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June 14, 2013

Local Government Energy Program
Energy Audit Report

Swartley Art Center
Dwight Englewood School

315 East Palisade Avenue
Englewood, NJ 07631

Project Number: LGEA106

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EXECUTIVE SUMMARY

The Dwight Englewood School's Swartley Art Center is a three story, 8,325 ft^2 structure built in 1910. Originally the Swartley Art Center was Dwight Englewood School's gymnasium; but as the school expanded and later on with the addition of the Modell Athletic complex Swartley was designated as the Art Center. In 1982 the facility underwent major renovation in order to accommodate the building's new activities. Table 1 below provides a comparison of the current building energy usage based on the period from December 2011 through November 2012 with the proposed energy usage resulting from the installation of the recommended Energy Conservation Measures (ECMs) excluding any renewable energy:

Table 1: State of Building—Energy Usage

	Electric Usage (kWh/yr)	Gas Usage (therms/yr)	Current Annual Cost of Energy ($)	Site Energy Use Intensity (kBtu/sq ft /yr)	Source Energy Use Intensity (kBtu/sq ft /yr)	Joint Energy Consumption (MMBtu/yr)
Current	76,043	2,257	$16,104	58.2	132	485
Proposed	42,405	2,139	$6,822	43.0	85	358
Savings	33,638	118	$9,282*	15.2	48	127
% Savings	44.2%	5.2%	57.6%	26.1%	35.9%	26.1%
*Includes operation and maintenance savings						

SWA has entered energy information about the Swartley Art Center facility into the U.S. Environmental Protection Agency's (EPA) Energy Star Portfolio Manager Energy Benchmarking system. The ENERGY STAR Energy Performance Rating was calculated to be 68. The building has a Site Energy Utilization Intensity of 58 kBtu/sqft/yr compared to the National Median of 69 kBtu/sqft/yr, for similar schools.

Recommendations

Based on the current state of the building and its energy use, SWA recommends implementing the following Energy Conservation Measures:

Recommended ECMs	Incentive Program (APPENDIX G for details)
Install 1 daylight sensors	Direct Install, Smart Start
Upgrade 36 incandescent fixtures with compact fluorescent lamps (CFLs)	Direct Install, Smart Start
Replace 1 Electric DHW heater with a Energy Star Natural Gas heater	Smart Start
Upgrade 12 lighting controls with occupancy sensors	Direct Install, Smart Start
Retro-commissioning	N/A
Replace 3 window air conditioning unit with energy star efficient type	Direct Install, Smart Start

Appendix H contains an Energy Conservation Measures table

Capital Improvements are recommendations for the building that may not be cost-effective at the current time, but that could yield a significant long-term payback. Capital improvements may also constitute equipment that is currently being operated beyond its useful lifetime. These recommendations should typically be considered as part of a long-term capital improvement plan. Capital improvements should be considered if additional funds are made available, or if the installed costs can be shared with other improvements, such as major building renovations.

- Balance and repair heating hot water systems
- Increase envelope thermal resistance
- Replace exterior doors

In addition to these ECMs, SWA recommends the following Operation and Maintenance (O&M) measures that would contribute to reducing energy usage at low or no cost:

- Replace old motors with NEMA premium efficiency models
- Install water-efficient fixtures and controls
- Inspect and replace cracked/ineffective caulk.
- Inspect and maintain sealants at all windows for airtight performance.
- Inspect and maintain weather-stripping around all exterior doors and roof hatches.
- Purchase Energy Star® appliances when new purchases are made
- Use smart electric power strips
- Create an energy educational program

There may be energy procurement opportunities for the Dwight Englewood School to reduce annual utility costs. The School currently pays a competitive utility rate for electric and gas, but may be able to further reduce utility costs. SWA recommends further evaluation with energy suppliers, listed in Appendix D.

Energy Conservation Measure Implementation

SWA recommends that Dwight Englewood School implement the following Energy Conservation Measures using an appropriate Incentive Program for reduced capital cost:

Table 2: Energy Conservation Measure Recommendations

Measures	First Year Savings ($)	Simple Payback Period (Years)	Initial Investment	CO2 Savings (lbs/yr)
0-5 Year	$9,282	1.7	$15,725	61,527
Total	$9,282	1.7	$15,725	61,527

Environmental Benefits

SWA estimates that implementing the recommended ECMs is equivalent to removing approximately 5 cars from the roads each year or is equivalent of planting 150 trees to absorb CO_2 from the atmosphere.

INTRODUCTION

Launched in 2008, the Local Government Energy Audit (LGEA) Program provides subsidized energy audits for municipal and local government-owned facilities, including offices, courtrooms, town halls, police and fire stations, sanitation buildings, transportation structures, schools and community centers. The Program will subsidize up to 100% of the cost of the audit. The Board of Public Utilities (BPUs) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

Steven Winter Associates, Inc. (SWA) is a 40-year-old architectural/engineering research and consulting firm, with specialized expertise in green technologies and procedures that improve the safety, performance, and cost effectiveness of buildings. SWA has a long-standing commitment to creating energy-efficient, cost-saving and resource-conserving buildings. As consultants on the built environment, SWA works closely with architects, developers, builders, and local, state, and federal agencies to develop and apply sustainable, 'whole building' strategies in a wide variety of building types: commercial, residential, educational and institutional.

SWA performed an energy audit and assessment for the Dwight Englewood School at 315 East Palisades Avenue, Englewood, NJ. The process of the audit included a facility visits on December 10th, 11th 2012, and January 2nd, 3rd 2013, benchmarking and energy bill analysis, assessment of existing conditions, energy conservation measures and other recommendations for improvements. The scope of work includes providing a summary of current building conditions, current operating costs, potential savings, and investment costs to achieve these savings. The facility description includes energy usage, occupancy profiles and current building systems along with a detailed inventory of building energy systems, recommendations for improvement and recommendations for energy purchasing and procurement strategies.

The goal of this Local Government Energy Audit is to provide sufficient information to the Dwight Englewood Schools to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures.

HISTORICAL ENERGY CONSUMPTION

Energy usage, load profile and cost analysis per building

SWA reviewed utility bills from December 2010 through November 2012 that were received from the utility companies supplying the School with electricity and natural gas. A 12 month period of analysis from December 2011 through November 2012 was used for all calculations and for purposes of benchmarking the building.

Swartley Art Center

Electricity – The Swartley Art Center receives electricity at one meter located in the basement level. The Dwight Englewood school purchases electricity from the Public Services Electricity and Gas (PSE&G) company at an average aggregated rate of $0.18/kWh. The Swartley Art Center consumed 76,043 kWh during the analysis periods for which it paid $13,782. The annual peak demand was 38 kW for the month of December, and the average monthly demand was 30 kW.

Figure 1 below shows the monthly electric usage and costs. The dashed green line represents the approximate baseload or minimum electric usage required to operate the School. The baseline usage for the facility is approximately 3,500 kWh. The monthly electric usage profile for the Swartley Art Center varies widely from month to month. Electric usage is highest during the winter months as a result of longer lighting periods and usage of electric space heating. Electric usage is lower during shoulder months when outside air temperatures are milder. Lastly, electric usage spikes again in June as a result of higher outside air temperatures and usage of cooling equipment.

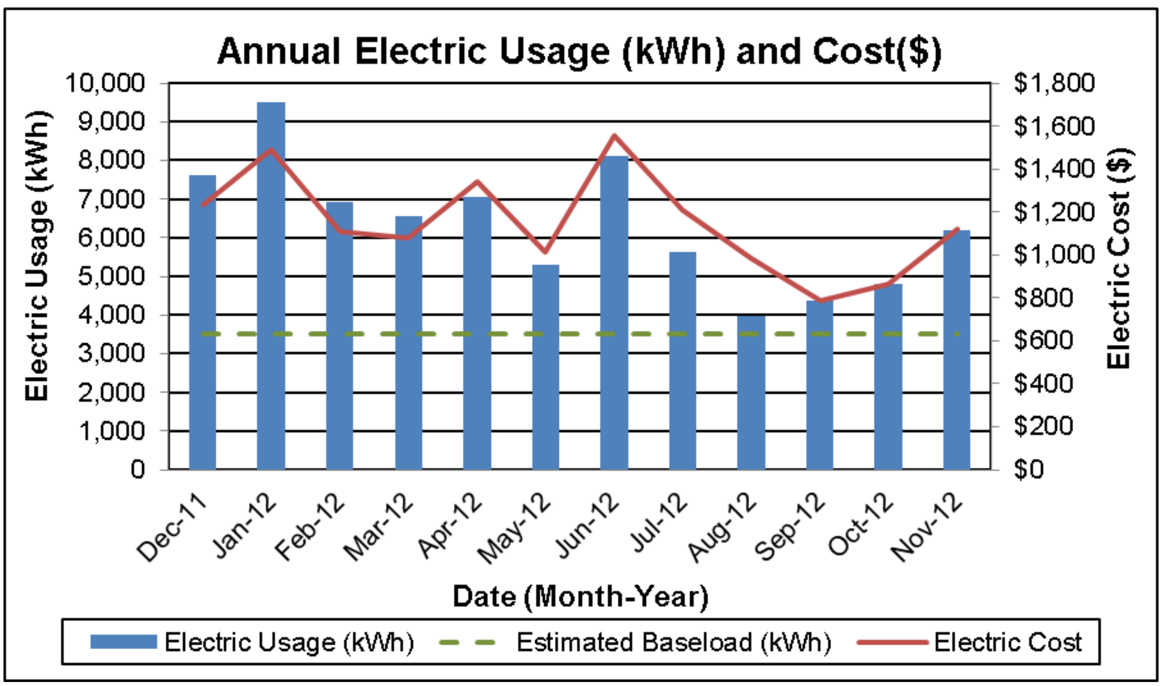


Figure 1: Annual Electric Usage (kWh) and Cost ($)

