Local Government Energy Audit:
Energy Audit Report

Westwood Regional Middle School

23 3rd Ave

Westwood, New Jersey 07676

Westwood Regional School District

October 4, 2018

Final Report by:

TRC Energy Services

Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate saving are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services (TRC) and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Westwood Regional Middle School.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist the Westwood Board of Education (BOE) in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

Westwood Regional Middle School is a one floor building, approximately 47,400 square foot. The facility is comprised of classrooms space, gymnasium, kitchen, cafeteria and office space. The building is occupied between 6:00 AM and 6:00 PM on weekdays with the gymnasium used until 10:00 PM on weekdays. The gymnasium is occupied between 8:00 AM and 1:00 PM on Saturdays and Sundays. The building is 100% heated and partially cooled. One portion of the building is heated directly with the use of steam, and a heat exchanger converts the steam to hot water for the hydronic heating system which serves the remainder of the building. The cafeteria is cooled by a packaged roof top unit and the new science classrooms are conditioned by packaged HVAC units located in mechanical spaces within each room. There are also a number of classrooms and offices cooled by unitary window air-conditioning (AC) units. Equipment is generally in fair to good condition and ranges from standard to high efficiency. A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated 13 measures of which 11 are recommended. The recommended measures represent an opportunity for Westwood Regional Middle School to reduce its annual energy costs by $25,831 and its annual greenhouse gas emissions by 191,811 lbs CO_2e. We estimate that if all measures are implemented as recommended, the project would pay for itself in energy savings in 7.6 years. A breakdown of current utility costs is shown in Figure 1. The estimated reduction in utility costs for the proposed measures in shown in Figure 2. Together these measures represent an opportunity to reduce Westwood Regional Middle School's annual energy use by 21% overall.

Figure 1 – Previous 12 Month Utility Costs

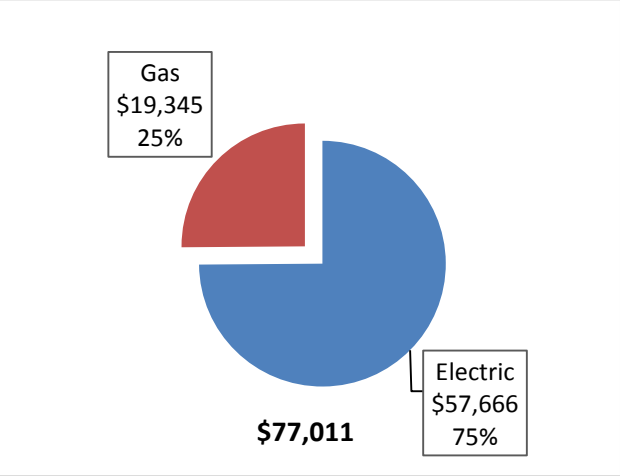
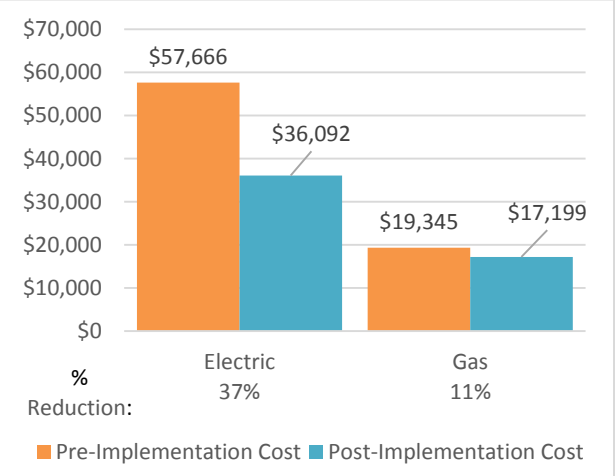


Figure 2 – Potential Post-Implementation Costs



A detailed description of Westwood Regional Middle School's existing energy use can be found in Section 3. Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3 – Summary of Energy Reduction Opportunities. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4.

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**123,053**	**19.3**	**0.0**	**$16,577.19**	**$137,467.96**	**$13,875.00**	**$123,592.96**	**7.5**	**123,913**
ECM 1	Install LED Fixtures	45,070	6.4	0.0	$6,071.59	$100,073.19	$7,670.00	$92,403.19	15.2	45,385
ECM 2	Retrofit Fixtures with LED Lamps	77,983	12.9	0.0	$10,505.60	$37,394.77	$6,205.00	$31,189.77	3.0	78,529
Lighting Control Measures		**26,606**	**3.9**	**0.0**	**$3,584.29**	**$31,930.00**	**$3,860.00**	**$28,070.00**	**7.8**	**26,792**
ECM 3	Install Occupancy Sensor Lighting Controls	26,349	3.9	0.0	$3,549.67	$31,570.00	$3,860.00	$27,710.00	7.8	26,534
ECM 4	Install Daylight Dimming Controls	257	0.0	0.0	$34.63	$360.00	$0.00	$360.00	10.4	259
Electric Unitary HVAC Measures		**1,080**	**0.6**	**0.0**	**$145.55**	**$2,210.93**	**$69.00**	**$2,141.93**	**14.7**	**1,088**
ECM 5	Install High Efficiency Electric AC	1,080	0.6	0.0	$145.55	$2,210.93	$69.00	$2,141.93	14.7	1,088
HVAC System Improvements		**1,319**	**0.0**	**10.7**	**$266.08**	**$1,649.35**	**$0.00**	**$1,649.35**	**6.2**	**2,586**
ECM 6	Install Programmable Thermostats	1,319	0.0	10.7	$266.08	$1,649.35	$0.00	$1,649.35	6.2	2,586
Domestic Water Heating Upgrade		**0**	**0.0**	**1.3**	**$10.29**	**$14.34**	**$0.00**	**$14.34**	**1.4**	**146**
	Install High Efficiency Gas Water Heater	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
ECM 7	Install Low-Flow Domestic Hot Water Devices	0	0.0	1.3	$10.29	$14.34	$0.00	$14.34	1.4	146
Custom Measures		**8,089**	**0.0**	**248.9**	**$3,137.23**	**$24,673.06**	**$0.00**	**$24,673.06**	**7.9**	**37,285**
ECM 8	Computer Power Management Software	6,776	0.0	0.0	$912.80	$3,685.00	$0.00	$3,685.00	4.0	6,823
ECM 9	Building Envelope Weatherization	113	0.0	52.2	$444.99	$6,100.00	$0.00	$6,100.00	13.7	6,230
ECM 10	Boiler Burner Replacement	0	0.0	71.3	$586.28	$668.06	$0.00	$668.06	1.1	8,344
ECM 11	Retro-Commissioning Study & HVAC Improvements	1,200	0.0	125.4	$1,193.16	$14,220.00	$0.00	$14,220.00	11.9	15,888
	Installation of an Energy Management System	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
TOTALS		**160,148**	**23.7**	**260.9**	**$23,720.64**	**$197,945.63**	**$17,804.00**	**$180,141.63**	**7.6**	**191,811**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measures save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Electric Unitary HVAC measures generally involve replacing older inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide equivalent cooling to older air condition systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical efficiency.

HVAC System Improvements generally involve the installation of automated controls to reduce heating and cooling demand during periods of reduced demand. These measures could encompass changing temperature setpoints, using outside air for free cooling, or limiting excessive outside air during extreme outdoor air temperature conditions. These measures save energy by reducing the demand on HVAC systems and the amount of time systems operate.

Domestic Hot Water upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

Energy Efficient Practices

TRC also identified 22 low cost (or no cost) energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Westwood Regional Middle School include:

- Reduce Air Leakage
- Close Doors and Windows
- Use Window Treatments/Coverings
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Turn Off Unneeded Motors
- Reduce Motor Short Cycling
- Perform Routine Motor Maintenance
- Use Fans to Reduce Cooling Load
- Install Destratification Fans
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Ensure Economizers are Functioning Properly
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Check for and Seal Duct Leakage
- Repair/Replace Steam Traps
- Perform Proper Boiler Maintenance
- Perform Proper Furnace Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls

For details on these energy efficient practices, please refer to Section 5.

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for Westwood Regional Middle School. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array.

Figure 3 – Photovoltaic Potential

Potential	High	
System Potential	114	kW DC STC
Electric Generation	85,778	kWh/yr
Displaced Cost	$7,460	/yr
Installed Cost	$296,400	

For details on our evaluation and on-site generation potential, please refer to Section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart
- Direct Install
- Energy Savings Improvement Program (ESIP)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 – Summary of Energy Reduction Opportunities are based on the SmartStart program. More details on this program and others are available in Section 8.

Larger facilities with an interest in a more comprehensive whole building approach to energy conservation should consider participating in the Pay for Performance (P4P) program. Projects eligible for this project program must meet minimum savings requirements. Final incentives are calculated based on actual measured performance achieved at the end of the project. The application process is more involved, and it requires working with a qualified P4P contractor, but the process may result in greater energy savings overall and more lucrative incentives, up to 50% of project's total cost.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.4 for additional information on the ESIP Program.

The Demand Response Energy Aggregator is a (non-NJCEP) program designed to reduce electric loads at commercial facilities, when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. Demand Response (DR) service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability. By enabling grid operators to call upon commercial facilities to reduce their electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and facilities receive payments whether or not they are called upon to curtail their load during times of peak demand. Refer to Section 7 for additional information on this program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
John Baumann	Director of Buildings and Grounds	john.baumann@wwrsd.org	201-664-0880 ext 2010
Keith Rosado	School Business Administrator / Board Secretary	keith.rosado@wwrsd.org	201-664-0880 ext 2004
TRC Energy Services			
Aimee Lalonde	Auditor	alalonde@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On July 20, 2017, TRC performed an energy audit at Westwood Regional Middle School located in Westwood, New Jersey. TRC's' team met with John Baumann, Director of Buildings and Grounds to review the facility operations and help focus our investigation on specific energy-using systems.

