/2012	54.0	13,280	\$658.94		\$1,187.33	\$0.14
Electricity	kWh	4/27/2012	5/29/2012	56.8	9,840	\$560.50		\$865.92	\$0.14
Electricity	kWh	5/29/2012	6/27/2012	54.8	11,240	\$1,112.89		\$989.12	\$0.19
TOTALS/AVERAGE				49.3	137,440	\$8,315.29		\$12,527.20	\$0.152



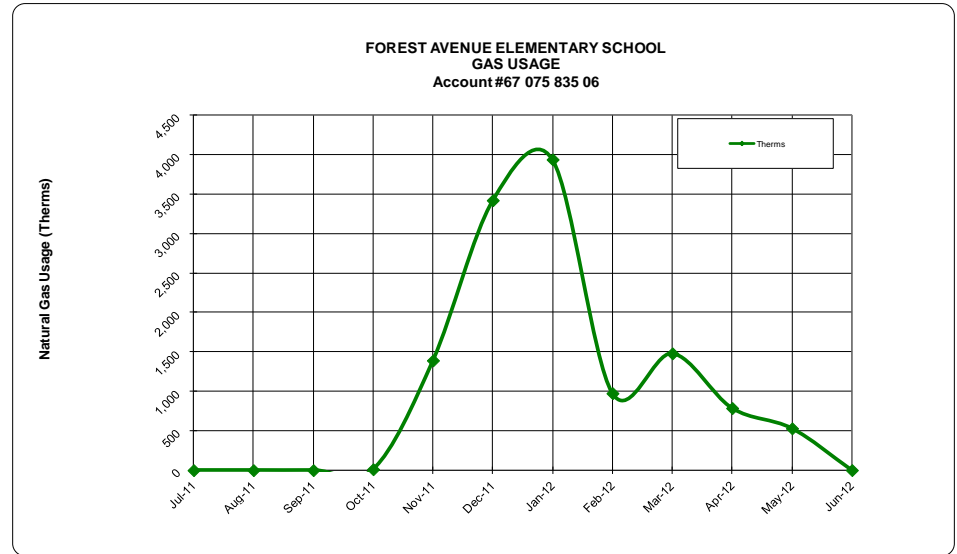
Historic Energy Consumption (cont'd)

Dome-Tech, Inc.

Utility Usage and Costs Summary

Time-period: June 2011 - May 2012

Facility Name Forest Avenue Elementary School
 Address 118 Forest Avenue
 Verona, NJ
 Account# 67 075 835 06 - PSE&G
 356872 / 356961 - HESS CORP
 Meter# 2344823 PoD ID: PG000010038744845193



Energy Type	Energy Unit	Start Date	End Date	Therms	PSE&G	HESS CORP /	\$/Therm
					Delivery Cost	COMPASS ENERGY*	
Natural Gas	Therms	6/28/2011	7/28/2011	0	\$97.65	\$0.00	#DIV/0!
Natural Gas	Therms	7/28/2011	8/26/2011	0	\$99.50	\$0.00	#DIV/0!
Natural Gas	Therms	8/26/2011	9/27/2011	0	\$99.50	\$0.00	#DIV/0!
Natural Gas	Therms	9/27/2011	10/26/2011	12	\$101.20	\$7.29	\$9.316
Natural Gas	Therms	10/26/2011	11/28/2011	1,390	\$896.92	\$943.89	\$1.324
Natural Gas	Therms	11/28/2011	12/28/2011	3,418	\$1,283.27	\$2,321.93	\$1.055
Natural Gas	Therms	12/28/2011	1/17/2012	3,934	\$1,306.41	\$2,673.25	\$1.012
Natural Gas	Therms	1/27/2012	2/28/2012	974	\$664.17	\$662.01	\$1.361
Natural Gas	Therms	2/28/2012	3/28/2012	1,478	\$759.94	\$1,004.81	\$1.194
Natural Gas	Therms	3/28/2012	4/27/2012	786	\$210.96	\$361.08	\$0.727
Natural Gas	Therms	4/27/2012	5/29/2012	529	\$274.04	\$147.09	\$0.795
Natural Gas	Therms	5/29/2012	6/27/2012	1	\$99.65	\$147.09	\$231.463
TOTALS/AVERAGE				12,523	\$5,893	\$8,268	\$1.131



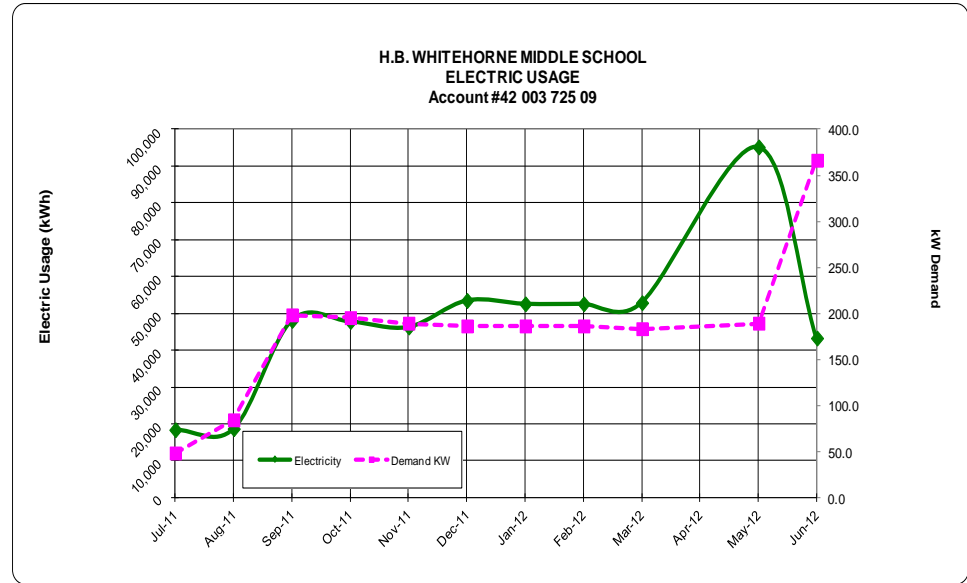
Historic Energy Consumption (cont'd)

Dome-Tech, Inc.

Utility Usage and Costs Summary

Time-period: June 2011 - May 2012

Facility Name H.B. Whitehorne Middle School
 Address 600 Bloomfield Avenue
 Verona, NJ
 Account# 42 003 725 09 - PSEG
 1113217 - Direct Energy
 Meter# 778017642 PoD ID: PE000009065729765391



Energy Type	Energy Unit	Start Date	End Date	Demand KW	KWH	DIRECT ENERGY		\$/kWh
						PSE&G Delivery Cost	Supplier Cost	
Electricity	kWh	6/28/2011	7/28/2011	48.0	18,300	\$1,428.10	\$2,341.09	\$0.21
Electricity	kWh	7/28/2011	8/26/2011	84.0	18,600	\$1,876.17	\$2,261.55	\$0.22
Electricity	kWh	8/26/2011	9/27/2011	198.0	48,000	\$4,012.62	\$4,826.80	\$0.18
Electricity	kWh	9/27/2011	10/26/2011	195.0	47,700	\$2,351.69	\$4,618.64	\$0.15
Electricity	kWh	10/26/2011	11/28/2011	189.0	46,200	\$2,311.21	\$4,529.00	\$0.15
Electricity	kWh	11/28/2011	12/28/2011	186.0	53,400	\$2,502.33	\$4,084.25	\$0.12
Electricity	kWh	12/28/2011	1/17/2012	186.0	52,500	\$2,504.42	\$4,620.00	\$0.14
Electricity	kWh	1/27/2012	2/28/2012	186.0	52,500	\$2,507.11	\$4,689.30	\$0.14
Electricity	kWh	2/28/2012	3/28/2012	183.0	52,800	\$2,505.08	\$4,646.40	\$0.14
Electricity	kWh	3/28/2012	5/29/2012	189.0	95,100	\$4,757.20	\$8,368.80	\$0.14
Electricity	kWh	5/29/2012	6/27/2012	366.0	43,200	\$5,958.41	\$3,801.60	\$0.23
TOTALS/AVERAGE				182.7	528,300	\$32,714.34	\$48,787.43	\$0.154



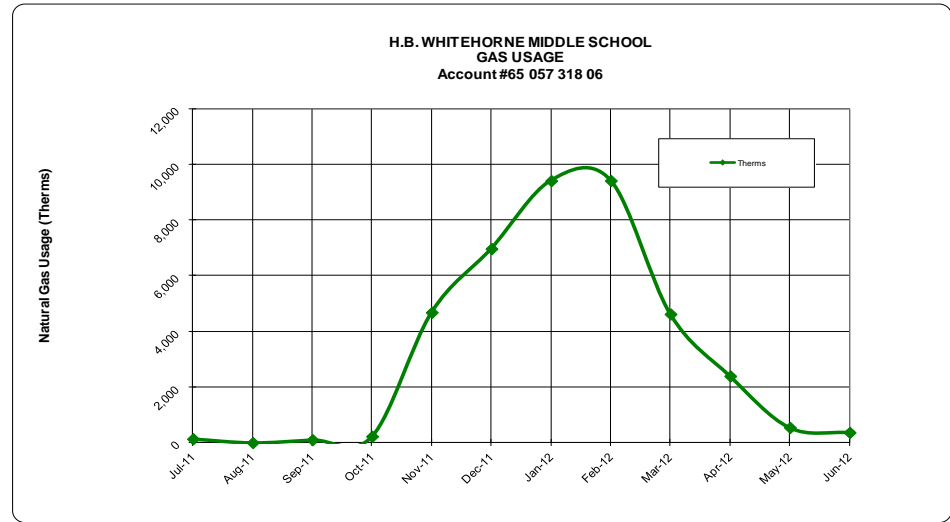
Historic Energy Consumption (cont'd)

Dome-Tech, Inc.

Utility Usage and Costs Summary

Time-period: June 2011 - May 2012

Facility Name H.B. Whitehorne Middle School
 Address 600 Bloomfield Avenue
 Verona, NJ
 Account# 65 057 318 06 - PSE&G
 356872 / 356958 - HESS CORP
 Meter# 3166068 PoD ID: PG00000809427131248



Energy Type	Energy Unit	Start Date	End Date	Therms	PSE&G	HESS CORP / COMPASS ENERGY*	\$/Therm
					Delivery Cost	Supply Cost	
Natural Gas	Therms	6/28/2011	7/28/2011	137	\$117.37	\$101.19	\$1.592
Natural Gas	Therms	7/28/2011	8/26/2011	0	\$99.50	\$0.00	#DIV/0!
Natural Gas	Therms	8/26/2011	9/27/2011	102	\$114.31	\$64.54	\$1.760
Natural Gas	Therms	9/27/2011	10/26/2011	226	\$132.49	\$141.79	\$1.211
Natural Gas	Therms	10/26/2011	11/28/2011	4,679	\$2,306.22	\$3,177.40	\$1.172
Natural Gas	Therms	11/28/2011	12/28/2011	6,966	\$2,742.44	\$4,732.46	\$1.073
Natural Gas	Therms	12/28/2011	1/17/2012	9,408	\$3,154.59	\$6,393.07	\$1.015
Natural Gas	Therms	1/27/2012	2/28/2012	9,412	\$3,110.69	\$6,395.22	\$1.010
Natural Gas	Therms	2/28/2012	3/28/2012	4,619	\$2,212.35	\$3,139.13	\$1.159
Natural Gas	Therms	3/28/2012	4/27/2012	2,393	\$375.55	\$1,099.25	\$0.616
Natural Gas	Therms	4/27/2012	5/29/2012	543	\$176.45	\$297.44	\$0.873
Natural Gas	Therms	5/29/2012	6/27/2012	366	\$151.33	\$348.04	\$1.366
TOTALS/AVERAGE				38,851	\$14,693	\$25,890	\$1.045



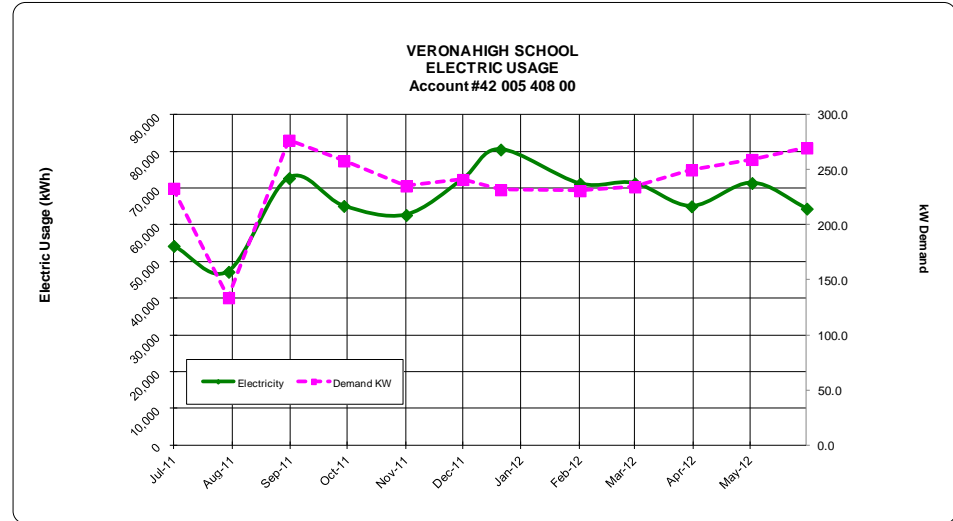
Historic Energy Consumption (cont'd)

Dome-Tech, Inc.

Utility Usage and Costs Summary

Time-period: June 2011 - May 2012

Facility Name **Verona High School - COMBINED**
 Address **151 Fairview Avenue**
Verona, NJ
 Account# **42 005 408 00 - PSE&G**
1113222 - Direct Energy
 Meter# **126408067** PoD ID: **PE000011746289545193**



Energy Type	Energy Unit	Start Date	End Date	Demand KW	KWH	PSE&G		DIRECT ENERGY	
						Delivery Cost	Supplier Cost	Supplier Cost	\$/kWh
Electricity	kWh	6/28/2011	7/28/2011	233.3	54,288	\$4,551.22	\$6,929.57		\$0.21
Electricity	kWh	7/28/2011	8/26/2011	133.9	47,229	\$3,241.97	\$6,456.17		\$0.21
Electricity	kWh	8/26/2011	9/27/2011	277.0	72,758	\$5,510.33	\$8,582.66		\$0.19
Electricity	kWh	9/27/2011	10/26/2011	258.2	65,181	\$3,048.39	\$7,296.93		\$0.16
Electricity	kWh	10/26/2011	11/28/2011	235.5	62,710	\$2,931.55	\$6,915.83		\$0.16
Electricity	kWh	11/28/2011	12/28/2011	241.3	72,368	\$3,221.48	\$7,738.94		\$0.15
Electricity	kWh	12/28/2011	1/17/2012	232.0	80,558	\$3,457.42	\$8,729.85		\$0.15
Electricity	kWh	1/27/2012	2/28/2012	231.1	71,230	\$3,195.42	\$8,349.59		\$0.16
Electricity	kWh	2/28/2012	3/28/2012	234.6	71,336	\$3,210.45	\$7,912.83		\$0.16
Electricity	kWh	3/28/2012	4/27/2012	250.0	65,076	\$3,088.16	\$7,400.71		\$0.16
Electricity	kWh	4/27/2012	5/29/2012	259.5	71,426	\$3,299.47	\$7,918.63		\$0.16
Electricity	kWh	5/29/2012	6/27/2012	270.0	64,441	\$5,451.21	\$7,296.96		\$0.20
TOTALS/AVERAGE				238.0	798,601	\$44,207.07	\$91,528.67		\$0.170



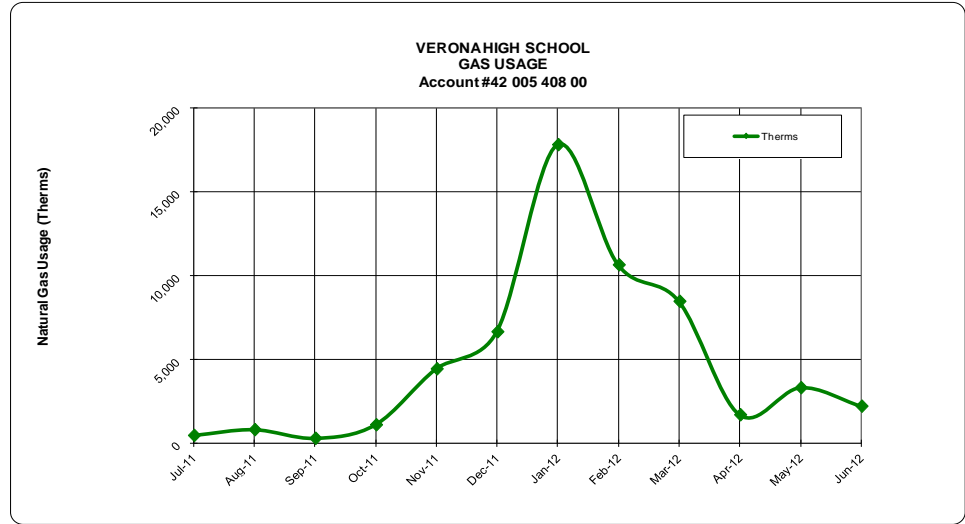
Historic Energy Consumption (cont'd)

Dome-Tech, Inc.

Utility Usage and Costs Summary

Time-period: June 2011 - May 2012

Facility Name Verona High School
 Address 151 Fairview Avenue
 Verona, NJ
 Account# 42 005 408 00 - PSE&G
 356872 / 356957 - HESS CORP
 Meter# 1639191 PoD ID: PG000011746288745193



Energy Type	Energy Unit	Start Date	End Date	Therms	PSE&G Delivery Cost	HESS CORP / COMPASS ENERGY* Supply Cost	\$/Therm
Natural Gas	Therms	6/28/2011	7/28/2011	488	\$167.78	\$359.82	\$1.081
Natural Gas	Therms	7/28/2011	8/26/2011	834	\$220.98	\$614.58	\$1.002
Natural Gas	Therms	8/26/2011	9/27/2011	318	\$145.89	\$202.17	\$1.093
Natural Gas	Therms	9/27/2011	10/26/2011	1,123	\$257.60	\$703.41	\$0.856
Natural Gas	Therms	10/26/2011	11/28/2011	4,456	\$1,645.95	\$2,213.44	\$0.866
Natural Gas	Therms	11/28/2011	12/28/2011	6,666	\$2,776.69	\$4,528.66	\$1.096
Natural Gas	Therms	12/28/2011	1/17/2012	17,809	\$4,797.50	\$12,101.40	\$0.949
Natural Gas	Therms	1/27/2012	2/28/2012	10,651	\$3,177.35	\$7,237.20	\$0.978
Natural Gas	Therms	2/28/2012	3/28/2012	8,479	\$2,554.64	\$5,762.25	\$0.981
Natural Gas	Therms	3/28/2012	4/27/2012	1,719	\$310.55	\$790.73	\$0.641
Natural Gas	Therms	4/27/2012	5/29/2012	3,332	\$466.06	\$1,824.97	\$0.688
Natural Gas	Therms	5/29/2012	6/27/2012	2,232	\$360.02	\$2,004.88	\$1.059
TOTALS/AVERAGE				58,107	\$16,881.01	\$38,343.51	\$0.950

* Supply company changed in September 2011



Energy Star Portfolio

Dome-Tech, Inc.

Energy Star Scores

- An *Energy Star* Score is 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)	<i>Energy Star</i> Score	Eligible to Apply for <i>Energy Star</i>	Current Site Energy Intensity (kBtu/sq ft)	Current Site Electric Energy Intensity (kBtu/sq ft)	Current Site Natural Gas Energy Intensity (kBtu/sq ft)	Current Source Energy Intensity (kBtu/sq ft)
Brookdale Avenue School	37,972	70	N/A	41	14	27	71.1
F.N. Brown School	38,985	7	N/A	87	20	67	133.7
Forest Avenue School	27,750	43	N/A	62	17	45	100.2
H.B. Whitehorne Middle School	118,224	81	YES	48	15	33	82.2
Laning Avenue School	46,477	18	N/A	71	18	53	111.9
Verona High School	120,245	64	N/A	71	23	48	121.4

- Note that natural gas fuel consumption at the F.N. Brown Elementary School is much greater, on a per square foot basis, than at any of the District's other schools.
- Possible reasons for increased heating energy consumption are: the school's age and construction, age of boilers, and losses through steam traps.



Energy Star Portfolio (cont'd)

Portfolio Manager Sign-In

- An account has been created for Verona School District in Portfolio Manager. You should have received an email to notify you of the generation of this account and shared access with Dome-Tech. Please use this to read your facility information. We would ask that you refrain from altering the sign-in information until after the report is finalized.
- Your building's information is currently shared as read only. When the report is finalized, the shared access will be changed so that you can use/edit the information as needed.
- Website link to sign-in:
<https://www.energystar.gov/istar/pmpam/index.cfm?fuseaction=login.Login>
- Username: VeronaSD
- Password: DTVerona1
- Email for account: pmcdevitt@veronaschools.org
- Security Verification Question: What is your birth city?
Answer: **Verona**



Facility Information

Building Name: Laning Avenue Elementary School

Address: 18 Laning Avenue
Verona, NJ 07044

Gross Floor Area: 46,477 sq ft

Year Built: 1911, renovated 1950s, 1998, 2007

Occupants: Students: 214

Staff: 49

Building Usage: Elementary School, K-4

Construction Features:

Façade: Single story brick façade, in good condition.

Roof Type: 30% pitched roof with asphalt shingles. 70% flat roof, metal deck, built up, ballasted with grey river rock

Windows: Covering approximately 25% of façade, double pane windows, operable. Good condition

Exterior Doors: 13 steel & glass double doors, 3 steel & glass single doors. Mostly in good condition.





Facility Information (cont'd)

Major Mechanical Systems - Laning Avenue Elementary School

Air Handlers / AC Systems / Ventilation Systems

The school's Media Center, Computer Room, Music Room, Main Office, Nurses office, and preschool office are conditioned by roof top air handling units (RTUs) which use direct expansion (DX) cooling and natural gas heating. A heating only natural gas fired RTU serves the preschool wing. A heating and ventilation unit, located in the attic, has been retrofitted with a duct mounted DX coil, and serves the Café/Auditorium. Most classrooms (except those in the 2007 section), are conditioned by unit ventilators. The unit ventilators were installed as part of the school's the 1998 retrofit.



Rooftop unit serving the Media Center



Facility Information (cont'd)

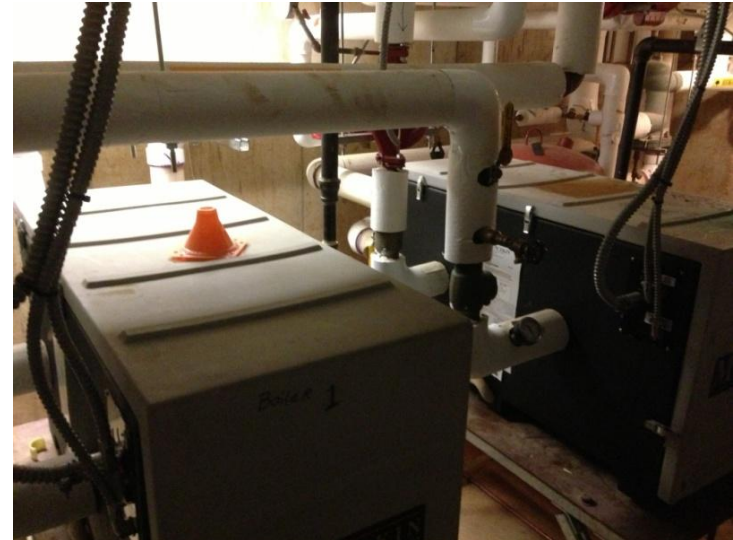
Major Mechanical Systems - Laning Avenue Elementary School

Boilers

The school is heated by four (4) natural gas boilers. Two (2) main 300 MBH cast iron sectional boilers produce heating hot water for the radiant heating systems, and two (2) 3.9 MBH Munchkin Boilers are used to provide heating hot water to the new gym. The main boilers are located in the basement and are served by two 5 HP circulating pumps. The Munchkin Boilers are located in the crawl space of the 2007 addition and are served by four $\frac{3}{4}$ HP circulating pumps. (two supply pumps and two return pumps).



300 MBH Boiler



3.9 MBH Munchkin Boilers



Facility Information (cont'd)

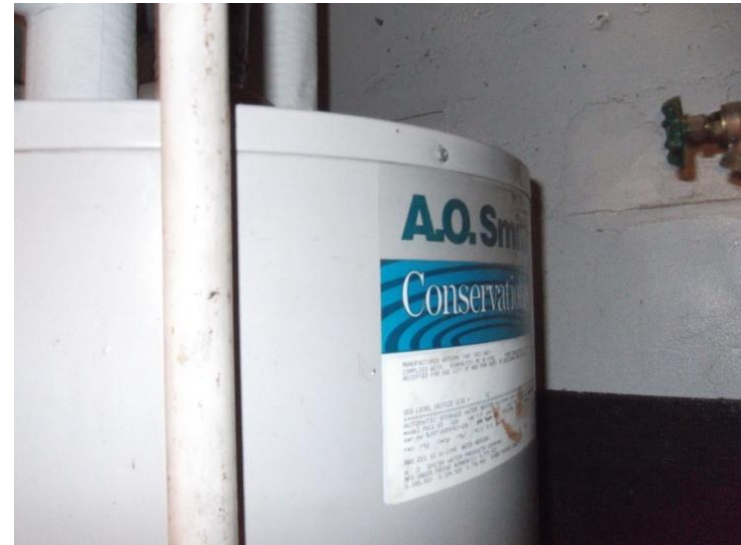
Major Mechanical Systems - Laning Avenue Elementary School

Domestic Hot Water

Domestic hot water is provided by two (2) domestic water heaters. One water heater is electric powered, and one is a natural gas fired. Both are located in the basement mechanical room.



HW#2, Electric Water Heater



HW#1, Natural Gas Water Heater

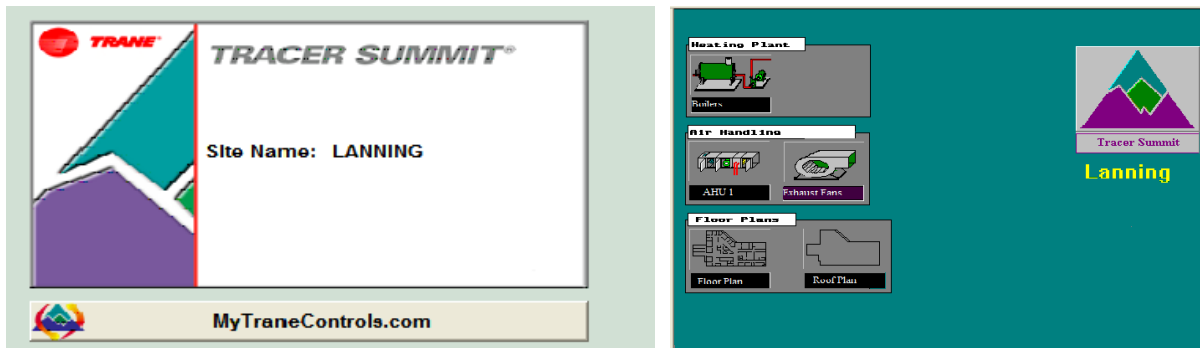


Facility Information (cont'd)

Major Electrical Systems – Laning Avenue Elementary School

Controls

Most of the school's HVAC equipment is monitored and controlled by a Trane Tracer® Building Management System (BMS). The system is functioning properly



Home Screens for Laning Avenue BMS

Utility Power

Electricity enters the facility as a 120/208VAC Wye service from the utility and is used for lighting and equipment power.

Lighting

Most of the school's interior is illuminated by linear fluorescent lighting fixtures, using 32 Watt T-8 lamps and electronic ballasts. Compact fluorescent bulbs are used in a few areas (rest rooms, lobby, and main office).

The gym and multi-purpose room are lit by metal halide high bay lighting fixtures.

Exterior lighting fixtures use high pressure sodium and compact fluorescent lamps.



Facility Information (cont'd)

Building Name:

Brookdale Elementary School

Address:

14 Brookdale Court
Verona, New Jersey 07044

Gross Floor Area:

37,972 sq ft

Year Built:

1927, Additions 1998

Occupants:

Students: 115
Staff: 15

Building Usage:

Elementary School, K-4

Construction Features:

Façade:

Two story brick façade, in good condition.

Roof Type:

Flat roof, metal deck, built up, ballasted with grey river rock

Windows:

Covering approximately 50% of façade, double pane, double hung windows, operable.

Exterior Doors:

4 steel & glass double doors, 3 steel double doors, and 4 steel and glass single doors. 1 Steel roll-up door. All in good condition.





Facility Information (cont'd)

Major Mechanical Systems - Brookdale Elementary School

Air Handlers / AC Systems / Ventilation Systems

The school's faculty room, main office, principal's office, nurses office, and the media center are conditioned by roof top air handling units (RTUs) which use direct expansion (DX) cooling and natural gas fired heating. Heating only natural gas fired RTU's serve the 2nd floor new addition classrooms, the cafeteria, and the new addition basement area. The gym is served by two (2) ceiling hung heating and ventilation units with hot water heating coils.

Classrooms (other than those in the new addition served by rooftop units) are served by unit ventilators with hot water coils. The SGI and Music rooms contain unit ventilators that contain hot water heating coils as well as DX cooling coils. All equipment, other than stand-alone cabinet unit heaters in the hallways, is controlled by a building management system.

Boilers

Two (2) 2,511,000 Btuh natural gas-fired Cleaver Brooks fire tube boilers produce heating hot water for the radiant hot water system, unit heaters and the air handlers. Two (2) 2HP pumps are used for heating hot water distribution. Two (2) additional ¾HP inline pumps distribute heating hot water to the new addition.



RTU#1 serving top floor class rooms



Fire tube hot water boiler



Heating hot water pumps



Facility Information (cont'd)

Major Mechanical Systems - Brookdale Elementary School

Domestic Hot Water

The school's domestic hot water is provided by two (2) domestic water heaters, located in the boiler mechanical room. One is a 3,600 Watt, 40 gallon, electric water heater and the other is a 40,000 BTU, 50 gallon, natural gas water heater.



Gas-fired water heater (left) and electric water heater (right)

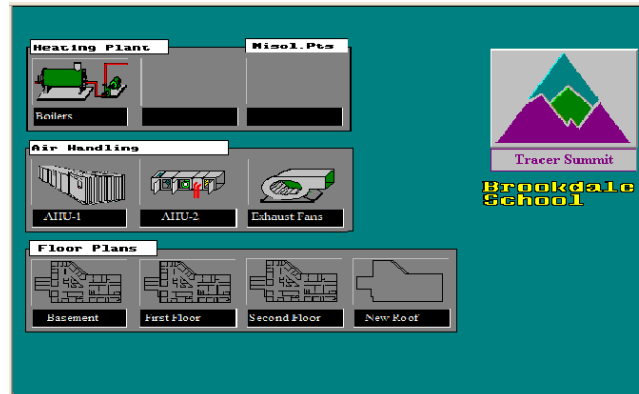


Facility Information (cont'd)

Major Electrical Systems – Brookdale Elementary School

Controls

Most of the school's HVAC equipment is monitored and controlled by a Trane Tracer[®] Building Management System (BMS). The system is functioning properly



BMS home Screen

Utility Power

Electricity enters the facility as a 120/208VAC Wye service from the utility and is used for lighting and equipment power.

Lighting

Most of the school's interior is illuminated by linear fluorescent lighting fixtures, using 32 Watt T-8 lamps and electronic ballasts. A few compact fluorescent bulbs are used in the media center.

The gym is lit by metal halide high bay lighting fixtures.

Exterior lighting fixtures use high pressure sodium and compact fluorescent lamps.