Natural gas – The Swartley Art Center uses natural gas only for space heating. Natural gas is supplied by Hess and delivered by PSE&G at an average aggregated rate of $1.029/therm. During the analysis period Swartley consumed 2,257therms of natural gas, for which Dwight Englewood paid $2,322. Figure 2 below shows the monthly natural gas usage and costs. The green line represents the approximate baseload or minimum natural gas usage required to operate the School.

As natural gas is used for space heating purposes only, the baseload for the building normalizes to zero during the non-heating season. Natural gas usage is highest during the winter months with the operation of the gas-fired hot water heating boiler. The monthly natural gas costs also peak in the winter months in correlation with the increased natural gas usage.

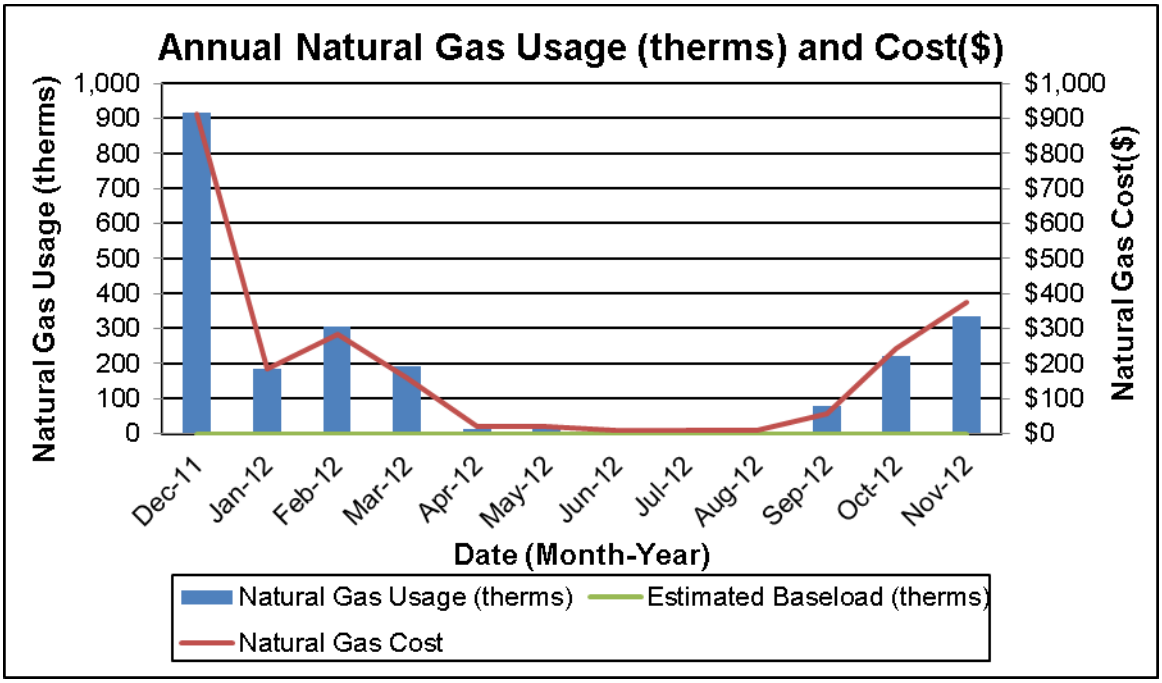


Figure 2: Annual Natural Gas Usage (therms) and Cost ($)

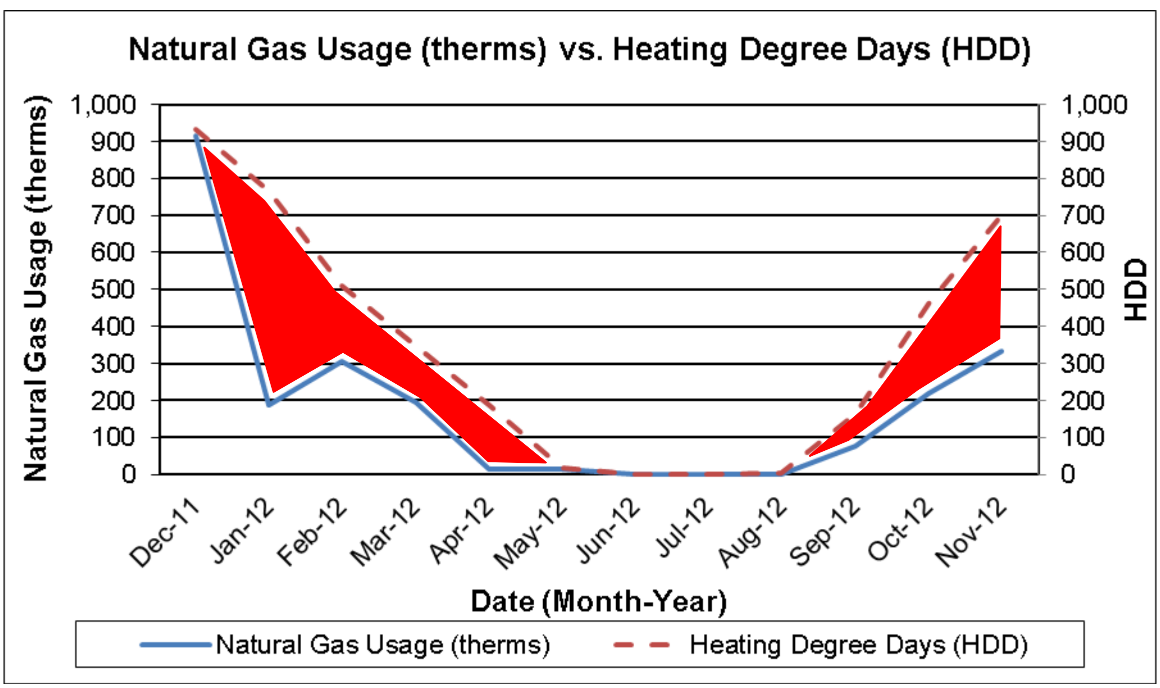


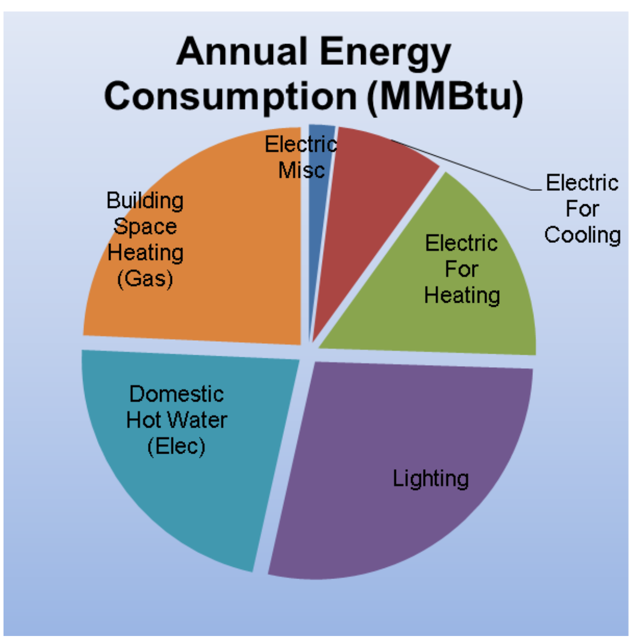
Figure 3: Natural Gas Usage (therms) vs. Heating Degree Days (HDD)

Figure 3 above shows the monthly natural gas usage along with the heating degree days or HDD. Heating degree days is the difference of the average daily temperature and a base temperature of 65°F, on a particular day. The heating degree days are zero for the days when the average temperature exceeds the base temperature. When comparing the natural gas usage curve with the HDD curve it is possible to observe the wide difference from one to the other. The red shaded area represents the areas where the heating system does not meet space heating demand. It is important to highlight that during the months when the natural gas usage curve drops the lowest, electric usage is highest as seen in figure 1. From this comparison it can be determined that the current heating system is inefficient and therefore the supplemental electric heating is required in order to provide comfort for the occupants.