Westwood Regional Middle School is a one floor building, approximately 47,400 square foot. The facility comprised of classrooms space, gymnasium, kitchen, cafeteria and office space. The building was constructed in 1951. The building is 100% heated and partially cooled. One portion of the building is heated directly with the use of steam, and a heat exchanger converts the steam to hot water for the hydronic heating system which serves the remainder of the building. The cafeteria is cooled by a packaged roof top unit and the new science classrooms are conditioned by packaged HVAC units located in mechanical spaces within each room. There are also a number of classrooms and offices cooled by unitary window air-conditioning (AC) units. Equipment is generally in fair to good condition and ranges from standard to high efficiency.

2.3 Building Occupancy

The building is occupied between 6:00 AM and 6:00 PM on weekdays with the gymnasium seeing use until 10PM on weekdays. The gymnasium is occupied between 8:00 AM and 1:00 PM on Saturdays and Sundays. The typical schedule is presented in the table below. During a typical day, the facility is occupied by 57 staff and 420 students.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Westwood Regional Middle School	Weekday	6AM - 6PM
Westwood Regional Middle School	Weekend	Partial
Gym	Weekday	6AM - 10PM
Gym	Weekend	8AM - 1PM

2.4 Building Envelope

The building is constructed of concrete masonry units with a brick façade. The building has flat roof sections which appear to be in fair condition. The building has double pane operable windows with metal frames. The sealant around these frames appears to be in poor condition. The exterior doors are typically metal or metal with glass panes and metal frames. The exterior doors have either missing or worn weather-stripping materials which show signs of excessive infiltration. The building envelope has deficiencies and contributes to a significant amount of air infiltration. There is an opportunity for energy savings by properly weather-stripping exterior doors and caulking the perimeter of window frames to reduce air infiltration, thus reducing the load on the building's HVAC systems.

2.5 On-Site Generation

Westwood Regional Middle School does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

Please see Appendix A: Equipment Inventory & Recommendations for an inventory of the facility's equipment.

Lighting System

The building is primarily illuminated by linear fluorescent fixtures which contain 32-Watt T8 lamps. There are also a number of T12 lamp fixtures throughout the building. Fixtures throughout the building include surface-mounted wrap fixtures, pendant-mounted continuous row fixtures, recessed troffer fixtures or industrial fixtures. The older classroom areas have fixtures which have yellowed lenses, some missing or cracked lenses and are in poor condition. Some areas have fixtures with compact fluorescent lamps, LED lamps, or incandescent lamps. The fixtures are generally in good condition and provide a great opportunity for energy savings by retrofitting to LED technology. Some fixtures are in poor condition and are recommended for replacement with new reduced wattage LED fixtures.





The gym is illuminated by metal halide high bay fixtures which contain 250-Watt lamps. The cafeteria has uplight wall-mounted fixtures which are assumed to contain 50-Watt metal halide lamps. There is an opportunity for energy savings by replacing these one-for-one with LED fixtures.


The exterior lighting includes building-mounted wall pack fixtures, canopy fixtures, flood fixtures and pole-mounted area light fixtures. These fixtures contain compact fluorescent lamps, halogen incandescent lamps, and metal halide lamps. Some have already been converted to LED technology. There is an opportunity for energy savings by upgrading the remaining fixtures to LED technology.

The lighting in individual rooms are manually controlled via wall switches and only the custodial office had an occupancy-based sensor. The classrooms and office areas are equipped with bi-level switching where each row is independently operated by a switch. There is an opportunity for energy savings by the installation of occupancy-based sensors in beneficial locations such as hallways, restrooms, classrooms and private offices. The exterior lighting is controlled by a timeclock or a photocell sensor or did not have controls. There is an opportunity for energy savings by installing photocell controls to the fixtures which were noted to be on during the day.

Motors

The HVAC systems that serve the building include fan and pump motors which are generally in good condition and of standard to high efficiency. These include hot water pumps, water supply pumps, supply and exhaust fans. The majority of equipment which was visible appears to be in good condition.

Domestic Water Heating System

The building domestic hot water is supplied by two gas-fired storage tank water heaters. One is 75 gallons and the other 100 gallons. These are in good condition and of standard efficiency. There is an opportunity for energy savings by replacing the existing water heater with a high efficiency condensing hot water heater, however, this measure is cost prohibitive. The sink aerators throughout the building are fit with higher flow devices (2.0 gallon per minute [gpm] or higher). There is an opportunity for energy savings by replacing these aerators with low-flow devices. This is a cost-effective approach to reducing energy used to provide hot water throughout the building.



Steam Hot Water Heating System

The building is heated by a steam system and hydronic heating system with the use of a heat exchanger between the two loops. The heating system is served by a gas-fired steam boiler that is in good condition and of standard efficiency. However, according to staff, the boiler burner includes mechanical linkage controls which are prone to falling out of calibration and reducing the system efficiency. There is an opportunity for energy savings by replacing the outdated controls with new with electronic boiler burner controls.








Direct Expansion Air Conditioning System (DX)

The cafeteria is conditioned by a roof top unit that is in good condition and of standard efficiency. The new science classrooms are each conditioned by a packaged HVAC unit and are in good condition. These are each controlled by a manual dial thermostat located in the space.

Many offices and classrooms are cooled by window AC units that are in good condition and of high efficiency with the exception of one unit located in an office. A split AC system of poor condition and low efficiency serves an IT room. There is an opportunity for energy savings by replacing the one window AC and the split AC system with high efficiency equipment.


The building has manual dial thermostats. The heating system is equipped with basic temperature controls. The newer science classrooms and the cafeteria have manual dial thermostats which can call for cooling while the spaces are unoccupied. Per discussions with facility management, there are currently no temperature setbacks. There is an opportunity for energy savings by replacing these with programmable thermostats.

There are temperature sensors located throughout the building which are tied into the units within the space. After ten years, there are components within the mechanical equipment as well as sensors throughout the building which may not be operating as intended. There is an opportunity for energy savings by performing a retro-commissioning study of the HVAC system and implementing improvements. This should include the following: areas with the steam heating system should be investigated for the opportunity for steam trap replacements and areas with the hot water heating system should be investigated for the opportunity for installing thermostatic radiator valves.

Food Service & Refrigeration Equipment

There are several types of refrigeration and cooking equipment in the kitchen. This equipment all appears to be in fair condition.

Building Plug Load

There is general office and café equipment throughout the building. There are a number of computers throughout the building in classrooms, office areas as well as in computer labs. Some of these were noted to be in idle mode or left on while not in use. This provides a potential for implementing computer power management software.

2.7 Water-Using Systems

There are many restrooms at this facility. A sampling of restrooms found that the faucets are rated for 2.0 gallons per minute (gpm) or higher. There is an opportunity for energy savings by installing low flow (0.5 gpm) aerators on sinks throughout the building.

3 SITE ENERGY USE AND COSTS

Utility data for electricity and natural gas was analyzed to identify opportunities for savings. In addition, data for electricity and natural gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

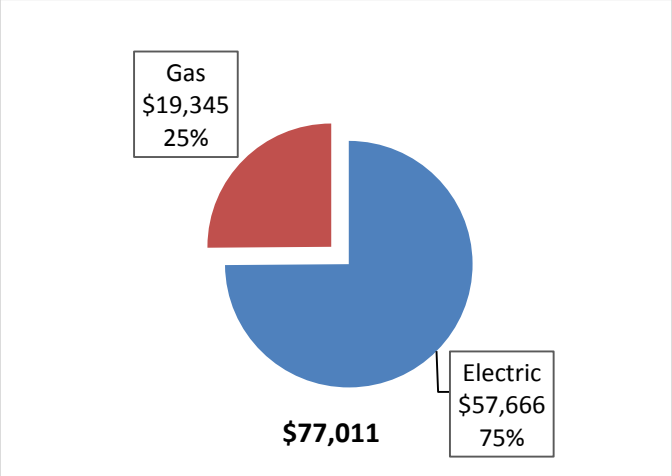
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Westwood Regional Middle School		
Fuel	**Usage**	**Cost**
Electricity	428,058 kWh	$57,666
Natural Gas	23,513 Therms	$19,345
Total		**$77,011**

The current annual energy cost for this facility is $77,011 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric cost over the past 12 months was $0.135/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The facility pays electrical demand charges. The monthly electricity consumption and peak demand are shown in the chart below. The relatively high summer power demand is typical for year round operation for buildings with a significant cooling load.

Figure 8 - Electric Usage & Demand

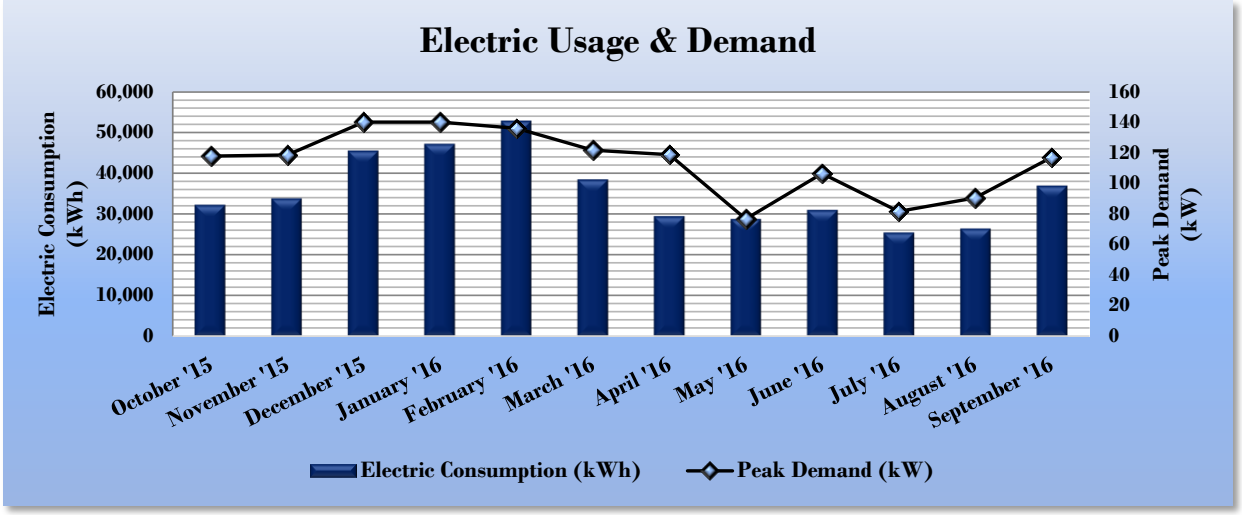


Figure 9 - Electric Usage & Demand

Electric Billing Data for Westwood Regional Middle School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
10/29/15	29	32,126	118	$1,458	$4,300
12/1/15	33	33,719	119	$1,461	$4,445
12/30/15	29	45,410	140	$3,044	$5,447
1/30/16	31	47,050	140	$1,465	$5,644
3/2/16	32	52,718	136	$1,464	$6,010
4/1/16	30	38,388	122	$971	$4,834
4/30/16	29	29,353	119	$1,450	$4,012
5/31/16	31	28,658	77	$926	$3,294
6/30/16	30	30,882	107	$2,335	$5,161
7/30/16	30	25,385	82	$2,033	$4,330
8/30/16	31	26,336	90	$2,142	$4,430
9/28/16	29	36,860	117	$2,494	$5,601
Totals	**364**	**426,885**	**140.25**	**$21,242**	**$57,508**
Annual	**365**	**428,058**	**140.25**	**$21,300**	**$57,666**

3.3 Natural Gas Usage

Natural gas is provided by PSE&G. The average gas cost for the past 12 months is $0.823/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below. The high winter use typifies a predominant heating-driven gas use profile.