Facility Information (cont'd)

Building Name: F.N. Brown Elementary School

Address: 125 Grove Avenue
Verona, New Jersey 07044

Gross Floor Area: 38,985 sq ft

Year Built: 1930s, Additions 1963

Occupants: Students: 192

Staff: 21

Building Usage: Elementary School, K-4



Construction Features:

Façade: Two story brick façade, in good condition.

Roof Type: 70% pitched roof with asphalt shingles. 30% flat roof, metal deck, built up, ballasted with grey river rock

Windows: Covering approximately 50% of façade, double pane, double hung windows, operable.

Exterior Doors: 10 steel & glass double doors, 4 steel double doors, and 4 steel or steel and glass and glass single doors. 1 Steel roll-up door. Most are in good condition, with some requiring either weather stripping replacement or door replacement due to rust.



Facility Information (cont'd)

Major Mechanical Systems - F.N. Brown Elementary School

Air Handlers / AC Systems / Ventilation Systems

Most of the school is conditioned by unit ventilators, equipped with steam heating coils. Three (3) steam heated air handling units are also used. Two (2) of these units serve the auditorium and one (1) serves the gym.

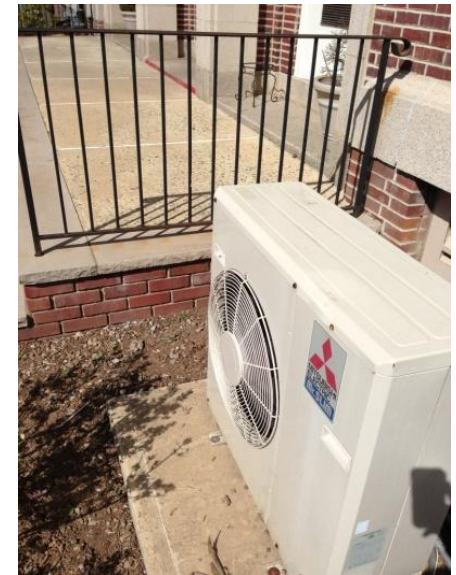
Mechanical cooling is available in some rooms (Music Room, OT/PT, Child Study, SGI, Faculty Room, Principal's Office, Teachers Work Room, Main Office, Computer Lab, Nurses Office and Library Office,), using split system direct refrigeration (DX) units. The DX condensing units are located in the front of the building and serve either ductless, wall mounted evaporators or ceiling mounted fan coil units, or unit. A few packaged unit ventilators also contain DX cooling. Most equipment, other than stand-alone cabinet unit heaters in the hallways, is controlled by a building management system.



Condensing unit serving OT/PT



Ductless evaporator unit (typ.)



Condensing unit serving the faculty room



Facility Information (cont'd)

Major Mechanical Systems - F.N. Brown Elementary School

Boilers

Two (2) Cleaver Brooks, natural gas fired 4,184,000 Btu fire tube boilers provide steam for the steam unit ventilators, unit heaters and air handlers. A small shell and tube heat exchanger is used to convert steam to heating hot water for the hydronic unit ventilators. Two (2) ½ HP pumps distribute the heating hot water to unit ventilators (approximately eight (8)); located in recently renovated lower level classrooms.



Fire tube steam boiler



Domestic Water Heater



Heating hot water pumps

Domestic Hot Water

One (1) natural gas fired 48 gallon, 65,000 BTU domestic water heater provides domestic hot water.

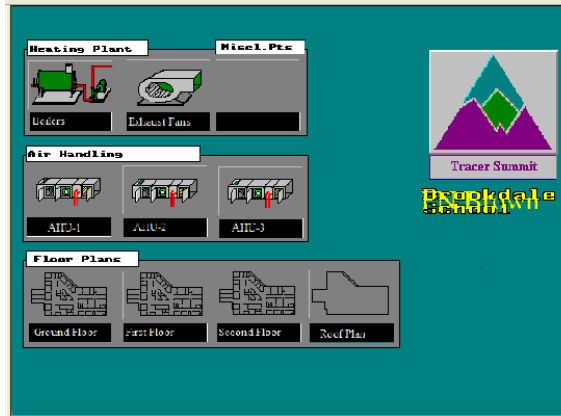


Facility Information (cont'd)

Major Electrical Systems – F.N. Brown Elementary School

Controls

The School has been retrofitted with a Trane Tracer® Building Management System that monitors and controls most HVAC equipment throughout the building. The system is functioning properly



BMS home Screen

Utility Power

Electricity enters the facility as a 120/208VAC Wye service from the utility and is used for lighting and equipment power.

Lighting

Most of the school's interior is illuminated by linear fluorescent lighting fixtures, using 32 Watt T-8 lamps and electronic ballasts. Compact fluorescent bulbs are used in the auditorium and miscellaneous areas. The gym is lit by new linear fluorescent high bay lighting fixtures which use T5 high output lamps. Exterior lighting fixtures use high pressure sodium and compact fluorescent lamps.



Facility Information (cont'd)

Building Name: Forest Avenue Elementary School

Address: 118 Forest Avenue
Verona, New Jersey 07044

Gross Floor Area: 27,750 sq ft

Year Built: 1930s, Addition circa 1960s

Occupants: Students: 208

Staff: 17

Building Usage: Elementary School, K-4

Construction Features:

Façade: Two story brick façade, in good condition.

Roof Type: Flat roof, metal deck, built up, ballasted with grey river rock

Windows: Covering approximately 50% of façade, double pane, double hung windows, operable. Good Condition

Exterior Doors: 4 steel & glass double doors and 3 steel or steel & glass single doors. 1 Steel roll-up door. All in good condition.





Facility Information (cont'd)

Major Mechanical Systems - Forest Avenue Elementary School

Air Handlers / AC Systems / Ventilation Systems

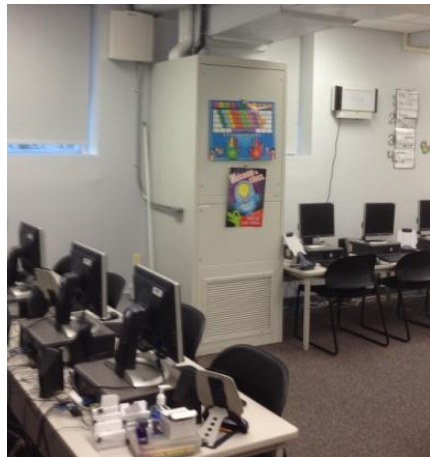
The main office and nurses office are conditioned by roof top air handling units (RTU) which use direct expansion (DX) cooling. The gym is served by two (2) ceiling hung heating and ventilation units with hot water heating coils. Classrooms are served by unit ventilators which use hot water coils. Unit ventilators serving the computer room and classroom #3 are equipped with DX cooling coils. A window air conditioner is used to cool the library. Most equipment, other than stand-alone cabinet unit heaters in the hallways, is controlled by a building management system.

Boilers

Two (2) natural gas fired Cleaver Brooks, 2,511,000 Btuh fire tube boilers provide heating hot water for the radiant hot water system, unit heaters and air handlers. Two (2) 3HP pumps and two (2) 1½HP pumps are used for heating hot water circulation through the boilers and for distribution throughout the building.



RTU serving main office



Computer room unit ventilator



Fire tube heating hot water boiler



Facility Information (cont'd)

Major Mechanical Systems - Forest Avenue Elementary School

Domestic Hot Water

Domestic hot water is provided by a gas fired 50 gallon, 40,000 BTU domestic water heater.



Domestic Water Heater

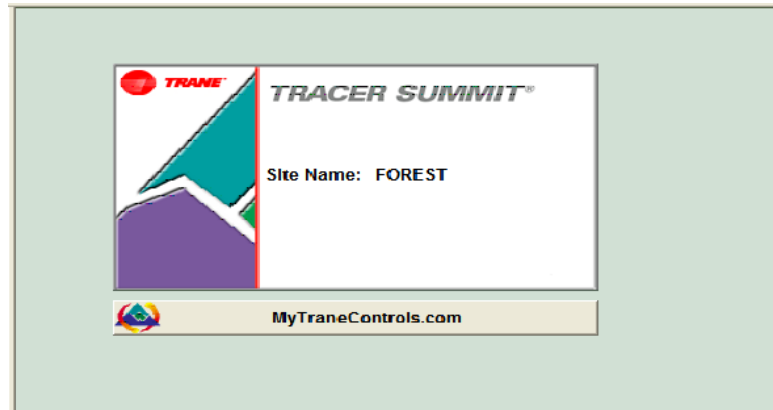


Facility Information (cont'd)

Major Electrical Systems - Forest Avenue Elementary School

Controls

The School has been retrofitted with a Trane Tracer® Building Management System that monitors and controls most HVAC equipment throughout the building. The system is functioning properly



BMS home Screen

Utility Power

Electricity enters the facility as a 120/208VAC Wye service from the utility and is used for lighting and equipment power.

Lighting

Most of the school's interior is illuminated by linear fluorescent lighting fixtures, using 32 Watt T-8 lamps and electronic ballasts. A few compact fluorescent bulbs are used in storage closets. The gym is lit by linear fluorescent fixtures, which use T8 lamps. Exterior lighting fixtures use metal halide lamps.



Facility Information (cont'd)

<u>Building Name:</u>	H.B. Whitehorne Middle School
Address:	600 Bloomfield Avenue Verona, New Jersey 07044
Gross Floor Area:	118,224 sq ft
Year Built:	1920, Additions -Late 1920s, 1967, 2007
# Occupants:	Students: 623 Staff: 65
Building Usage:	Grades 5 - 8



Construction Features:

Façade:	Two story brick façade, in good condition.
Roof Type:	45% pitched roof with asphalt shingles. 55% flat roof, metal deck, built up, ballasted with grey river rock
Windows:	Covering approximately 50% of façade, double pane, double hung windows, operable. Windows installed 1998 and many no longer open correctly. Good condition, but some of the operable windows are difficult to open.
Exterior Doors:	11 steel & glass double doors, 4 steel double doors, and 7 steel or steel & glass and glass single doors. Most are in good condition, with some requiring either weather stripping replacement or door replacement due to rust.



Facility Information (cont'd)

Major Mechanical Systems - H.B. Whitehorne Middle School

Air Handlers / AC Systems / Ventilation Systems

The new computer lab, the core offices, science labs and the media center are served by roof top air handling units (RTUs) using direct expansion (DX) cooling and natural gas heating. A heating only natural gas fired RTU serves the new cafeteria. Ceiling hung air handling units that utilize DX cooling serve the faculty room, guidance offices, the main office, the music room and two (2) classrooms. Six (6) additional heating and ventilation units serve the old gym area and the auditorium. Most other classrooms are served by unit ventilators using either hot water heating coils (1967 and 2007 additions only) or steam heating coils. The old computer room is served by unit ventilators and a ductless split DX cooling system.



RTU#5 serving Media Center



Auditorium AHU (1 of 2)



Unit ventilators serving cafeteria (3)



Facility Information (cont'd)

Major Mechanical Systems - H.B. Whitehorne Middle School

Boilers

Two (2) natural gas fired Cleaver Brooks, 6,277,000 BTU fire tube boilers provide steam for the steam unit ventilators, unit heaters and radiant heating. Two (2) shell and tube heat exchangers are used to convert steam to heating hot water. One of the heat exchangers serves the 1967 addition and the other serves the 2007 addition. Each utilizes a set of 5HP pumps to distribute water to terminal units.



Steam to heating hot water heat exchanger (1 of 2)



Fire tube steam boiler



Heating hot water pumps for 1967 section of building



Facility Information (cont'd)

Major Mechanical Systems - H.B. Whitehorne Middle School

Domestic Hot Water

Domestic hot water is provided by two (2) natural gas fired 76,000 Btuh domestic water heaters with 75 gallon tanks.



Natural gas fired domestic hot water heaters

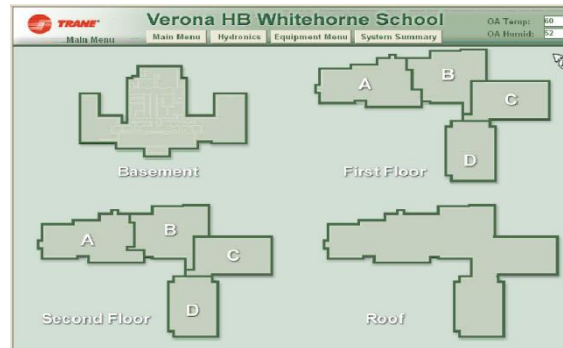


Facility Information (cont'd)

Major Electrical Systems – H.B. Whitehorne Middle School

Controls

The School has been retrofitted with a Trane Tracer® Building Management System that monitors and controls most HVAC equipment throughout the building. The system is functioning properly



BMS home Screen

Utility Power

Electricity enters the facility from two (2) services. Both services are 120/208VAC Wye and are used for lighting and equipment power.

Lighting

Most of the school's interior is illuminated by linear fluorescent lighting fixtures, using 32 Watt T-8 lamps and electronic ballasts. A few fixtures use older, less efficient T12 lamps and magnetic ballasts. A few compact fluorescent and incandescent bulbs are used in various areas.

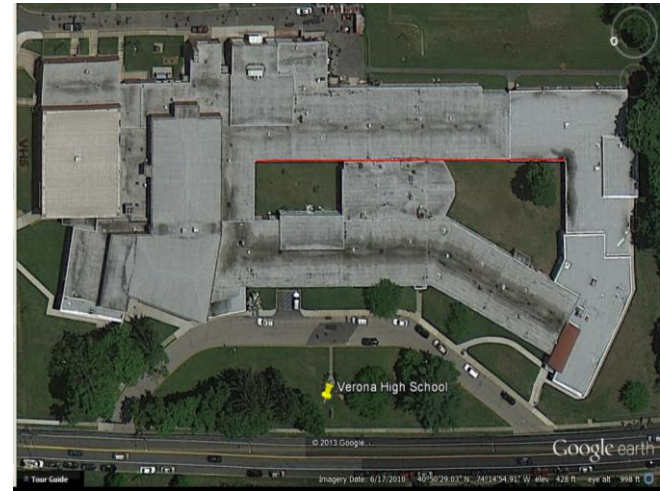
The gym is lit by metal halide high bay lighting fixtures.

Exterior lighting fixtures use metal halide lamps.



Facility Information (cont'd)

Building Name: Verona High School
Address: 120 Fairview Avenue
Verona, New Jersey 07044
Gross Floor Area: 120,224 sq ft
Year Built: 1956, Additions 1975, 2007
Occupants: Students: 604
Staff: 89
Building Usage: Grades 9 - 12



Construction Features:

Façade: Two story brick façade, in good condition.
Roof Type: Flat roof, metal deck, built up, ballasted with grey river rock
Windows: Covering approximately 50% of façade, double pane, double hung windows, operable. Good Condition
Exterior Doors: 7 steel & glass double doors, 9 steel double doors, and 5 steel & glass single doors, and 4 steel single doors. 2 roll-up doors. Most in good condition, some require weather stripping replacement.



Facility Information (cont'd)

Major Mechanical Systems - Verona High School

Air Handlers / AC Systems / Ventilation Systems

Roof top air handling units (RTUs) utilizing direct expansion (DX) cooling and natural gas heating supply air to the Board Offices and Special Services Rooms, Café, and Inner Offices. The old gym is served by two (2) hot water heating only air handling units (AHUs) located in the penthouse mechanical rooms. The new gym is served by two (2) heating hot water only ceiling hung AHUs, and the Auditorium is served by an air handler located in the second penthouses. Most rooms contain heating only unit ventilators, but some rooms also contain ductless split, direct expansion cooling units. These include the Graphics Room, Guidance Offices, Student Activities Room, and classrooms 12, 14, 18, 26 and 30.

Boilers

Two (2) natural gas fired Cleaver Brooks, 5,230,000 Btuh fire tube boilers provide heating hot water for the radiant hot water system, unit heaters and the air handlers. Three (3) 7.5HP constant speed primary pumps and one (1) 3HP standby pump are used for heating hot water distribution.



Fire tube heating hot water boiler



Facility Information (cont'd)

Major Mechanical Systems - Verona High School

Domestic Hot Water

Domestic hot water is provided by two (2) natural gas fired domestic water heaters, located in the boiler mechanical room. Only one- an 85 gallon, 500,000 Btuh unit- is currently operational. The other 80 gallon, 750,000 Btuh unit is currently offline and requires replacement.



Natural gas fired domestic hot water heaters



Facility Information (cont'd)

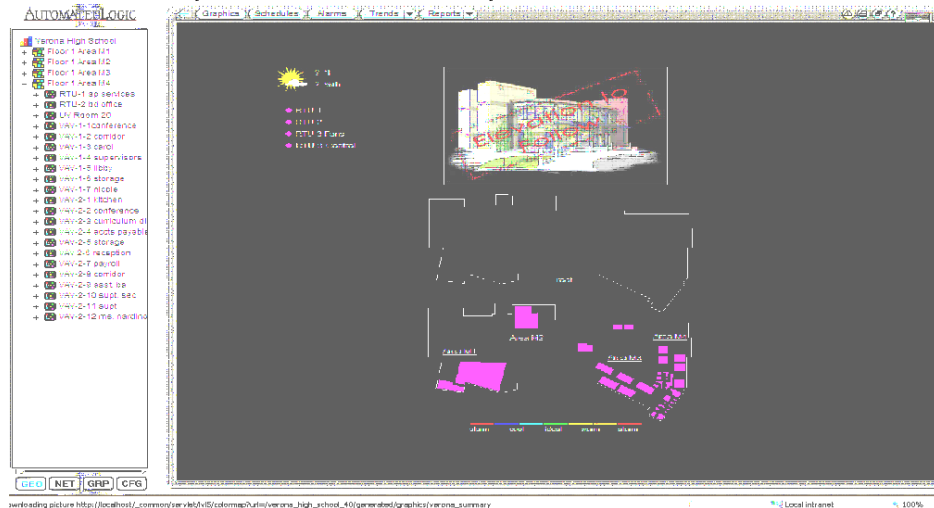
Dome-Tech, Inc.

Major Electrical Systems – Verona High School

Controls

The School has been retrofitted with an Automated Logic Building Management System (BMS) that monitors and controls HVAC equipment. Unlike the other schools in the District, the control upgrade is not as comprehensive and does not include the majority of the HVAC equipment. The portion of the building that is controlled by the BMS is functioning properly.

The boiler room equipment, HAC-1 serving inner offices, gym H&V units, exhaust fans, and many classroom unit ventilators are not controlled by the Automated Logic System. These pieces of equipment rely on building staff, mechanical time clocks, pneumatic control panels and pneumatic actuators to operate. Exhaust fans, for example, are turned on and off by the maintenance staff and operate for many more hours than necessary. In addition, HAC-1 is controlled from a pneumatic control panel that limits the units functionality.



BMS home Screen



Facility Information (cont'd)

Major Electrical Systems – Verona High School (cont'd)

Utility Power

The facility is served by two (2) electrical services. The original service is 120/208VAC and the main disconnect is located in the boiler mechanical room. The second service is provided from the utility company at 480VAC. The service enters the facility as a 120/208VAC Wye from a facility owned 480-120/208VAC pad-mounted transformer located at the back of the school.

Lighting

Most of the school's interior is illuminated by linear fluorescent lighting fixtures, using 32 Watt T-8 lamps and electronic ballasts. A few fixtures use older, less efficient T12 lamps and magnetic ballasts. Compact fluorescent bulbs are used in the auditorium.

The gyms are lit by metal halide high bay lighting fixtures.

Exterior lighting fixtures use metal halide and high pressure sodium lamps.



Greenhouse Gas Emission Reduction

Implementation of all identified ECMs will yield:

- 615,000 kilowatt-hours of annual avoided electric usage.
- 15,100 therms of annual avoided natural gas usage.
- This equates to the following **annual** reductions:

- 292 tons of CO₂;

-OR-

- 50 Cars removed from road;

-OR-

- 80 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 lbs is equivalent to planting an acre of trees.*

- The following utility prices calculated from the utility bills provided were used within this study:

School	\$ / kWh	\$ / Therms
Laning Avenue Elementary School	\$ 0.15	\$ 1.02
Brookdale Avenue Elementary School	\$ 0.15	\$ 1.17
F.N. Brown Elementary School	\$ 0.17	\$ 1.03
Forest Avenue Elementary School	\$ 0.15	\$ 1.13
H.B. Whitehorne Middle School	\$ 0.15	\$ 1.04
Verona High School	\$ 0.17	\$ 0.95
Averaged Costs	\$ 0.16	\$ 1.06



ECM #1: Computer Power Management

	Brookdale E.S.	F.N. Brown School	Forest E.S.	H.B. Whitehorne M.S.	Laning Avenue School	Verona High School	TOTAL
Estimated Annual Savings:	\$1,860	\$2,840	\$2,730	\$7,500	\$2,780	\$11,800	\$29,510
Gross Estimated Implementation Cost ¹ :	\$810	\$1,080	\$1,170	\$3,320	\$1,170	\$4,660	\$12,210
Approx. NJ Smart Start Rebate ² :	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net Estimated Implementation Cost:	\$810	\$1,080	\$1,170	\$3,320	\$1,170	\$4,660	\$12,210
Simple Payback (years):	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Annual Avoided CO ₂ Emissions (tons):	4	5	6	16	6	23	61

¹ Cost estimates based on RSMeans cost estimating data.

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

➤ Observations/Issues

Dome-Tech observed, and staff indicate, that at night and on weekends many personal computers are left “on” in a screen saver- mode. 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 75W for the computer and monitor.

➤ Recommended Measure

Dome-Tech recommends installing a school district wide computer power management system (such as *Verdiem 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.



ECM #2: Insulate Piping

	F.N. Brown School	Verona High School	TOTAL
Estimated Annual Savings:	\$180	\$400	\$2,440
Gross Estimated Implementation Cost ¹ :	\$230	\$870	\$1,910
Approx. NJ Smart Start Rebate ² :	\$0	\$0	\$0
Net Estimated Implementation Cost:	\$230	\$870	\$1,910
Simple Payback (years):	1.3	2.2	0.8
Annual Avoided CO ₂ Emissions (tons):	1	2	7

¹ Cost estimates based on RSMMeans cost estimating data.

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

➤ Observations/Issues

Approximately 75 feet of bare, uninsulated heating hot water (HHW) supply and return piping was found at Verona High School, at the two (2) penthouse air handling units.

Approximately 20 feet of bare, uninsulated low pressure condensate (LPC) piping was found at F.N. Brown Elementary School, near the condensate return station in the boiler room.

➤ Recommended Measure

Insulate HHW and LPC piping to reduce heat losses.



ECM #3: Install Vending Machine Controls

	F.N. Brown School	H.B. Whitehorne M.S.	Verona High School	TOTAL
Estimated Annual Savings:	\$670	\$300	\$1,670	\$2,640
Gross Estimated Implementation Cost ¹ :	\$1,360	\$680	\$3,400	\$5,440
Approx. NJ Smart Start Rebate ² :	\$0	\$0	\$0	\$0
Net Estimated Implementation Cost:	\$1,360	\$680	\$3,400	\$5,440
Simple Payback (years):	2.0	2.3	2.0	2.1
Annual Avoided CO ₂ Emissions (tons):	1.3	0.6	3	5.2



¹ Cost estimates based on published retail costs.

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

➤ Observations/Issues

There are two (2) beverage vending machines located at F.N. Brown Elementary School, five (5) machines at Verona High School, and one (1) machine at H.B. Whitehorne Middle School. These machines are plugged in and cooling their contents 24/7.

➤ Recommended Measures

- ❖ Install vending machine occupancy control devices for each vending machine.
- ❖ These devices reduce electrical energy consumption by turning off the unit's lights and managing compressor cooling cycles when the surrounding area is vacant. They automatically re-powers the cooling system at one to three hour intervals, independent of sales, to ensure that the product stays cold.
- ❖ The microcontroller will never power down the machine while the compressor is running, eliminating compressor short-cycling. In addition, when the machine is powered up, the cooling cycle is allowed to finish before again powering down (which reduces compressor wear and tear).
- ❖ This measure can be implemented by the operations staff.
- ❖ This ECM is not expected to reduce the building(s)' electrical demand.



ECM #4: Steam Trap Maintenance Program

	F.N. Brown School	H.B. Whitehorne Middle School	TOTAL
Estimated Annual Savings:	\$1,220	\$2,610	\$3,830
Gross Estimated Implementation Cost ¹ :	\$3,010	\$6,620	\$9,630
Approx. NJ Smart Start Rebate ² :	\$0	\$0	\$0
Net Estimated Implementation Cost:	\$3,010	\$6,620	\$9,630
Simple Payback (years):	2.5	2.5	2.5
Annual Avoided CO ₂ Emissions (tons):	7	15	22

¹ Cost estimates based on RSMean cost estimating data.

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

➤ Observations/Issues

H.B Whitehorne Middle School and F.N. Brown Elementary School use low pressure steam for heating. Interviews with building maintenance staff indicate that all steam traps were replaced during the 1998 renovations, but have not been tested since then. Currently, there is no steam trap testing and maintenance program in place at H.B Whitehorne Middle School and F.N. Brown Elementary School.

The U.S. Department of Energy estimates that in steam systems that have not been maintained for 3 to 5 years, between 15% to 30% of the installed steam traps may have failed—thus allowing live steam to escape into the condensate return system. In systems with a regularly scheduled maintenance program, leaking traps should account for less than 5% of the trap population. (Dome Tech assumed 10% trap failure rate for calculations)

➤ Recommended Measure

Implement an annual steam trap maintenance program to reduce or eliminate energy loss associated with steam trap failure.



ECM #5: Replace Electric Hot Water Heaters

	Brookdale E.S.	Laning Avenue School	TOTAL
Estimated Annual Savings:	\$430	\$980	\$1,410
Gross Estimated Implementation Cost ¹ :	\$2,210	\$2,140	\$4,350
Approx. NJ Smart Start Rebate ² :	\$0	\$0	\$0
Net Estimated Implementation Cost:	\$2,210	\$2,140	\$4,350
Simple Payback (years):	4.8	2.1	3.1
Annual Avoided CO ₂ Emissions (tons):	0	0	0

¹ Cost estimates based on RSMean cost estimating data.

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

➤ Observations/Issues

Laning Avenue School and Brookdale Elementary School are each served by an electric domestic hot water heater, that operates in conjunction with a natural gas hot water heater.

Based on the District's current energy rates, it is approximately three-and-a-half times more expensive to generate domestic hot water using electricity, versus natural gas.

➤ Recommended Measure

- ❖ Replace the electric hot water heaters with natural gas hot water heaters.
- ❖ The cost estimate includes new gas fired water heaters, gas piping, and flue modification.



ECM #6: Replace CRT Monitors w/Flat Screen

	Brookdale E.S.	F.N. Brown School	Forest E.S.	H.B. Whitehorne M.S.	Laning Avenue School	TOTAL
Estimated Annual Savings:	\$60	\$70	\$50	\$30	\$20	\$230
Gross Estimated Implementation Cost ¹ :	\$300	\$300	\$230	\$150	\$80	\$1,060
Approx. NJ Smart Start Rebate ² :	\$0	\$0	\$0	\$0	\$0	\$0
Net Estimated Implementation Cost:	\$300	\$300	\$230	\$150	\$80	\$1,060
Simple Payback (years):	5.0	4.3	4.6	5.0	4.0	4.6
Annual Avoided CO ₂ Emissions (tons):	0.1	0.1	0.1	0.1	0.0	0.5

¹ Cost estimates based on published retail costs.

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



Observations/Issues

While most of the District's personal computers use modern Liquid Crystal Display (LCD) flat screen monitors, older, inefficient Cathode Ray Tube (CRT) computer monitors are utilized in each of the schools.

- ❖ *Brookdale E.S.:* 4 CRTs
- ❖ *FN Brown:* 4 CRTs
- ❖ *Forest E.S.:* 3 CRTs
- ❖ *HB Whitehorne MS:* 2 CRTs
- ❖ *Laning Avenue School:* 1 CRT

Recommended Measures

- ❖ Replace the remaining CRT monitors with LCD flat screen monitors.
- ❖ LCD monitors consume approximately one quarter of the energy of CRT monitors.



ECM #7: Lighting Upgrade

	Brookdale E.S.	F.N. Brown School	Forest E.S.	H.B. Whitehorne M.S.	Laning Avenue School	Verona High School	TOTAL
Estimated Annual Savings:	\$6,290	\$7,710	\$6,140	\$5,580	\$10,200	\$27,800	\$63,720
Gross Estimated Implementation Cost ¹ :	\$47,400	\$58,400	\$50,900	\$46,700	\$67,800	\$170,000	\$441,200
Approx. NJ Smart Start Rebate ² :	\$5,710	\$6,100	\$5,460	\$5,600	\$8,110	\$20,300	\$51,280
Net Estimated Implementation Cost:	\$41,600	\$52,300	\$45,400	\$41,100	\$59,700	\$150,000	\$390,100
Simple Payback (years):	6.6	6.8	7.4	7.4	5.9	5.4	6.2
Annual Avoided CO ₂ Emissions (tons):	13	15	13	12	22	54	130

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

➤ Observations/Issues

Dome-Tech, performed a room-by-room lighting audit of all six buildings. Audit findings and recommendations are summarized below:

Interior Lighting

- ❖ General Linear Fluorescent Lighting:
 - The vast majority of linear fluorescent light fixtures in the District’s schools use higher efficiency 32 Watt T-8 lamps with electronic ballasts.
 - Only a handful of areas use older, inefficient T12 lamps with magnetic ballasts.
- ❖ Screw in bulbs:
 - Located in miscellaneous areas (storage, closets, mechanical spaces, etc.).
 - Most areas lit with screw-in compact fluorescent lamps.
 - A few areas use incandescent light bulbs
- ❖ High Bay Lighting:
 - High bay areas (gyms, multipurpose rooms, auditoriums) use metal halide fixtures and linear fluorescent fixtures (with both T8 and T5 lamps).



ECM #7: Lighting Upgrade (cont'd)

Exterior Lighting

- ❖ Schools use mercury vapor, high pressure sodium, metal halide, and compact lamps for exterior lighting.

➤ Recommended Measures

Interior Lighting

- ❖ Re-lamp and re-ballast linear fluorescent fixtures from 4ft 32W T8 lamps with standard ballasts- to 28W T8 lamps with high efficiency, low power ballasts.
- ❖ Due to marginal measured light levels, the addition of specular reflectors is recommended for linear fluorescent fixtures in classrooms at FN Brown and Forest Ave Elementary Schools.
 - Note that lighting fixture mock-ups, and/or a more detailed lighting design study may be required to ensure that the proposed retrofits meet required classroom light levels.
- ❖ Replace screw-in incandescent lamps with compact fluorescent lamps.
- ❖ Replace metal halide high bay lighting with new induction fixtures

Exterior Lighting

- ❖ Replace mercury vapor, high pressure sodium, and metal halide exterior lighting with induction lighting. This will reduce electrical energy consumption by nearly 50% and provide approximately equal lighting output. Additionally, induction lamps operate for approximately 100,000 hours, which is up to five (5) times longer than existing metal halide lamps.

Occupancy Sensors

- ❖ Install dual technology occupancy sensors to control lights in classrooms, offices, rest rooms, libraries, cafeterias, and multi purpose rooms.

A complete room-by-room lighting survey of each school is included in the Appendix.



ECM #8: Door Weather Stripping

	F.N. Brown School	H.B. Whitehorne M.S.	Laning Avenue School	Verona High School	TOTAL
Estimated Annual Savings:	\$70	\$70	\$20	\$4	\$164
Gross Estimated Implementation Cost ¹ :	\$470	\$470	\$240	\$80	\$1,260
Approx. NJ Smart Start Rebate ² :	\$0	\$0	\$0	\$0	\$0
Net Estimated Implementation Cost:	\$470	\$470	\$240	\$80	\$1,260
Simple Payback (years):	6.7	6.7	12.0	18.7	7.7
Annual Avoided CO ₂ Emissions (tons):	0.4	0.4	0.1	0.0	0.9

¹ Cost estimates based on RSMeans cost estimating data.