The following graphs, pie charts, and table show energy use for Swartely Art Center based on utility bills for the analyzed billing period. Note: electrical cost at $53/MMBtu of energy is over 4 times as expensive as natural gas at $10/MMBtu

Annual Energy Consumption / Costs					
	MMBtu	**% MMBtu**	**$**	**% $**	**$/MMBtu**
Electric Misc	9	2%	$497	3%	53
Electric For Cooling	39	8%	$2,065	13%	53
Electric For Heating	76	16%	$4,014	25%	53
Lighting	136	28%	$7,205	45%	53
Domestic Hot Water (Elec)	108	22%	$1,110	7%	10
Building Space Heating (Gas)	118	24%	$1,212	8%	10
Totals	485	100%	$16,104	100%	33
Total Electric Usage	259	53%	$13,782	86%	53
Total Gas Usage	226	47%	$2,322	14%	10
Totals	485	100%	$16,104	100%	33

Table 3: Summary of Annual Energy Consumption and Costs



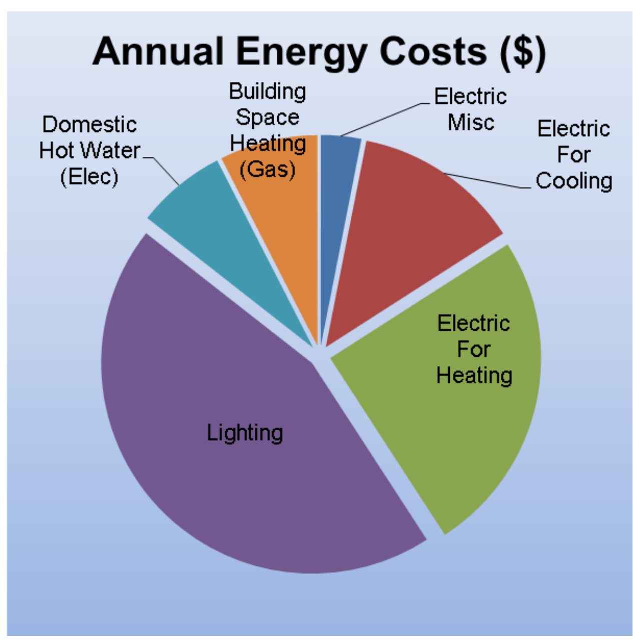


Figure 4: Estimated annual energy usage and costs breakdown by end use

Energy Benchmarking

SWA has entered energy information about the School in the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager energy benchmarking system. This school facility is categorized as a "K-12 School" space type. The ENERGY STAR® Portfolio Manager calculated the Energy Performance Rating to be 68. For reference, a score of 69 is required for LEED for Existing Buildings certification, and a score of 75 is required for ENERGY STAR® certification. The Site Energy Utilization Intensity (Site EUI) was calculated to be 58 kBtu/sqft/yr compared to the National Median of 69 kBtu/sqft/yr. See the ECM section for guidance on how to further reduce the building's energy intensity.

The ENERGY STAR® Portfolio Manager uses a national survey conducted by the U.S. Energy Information Administration (EIA). This national survey, known as the Commercial Building Energy Consumption Survey (CBECS), is conducted every four years, and gathers data on building characteristics and energy use from thousands of buildings across the United States. The Portfolio Manager software uses this data to create a database by building type. By entering the building parameters and utility data into the software, Portfolio Manager is able to generate a performance scale from 1-100 by comparing it to similar school buildings. This 100 point scale determines how well the building performs relative to other buildings across the country, regardless of climate and other differentiating factors.

The Site Energy Use Intensity (SEUI) is 58 kBtu/sqft/yr compared to the national median SEUI of a "K-12 School" building consuming 69 kBtu/sqft/yr. This is a 16% difference between the buildings intensity and the national median. See the recommendations presented in this report for guidance on how to improve the building's rating.

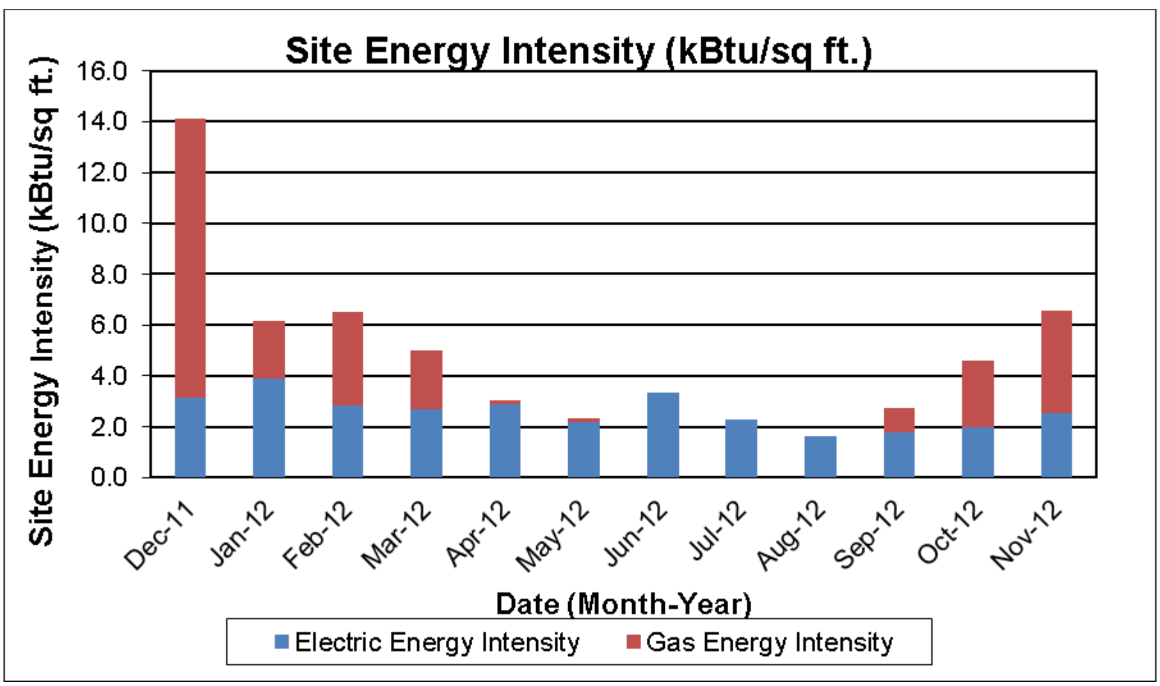


Figure 5: Site Energy Intensity (kBtu/sq.ft)

Per the LGEA program requirements, SWA has assisted the Dwight Englewood School in creating an ENERGY STAR® Portfolio Manager account and sharing the school information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager account information with the Dwight Englewood School (user name of [redacted]" with a password of "[redacted]") and TRC Energy Services (user name of [redacted]).

Tariff analysis

Tariff analysis can help determine if the school is paying the lowest rate possible for electric and gas service. Tariffs are typically assigned to buildings based on size and building type. Rate fluctuations are expected during periods of peak usage. Natural gas prices often increase during winter months since large volumes of natural gas is needed for heating equipment. Similarly, electricity prices often increase during the summer months when additional electricity is needed for cooling equipment.

As part of the utility bill analysis, SWA evaluated the current utility rates and tariffs for the Dwight Englewood School. The School is currently paying a general service rate for natural gas including fixed costs such as meter reading charges. The electric use for the building is direct-metered and purchased at a general service rate with an additional charge for electrical demand factored into each monthly bill. The general service rate is a market-rate based on electric usage and electric demand. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year.

Energy Procurement strategies

Billing analysis was conducted using an average aggregated rate which is estimated based on the total cost divided by the total energy usage for each utility over a 12 month period. Average aggregated rates do not separate demand charges from usage, and instead provide a metric of inclusive cost per unit of energy. Average aggregated rates are used in order to equitably compare building utility rates to average utility rates throughout the state of New Jersey.

The average estimated NJ commercial utility rates for electric are $0.137/kWh, while the School pays a competitive rate of $0.181/kWh, The School annual electric utility costs are $3,364 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows fluctuations up to 13% over the analyzed billing period. Electric rate fluctuations in the winter and spring can be attributed to a combination of demand charges, market rate changes and actual and estimated meter readings.