Figure 10 - Natural Gas Usage

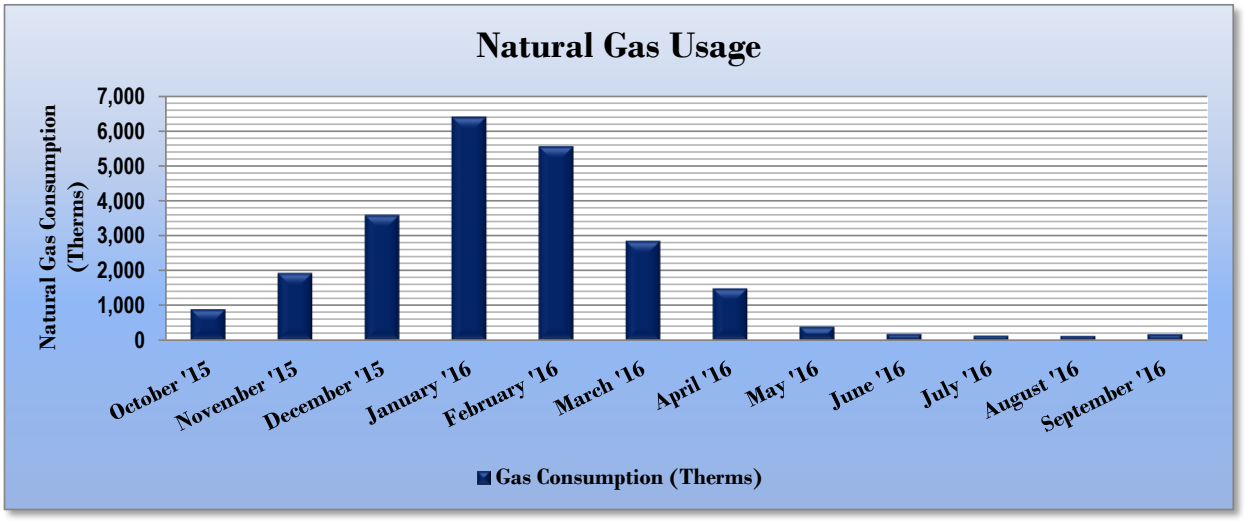


Figure 11 - Natural Gas Usage

Gas Billing Data for Westwood Regional Middle School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
10/27/15	32	887	$174
11/25/15	29	1,929	$196
12/26/15	31	3,588	$592
1/27/16	32	6,400	$2,091
2/29/16	33	5,555	$3,098
3/30/16	30	2,846	$4,814
4/28/16	29	1,486	$4,277
5/26/16	28	395	$2,642
6/27/16	32	184	$911
7/27/16	30	137	$321
8/25/16	29	127	$207
9/27/16	33	171	$181
Totals	**368**	**23,706**	**$19,504**
Annual	**365**	**23,513**	**$19,345**

3.4 Benchmarking

This facility was benchmarked using Portfolio Manager®, an online tool created and managed by the United States Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager® analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR® score for select building types.

The EUI is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy." Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Westwood Regional Middle School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	148.8	141.4
Site Energy Use Intensity (kBtu/ft^2)	80.4	58.2

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the table below:

Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Westwood Regional Middle School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	106.9	141.4
Site Energy Use Intensity (kBtu/ft^2)	63.4	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75% of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. Your building is not is one of the building categories that are eligible to receive a score. This facility has a current score of 48.

A Portfolio Manager® Statement of Energy Performance (SEP) was generated for this facility, see Appendix B: ENERGY STAR® Statement of Energy Performance.

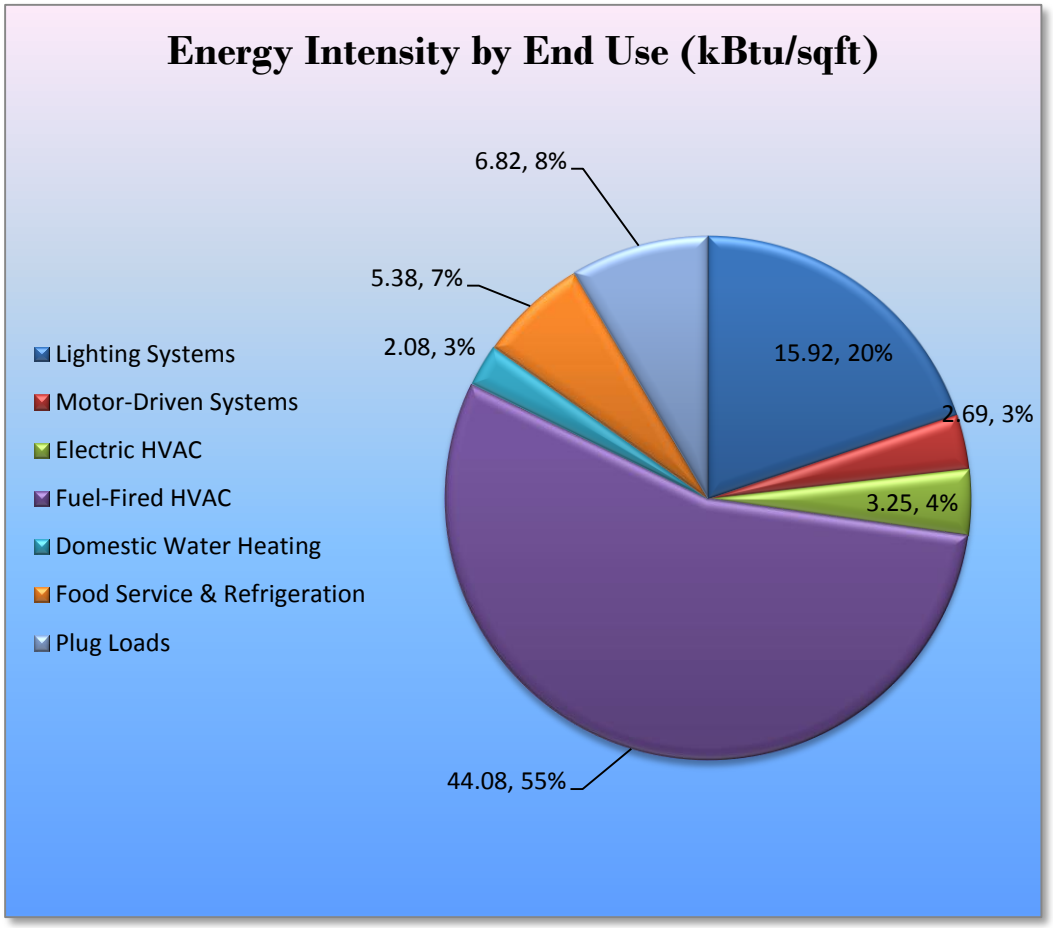
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

A Portfolio Manager® account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager® regularly, so that you can keep track of your building's performance. Free online training is available to help you use ENERGY STAR® Portfolio Manager® to track your building's performance at: https://www.energystar.gov/buildings/training.

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 14 - Energy Balance (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Westwood Regional Middle School regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016 approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**123,053**	**19.3**	**0.0**	**$16,577.19**	**$137,467.96**	**$13,875.00**	**$123,592.96**	**7.5**	**123,913**
ECM 1	Install LED Fixtures	45,070	6.4	0.0	$6,071.59	$100,073.19	$7,670.00	$92,403.19	15.2	45,385
ECM 2	Retrofit Fixtures with LED Lamps	77,983	12.9	0.0	$10,505.60	$37,394.77	$6,205.00	$31,189.77	3.0	78,529
Lighting Control Measures		**26,606**	**3.9**	**0.0**	**$3,584.29**	**$31,930.00**	**$3,860.00**	**$28,070.00**	**7.8**	**26,792**
ECM 3	Install Occupancy Sensor Lighting Controls	26,349	3.9	0.0	$3,549.67	$31,570.00	$3,860.00	$27,710.00	7.8	26,534
ECM 4	Install Photocell Controls	257	0.0	0.0	$34.63	$360.00	$0.00	$360.00	10.4	259
Electric Unitary HVAC Measures		**1,080**	**0.6**	**0.0**	**$145.55**	**$2,210.93**	**$69.00**	**$2,141.93**	**14.7**	**1,088**
ECM 5	Install High Efficiency Electric AC	1,080	0.6	0.0	$145.55	$2,210.93	$69.00	$2,141.93	14.7	1,088
HVAC System Improvements		**1,319**	**0.0**	**10.7**	**$266.08**	**$1,649.35**	**$0.00**	**$1,649.35**	**6.2**	**2,586**
ECM 6	Install Programmable Thermostats	1,319	0.0	10.7	$266.08	$1,649.35	$0.00	$1,649.35	6.2	2,586
Domestic Water Heating Upgrade		**0**	**0.0**	**9.5**	**$77.89**	**$4,354.37**	**$150.20**	**$4,204.17**	**54.0**	**1,108**
	Install High Efficiency Gas Water Heater	0	0.0	8.2	$67.60	$4,340.03	$150.20	$4,189.83	62.0	962
ECM 7	Install Low-Flow Domestic Hot Water Devices	0	0.0	1.3	$10.29	$14.34	$0.00	$14.34	1.4	146
ECM 8	Computer Power Management Software	6,776	0.0	0.0	$912.80	$3,685.00	$0.00	$3,685.00	4.0	6,823
ECM 9	Building Envelope Weatherization	113	0.0	52.2	$444.99	$6,100.00	$0.00	$6,100.00	13.7	6,230
ECM 10	Boiler Burner Replacement	0	0.0	71.3	$586.28	$668.06	$0.00	$668.06	1.1	8,344
ECM 11	Retro-Commissioning Study & HVAC Improvements	1,200	0.0	125.4	$1,193.16	$14,220.00	$0.00	$14,220.00	11.9	15,888
	Installation of an Energy Management System	2,400	0.0	209.0	$2,042.49	$71,100.00	$0.00	$71,100.00	34.8	26,883
TOTALS FOR HIGH PRIORITY MEASURES		**160,148**	**24**	**260.9**	**$23,721**	**$197,946**	**$17,804**	**$180,142**	**7.6**	**191,811**
TOTALS		**162,548**	**23.7**	**478.0**	**$25,831**	**$273,386**	**$17,954**	**$255,431**	**9.9**	**219,656**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