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

➤ Observations/Issues

Doors at multiple schools are inadequately sealed. This implies that either weather stripping requires replacement or that the door's bottom brushes are missing, worn, or damaged.

➤ Recommended Measures

Replace door seals to reduce air infiltration which will reduce conditioning costs and increase occupant comfort.

	F.N. Brown School	H.B. Whitehorne M.S.	Laning Avenue School	Verona High School	TOTAL
Door Weather Stripping To Be Replaced	6	6	3	1	16



ECM #9: Demand Controlled Ventilation

	Brookdale E.S.	F.N. Brown School	Forest E.S.	H.B. Whitehorne M.S.	Laning Avenue School	Verona High School	TOTAL
Estimated Annual Savings:	\$360	\$680	\$280	\$540	\$820	\$1,570	\$4,250
Gross Estimated Implementation Cost ¹ :	\$10,800	\$13,200	\$7,870	\$15,000	\$13,200	\$18,100	\$78,170
Approx. NJ Smart Start Rebate ² :	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net Estimated Implementation Cost:	\$10,800	\$13,200	\$7,870	\$15,000	\$13,200	\$18,100	\$78,170
Simple Payback (years):	30.0	19.4	28.1	27.8	16.1	11.5	18.4
Annual Avoided CO ₂ Emissions (tons):	2	4	2	3	5	9	24

¹ Cost estimates based on RSMeans cost estimating data.

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

➤ Observations/Issues

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.

Note that the savings presented in the table above are based on an *adjusted baseline* (see O&M section of this report). Air handling units throughout the school district currently operate with no ventilation outside air. The minimum outside air percentage is often programmed in the building management systems (BMS) as 0%. While many of the units do take advantage of free cooling when outside air conditions permit, their fresh air dampers are completely closed during the heating season. Operating in this manner reduces energy consumption at the expense of building indoor air quality (IAQ). A lack of fresh air in a facility can adversely affect air quality by raising CO₂ concentrations, creating "sick building syndrome".



ECM #9: Demand Controlled Ventilation (cont'd)

Dome-Tech, Inc.

➤ Recommended Measures

- ❖ 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/or where occupancy varies dramatically (gymnasiums and libraries).
- ❖ Because CO₂ levels correlate directly with the number of people in an occupied zone, CO₂ sensors are used to control 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.
- ❖ Dome-Tech recommends adding DCV control sequences, including CO₂ sensors, related hardware, and controls programming. This will allow air handling units to provide the correct outside air ventilation rates for any particular occupancy level.
- ❖ Dome-Tech also recommends testing CO₂ sensor calibrations, per the manufacturer's calibration schedule.
- ❖ The chart below indicates the RTUs/areas where the control sequence should be installed:

School	Area/ AHU to Install DCV
Brookdale Avenue School	Gym / Café AHUs (2) and Media Center RTU
F.N. Brown School	Gym / Café AHU and Auditorium AHUs (2)
Forest Avenue School	Gym AHUs (2)
H.B. Whitehorne Middle School	1967 Gym AHUs (4), Other Gym/ Auditorium AHUs (2), New Café RTU, Computer Room RTU and Media Center RTU
Laning Avenue School	Gym 1 AHUs (2), Café / Auditorium attic-hung AHU
Verona High School	Old Gym AHUs in penthouses (2), New Gym AHUs (2), Auditorium RTU and Cafeteria RTU



ECM #10: Replace Window ACs w/ DX Split

	F.N. Brown School	Forest E.S.	Laning Avenue School	TOTAL
Estimated Annual Savings:	\$140	\$680	\$60	\$880
Gross Estimated Implementation Cost ¹ :	\$12,500	\$11,200	\$6,870	\$30,570
Approx. NJ Smart Start Rebate ² :	\$120	\$280	\$80	\$480
Net Estimated Implementation Cost:	\$12,400	\$10,900	\$6,790	\$30,090
Simple Payback (years):	88.6	16.0	113.2	34.2
Annual Avoided CO ₂ Emissions (tons):	0.5	1	0.2	2.0

¹ Cost estimates based on RSMeans cost estimating data.

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

➤ Observations/Issues

There are window air conditioning units located in various schools. The use of window air conditioners results in air infiltration simply by the nature of their installation method. They also are less efficient than alternative cooling methods.

➤ Recommended Measures

Replace window air conditioning units with ductless split air conditioning systems similar to those that are installed throughout the District. The Seasonal Energy Efficiency Ratio (SEER) of typical window AC units is limited to approximately 10 SEER, while comparably sized split AC units range from 14-16 SEER or greater.

- ❖ FN Brown: 2 units (includes spot cooler in Music Tech Room & Kitchen Unit)
- ❖ Forest E.S.: 1 unit (Library AC)
- ❖ Laning Avenue School: 1 unit (Special Instruction Room)

ECM #11: Replace Boilers with High Efficiency Modulating Condensing Boilers

- Several of the Verona Schools are equipped with older fire tube, heating hot water or boilers.
- For the most part, these boilers are old and are nearing or past the end of the equipment service life (ASHRAE states the service life of similar equipment to be 25 years).
- The ages, sizes, types and configurations of the boilers do not lend themselves to efficient operation. Generally, as boilers approach the end of their service life, the efficiency degrades and the boiler must consume more fuel in order to produce the same rated output. In addition, there is a direct correlation between risk of equipment failure (tube breaks & meltdown, shell cracks, furnace surface area failure) and equipment age.
- If the existing boilers could be replaced by high efficiency, modulating or modular condensing boilers, savings will be realized in two ways.
 - Modulating boilers, usually 1,000 MBH or smaller, employ multiple burners to meet the heating load. Each burner operates independently, eliminating the “all on/all off” operation of single burner boilers. As building loads increase only those burners necessary to meet the load are fired. This allows each burner to run at optimal efficiency. Modular boilers operate under the same principal but for larger installations. In this case multiple boilers are used rather than multiple burners. Modular boilers usually are employed in 1500, 2000 or 3000 MBH sizes.
 - Condensing boilers recover energy from the exhaust gas thus allowing efficiencies of 90% and above.
- When a boiler is both a modulating/modular type and a condensing type, extremely high efficiencies can be realized.



Forest E.S. Boiler

ECM #11: Replace Boilers with High Efficiency Modulating Condensing Boilers (cont'd)

The high first cost of a new boiler system may preclude this ECM from being justified by economics alone at some of the facilities; however, reliability issues warrant consideration of these projects as part of a long-term capital improvement plan. The ECM table details the economics at each site

	Brookdale E.S	Forest	Laning E.S.	Verona HS	TOTAL
Estimated Annual Savings:	\$920	\$1,100	\$1,870	\$3,670	\$7,560
Gross Estimated Implementation Cost ¹ :	\$344,000	\$344,000	\$344,000	\$572,000	\$1,604,000
NJ Smart Start Rebate ² :	\$10,500	\$10,500	\$10,500	\$18,400	\$49,900
Avoided Cost (Like and Kind Replacement): *	\$216,000	\$216,000	\$247,000	\$299,000	\$978,000
Net Estimated Incremental Implementation Cost:	\$118,000	\$118,000	\$86,500	\$255,000	\$577,500
Estimated Simple Payback (years): <i>(Incremental and without Avoided Costs)</i>	128.3	107.3	46.3	69.5	76.4
Annual Avoided CO ₂ Emissions (tons):	5	6	11	23	44

NOTE 1: The presented economics should be used for planning purposes only. If the client decides to proceed with any boiler replacement project, these economics should be refined with an investment grade analysis.

* = Avoided Cost: Cost of Like and Kind replacement..



O&M: Supply Correct Outside Air Ventilation

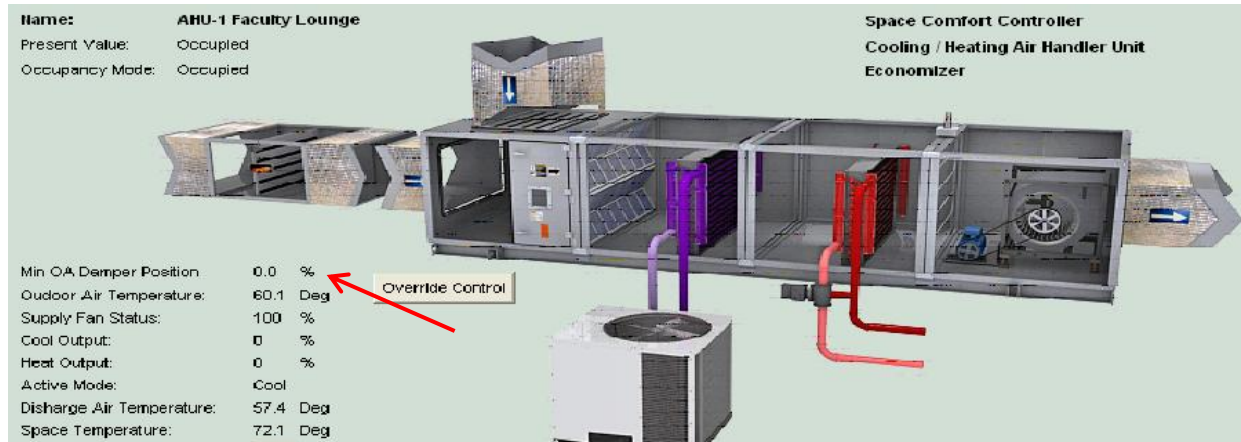
	Brookdale E.S.	F.N. Brown School	Forest E.S.	H.B. Whitehorne M.S.	Laning Avenue School	Verona High School	TOTAL
Estimated Annual Energy <i>Penalty</i> :	\$740	\$1,250	\$690	\$2,500	\$2,080	\$3,060	\$10,320

➤ Observations/Issues

Many of the school district’s air handling units operate without ventilation air. The minimum outside air percentage is often programmed in the building management systems (BMS) as 0%. While many of the units do take advantage of free cooling when outside air conditions permit, their fresh air dampers are completely closed during the heating season.

Also, areas at Brookdale Avenue Elementary School are inadequately ventilated because some unit ventilators have their outside air intakes covered with either Plexiglas or plywood in an attempt to prevent freezing coils.

A lack of fresh air in a facility can adversely affects air quality by raising CO₂ concentrations, creating “sick building syndrome”.



Example screenshot of unit operating w/ 0% outside air (typ.)



➤ Recommended Measures

- ❖ Re-program BMS for all air handling units to utilize minimum design outside air percentages (typically ~20% of total airflow).
- ❖ Remove Plexiglas/plywood from the inlets of unit ventilators at Brookdale. Install freeze-stats to open the heating valves and start heating pump to circulate water, to prevent coil damage during freezing conditions.
- ❖ Increasing ventilation rates will increase energy consumption (estimated energy cost penalty shown above), but will satisfy building code requirements and improve air quality.
- ❖ Much of the energy penalty associated with this issue can be offset by implementing demand controlled ventilation (see ECM#8)



O&M: Brookdale Elementary School

- **Observations/Issues**
Unit vent intakes are covered (due to past coil freezing issues).
Operation in this manner does not provide adequate ventilation to the building.



- **Recommended Measures**
Remove Plexiglas and plywood over unit vent OA intakes.

- **Observations/Issues**
Small amount of bare uninsulated DHW piping observed at Brookdale Elementary, directly above water heater



- **Recommended Measures**
Insulate DHW piping ~8ft of ¾" directly above water heater



O&M: F.N. Brown Elementary School



Observations/Issues

FNB utilizes many DX split units. Units are approximately 10 years old and half-way through their useful lives.



Recommended Measures

Consider 2 pipe VRV system at end of equipment useful life.



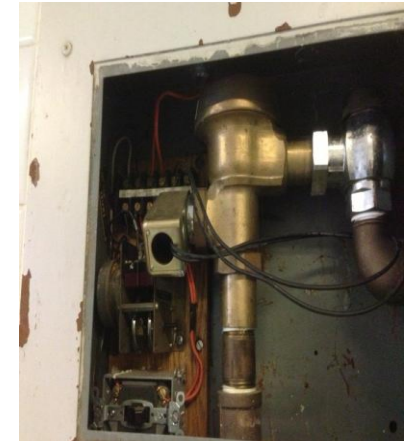
F.N. Brown School



O&M: Forest Avenue Elementary School

➤ **Observations/Issues**

Three urinals are controlled by door switch and solenoid valve. Solenoid valve leaks.



➤ **Recommended Measures**

Replace with auto flush valves.

➤ **Observations/Issues**

AHU's in Gym/ Auditorium have extremely dirty coils.



➤ **Recommended Measures**

Clean coil with water based neutral-pH coil cleaning solution.

Forest Avenue School



O&M: Forest Avenue Elementary School (cont'd)

- **Observations/Issues**
Art room is too hot due to a blocked exhaust grill located in closet.
- **Recommended Measures**
Relocate exhaust grill to the center of the room to allow air circulation and reduce overheating.



Forest Avenue School



O&M: Laning Avenue Elementary School

- **Observations/Issues**
PTAC unit in Faculty Room 117 has dirty coil. (This building is clean)
- **Recommended Measures**
Clean coil with water based neutral-pH coil cleaning solution.



Room 117 PTAC Coil



O&M: H.B. Whitehorne Middle School

- **Observations/Issues**
Discharge grilles on Café unit vents are dirty.

- **Recommended Measures**
Clean unit vents.



- **Observations/Issues**
Floor mounted urinals flush by way of solenoid valve and timer located in the crawlspace behind the wall.

- **Recommended Measures**
Replace w/ auto flush valves to conserve water.



H.B. Whitehorne Middle School



O&M: H.B. Whitehorne Middle School (cont'd)

- **Observations/Issues**
New water heater installed with PEX piping has not been insulated.
- **Recommended Measures**
Insulate $\frac{3}{4}$ " domestic hot water piping. ~10ft.
- **Observations/Issues**
Walk-in freezer evaporator coil is frozen.
- **Recommended Measures**
Install defrost cycle.

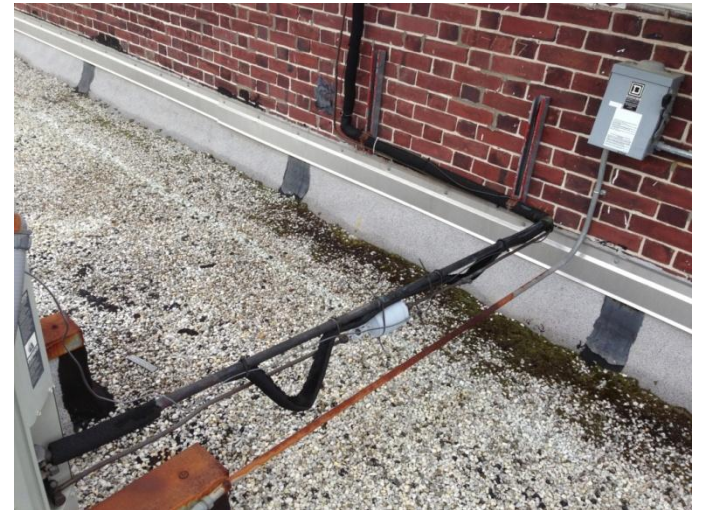


H.B. Whitehorne Middle School



O&M: H.B. Whitehorne Middle School (cont'd)

- **Observations/Issues**
Small domestic hot water pumps (1/12 HP) are energized 24/7.
- **Recommended Measures**
Install aquastat and operate recirculation pumps based on loop temp.
- **Observations/Issues**
Approximately 10 feet of refrigerant piping on roof (to UV-22 condenser) has damaged insulation.
- **Recommended Measures**
Reinsulate to improve system efficiency and increase system output.



H.B. Whitehorne Middle School



O&M: Verona High School

Dome-Tech, Inc.

➤ **Observations/Issues**
Door Switch flushes 4 urinal simultaneously.

➤ **Recommended Measures**
Replace w/ auto flush urinals.

➤ **Observations/Issues**
Exhaust fans are manually turned on at 6am and off at 11pm. Building occupancy varies and there are classes/ events after regular hours.

➤ **Recommended Measures**
Determine an optimum time to shut off exhaust fans that does not disrupt afterschool activities.



Verona High School



O&M: Verona High School (cont'd)

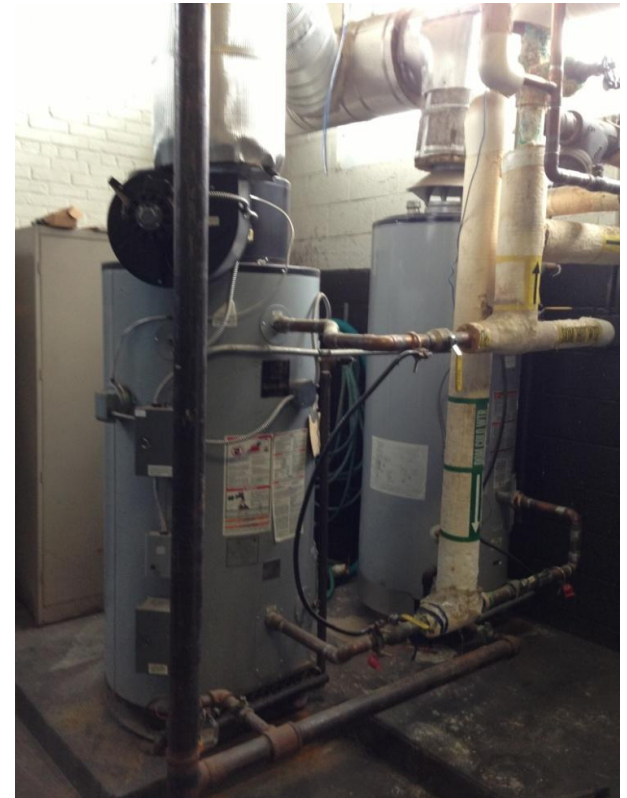
➤ Observations/Issues

Domestic Water setpoint is at 160°F.

Setpoint was noted while one water heater was offline and may have been raised to satisfy building demands while second unit is being replaced.

➤ Recommended Measures

Reduce setpoints to 120-125°F after completion.



Verona High School



O&M: Verona High School (cont'd)

➤ Observations/Issues

Boiler Reset functions are no longer functioning properly. Boiler temp setpoint is adjusted by staff periodically.

➤ Recommended Measures

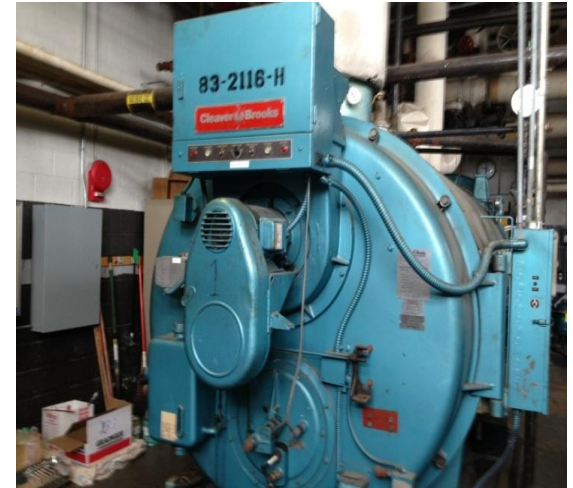
Automatic reset function should be restored. (Because setpoint is being adjusted, proper reset savings are difficult to quantify).

➤ Observations/Issues

RTU-3 serving the café utilizes an enthalpy heat recovery wheel., which is dirty.

➤ Recommended Measures

Clean heat wheel to optimize heat recovery.



Verona High School



O&M: Verona High School (cont'd)

- **Observations/Issues**
HS utilizes many DX split units. Units are approx 10yrs old and ½ way through useful life.
- **Recommended Measures**
Consider 2- pipe VRV system at end of useful life.



Verona High School



O&M: Verona High School (cont'd)

- **Observations/Issues**
HHW pumps have rusted flex connectors (2).
- **Recommended Measures**
Replace prior to failure.



Verona High School



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.



Renewable Energy Technologies: Wind

Wind turbines generate electricity by harnessing a wind stream's kinetic energy as it spins the turbine airfoils. As with most renewable energy sources, wind energy is subject to intermittent performance due to the unpredictability of wind resources.

NJ Wind Speed

As previously stated, wind speed is critical to the successful wind turbine installation. According to average wind data from NASA's Surface Meteorology and Solar Energy records, the average annual wind speed for the Verona area is **5.8 meters per second** at 50 meters above the surface of the earth. Ideal wind speeds for a successful project should average over **6 meters per second**.

For the Verona School District, Dome-Tech considered three (3) types of wind turbine technologies; building integrated wind turbines (1 kW each) and traditional ground mounted wind turbines (5 kW & 50 kW).

Building Integrated Wind Turbines

Model: AeroVironment AVX1000
Height: 8.5'
Rotor Diameter: 6'
Weight: 130 lbs.
Cut-In Wind Speed: 2.2 m/s
Maximum Generating Capacity: 1kW

5 kW Ground Mount

Model: WES5 Tulipo
Height: 40'
Rotor Diameter: 16'
Weight: 1,900 lbs.
Cut-In Wind Speed: 3.0 m/s
Maximum Generating Capacity: 5.2 kW

50 kW Ground Mount

Model: Entegrity EW50
Height: 102'
Rotor Diameter: 50'
Weight: 21,000 lbs.
Cut-In Wind Speed: 4.0 m/s
Maximum Generating Capacity: 50 kW





Renewable Energy Technologies: Wind (cont'd)

The project economics and wind turbine pros and cons are presented in the following tables:

Wind Turbine Economics

	Building Integrated	Ground Mount 5 kW	Ground Mount 50 kW
Gross Installation Cost Estimate	\$325,000	\$312,000	\$250,000
Number of Units	50	10	1
Net Installation Cost Estimate	\$325,000	\$312,000	\$250,000
Annual Energy Savings	\$6,308	\$9,956	\$18,780
Simple Payback	51.5 yrs.	31.3 yrs.	13.3 yrs.
System Capacity	50 kW	52 kW	50 kW
Annual Avoided Energy Use	37,108 kWh	58,567 kWh	110,472 kWh
Annual CO2 Emissions, tons	13	20	39
% of Annual Electric Use*	4.6%	7.3%	13.8%

Verona High School: 798,601 kWh/year annual consumption

Wind Turbine Pros & Cons

Pros	Cons
<ul style="list-style-type: none"> ➤ Annual reduction in energy spend and use can be potentially reduced by \$18,780 (2.5% reduction). ➤ Typical equipment life span is 15-30 years. ➤ Reduction of annual greenhouse gas emissions by 39 tons per year. ➤ A wind turbine project could be incorporated into science and other curriculums to raise student awareness of energy alternatives. ➤ High visible "green" project. 	<ul style="list-style-type: none"> ➤ Payback period is at least 13.3 years. ➤ Average area wind speed is just below minimum requirements. ➤ Prone to lightning strikes. ➤ Bird collisions are likely, but may be reduced with avian guard (building integrate only). ➤ Zoning may be an issue. Check with local zoning regulations. ➤ Wind turbines do create noise, although below 50 dB (a typical car ride is over 80 dB).

Due to an average annual wind speed of 5.8 meters/sec, which is slightly below the minimum required wind speed of 6.0 meters/sec, Dome-Tech does not recommend installation of a wind turbine.

The New Jersey State Clean Energy Program does not currently provide rebates for small wind system projects.



➤ 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 as parking lots, in overhead mounting.



Renewable Energy Technologies: Solar Photovoltaic (cont'd)

Building	BROOKDALE AVENUE ELEMENTARY SCHOOL	LANING AVENUE ELEMENTARY SCHOOL	F.N. BROWN ELEMENTARY SCHOOL	FOREST AVENUE ELEMENTARY SCHOOL	H.B. WHITEHORNE MIDDLE SCHOOL	VERONA HIGH SCHOOL	TOTALS
Site Energy Use (kWh):	329,200	329,200	329,200	329,200	329,200	329,200	1,975,200 kw dc
Location to Install Panels:	roof	roof	roof	roof	roof	roof	roof
Assumptions							
System Capacity, kw-dc (maximum utilization of roof space)	40 kw dc	127 kw dc	39 kw dc	61 kw dc	104 kw dc	309 kw dc	681 kw dc
Annual Electric Generation, kWhs of AC electricity produced	42,666 kwh	134,058 kwh	41,454 kwh	63,999 kwh	109,695 kwh	325,449 kwh	717,321 kw dc
Total Annual Facility Electric Use, kWhs	329,200 kwh	329,200 kwh	329,200 kwh	329,200 kwh	329,200 kwh	329,200 kwh	1,975,200 kw dc
% of Total Annual Usage	13%	41%	13%	19%	33%	99%	36%
All-In Cost of Electric Year 1	\$0.155 / kwh	\$0.151 / kwh	\$0.172 / kwh	\$0.152 / kwh	\$0.154 / kwh	\$0.170 / kwh	\$0.159 / kwh
Annual Electric Cost Savings	\$6,605	\$20,247	\$7,122	\$9,705	\$16,923	\$55,316	115,917 kw dc
Estimated SREC Value (Year 1):	\$100 / SREC	\$100 / SREC	\$100 / SREC	\$100 / SREC	\$100 / SREC	\$100 / SREC	\$100 / SREC
Estimated Year 1 SREC Revenue:	\$4,247	\$13,343	\$4,126	\$6,370	\$10,918	\$32,392	71,395 kw dc
Environmental Impact							
Equivalent Annual CO2 Emission Reduction (tons per year) ¹	14 tons/yr	44 tons/yr	14 tons/yr	21 tons/yr	36 tons/yr	107 tons/yr	237 tons/yr
Equivalent Cars Removed From Road Annually ²	2	8	2	4	6	19	7
Equivalent Acres of Trees Planted Annually ³	4	12	4	6	10	29	65
Financial Results							
System Installed Cost	\$222,640	\$699,545	\$216,315	\$333,960	\$572,413	\$1,698,263	\$3,743,135
Simple Payback	20.0	20.4	18.2	20.3	20.0	18.3	19.5
IRR (25 Years)	1.7%	1.5%	2.4%	1.5%	1.7%	2.4%	1.9%
Net Present Value (25 yrs, 4% discount rate)	(\$47,364)	(\$158,731)	(\$32,275)	(\$75,003)	(\$122,938)	(\$265,040)	(\$701,350)



Solar Photo Voltaic System

➤ Non-Financial Benefits of Solar PV

The implementation of solar PV projects at the Verona schools would place your facilities at the forefront of renewable energy utilization. This allows the Verona 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, separation 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 Verona Schools, due to the lack of year-round thermal load.



Retail Energy Purchasing: Recommendations and Resources

Electric

- For the period studied, Verona School District was utilizing Direct Energy as a Third Party Supplier for electricity at all schools at a fixed rate of \$0.088 per kWh starting in Jan 2012. Direct Energy contracts were not provided to Dome-Tech therefore further details about the term of contract were unknown.
- Dome-Tech recommends the District evaluate their current contract with Direct Energy. All schools utilized a third party supplier at fixed rate but for an undetermined period of time. Based on information received, these accounts were locked into a new fixed price contract in early 2012 that may have already ended.

Natural Gas

- For the period studied, the District was utilizing Hess Corp. as a Third Party Supplier for natural gas at a fixed rate of \$0.68 per therm in the summer period and a variable floating rate in the winter period. The Hess contract began in September 2011 and the previous supplier was Compass Energy. Supplier contracts and invoices were not provided therefore Dome-Tech was unable to include further contract details in this report.
- If the District is seeking budget certainty or would like to reduce their market exposure for Natural Gas, the District should consider a fixed price contract with a supplier. Further details are outlined in the following sections.

Energy Purchasing Co-Operatives

- Many public entities participate in various energy aggregation buying groups. Sometimes, an entity will have multiple options to choose from. These might include purchasing through a County co-operative, or purchasing through a trade-type association like ACES. It is likely that Verona School District currently participates in ACES. Co-operative purchasing may not necessarily provide you with the lowest rates; however, there is often substantial volume, and it can represent a good alternative for entities with limited energy consumption who can have a difficult time getting energy suppliers to respond to them on a direct, singular basis.



Retail Energy Purchasing: Recommendations and Resources

- 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, please 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
IntegrYS	X		integrYSenergy.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. Refer to the BPU website for current supplier list.*



Utility Tariff and Rate Review: Electricity

- **Accounts and Rate Class:** The District has six facilities included in this study and each school has its own electric account. All accounts are served by Public Service Electric & Gas under rate classes General Lighting and Power (GLP) or Large Power and Lighting (LPL-S) and Direct Energy as a third party supplier.

Note: F.N. Brown Elementary and Verona High School appear to have multiple combined meters but their own account numbers.

- **Electric Consumption and Cost:** Based on the one-year period studied, the total annual electric expenditure for is about \$338,000 and the total annual consumption is about 2,094,000 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 15.1¢/kWh to 17.1¢/kWh, inclusive of utility delivery charges. The District's overall, average cost per kilowatt-hour during this period was 16.2¢/kWh.
 - *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:** The District has six facilities included in this study each with its own natural gas account. All accounts are served by Public Service Electric & Gas under rate class Large Volume Gas (LVG) and Hess Corp. as the Third Party Supplier.

- **Natural Gas Consumption and Cost:** Based on the one-year period studied, the total annual natural gas expenditure for the District is about \$174,000 and the total annual consumption is about 170,000 therms. Natural Gas is used mostly in the winter period for heating purposes.

- **Average/Effective Rate per Therm:** For the one year period studied, the District's overall, average cost was \$1.022 per therm.
 - *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 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:

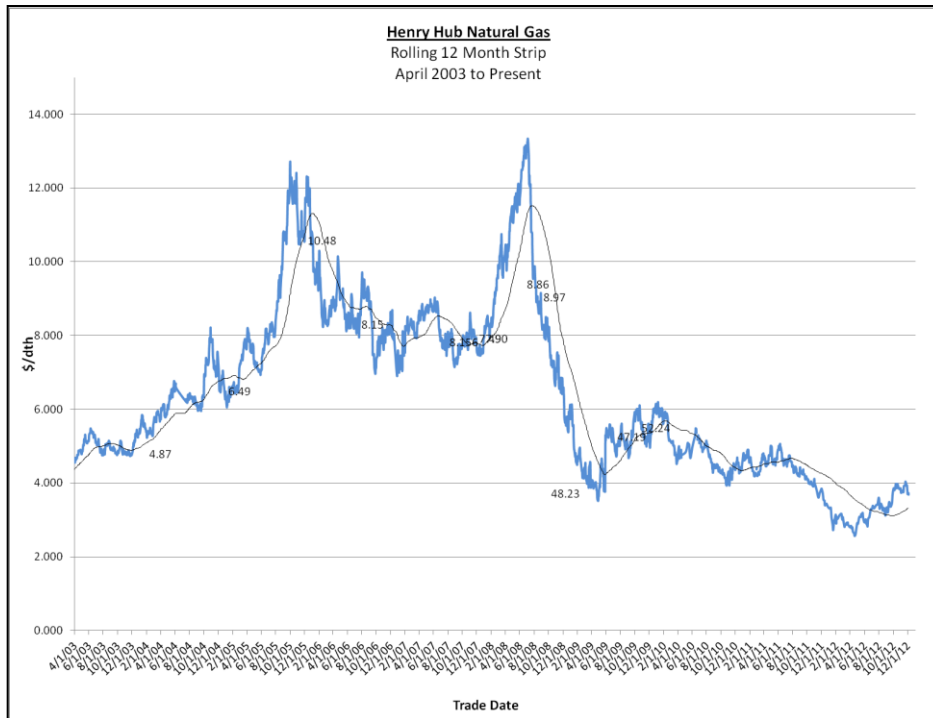
- The natural gas market in New Jersey is also deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. While natural gas is a commodity that is exceptionally volatile and that is traded minute-by-minute during 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.