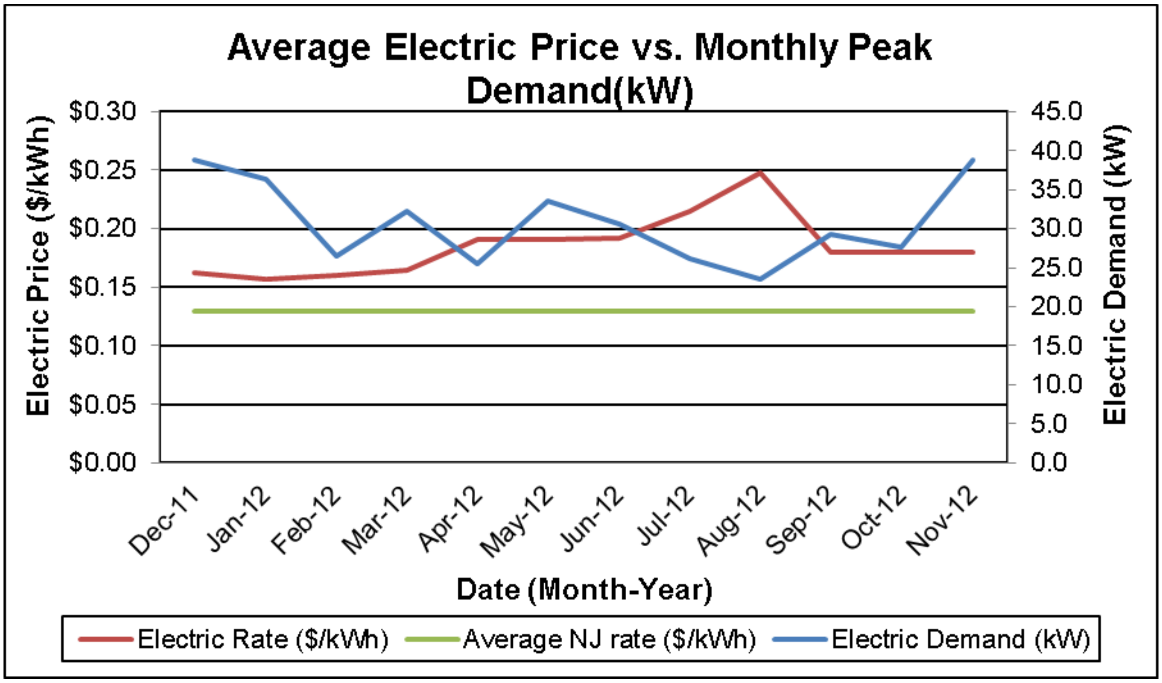


Figure 6: Average electric price vs. Monthly peak demand

The average estimated NJ commercial utility rates for gas are $0.811/therm, while the School pays a rate of $1.029/therm. The School annual natural gas costs are $1,928 higher, when compared to the average estimated NJ commercial utility rates. Natural gas bill analysis shows fluctuations over the analyzed billing period. Utility rate fluctuations in the spring and summer months may have been caused by a combination of low usage and the assessment of fixed fees and costs.

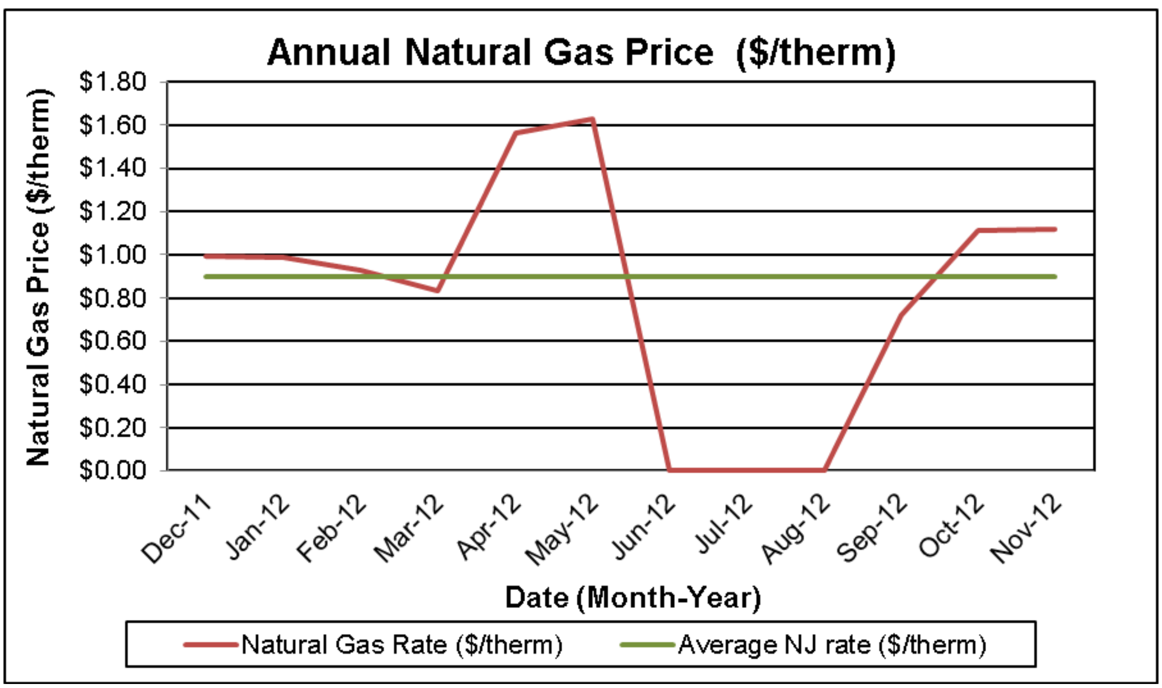


Figure 7: Annual natural gas price ($/therm)

Preceding the expiration of any third-party supplier contract, SWA recommends that the School further explore opportunities of purchasing electricity and natural gas from other third-party suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for Dwight Englewood Schools. Appendix D contains a complete list of third-party energy suppliers for the Dwight Englewood service area.

EXISTING FACILITY AND SYSTEMS DESCRIPTION

This section gives an overview of the current state of the facility and systems. Please refer to the Proposed Further Recommendations section for recommendations for improvement.

Based on visits from SWA on December 10 & 11, 2012 and January 2 & 3, 2013, the following data was collected and analyzed.

Building Characteristics

The Dwight Englewood School's Swartley Art Center is a three story, 8,325 ft^2 house. The house was built about 1910 and it underwent major renovation in 1982. The Swartley Art Center as its name indicates, it is the main point for art classes for all students at the D-E School

Image 1 Front façade

Image 2 Front façade

Building Occupancy Profiles

The facility has an average occupancy of 10 adults and student occupancy varies depending on number of scheduled classes and activities. However, student occupancy does not exceed more that 80 students at a time. The Art Center is open on weekdays only. Normal hours of operation are from 7:30 a.m. to 6:00pm and custodians service the house from 6 p.m. to 8 p.m. The building is in use year-round.

Building Envelope

On January 3rd, 2013, SWA performed a building envelope analysis. At this time, the average outside dry bulb temperature was approximately 34°F with an average wind speed of 8 mph. These conditions are considered favorable for infrared imagery. Infrared imagery requires a minimum temperature difference of 18°F, between indoor and outdoor spaces. Infrared images below exhibit specific building envelope deficiencies, such as unwanted heat transfer and air infiltration. Additional building envelope characteristics are detailed below.

General Note: All findings and recommendations on the exterior envelope (base, walls, roofs, doors and windows) are based on the energy auditors' experience and expertise on detailed visual analysis, as far as accessibility and weather conditions allowed at the time of the field audit.

Exterior Walls

The exterior construction of the Swartley Art Center is comprised of unfinished wood shingles and painted wood trim around windows and doors. The estimated insulation inside the wall cavities is 1 inch. Penetrations for thru-the-wall air-conditioners and/or vents are present around the perimeter of the building; penetrations are also trimmed with painted wood. Image 2 shows the building's north exposure, from the image it can be observed the wood shingles and the penetrations for air venting on the second floor. Image 3 shows the infrared picture taken in the same exposure during the site visit; from this image it is possible to observe that most of the exposure has a yellowish color which means that the lack of insulation on this exposure is allowing a large amount of heat to leave the building.