4.1.1 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 16 below.

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**123,053**	**19.3**	**0.0**	**$16,577.19**	**$137,467.96**	**$13,875.00**	**$123,592.96**	**7.5**	**123,913**
ECM 1	Install LED Fixtures	45,070	6.4	0.0	$6,071.59	$100,073.19	$7,670.00	$92,403.19	15.2	45,385
ECM 2	Retrofit Fixtures with LED Lamps	77,983	12.9	0.0	$10,505.60	$37,394.77	$6,205.00	$31,189.77	3.0	78,529

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	37,925	5.4	0.0	$5,109.04	$86,395.23	$6,970.00	$79,425.23	15.5	38,190
Exterior	7,145	1.0	0.0	$962.55	$13,677.96	$700.00	$12,977.96	13.5	7,195

Measure Description

We recommend replacing the metal halide high bay fixtures in the gym and the metal halide wall mounted up light fixtures in the cafeteria, one-for-one with new LED high bay fixtures. This measure includes the replacement of fixtures and assumes the ability to reuse the existing mounting configuration. The existing lamps frequently burn out and the maintenance is problematic due to the need to use a lift. The proposed fixtures are new high performance LEDs which have much longer lifespans. Therefore, this measure saves energy by reducing the electrical demand and use of the gymnasium light fixtures, improves light output as well as significantly reduces required maintenance.

This measure also recommends replacing linear fluorescent fixtures that are in poor condition with new LED fixtures, and replacing exterior fixtures with LED fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable or improved light output. Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice than older technologies.

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	76,455	12.4	0.0	$10,299.67	$36,533.84	$6,175.00	$30,358.84	2.9	76,989
Exterior	1,529	0.5	0.0	$205.93	$860.93	$30.00	$830.93	4.0	1,539

Measure Description

We recommend retrofitting existing compact fluorescent technologies with LED lamps. Existing fixtures in the interior and exterior applications are included within this measure. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space. Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent lamps and more than ten times longer than many incandescent lamps.

4.1.2 Lighting Control Measures

Our recommendations for upgrades to existing lighting controls are summarized in Figure 17 below.

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**26,606**	**3.9**	**0.0**	**$3,584.29**	**$31,930.00**	**$3,860.00**	**$28,070.00**	**7.8**	**26,792**
ECM 3	Install Occupancy Sensor Lighting Controls	26,349	3.9	0.0	$3,549.67	$31,570.00	$3,860.00	$27,710.00	7.8	26,534
ECM 4	Install Daylight Dimming Controls	257	0.0	0.0	$34.63	$360.00	$0.00	$360.00	10.4	259

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 3: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
26,349	3.9	0.0	$3,549.67	$31,570.00	$3,860.00	$27,710.00	7.8	26,534

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in restrooms, classrooms, offices areas, gym and cafeteria. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote-mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

ECM 4: Install Photocell Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
257	0.0	0.0	$34.63	$360.00	$0.00	$360.00	10.4	259

Measure Description

We recommend installing photocell controls that use photosensors to limit the operation of exterior light fixtures to dusk to dawn hours. During the audit there were a few fixtures which were on during the day.

4.1.3 Electric Unitary HVAC Measures

Our recommendation for upgrades to unitary HVAC measures is summarized in Figure 18 below.

Figure 18 - Summary of Unitary HVAC ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**1,080**	**0.6**	**0.0**	**$145.55**	**$2,210.93**	**$69.00**	**$2,141.93**	**14.7**	**1,088**
ECM 5	Install High Efficiency Electric AC	1,080	0.6	0.0	$145.55	$2,210.93	$69.00	$2,141.93	14.7	1,088

ECM 5: Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,080	0.6	0.0	$145.55	$2,210.93	$69.00	$2,141.93	14.7	1,088

Measure Description

We recommend replacing standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

4.1.4 HVAC System Upgrades

Our recommendation for upgrades for HVAC system improvement is summarized in Figure 19 below.

Figure 19 - Summary of HVAC System Improvement ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**1,319**	**0.0**	**10.7**	**$266.08**	**$1,649.35**	**$0.00**	**$1,649.35**	**6.2**	**2,586**
ECM 6	Install Programmable Thermostats	1,319	0.0	10.7	$266.08	$1,649.35	$0.00	$1,649.35	6.2	2,586

ECM 6: Install Programmable Thermostats

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,319	0.0	10.7	$266.08	$1,649.35	$0.00	$1,649.35	6.2	2,586

Measure Description

We recommend replacing manual thermostats with programmable thermostats. Manual thermostats are generally adjusted to a single heating and cooling setpoint and left at that setting regardless of occupancy in the area served by the HVAC equipment. As a result, the same level of heating and cooling is provided regardless of the occupancy in the space. Programmable thermostats can be set to maintain different temperature settings for different times of day and for different days of the week. By reducing heating temperature setpoints and raising cooling temperature setpoints when spaces are unoccupied, the operation of the HVAC equipment is reduced while still maintaining reasonable space temperatures for building usage at all times.

Programmable thermostats provide energy savings by reducing heating and cooling energy usage when a room is unoccupied.

4.1.5 Domestic Hot Water Heating System Upgrades

Our recommendation for upgrades for domestic hot water heating system improvements is summarized in Figure 20 below.

Figure 20 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**1.3**	**$10.29**	**$14.34**	**$0.00**	**$14.34**	**1.4**	**146**
ECM 7	Install Low-Flow Domestic Hot Water Devices	0	0.0	1.3	$10.29	$14.34	$0.00	$14.34	1.4	146

ECM 7: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	1.3	$10.29	$14.34	$0.00	$14.34	1.4	146

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators can reduce hot water usage, relative to standard aerators, which saves energy.

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

4.1.6 Custom Measures

Additional custom measure energy saving opportunities are addressed in this section. Our recommendations for custom measures are summarized in Figure 21 below.

Figure 21 - Summary of Custom ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Custom Measures		**8,089**	**0.0**	**248.9**	**$3,137.23**	**$24,673.06**	**$0.00**	**$24,673.06**	**7.9**	**37,285**
ECM 8	Computer Power Management Software	6,776	0.0	0.0	$912.80	$3,685.00	$0.00	$3,685.00	4.0	6,823
ECM 9	Building Envelope Weatherization	113	0.0	52.2	$444.99	$6,100.00	$0.00	$6,100.00	13.7	6,230
ECM 10	Boiler Burner Replacement	0	0.0	71.3	$586.28	$668.06	$0.00	$668.06	1.1	8,344
ECM 11	Retro-Commissioning Study & HVAC Improvements	1,200	0.0	125.4	$1,193.16	$14,220.00	$0.00	$14,220.00	11.9	15,888

ECM 8: Computer Power Management Software

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
6,776	0.0	0.0	$912.80	$3,685.00	$0.00	$3,685.00	4.0	6,823

Measure Description

We recommend the implementation of computer power management software. The computing environment in most school and office facilities includes desktops, which are typically left on overnight, and on weekends and holidays. Screen savers are commonly confused as a power management strategy. This contributes to excessive electrical energy consumption, which may be avoided by proper management.

There are innovative software packages available in the market today that are designed to deliver significant energy saving and provide ongoing tracking measurements. Operational and maintenance benefits are captured through the use of a central power management platform where issues may be diagnosed and problematic devices may be isolated. Energy savings policies may be enforced as well as identifying and eliminating underutilized devices. This measure investigates the potential benefits to implementing computer power management software to better match the energy use to user needs.

ECM 9: Building Envelope Weatherization

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
113	0.0	52.2	$444.99	$6,100.00	$0.00	$6,100.00	13.7	6,230

Measure Description

We recommend weather-stripping the exterior doors throughout the building. There are nine double doors and thirty-two single doors which were noted to have missing or worn weather-stripping with clear air gaps. There are approximately 900 linear feet of window frames which are recommended to be caulked. Building envelopes that limit air infiltration and that have adequate insulation play a key role in optimizing heating and cooling efficiency, controlling moisture, and providing occupant comfort. Cracks and gaps throughout your building around windows and doors, through utility openings, at the foundation and roof, may not seem significant, but their effects add up. Reducing uncontrolled air infiltration through air sealing is a cost effective way to improve the performance and energy efficiency of your facility. The proper sealing of sources for air infiltration and exfiltration will mitigate the air through the building and thus reduce the load on the facility's heating and cooling equipment. Exterior doors should be properly weather-stripped which may include the installation of a bottom sweep, center sweep and weather-stripping around the perimeter of the door.