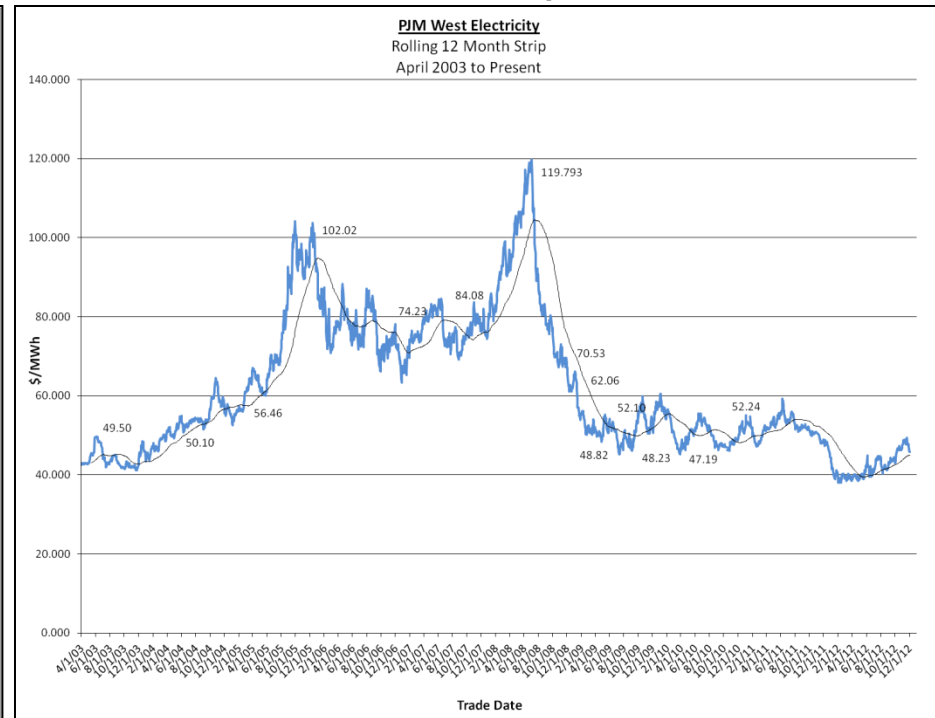
Historical Energy Futures Settlement Prices

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:**
 - *Piping Insulation*
 - *PC Power Management*
 - *Implement a Steam Trap Repair Program*
 - *Replace Electric Water Heaters with Gas*
 - *Replace CRT Screens with Flat Screen Monitors*
 - *Lighting Upgrades*

Note that additional "Phase 2" engineering may be required to further develop these projects, to bring them to bidding and implementation.

- **Consider applying for Pay-For-Performance Program**
- **Continue with ESIP process**



www.dome-tech.com

510 Thornall Street, Suite 170
Edison, NJ 08837
Tel: 732.590.0122
Fax: 732.590.0129

PORTFOLIO MANAGER / ENERGY STAR



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energystar.gov

ENERGY STAR® Statement of Energy Performance

70

ENERGY STAR®
Score¹

Verona - Brookdale Avenue School

Primary Property Function: K-12 School

Gross Floor Area (ft²): 37,972

Built: 1928

For Year Ending: June 30, 2012

Date Generated: August 22, 2013

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

Verona - Brookdale Avenue School
14 Brookdale Court
Verona, New Jersey 07044

Property Owner

, _____
(____)____-_____

Primary Contact

, _____
(____)____-_____

Property ID: 3551278

Energy Consumption and Energy Use Intensity (EUI)

Site EUI

40.9 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu) 512,728 (33%)
Natural Gas (kBtu) 1,039,700 (67%)

National Median Comparison

National Median Site EUI (kBtu/ft²) 49.8
National Median Source EUI (kBtu/ft²) 86.6
% Diff from National Median Source EUI -18%

Source EUI

71.1 kBtu/ft²

Annual Emissions

Greenhouse Gas Emissions (MtCO2e/year) 120

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® Statement of Energy Performance

7

Verona - F.N. Brown School

Primary Property Function: K-12 School

Gross Floor Area (ft²): 38,985

Built: 1932

**ENERGY STAR®
Score¹**

For Year Ending: June 30, 2012

Date Generated: August 22, 2013

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

Verona - F.N. Brown School
125 Grove Avenue
Verona, New Jersey 07044

Property Owner

, _____
(____)____-_____

Primary Contact

, _____
(____)____-_____

Property ID: 3551293

Energy Consumption and Energy Use Intensity (EUI)

Site EUI

87 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu) 2,604,140 (77%)
Electric - Grid (kBtu) 789,101 (23%)

National Median Comparison

National Median Site EUI (kBtu/ft²) 53.5
National Median Source EUI (kBtu/ft²) 82.2
% Diff from National Median Source EUI 63%

Source EUI

133.7 kBtu/ft²

Annual Emissions

Greenhouse Gas Emissions (MtCO2e/year) 238

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® Statement of Energy Performance

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ENERGY STAR®
Score¹

Verona - Forest Avenue School

Primary Property Function: K-12 School
Gross Floor Area (ft²): 27,750
Built: 1928

For Year Ending: June 30, 2012
Date Generated: August 22, 2013

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

Verona - Forest Avenue School
118 Forest Avenue
Verona, New Jersey 07044

Property Owner

, _____
(____)____-_____

Primary Contact

, _____
(____)____-_____

Property ID: 3551295

Energy Consumption and Energy Use Intensity (EUI)

Site EUI	Annual Energy by Fuel		National Median Comparison	
62 kBtu/ft²	Natural Gas (kBtu)	1,252,200 (73%)	National Median Site EUI (kBtu/ft²)	58.7
	Electric - Grid (kBtu)	467,048 (27%)	National Median Source EUI (kBtu/ft²)	94.9
			% Diff from National Median Source EUI	6%
Source EUI	Annual Emissions			
100.2 kBtu/ft²	Greenhouse Gas Emissions (MtCO2e/year)		126	

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® Statement of Energy Performance

81

ENERGY STAR®
Score¹

Verona - H.B. Whitehorne

Primary Property Function: K-12 School

Gross Floor Area (ft²): 118,224

Built: 1922

For Year Ending: June 30, 2012

Date Generated: August 22, 2013

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

Verona - H.B. Whitehorne
600 Bloomfield Avenue
Verona, New Jersey 07044

Property Owner

, _____
(____)____-_____

Primary Contact

, _____
(____)____-_____

Property ID: 3551272

Energy Consumption and Energy Use Intensity (EUI)

Site EUI

48 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu) 3,883,730 (68%)
Electric - Grid (kBtu) 1,796,316 (32%)

National Median Comparison

National Median Site EUI (kBtu/ft²) 66.7
National Median Source EUI (kBtu/ft²) 114.2
% Diff from National Median Source EUI -28%

Source EUI

82.2 kBtu/ft²

Annual Emissions

Greenhouse Gas Emissions (MtCO₂e/year) 434

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® Statement of Energy Performance

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ENERGY STAR®
Score¹

Verona - Laning Avenue School

Primary Property Function: K-12 School

Gross Floor Area (ft²): 46,477

Built: 1911

For Year Ending: June 30, 2012

Date Generated: August 22, 2013

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

Verona - Laning Avenue School
18 Laning Road
Verona, New Jersey 07044

Property Owner

, _____
(____)____-_____

Primary Contact

, _____
(____)____-_____

Property ID: 3551274

Energy Consumption and Energy Use Intensity (EUI)

Site EUI

70.8 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu) 2,452,713 (75%)
Electric - Grid (kBtu) 835,667 (25%)

National Median Comparison

National Median Site EUI (kBtu/ft²) 52.4
National Median Source EUI (kBtu/ft²) 82.8
% Diff from National Median Source EUI 35%

Source EUI

111.9 kBtu/ft²

Annual Emissions

Greenhouse Gas Emissions (MtCO₂e/year) 236

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® Statement of Energy Performance

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ENERGY STAR®
Score¹

Verona - Verona High School

Primary Property Function: K-12 School

Gross Floor Area (ft²): 120,245

Built: 1956

For Year Ending: June 30, 2012

Date Generated: August 22, 2013

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

Verona - Verona High School
151 Fairview Avenue
Verona, New Jersey 07044

Property Owner

, _____
(____)____-_____

Primary Contact

, _____
(____)____-_____

Property ID: 3551223

Energy Consumption and Energy Use Intensity (EUI)

Site EUI

70.8 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu) 5,805,820 (68%)
Electric - Grid (kBtu) 2,705,689 (32%)

National Median Comparison

National Median Site EUI (kBtu/ft²) 80.5
National Median Source EUI (kBtu/ft²) 138.1
% Diff from National Median Source EUI -12%

Source EUI

121.4 kBtu/ft²

Annual Emissions

Greenhouse Gas Emissions (MtCO2e/year) 651

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)



www.dome-tech.com

510 Thornall Street, Suite 170
Edison, NJ 08837
Tel: 732.590.0122
Fax: 732.590.0129

EQUIPMENT INVENTORY LISTS

**VERONA SCHOOL DISTRICT
Brookdale Avenue School**

EQUIPMENT LIST

Fans														
Bldg	Tag#	Location	Area Serving	Equipment	Quantity	Mfg	Model	Fuel	CFM	Output Btuh	Age	Estimated Service Life	Efficiency	Notes
Brookdale	EF#1	Roof		Exhaust Fan		Cook	135ace				1998	20		
Brookdale	EF#4	Roof		Exhaust Fan		Cook	90acem				1998	20		
Brookdale	EF#2	Roof		Exhaust Fan		Cook	1203cb				1998	20		
Brookdale	EF#4	Roof		Exhaust Fan		Cook	150c2e				1998	20		
Brookdale	EF#5	Roof		Exhaust Fan		Cook	150c4b				1998	20		
Brookdale	EF#6	Roof		Exhaust Fan		Cook	150c2e				1998	20		
Brookdale	EF#7	Roof		Exhaust Fan		Cook	180c4b				1998	20		
Brookdale	EF#3	Roof		Exhaust Fan		Dayton					1998	20		
Brookdale	EF#3	Roof		Exhaust Fan		CaptiveAir	du50hfa				1998	20		
Brookdale	EF#8	Roof		Exhaust Fan		Cook	150c2e				1998	20		
Brookdale	EF#12	Roof	gym	Exhaust Fan		Cook					1998	20		
Brookdale	EF#13	Roof	stage	Exhaust Fan		Cook					1998	20		

Ventilators															
Bldg	Tag#	Location	Area Serving	Equipment	Mfgr	Model	Quantity	GPM	Head ft	HP	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
Brookdale	CH	Corridors / Stairs / Boys BR / Gym	Corridors / Stairs / Boys BR / Gym	Cabinet Unit Heaters	Trane		-7						No	1998	20
Brookdale	uv#1	art room	art room &	Unit Vent w/ DX	MagicAire		1						No	1998	20
Brookdale	uv#10	rm 8	rm 8	Unit Ventilator	MagicAire		1						No	1998	20
Brookdale	uv#11	rm 7	rm 7	Unit Ventilator	MagicAire		1						No	1998	20
Brookdale	uv#12	rm 6	rm 6	Unit Ventilator	MagicAire		1						No	1998	20
Brookdale	uv#13	computer rm	computer rm	Unit Ventilator	MagicAire		1						No	1998	20
Brookdale	uv#2	ldtc 113	ldtc 113	Unit Ventilator	MagicAire		1						No	1998	20
Brookdale	uv#3	sgi 112	sgi 112	Unit Ventilator	MagicAire		1						No	1998	20
Brookdale	uv#5	kindergarten	kindergarten	Unit Ventilator	MagicAire		1						No	1998	20
Brookdale	uv#8	rm 2	rm 2	Unit Ventilator	MagicAire		1						No	1998	20
Brookdale	uv#9	rm 1	rm 1	Unit Ventilator	MagicAire		1						No	1998	20

VAVs															
Bldg	Tag#	Location	Area Serving	Equipment	Mfgr	Model	Quantity	GPM	Head ft	HP	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
Brookdale	vav#1	Ceiling	media 201	VAV Box			1							1998	20
Brookdale	vav#2	Ceiling	computer room	VAV Box			1							1998	20
Brookdale	vav#3	Ceiling	corridor 208	VAV Box			1							1998	20
Brookdale	vav#4	Ceiling	girls toilet	VAV Box			1							1998	20
Brookdale	vav#5	Ceiling	media office	VAV Box			1							1998	20
Brookdale	vav#6	Ceiling	media center	VAV Box			1							1998	20
Brookdale	vav#10	Ceiling	rm 302	VAV Box			1							1998	20
Brookdale	vav#11	Ceiling	boys toilet 308	VAV Box			1							1998	20
Brookdale	vav#12	Ceiling	corridor 301	VAV Box			1							1998	20
Brookdale	vav#7	Ceiling	sgi 306	VAV Box			1							1998	20
Brookdale	vav#8	Ceiling	lld 304	VAV Box			1							1998	20
Brookdale	vav#9	Ceiling	rm 303	VAV Box			1							1998	20

VERONA SCHOOL DISTRICT
 F.N. Brown Elementary School
 EQUIPMENT LIST

Boilers

Bldg	Tag#	Location	Area Serving	Equipment	Mfg	Model	Quantity	Fuel	Heating Input Btuh	Output Btuh	Age	Estimated Service Life	Efficiency	Notes
FN Brown		Boiler Room	Steam Heat & HX	Boiler	Cleaver Brooks	CB700 100 015	2	nat ga	4,184,000		1998	30		

Heating Hot Water Pumps

Bldg	Tag#	Location	Area Serving	Equipment	Pump Mfg	Pump Model	Motor Mfg	Motor Model	Quantity	GPM	Head ft	HP	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
FN Brown		Boiler Room	HHW System (HX)	HHW Pump	B&G		ITT	M3154T	2			0.5, 1phase			NO	1998	20

Heat Exchangers

Bldg	Tag#	Location	Area Serving	Equipment	Type	Make	Model	GPM	Head ft	HP	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
FN Brown	HX	Boiler Room	Lower Level Fan Coils & FinTube	Heat Exchanger	Shell & Tube										24

VERONA SCHOOL DISTRICT
 F.N. Brown Elementary School
 EQUIPMENT LIST

Air Handling Units - AHUs

Bldg	Tag#	Location	Area Serving	Equipment	Mfg	Model	Quantity	Cooling Capacity (Tons)	Cooling Technology	Heating Technology	Heating Capacity (MBH)	Heating GPM	Supply Air CFM	Static Pressure w.c.	Fan HP	Age	Estimated Service Life	Efficiency	Controls	Notes:
FN Brown	AHU-1,2	Auditorium	Auditorium	AHU	Trane		2		na	Steam						1998	20			
FN Brown	AHU-1	Gym	Gym	AHU	Trane		1		na	Steam					2	1998	20			

VERONA SCHOOL DISTRICT
F.N. Brown Elementary School
EQUIPMENT LIST

Condensing Units

Bldg	Tag#	Location	Area Serving	Equipment	Type	Mfg	Quantity	Model	Tons	kW/Ton	Refrigerant	VFD?	Estimated Service Life
FN Brown	SAC01	OUTSIDE	Library Office	COND	Scroll	Mitsubishi	1	Slim - PU18EK1	1.5	12A COMP	R22	1998	20
FN Brown	SAC02	OUTSIDE	Nurses Office	COND	Scroll	EMI	1	S1CA8000		5.4A COMP	R22	1998	20
FN Brown	SAC03	OUTSIDE	Computer Lab	COND	Scroll	EMI	1	S1CA4000		8A COMP,	R22	1998	20
FN Brown	SAC04	OUTSIDE	Main Office	COND	Scroll	EMI	1	S1CA4000		8A COMP,	R22	1998	20
FN Brown	SAC05	OUTSIDE	Teachers Work Room	COND	Scroll	YORK	1	AFFINITY, CZB02411A	2	12.8A COM	R410	1998	20
FN Brown	SAC06	OUTSIDE	Principal's Office	COND	Scroll	Freidrich	1	MR24C3E	2	9.6A COMP	R22	1998	20
FN Brown	SAC07	OUTSIDE	Faculty Room	COND	Scroll	Mitsubishi	1	Slim - mu24wn	2	16A COMP	R22	1998	20
FN Brown	SAC08	OUTSIDE	MUSIC	COND	Scroll	TRANE	1	XB13, 2TT13304ZA1000AA		15.4A COM	R22	1998	20
FN Brown	SAC09	OUTSIDE	CHILD STUDY	COND	Scroll	YORK	1	AFFINITY, CZB01811A	1.5	10.3A COM	R410	1998	20
FN Brown	SAC10	OUTSIDE	OT/PT	COND	Scroll	YORK	1	AFFINITY, CZB01811A	1.5	10.3A COM	R410	1998	20
FN Brown	SAC11	OUTSIDE	SGI	COND	Scroll	YORK	1	AFFINITY, CZB01811A	1.5	10.3A COM	R410	1998	20

VERONA SCHOOL DISTRICT
F.N. Brown Elementary School

EQUIPMENT LIST

Domestic Hot Water

Bldg	Tag#	Location	Area Serving	Equipment	Quantity	Mfg	Model	Fuel	Gal	Btuh Input	# of elements	Age	Estimated Service Life	Notes
FN Brown		Boiler Room	Domestic Hot Water	Water Heater	1	BRADFORD WHITE	Defender M2XR504T6FBN	Natural Gas	48 gal	65,000		1998	20	

Fans														
Bldg	Tag#	Location	Area Serving	Equipment	Quantity	Mfg	Model	HP	CFM	Output Btuh	Age	Estimated Service Life	Efficiency	Notes
FN Brown	EF#1	Roof	work room	Exhaust Fan	Cook						1998	20		
FN Brown	EF#10	Auditorium	Auditorium	Exhaust Fan	1	Cook	21CS0NB	0.50				20		
FN Brown	EF#11	Auditorium	Auditorium	Exhaust Fan	1	Cook	21CS0NB	0.50				20		
FN Brown	EF#14	Roof		Exhaust Fan	1	Cook	270cpv				1998	20		
FN Brown	EF#15	Roof	attic	Exhaust Fan	1	Cook	165cpv				1998	20		
FN Brown	EF#2	Roof	attic child study	Exhaust Fan	1	Cook	120cpv				1998	20		
FN Brown	EF#3	Café	Café	Exhaust Fan	1	Cook	120son10d					20		
FN Brown	EF#4	Roof	cafeteria 011	Exhaust Fan	1	Cook					1998	20		
FN Brown	EF#6	Roof	annex	Exhaust Fan	1	Cook					1998	20		
FN Brown	EF#7	Roof	breezeway direct drive	Exhaust Fan	1	Cook					1998	20		
FN Brown	EF#8	Roof	stage	Exhaust Fan	1	Cook					1998	20		
FN Brown	EF#9	Auditorium	Auditorium	Exhaust Fan	1	Cook	21CS0NB	0.50				20		

Ventilators															
Bldg	Tag#	Location	Area Serving	Equipment	Mfgr	Model	Quantity	GPM	Head ft	HP	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
FN Brown	FCU	Art Storage	Art Storage	FCU w/ Dx	Envirotech	HPE08	1							1998	20
FN Brown	UV	Rm A2	Rm A2	Unit Ventilator	Trane		1							1998	20
FN Brown	UV	Rm A3	Rm A3	Unit Ventilator	Trane		1							1998	20
FN Brown	UV	Café#2	Café#2	Unit Vent	Trane		2							1998	20
FN Brown	AC	Kitchen	Kitchen	Window AC	(old)		1							1998	20
FN Brown	FCU	B-8 SGI	B-8 SGI	FCU w/ Dx	Envirotech		1							1998	20
FN Brown	FCU	Physical Therapy	Physical Therapy	FCU w/ Dx	Envirotech		1							1998	20
FN Brown	FCU	Boys BR	Boys BR	FCU	Envirotech		1							1998	20
FN Brown	FCU	North Stair Tower	North Stair Tower	Cabinet Unit Heaters	Envirotech		1							1998	20
FN Brown	FCU	Child Study	Study	FCU w/ Dx	Envirotech	HPE06	1							1998	20
FN Brown	FCU	Rm B9	Rm B9	FCU w/ Dx	Envirotech	HPE06	1							1998	20
FN Brown	FCU	Rm B8	Rm B8	FCU w/ Dx	Envirotech	HPE06	1							1998	20
FN Brown	FCU	Teachers Work Room	Teachers Work Room	FCU w/ Dx	Envirotech	HPE08	1							1998	20
FN Brown	UV#2/UV#14?	Computer Room	Computer Room	Trane UV w/ Dx	Envirotech		1							1998	20
FN Brown	UV	Principals Office	Principals Office	Trane UV w/ Dx	Trane	PTEC090TGB	1							1998	20
FN Brown	UV	Conference Room	Conference Room	Trane UV w/ Dx	Trane	PTEC090TGB	1							1998	20
FN Brown	UV#19	ROOM #11	ROOM #11	Unit Ventilator	trane	uvb125	1							1998	20
FN Brown	UV#20	ROOM #13	ROOM #13	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#21	ROOM #15	ROOM #15	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#22	ROOM #16	ROOM #16	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#17	ROOM #17	ROOM #17	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#18	ROOM #18	ROOM #18	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#3	ROOM #10 resource room	ROOM #10 resource room	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#11	main office a/c	main office a/c	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#12	room #7 2nd grades	room #7 2nd grades	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#1	room b7 007 music a/c	room b7 007 music a/c	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#01	cafeteria	cafeteria	Unit Ventilator	Trane	vuv100	1							1998	20
FN Brown	UV#02	cafeteria 013 right	cafeteria 013 right	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#03	cafeteria 011 left	cafeteria 011 left	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#04	cafeteria 011 right	cafeteria 011 right	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#13	room #6 2nd grades	room #6 2nd grades	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#12	room #7 2nd grades	room #7 2nd grades	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#15	room#1 media center & a/c	room#1 media center & a/c	Unit Ventilator	Trane		1							1998	20
FN Brown	CHs	Corridors / Stairs / Bathrooms	Corridors / Stairs / Bathrooms	Cabinet Heaters			-11							1998	20

Split Units															
Bldg	Tag#	Location	Area Serving	Equipment	Mfg	Model	Quantity	GPM	Head ft	Tons	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
FN Brown	SAC12	Rm A2	Rm A2	Evaporator	Freidrich	MW24CBE									
FN Brown		Main Office	Main Office	Evaporator	EMI										
FN Brown		Nurses Office	Nurses Office	Evaporator	EMI										
FN Brown		Principals Room	Principals Office	Evaporator	Freidrich										

VERONA SCHOOL DISTRICT
 Forest Avenue School
 EQUIPMENT LIST

Boilers

Bldg	Tag#	Location	Area Serving	Equipment	Mfg	Model	Quantity	Fuel	Heating Input Btuh	Output Btuh	Age	Estimated Service Life	Efficiency	Notes
Forest		Boiler Room	HHW System	Boiler	Cleaver Brooks	CB 700 060 030	2	nat ga	2,511,000		1998	30		

Heating Hot Water Pumps

Bldg	Tag#	Location	Area Serving	Equipment	Pump Mfg	Pump Model	Motor Mfg	Motor Model	Quantity	GPM	Head ft	HP	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
Forest		Boiler Room	HHW System	HHW Pumps	TACO	FE1507E	Baldor	M3154T	4			1.5	79.5			1998	20

VERONA SCHOOL DISTRICT
 Forest Avenue School
 EQUIPMENT LIST

Air Handling Units - AHUs

Bldg	Tag#	Location	Area Serving	Equipment	Mfg	Model	Quantity	Cooling Capacity (Tons)	Cooling Technology	Heating Technology	Heating Capacity (MBH)	Heating GPM	Supply Air CFM	Static Pressure w.c.	Fan HP	Age	Estimated Service Life	Efficiency	Controls	Notes:
Forest	RTU	Roof		RTU	Trane	tcc024f100bd	1		DX	Natural Gas							15			
Forest	AHU-1,2	Gym	Gym	AHU	Trane	MCAA06GAR0AB A000...	2	na	na	HHW							20			

VERONA SCHOOL DISTRICT
Forest Avenue School
EQUIPMENT LIST

Condensing Units

Bldg	Tag#	Location	Area Serving	Equipment	Type	Mfg	Quantity	Model	Tons	kW/Ton	Refrigerant	VFD?	Age
Forest	SAC#1	Roof	Computer Room	Condensing Unit		Carrier	1						
Forest	SAC#2	Roof	Music Room	Condensing Unit		Carrier	1						

VERONA SCHOOL DISTRICT
 Forest Avenue School
 EQUIPMENT LIST

Domestic Hot Water

Bldg	Tag#	Location	Area Serving	Equipment	Quantity	Mfg	Model	Fuel	Gal	Btuh Input	# of elements	Age	Estimated Service Life	Notes
Forest		Boiler Room	Domestic Hot Water	Water Heater	1	Bradford White	MI5036FBN	Natural Gas	50	40,000			20	

SOUTH PLAINFIELD
FRANKLIN ELEMENTARY SCHOOL
EQUIPMENT LIST

Boilers

Bldg	Tag#	Location	Area Serving	Equipment	Mfg	Model	Quantity	Fuel	Heating Input Btuh	Output Btuh	Age	Estimated Service Life	Efficiency	Notes
HBW MS	Boiler 1 & 2	Boiler Room	Steam Heating	Fire-Tube Boiler	CLEAVER BROOKS	CB7001500015	2	nat ga	6277000		1998	30		

Heating Hot Water Pumps

Bldg	Tag#	Location	Area Serving	Equipment	Pump Mfg	Pump Model	Motor Mfg	Motor Model	Quantity	GPM	Head ft	HP	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
HBW MS			HHW LOOP1	HHW Pump	GOULD	#3756	Baldor Reliance		2			5	87.5%		NO		20
HBW MS			HHW LOOP2	HHW Pump	CRANE		Marathon		2			5	87.5%		NO		20

Heat Exchangers

Bldg	Tag#	Location	Area Serving	Equipment	Type	Make	Model	GPM	Head ft	HP	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
HBW MS	HX-1	Boiler Room	HHW LOOP2	Heat Exchanger	SHELL & TUBE	THRUSH									24
	HX-2	Boiler Room	HHW LOOP1	Heat Exchanger	SHELL & TUBE	THRUSH									24

Boilers

Bldg	Tag#	Location	Area Serving	Equipment	Mfg	Model	Quantity	Fuel	Heating Input Btuh	Output Btuh	Age	Estimated Service Life	Efficiency	Notes
Laning	Boiler 1 & 2	Boiler Room	HHW	Cast Iron Sectional	Weil McLain	128P	2	nat ga	3,753,000	3,000,000		30		

Heating Hot Water Pumps

Bldg	Tag#	Location	Area Serving	Equipment	Pump Mfg	Pump Model	Motor Mfg	Motor Model	Quantity	GPM	Head ft	HP	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
Laning	HWP	Boiler Rm	HHW System	HHW Pump	2	Baldor	M32-18T			5	81.5%		NO	1998	20		20

VERONA SCHOOL DISTRICT

Verona High School

EQUIPMENT LIST

Fans														
Bldg	Tag#	Location	Area Serving	Equipment	Quantity	Mfg	Model	Fuel	CFM	Output Btuh	Age	Estimated Service Life	Efficiency	Notes
Verona HS	RF	Fan Rm 2	Auditorium	Return Fan for HAC#3	1				8000		2007	20		Axial Fan
Verona HS	EF-1	Roof	Main Office	Exhaust Fan	1	Cook	18-1					20		
Verona HS	EF-2	Roof	West Wing	Exhaust Fan	1	Cook	01M					20		
Verona HS	EF-3	Roof	East Wing	Exhaust Fan	1	Cook	1225ACEB					20		
Verona HS	EF-4	Roof	Board Office	Exhaust Fan	1	Cook	120ACE					20		
Verona HS	EF-5	Roof	Toilet	Exhaust Fan	1	Cook						20		
Verona HS	EF-6	Roof	Science	Exhaust Fan	1	Cook						20		
Verona HS	EF-7	Roof	Old Gym Boys	Exhaust Fan	1	Cook						20		
Verona HS	EF-8	Roof		Exhaust Fan	1	Cook						20		
Verona HS	EF-9	Roof	Home Economics	Exhaust Fan	1	Cook	16510d					20		
Verona HS	EF-10	Roof	Faculty Toilets	Exhaust Fan	1	Cook						20		
Verona HS	EF-11	Roof	Inner Offices	Exhaust Fan	1	Cook						20		
Verona HS	EF-12	Roof	Teachers Work Room	Exhaust Fan	1	Dayton	4YC72					20		
Verona HS	EF-13	Roof	Ticket Booth	Exhaust Fan	1	Cook						20		
Verona HS	EF-14	Roof	Ice Room	Exhaust Fan	1	Cook						20		
Verona HS	EF-15	Roof	Kitchen Toilet	Exhaust Fan	1	Cook						20		
Verona HS	EF-16	Roof	Kitchen Storage	Exhaust Fan	1	Cook	1195 ACEB					20		
Verona HS	EF-17	Roof	Library	Exhaust Fan	1	Cook						20		
Verona HS	EF-18	Roof	Girls Locker	Exhaust Fan	1	Cook						20		
Verona HS	EF-19	Roof	Old Gym Corridor	Exhaust Fan	1	Cook						20		
Verona HS	EF-20	Roof	Dish Room	Exhaust Fan	1	Cook						20		
Verona HS	EF-21	Roof	Dish Room	Exhaust Fan	1	Cook						20		
Verona HS	EF-22	Roof	Front Hood	Exhaust Fan	1	Cook						20		
Verona HS	EF-23	Roof	Team Room	Exhaust Fan	1	Cook						20		
Verona HS	EF-24	Roof	Corridor	Exhaust Fan	1	Cook						20		
Verona HS	EF-25	Roof	Large Hood	Exhaust Fan	1	Cook						20		
Verona HS	EF-26	Roof	Girls Locker	Exhaust Fan	1	Cook	225ACEB					20		
Verona HS	EF-27	Roof	Coaches Office	Exhaust Fan	1	Cook	245R3B					20		
Verona HS	EF-28	Roof	Graphics	Exhaust Fan	1	Cook						20		
Verona HS	EF-29	Roof	Darkroom	Exhaust Fan	1	Cook						20		
Verona HS	EF-30	Roof	Math Wing Toilet	Exhaust Fan	1	Cook						20		
Verona HS	EF-31	Roof	Old Gym	Exhaust Fan	1	Cook						20		
Verona HS	EF-32	Roof	New Gym	Exhaust Fan	1	Cook						20		
Verona HS	EF-33	Roof	Stage	Exhaust Fan	1	Cook						20		
Verona HS	Fume Hood 1	Roof	Science	Hood Exhaust	1	Airmaster	ardk10500x-01					20		
Verona HS	Fume Hood 2	Roof	Science	Hood Exhaust	1	Cook	120ucv					20		