Image 3 North exposure

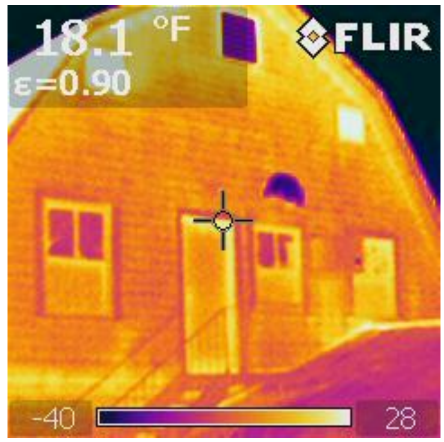


Image 4 Infrared image of North exposure

Image 5 below shows a picture of the west exposure of the building. Image 6 shows the infrared picture of the same exposure; from this image it is possible to observe that the roof has a lower heat loss than the exterior walls. The yellowish color shown on the exterior wall on image 4 is due to lack of insulation.

Image 5 West exposure

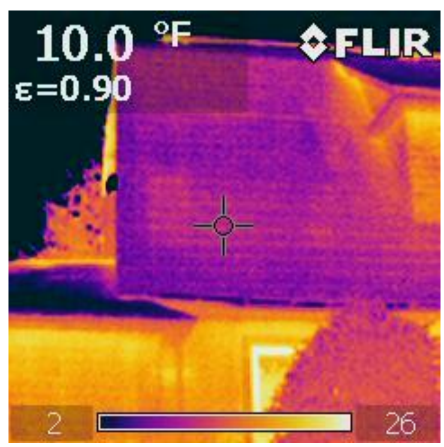


Image 6 Infrared image of west exposure

Roof

The Swartley Art Center roof is a steep sloped roof with asphalt shingles, the estimated insulation below the roof deck is 2 inches of fiber glass insulation. The roof appears to be in good conditions, there were no visible signs of leakage or water damage in the top floor ceiling. The rain water in the roof is drained by painted metal gutters surrounding the house. Image 5 above shows a partial section of the roof; image 6 shows the infrared picture of the same area as image 5. From image 6 it can be assumed that the roof has acceptable levels of insulation. However, further improving roof insulation can bring additional benefits to the building's energy performance.

Base

The building's base is composed of a slab-on-grade floor with a perimeter footing with concrete block foundation walls and no detectable slab edge/perimeter insulation.

The building's base and its perimeter were inspected for signs of uncontrolled moisture or water presence and other energy-compromising issues. Overall the base was reported to be in fair condition with a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues neither visible on the interior nor exterior.

Windows

The Swartley Art Center has double glazing aluminum framed operable double-hung windows. Windows, shading devices, sill, related flashing and caulking were inspected as far as accessibility allowed for signs of moisture, air-leakage, and other energy compromising issues. Image 7 and 8 show a typical double glaze double hung operable window with shading device. Overall, the windows were found to be in good conditions.

Image 7 Typical double hung window

Image 8 Typical window

Exterior doors

The Swartley Art Center has three exterior doors, one door in the east exposure, one door in the south exposure, and one door in the north exposure. The door facing the east exposure is the main entrance to the facility; this door is a double swing non-insulated aluminum door with aluminum frame and single glazing windows. SWA observed considerable amounts of air infiltration through the main entrance door due to lack of proper weather stripping. The main entrance door leads directly into the occupied space.

Image 9 Main Entrance

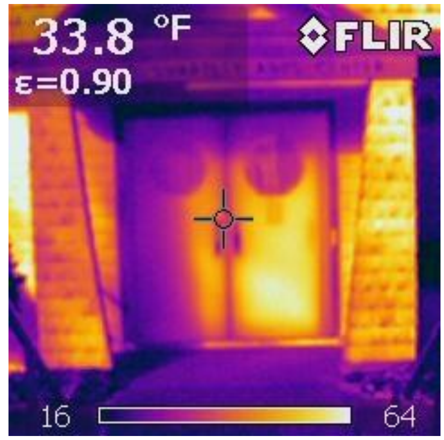


Image 10 Infrared image of front entrance

The door located in the south exposure is a single leaf door with double glazing and aluminum frame. The doors were found to show significant air leakage and heat transfer due to a combination of single paned windows and poor weather stripping.

Image 11 South entrance

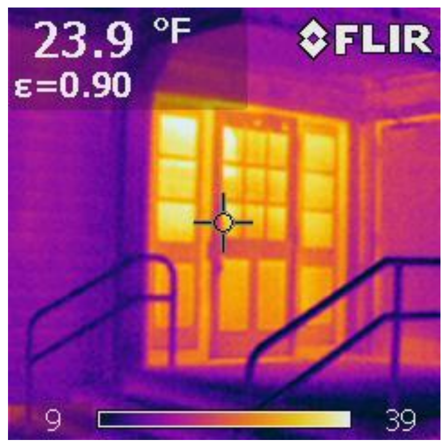


Image 12 Infrared image of south entrance

All exterior doors, thresholds, related flashing, caulking and weather-stripping were inspected for signs of moisture, air-leakage and other energy-compromising issues.

Building air-tightness

Overall the field auditors found the building to not be adequately air-tight with numerous areas if suggested improvements, as described in more detail earlier in this section.

The air tightness of buildings helps maximize all other implemented energy measures and investments, and minimizes potentially costly long-term maintenance, repair and replacement expenses.

Mechanical Systems

Heating Systems

Heating at the Swartley Art Center is generated by two (2) gas fired HydroTherm Multi-pulse AM series heating hot water boilers each one rated at 77MBH. The boilers are located in the mechanical room at the basement level. The boilers are controlled by a timer that turns the boilers on at 6a.m. and turns them off at 10p.m. Heating hot water is distributed to baseboard heaters in classrooms by two (2) fractional horse power circulation pumps located in the basement. The heating hot water distribution loop is divided into 7 zones; flow control for each zone is provided by zone control valves located in the basement. Image 14 shows the 7 zones and associated control valves.


Image 13 HHW Boilers


Image 14 Zone control valves for heating loop

Space thermostats provide temperature feed back to the zone control valves which open or close depending on the heating demand.

Classrooms are also provided with additional heating by thru-the-wall packaged terminal air conditioning (PTAC) units and heat pump. These PTACs heating and cooling capabilities; SWA was unable to confirm unit capacities at the time of the walkthrough.

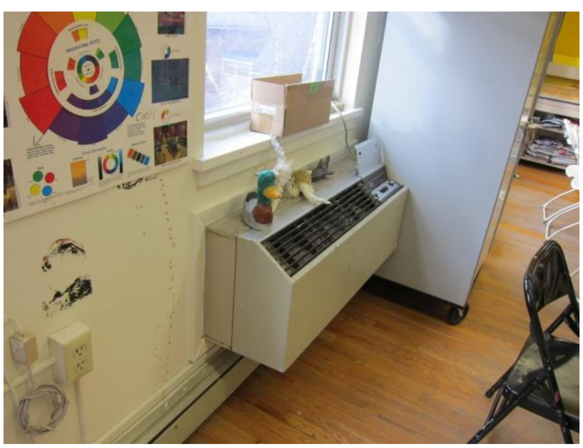


Image 15 PTAC Unit


Image 16 PTAC Unit

During the walkthrough performed on December 11th, 2012 SWA observed that the baseboard heating the attic was cold and the air to air heat pumps in the room were being used in heating mode. Image 17 shows a “thru-the-wall” air to air heat pump air conditioning unit located in one of the rooms in the attic level. Image 18 shows the heat pump temperature setpoint at the time of the audit; the room where this unit was located was warmer than recommended and was unoccupied.

Image 17 *Image 18*

Cooling Systems

During the summer months space cooling for The Swartley Art Center is provided by “thru-the-wall” heat pump air conditioning units, window air conditioning units, wall mounted mini split DX units and PTACs. Each space has at least one of these units; the units are operated by school personnel. Images 19 and 20 show typical cooling only air conditioning units in the classrooms, these units are not energy star rated and are estimated to be over 15 years old.

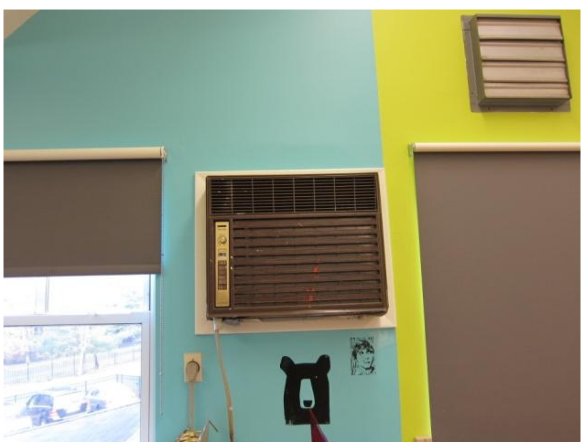


Image 19 *Image 20*

Images 21 and 22 show a typical PTACs unit and its integrated onboard controller.