ECM 10: Boiler Burner Replacement

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	71.3	$586.28	$668.06	$0.00	$668.06	1.1	8,344

Measure Description

The combustion efficiency can be improved through the upgrade of boiler burner controls from mechanical linkage type to electronic. Due to the nature of mechanical linkage controls, they are prone to fall out of calibration leading to decreases in combustion efficiency. Industry leaders have researched and developed a basis of typical percent energy savings from 10% to 30% based on these boiler control improvements. For the purposes of this report, the potential energy savings is based on an estimated increase in efficiency by 5.5%.

We recommend that an HVAC contractor who specializes in boiler control systems be contacted for a detailed evaluation and implementation costs. For the purposes of this report, the potential energy savings and measure costs were estimated to demonstrate the cost effectiveness of this measure and promote moving forward.

ECM 11: Retro-Commissioning Study & HVAC Improvements

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,200	0.0	125.4	$1,193.16	$14,220.00	$0.00	$14,220.00	11.9	15,888

Measure Description

Due to the complexity of today's HVAC systems and controls, it is likely for systems to be operating incorrectly or not as efficiently as they could be. Retro-commissioning studies reveal hidden deficiencies and highlights operational and maintenance issues that could have been avoided as well as exposes hidden control system problems. Examples of areas to investigate include the following: areas with the steam heating system should be evaluated for the opportunity for steam trap replacements, and the hot water heating system should be evaluated for the opportunity of installing thermostatic radiator valves.

There are valuable benefits to retro-commissioning in existing buildings. It is a detailed and specialized process that reviews how an HVAC system is controlled and designed to operate. Applying retro-commissioning to existing facilities includes planning, discovering root causes of inefficiencies, development of a cost-effective project delivery and a focus on optimizing value to the building owner. The study includes functional system testing under various modes, such as heating or cooling loads, occupied and unoccupied modes, varying outside air temperature and space temperatures. This is a systematic process to ensure that the building energy systems perform interactively according to the original design intent and the current operational needs of the facility.

Retro-commissioning is a common practice recommended by the American Society of Heating Refrigeration and Energy (ASHRAE) to be revisited every couple of years. We recommend that an engineering firm who specializes in energy control systems and retro-commissioning be contacted for a detailed evaluation and implementation costs. Facility operations personnel would work with the engineers to develop goals and objectives. During on site testing, the qualified personnel conducting the study would immediately make any no/low-cost improvements as identified. Furthermore, any suggested corrective actions which require the purchase of material, a contractor who specializes in that scope of work would be contacted to implement the remaining improvements. For the purposes of this report, the potential energy savings and measure costs were estimated to demonstrate the cost effectiveness of this measure and promote moving forward.

4.2 ECMs Evaluated But Not Recommended

The measures below have been evaluated by the auditor but are not recommended for implementation at the facility. Reasons for exclusion can be found in each measure description section.

Figure 22 – Summary of Measures Evaluated, But Not Recommended

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade	**0**	**0.0**	**8.2**	**$67.60**	**$4,340.03**	**$150.20**	**$4,189.83**	**62.0**	**962**
Install High Efficiency Gas Water Heater	0	0.0	8.2	$67.60	$4,340.03	$150.20	$4,189.83	62.0	962
Custom Measures	**2,400**	**0.0**	**209.0**	**$2,042.49**	**$71,100.00**	**$0.00**	**$71,100.00**	**34.8**	**26,883**
Installation of an Energy Management System	2,400	0.0	209.0	$2,042.49	$71,100.00	$0.00	$71,100.00	34.8	26,883
TOTALS	**2,400**	**0.0**	**217.2**	**$2,110.09**	**$75,440.03**	**$150.20**	**$75,289.83**	**35.7**	**27,845**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Install High Efficiency Gas Water Heater

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	8.2	$67.60	$4,340.03	$150.20	$4,189.83	62.0	962

Measure Description

In many cases, we recommend replacing existing tank water heaters with high efficiency tank water heaters. Improvements in combustion efficiency and reductions in heat losses have improved the overall efficiency of storage water heaters. Energy savings results from using less gas to heat water, due to higher unit efficiency, and fewer run hours to maintain the tank water temperature.

Reasons for not Recommending

This measure is cost prohibitive. Replacement of the unit now is not recommended on the basis of energy savings alone because the payback period for replacing them exceeds the useful life of the equipment. However, this measure was at least evaluated to demonstrate the potential savings by upgrading to high efficiency equipment that may be beneficial once the unit reaches the end of its useful life.

Installation of an Energy Management System

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
2,400	0.0	209.0	$2,042.49	$71,100.00	$0.00	$71,100.00	34.8	26,883

Measure Description

The installation of an Energy Management System (EMS) increases the efficiency of the building HVAC system operation. Upgrade of controls to optimize the start/stop of all key HVAC equipment, tying in all space temperature controls will minimize the amount of waste energy. Schedules may be put in place to limit system operation when the building is closed. Temperature set back controls may be applied to operate systems only to the point necessary. Ventilation and economizer controls and programming would allow air handling units to operate according to room schedules, occupancy and availability for "free cooling" or "free heating." If this measure is of high interest regardless of the poor payback period, we recommend that an HVAC contractor who specializes in energy management systems be contacted for a detailed evaluation and implementation costs.

Reasons for not Recommending

This measure is cost prohibitive. Installation of a sophisticated control system at this time is not recommended on the basis of energy savings alone due to the poor payback period. However, this measure was at least evaluated to demonstrate the potential savings and should be considered in the future, perhaps as a capital improvement measure.

The recommended retro-commissioning study could help the District with further evaluation of the cost effectiveness of this measure by providing a deeper analysis of the building system operations.

5 ENERGY EFFICIENT PRACTICES

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Reduce Air Leakage

Air leakage, or infiltration, occurs when outside air enters a building uncontrollably through cracks and openings. Properly sealing such cracks and openings can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. This includes caulking or installing weather stripping around leaky doors and windows allowing for better control of indoor air quality trough controlled ventilation.

Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

Use Window Treatments/Coverings

A substantial amount of heat gain can occur through uncovered or untreated windows, especially older single pane windows and east or west-facing windows. Treatments such as high-reflectivity films or covering windows with shades or shutters can reduce solar heat gain and, consequently, cooling load and can reduce internal heat loss and the associated heating load.

Perform Proper Lighting Maintenance

In order to sustain optimal lighting levels, lighting fixtures should undergo routine maintenance. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust on lamps, fixtures and reflective surfaces. Together, these factors can reduce total illumination by 20%-60% or more, while operating fixtures continue drawing full power. To limit this reduction, lamps, reflectors and diffusers should be thoroughly cleaned of dirt, dust, oil, and smoke film buildup approximately every 6–12 months.

Develop a Lighting Maintenance Schedule

In addition to routine fixture cleaning, development of a maintenance schedule can both ensure maintenance is performed regularly and can reduce the overall cost of fixture re-lamping and re-ballasting. By re-lamping and re-ballasting fixtures in groups, lighting levels are better maintained and the number of site visits by a lighting technician or contractor can be minimized, decreasing the overall cost of maintenance.

Ensure Lighting Controls Are Operating Properly

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

Turn Off Unneeded Motors

Electric motors often run unnecessarily, and this is an overlooked opportunity to save energy. These motors should be identified and turned off when appropriate. For example, exhaust fans often run unnecessarily when ventilation requirements are already met. Reducing run hours for these motors can result in significant energy savings. Whenever possible, use automatic devices such as twist timers or occupancy sensors to ensure that motors are turned off when not needed.

Reduce Motor Short Cycling

Frequent stopping and starting of motors subjects rotors and other parts to substantial stress. This can result in component wear, reducing efficiency, and increasing maintenance costs. Adjust the load on the motor to limit the amount of unnecessary stopping and starting to improve motor performance.

Perform Routine Motor Maintenance

Motors consist of many moving parts whose collective degradation can contribute to a significant loss of motor efficiency. In order to prevent damage to motor components, routine maintenance should be performed. This maintenance consists of cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

Use Fans to Reduce Cooling Load

Utilizing ceiling fans to supplement cooling is a low cost strategy to reduce cooling load considerably. Thermostat settings can be increased by 4°F with no change in overall occupant comfort when the wind chill effect of moving air is employed for cooling.

Install Destratification Fans

Allowing air to thermally stratify in spaces with high ceilings results in additional energy consumption by requiring the heating system to heat a volume of space much larger than the actual occupied space. Additional inefficiencies also occur because there are higher temperatures at the ceiling level than at the floor level. Higher temperatures at the ceiling accelerate heat loss through the roof, requiring additional energy consumption by the heating equipment in order to compensate for the accelerated heat transfer.

Destratification fans are specially designed to deliver a columnar, laminar flow of air balancing the air temperature from floor to ceiling. In addition to fuel savings, the use of destratification fans will reduce the recovery time necessary to warm the space after nightly temperature setbacks and will increase the comfort level of the occupants.

Practice Proper Use of Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5°F-10°F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Ensure Economizers are Functioning Properly

Economizers, when properly configured, can be used to significantly reduce mechanical cooling. However, if the outdoor thermostat or enthalpy control is malfunctioning or the damper is stuck or improperly adjusted, benefits from the economizer may not be fully realized. As such, periodic inspection and maintenance is required to ensure proper operation. This maintenance should be scheduled with maintenance of the facility's air conditioning system and should include proper setting of the outdoor thermostat/enthalpy control, inspection of control and damper operation, lubrication of damper connections, and adjustment of minimum damper position. A malfunctioning economizer can significantly increase the amount of heating and mechanical cooling required by introducing excess amounts of cold or hot outside air.

Clean Evaporator/Condenser Coils on AC Systems

Dirty evaporators and condensers coils cause a restriction to air flow and restrict heat transfer. This results in increased evaporator and condenser fan load and a decrease in cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

Clean and/or Replace HVAC Filters

Air filters work to reduce the amount of indoor air pollution and increase occupant comfort. Over time, filters become less and less effective as particulate buildup increases. In addition to health concerns related to clogged filters, filters that have reached saturation also restrict air flow through the facility's air conditioning or heat pump system, increasing the load on the distribution fans and decreasing occupant comfort levels. Filters should be checked monthly and cleaned or replaced when appropriate.