VERONA SCHOOL DISTRICT

Verona High School

EQUIPMENT LIST

Ventilators															
Bldg	Tag#	Location	Area Serving	Equipment	Mfg	Model	Quantity	GPM	Head ft	HP	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
Verona HS	-	Boys Locker Room	Boys Locker Room	Unit Vent	Trane	-	2								20
Verona HS	-	Boys New Gym Locker Room	Boys New Gym Locker Room	Unit Vent	Trane	-	2								20
Verona HS	-	Boys Sports Locker Room	Boys Sports Locker Room	Unit Vent	Trane	-	1								20
Verona HS	-	Corridors	Corridors	Ceiling	-	-	12								20
Verona HS	-	Faculty Dining	Faculty Dining	Unit Vent	Nesbit	-	1								20
Verona HS	-	Music Room	Music Room	Unit Vent	Nesbit	-	1								20
Verona HS	-	Rm 10	Rm 10	Unit Vent	Nesbit	-	1								20
Verona HS	-	Rm 11	Rm 11	Unit Vent	Nesbit	-	1								20
Verona HS	-	Rm 12	Rm 12	Unit Vent	Nesbit	-	1								20
Verona HS	-	Rm 13	Rm 13	Unit Vent	Trane	-	1								20
Verona HS	-	Rm 15	Rm 15	Unit Vent	Nesbit	-	1								20
Verona HS	-	Rm 18	Rm 18 Science	Unit Vent	-	-	1								20
Verona HS	-	RM 20	RM 20	Unit Vent	Carrier	40uvf3	1			1/5					20
Verona HS	-	RM 22	RM 22	Unit Vent	Carrier	40uvf3	1			1/5					20
Verona HS	-	Rm 23	Rm 23	Unit Vent	Airedale	Sentinel	1								20
Verona HS	-	RM 24	RM 24	Unit Vent	Carrier	40uvf3	1			1/5					20
Verona HS	-	RM 25	RM 25	Unit Vent	Carrier	40uvf3	1			1/5					20
Verona HS	-	RM 26	RM 26	Unit Vent	Nesbit	-	1								20
Verona HS	-	RM 27	RM 27	Unit Vent	Carrier	40uvf3	1			1/5					20
Verona HS	-	RM 28	RM 28	Unit Vent	Nesbit	-	1								20
Verona HS	-	RM 29	RM 29	Unit Vent	-	-	1								20
Verona HS	-	RM 30	RM 30	Unit Vent	-	-	1								20
Verona HS	-	RM 31	RM 31	Unit Vent	-	-	1								20
Verona HS	-	RM 32	RM 32	Unit Vent	-	-	1								20
Verona HS	-	RM 33	RM 33	Unit Vent	Nesbit	-	1								20
Verona HS	-	RM 34	RM 34	Unit Vent	Nesbit	-	1								20
Verona HS	-	RM 35	RM 35	Unit Vent	-	-	1								20
Verona HS	-	RM 36	RM 36	Unit Vent	-	-	1								20
Verona HS	-	RM 37	RM 37	Unit Vent	-	-	1								20
Verona HS	-	RM 38	RM 38	Unit Vent	-	-	1								20
Verona HS	-	RM 39	RM 39	Unit Vent	-	-	1								20
Verona HS	-	RM 40	RM 40	Unit Vent	-	-	1								20
Verona HS	-	RM 41	RM 41	Unit Vent	-	-	1								20
Verona HS	-	RM 43	RM 43	Unit Vent	-	-	1								20
Verona HS	-	Rm 45	Rm 45	Ceiling Mntd	Carrier	24abr324a	1								20
Verona HS	-	RM 47	RM 47	Ceiling Mntd	Carrier	24abr324a	1								20
Verona HS	-	Rm 49	Rm 49	Unit Vent	Nesbit	-	1								20
Verona HS	-	RM 51	RM 51	Unit Vent	-	-	1								20
Verona HS	-	RM 53	RM 53	Unit Vent	-	-	1								20
Verona HS	-	Rm 53	Rm 53	Unit Vent	Nesbit	-	1								20
Verona HS	-	RM 55	RM 55	Unit Vent	Nesbit	-	1								20
Verona HS	-	STORAGE	STORAGE	Unit Vent	-	-	1								20
Verona HS	-	Woodshop	Woodshop	Unit Vent	Nesbit	-	1								20

VERONA SCHOOL DISTRICT

Verona High School

EQUIPMENT LIST

Split Units															
Bldg	Tag#	Location	Area Serving	Equipment	Mfg	Model	Quantity	GPM	Head	HP	Efficien	Motor RPM	VFD?	Age	Estimated
Verona HS	-	Main Office	Main Office	Evaporator	Sanyo	-	1								15
Verona HS	-	Server Room	Server Room	Evaporator	Sanyo	-	1								15
Verona HS	-	Rm 12	Rm 12	Evaporator	Goodman	wwwCZ4-1A	1								15
Verona HS	-	Rm 10	Rm 10 Computer Room	Evaporator	Goodman	-	1								15
Verona HS	-	Nurses Office	Nurses Office	Evaporator	Goodman	-	1							10 yrs old	15
Verona HS	-	Vice Principal	Vice Principal	Evaporator	Freidrich	-	1								15
Verona HS	-	Teachers Copy Room	Teachers Copy Room	Evaporator	Freidrich	-	1								15
Verona HS	-	Computer Room	Computer Rm	Evaporator	Panasonic	CS-	1								15
Verona HS	-	Rm 49	Rm 49	Evaporator	Freidrich	-	1								15
Verona HS	-	Computer Room	Computer	Evaporator	Goodman	-	2								15
Verona HS	-	Rm 39	Rm 39	Evaporator	Freidrich	-	1								15
Verona HS	-	Rm 34	Rm 34	Evaporator	Freidrich	-	1								15
Verona HS	-	Rm 26	Rm 26	Evaporator	Mitsubishi	Slim	2								15
Verona HS	-	Rm 45	Rm 45	Ceiling Mntd	Carrier	24abr324a	1								15
Verona HS	-	RM 47	RM 47	Ceiling Mntd	Carrier	24abr324a	1								15
Verona HS	-	Faculty Dining	Faculty Dining	Evaporator	Freidrich	-	1								15
Verona HS	-	Board Office	Board Office	Evaporator	Sanyo	KS2472	1								15
Verona HS	-	Music Office	Music Office	Evaporator	Haier	HSUTZXC	1								15
Verona HS	SAC-6	Library	Library	Evaporator	Trane	-	1								15
Verona HS	SAC-4	Conference Room	Conference	Evaporator	Carrier	38hdf024-	1								15



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LIGHTING INVENTORY LISTS



LIGHTING RETROFIT SUMMARY FOR: Brookdale Avenue 14 Brookdale Avenue

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	ANNUAL KWH SAVED WITH SENSORS	ANNUAL SAVINGS \$ FIXT.	ANNUAL SAVINGS \$ SENSORS	ANNUAL SAVINGS \$ TOTAL	CO2 REDUCTION (TONS)	NJ Smart Start REBATE \$	FIXTURES TOTAL (INSTALLED) COST \$	SENSORS TOTAL (INSTALLED) COST \$	MATERIAL TOTAL (INSTALLED) COST \$	SIMPLE PAYBACK NET OF REBATE (YEARS)
Brookdale Avenue	37,972	431	42,176	68,051	1.11	431	27,301	34,141	0.72	14,875	33,910	6,690	\$5,250	\$1,036	\$6,285	11.2	\$5,710	\$34,390	\$12,962	\$47,353	6.6

12%	PERCENTAGE OF REBATES IN TOTAL INSTALLED COST
50%	PERCENTAGE OF CONSUMPTION COMPARE TO EXISTING STATE
45%	EXISTING PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING
23%	PROPOSED PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING



LIGHTING RETROFIT SUMMARY FOR: FN Brown 125 Grove Avenue

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	ANNUAL KWH SAVED WITH SENSORS	ANNUAL SAVINGS \$ FIXT.	ANNUAL SAVINGS \$ SENSORS	ANNUAL SAVINGS \$ TOTAL	CO2 REDUCTION (TONS)	NJ Smart Start REBATE \$	FIXTURES TOTAL (INSTALLED) COST \$	SENSORS TOTAL (INSTALLED) COST \$	MATERIAL TOTAL (INSTALLED) COST \$	SIMPLE PAYBACK NET OF REBATE (YEARS)
FN Brown	38,985	626	42,114	76,298	1.08	626	28,079	40,861	0.72	14,035	35,437	9,452	\$6,088	\$1,624	\$7,712	11.7	\$6,095	\$39,706	\$18,658	\$58,364	6.8

10%	PERCENTAGE OF REBATES IN TOTAL INSTALLED COST
54%	PERCENTAGE OF CONSUMPTION COMPARE TO EXISTING STATE
33%	EXISTING PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING
18%	PROPOSED PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING



LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	FACILITY SQ. FT. 38,985	DATE OF AUDIT: 5/6/2013	CUSTOMER FACILITY:	Verona Schools FN Brown
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SPACE DESCRIPTION			EXISTING FIXTURES		REPLACEMENT FIXTURES						ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	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	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
								2610								\$0.172						
1	2	3	4	5	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	53	54	55
1	N/A	1A OFFICE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	Wall	1	84	1,346	174	113	16	32	725	66	61	\$22	\$137	\$215	\$331	\$20	\$0	\$20
2	N/A	MEDIA CENTER	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,346	1,391	904	16	256	725	530	487	\$175	\$1,612	\$363	\$1,780	\$160	\$35	\$195
3	N/A	MEDIA CENTER OFFICE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	Wall	1	84	1,346	174	113	16	32	725	66	61	\$22	\$137	\$215	\$331	\$20	\$0	\$20
4	N/A	MEDIA CENTER REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	Wall	1	42	108	15	5	16	16	252	6	11	\$3	\$68	\$215	\$273	\$10	\$0	\$10
5	N/A	MEDIA CENTER	Exit Sign w/ LED Emergency Lights	1			2	8,760	18	18	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
6	N/A	STAIRWELL- MEDIA CENTER	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	2,610	110	110	16	16	0	42	0	\$7	\$68	\$0	\$58	\$10	\$0	\$10
7	N/A	BOYS REST ROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	3	Wall	1	84	1,035	174	87	30	90	1,035	186	87	\$47	\$181	\$215	\$366	\$30	\$0	\$30
8	N/A	CUSTODIAN CLOSET		0			0	360	0	0	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
9	N/A	COMPUTER LAB	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	\$119	\$913	\$363	\$1,121	\$120	\$35	\$155
10	N/A	COMPUTER LAB- STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	360	30	30	16	32	0	12	0	\$2	\$137	\$0	\$117	\$20	\$0	\$20
11	N/A	NURSE'S OFFICE	2'x2' Troffer w/ (3) FB32T8 1-5/8"-U Lamps & (1) Electronic Ballast	5	Wall	1	195	1,346	404	262	48	240	725	497	141	\$110	\$254	\$215	\$398	\$50	\$20	\$70
12	N/A	NURSE'S OFFICE	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	2	Wall	0	56	1,346	116	75	30	60	725	124	41	\$28	\$121	\$0	\$101	\$20	\$0	\$20
13	N/A	NURSE'S REST ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	Wall	1	42	1,035	87	43	16	16	1,035	33	43	\$13	\$68	\$215	\$273	\$10	\$0	\$10
14	N/A	MAIN OFFICE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	4			252	2,070	522	522	25	100	0	207	0	\$36	\$304	\$0	\$264	\$40	\$0	\$40
15	N/A	MAIN OFFICE	2'x2' Troffer w/ (3) FB32T8 1-5/8"-U Lamps & (1) Electronic Ballast	2			78	2,070	161	161	48	96	0	199	0	\$34	\$101	\$0	\$81	\$20	\$0	\$20
16	N/A	MAIN OFFICE	Downlight Fixture w/ (1) 26w CFL & Electronic Ballast	3			78	2,070	161	161	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
17	N/A	SMALL CONFERENCE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	Wall	1	126	1,346	261	170	25	50	725	104	91	\$33	\$152	\$215	\$347	\$20	\$0	\$20
18	N/A	PRINCIPAL' S OFFICE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	Wall	1	126	1,346	261	170	25	50	725	104	91	\$33	\$152	\$215	\$347	\$20	\$0	\$20
19	N/A	FACULTY RM CORRIDOR	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	2			56	2,610	146	146	30	60	0	157	0	\$27	\$121	\$0	\$101	\$20	\$0	\$20
20	N/A	FACULTY RM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	1	Wall	1	63	1,346	130	85	25	25	725	52	46	\$17	\$76	\$215	\$281	\$10	\$0	\$10
21	N/A	FACULTY RM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	6	Wall	0	252	1,346	522	339	16	96	725	199	183	\$66	\$410	\$0	\$350	\$60	\$0	\$60
22	N/A	CONFERENCE RM	2'x2' Troffer w/ (3) FB32T8 3"-U Lamps & (1) Electronic Ballast	5	Wall	1	255	1,346	528	343	37	185	725	383	185	\$98	\$488	\$215	\$632	\$50	\$20	\$70
23	N/A	CLASSROOM 7	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,224	1,028	823	16	256	306	392	206	\$103	\$1,612	\$363	\$1,780	\$160	\$35	\$195
24	N/A	CLASSROOM 7- TEACHER STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	\$1	\$68	\$0	\$58	\$10	\$0	\$10
25	N/A	CLASSROOM 6	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	504	1,530	771	771	16	192	0	294	0	\$50	\$1,209	\$363	\$1,417	\$120	\$35	\$155
26	N/A	CLASSROOM 6- TEACHER STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	\$1	\$68	\$0	\$58	\$10	\$0	\$10
27	N/A	GIRLS REST ROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	2	Ceiling	1	56	1,035	116	58	30	60	1,035	124	58	\$31	\$121	\$363	\$464	\$20	\$0	\$20
28	N/A	GIRLS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	Ceiling	0	42	1,035	87	43	16	16	1,035	33	43	\$13	\$68	\$0	\$58	\$10	\$0	\$10



LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	FACILITY SQ. FT. 38,985	DATE OF AUDIT: 5/6/2013	CUSTOMER FACILITY:	Verona Schools FN Brown
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SPACE DESCRIPTION			EXISTING FIXTURES	REPLACEMENT FIXTURES							ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	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	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
								2610								\$0.172						
29	N/A	LOBBY CHANDELIER	Fixture w/ 23w Screw-In CFL	6			138	2,610	360	360	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	
30	N/A	AUDITORIUM LOBBY	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	2,610	219	219	16	32	0	84	0	\$14	\$137	\$0	\$117	\$20	\$0	\$20
31	N/A	OFFICE 8	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	Wall	1	42	1,346	87	57	16	16	725	33	30	\$11	\$68	\$215	\$273	\$10	\$0	\$10
32	N/A	AUDITORIUM	Fixture w/ 23w Screw-In CFL	64	Ceiling	3	1,472	1,224	2,252	1,802	0	0	306	0	450	\$77	\$0	\$1,090	\$985	\$0	\$105	\$105
33	N/A	AUDITORIUM	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	
34	N/A	STAIRWELL- LEFT SIDE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	2,610	219	219	16	32	0	84	0	\$14	\$137	\$0	\$117	\$20	\$0	\$20
35	N/A	STAIRWELL- LEFT SIDE	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	
36	N/A	STAIRWELL- RIGHT SIDE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	2,610	219	219	16	32	0	84	0	\$14	\$137	\$0	\$117	\$20	\$0	\$20
37	N/A	STAIRWELL- RIGHT SIDE	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	
38	N/A	STORAGE BELOW AUDITORIUM		0			0	2,610	0	0	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	
39	N/A	STAGE		0			0	2,070	0	0	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	
40	N/A	MECHANICAL ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	2,610	110	110	16	16	0	42	0	\$7	\$68	\$0	\$58	\$10	\$0	\$10
41	N/A	MECHANICAL ROOM 2	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	2,610	110	110	16	16	0	42	0	\$7	\$68	\$0	\$58	\$10	\$0	\$10
42	N/A	MECH RM HALL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	2,610	219	219	16	32	0	84	0	\$14	\$137	\$0	\$117	\$20	\$0	\$20
43	N/A	MECH RM HALL	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	
44	N/A	LOWER STAGE		0			0	2,610	0	0	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	
45	N/A	GYM	New 2'x4' Pendant Mounted Box w/ (4) F54T5HO Lamps & (2) 2/54 T5 Elec. HO Ballasts	12	Ceiling	3	2,904	1,224	4,443	3,554	0	0	306	0	889	\$153	\$0	\$1,090	\$985	\$0	\$105	\$105
46	N/A	GYM	Exit Sign w/ LED	4			8	8,760	70	70	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	
47	N/A	GYM HALL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	2,610	219	219	16	32	0	84	0	\$14	\$137	\$0	\$117	\$20	\$0	\$20
48	N/A	GYM STAIRS	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	5			210	2,610	548	548	16	80	0	209	0	\$36	\$341	\$0	\$291	\$50	\$0	\$50
49	N/A	PHYSICAL THERAPY	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	6	Wall	1	252	1,346	522	339	70	420	725	869	183	\$181	\$605	\$215	\$709	\$90	\$20	\$110
50	N/A	B-8 SGI ROOM	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	3	Wall	1	126	1,346	261	170	70	210	725	435	91	\$90	\$302	\$215	\$472	\$45	\$0	\$45
51	N/A	B-7 MUSIC CLASSROOM	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	\$247	\$1,209	\$363	\$1,357	\$180	\$35	\$215
52	N/A	B-7 MUSIC CLASSROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	2	Ceiling	0	56	1,224	86	69	30	60	306	92	17	\$19	\$121	\$0	\$101	\$20	\$0	\$20
53	N/A	CAFETERIA #1	4' Fixture w/ (3) FO32T8 Lamps & (1) Electronic Ballast	8	Ceiling	1	504	1,346	1,043	678	25	200	725	414	365	\$134	\$608	\$363	\$857	\$80	\$35	\$115
54	N/A	CAFETERIA #1	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	3	Ceiling	1	84	1,346	174	113	30	90	725	186	61	\$42	\$181	\$363	\$515	\$30	\$0	\$30
55	N/A	CAFETERIA #1	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	
56	N/A	CAFETERIA #1	Downlight Fixture w/ (1) 26w CFL & Electronic Ballast	6	Ceiling	1	156	1,346	323	210	0	0	725	0	113	\$19	\$0	\$363	\$363	\$0	\$0	\$0



LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	FACILITY SQ. FT. 38,985	DATE OF AUDIT: 5/6/2013	CUSTOMER FACILITY:	Verona Schools FN Brown
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SPACE DESCRIPTION			EXISTING FIXTURES	REPLACEMENT FIXTURES							ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	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	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
								2610								\$0.172						
57	N/A	KITCHEN	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	4			252	2,070	522	522	25	100	0	207	0	\$36	\$304	\$0	\$264	\$40	\$0	\$40
58	N/A	CAFETERIA #2	Downlight Fixture w/ (1) 26w CFL & Electronic Ballast	6	Ceiling	1	156	1,346	323	210	0	0	725	0	113	\$19	\$0	\$363	\$363	\$0	\$0	\$0
59	N/A	CAFETERIA #2	4' Fixture w/ (3) FO32T8 Lamps & (1) Electronic Ballast	18	Ceiling	1	1,134	1,346	2,347	1,526	25	450	725	932	822	\$301	\$1,369	\$363	\$1,517	\$180	\$35	\$215
60	N/A	CAFETERIA #2	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	4	Ceiling	1	112	1,346	232	151	30	120	725	248	81	\$57	\$242	\$363	\$565	\$40	\$0	\$40
61	N/A	CAFETERIA #2	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
62	N/A	BOILER ROOM	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	6			252	2,610	658	658	70	420	0	1,096	0	\$188	\$605	\$0	\$515	\$90	\$0	\$90
63	N/A	BOILER ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	2,610	110	110	16	16	0	42	0	\$7	\$68	\$0	\$58	\$10	\$0	\$10
64	N/A	BOILER ROOM- STORAGE	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	360	30	30	16	32	0	12	0	\$2	\$137	\$0	\$117	\$20	\$0	\$20
65	N/A	GIRLS REST ROOM- ENTRANCE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	Wall	1	42	1,035	87	43	16	16	1,035	33	43	\$13	\$68	\$215	\$273	\$10	\$0	\$10
66	N/A	GIRLS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	Ceiling	1	84	1,035	174	87	16	32	1,035	66	87	\$26	\$137	\$363	\$480	\$20	\$0	\$20
67	N/A	GIRLS REST ROOM	4' Wrap Fluorescent w/ (1) FO32T8 Lamp & (1) Electronic Ballast	1	Ceiling	0	22	1,035	46	23	10	10	1,035	21	23	\$7	\$51	\$0	\$41	\$10	\$0	\$10
68	N/A	FACULTY REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	Wall	1	42	1,035	87	43	16	16	1,035	33	43	\$13	\$68	\$215	\$273	\$10	\$0	\$10
69	N/A	ART STORAGE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	4			252	360	91	91	25	100	0	36	0	\$6	\$304	\$0	\$264	\$40	\$0	\$40
70	N/A	TEACHERS WORK RM	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	7	Wall	1	294	1,346	609	396	70	490	725	1,014	213	\$211	\$705	\$215	\$795	\$105	\$20	\$125
71	N/A	BOYS REST ROOM- ENTRANCE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	Wall	1	42	1,035	87	43	16	16	1,035	33	43	\$13	\$68	\$215	\$273	\$10	\$0	\$10
72	N/A	BOYS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	Ceiling	1	84	1,035	174	87	16	32	1,035	66	87	\$26	\$137	\$363	\$480	\$20	\$0	\$20
73	N/A	BOYS REST ROOM	4' Wrap Fluorescent w/ (1) FO32T8 Lamp & (1) Electronic Ballast	1	Ceiling	1	22	1,035	46	23	10	10	1,035	21	23	\$7	\$51	\$363	\$404	\$10	\$0	\$10
74	N/A	CUSTODIAN CLOSET	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	\$1	\$68	\$0	\$58	\$10	\$0	\$10
75	N/A	PIPE CHASE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	\$1	\$68	\$0	\$58	\$10	\$0	\$10
76	N/A	CHILD STUDY TEAM	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	4	Wall	1	168	1,346	348	226	70	280	725	580	122	\$120	\$403	\$215	\$558	\$60	\$0	\$60
77	N/A	MECH ELEC RM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	360	30	30	16	32	0	12	0	\$2	\$137	\$0	\$117	\$20	\$0	\$20
78	N/A	BASEMENT HALL BY CAFETERIA	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16			672	2,610	1,754	1,754	16	256	0	668	0	\$115	\$1,092	\$0	\$932	\$160	\$0	\$160
79	N/A	BASEMENT HALL BY CAFETERIA	Exit Sign w/ LED	4			8	8,760	70	70	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
80	N/A	BASEMENT CLASSROOM HALL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	11			462	2,610	1,206	1,206	16	176	0	459	0	\$79	\$751	\$0	\$641	\$110	\$0	\$110
81	N/A	BASEMENT CLASSROOM HALL	Exit Sign w/ LED	4			8	8,760	70	70	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
82	N/A	CLASSROOM A1	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	504	1,224	771	617	16	192	306	294	154	\$77	\$819	\$363	\$1,027	\$120	\$35	\$155
83	N/A	A1 REST ROOM	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	Wall	1	14	108	5	2	46	46	252	17	4	\$3	\$16	\$215	\$231	\$0	\$0	\$0
84	N/A	CLASSROOM A3	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	14	Ceiling	1	588	1,224	900	720	16	224	306	343	180	\$90	\$1,411	\$363	\$1,599	\$140	\$35	\$175



LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	FACILITY SQ. FT. 38,985	DATE OF AUDIT: 5/6/2013	CUSTOMER FACILITY:	Verona Schools FN Brown
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SPACE DESCRIPTION			EXISTING FIXTURES	REPLACEMENT FIXTURES							ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	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	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
								2610								\$0.172						
85	N/A	A3 REST ROOM	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	Wall	1	14	108	5	2	46	46	252	17	4	\$3	\$16	\$215	\$231	\$0	\$0	\$0
86	N/A	CLASSROOM A5	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	14	Ceiling	1	588	1,224	900	720	16	224	306	343	180	\$90	\$1,411	\$363	\$1,599	\$140	\$35	\$175
87	N/A	A5 REST ROOM	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	Wall	1	14	108	5	2	46	46	252	17	4	\$3	\$16	\$215	\$231	\$0	\$0	\$0
88	N/A	CLASSROOM A6	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	14	Ceiling	1	588	1,224	900	720	16	224	306	343	180	\$90	\$1,411	\$363	\$1,599	\$140	\$35	\$175
89	N/A	A6 REST ROOM	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	Wall	1	14	108	5	2	46	46	252	17	4	\$3	\$16	\$215	\$231	\$0	\$0	\$0
90	N/A	CLASSROOM A4	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	14	Ceiling	1	588	1,224	900	720	16	224	306	343	180	\$90	\$1,411	\$363	\$1,599	\$140	\$35	\$175
91	N/A	A4 REST ROOM	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	Wall	1	14	108	5	2	46	46	252	17	4	\$3	\$16	\$215	\$231	\$0	\$0	\$0
92	N/A	CLASSROOM A2	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	14	Ceiling	1	588	1,224	900	720	16	224	306	343	180	\$90	\$1,411	\$363	\$1,599	\$140	\$35	\$175
93	N/A	A2 REST ROOM	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	Wall	1	14	108	5	2	46	46	252	17	4	\$3	\$16	\$215	\$231	\$0	\$0	\$0
94	N/A	STAIRWELL BY LARGE CAFETERIA	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	4			168	2,610	438	438	16	64	0	167	0	\$29	\$273	\$0	\$233	\$40	\$0	\$40
95	N/A	STAIRWELL BY LARGE CAFETERIA	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	1			42	2,610	110	110	70	70	0	183	0	\$31	\$101	\$0	\$86	\$15	\$0	\$15
96	N/A	FIRST FLOOR HALL	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	11			462	2,610	1,206	1,206	70	770	0	2,010	0	\$345	\$1,108	\$0	\$943	\$165	\$0	\$165
97	N/A	FIRST FLOOR HALL	Exit Sign w/ LED	5			10	8,760	88	88	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
98	N/A	MAIN HALL DISPLAY CASE	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1			14	360	5	5	46	46	0	17	0	\$3	\$16	\$0	\$16	\$0	\$0	\$0
99	N/A	MAIN HALL DISPLAY CASE	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1			14	360	5	5	46	46	0	17	0	\$3	\$16	\$0	\$16	\$0	\$0	\$0
100	N/A	MAIN ENTRANCE CHANDELIER	Incandescent Fixture w/ (1) 60w Incandescent Lamp	2			28	2,610	73	73	46	92	0	240	0	\$41	\$33	\$0	\$33	\$0	\$0	\$0
101	N/A	MAIN ENTRANCE CHANDELIER	Compact Fluorescent Antique Chandelier Fixture w/ (2) 13w CFL & Magnetic Ballast	1			30	2,610	78	78	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
102	N/A	ROOM 9 SPEECH	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	2	Wall	1	84	1,224	129	103	70	140	306	214	26	\$41	\$202	\$215	\$386	\$30	\$0	\$30
103	N/A	CLASSROOM 11	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	15	Ceiling	1	945	1,224	1,446	1,157	25	375	306	574	289	\$148	\$1,141	\$363	\$1,319	\$150	\$35	\$185
104	N/A	CLASSROOM 11	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	2	Ceiling	0	84	1,224	129	103	70	140	306	214	26	\$41	\$202	\$0	\$172	\$30	\$0	\$30
105	N/A	ROOM 10 SGI	2'x2' Troffer w/ (3) FB32T8 3"-U Lamps & (1) Electronic Ballast	9	Wall	1	459	1,346	950	618	37	333	725	689	333	\$176	\$878	\$215	\$982	\$90	\$20	\$110
106	N/A	BOYS REST ROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	4	Ceiling	1	112	1,035	232	116	30	120	1,035	248	116	\$63	\$242	\$363	\$565	\$40	\$0	\$40
107	N/A	CUSTODIAN CLOSET	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1			14	360	5	5	46	46	0	17	0	\$3	\$16	\$0	\$16	\$0	\$0	\$0
108	N/A	CLASSROOM 13	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	\$119	\$913	\$363	\$1,121	\$120	\$35	\$155
109	N/A	CLASSROOM 13- STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	\$1	\$68	\$0	\$58	\$10	\$0	\$10
110	N/A	ART ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	\$119	\$913	\$363	\$1,121	\$120	\$35	\$155
111	N/A	ART STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	\$1	\$68	\$0	\$58	\$10	\$0	\$10
112	N/A	CLASSROOM 15	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	\$119	\$913	\$363	\$1,121	\$120	\$35	\$155



LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	FACILITY SQ. FT. 38,985	DATE OF AUDIT: 5/6/2013	CUSTOMER FACILITY:	Verona Schools FN Brown
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SPACE DESCRIPTION			EXISTING FIXTURES		REPLACEMENT FIXTURES						ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	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	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
								2610								\$0.172						
113	N/A	CLASSROOM 15- STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	\$1	\$68	\$0	\$58	\$10	\$0	\$10
114	N/A	CLASSROOM 14	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	\$119	\$913	\$363	\$1,121	\$120	\$35	\$155
115	N/A	CLASSROOM 14- STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	\$1	\$68	\$0	\$58	\$10	\$0	\$10
116	N/A	CLASSROOM 17	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	\$119	\$913	\$363	\$1,121	\$120	\$35	\$155
117	N/A	CLASSROOM 17- STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	\$1	\$68	\$0	\$58	\$10	\$0	\$10
118	N/A	CLASSROOM 16	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	\$119	\$913	\$363	\$1,121	\$120	\$35	\$155
119	N/A	CLASSROOM 16- STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	\$1	\$68	\$0	\$58	\$10	\$0	\$10
120	N/A	GIRLS REST ROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	2	Ceiling	1	56	1,035	116	58	30	60	1,035	124	58	\$31	\$121	\$363	\$464	\$20	\$0	\$20
121	N/A	GIRLS REST ROOM	4' Wrap Fluorescent w/ (1) FO32T8 Lamp & (1) Electronic Ballast	1	Ceiling	0	22	1,035	46	23	10	10	1,035	21	23	\$7	\$51	\$0	\$41	\$10	\$0	\$10
122	N/A	AUDITORIUM BALCONY STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	\$1	\$68	\$0	\$58	\$10	\$0	\$10
123	N/A	AUDITORIUM BALCONY FAN ROOM	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	4			168	360	60	60	70	280	0	101	0	\$17	\$403	\$0	\$343	\$60	\$0	\$60
124	N/A	AUDIT. BALCONY FAN ROOM ENTRANCE	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	1			42	360	15	15	70	70	0	25	0	\$4	\$101	\$0	\$86	\$15	\$0	\$15
125	N/A	BALCONY SIDE STAIRWELL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	\$1	\$68	\$0	\$58	\$10	\$0	\$10
126	N/A	UPPER FLOOR HALLWAY	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	10			420	2,610	1,096	1,096	70	700	0	1,827	0	\$314	\$1,008	\$0	\$858	\$150	\$0	\$150
127	N/A	UPPER FLOOR HALLWAY	Exit Sign w/ LED	4			8	8,760	70	70	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
128	N/A	EXTERIOR- MAIN ENTRANCE	HID Fixture w/ (1) 100w High Pressure Sodium	1			25	4,745	119	119	105	105	0	498	0	\$86	\$75	\$0	\$75	\$0	\$0	\$0
129	N/A	EXTERIOR- RIGHT ENTRANCE	Downlight Fixture w/ (1) 26w CFL & Electronic Ballast	1			26	4,745	123	123	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
130	N/A	EXTERIOR- LOWER HALL	Compact Fluorescent Wall Pack Fixture w/ (1) 13w CFL	1			15	4,745	71	71	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
131	N/A	EXTERIOR- LOWER HALL UNDER EAVE	HID Wall Pack Fixture w/ (1) 35w High Pressure Sodium	3			135	4,745	641	641	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
132	N/A	EXTERIOR- CAFÉ/ SIDE/ FRONT	Compact Fluorescent Wall Pack Fixture w/ (1) 13w CFL	9			135	4,745	641	641	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0



LIGHTING RETROFIT SUMMARY FOR: Forest Avenue 118 Forest Avenue

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	ANNUAL KWH SAVED WITH SENSORS	ANNUAL SAVINGS \$ FIXT.	ANNUAL SAVINGS \$ SENSORS	ANNUAL SAVINGS \$ TOTAL	CO2 REDUCTION (TONS)	NJ Smart Start REBATE \$	FIXTURES TOTAL (INSTALLED) COST \$	SENSORS TOTAL (INSTALLED) COST \$	MATERIAL TOTAL (INSTALLED) COST \$	SIMPLE PAYBACK NET OF REBATE (YEARS)
Forest Avenue	27,750	598	49,876	70,513	1.80	598	38,807	37,719	1.40	11,069	32,794	7,667	\$4,973	\$1,163	\$6,136	10.8	\$5,455	\$39,159	\$11,723	\$50,882	7.4

11%	PERCENTAGE OF REBATES IN TOTAL INSTALLED COST
53%	PERCENTAGE OF CONSUMPTION COMPARE TO EXISTING STATE
51%	EXISTING PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING
27%	PROPOSED PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING