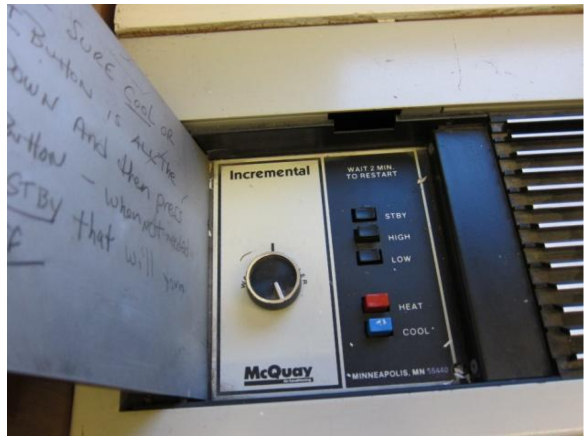


Image 21: PTAC unit *Image 22: PTAC on-board controller*

Images 23 and 24 show a ductless mini split DX unit located in one of the classrooms and its associated outdoor condensing unit.

Image 23: Ductless mini split *Image 24: Condenser unit*

Ventilation Systems

Ventilation for the Swartley Art Center is provided by ventilators in the attic, air conditioning units, operable windows and louvered wall penetrations.

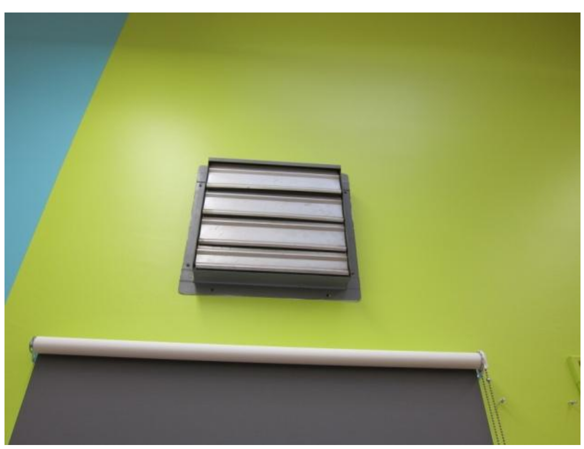


Image 25 Louvered wall penetration for ventilation

Controls

All equipment in operation at the Swartley Art Center has onboard integrated controls specific to each type of equipment.

Image 26: Wall mounted thermostat for mini split DX

Domestic Hot Water

Domestic hot water for The Swartley Art Center is provided by one (1) 65 gallon electric water heater model: Rheem 82V66-2. The domestic hot water tank is located in the basement mechanical room. Domestic hot water is delivered to restrooms by a circulator pump with fractional horse power. All domestic how water piping was insulated at the time of the audit.


Image 27: DHW Heater tank

Image 28: DHW heater tank model

Electrical systems

Lighting

See attached lighting schedule in Appendix B for a complete inventory of lighting throughout the building including estimated power consumption and proposed lighting recommendations.

Interior lighting – A variety of lights were used inside the Swartley Art Center due to the different area types and uses. The gallery areas had flood lighting while the art rooms contained T8 Fluorescent Lights. There were several incandescent fixtures in the film drying room.

Incandescent and halogen lighting should be retrofitted with fluorescent lighting for a more efficient light fixture.

Image 29: Track lighting

Image 30 Large art room lighting

Exit Lights - Exit signs were found to be LED types.

Exterior Lighting – One 60-watt incandescent lamp used for exterior lighting. There are several High Pressure Sodium parking lot lights in the vicinity of the Swartley Art Center which have been attributed to the building's electric meter.

Elevators

There are no elevators in this building.

Other electrical systems

There are currently no other significant energy-impacting electrical systems installed at the Dwight Englewood Swartley Art Center.

RENEWABLE AND DISTRIBUTED ENERGY MEASURES

Renewable energy is defined as any power source generated from sources which are naturally replenished, such as sunlight, wind and geothermal. Technology for renewable energy is improving and the cost of installation is decreasing due to both demand and the availability of government-sponsored funding. Renewable energy reduces the need for using either electricity or fossil fuel, therefore lowering costs by reducing the amount of energy purchased from the utility company. Solar photovoltaic panels and wind turbines use natural resources to generate electricity. Geothermal systems offset the thermal loads in a building by using water stored in the ground as either a heat sink or heat source. Cogeneration or Combined Heat and Power (CHP) allows for heat recovery during electricity generation.

Existing systems

Currently the Swartley Art Center does not implement any renewable energy methods.

Evaluated Systems

Solar Photovoltaic

Photovoltaic panels convert light energy received from the sun into a usable form of electricity. Panels can be connected into arrays and mounted directly onto building roofs, as well as installed onto built canopies over areas such as parking lots, building roofs or other open areas. Electricity generated from photovoltaic panels is generally sold back to the utility company through a net meter. Net-metering allows the utility to record the amount of electricity generated in order to pay credits to the consumer that can offset usage and demand costs on the electric bill. In addition to generation credits, there are incentives available called Solar Renewable Energy Credits (SRECs) that are subsidized by the state government. Specifically, the New Jersey State government pays a market-rate SREC to facilities that generate electricity in an effort to meet state-wide renewable energy requirements.

SWA studied the feasibility of installing solar photovoltaic panels on the roof of the Swartley Art Center. Given the existing roof geometry and orientation, SWA determined that solar photovoltaic panels are not a good option for this building. Typically, a good candidate for this type of installation is a flat roof or a slopped roof with southern exposure. Such characteristics increase the ability of the solar panel to harness solar energy and convert it to useful electric energy.

Solar Thermal Collectors

Solar thermal collectors are not cost-effective for this building and would not be recommended due to the insufficient and intermittent use of domestic hot water throughout the building to justify the expenditure.

Wind

The School is not a good candidate for wind power generation due to insufficient wind conditions in this area of New Jersey.

Geothermal

The School is not a good candidate for geothermal installation since it would require replacement of the entire existing HVAC system, as well as extensive installation of geothermal wells and pumping equipment.

Combined Heat and Power

The School is not a good candidate for CHP installation and would not be cost-effective due to the size and operations of the building. Typically, CHP is best suited for buildings with a constant electrical baseload to accommodate the electricity generated, as well as a means for using waste heat generated. Additionally, the seasonal occupancy schedule of the School is not well suited for a CHP installation.

PROPOSED ENERGY CONSERVATION MEASURES

Energy Conservation Measures (ECMs) are recommendations determined for the building based on improvements over current building conditions. ECMs have been determined for the building based on installed cost, as well as energy and cost-savings opportunities.

Capital Improvements are recommendations for the building that may not be cost-effective at the current time, but that could yield a significant long-term payback. Capital improvements may also constitute equipment that is currently being operated beyond its useful lifetime. These recommendations should typically be considered as part of a long-term capital improvement plan. Capital improvements should be considered if additional funds are made available, or if the installed costs can be shared with other improvements, such as major building renovations.

Recommendations: Energy Conservation Measures

#	Energy Conservation Measures
ECM 1	**Install 1 Daylight Sensor**
ECM 2	**Upgrade 36 Incandescent and Halogen Fixtures with Compact Fluorescent Lamps (CFLs)**
ECM 3	**Replace 1 Electric DHW heater with an Energy Star Natural Gas heater**
ECM 4	**Upgrade 12 Lighting Controls with Occupancy Sensors**
ECM 5	**Retro-commissioning**
ECM 6	**Replace 3 Window Air Conditioning unit with Energy Star efficient type**

In order to clearly present the overall energy opportunities for the building and ease the decision of which ECM to implement, SWA calculated each ECM independently and did not incorporate slight/potential overlaps between some of the listed ECMs (i.e. lighting change influence on heating/cooling.

ECM #1: Install 1 Daylight Sensors

At the time of the visit SWA found two areas that could benefit from the installation of daylight dimming controls; the classrooms in the top floor. Daylight sensors are a type of lighting control that automatically maintain a specified light level based on the amount of daylight coming into the building. As daylight increases, the light fixtures are dimmed thus reducing electric consumption. The use of daylight controls help maintain a minimum required light level, without over lighting a space or area. SWA recommends installing daylight sensors in areas that use light fixtures and building openings (i.e. windows) to illuminate the space.

Installation cost:

Estimated installed cost: $195 (includes $60 of labor)
Source of cost estimate: RS Means, Published and established costs, NJ Clean Energy Program

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$195	1,445	0	0	0.6	$1,086	$1,348	15	$20,214	0.1	10,266%	684%	691%	$15,177	2,588

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. Existing light fixtures are assumed to have dimming capabilities.