Check for and Seal Duct Leakage

Duct leakage in commercial buildings typically accounts for 5% to 25% of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building, significantly increasing cooling and heating costs. By sealing sources of leakage, cooling, heating, and ventilation energy use can be reduced significantly, depending on the severity of air leakage.

Repair/Replace Steam Traps

Properly functioning steam traps ensure that all latent heat in the steam is delivered to the end use by preventing pressurized steam from leaking. Steam traps should be inspected as part of the regular steam system maintenance. Traps that are blocked, venting, or allowing steam to leak through should be repaired or replaced. Repairing or replacing existing steam traps will reduce steam losses.

Perform Proper Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

Perform Proper Furnace Maintenance

Preventative furnace maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. Following the manufacturer's instructions, a yearly tune-up should include tasks such as checking for gas/carbon monoxide leaks; changing the air and fuel filters; checking components for cracks, corrosion, dirt, or debris build-up; ensuring the ignition system is working properly; testing and adjusting operation and safety controls; inspecting the electrical connections; and ensuring proper lubrication for motors and bearings.

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

Water Conservation

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.1.5 for any low-flow ECM recommendations.

6 On-Site Generation Measures

On-site generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

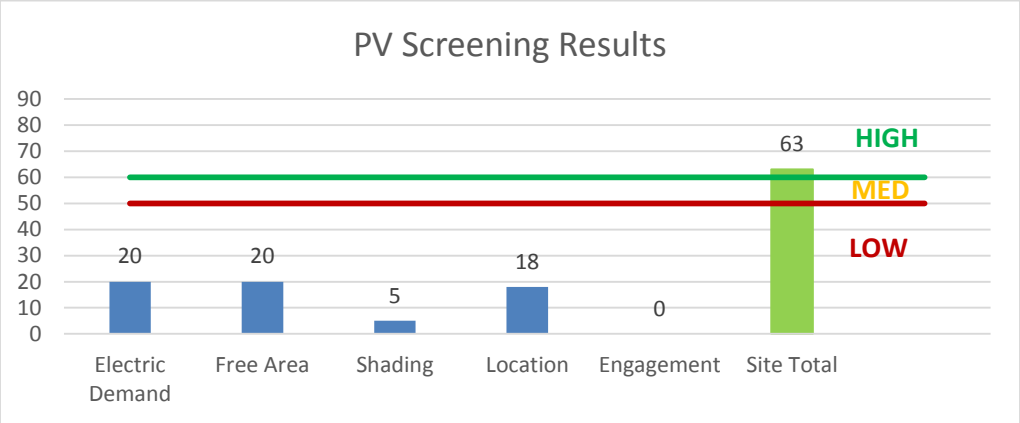
6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a High potential for installing a PV array.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential for PV at the site. A PV array located on the roof of the main building may be feasible. If Westwood Regional Middle School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 23 - Photovoltaic Screening



Potential	High	
System Potential	114	kW DC STC
Electric Generation	85,778	kWh/yr
Displaced Cost	$7,460	/yr
Installed Cost	$296,400	

Solar projects must register their projects in the SREC (Solar Renewable Energy Certificate) Registration Program (SRP) prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.3 for additional information.

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs

- **Approved Solar Installers in the NJ Market**: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

6.2 Combined Heat and Power

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

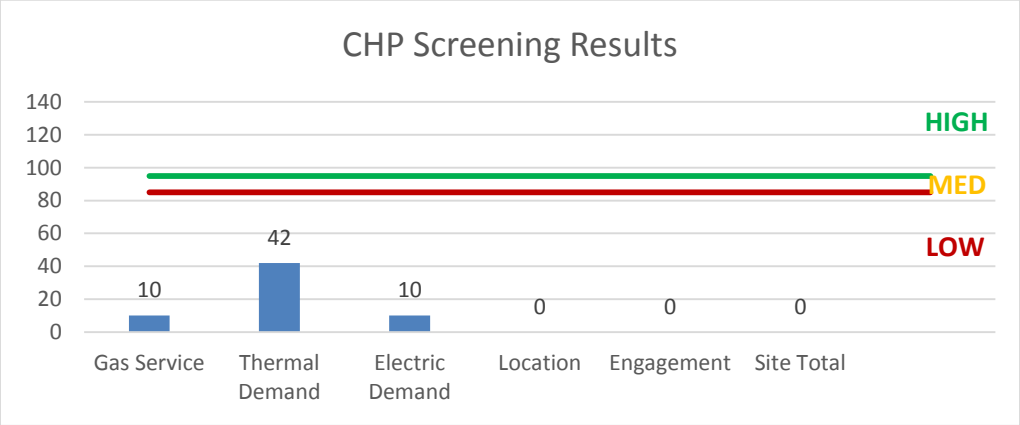
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a low to no potential for installing a cost-effective CHP system.

Due to low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/.

Figure 24 - Combined Heat and Power Screening



7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats, so that air conditioning units run less frequently, or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (http://www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (http://www.pjm.com/training/training%20material.aspx), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund, your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 25 for a list of the eligible programs identified for each recommended ECM.

Figure 25 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	x		x			
ECM 2	Retrofit Fixtures with LED Lamps	x		x			
ECM 3	Install Occupancy Sensor Lighting Controls	x		x			
ECM 4	Install Photocell Controls			x			
ECM 5	Install High Efficiency Electric AC	x		x			
ECM 6	Install Programmable Thermostats	x		x			
ECM 7	Install Low-Flow Domestic Hot Water Devices			x			
ECM 8	Computer Power Management Software			x			
ECM 9	Building Envelope Weatherization						
ECM 10	Boiler Burner Replacement						
ECM 11	Retro-Commissioning Study & HVAC Improvements						

SmartStart is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities. It requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SmartStart program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: www.njcleanenergy.com/ci.

8.1 SmartStart

Overview

The SmartStart program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The SmartStart prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SmartStart program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

Since your facility is an existing building, only the retrofit incentives have been applied in this report. Custom measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less). Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB.

8.2 Direct Install

Overview

Direct Install is a turnkey program available to existing small to medium-sized facilities with an average peak electric demand that does not exceed 200 kW over the recent 12-month period. You work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives and controls.

Incentives

The program pays up to 70% of the total installed cost of eligible measures, up to $125,000 per project. Each entity is limited to incentives up to $250,000 per fiscal year.

How to Participate

To participate in Direct Install, you will need to contact the participating contractor assigned to the region of the state where your facility is located. A complete list of Direct Install program partners is provided on the Direct Install website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

Detailed program descriptions and applications can be found at: www.njcleanenergy.com/DI.

8.3 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number which enables it to generate New Jersey SRECs. SRECs are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SRECs to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar RPS. One way they can meet the RPS requirements is by purchasing SRECs. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period can and will fluctuate depending on supply and demand.

Information about the SRP can be found at: www.njcleanenergy.com/srec.

8.4 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract," whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an Energy Services Company or "ESCO."
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program description and application can be found at: www.njcleanenergy.com/ESIP.

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e., non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been 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. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a third party supplier for natural gas commodity.

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 signing up for service through a third party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.11	198	0.0	$26.67	$351.00	$60.00	10.91
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.04	76	0.0	$10.22	$117.00	$20.00	9.49
Storage	2	Incandescent: Screw in Lamps	Wall Switch	100	1,000	Relamp	No	2	LED Screw-In Lamps: Screw-in lamp	Wall Switch	11	1,000	0.12	205	0.0	$27.58	$107.51	$10.00	3.54
Storage	1	Incandescent: Screw in Lamps	Wall Switch	200	1,000	Relamp	No	1	LED Screw-In Lamps: Screw-in lamp	Wall Switch	23	1,000	0.12	204	0.0	$27.42	$53.75	$5.00	1.78
Vestibules	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,680	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,680	0.13	1,066	0.0	$143.56	$351.00	$60.00	2.03
Lobby	4	Compact Fluorescent: Screw in Lamps	Wall Switch	23	4,680	Relamp	No	4	LED Screw-In Lamps: Screw-in lamp	Wall Switch	9	4,680	0.04	301	0.0	$40.60	$215.01	$0.00	5.30
Lobby	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,680	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,680	0.02	178	0.0	$23.93	$58.50	$10.00	2.03
Display	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	4,680	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,680	0.01	94	0.0	$12.69	$35.90	$5.00	2.44
Main Office	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,808	Relamp	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,966	0.24	1,185	0.0	$159.65	$745.67	$135.00	3.82
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	500	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.02	19	0.0	$2.56	$58.50	$10.00	18.97
Private Office	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,808	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,966	0.10	502	0.0	$67.69	$522.80	$35.00	7.21
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,808	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,808	0.01	52	0.0	$6.96	$48.20	$10.00	5.49
Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,680	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,276	0.11	898	0.0	$120.94	$504.00	$40.00	3.84
Private Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,808	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,966	0.10	474	0.0	$63.86	$306.27	$60.00	3.86
Guidance Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,808	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,966	0.12	606	0.0	$81.63	$341.60	$65.00	3.39
Private Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,808	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,966	0.08	404	0.0	$54.42	$266.40	$50.00	3.98
Private Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,808	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,966	0.08	404	0.0	$54.42	$266.40	$50.00	3.98
Conference Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,808	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,966	0.04	202	0.0	$27.21	$191.20	$15.00	6.48
Cafeteria	14	Metal Halide: (1) 50W Lamp	Wall Switch	72	2,808	Fixture Replacement	Yes	14	LED - Fixtures: Other	Occupancy Sensor	18	1,966	0.55	2,685	0.0	$361.77	$4,221.36	$105.00	11.38
Cafeteria	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,808	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,966	0.17	815	0.0	$109.80	$871.60	$155.00	6.53
Cafeteria	12	Metal Halide: (1) 50W Lamp	Wall Switch	72	2,808	Fixture Replacement	Yes	12	LED - Fixtures: Other	Occupancy Sensor	18	1,966	0.47	2,302	0.0	$310.09	$3,656.88	$95.00	11.49
Cafeteria	5	Compact Fluorescent: Plug in Lamps	Wall Switch	26	2,808	Relamp	No	5	LED Screw-In Lamps: Plug In Lamps	Wall Switch	14	2,808	0.04	194	0.0	$26.10	$537.53	$0.00	20.59
Girl's Restroom	1	LED - Fixtures: Decorative: Other	Wall Switch	12	2,808	None	Yes	1	LED - Fixtures: Decorative: Other	Occupancy Sensor	12	1,966	0.00	12	0.0	$1.57	$27.00	$3.50	15.01
Girl's Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,808	Relamp	Yes	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,966	0.04	212	0.0	$28.52	$350.70	$15.00	11.77
Boy's Restroom	1	LED - Fixtures: Decorative: Other	Wall Switch	12	2,808	None	Yes	1	LED - Fixtures: Decorative: Other	Occupancy Sensor	12	1,966	0.00	12	0.0	$1.57	$27.00	$0.00	17.24