**LIGHTING UPGRADE PROJECT
LINE x LINE DETAIL**

**FACILITY SQ. FT.
27,750**

**DATE OF AUDIT:
5/6/2013**

**CUSTOMER: Verona Schools
FACILITY: Forest Avenue**

SPACE DESCRIPTION			EXISTING FIXTURES	REPLACEMENT FIXTURES							ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	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	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
1	2	3	4	5	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	53	54	55
1	N/A	FACULTY ROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	6	Wall	1	168	1,346	348	226	30	180	725	373	122	\$75	\$363	\$215	\$517	\$60	\$0	\$60
2	N/A	COPY ROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	4	Wall	1	112	1,346	232	151	30	120	725	248	81	\$50	\$242	\$215	\$416	\$40	\$0	\$40
3	N/A	LIBRARY	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	18	Ceiling	2	756	1,224	1,157	925	16	288	306	441	231	\$102	\$1,814	\$727	\$2,290	\$180	\$70	\$250
4	N/A	CLASSROOM 17	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,224	1,028	823	16	256	306	392	206	\$91	\$1,612	\$363	\$1,780	\$160	\$35	\$195
5	N/A	CLASSROOM 11	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	18	Ceiling	1	756	1,224	1,157	925	16	288	306	441	231	\$102	\$1,814	\$363	\$1,962	\$180	\$35	\$215
6	N/A	CLASSROOM 16	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,224	1,028	823	16	256	306	392	206	\$91	\$1,612	\$363	\$1,780	\$160	\$35	\$195
7	N/A	CLASSROOM 12	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	\$105	\$913	\$363	\$1,121	\$120	\$35	\$155
8	N/A	CLASSROOM 13	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	15	Ceiling	1	945	1,224	1,446	1,157	25	375	306	574	289	\$131	\$1,141	\$363	\$1,319	\$150	\$35	\$185
9	N/A	RESOURCE ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	3	Wall	1	126	1,346	261	170	16	48	725	99	91	\$29	\$302	\$215	\$487	\$30	\$0	\$30
10	N/A	MENS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	Wall	1	42	1,035	87	43	16	16	1,035	33	43	\$12	\$68	\$215	\$273	\$10	\$0	\$10
11	N/A	CLASSROOM 14	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	504	1,224	771	617	16	192	306	294	154	\$68	\$1,209	\$363	\$1,417	\$120	\$35	\$155
12	N/A	CLASSROOM 14	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	4	Ceiling		168	1,224	257	206	70	280	306	428	51	\$73	\$403	\$0	\$343	\$60	\$0	\$60
13	N/A	CLASSROOM 14	Incandescent Fixture w/ (2) 60w Incandescent Lamps	1	Ceiling	0	30	1,224	46	37	90	90	306	138	9	\$22	\$23	\$0	\$23	\$0	\$0	\$0
14	N/A	FACULTY REST ROOM	Incandescent Fixture w/ (2) 60w Incandescent Lamps	1	Wall	1	30	1,035	62	31	90	90	1,035	186	31	\$33	\$23	\$215	\$237	\$0	\$0	\$0
15	N/A	CUSTODIAN CLOSET		0			0	360	0	0	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
16	N/A	BOYS REST ROOM	2'x4' Troffer w/ (1) FO32T8 Lamp & (1) Electronic Ballast	4	Wall	1	100	1,035	207	104	7	28	1,035	58	104	\$24	\$101	\$215	\$276	\$40	\$0	\$40
17	N/A	GIRLS REST ROOM	2'x4' Troffer w/ (1) FO32T8 Lamp & (1) Electronic Ballast	4	Wall	1	100	1,035	207	104	7	28	1,035	58	104	\$24	\$101	\$215	\$276	\$40	\$0	\$40
18	N/A	AUDITORIUM/ GYM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	42	Ceiling	3	1,764	1,482	4,075	2,614	16	672	828	1,552	1,461	\$457	\$4,232	\$1,090	\$4,797	\$420	\$105	\$525
19	N/A	AUDITORIUM/ GYM	Exit Sign w/ LED	3			6	8,760	53	53	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
20	N/A	STAGE	Incandescent Fixture w/ (1) 150w Incandescent Lamp	124			18,600	360	6,696	6,696	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
21	N/A	STAGE STORAGE	Incandescent 12"x12" Square Fixture w/ 23w Screw-In CFL	1			23	360	8	8	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
22	N/A	STAGE STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	\$1	\$68	\$0	\$58	\$10	\$0	\$10
23	N/A	ART ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	504	1,224	771	617	16	192	306	294	154	\$68	\$1,209	\$363	\$1,417	\$120	\$35	\$155
24	N/A	NURSE'S OFFICE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	4	Wall	1	168	1,346	348	226	16	64	725	132	122	\$39	\$273	\$215	\$448	\$40	\$0	\$40
25	N/A	NURSE'S OFFICE	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	Wall		14	2,070	29	29	46	46	0	95	0	\$14	\$16	\$0	\$16	\$0	\$0	\$0
26	N/A	NURSE'S STORAGE	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1			14	360	5	5	46	46	0	17	0	\$3	\$16	\$0	\$16	\$0	\$0	\$0
27	N/A	NURSE'S REST ROOM	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	Wall	1	14	108	5	2	46	46	252	17	4	\$3	\$16	\$215	\$231	\$0	\$0	\$0
28	N/A	MAIN OFFICE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	4	Ceiling	1	168	1,346	348	226	16	64	725	132	122	\$39	\$273	\$363	\$596	\$40	\$0	\$40
29	N/A	OFFICE STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	\$1	\$68	\$0	\$58	\$10	\$0	\$10



LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	FACILITY SQ. FT. 27,750	DATE OF AUDIT: 5/6/2013	CUSTOMER: Verona Schools FACILITY: Forest Avenue
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SPACE DESCRIPTION			EXISTING FIXTURES	REPLACEMENT FIXTURES							ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	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	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
								2610								\$0.152						
30	N/A	PRINCIPAL OFFICE	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	2	Wall	1	84	1,346	174	113	70	140	725	290	61	\$53	\$202	\$215	\$386	\$30	\$0	\$30
31	N/A	BOILER ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	8			336	2,610	877	877	16	128	0	334	0	\$51	\$546	\$0	\$466	\$80	\$0	\$80
32	N/A	BOILER ROOM	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
33	N/A	ELECTRICAL ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	360	30	30	16	32	0	12	0	\$2	\$137	\$0	\$117	\$20	\$0	\$20
34	N/A	CUSTODIAN CLOSET	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	\$1	\$68	\$0	\$58	\$10	\$0	\$10
35	N/A	CAFETERIA	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	26	Ceiling	3	1,092	1,482	2,523	1,618	70	1,820	828	4,204	904	\$775	\$2,620	\$1,090	\$3,215	\$390	\$105	\$495
36	N/A	KITCHEN	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	2,070	174	174	16	32	0	66	0	\$10	\$137	\$0	\$117	\$20	\$0	\$20
37	N/A	KITCHEN STORAGE		0			0	360	0	0	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
38	N/A	CLASSROOM 3	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	\$105	\$913	\$363	\$1,121	\$120	\$35	\$155
39	N/A	COMPUTER LAB	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	\$105	\$913	\$363	\$1,121	\$120	\$35	\$155
40	N/A	STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	\$1	\$68	\$0	\$58	\$10	\$0	\$10
41	N/A	GIRLS REST ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	3	Wall	1	126	1,035	261	130	16	48	1,035	99	130	\$35	\$205	\$215	\$389	\$30	\$0	\$30
42	N/A	RESOURCE ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	11	Wall	1	693	1,346	1,435	932	25	275	725	569	502	\$162	\$837	\$215	\$921	\$110	\$20	\$130
43	N/A	CUSTODIAN CLOSET	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	\$1	\$68	\$0	\$58	\$10	\$0	\$10
44	N/A	BOYS REST ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	3	Wall	1	126	1,035	261	130	16	48	1,035	99	130	\$35	\$205	\$215	\$389	\$30	\$0	\$30
45	N/A	CLASSROOM 23	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,224	1,028	823	16	256	306	392	206	\$91	\$1,612	\$363	\$1,780	\$160	\$35	\$195
46	N/A	CLASSROOM 23 STORAGE	Incandescent 12"x12" Square Fixture w/ 23w Screw-In CFL	1			84	360	30	30	-61	-61	0	-22	0	-\$3	\$84	\$0	\$74	\$10	\$0	\$10
47	N/A	CLASSROOM 22	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,224	1,028	823	16	256	306	392	206	\$91	\$1,612	\$363	\$1,780	\$160	\$35	\$195
48	N/A	CLASSROOM 22 STORAGE	Incandescent 12"x12" Square Fixture w/ 23w Screw-In CFL	1			23	360	8	8	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
49	N/A	CLASSROOM 24	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,224	1,028	823	16	256	306	392	206	\$91	\$1,612	\$363	\$1,780	\$160	\$35	\$195
50	N/A	READING CLOSET	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	360	30	30	16	32	0	12	0	\$2	\$137	\$0	\$117	\$20	\$0	\$20
51	N/A	CLASSROOM 25	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,224	1,028	823	16	256	306	392	206	\$91	\$1,612	\$363	\$1,780	\$160	\$35	\$195
52	N/A	CLASSROOM 21	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,224	1,028	823	16	256	306	392	206	\$91	\$1,612	\$363	\$1,780	\$160	\$35	\$195
53	N/A	CLASSROOM 21 STORAGE	Incandescent 12"x12" Square Fixture w/ 23w Screw-In CFL	1			23	360	8	8	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
54	N/A	CLASSROOM 20	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,224	1,028	823	16	256	306	392	206	\$91	\$1,612	\$363	\$1,780	\$160	\$35	\$195
55	N/A	CLASSROOM 20 STORAGE	Incandescent 12"x12" Square Fixture w/ 23w Screw-In CFL	1			23	360	8	8	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
56	N/A	STORAGE ROOM	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	1			42	360	15	15	70	70	0	25	0	\$4	\$101	\$0	\$86	\$15	\$0	\$15
57	N/A	GIRLS REST ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	3	Wall	1	189	1,035	391	196	25	75	1,035	155	196	\$53	\$228	\$215	\$393	\$30	\$20	\$50
58	N/A	SECOND FLOOR HALL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	7			294	2,610	767	767	16	112	0	292	0	\$44	\$478	\$0	\$408	\$70	\$0	\$70



LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	FACILITY SQ. FT. 27,750	DATE OF AUDIT: 5/6/2013	CUSTOMER: Verona Schools FACILITY: Forest Avenue
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SPACE DESCRIPTION			EXISTING FIXTURES		REPLACEMENT FIXTURES						ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	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	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
59	N/A	SECOND FLOOR HALL	Exit Sign w/ LED	2			4	8,760	35	35	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	
60	N/A	STAIRWELL A	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	6			252	2,610	658	658	16	96	0	251	0	\$38	\$410	\$0	\$350	\$60	\$0	\$60
61	N/A	STAIRWELL A	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	
62	N/A	STAIRWELL B	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	6			252	2,610	658	658	16	96	0	251	0	\$38	\$410	\$0	\$350	\$60	\$0	\$60
63	N/A	STAIRWELL B	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	
64	N/A	FIRST FLOOR HALL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	7			294	2,610	767	767	16	112	0	292	0	\$44	\$478	\$0	\$408	\$70	\$0	\$70
65	N/A	FIRST FLOOR HALL	2'x4' Troffer w/ (1) FO32T8 Lamp & (1) Electronic Ballast	14			350	2,610	914	914	7	98	0	256	0	\$39	\$355	\$0	\$215	\$140	\$0	\$140
66	N/A	FIRST FLOOR HALL	Troffer w/ (4) F17T8 Lamps & (1) 4/17 Elec. NP HE Ballast	2			116	2,610	303	303	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	
67	N/A	FIRST FLOOR HALL	2'x4' Troffer w/ (6) FO32T8/32w Lamps & (2) Electronic Ballasts	3			378	2,610	987	987	40	120	0	313	0	\$47	\$456	\$0	\$426	\$30	\$0	\$30
68	N/A	FIRST FLOOR HALL	Exit Sign w/ LED	5			10	8,760	88	88	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	
69	N/A	MAIN ENTRANCE	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	1			42	2,610	110	110	70	70	0	183	0	\$28	\$101	\$0	\$86	\$15	\$0	\$15
70	N/A	MAIN ENTRANCE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	2,610	110	110	16	16	0	42	0	\$6	\$68	\$0	\$58	\$10	\$0	\$10
71	N/A	MAIN ENTRANCE	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0	
72	N/A	EXTERIOR- MAIN ENTRANCE EAVE	HID Fixture w/ (1) 250w Metal Halide Lamp & Ballast	1			175	4,745	830	830	120	120	0	569	0	\$86	\$384	\$0	\$334	\$50	\$0	\$50
73	N/A	EXTERIOR- FRONT	Incandescent Flood Fixture w/ (1) 100w Halogen Lamp	17			391	4,745	1,855	1,855	77	1,309	0	6,211	0	\$942	\$387	\$0	\$387	\$0	\$0	\$0
74	N/A	EXTERIOR- SIDE ENTRANCE WALLPACK	HID Fixture w/ (1) 100w Metal Halide Lamp & Ballast	1			70	4,745	332	332	50	50	0	237	0	\$36	\$293	\$0	\$243	\$50	\$0	\$50
75	N/A	EXTERIOR- SIDE ENTRANCE WALL SCONCE	HID Fixture w/ (1) 100w Metal Halide Lamp & Ballast	1			70	4,745	332	332	50	50	0	237	0	\$36	\$293	\$0	\$243	\$50	\$0	\$50
				598		38	38,807		45,385	37,719		11,069	19,733	25,127	7,667	\$4,973	\$39,159	\$11,723	\$45,427	\$4,610	\$845	\$5,455



LIGHTING RETROFIT SUMMARY FOR: HB Whitehorne Middle School 600 Bloomfield Avenue

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	ANNUAL KWH SAVED WITH SENSORS	ANNUAL SAVINGS \$ FIXT.	ANNUAL SAVINGS \$ SENSORS	ANNUAL SAVINGS \$ TOTAL	CO2 REDUCTION (TONS)	NJ Smart Start REBATE \$	FIXTURES TOTAL (INSTALLED) COST \$	SENSORS TOTAL (INSTALLED) COST \$	MATERIAL TOTAL (INSTALLED) COST \$	SIMPLE PAYBACK NET OF REBATE (YEARS)
HB Whitehorne Middle School	118,224	412	34,601	69,349	0.29	412	22,403	39,404	0.19	12,198	29,945	6,238	\$4,620	\$962	\$5,582	9.9	\$5,600	\$37,301	\$9,430	\$46,730	7.4

12%	PERCENTAGE OF REBATES IN TOTAL INSTALLED COST
57%	PERCENTAGE OF CONSUMPTION COMPARE TO EXISTING STATE
13%	EXISTING PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING
7%	PROPOSED PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING



LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	CUSTOMER: Verona Schools	FACILITY SQ. FT. 118,224	DATE OF AUDIT: 5/9/2013
	FACILITY: HB Whitehorse Middle School		

SPACE DESCRIPTION			EXISTING FIXTURES						REPLACEMENT FIXTURES								ENERGY ANALYSIS						COST ANALYSIS			REBATES						
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS	PRE ANNUAL KWH	PRE AVERAGE LIGHT LEVEL FOOT CANDLES	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	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE	
						2610										2610								\$0.154								
216	N/A	STAIRWELL, MEDIA CENTER	4' Strip Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	2,610	151		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	2,610	110	110	16	16	0	42	0	\$6	\$68	\$0	\$58	\$10	\$0	\$10	
217	N/A	STAIRWELL, MEDIA CENTER	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0		
218	N/A	STAIRWELL, MEDIA CENTER	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	4	58	232	2,610	606		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	4	42				168	2,610	438	438	16	64	0	167	0	\$26	\$273	\$0	\$233	\$40	\$0	\$40	
219	N/A	STAIRWELL, CENTER 1	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	7	58	406	2,610	1,060		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	7	42				294	2,610	767	767	16	112	0	292	0	\$45	\$478	\$0	\$408	\$70	\$0	\$70	
220	N/A	STAIRWELL, CENTER 2	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	7	58	406	2,610	1,060		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	7	42				294	2,610	767	767	16	112	0	292	0	\$45	\$478	\$0	\$408	\$70	\$0	\$70	
221	N/A	AUDITORIUM	Incandescent Drum Fixture w/ (2) 60w Incandescent Lamps	5	120	600	1,530	918		Relamp w/ (2) 15 watt Compact Fluorescent Screw-In	5	30	306	Ceiling	1	150	1,224	230	184	90	450	306	689	46	\$113	\$114	\$363	\$477	\$0	\$0	\$0	
222	N/A	AUDITORIUM	Exit Sign w/ LED	5	2	10	8,760	88		None	5	2				10	8,760	88	88	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0		
223	N/A	AUDITORIUM	5 Watt LED PAR 19 fixture	12	5	60	1,530	92		None	12	5	306	Ceiling	1	60	1,224	92	73	0	0	306	0	18	\$3	\$0	\$363	\$363	\$0	\$0	\$0	
224	N/A	AUDITORIUM	HID Fixture w/ (1) 400w Metal Halide Lamp & Ballast	9	455	4,095	1,530	6,265		New Fixture w/ (1) 165w Induction Lamp & Induction Ballast Universal Voltage	9	175	306	Ceiling	1	1,575	1,224	2,410	1,928	280	2,520	306	3,856	482	\$669	\$3,452	\$363	\$3,330	\$450	\$35	\$485	
225	N/A	MAIN LOBBY	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	8	112	896	2,610	2,339		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	8	42				336	2,610	877	877	70	560	0	1,462	0	\$225	\$806	\$0	\$686	\$120	\$0	\$120	
226	N/A	MAIN LOBBY	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0		
227	N/A	EXTERIOR, ENTRANCE SCNCE	Incandescent Vanity Fixture w/ (4) 15w Incandescent Lamps	1	60	60	4,745	285	OFF	None	1	60				60	4,745	285	285	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0		
228	N/A	EXTERIOR, ENTRANCE CHANDELIER		1	0	0	4,745	0	OFF		1	0				0	4,745	0	0	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0		
229	N/A	EXTERIOR, WALL PACK	HID Fixture w/ (1) 150w Metal Halide Lamp & Ballast	15	195	2,925	4,745	13,879		New Fixture w/ (1) 100w Induction Lamp & Induction Ballast Universal Voltage	15	110				1,650	4,745	7,829	7,829	85	1,275	0	6,050	0	\$933	\$5,655	\$0	\$4,605	\$1,050	\$0	\$1,050	
230	N/A	BENCH LIGHTS		2	0	0	4,745	0			2	0				0	4,745	0	0	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0		
231	N/A	EXTERIOR, SIDE DOOR WALL PACK	HID Fixture w/ (1) 50w Metal Halide Lamp & Ballast	3	62	186	4,745	883		New Wall Pack Fixture w/ (1) 40w Induction Lamp & Induction Ballast Universal Voltage	3	40				120	4,745	569	569	22	66	0	313	0	\$48	\$761	\$0	\$761	\$0	\$0	\$0	
232	N/A	EXTERIOR, FLOODLIGHTS		2	0	0	4,745	0	H1X50		2	0				0	4,745	0	0	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0		
233	N/A	EXTERIOR, REAR EAVE	HID Fixture w/ (1) 50w High Pressure Sodium Lamp & Ballast	2	60	120	4,745	569		New Wall Pack Fixture w/ (2) 18w CF Lamps & Electronic Ballast Photocell	2	40				80	4,745	380	380	20	40	0	190	0	\$29	\$163	\$0	\$163	\$0	\$0	\$0	
234	N/A	EXTERIOR, MEDIA SCNCE	HID Fixture w/ (1) 50w Metal Halide Lamp & Ballast	3	62	186	4,745	883		None	3	62				186	4,745	883	883	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0		
				412		34,601		69,349						412		28	22,403		45,642	39,404		12,198	11,201	23,707	6,238	\$4,620	\$37,301	\$9,430	\$41,130	\$5,005	\$595	\$5,600



LIGHTING RETROFIT SUMMARY FOR: Laning Ave 18 Laning Road

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	ANNUAL KWH SAVED WITH SENSORS	ANNUAL SAVINGS \$ FIXT.	ANNUAL SAVINGS \$ SENSORS	ANNUAL SAVINGS \$ TOTAL	CO2 REDUCTION (TONS)	NJ Smart Start REBATE \$	FIXTURES TOTAL (INSTALLED) COST \$	SENSORS TOTAL (INSTALLED) COST \$	MATERIAL TOTAL (INSTALLED) COST \$	SIMPLE PAYBACK NET OF REBATE (YEARS)
Laning Ave	46,477	574	52,368	106,614	1.13	574	28,169	48,973	0.61	24,199	57,641	9,939	\$8,705	\$1,501	\$10,206	19.1	\$8,105	\$50,330	\$17,471	\$67,801	5.8

12%	PERCENTAGE OF REBATES IN TOTAL INSTALLED COST
46%	PERCENTAGE OF CONSUMPTION COMPARE TO EXISTING STATE
43%	EXISTING PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING
20%	PROPOSED PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING



LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	CUSTOMER: FACILITY: Verona Schools Laning Ave	FACILITY SQ. FT. 46,477	DATE OF AUDIT: 5/6/2013
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SPACE DESCRIPTION			EXISTING FIXTURES						REPLACEMENT FIXTURES								ENERGY ANALYSIS					COST ANALYSIS			REBATES						
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS	PRE ANNUAL KWH	PRE AVERAGE LIGHT LEVEL FOOT CANDLES	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	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
						2610										2610															
87	N/A	MAIN HALLWAY	2'x4' Troffer w/ (4) F032T8 Lamps & (2) Electronic Ballasts	27	112	3,024	2,610	7,893		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	27	42			1,134	2,610	2,960	2,960	70	1,890	0	4,933	0	\$745	\$2,720	\$0	\$2,315	\$405	\$0	\$405	
88	N/A	MAIN HALLWAY	Exit Sign w/ LED	4	2	8	2,610	21		None	4	2			8	2,610	21	21	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0		
89	N/A	EXTERIOR- 1/2 ROUND WALL SCNCE	Wall-Mounted Fixture w/ (1) 42W CFL and Electronic Ballast	7	45	315	8,760	2,759		None	7	45			315	8,760	2,759	2,759	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0		
90	N/A	EXTERIOR- MEDIUM WALLPACK	HID Fixture w/ (1) 250w High Pressure Sodium	6	295	1,770	2,610	4,620		New Fixture w/ (1) 150w Induction Lamp & Induction Ballast Universal Voltage	6	157			942	2,610	2,459	2,459	138	828	0	2,161	0	\$326	\$2,652	\$0	\$2,352	\$300	\$0	\$300	
91	N/A	EXTERIOR- SMALL WALLPACK	HID Fixture w/ (1) 70w High Pressure Sodium Lamp & Ballast	3	92	276	4,745	1,310		New Wall Pack Fixture w/ (1) 40w Induction Lamp & Induction Ballast Universal Voltage	3	40			120	4,745	569	569	52	156	0	740	0	\$112	\$761	\$0	\$761	\$0	\$0	\$0	
92	N/A	EXTERIOR- MAIN ENTRANCE	Wall-Mounted Fixture w/ (1) 42W CFL and Electronic Ballast	6	45	270	2,610	705		None	6	45			270	2,610	705	705	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0		
93	N/A	EXTERIOR- GYM ENTRANCE	Wall-Mounted Fixture w/ (1) 42W CFL and Electronic Ballast	9	45	405	8,760	3,548		None	9	45			405	8,760	3,548	3,548	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0	\$0		
				574		52,368		106,614			574			53	28,169		58,913	48,973		24,199	21,177	47,701	9,939	8,705	50,330	17,471	59,696	6,925	1,180	8,105	



LIGHTING RETROFIT SUMMARY FOR: Verona High School 151 Fairview Avenue

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	ANNUAL KWH SAVED WITH SENSORS	ANNUAL SAVINGS \$ FIXT.	ANNUAL SAVINGS \$ SENSORS	ANNUAL SAVINGS \$ TOTAL	CO2 REDUCTION (TONS)	NJ Smart Start REBATE \$	FIXTURES TOTAL (INSTALLED) COST \$	SENSORS TOTAL (INSTALLED) COST \$	MATERIAL TOTAL (INSTALLED) COST \$	SIMPLE PAYBACK NET OF REBATE (YEARS)
Verona High School	120,245	1578	167,788	358,721	1.40	1,578	106,996	218,205	0.89	60,792	140,517	23,085	\$23,883	\$3,924	\$27,807	46.4	\$20,340	\$138,772	\$31,405	\$170,178	5.4

12%	PERCENTAGE OF REBATES IN TOTAL INSTALLED COST
61%	PERCENTAGE OF CONSUMPTION COMPARE TO EXISTING STATE
45%	EXISTING PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING
27%	PROPOSED PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING



LIGHTING UPGRADE PROJECT
LINE x LINE DETAIL

CUSTOMER:
FACILITY:

Verona Schools
Verona High School

FACILITY SQ. FT.
120,245

DATE OF AUDIT:
5/7/2013

Table with columns: SPACE DESCRIPTION, EXISTING FIXTURES, REPLACEMENT FIXTURES, ENERGY ANALYSIS, COST ANALYSIS, REBATES. Includes detailed data for 172 line items across various rooms like classrooms, boiler rooms, and locker rooms.



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ECM COSTS & CALCULATIONS



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ECM #1:

PC POWER MANAGEMENT

Brookdale Elementary School - Computer Time of Day Optimization

Summary

Electricity Savings (kWh/yr)	12,043
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings (\$/yr)	\$1,864
Estimated Implementation Cost (\$)	\$807
Estimated Rebate (\$)	\$0
Estimated Implementation Cost after Rebate (\$)	\$807
Simple Payback (Years)	0.4

1. Assuming computers are completely powered down during summer vacation.
2. Computer and monitor power consumption values based on 2009 ASHRAE Fundamentals, Section 18.12, Table 8.
3. Savings assumes all computers go into standby/sleep mode during unoccupied building hours.

FN Brown School - Computer Time of Day Optimization

Summary

Electricity Savings (kWh/yr)	16,503
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings (\$/yr)	\$2,835
Estimated Implementation Cost (\$)	\$1,076
Estimated Rebate (\$)	\$0
Estimated Implementation Cost after Rebate (\$)	\$1,076
Simple Payback (Years)	0.4

1. Assuming computers are completely powered down during summer vacation.
2. Computer and monitor power consumption values based on 2009 ASHRAE Fundamentals, Section 18.12, Table 8.
3. Savings assumes all computers go into standby/sleep mode during unoccupied building hours.

Forest Elementary School - Computer Time of Day Optimization

Summary

Electricity Savings (kWh/yr)	17,990
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings (\$/yr)	\$2,728
Estimated Implementation Cost (\$)	\$1,166
Estimated Rebate (\$)	\$0
Estimated Implementation Cost after Rebate (\$)	\$1,166
Simple Payback (Years)	0.4

1. Assuming computers are completely powered down during summer vacation.
2. Computer and monitor power consumption values based on 2009 ASHRAE Fundamentals, Section 18.12, Table 8.
3. Savings assumes all computers go into standby/sleep mode during unoccupied building hours.

Laning Avenue School - Computer Time of Day Optimization

Summary

Electricity Savings (kWh/yr)	17,990
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings (\$/yr)	\$2,775
Estimated Implementation Cost (\$)	\$1,166
Estimated Rebate (\$)	\$0
Estimated Implementation Cost after Rebate (\$)	\$1,166
Simple Payback (Years)	0.4

1. Assuming computers are completely powered down during summer vacation.
2. Computer and monitor power consumption values based on 2009 ASHRAE Fundamentals, Section 18.12, Table 8.
3. Savings assumes all computers go into standby/sleep mode during unoccupied building hours.

HB Whitehorne Middle School - Computer Time of Day Optimization

Summary

Electricity Savings (kWh/yr)	49,659
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings (\$/yr)	\$7,500
Estimated Implementation Cost (\$)	\$3,319
Estimated Rebate (\$)	\$0
Estimated Implementation Cost after Rebate (\$)	\$3,319
Simple Payback (Years)	0.4

1. Assuming computers are completely powered down during summer vacation.
2. Computer and monitor power consumption values based on 2009 ASHRAE Fundamentals, Section 18.12, Table 8.
3. Savings assumes all computers go into standby/sleep mode during unoccupied building hours.

Verona High School - Computer Time of Day Optimization

Summary

Electricity Savings (kWh/yr)	69,285
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings (\$/yr)	\$11,776
Estimated Implementation Cost (\$)	\$4,664
Estimated Rebate (\$)	\$0
Estimated Implementation Cost after Rebate (\$)	\$4,664
Simple Payback (Years)	0.4

1. Assuming computers are completely powered down during summer vacation.
2. Computer and monitor power consumption values based on 2009 ASHRAE Fundamentals, Section 18.12, Table 8.
3. Savings assumes all computers go into standby/sleep mode during unoccupied building hours.