Rebates/financial incentives:

- NJ Clean Energy – Smart Start - $25 per fixture – Maximum incentive amount is $50.

Please see APPENDIX G for more information on Incentive Programs.

ECM #2: Upgrade 36 Incandescent and Halogen fixtures with Compact Fluorescent lamps

The building is equipped with fixtures containing inefficient incandescent lamps. SWA recommends that each incandescent lamp be replaced with a more efficient Compact Fluorescent Lamp (CFL). CFLs are capable of providing equivalent or better light output while using less power when compared to incandescent, halogen and Metal Halide fixtures. CFL bulbs produce the same lumen output with less wattage than incandescent bulbs and last up to five times longer. The labor for the recommended installations is evaluated using prevailing electrical contractor wages. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor.

Installation cost:

Estimated installed cost: $353 (includes $144 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$353	8,160	2	0	3.3	$40	$1,517	5	$7,583	0.2	2,047%	409%	429%	$6,350	14,611

Assumptions: SWA calculated the savings for this measure using measurements taken on the day of the field visit and using the billing analysis. SWA also assumed 2 hours/day to replace aging burnt out lamps.

Rebates/financial incentives:

- There currently are no incentives for this measure at this time.

Please see APPENDIX G for more information on Incentive Programs.

ECM #3: Replace 1 standard efficiency natural gas DHW heater with an Energy Star Natural Gas Condensing Boiler

The Swartley Art Center currently uses an electric domestic hot water heater. Electric water heaters tend to have high efficiency factors, in the range of 0.9 and 0.95. However, high electric rates make electric water heater a driving factor for costly monthly electric bills. The expected service life of a DHW heater is 10-13 years.

New energy-efficient gas-fired storage water heaters are a good, cost-effective replacement option for electric water heaters. They have higher levels of insulation around the tank and one-way valves where pipes connect to the tank, substantially reducing standby heat loss. SWA recommends replacing the old electric water heater with a similar sized new energy efficient gas fired storage tank.

Installation cost:

Estimated installed cost: $1,800 (includes $540 of labor)
Source of cost estimate: RS Means

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$1,800	13,472	0	0	5.5	$18	$2,459	12	$29,508	0.7	1,539%	128%	137%	$21,693	24,122

Assumptions: SWA assumed an efficiency factor of 0.7 for the new gas fired domestic hot water heater, and an efficiency factor of 0.9 for the existing electric domestic hot water heater.

Rebates/financial incentives:

NJ Clean Energy – SmartStart – Gas-fired water heaters > 50 gallons ($1.00 - $2.00 per MBH)
Or up to $480 for a 240 MBH water heater

Please see APPENDIX G for more information on Incentive Programs.

ECM #4: Upgrade 12 Lighting Controls with Occupancy Sensors

The building contains several areas that could benefit from the installation of occupancy sensors. These areas consisted of various classrooms, bathrooms and offices that are used sporadically throughout the day and could show energy savings by having the lights turn off after a period of no occupancy. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion is detected within a set time period. Advanced ultrasonic lighting sensors include sound detection as a means to controlling lighting operation.

Installation cost:

Estimated installed cost: $2,400 (includes $720 of labor)
Source of cost estimate: RS Means, Published and established costs, NJ Clean Energy Program

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$2,400	5,841	1	0	2.4	$0	$1,057	15	$15,859	2.3	561%	37%	44%	$9,729	10,459

Assumptions: SWA calculated the savings for this measure using measurements taken on the day of the field visit and using the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – SmartStart – Wall-mounted occupancy sensors ($20 per occupancy sensor) – Maximum incentive amount is $740

Please see APPENDIX G for more information on Incentive Programs.

ECM #5: Retro-commissioning

Retro-commissioning is a process that seeks to improve how building equipment and systems function together. Depending on the age of the building, retro-commissioning can often resolve problems that occurred during design or construction and/or address problems that have developed throughout the building's life. Owners often undertake retro-commissioning to optimize building systems, reduce operating costs, and address comfort complaints from building occupants.

Since the systems in the building have undergone some renovations in recent years, and the occupants continue to have concerns with thermal comfort control, SWA recommends undertaking retro-commissioning to optimize system operation as a follow-up to completion of the upgrades. The retro-commissioning process should include a review of existing operational parameters for both newer and older installed equipment. During retro-commissioning, the individual loop temperatures and (setback) schedules should also be reviewed to identify opportunities for optimizing system performance, besides air balancing and damper proper operation.

The goals of RCx include:

- Finding opportunities to reduce energy costs through readily implemented changes to the operation of the building.
- Evaluating set points of equipment and systems with the intent of bringing them to a proper operational state.
- Improving indoor environmental quality (IEQ) thereby reducing occupant complaints and reducing staff time spent on complaint calls.
- Improving equipment reliability through enhanced operation and maintenance procedures.

Installation cost:

Estimated installed cost: $10,406 (includes $8,845 of labor)
Source of cost estimate: Similar Projects

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$10,406	4,495	0	118	3.3	$1,820	$2,756	12	$33,070	3.8	218%	18%	25%	$16,183	9,347

Assumptions: SWA calculated the estimated the ECM cost at $1.25/ft^2$, which is typical of buildings of this size and type.

Rebates/financial incentives:

- Currently there are not any incentives for this measure.

Please see APPENDIX G for more information on Incentive Programs.

ECM #6: Replace 3 Window air conditioning units with new Energy Star Type

During the field audit, SWA completed the building HVAC equipment inventory and observed spaces cooled by window air conditioning units. Room air conditioners, sometimes referred to as window air conditioners, cool rooms rather than the entire building. If they provide cooling only where they're needed, room air conditioners are less expensive to operate than central units, even though their efficiency is generally lower than that of central air conditioners. A room air conditioner features a condenser on the end that faces the outside and a condenser fan behind it that blows air through it, helping to remove the heat from the condenser. On the end facing the room is the evaporator, with an evaporator fan behind that to push the cool air into the room. The filter is mounted in the front grill. When buying a new room air conditioner, look for units with an EER of 10.0 or above. Check the EnergyGuide label for the unit, and also look for room air conditioners with the ENERGY STAR® label.

The labor for the recommended installations is evaluated using prevailing mechanical/electrical contractor wages. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor. The Maintenance office window AC is operating beyond its expected service life.

Installation cost:

Estimated installed cost: $570 (includes $142 of labor)
Source of cost estimate: Similar Projects

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$570	224	0	0	0.1	$105	$146	15	$2,184	3.9	283%	19%	25%	$1,108	401

Assumptions: SWA calculated the savings for this measure using measurements taken on the day of the field visit and using the billing analysis.

Rebates/financial incentives:

- Currently there are not any incentives for this measure.

Please see APPENDIX G for more information on Incentive Programs.

Proposed Further Recommendations

Capital Improvements

Capital improvements are recommendations for the building that may not be cost-effective at the current time, but that could yield a significant long-term payback. These recommendations should typically be considered as part of a long-term capital improvement plan. Capital improvements should be considered if additional funds are made available. SWA recommends the following capital improvements for the Dwight Englewood School.

- Balance and repair heating hot water system – During the audit SWA observed that the radiant baseboard heaters in the top level of the Swartley Art Center were cold and air source heat pumps were providing space heating in lieu of the boiler. According to the facilities manager the zone providing heating hot water to the top floor and other areas in the building is not working properly and therefore occupants must use air source heat pumps to condition spaces during the winter season. SWA recommends hiring a testing and balancing contractor to inspect the hydronic system and repair any deficiencies. SWA estimates the cost of hiring the testing and balancing contractor to be approximately $5,000 to $10,000 depending on the amount of valves and raisers that need to be inspected and balanced. Savings associated with this recommendation are approximately 5 to 15% of total energy use or $805/yr. Further study is recommended in order to determine complete scope of work.

- Increase envelope thermal resistance. During the energy audit, SWA took infrared images of the building envelope. The images showed that heat loss through the wall due to low R-values. SWA estimates that the current R-value for the wall insulation is below the minimum recommended by ASHRAE 90.1 1999 which is R-13. The current overall wall U-factor is estimated to be 0.129 Btu/hr*ft^2*°F. ASHRAE 90.1 2010 recommends a minimum R-value of 13 plus a continuous insulation thermal resistance value of R-7.5, to achieve an overall U-factor of 0.062Btu/hr*ft^2*°F. SWA recommends that Dwight Englewood considers increasing the R-value of the wall by injecting Closed Cell spray foam insulation in the cavity walls. The National Research Council Canada (NRCC) estimates that spray foam insulation can perform up to 30% better than conventional insulation due to the additional benefit of air leakage reduction. Based on the values published by the NRCC SWA estimates that the existing insulation can be improved by 30%, therefore achieving and overall U-factor of 0.0954Btu/hr*ft^2*°F. Assuming the overall U-factor will be improved by 30% SWA estimates that the heat loss through the wall is approximately 3.35kBtu/ft^2 during the heating season and 2.57kBtu/ft^2 during the cooling season. With an approximate wall area of 4,000ft^2 the energy savings associated with improving the overall U-factor is 23,680kBtu/yr or $735/yr. the estimated cost of installing closed cell spray foam insulation is approximately $1.68/ft^2 or $6,720. The estimated payback time is 9 years. Further study is recommended in order to determine feasibility of installation and also to calculate actual wall area and additional installation details.