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boy's Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,808	Relamp	Yes	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,966	0.04	212	0.0	$28.52	$350.70	$15.00	11.77
Custodial Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,966	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,966	0.03	112	0.0	$15.07	$75.20	$15.00	3.99
Custodial Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,808	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,808	0.03	160	0.0	$21.53	$75.20	$15.00	2.80
Kitchen	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,680	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,680	0.13	1,066	0.0	$143.56	$300.80	$60.00	1.68
Kitchen	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,680	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,680	0.06	533	0.0	$71.78	$150.40	$30.00	1.68
Nurse's Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,808	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,808	0.19	959	0.0	$129.20	$451.20	$90.00	2.80
Hallway	26	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,680	Relamp	Yes	26	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,276	0.71	5,835	0.0	$786.09	$2,061.00	$260.00	2.29
Media Center	42	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,808	Relamp	Yes	42	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,966	1.15	5,656	0.0	$761.90	$3,537.00	$560.00	3.91
Closet	1	Incandescent: Screw in Lamps	Wall Switch	100	500	Relamp	No	1	LED Screw-In Lamps: Screw-in lamp	Wall Switch	9	500	0.06	52	0.0	$7.05	$53.75	$5.00	6.92
Girl's Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,808	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,966	0.08	404	0.0	$54.42	$445.50	$65.00	6.99
Boy's Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,808	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,966	0.08	404	0.0	$54.42	$445.50	$65.00	6.99
Staff Restroom	1	Incandescent: Screw in Lamps	Wall Switch	100	2,808	Relamp	No	1	LED Screw-In Lamps: Screw-in lamp	Wall Switch	9	2,808	0.06	294	0.0	$39.59	$53.75	$5.00	1.23
Teacher's Lounge	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,808	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,966	0.27	1,347	0.0	$181.41	$855.00	$135.00	3.97
Restroom	1	Incandescent: Screw in Lamps	Wall Switch	100	2,808	Relamp	No	1	LED Screw-In Lamps: Screw-in lamp	Wall Switch	9	2,808	0.06	294	0.0	$39.59	$53.75	$5.00	1.23
Classroom 12	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,978	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,785	0.66	4,578	0.0	$616.78	$2,214.00	$345.00	3.03
Classroom 13	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,978	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,785	0.66	4,578	0.0	$616.78	$2,214.00	$345.00	3.03
Classroom 14	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,978	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,785	0.66	4,578	0.0	$616.78	$2,214.00	$345.00	3.03
Hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,680	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,276	0.16	1,347	0.0	$181.41	$621.00	$60.00	3.09
Stage	6	Incandescent: Screw in Lamps	Wall Switch	100	500	Relamp	No	6	LED Screw-In Lamps: Screw-in lamp	Wall Switch	7	500	0.37	321	0.0	$43.22	$322.52	$30.00	6.77
Stage	3	Halogen Incandescent: Screw in Lamps	Wall Switch	200	500	Relamp	No	3	LED Screw-In Lamps: Screw-in lamp	Wall Switch	18	500	0.36	314	0.0	$42.29	$161.26	$15.00	3.46
Gym	12	Metal Halide: (1) 250W Lamp	Wall Switch	295	4,680	Fixture Replacement	Yes	12	LED - Fixtures: High-Bay	Occupancy Sensor	78	3,276	1.89	15,526	0.0	$2,091.60	$34,862.40	$2,220.00	15.61
Girl's Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,808	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,966	0.08	404	0.0	$54.42	$420.40	$65.00	6.53
Custodial Office	1	Incandescent: Screw in Lamps	Wall Switch	200	2,808	Relamp	No	1	LED Screw-In Lamps: Screw-in lamp	Wall Switch	18	2,808	0.12	588	0.0	$79.17	$53.75	$5.00	0.62
Boy's Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,808	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,966	0.08	404	0.0	$54.42	$420.40	$65.00	6.53
Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,680	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,276	0.27	2,244	0.0	$302.34	$855.00	$100.00	2.50

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Science Hallways	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,978	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,785	0.22	1,526	0.0	$205.59	$738.00	$80.00	3.20
Science Hallways	3	LED - Fixtures: Decorative: Other	Wall Switch	10	3,978	None	Yes	3	LED - Fixtures: Decorative: Other	Occupancy Sensor	10	2,785	0.01	41	0.0	$5.55	$0.00	$0.00	0.00
Science Hallways	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,978	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,785	0.11	800	0.0	$107.73	$557.20	$40.00	4.80
Mechanical Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,978	Fixture Replacement	No	2	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	44	3,978	0.06	448	0.0	$60.40	$836.33	$90.00	12.36
Hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	4,680	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,276	0.16	1,347	0.0	$181.41	$621.00	$60.00	3.09
Custodial Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,978	Fixture Replacement	No	1	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	58	3,978	0.04	256	0.0	$34.51	$418.17	$45.00	10.81
Storage Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,978	Fixture Replacement	No	1	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	29	3,978	0.02	151	0.0	$20.34	$418.17	$45.00	18.35
Classroom 1	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,978	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,785	0.66	4,578	0.0	$616.78	$2,214.00	$345.00	3.03
Classroom 2	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,978	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,785	0.66	4,578	0.0	$616.78	$2,214.00	$345.00	3.03
Classroom 3	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,978	Relamp	Yes	23	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,785	0.63	4,388	0.0	$591.08	$2,155.50	$335.00	3.08
Classroom 4	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,978	Relamp	Yes	23	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,785	0.63	4,388	0.0	$591.08	$2,155.50	$335.00	3.08
Classroom 5	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,978	Relamp	Yes	23	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,785	0.63	4,388	0.0	$591.08	$2,155.50	$335.00	3.08
Classroom 6	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,978	Relamp	Yes	23	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,785	0.63	4,388	0.0	$591.08	$2,155.50	$335.00	3.08
Classroom 7	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,978	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,785	0.66	4,578	0.0	$616.78	$2,214.00	$345.00	3.03
Classroom 8	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,978	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,785	0.66	4,578	0.0	$616.78	$2,214.00	$345.00	3.03
Classroom 9	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,978	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,785	0.66	4,578	0.0	$616.78	$2,214.00	$345.00	3.03
Classroom 11	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,978	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,785	0.66	4,578	0.0	$616.78	$2,214.00	$345.00	3.03
Classroom 16	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,978	Fixture Replacement	Yes	18	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	44	2,785	0.73	5,122	0.0	$689.99	$8,336.99	$915.00	10.76
Classroom 17	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,978	Fixture Replacement	Yes	18	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	44	2,785	0.73	5,122	0.0	$689.99	$8,336.99	$915.00	10.76
Classroom 18	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,978	Fixture Replacement	Yes	18	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	44	2,785	0.73	5,122	0.0	$689.99	$8,336.99	$915.00	10.76
Classroom 19	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,978	Fixture Replacement	Yes	18	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	44	2,785	0.73	5,122	0.0	$689.99	$8,336.99	$915.00	10.76
Classroom 20	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,978	Fixture Replacement	Yes	18	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	44	2,785	0.73	5,122	0.0	$689.99	$8,336.99	$915.00	10.76
Classroom 21	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,978	Fixture Replacement	Yes	18	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	44	2,785	0.73	5,122	0.0	$689.99	$8,336.99	$915.00	10.76
Classroom 22	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,978	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,785	0.48	3,358	0.0	$452.35	$1,761.33	$305.00	3.22

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 23	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,978	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,785	0.48	3,358	0.0	$452.35	$1,761.33	$305.00	3.22
Classroom 24	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,978	Relamp	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,785	0.38	2,686	0.0	$361.88	$1,571.07	$265.00	3.61
Classroom 25	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,978	Relamp	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,785	0.38	2,686	0.0	$361.88	$1,571.07	$265.00	3.61
Classroom 22	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,978	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,785	0.11	800	0.0	$107.73	$1,097.20	$145.00	8.84
Classroom 23	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,978	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,785	0.11	800	0.0	$107.73	$1,097.20	$145.00	8.84
Classroom 24	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,978	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,785	0.11	800	0.0	$107.73	$1,097.20	$145.00	8.84
Classroom 25	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,978	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,785	0.11	800	0.0	$107.73	$1,097.20	$145.00	8.84
Storage Closets	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	500	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.04	38	0.0	$5.11	$117.00	$20.00	18.97
Restrooms	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,340	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,340	0.02	86	0.0	$11.60	$96.40	$20.00	6.59
Restrooms	4	Incandescent: Screw in Lamps	Wall Switch	60	2,340	Relamp	No	4	LED Screw-In Lamps: Screw-in lamp	Wall Switch	7	2,340	0.14	570	0.0	$76.85	$215.01	$20.00	2.54
Exterior	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	12	8,760	None	Yes	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	12	4,000	0.01	197	0.0	$26.55	$270.00	$0.00	10.17
Exterior	1	Metal Halide: (1) 50W Lamp	None	72	8,760	Fixture Replacement	Yes	1	LED - Fixtures: Fuel Pump Canopy	Daylight Dimming	18	4,000	0.04	643	0.0	$86.56	$2,050.00	$100.00	22.53
Exterior	6	Halogen Incandescent: Screw in Lamps	Occupancy Sensor	150	1,638	Relamp	No	6	LED Screw-In Lamps: Screw-in lamp	Occupancy Sensor	14	1,638	0.53	1,537	0.0	$207.07	$645.92	$30.00	2.97
Exterior	6	LED - Fixtures: Decorative: Other	None	10	4,000	None	No	6	LED - Fixtures: Decorative: Other	None	10	4,000	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	6	Metal Halide: (1) 400W Lamp	None	458	4,000	Fixture Replacement	No	6	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	180	4,000	1.09	7,673	0.0	$1,033.65	$11,717.96	$600.00	10.76
Exterior	4	Compact Fluorescent: Screw in Lamps	None	23	4,000	Relamp	No	4	LED Screw-In Lamps: Screw-in lamp	None	11	4,000	0.03	221	0.0	$29.75	$215.01	$0.00	7.23