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ECM #2:

INSULATE PIPING

CALCULATIONS

Verona High School - HHW Pipe Insulation

N/N	SCRIPTION WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	2" Pipe Insu	LF	75	5	375	5	341	716
2			1		-		-	-
3			1		-		-	-
4			1		-		-	-
5			1		-		-	-
6			1		-		-	-
Other Estimated Implementation Costs								150

TOTAL								\$ 866
SUB-TOTAL								716
O&P						10%		72
ASBESTOS ABATEMENT								-
DIRECT COST								787
PAYMENT & PERFORMANCE BOND						0%		-
SUB-TOTAL								787
CONTINGENCY						10%		79
ASBESTOS CONTINGENCY						0%		-
SUB-TOTAL								866
ASBESTOS DESIGN & AIR MONITORING, TESTING								-
IC FEE						0.0%		-
SUB-TOTAL								866
INTEREST DURING CONSTRUCTION						0%		-
TOTAL								\$ 866

FN Brown Elementary School - HHW Pipe Insulation

N/N	SCRIPTION WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	2" Pipe Insu	LF	20	5	100	5	91	191
2			1		-		-	-
3			1		-		-	-
4			1		-		-	-
5			1		-		-	-
6			1		-		-	-
Other Estimated Implementation Costs								40

TOTAL								\$ 231
SUB-TOTAL								191
O&P						10%		19
ASBESTOS ABATEMENT								-
DIRECT COST								210
PAYMENT & PERFORMANCE BOND						0%		-
SUB-TOTAL								210
CONTINGENCY						10%		21
ASBESTOS CONTINGENCY						0%		-
SUB-TOTAL								231
ASBESTOS DESIGN & AIR MONITORING, TESTING								-
IC FEE						0.0%		-
SUB-TOTAL								231
INTEREST DURING CONSTRUCTION						0%		-
TOTAL								\$ 231

CALCULATIONS

Verona Highschool - Insulate HHW Piping

1. Price of #2 Fuel Oil, \$/gal	x
2. Price of City Water, \$/1000 gallons	x
3. Price of Electricity, \$/kWh (blended rate)	\$0.170
4. Price of the Demand of Electricity, \$/kW/month	\$0.000
5. Price of Natural Gas, \$/therm	\$0.950

Total Savings			
	Existing Condition	Proposed System	Savings
Number of Ft of underinsulated pipe	75	75	
Inches of insulation	0	1.0	
Annual Btu losses	50,159,983	7,760,539	42,399,444
Annual Therms lost	502	78	424
Annual Cost and Savings, \$	\$ 477	\$ 74	\$ 403

1. Assumes HHW reset between 150 and 180degF
2. Assumes 75 feet of 2.00 inch pipe.

CALCULATIONS

F.N. Brown - Insulate LPC Piping

1. Price of #2 Fuel Oil, \$/gal	x
2. Price of City Water, \$/1000 gallons	x
3. Price of Electricity, \$/kWh (blended rate)	\$0.172
4. Price of the Demand of Electricity, \$/kW/month	\$0.000
5. Price of Natural Gas, \$/therm	\$1.032

Total Savings			
	Existing Condition	Proposed System	Savings
Number of Ft of underinsulated pipe	20	20	
Inches of insulation	0	1.0	
Annual Btu losses	20,068,364	3,030,067	17,038,297
Annual Therms lost	201	30	170
Annual Cost and Savings, \$	\$ 207	\$ 31	\$ 176

1. Assumes 20 feet of 2.00 inch pipe.



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ECM #3:

VENDING MACHINE CONTROLS

CALCULATIONS

Verona HS - Vending Meiser								
N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	Soda Machine		5	179	895	500	2,500	3,395
2	Snack Machine		-	179	-	500	-	-
Other Estimated Implementation Costs								-
TOTAL								\$ 3,395
SUB-TOTAL								3,395
O&P								0% -
ASBESTOS ABATEMENT								-
DIRECT COST								3,395
PAYMENT & PERFORMANCE BOND								0% -
SUB-TOTAL								3,395
CONTINGENCY								0% -
ASBESTOS CONTINGENCY								0% -
SUB-TOTAL								3,395
ASBESTOS DESIGN & AIR MONITORING, TESTING								-
IC FEE								0.0% -
SUB-TOTAL								3,395
INTEREST DURING CONSTRUCTION								0% -
TOTAL								\$ 3,395

HB Whitehorne Middle School - Vending Miser								
N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	Soda Machine		1	179	179	500	500	679
2	Snack Machine		-	179	-	500	-	-
Other Estimated Implementation Costs								-
TOTAL								\$ 679
SUB-TOTAL								679
O&P								0% -
ASBESTOS ABATEMENT								-
DIRECT COST								679
PAYMENT & PERFORMANCE BOND								0% -
SUB-TOTAL								679
CONTINGENCY								0% -
ASBESTOS CONTINGENCY								0% -
SUB-TOTAL								679
ASBESTOS DESIGN & AIR MONITORING, TESTING								-
IC FEE								0.0% -
SUB-TOTAL								679
INTEREST DURING CONSTRUCTION								0% -
TOTAL								\$ 679

FN Brown - Vending Miser								
N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	Soda Machine		2	179	358	500	1,000	1,358
2	Snack Machine		-	179	-	500	-	-
Other Estimated Implementation Costs								-
TOTAL								\$ 1,358
SUB-TOTAL								1,358
O&P								0% -
ASBESTOS ABATEMENT								-
DIRECT COST								1,358
PAYMENT & PERFORMANCE BOND								0% -
SUB-TOTAL								1,358
CONTINGENCY								0% -
ASBESTOS CONTINGENCY								0% -
SUB-TOTAL								1,358
ASBESTOS DESIGN & AIR MONITORING, TESTING								-
IC FEE								0.0% -
SUB-TOTAL								1,358
INTEREST DURING CONSTRUCTION								0% -
TOTAL								\$ 1,358

CALCULATIONS

Verona High School - Vending Machine Power Management System

Price of #2 Fuel Oil, \$/gal	
Price of City Water, \$/1000 gallons	
Price of Electricity, \$/kWh (blended rate)	\$0.170
Price of the Demand of Electricity, \$/kW/month	
Price of Natural Gas, \$/therm	

	Existing Condition	Proposed System	Savings
Soda Machine Power Consumption	100%	44%	56%
Soda Machine Annual Op Cost	\$ 2,978	\$ 1,310	1,668
Run Hours	8,760	8,760	
Soda Annual Energy Consumption (kWh)	17,520	7,709	9,811
Snack Machine Power Consumption	100%	44%	56%
Annual Op Cost	\$ -	\$ -	0
Run Hours	8,760	8,760	
Annual Energy Consumption (kWh)	-	-	-
Total Annual Energy Consumption (kWh)	17,520	7,709	9,811
Annual Cost and Savings, \$	\$ 2,978	\$ 1,310	\$ 1,668

1. Run hours based on fan motors being run 8760 hrs

CALCULATIONS

HB Whitehorne Middle School- Vending Machine Power Management System

Price of #2 Fuel Oil, \$/gal	
Price of City Water, \$/1000 gallons	
Price of Electricity, \$/kWh (blended rate)	\$0.154
Price of the Demand of Electricity, \$/kW/month	
Price of Natural Gas, \$/therm	

	Existing Condition	Proposed System	Savings
Soda Machine Power Consumption	100%	44%	56%
Soda Machine Annual Op Cost	\$ 541	\$ 238	303
Run Hours	8,760	8,760	
Soda Annual Energy Consumption (kWh)	3,504	1,542	1,962
Snack Machine Power Consumption	100%	44%	56%
Annual Op Cost	\$ -	\$ -	0
Run Hours	8,760	8,760	
Annual Energy Consumption (kWh)	-	-	-
Total Annual Energy Consumption (kWh)	3,504	1,542	1,962
Annual Cost and Savings, \$	\$ 541	\$ 238	\$ 303

1. Run hours based on fan motors being run 8760 hrs

CALCULATIONS

FN Brown Elementary - Vending Machine Power Management System

Price of #2 Fuel Oil, \$/gal	
Price of City Water, \$/1000 gallons	
Price of Electricity, \$/kWh (blended rate)	\$0.172
Price of the Demand of Electricity, \$/kW/month	
Price of Natural Gas, \$/therm	

	Existing Condition	Proposed System	Savings
Soda Machine Power Consumption	100%	44%	56%
Soda Machine Annual Op Cost	\$ 1,204	\$ 530	674
Run Hours	8,760	8,760	
Soda Annual Energy Consumption (kWh)	7,008	3,084	3,924
Snack Machine Power Consumption	100%	44%	56%
Annual Op Cost	\$ -	\$ -	0
Run Hours	8,760	8,760	
Annual Energy Consumption (kWh)	-	-	-
Total Annual Energy Consumption (kWh)	7,008	3,084	3,924
Annual Cost and Savings, \$	\$ 1,204	\$ 530	\$ 674

1. Run hours based on fan motors being run 8760 hrs



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ECM #4:

STEAM TRAP REPAIR PROGRAM

COST ESTIMATE

F.N.Brown - Steam Trap Survey

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL	
				PER UNIT	TOTAL	PER UNIT	TOTAL		
1	Steam Trap Survey	ea	30	0	-	55	1,650	1,650	
2	Replace Failed Traps	ea	3	82	246	40	120	366	
Other Estimated Implementation Costs								998	
TOTAL								\$ 3,014	
SUB-TOTAL								2,016	
O&P								15%	302
ASBESTOS ABATEMENT									-
DIRECT COST									2,318
PAYMENT & PERFORMANCE BOND								0%	-
SUB-TOTAL									2,318
CONTINGENCY								30%	696
ASBESTOS CONTINGENCY								10%	-
SUB-TOTAL									3,014
ASBESTOS DESIGN & AIR MONITORING, TESTING									-
IC FEE								0.0%	-
SUB-TOTAL									3,014
INTEREST DURING CONSTRUCTION								0%	-
TOTAL								\$ 3,014	
New Jersey Smart Start Rebate								\$ -	

Middle School - Steam Trap Survey

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL	
				PER UNIT	TOTAL	PER UNIT	TOTAL		
1	Steam Trap Survey	ea	65	0	-	55	3,575	3,575	
2	Replace Failed Traps	ea	7	82	574	40	280	854	
Other Estimated Implementation Costs								2,192	
TOTAL								\$ 6,621	
SUB-TOTAL								4,429	
O&P								15%	664
ASBESTOS ABATEMENT									-
DIRECT COST									5,093
PAYMENT & PERFORMANCE BOND								0%	-
SUB-TOTAL									5,093
CONTINGENCY								30%	1,528
ASBESTOS CONTINGENCY								10%	-
SUB-TOTAL									6,621
ASBESTOS DESIGN & AIR MONITORING, TESTING									-
IC FEE								0.0%	-
SUB-TOTAL									6,621
INTEREST DURING CONSTRUCTION								0%	-
TOTAL								\$ 6,621	
New Jersey Smart Start Rebate								\$ -	

CALCULATIONS

Savings from Steam Trap Maintenance Program - F.N. Brown

Price of Natural Gas, \$/therm \$1.03

Estimated Number of Steam Traps ¹	30
Estimated Failure Rate ²	10%
Reduction in Number of Leaking Traps	3
Avg. Size of Orifice (inches diameter) ³	0.12
Average Steam Pressure (psig)	7
Steam Loss Through Trap(s) (lbs/hr) ⁴	7.6
Annual Steam Plant Operating Hours	4,320
Heating Plant Efficiency	80%
Annual Steam Loss (lbs)	98,166
Latent Heat of Steam at Avg Pressure (Btu/lbm)	960
Annual Fuel Savings (therms)	1,178
Annual Fuel Savings	\$1,215

1. Steam trap quantity estimated based on building blueprints and equipment.
 2. Per Hart F.L. and Jaber D., *Best Practices in Steam System Management. Steam Digest. US DoE: "In steam systems that have not been maintained for 3 to 5 years, from 15 to 30 percent of traps may have failed, and regularly-scheduled maintenance should reduce this to under 5 percent of traps."*
 3. Based on Spirax Sarco 1/2" thermostatic trap
 4. Based on modified Napier equation. $\text{Steam flow (lb/hr)} = 24.24 \times P_a \times D^2$
 Where P_a is absolute pressure, psia, and D is Orifice diameter in inches

CALCULATIONS

**Savings from Steam Trap Maintenance Program -
HB Whitehorne Middle School**

Price of Natural Gas, \$/therm \$1.04

Estimated Number of Steam Traps ¹	65
Estimated Failure Rate ²	10%
Reduction in Number of Leaking Traps	7
Avg. Size of Orifice (inches diameter) ³	0.12
Average Steam Pressure (psig)	5
Steam Loss Through Trap(s) (lbs/hr) ⁴	6.9
Annual Steam Plant Operating Hours	4,320
Heating Plant Efficiency	80%
Annual Steam Loss (lbs)	207,942
Latent Heat of Steam at Avg Pressure (Btu/lbm)	960
Annual Fuel Savings (therms)	2,495
Annual Fuel Savings	\$2,607

1. Steam trap quantity estimated based on building blueprints and equipment.
 2. Per Hart F.L. and Jaber D., *Best Practices in Steam System Management. Steam Digest.* US DoE:
"In steam systems that have not been maintained for 3 to 5 years, from 15 to 30 percent of traps may have failed, and regularly-scheduled maintenance should reduce this to under 5 percent of traps."
 3. Based on Spirax Sarco 1/2" thermostatic trap
 4. Based on modified Napier equation. $\text{Steam flow (lb/hr)} = 24.24 \times P_a \times D^2$
 Where P_a is absolute pressure, psia, and D is Orifice diameter in inches

CALCULATIONS

School	\$ / kWh	\$ / Therms
Laning Avenue Elementary School	\$ 0.15	\$ 1.02
Brookdale Avenue Elementary School	\$ 0.15	\$ 1.17
F.N. Brown Elementary School	\$ 0.17	\$ 1.03
Forest Avenue Elementary School	\$ 0.15	\$ 1.13
H.B. Whitehorne Middle School	\$ 0.15	\$ 1.04
Verona High School	\$ 0.17	\$ 0.95
Averaged Costs	\$ 0.16	\$ 1.06



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ECM #5:

REPLACE ELECTRIC DHW WITH NATURAL GAS

COST ESTIMATES

Brookdale Elementary School - Replace Electric Resistance Water Heaters With natural gas units

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	Install new 60 gal, 65 MBH nat gas Water Heater	each	1	1215.00	1,215	328.00	328	1,543
2	Install new 75 gal, 75 MBH nat gas Water Heater	each	-	1520.00	-	492.00	-	-
3	Install new 100 gal, 75 MBH nat gas Water Heater	each	-	1870.00	-	656.00	-	-
4	Demo For Large Heaters	each	-		-	230.00	-	-
5	Install Nat Gas Piping	ft per heater	25	6.25	156	5.80	145	301
6	Install Flue	ft per heater	50	9.00	450	1.45	73	523
Other Estimated Implementation Costs								369

TOTAL		\$ 369
SUB-TOTAL		1,844
O&P	20%	369
ASBESTOS ABATEMENT		-
DIRECT COST		2,213
PAYMENT & PERFORMANCE BOND	0%	-
SUB-TOTAL		2,213
CONTINGENCY	0%	-
ASBESTOS CONTINGENCY	0%	-
SUB-TOTAL		2,213
ASBESTOS DESIGN & AIR MONITORING, TESTING		-
IC FEE	0.0%	-
SUB-TOTAL		2,213
INTEREST DURING CONSTRUCTION	0%	-
TOTAL		\$ 2,213
NJ SmartStart Rebate		\$ 130

Laning Avenue Elementary - Replace Electric Resistance Water Heaters With natural gas units

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	Install new 60 gal, 65 MBH nat gas Water Heater	each	1	1215.00	1,215	328.00	328	1,543
2	Install new 75 gal, 75 MBH nat gas Water Heater	each	-	1520.00	-	492.00	-	-
3	Install new 100 gal, 75 MBH nat gas Water Heater	each	-	1870.00	-	656.00	-	-
4	Demo For Large Heaters	each	-		-	230.00	-	-
5	Install Nat Gas Piping	ft per heater	20	6.25	125	5.80	116	241
6	Install Flue	ft per heater	50	9.00	450	1.45	73	523
Other Estimated Implementation Costs								357

TOTAL		\$ 357
SUB-TOTAL		1,784
O&P	20%	357
ASBESTOS ABATEMENT		-
DIRECT COST		2,141
PAYMENT & PERFORMANCE BOND	0%	-
SUB-TOTAL		2,141
CONTINGENCY	0%	-
ASBESTOS CONTINGENCY	0%	-
SUB-TOTAL		2,141
ASBESTOS DESIGN & AIR MONITORING, TESTING		-
IC FEE	0.0%	-
SUB-TOTAL		2,141
INTEREST DURING CONSTRUCTION	0%	-
TOTAL		\$ 2,141
NJ SmartStart Rebate		\$ 130

CALCULATIONS

Brookdale Elementary School - Replace Electric Resistance Water Heaters With natural gas units

Price of natural gas (\$/therm) \$1.17
 Price of Electricity, \$/kWh (blended rate) \$0.15

	Existing Condition	Proposed System	Savings
Annual domestic water heating energy input, kWh	4,787	0	4,787
Annual domestic water heating energy input, therms	0	263	-263
Annual Cost and Savings, \$	\$ 741	\$ 308	\$ 433

Existing water heater energy factor 0.88

Proposed water heater energy factor 0.544



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ECM #6:

CHANGE CRT'S TO FLATSCREENS

CALCULATIONS

Laning Avenue Elementary - Replace Electric Resistance Water Heaters With natural gas units

Price of natural gas (\$/therm) \$1.02
 Price of Electricity, \$/kWh (blended rate) \$0.15

	Existing Condition	Proposed System	Savings
Annual domestic water heating energy input, kWh	10,620	0	10,620
Annual domestic water heating energy input, therms	0	609	-609
Annual Cost and Savings, \$	\$ 1,604	\$ 624	\$ 980

Existing water heater energy factor 0.85
 Proposed water heater energy factor 0.506

CALCULATIONS

FN Brown - CRT to FlatScreen Computer
--

Summary

Electricity Savings (kWh/yr)	401
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings (\$/yr)	\$69
Estimated Implementation Cost (\$)	\$300
Estimated Rebate (\$)	\$0
Estimated Implementation Cost after Rebate (\$)	\$300
Simple Payback (Years)	4.3

CALCULATIONS

Forest Elem - CRT to FlatScreen Computer

Summary

Electricity Savings (kWh/yr)	301
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings (\$/yr)	\$46
Estimated Implementation Cost (\$)	\$225
Estimated Rebate (\$)	\$0
Estimated Implementation Cost after Rebate (\$)	\$225
Simple Payback (Years)	4.9

CALCULATIONS

Middle School - CRT to FlatScreen Computer

Summary

Electricity Savings (kWh/yr)	201
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings (\$/yr)	\$31
Estimated Implementation Cost (\$)	\$150
Estimated Rebate (\$)	\$0
Estimated Implementation Cost after Rebate (\$)	\$150
Simple Payback (Years)	4.8

CALCULATIONS

Brookdale - CRT to FlatScreen Computer

Summary

Electricity Savings (kWh/yr)	401
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings (\$/yr)	\$62
Estimated Implementation Cost (\$)	\$300
Estimated Rebate (\$)	\$0
Estimated Implementation Cost after Rebate (\$)	\$300
Simple Payback (Years)	4.8

CALCULATIONS

Brookdale - CRT to FlatScreen Computer

Summary

Electricity Savings (kWh/yr)	100
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings (\$/yr)	\$15
Estimated Implementation Cost (\$)	\$75
Estimated Rebate (\$)	\$0
Estimated Implementation Cost after Rebate (\$)	\$75
Simple Payback (Years)	4.9



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ECM #8:

DOOR WEATHERIZATION

COST ESTIMATES

Laning Avenue School - Door Weatherization									
N/N	DESCRIPTION WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL	
				PER UNIT	TOTAL	PER UNIT	TOTAL		
1	Door Wea	Ea	3	\$ 22	\$ 65	\$ 57	\$ 171	\$ 235	
	Other Estimated Implementation Costs							-	
	TOTAL							\$ 235	
	SUB-TOTAL							235	
	O&P						0%	-	
	ASBESTOS ABATEMENT					SF		-	
	DIRECT COST							235	
	PAYMENT & PERFORMANCE BOND						0%	-	
	SUB-TOTAL							235	
	CONTINGENCY						0%	-	
	Engineering Fees						0%	-	
	Architectural fees for Renovation						0%	-	
	ASBESTOS CONTINGENCY						15%	-	
	SUB-TOTAL							235	
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-	
	IC FEE						0.0%	-	
	SUB-TOTAL							235	
	INTEREST DURING CONSTRUCTION						0%	-	
	TOTAL							\$ 235	

Verona High School - Door Weatherization									
N/N	DESCRIPTION WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL	
				PER UNIT	TOTAL	PER UNIT	TOTAL		
1	Door Wea	Ea	1	\$ 22	\$ 22	\$ 57	\$ 57	\$ 78	
	Other Estimated Implementation Costs							-	
	TOTAL							\$ 78	
	SUB-TOTAL							78	
	O&P						0%	-	
	ASBESTOS ABATEMENT					SF		-	
	DIRECT COST							78	
	PAYMENT & PERFORMANCE BOND						0%	-	
	SUB-TOTAL							78	
	CONTINGENCY						0%	-	
	Engineering Fees						0%	-	
	Architectural fees for Renovation						0%	-	
	ASBESTOS CONTINGENCY						15%	-	
	SUB-TOTAL							78	
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-	
	IC FEE						0.0%	-	
	SUB-TOTAL							78	
	INTEREST DURING CONSTRUCTION						0%	-	
	TOTAL							\$ 78	

COST ESTIMATES

Middle School - Door Weatherization									
N/N	DESCRIPTION WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL	
				PER UNIT	TOTAL	PER UNIT	TOTAL		
1	Door Wea	Ea	6	\$ 22	\$ 130	\$ 57	\$ 341	\$ 471	
	Other Estimated Implementation Costs								-
	TOTAL							\$ 471	
	SUB-TOTAL							471	
	O&P						0%	-	
	ASBESTOS ABATEMENT					SF		-	
	DIRECT COST							471	
	PAYMENT & PERFORMANCE BOND						0%	-	
	SUB-TOTAL							471	
	CONTINGENCY						0%	-	
	Engineering Fees						0%	-	
	Architectural fees for Renovation						0%	-	
	ASBESTOS CONTINGENCY						15%	-	
	SUB-TOTAL							471	
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-	
	IC FEE						0.0%	-	
	SUB-TOTAL							471	
	INTEREST DURING CONSTRUCTION						0%	-	
	TOTAL							\$ 471	

FN Brown - Door Weatherization									
N/N	DESCRIPTION WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL	
				PER UNIT	TOTAL	PER UNIT	TOTAL		
1	Door Wea	Ea	6	\$ 22	\$ 130	\$ 57	\$ 341	\$ 471	
	Other Estimated Implementation Costs								-
	TOTAL							\$ 471	
	SUB-TOTAL							471	
	O&P						0%	-	
	ASBESTOS ABATEMENT					SF		-	
	DIRECT COST							471	
	PAYMENT & PERFORMANCE BOND						0%	-	
	SUB-TOTAL							471	
	CONTINGENCY						0%	-	
	Engineering Fees						0%	-	
	Architectural fees for Renovation						0%	-	
	ASBESTOS CONTINGENCY						15%	-	
	SUB-TOTAL							471	
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-	
	IC FEE						0.0%	-	
	SUB-TOTAL							471	
	INTEREST DURING CONSTRUCTION						0%	-	
	TOTAL							\$ 471	

COST ESTIMATES

Laning Avenue Elementary School - Savings From Weatherstripping Doors

1. Price of #2 Fuel Oil, \$/gal	
2. Price of City Water, \$/1000 gallons	
3. Price of Electricity, \$/kWh (blended rate)	\$0.151
4. Price of the Demand of Electricity, \$/kW/month	
5. Price of Natural Gas, \$/therm	\$1.024

	Existing Condition	Proposed System	Savings
Number of Doors	3	3	
Estimated Infiltration Rate per Door, CFM	11	2	
Annual Cooling Infiltration Total Hours, OAT > 80F	814	814	
Annual Heating Infiltration Total Hours, OAT < 65F	1,729	1,729	
Annual Cooling Load, kBTU	-	-	
Annual Cooling Electrical Consumption, kWh	-	-	0
Annual Heating Load, kBTU	1,913	486	
Annual Heating Consumption, Therms	23	5.93	17
Annual Cost and Savings, \$	\$ 24	\$ 6	\$ 18

1. Infiltration rate was calculated according to ASHRAE Fundamentals 2005 Door Leakage Rate Equation F27.12
2. Estimated hours of infiltration was based on all hours below 65F and above 80F for the region.
3. It is assumed that each door has a leakage area of 2 square inches (3 linear feet by 0.05 in). Vestibule doors are not included. There is/are 3 door(s).
4. A 60% load factor was used when calculating the existing leakage rate.
5. Assume no cooling
6. The average outside air temperature above 80F during the year is 81F. The average outside air temperature below 65F is 42F.
7. New weatherstripping is assumed to reduce infiltration by 80%.

COST ESTIMATES

Verona High School - Savings From Weatherstripping Doors

1. Price of #2 Fuel Oil, \$/gal	
2. Price of City Water, \$/1000 gallons	
3. Price of Electricity, \$/kWh (blended rate)	\$0.170
4. Price of the Demand of Electricity, \$/kW/month	
5. Price of Natural Gas, \$/therm	\$0.950

	Existing Condition	Proposed System	Savings
Number of Doors	1	1	
Estimated Infiltration Rate per Door, CFM	8	2	
Annual Cooling Infiltration Total Hours, OAT > 80F	814	814	
Annual Heating Infiltration Total Hours, OAT < 65F	1,729	1,729	
Annual Cooling Load, kBTU	-	-	
Annual Cooling Electrical Consumption, kWh	-	-	0
Annual Heating Load, kBTU	496	126	
Annual Heating Consumption, Therms	6	1.54	5
Annual Cost and Savings, \$	\$ 6	\$ 1	\$ 4

1. Infiltration rate was calculated according to ASHRAE Fundamentals 2005 Door Leakage Rate Equation F27.12
2. Estimated hours of infiltration was based on all hours below 65F and above 80F for the region.
3. It is assumed that each door has a leakage area of 4 square inches (7 linear feet by 0.05 in). Vestibule doors are not included. There is/are 1 door(s).
4. A 60% load factor was used when calculating the existing leakage rate.
5. Assume no cooling
6. The average outside air temperature above 80F during the year is 81F. The average outside air temperature below 65F is 42F.
7. New weatherstripping is assumed to reduce infiltration by 80%.

COST ESTIMATES

Middle School Savings - Savings From Weatherstripping Doors

1. Price of #2 Fuel Oil, \$/gal	
2. Price of City Water, \$/1000 gallons	
3. Price of Electricity, \$/kWh (blended rate)	\$0.154
4. Price of the Demand of Electricity, \$/kW/month	
5. Price of Natural Gas, \$/therm	\$1.045

	Existing Condition	Proposed System	Savings
Number of Doors	6	6	
Estimated Infiltration Rate per Door, CFM	21	4	
Annual Cooling Infiltration Total Hours, OAT > 80F	814	814	
Annual Heating Infiltration Total Hours, OAT < 65F	1,729	1,729	
Annual Cooling Load, kBTU	-	-	
Annual Cooling Electrical Consumption, kWh	-	-	0
Annual Heating Load, kBTU	7,652	1,945	
Annual Heating Consumption, Therms	93	23.72	70
Annual Cost and Savings, \$	\$ 97	\$ 25	\$ 73

1. Infiltration rate was calculated according to ASHRAE Fundamentals 2005 Door Leakage Rate Equation F27.12
2. Estimated hours of infiltration was based on all hours below 65F and above 80F for the region.
3. It is assumed that each door has a leakage area of 2 square inches (3 linear feet by 0.05 in). Vestibule doors are not included. There is/are 6 door(s).
4. A 60% load factor was used when calculating the existing leakage rate.
5. Assume no cooling
6. The average outside air temperature above 80F during the year is 81F. The average outside air temperature below 65F is 42F.
7. New weatherstripping is assumed to reduce infiltration by 80%.

COST ESTIMATES

FN Brown - Savings From Weatherstripping Doors

1. Price of #2 Fuel Oil, \$/gal	
2. Price of City Water, \$/1000 gallons	
3. Price of Electricity, \$/kWh (blended rate)	\$0.172
4. Price of the Demand of Electricity, \$/kW/month	
5. Price of Natural Gas, \$/therm	\$1.032

	Existing Condition	Proposed System	Savings
Number of Doors	6	6	
Estimated Infiltration Rate per Door, CFM	21	4	
Annual Cooling Infiltration Total Hours, OAT > 80F	814	814	
Annual Heating Infiltration Total Hours, OAT < 65F	1,729	1,729	
Annual Cooling Load, kBTU	-	-	
Annual Cooling Electrical Consumption, kWh	-	-	0
Annual Heating Load, kBTU	7,652	1,945	
Annual Heating Consumption, Therms	93	23.72	70
Annual Cost and Savings, \$	\$ 96	\$ 24	\$ 72

1. Infiltration rate was calculated according to ASHRAE Fundamentals 2005 Door Leakage Rate Equation F27.12
2. Estimated hours of infiltration was based on all hours below 65F and above 80F for the region.
3. It is assumed that each door has a leakage area of 2 square inches (3 linear feet by 0.05 in). Vestibule doors are not included. There is/are 6 door(s).
4. A 60% load factor was used when calculating the existing leakage rate.
5. Assume no cooling
6. The average outside air temperature above 80F during the year is 81F. The average outside air temperature below 65F is 42F.
7. New weatherstripping is assumed to reduce infiltration by 80%.



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ECM #9:

DEMAND CONTROL VENTILATION

COST ESTIMATE

Laning Avenue - Demand Control Ventilation

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL	
				PER UNIT	TOTAL	PER UNIT	TOTAL		
1	CO2 Sensors & Control Wiring	EA	2	375	750	625	1,250	2,000	
2	RA / OA Modulating Damper Actuators	EA (avg)	3	600	1,800	100	300	2,100	
3	Commissioning	hrs	4		0	150.0	600	600	
4	Modulating exhaust dampers 26"x26" with actuator	EA	3	895	2,685	125.0	375	3,060	
5	Ductwork demolition	lbs	194		0	0.75	146	146	
6	Ductwork modifications	lbs	194	0.69	134	4.77	927	1,061	
Other Estimated Implementation Costs								4,241	
TOTAL								\$ 13,208	
SUB-TOTAL								8,967	
O&P								30%	2,690
ASBESTOS ABATEMENT									-
DIRECT COST									11,657
PAYMENT & PERFORMANCE BOND								0%	-
SUB-TOTAL									11,657
CONTINGENCY								10%	1,166
ASBESTOS CONTINGENCY								0%	-
SUB-TOTAL									12,823
DISPOSAL									-
MATERIAL HANDLING FEE								0.0%	-
ASBESTOS DESIGN & AIR MONITORING, TESTING									-
SUB-TOTAL									12,823
IC FEE								3.0%	385
SUB-TOTAL									13,208
INTEREST DURING CONSTRUCTION								0%	-
TOTAL								\$ 13,208	

COST ESTIMATE

Brookdale Elementary - Demand Control Ventilation

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL	
				PER UNIT	TOTAL	PER UNIT	TOTAL		
1	CO2 Sensors & Control Wiring	EA	2	375	750	625	1,250	2,000	
2	RA / OA Modulating Damper Actuators	EA (avg)	3	600	1,800	100	300	2,100	
3	Commissioning	hrs	4		0	150.0	600	600	
4	Modulating exhaust dampers 26" x26" with actuator	EA	2	895	1,790	125.0	250	2,040	
5	Ductwork demolition	lbs	97		0	0.75	73	73	
6	Ductwork modifications	lbs	97	0.69	67	4.77	464	531	
Other Estimated Implementation Costs								3,473	
TOTAL								\$ 10,816	
SUB-TOTAL								7,344	
O&P								30%	2,203
ASBESTOS ABATEMENT									-
DIRECT COST									9,547
PAYMENT & PERFORMANCE BOND								0%	-
SUB-TOTAL									9,547
CONTINGENCY								10%	955
ASBESTOS CONTINGENCY								0%	-
SUB-TOTAL									10,501
DISPOSAL									-
MATERIAL HANDLING FEE								0.0%	-
ASBESTOS DESIGN & AIR MONITORING, TESTING									-
SUB-TOTAL									10,501
IC FEE								3.0%	315
SUB-TOTAL									10,816
INTEREST DURING CONSTRUCTION								0%	-
TOTAL								\$ 10,816	

COST ESTIMATE

FN Brown - Demand Control Ventilation

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL	
				PER UNIT	TOTAL	PER UNIT	TOTAL		
1	CO2 Sensors & Control Wiring	EA	2	375	750	625	1,250	2,000	
2	RA / OA Modulating Damper Actuators	EA (avg)	3	600	1,800	100	300	2,100	
3	Commissioning	hrs	4		0	150.0	600	600	
4	Modulating exhaust dampers 48" x48" with actuator	EA	3	895	2,685	125.0	375	3,060	
5	Ductwork demolition	lbs	194		0	0.75	146	146	
6	Ductwork modifications	lbs	194	0.69	134	4.77	927	1,061	
Other Estimated Implementation Costs								4,241	
TOTAL								\$ 13,208	
SUB-TOTAL								8,967	
O&P								30%	2,690
ASBESTOS ABATEMENT									-
DIRECT COST									11,657
PAYMENT & PERFORMANCE BOND								0%	-
SUB-TOTAL									11,657
CONTINGENCY								10%	1,166
ASBESTOS CONTINGENCY								0%	-
SUB-TOTAL									12,823
DISPOSAL									-
MATERIAL HANDLING FEE								0.0%	-
ASBESTOS DESIGN & AIR MONITORING, TESTING									-
SUB-TOTAL									12,823
IC FEE								3.0%	385
SUB-TOTAL									13,208
INTEREST DURING CONSTRUCTION								0%	-
TOTAL								\$	13,208

COST ESTIMATE

Forest Avenue - Demand Control Ventilation

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL	
				PER UNIT	TOTAL	PER UNIT	TOTAL		
1	CO2 Sensors & Control Wiring	EA	1	375	375	625	625	1,000	
2	RA / OA Modulating Damper Actuators	EA (avg)	2	600	1,200	100	200	1,400	
3	Commissioning	hrs	2		0	150.0	300	300	
4	Modulating exhaust dampers 48" x48" with actuator	EA	2	895	1,790	125.0	250	2,040	
5	Ductwork demolition	lbs	97		0	0.75	73	73	
6	Ductwork modifications	lbs	97	0.69	67	4.77	464	531	
Other Estimated Implementation Costs								2,527	
TOTAL								\$ 7,871	
SUB-TOTAL								5,344	
O&P								30%	1,603
ASBESTOS ABATEMENT									-
DIRECT COST									6,947
PAYMENT & PERFORMANCE BOND								0%	-
SUB-TOTAL									6,947
CONTINGENCY								10%	695
ASBESTOS CONTINGENCY								0%	-
SUB-TOTAL									7,641
DISPOSAL									-
MATERIAL HANDLING FEE								0.0%	-
ASBESTOS DESIGN & AIR MONITORING, TESTING									-
SUB-TOTAL									7,641
IC FEE								3.0%	229
SUB-TOTAL									7,871
INTEREST DURING CONSTRUCTION								0%	-
TOTAL								\$	7,871