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classrooms	HV Units	27	Supply Fan	0.3	72.0%	No	2,059	No	72.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Science Classrooms	HVAC Units	4	Supply Fan	0.8	72.0%	No	2,059	No	72.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Science Classrooms	HVAC Units	4	Exhaust Fan	0.3	72.0%	No	2,059	No	72.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Boiler Burner	1	Other	3.0	90.0%	No	2,059	No	90.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Hot Water Pumps	3	Heating Hot Water Pump	0.8	72.0%	No	2,059	No	72.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Pnuematic Controls	2	Air Compressor	0.8	72.0%	No	3,718	No	72.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Rooms	Domestic Water	2	Water Supply Pump	0.5	72.0%	No	2,059	No	72.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Middle School	8	Exhaust Fan	0.3	72.0%	No	2,059	No	72.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Gym	2	Exhaust Fan	0.3	72.0%	No	2,059	No	72.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Gym	2	Supply Fan	1.0	84.0%	No	2,059	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Cafeteria	1	Supply Fan	7.5	89.5%	No	2,543	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Cafeteria	1	Exhaust Fan	0.3	72.0%	No	2,059	No	72.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Teacher's Lounge	Teacher's Lounge	1	Window AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classrooms	Classrooms	8	Window AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Storage	Storage	1	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Offices	Offices	2	Window AC	0.83		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Offices	Offices	1	Window AC	1.26		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Offices	Offices	1	Window AC	1.00		Yes	1	Window AC	1.00		12.00		No	0.26	191	0.0	$25.76	$1,088.76	$0.00	42.26
Computer Lab	Computer Lab	1	Window AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classrooms	Classrooms	2	Window AC	1.26		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Roof	1	Split-System AC	0.75		Yes	1	Split-System AC	0.75		14.00		No	0.30	889	0.0	$119.79	$1,122.17	$69.00	8.79
Roof	Cafeteria	1	Packaged AC	16.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Rooms	Science Classrooms	4	Packaged AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Whole Building	1	Forced Draft Steam Boiler	3,563.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Cafeteria	1	Furnace	219.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Rooms	Science Classrooms	4	Furnace	100.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Programmable Thermostat Recommendations

		Recommendation Inputs				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	Thermostat Quantity	Cooling Capacity of Controlled System (Tons)	Electric Heating Capacity of Controlled System (kBtu/hr)	Output Heating Capacity of Controlled System (MBh)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Cafeteria	1	16.00		219.00	0.00	1,141	7.3	$214.08	$329.87	$0.00	1.54
Mechanical Rooms	Science Classrooms	4	2.00		100.00	0.00	178	3.4	$52.00	$1,319.48	$0.00	25.37

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Half the Building	1	Storage Tank Water Heater (> 50 Gal)	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	96.00%	Et	0.00	0	8.2	$67.60	$4,340.03	$150.20	61.98
Mechanical Room	Half the Building	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms	1	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	0.7	$5.61	$7.17	$0.00	1.28
Restrooms	1	Faucet Aerator (Lavatory)	2.00	1.00	0.00	0	0.6	$4.68	$7.17	$0.00	1.53

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Freezer Chest	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Stand-Up Refrigerator, Glass Door (≤15 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Refrigerator Chest	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Freezer, Solid Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Lounge	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Lounge	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	2	Insulated Food Holding Cabinet (1/2 Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Gas Combination Oven/Steam Cooker (<15 Pans)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Middle School	79	Computers	120.0	
Middle School	2	Projector	350.0	
Middle School	7	TV	120.0	
Middle School	15	Printer	250.0	
Middle School	29	Smart Board	500.0	
Middle School	4	Mini Fridge	260.0	
Middle School	3	Coffee Maker	1,100.0	
Middle School	3	Microwave	1,500.0	
Middle School	1	Dishwasher	2,500.0	
Middle School	17	Fan	100.0	
Middle School	14	Speakers	150.0	
Middle School	121	Laptops	90.0	

Custom Recommendations

Computer Power Management Software

Normal Running Mode					Idle Running Mode					Suspended/Off Mode				
Mon - Fri 8AM-5PM	*Mon - Fri 5PM-8AM*	*Weekends & Holidays*	Energy Rate (W)*	Weekly Run Hours	Mon - Fri 8AM-5PM	Mon - Fri 5PM-8AM	*Weekends & Holidays*	*Energy Rate (W)**	*Weekly Run Hours*	Mon - Fri 8AM-5PM	Mon - Fri 5PM-8AM	Weekends & Holidays	Energy Rate (W)*	*Weekly Run Hours*
80%	15%	5%	120	**46**	5%	15%	5%	80	**16**	15%	70%	90%	5	**105**
75%	5%	0%	120	**34**	5%	5%	0%	80	**6**	20%	90%	100%	5	**128**

Usage per Device			Energy Impact & Financial Analysis					
Weeks of Use	Annual kWh Usage	*Diversity Factor***	Total Annual kWh Savings	Total Annual Energy Cost Savings	*Cost per Desktop*	*Add'l Hardware Cost*	Total Installation Cost	Simple Payback Period (Years)
48	355	90%	6,776	$913	$15.00	$2,500.0	$3,685	4.04
48	260							

Retro-Commissioning Study & HVAC Improvements

Existing Conditions			Proposed Conditions			Energy Impact & Financial Analysis				
Annual Electric HVAC Energy Use (kWh)	*Annual Heating Energy Use (mmBtu)*	*Annual Fan Energy Use (kWh)*	Assumed % Cooling Savings	Assumed % Heating Savings	Assumed % Motor Savings	Total Annual kWh Savings	Total Annual mmBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Simple Payback Period (Years)
45,169	2,089.5	37,428	1%	6%	2%	1,200	125	$1,193	$14,220	11.92

Equations: (Based on Industry Standards)

Average Cost for retro-commissioining studies and control improvements is $0.30/sqft

Energy savings range between 5% and 20% with a typical payback of two years or less

Based on a comprehensive study by the Environmental Protection Agency, the value of energy savings range from $0.11 and $0.72/sqft

Installation of an Energy Management System

Existing Conditions			Proposed Conditions			Energy Impact & Financial Analysis				
Annual Electric HVAC Energy Use (kWh)	*Annual Heating Energy Use (mmBtu)*	*Annual Fan Energy Use (kWh)*	Assumed % Cooling Savings	Assumed % Heating Savings	Assumed % Motor Savings	Total Annual kWh Savings	Total Annual mmBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Simple Payback Period (Years)
45,169	2,089.5	37,428	2%	10%	4%	2,400	209	$2,042	$71,100	34.81

Equations: (Based on Industry Standards)
Average Cost for EMS installation is $1.50/sqft
Energy savings range between 10% and 30%

Building Envelope Weatherization

Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis				
Annual Electric HVAC Energy Use (kWh)	*Annual Heating Energy Use (mmBtu)*	Assumed % Electric HVAC Savings	Assumed % Gas HVAC Savings	Total Annual kWh Savings	Total Annual mmBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Simple Payback Period (Years)
45,169	2,089.5	0.3%	2.5%	113	52	$445	$6,100	13.71

	qty	unit	$/unit	est. costs
Weather-strip Exterior Double Doors	9	EA	100	$ 900
Weather-strip Exterior Single Doors	32	EA	50	$ 1,600
Caulk the Perimeter of Windows	900	LF	4	$ 3,600
		Total Estimated Costs		**$ 6,100**

Boiler Burner Replacement

Existing Conditions		Proposed Conditions				Energy Impact & Financial Analysis				
Output Capacity per Unit (MBh)	*Annual Heating Energy Use (mmBtu)*	Assumed % Savings - Improved Turndown Capabilities	Assumed % Savings - Reduced Minimizing Boiler Cycling	Assumed % Savings - Improved System Efficiency	Assumed % Savings - Excess Air Control	Total Annual kWh Savings	Total Annual mmBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Simple Payback Period (Years)
3,563	1,781.5	1.5%	0.5%	1.0%	2.5%	0	71	$586	$668	1.14

Equations: (Based on Industry Standards)

Affordable Costs for boiler burner installation may provide payback periods between a few months and a few years

An average of between 5% and 15% energy savings could be expected

Recommend asking a qualified boiler engineer for burner evaluation

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Westwood Regional Middle School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 47,400
Built: 1951

For Year Ending: August 31, 2016
Date Generated: August 02, 2017

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	Property Owner	Primary Contact
Westwood Regional Middle School 23 3rd Ave Westwood, New Jersey 07676	Westwood BOE 701 Ridgewood Rd Township of Washington, NJ 07675 201-664-0880 ext 2010	John Baumann 701 Ridgewood Rd Township of Washington, NJ 07675 201-664-0880 ext 2010 john.baumann@wwrsd.org

Property ID: 5969173

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
80.2 kBtu/ft²

Source EUI
147.3 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	1,430,556 (38%)
Natural Gas (kBtu)	2,370,143 (62%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	79.3
National Median Source EUI (kBtu/ft²)	145.6
% Diff from National Median Source EUI	1%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	290

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

Aimee Lalonde
1430 Broadway
10th Floor
New York, NY 10018
347-913-2422
alalonde@trcsolutions.com

Professional Engineer Stamp (if applicable)