COST ESTIMATE

HB Whitehorne Middle School - Demand Control Ventilation

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL	
				PER UNIT	TOTAL	PER UNIT	TOTAL		
1	CO2 Sensors & Control Wiring	EA	2	375	750	625	1,250	2,000	
2	RA / OA Modulating Damper Actuators	EA (avg)	6	600	3,600	100	600	4,200	
3	Commissioning	hrs	4		0	150.0	600	600	
4	Modulating exhaust dampers 48" x48" with actuator	EA	3	895	2,685	125.0	375	3,060	
5	Ductwork demolition	lbs	194		0	0.75	146	146	
6	Ductwork modifications	lbs	194	0.69	134	4.77	927	1,061	
Other Estimated Implementation Costs								3,980	
TOTAL								\$ 15,047	
SUB-TOTAL								11,067	
O&P								20%	2,213
ASBESTOS ABATEMENT									-
DIRECT COST									13,281
PAYMENT & PERFORMANCE BOND								0%	-
SUB-TOTAL									13,281
CONTINGENCY								10%	1,328
ASBESTOS CONTINGENCY								0%	-
SUB-TOTAL									14,609
DISPOSAL									-
MATERIAL HANDLING FEE								0.0%	-
ASBESTOS DESIGN & AIR MONITORING, TESTING									-
SUB-TOTAL									14,609
IC FEE								3.0%	438
SUB-TOTAL									15,047
INTEREST DURING CONSTRUCTION								0%	-
TOTAL								\$	15,047

COST ESTIMATE

Verona High School - Demand Control Ventilation

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL	
				PER UNIT	TOTAL	PER UNIT	TOTAL		
1	CO2 Sensors & Control Wiring	EA	4	375	1,500	625	2,500	4,000	
2	RA / OA Modulating Damper Actuators	EA (avg)	4	600	2,400	100	400	2,800	
3	Commissioning	hrs	8		0	150.0	1,200	1,200	
4	Modulating exhaust dampers 48" x48" with actuator	EA	3	895	2,685	125.0	375	3,060	
5	Ductwork demolition	lbs	194		0	0.75	146	146	
6	Ductwork modifications	lbs	194	0.69	134	4.77	927	1,061	
Other Estimated Implementation Costs								5,801	
TOTAL								\$ 18,068	
SUB-TOTAL								12,267	
O&P								30%	3,680
ASBESTOS ABATEMENT									-
DIRECT COST									15,947
PAYMENT & PERFORMANCE BOND								0%	-
SUB-TOTAL									15,947
CONTINGENCY								10%	1,595
ASBESTOS CONTINGENCY								0%	-
SUB-TOTAL									17,542
DISPOSAL									-
MATERIAL HANDLING FEE								0.0%	-
ASBESTOS DESIGN & AIR MONITORING, TESTING									-
SUB-TOTAL									17,542
IC FEE								3.0%	526
SUB-TOTAL									18,068
INTEREST DURING CONSTRUCTION								0%	-
TOTAL								\$ 18,068	

CALCULATIONS

Laning Avenue - Demand Control Ventilation

3. Price of Electricity, \$/kWh (blended rate)	\$0.151
5. Price of Natural Gas, \$/therm	\$1.024

	Existing Condition	Proposed System	Savings
Run Hours	2,592	2,592	
Heating-Only Units Airflow, CFM	12,800	12,800	
Heating and Cooling Units Airflow, CFM	0	0	
Estimated Cooling Electric Use, kWh	0	0	-
Estimated Heating Natural Gas Use, therms	2,907	2,107	800
Annual Electric Cost	\$ -	\$ -	\$ -
Annual Natural Gas Cost	\$ 2,978	\$ 2,159	\$ 819
Annual Cost and Savings, \$	\$ 2,978	\$ 2,159	\$ 819

CALCULATIONS

Brookdale Elementary - Demand Control Ventilation
--

3. Price of Electricity, \$/kWh (blended rate)	\$0.151
5. Price of Natural Gas, \$/therm	\$1.024

	Existing Condition	Proposed System	Savings
Run Hours	2,592	2,592	
Heating-Only Units Airflow, CFM	4,000	4,000	
Heating and Cooling Units Airflow, CFM	5,000	5,000	
Estimated Cooling Electric Use, kWh	24,253	23,936	317
Estimated Heating Natural Gas Use, therms	1,612	1,309	303
Annual Electric Cost	\$ 3,663	\$ 3,615	\$ 48
Annual Natural Gas Cost	\$ 1,652	\$ 1,341	\$ 310
Annual Cost and Savings, \$	\$ 5,314	\$ 4,956	\$ 358

CALCULATIONS

FN Brown - Demand Control Ventilation
--

3. Price of Electricity, \$/kWh (blended rate)	\$0.151
5. Price of Natural Gas, \$/therm	\$1.024

	Existing Condition	Proposed System	Savings
Run Hours	2,592	2,592	
Heating-Only Units Airflow, CFM	9,000	9,000	
Heating and Cooling Units Airflow, CFM	0	0	
Estimated Cooling Electric Use, kWh	0	0	-
Estimated Heating Natural Gas Use, therms	2,044	1,377	667
Annual Electric Cost	\$ -	\$ -	\$ -
Annual Natural Gas Cost	\$ 2,094	\$ 1,410	\$ 683
Annual Cost and Savings, \$	\$ 2,094	\$ 1,410	\$ 683

CALCULATIONS

Forest Avenue - Demand Control Ventilation

3. Price of Electricity, \$/kWh (blended rate)	\$0.151
5. Price of Natural Gas, \$/therm	\$1.024

	Existing Condition	Proposed System	Savings
Run Hours	2,592	2,592	
Heating-Only Units Airflow, CFM	5,000	5,000	
Heating and Cooling Units Airflow, CFM	0	0	
Estimated Cooling Electric Use, kWh	0	0	-
Estimated Heating Natural Gas Use, therms	1,135	859	277
Annual Electric Cost	\$ -	\$ -	\$ -
Annual Natural Gas Cost	\$ 1,163	\$ 880	\$ 283
Annual Cost and Savings, \$	\$ 1,163	\$ 880	\$ 283

CALCULATIONS

HB Whitehorse Middle School - Demand Control Ventilation

3. Price of Electricity, \$/kWh (blended rate)	\$0.151
5. Price of Natural Gas, \$/therm	\$1.024

	Existing Condition	Proposed System	Savings
Run Hours	2,592	2,592	
Heating-Only Units Airflow, CFM	15,000	15,000	
Heating and Cooling Units Airflow, CFM	0	0	
Estimated Cooling Electric Use, kWh	0	0	-
Estimated Heating Natural Gas Use, therms	3,406	2,878	528
Annual Electric Cost	\$ -	\$ -	\$ -
Annual Natural Gas Cost	\$ 3,490	\$ 2,948	\$ 541
Annual Cost and Savings, \$	\$ 3,490	\$ 2,948	\$ 541

CALCULATIONS

Verona High School - Demand Control Ventilation
--

3. Price of Electricity, \$/kWh (blended rate)	\$0.151
5. Price of Natural Gas, \$/therm	\$1.024

	Existing Condition	Proposed System	Savings
Run Hours	2,592	2,592	
Heating-Only Units Airflow, CFM	18,800	18,800	
Heating and Cooling Units Airflow, CFM	12,200	12,200	
Estimated Cooling Electric Use, kWh	59,178	58,486	692
Estimated Heating Natural Gas Use, therms	6,097	4,662	1,435
Annual Electric Cost	\$ 8,938	\$ 8,833	\$ 104
Annual Natural Gas Cost	\$ 6,246	\$ 4,776	\$ 1,470
Annual Cost and Savings, \$	\$ 15,184	\$ 13,609	\$ 1,574



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ECM #10:

REPLACE WINDOW AC'S WITH SPLITS

COST ESTIMATES

FN Brown Elementary School - Replace Window A/C & Spot Cooler Unit with Split Units

N/N	DESCRIPTION OF	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	Remove Window AC	each	2		-	130.00	260	260
2	Install Insulated	sq ft	3.8	15.00	2		-	2
3	Caulk new panels	l.f	16.0	0.09	1	0.87	14	15
4	Compressors, 1/2 ton	each	2.0	1500.00	3,000	1200.00	2,400	5,400
5	Evaporators, 1/2 ton	each	2.0	1000.00	2,000	225.00	450	2,450
6	Evaporators, 1 1/2	each	0.0	1700.00	-	225.00	-	-
7	Refrigerant Piping, Evap Liquid, 1/4"	l.f	60	2.80	168	3.67	220	388
8	Refrigerant Piping, Evap Gas, 1/2"	l.f	60	3.35	201	3.95	237	438
12	Electric Wiring, Cond, 14 AWG in conduit	l.f	150.0	2.81	421	4.91	737	1,157
Other Estimated Implementation Costs								2,386
Cost Adjustmen to Match Revised Cost Estimate								
TOTAL								\$ 14,883

SUB-TOTAL		\$ 10,111
O&P	20%	2,022
ASBESTOS ABATEMENT		-
DIRECT COST		12,133
PAYMENT & PERFORMANCE BOND	0%	-
SUB-TOTAL		12,133
CONTINGENCY	0%	-
ASBESTOS CONTINGENCY	10%	-
SUB-TOTAL		12,133
ASBESTOS DESIGN & AIR MONITORING, TESTING		-
IC FEE	3.0%	364
SUB-TOTAL		12,497
INTEREST DURING CONSTRUCTION	0%	-
TOTAL		\$ 12,497
NJ Smart Start Rebate		\$ 123

COST ESTIMATES

Laning Elementary School - Replace Window A/C Unit with Split Unit

N/N	DESCRIPTION OF	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	Remove Window AC	each	1		-	130.00	130	130
2	Install Insulated	sq ft	1.9	15.00	1		-	1
3	Caulk new panels	l.f	8.0	0.09	1	0.87	7	8
4	Compressors, 1 ton	each	1.0	2000.00	2,000	1200.00	1,200	3,200
5	Evaporators, 1 ton	each	1.0	1000.00	1,000	225.00	225	1,225
6	Evaporators, 1 1/2	each	0.0	1700.00	-	225.00	-	-
7	Refrigerant Piping, Evap Liquid, 1/4"	l.f	30	2.80	84	3.67	110	194
8	Refrigerant Piping, Evap Gas, 1/2"	l.f	30	3.35	101	3.95	119	219
9	Electric Wiring, Cond, 14 AWG in conduit	l.f	75.0	2.81	210	4.91	368	579
Other Estimated Implementation Costs								1,311
Cost Adjustmen to Match Revised Cost Estimate								
TOTAL								\$ 8,178

SUB-TOTAL		\$ 5,555
O&P	20%	1,111
ASBESTOS ABATEMENT		-
DIRECT COST		6,666
PAYMENT & PERFORMANCE BOND	0%	-
SUB-TOTAL		6,666
CONTINGENCY	0%	-
ASBESTOS CONTINGENCY	10%	-
SUB-TOTAL		6,666
ASBESTOS DESIGN & AIR MONITORING, TESTING		-
IC FEE	3.0%	200
SUB-TOTAL		6,866
INTEREST DURING CONSTRUCTION	0%	-
TOTAL		\$ 6,866
NJ Smart Start Rebate		\$ 77

COST ESTIMATES

Forest Elementary School - Replace Window A/C Unit with Split Unit

N/N	DESCRIPTION OF	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	Remove Window AC	each	1		-	130.00	130	130
2	Install Insulated	sq ft	1.9	15.00	1		-	1
3	Caulk new panels	l.f	8.0	0.09	1	0.87	7	8
4	Compressors, 3 ton	each	1.0	5000.00	5,000	1200.00	1,200	6,200
5	Evaporators, 3 ton	each	1.0	1500.00	1,500	225.00	225	1,725
6	Evaporators, 1 1/2	each	0.0	1700.00	-	225.00	-	-
7	Refrigerant Piping, Evap Liquid, 1/4"	l.f	30	2.80	84	3.67	110	194
8	Refrigerant Piping, Evap Gas, 1/2"	l.f	30	3.35	101	3.95	119	219
9	Electric Wiring, Cond, 14 AWG in conduit	l.f	75	2.81	210	4.91	368	579
Other Estimated Implementation Costs								2,137
Cost Adjustmen to Match Revised Cost Estimate								

TOTAL **\$ 13,330**

SUB-TOTAL **\$ 9,055**

O&P 20% 1,811

ASBESTOS ABATEMENT -

DIRECT COST **10,866**

PAYMENT & PERFORMANCE BOND 0% -

SUB-TOTAL **10,866**

CONTINGENCY 0% -

ASBESTOS CONTINGENCY 10% -

SUB-TOTAL **10,866**

ASBESTOS DESIGN & AIR MONITORING, TESTING -

IC FEE 3.0% 326

SUB-TOTAL **11,192**

INTEREST DURING CONSTRUCTION 0% -

TOTAL **\$ 11,192**

NJ Smart Start Rebate **\$ 276**

CALCULATIONS

FN Brown Elementary School - Replace Window A/C & Spot Cooler Unit with Split Units

1. Price of #2 Fuel Oil, \$/gal	\$0.000
2. Price of City Water, \$/1000 gallons	N/A
3. Price of Electricity, \$/kWh (blended rate)	\$0.155
4. Price of the Demand of Electricity, \$/kW/month	N/A
5. Price of Natural Gas, \$/therm	\$1.170

Energy Savings Due to Efficiency Improvement

	Existing Condition	Proposed System	Savings
Annual Cooling Energy, kWh	940	470	470
Annual Electric and Savings, \$	\$ 146	\$ 73	\$ 73
Total Annual Cost and Savings, \$	\$ 146	\$ 73	\$ 73

CALCULATIONS

Laning Elementary School - Replace Window A/C Unit with Split Unit

1. Price of #2 Fuel Oil, \$/gal	\$0.000
2. Price of City Water, \$/1000 gallons	N/A
3. Price of Electricity, \$/kWh (blended rate)	\$0.151
4. Price of the Demand of Electricity, \$/kW/month	N/A
5. Price of Natural Gas, \$/therm	\$1.024

Energy Savings Due to Efficiency Improvement

	Existing Condition	Proposed System	Savings
Annual Cooling Energy, kWh	522	294	229
Annual Electric and Savings, \$	\$ 79	\$ 44	\$ 35
Total Annual Cost and Savings, \$	\$ 79	\$ 44	\$ 35

CALCULATIONS

Forest Elementary School - Replace Window A/C Unit with Split Unit

1. Price of #2 Fuel Oil, \$/gal	\$0.000
2. Price of City Water, \$/1000 gallons	N/A
3. Price of Electricity, \$/kWh (blended rate)	\$0.172
4. Price of the Demand of Electricity, \$/kW/month	N/A
5. Price of Natural Gas, \$/therm	\$1.032

Energy Savings Due to Efficiency Improvement

	Existing Condition	Proposed System	Savings
Annual Cooling Energy, kWh	8,027	4,264	3,763
Annual Electric and Savings, \$	\$ 1,379	\$ 733	\$ 646
Total Annual Cost and Savings, \$	\$ 1,379	\$ 733	\$ 646



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ECM #11:

CHANGE TO MODULAR CONDENSING BOILERS

COST ESTIMATES

Brookdale Elementary School - Boiler Conversion to High Efficiency Condensing Boilers

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	1,500 MBH Nat Gas Condensing Boiler	ea	4	37,000	148,000	10,000	40,000	188,000
2	Demo Existing Boilers	ls	2		-	2,776	5,552	5,552
3	Piping Modifications	ls	1	4,000	4,000	6,000	6,000	10,000
4	HHW piping	LF	300	13	3,825.00	21	6,225	10,050
5	radiator	ea	-	2,933	0	2,840	-	-
Other Estimated Implementation Costs								130,853
TOTAL								\$ 344,450
SUB-TOTAL								213,602
O&P								20% 42,720.40
ASBESTOS ABATEMENT								0% -
DIRECT COST								256,322
PAYMENT & PERFORMANCE BOND								0% -
SUB-TOTAL								256,322
CONTINGENCY								10% 25,632
ASBESTOS CONTINGENCY								10% 21,360.20
SUB-TOTAL								303,315
ASBESTOS DESIGN & AIR MONITORING, TESTING								15% 32,040.30
IC FEE								3.0% 9,099
SUB-TOTAL								344,455
INTEREST DURING CONSTRUCTION								0% -
TOTAL								\$ 344,455
Total SmartStart Rebate								\$ 10,500
								Total \$ 333,955

Brookdale Elementary School - Like in Kind Boiler Replacement

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	2511 MBH Nat Gas Fire Tube Boiler	ea	2	49,201	98,402	5,024	10,048	108,450
2	Demo Existing Boilers	ls	2		-	2,776	5,552	5,552
3	Piping Modifications	ls	1	4,000	4,000	6,000	6,000	10,000
4	HHW piping	LF	300	13	3,825.00	21	6,225	10,050
5	radiator	ea	-	2,933	0	2,840	-	-
Other Estimated Implementation Costs								82,120
TOTAL								\$ 216,170
SUB-TOTAL								134,052
O&P								20% 26,810.39
ASBESTOS ABATEMENT								0% -
DIRECT COST								160,862
PAYMENT & PERFORMANCE BOND								0% -
SUB-TOTAL								160,862
CONTINGENCY								10% 16,086
ASBESTOS CONTINGENCY								10% 13,405.20
SUB-TOTAL								190,354
ASBESTOS DESIGN & AIR MONITORING, TESTING								15% 20,107.79
IC FEE								3.0% 5,711
SUB-TOTAL								216,172
INTEREST DURING CONSTRUCTION								0% -
TOTAL								\$ 216,172
Total SmartStart Rebate								\$ 216,172
								Total \$ 216,172

COST ESTIMATES

Laning Avenue School - Boiler Conversion to High Efficiency Condensing Boilers

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	1,500 MBH Nat Gas Condensing Boiler	ea	4	37,000	148,000	10,000	40,000	188,000
2	Demo Existing Boilers	ls	2		-	2,776	5,552	5,552
3	Piping Modifications	ls	1	4,000	4,000	6,000	6,000	10,000
4	HHW piping	LF	300	13	3,825.00	21	6,225	10,050
5	radiator	ea	-	2,933	0	2,840	-	-
Other Estimated Implementation Costs								130,853
TOTAL								\$ 344,450
SUB-TOTAL								213,602
O&P								20% 42,720.40
ASBESTOS ABATEMENT								0% -
DIRECT COST								256,322
PAYMENT & PERFORMANCE BOND								0% -
SUB-TOTAL								256,322
CONTINGENCY								10% 25,632
ASBESTOS CONTINGENCY								10% 21,360.20
SUB-TOTAL								303,315
ASBESTOS DESIGN & AIR MONITORING, TESTING								15% 32,040.30
IC FEE								3.0% 9,099
SUB-TOTAL								344,455
INTEREST DURING CONSTRUCTION								0% -
TOTAL								\$ 344,455
Total SmartStart Rebate								\$ 10,500
								Total \$ 333,955

Laning Avenue School - Like in Kind Boiler Replacement

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	3000 MBH Nat Gas Fire Tube Boiler	ea	2	58,654	117,309	5,024	10,048	127,357
2	Demo Existing Boilers	ls	2		-	2,776	5,552	5,552
3	Piping Modifications	ls	1	4,000	4,000	6,000	6,000	10,000
4	HHW piping	LF	300	13	3,825.00	21	6,225	10,050
5	radiator	ea	-	2,933	0	2,840	-	-
Other Estimated Implementation Costs								93,702
TOTAL								\$ 246,660
SUB-TOTAL								152,959
O&P								20% 30,591.71
ASBESTOS ABATEMENT								0% -
DIRECT COST								183,550
PAYMENT & PERFORMANCE BOND								0% -
SUB-TOTAL								183,550
CONTINGENCY								10% 18,355
ASBESTOS CONTINGENCY								10% 15,295.86
SUB-TOTAL								217,201
ASBESTOS DESIGN & AIR MONITORING, TESTING								15% 22,943.79
IC FEE								3.0% 6,516
SUB-TOTAL								246,661
INTEREST DURING CONSTRUCTION								0% -
TOTAL								\$ 246,661
Total SmartStart Rebate								\$ 246,661
								Total \$ 246,661

COST ESTIMATES

Forest Elementary School - Boiler Conversion to High Efficiency Condensing Boilers

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	1,500 MBH Nat Gas Condensing Boiler	ea	4	37,000	148,000	10,000	40,000	188,000
2	Demo Existing Boilers	ls	2		-	2,776	5,552	5,552
3	Piping Modifications	ls	1	4,000	4,000	6,000	6,000	10,000
4	HHW piping	LF	300	13	3,825.00	21	6,225	10,050
5	radiator	ea	-	2,933	0	2,840	-	-
Other Estimated Implementation Costs								130,853
TOTAL								\$ 344,450
SUB-TOTAL								213,602
O&P								20% 42,720.40
ASBESTOS ABATEMENT								0% -
DIRECT COST								256,322
PAYMENT & PERFORMANCE BOND								0% -
SUB-TOTAL								256,322
CONTINGENCY								10% 25,632
ASBESTOS CONTINGENCY								10% 21,360.20
SUB-TOTAL								303,315
ASBESTOS DESIGN & AIR MONITORING, TESTING								15% 32,040.30
IC FEE								3.0% 9,099
SUB-TOTAL								344,455
INTEREST DURING CONSTRUCTION								0% -
TOTAL								\$ 344,455
Total SmartStart Rebate								\$ 10,500
								Total \$ 333,955

Forest Elementary School - Like in Kind Boiler Replacement

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	2511 MBH Nat Gas Fire Tube Boiler	ea	2	49,201	98,402	5,024	10,048	108,450
2	Demo Existing Boilers	ls	2		-	2,776	5,552	5,552
3	Piping Modifications	ls	1	4,000	4,000	6,000	6,000	10,000
4	HHW piping	LF	300	13	3,825.00	21	6,225	10,050
5	radiator	ea	-	2,933	0	2,840	-	-
Other Estimated Implementation Costs								82,120
TOTAL								\$ 216,170
SUB-TOTAL								134,052
O&P								20% 26,810.39
ASBESTOS ABATEMENT								0% -
DIRECT COST								160,862
PAYMENT & PERFORMANCE BOND								0% -
SUB-TOTAL								160,862
CONTINGENCY								10% 16,086
ASBESTOS CONTINGENCY								10% 13,405.20
SUB-TOTAL								190,354
ASBESTOS DESIGN & AIR MONITORING, TESTING								15% 20,107.79
IC FEE								3.0% 5,711
SUB-TOTAL								216,172
INTEREST DURING CONSTRUCTION								0% -
TOTAL								\$ 216,172
Total SmartStart Rebate								\$ 216,172
								Total \$ 216,172

COST ESTIMATES

Verona High School - Boiler Conversion to High Efficiency Condensing Boilers

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	1,500 MBH Nat Gas Condensing Boiler	ea	7	37,000	259,000	10,000	70,000	329,000
2	Demo Existing Boilers	ls	2		-	2,776	5,552	5,552
3	Piping Modifications	ls	1	4,000	4,000	6,000	6,000	10,000
4	HHW piping	LF	300	13	3,825.00	21	6,225	10,050
5	radiator	ea	-	2,933	0	2,840	-	-
Other Estimated Implementation Costs								217,229
TOTAL								\$ 571,830
SUB-TOTAL								354,602
O&P								20% 70,920.40
ASBESTOS ABATEMENT								0% -
DIRECT COST								425,522
PAYMENT & PERFORMANCE BOND								0% -
SUB-TOTAL								425,522
CONTINGENCY								10% 42,552
ASBESTOS CONTINGENCY								10% 35,460.20
SUB-TOTAL								503,535
ASBESTOS DESIGN & AIR MONITORING, TESTING								15% 53,190.30
IC FEE								3.0% 15,106
SUB-TOTAL								571,831
INTEREST DURING CONSTRUCTION								0% -
TOTAL								\$ 571,831
Total SmartStart Rebate								\$ 18,375
								Total \$ 553,456

Verona High School - Like in Kind Boiler Replacement

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	5200 MBH Nat Gas Fire Tube Boiler	ea	2	74,860	149,720	5,024	10,048	159,768
2	Demo Existing Boilers	ls	2		-	2,776	5,552	5,552
3	Piping Modifications	ls	1	4,000	4,000	6,000	6,000	10,000
4	HHW piping	LF	300	13	3,825.00	21	6,225	10,050
5	radiator	ea	-	2,933	0	2,840	-	-
Other Estimated Implementation Costs								113,558
TOTAL								\$ 298,930
SUB-TOTAL								185,370
O&P								20% 37,073.98
ASBESTOS ABATEMENT								0% -
DIRECT COST								222,444
PAYMENT & PERFORMANCE BOND								0% -
SUB-TOTAL								222,444
CONTINGENCY								10% 22,244
ASBESTOS CONTINGENCY								10% 18,536.99
SUB-TOTAL								263,225
ASBESTOS DESIGN & AIR MONITORING, TESTING								15% 27,805.48
IC FEE								3.0% 7,897
SUB-TOTAL								298,927
INTEREST DURING CONSTRUCTION								0% -
TOTAL								\$ 298,927
Total SmartStart Rebate								\$ 298,927
								Total \$ 298,927

CALCULATIONS

Brookdale Elementary School- Replace Boilers with Higher Efficiency Boilers

1. Price of #2 Fuel Oil, \$/gal	
2. Price of City Water, \$/1000 gallons	
3. Price of Electricity, \$/kWh (blended rate)	\$0.155
4. Price of the Demand of Electricity, \$/kW/month	
5. Price of Natural Gas, \$/therm	\$1.170

	Existing Condition	Proposed System	Savings
Heating Boiler Fuel Consumption, therms	10,106	9,320	786
Heating Boiler Fuel Cost	\$ 11,822	\$ 10,902	\$ 919

CALCULATIONS

Laning Avenue School- Replace Boilers with Higher Efficiency Boilers

1. Price of #2 Fuel Oil, \$/gal	
2. Price of City Water, \$/1000 gallons	
3. Price of Electricity, \$/kWh (blended rate)	\$0.151
4. Price of the Demand of Electricity, \$/kW/month	
5. Price of Natural Gas, \$/therm	\$1.024

	Existing Condition	Proposed System	Savings
Heating Boiler Fuel Consumption, therms	23,476	21,650	1,826
Heating Boiler Fuel Cost	\$ 24,050	\$ 22,179	\$ 1,871

CALCULATIONS

Forest Elementary School- Replace Boilers with Higher Efficiency Boilers

1. Price of #2 Fuel Oil, \$/gal	
2. Price of City Water, \$/1000 gallons	
3. Price of Electricity, \$/kWh (blended rate)	\$0.152
4. Price of the Demand of Electricity, \$/kW/month	
5. Price of Natural Gas, \$/therm	\$1.131

	Existing Condition	Proposed System	Savings
Heating Boiler Fuel Consumption, therms	12,487	11,516	971
Heating Boiler Fuel Cost	\$ 14,121	\$ 13,023	\$ 1,098

CALCULATIONS

Verona High School- Replace Boilers with Higher Efficiency Boilers

1. Price of #2 Fuel Oil, \$/gal	
2. Price of City Water, \$/1000 gallons	
3. Price of Electricity, \$/kWh (blended rate)	\$0.170
4. Price of the Demand of Electricity, \$/kW/month	
5. Price of Natural Gas, \$/therm	\$0.950

	Existing Condition	Proposed System	Savings
Heating Boiler Fuel Consumption, therms	49,583	45,726	3,856
Heating Boiler Fuel Cost	\$ 47,123	\$ 43,458	\$ 3,665



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RENEWABLES CALCULATIONS

VERONA SCHOOL DISTRICT
(ALL SCHOOLS)
PV SYSTEM SIZING

Building	BROOKDALE AVENUE ELEMENTARY SCHOOL	LANING AVENUE ELEMENTARY SCHOOL	F.N. BROWN ELEMENTARY SCHOOL	FOREST AVENUE ELEMENTARY SCHOOL	H.B. WHITEHORNE MIDDLE SCHOOL	VERONA HIGH SCHOOL	TOTALS
Site Energy Use (kWh):	329,200	329,200	329,200	329,200	329,200	329,200	1,975,200 kw dc
Location to Install Panels:	roof	roof	roof	roof	roof	roof	roof
Assumptions							
System Capacity, kw-dc (maximum utilization of roof space)	40 kw dc	127 kw dc	39 kw dc	61 kw dc	104 kw dc	309 kw dc	681 kw dc
Annual Electric Generation, kWh of AC electricity produced	42,666 kwh	134,058 kwh	41,454 kwh	63,999 kwh	109,695 kwh	325,449 kwh	717,321 kw dc
Total Annual Facility Electric Use, kWhrs	329,200 kwh	329,200 kwh	329,200 kwh	329,200 kwh	329,200 kwh	329,200 kwh	1,975,200 kw dc
% of Total Annual Usage	13%	41%	13%	19%	33%	99%	36%
All-In Cost of Electric Year 1	\$0.155 / kwh	\$0.151 / kwh	\$0.172 / kwh	\$0.152 / kwh	\$0.154 / kwh	\$0.170 / kwh	\$0.159 / kwh
Annual Electric Cost Savings	\$6,605	\$20,247	\$7,122	\$9,705	\$16,923	\$55,316	115,917 kw dc
Estimated SREC Value (Year 1):	\$100 / SREC	\$100 / SREC	\$100 / SREC	\$100 / SREC	\$100 / SREC	\$100 / SREC	\$100 / SREC
Estimated Year 1 SREC Revenue:	\$4,247	\$13,343	\$4,126	\$6,370	\$10,918	\$32,392	71,395 kw dc
Environmental Impact							
Equivalent Annual CO2 Emission Reduction (tons per year) ¹	14 tons/yr	44 tons/yr	14 tons/yr	21 tons/yr	36 tons/yr	107 tons/yr	237 tons/yr
Equivalent Cars Removed From Road Annually ²	2	8	2	4	6	19	7
Equivalent Acres of Trees Planted Annually ³	4	12	4	6	10	29	65
Financial Results							
System Installed Cost	\$222,640	\$699,545	\$216,315	\$333,960	\$572,413	\$1,698,263	\$3,743,135
Simple Payback	20.0	20.4	18.2	20.3	20.0	18.3	19.5
IRR (25 Years)	1.7%	1.5%	2.4%	1.5%	1.7%	2.4%	1.9%
Net Present Value (25 yrs, 4% discount rate)	(\$47,364)	(\$158,731)	(\$32,275)	(\$75,003)	(\$122,938)	(\$265,040)	(\$701,350)

1. Estimated CO2 Emissions Rate: 0.66 lbs/kWh

2. EPA Estimate: 11,560 lbs CO2 per car

3. EPA Estimate: 7,333 lbs CO2 per acre of trees planted

VERONA SCHOOL DISTRICT

WIND ANALYSIS

Wind Turbine Economics

	Building Integrated	Ground Mount 5 kW	Ground Mount 50 kW
Gross Installation Cost Estimate	\$325,000	\$312,000	\$250,000
Number of Units	50	10	1
Net Installation Cost Estimate	\$325,000	\$312,000	\$250,000
Annual Energy Savings	\$6,308	\$9,956	\$18,780
Simple Payback	51.5 yrs.	31.3 yrs.	13.3 yrs.
System Capacity	50 kW	52 kW	50 kW
Annual Avoided Energy Use	37,108 kWh	58,567 kWh	110,472 kWh
Annual CO2 Emissions, tons	13	20	39
% of Annual Electric Use*	4.6%	7.3%	13.8%

Verona High School:

798,601 kWh/year annual consumption