- Replace exterior doors. As seen in the Building Description section of this report, the main entrance door lack adequate thermal insulation, allowing heat to escape the building. The heat loss increases the building's heat load which requires additional heat generation and energy consumption. SWA recommends replacing the doors and frames with similar insulated models. SWA estimates the cost of doors with installation of approximately $1,500 per door. The associated savings by replacing the doors are 1,451kBtu/yr or $91.55 per year. The simple payback for this recommendation would be

16 years. Further study is recommended in order to determine type of door replacement and available models that comply with the building appearance.

Operations and Maintenance

Operations and Maintenance measures consist of low/no cost measures that are within the capability of the current building staff to handle. These measures typically require little investment, and they yield a short payback period. These measures may address equipment settings or staff operations that, when addressed will reduce energy consumption or costs.

- Replace motors with NEMA premium efficiency models – SWA observed several motors that were not NEMA premium efficiency models and are beyond their useful lifetime. Since these motors have been maintained well, SWA recommends replacing them with high efficiency models as part of routine O&M the next time that they fail. This measure can be conducted by in-house maintenance staff.

- Install water-efficient fixtures and controls – Building staff can also easily install faucet aerators and/or low-flow fixtures to reduce water consumption. There are many retrofit options, which can be installed now or incorporated as equipment is replaced. Routine maintenance practices that identify and quickly address water leaks are a low-cost way to save water and energy. Retrofitting with more efficient water-consumption fixtures/appliances will reduce energy consumption for water heating, while also decreasing water/sewer bills. This measure can be conducted by in-house maintenance staff with little investment, and yield a short payback.

- Inspect and replace cracked/ineffective caulk. This measure can be conducted by in-house maintenance staff with little investment, and yield a short payback.

- Inspect and maintain sealants at all windows for airtight performance. This measure can be conducted by in-house maintenance staff with little investment, and yield a short payback.

- Inspect and maintain weather-stripping around all exterior doors and roof hatches. This measure can be conducted by in-house maintenance staff with little investment, and yield a short payback.

- SWA recommends that the building considers purchasing the most energy-efficient equipment, including ENERGY STAR® labeled appliances, when equipment is installed or replaced. ENERGY STAR® appliances meet stricter standards compared to standard appliances. Stricter standards include exceeding Federal minimum efficiencies and reduced environmental impact. More information can be found in the "Products" section of the ENERGY STAR® website at: http://www.energystar.gov.

- Consider the use of smart power electric strips - in conjunction with occupancy sensors to power down computer equipment when left unattended for extended periods of time.

- Create an energy educational program - that teaches students and professionals how to minimize energy use. An educational program may be incorporated into school curricula to increase students' environmental awareness. The U.S. Department of Energy offers free information for hosting energy efficiency educational programs and plans. For more information please visit: http://www1.eere.energy.gov/education/.

APPENDIX A: EQUIPMENT LIST

Note: The remaining useful life of a system (in %) is an estimate based on the system date of built and existing conditions derived from visual inspection.

Building System	Description	Model #	Fuel	Location	Space Served	Year Installed	Estimated Remaining Useful Life %
Domestic Hot Water	Capacity - 65 Gal Voltage - 240/208 Wattage - 4500/3380	Rheem Model # 82V66-2 Serial # RH 0507249295	Natural Gas	Boiler Room	Schwartley	2007	N/A
Heating	HHW Boiler - Input BTU/HR - 100,000 Output (water) BTU/HR - 77,000	Hydrotherm Model # - AM-100 Serial # 0040719E	Natural Gas	Boiler Room	Schwartley	2000	20%
Heating	HHW Boiler - Input BTU/HR - 100,000 Output (water) BTU/HR - 77,000	Hydrotherm Model # - AM-100 Serial # 9430909B	Natural Gas	Boiler Room	Schwartley	2001	27%
HHW	HP - 1/3 RPM - 1725 Volts - 115 / 130 Amp - 4.2 / 2.1	Bell & Gossett Motor Model # M80121	Electric	Boiler Room	Schwartley		N/A
HHW	HP - 1/3 RPM - 1725 Volts - 115 / 130 Amp - 4.2 / 2.1	Bell & Gossett Motor Model # M80121	Electric	Boiler Room	Schwartley		N/A
Cooling	Split DX Condensing Unit, Compressor RLA - 14.6 Outdoor Motor HP - 1/4, FLA - 1.9	Mitsubishi Model # PUG36BKB Serial # 01134261	Electric	Outside	Schwartley	2005	53%

Appendix B: Lighting Study

Location			Existing Fixture Information												Retrofit Information													Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	1	Vestibule (Foyer)	Recessed Parabolic	S	CFL	7	2	32	Sw	16	230	0	448	1,649	C	Recessed Parabolic	CFL	S	N	7	2	32	16	230	0	448	1649	0	0	0
2	1	Hallway	Track	S	Hal	16	2	50	Sw	16	230	22	1,952	7,183	CFL	Track	CFL	S	OS	16	2	15	12	230	0	480	1325	5417	442	5859
3	1	Classroom (Class)	Recessed Parabolic	E	4'T8	20	2	32	Sw	9	230	10	1,480	3,064	C	Recessed Parabolic	4'T8	E	OS	20	2	32	7	230	10	1480	2298	0	766	766
4	1	Classroom (Ceramics)	Recessed Parabolic	E	4'T8	18	2	32	Sw	9	230	10	1,332	2,757	C	Recessed Parabolic	4'T8	E	OS	18	2	32	7	230	10	1332	2068	0	689	689
5	1	Classroom (Gallery)	Track	E	Hal	11	1	75	Sw	9	230	17	1,007	2,083	CFL	Track	CFL	E	N	11	1	25	9	230	0	275	569	1514	0	1514
6	1	Classroom (Gallery)	Recessed Parabolic	E	4'T8	6	1	32	Sw	9	230	5	222	460	C	Recessed Parabolic	4'T8	E	N	6	1	32	9	230	5	222	460	0	0	0
7	1	Bathroom Men	Recessed Parabolic	E	4'T8 U-Shaped	2	2	32	Sw	9	230	10	148	306	C	Recessed Parabolic	4'T8 U-Shaped	E	N	2	2	32	9	230	10	148	306	0	0	0
8	1	Classroom (Music Room 1)	Recessed Parabolic	E	4'T8	15	2	32	Sw	9	230	10	1,110	2,298	C	Recessed Parabolic	4'T8	E	OS	15	2	32	7	230	10	1110	1723	0	574	574
9	1	Classroom (Music Room 2)	Recessed Parabolic	E	4'T8	13	2	32	Sw	9	230	10	962	1,991	C	Recessed Parabolic	4'T8	E	OS	13	2	32	7	230	10	962	1494	0	498	498
10	1	Classroom (Dark Room)	Ceiling Suspended	S	CFL	1	1	32	Sw	9	230	0	32	66	C	Ceiling Suspended	CFL	S	N	1	1	32	9	230	0	32	66	0	0	0
11	1	Classroom (Dark Room)	Ceiling Mounted	E	4'T8	1	2	32	Sw	9	230	10	74	153	C	Ceiling Mounted	4'T8	E	N	1	2	32	9	230	10	74	153	0	0	0
12	1	Classroom (Photography)	Ceiling Mounted	E	4'T8	13	2	32	Sw	9	230	10	962	1,991	C	Ceiling Mounted	4'T8	E	OS	13	2	32	7	230	10	962	1494	0	498	498
13	1	Classroom (Photography)	Ceiling Mounted	E	4'T8	6	2	32	Sw	9	230	10	444	919	C	Ceiling Mounted	4'T8	E	OS	6	2	32	7	230	10	444	689	0	230	230
14	1	Classroom (Film Drying)	Ceiling Suspended	S	Inc	4	1	60	Sw	9	230	0	240	497	CFL	Ceiling Suspended	CFL	S	N	4	1	20	9	230	0	80	166	331	0	331
15	1	Hallway	Recessed Parabolic	E	4'T5	5	2	28	Sw	16	230	8	320	1,177	C	Recessed Parabolic	4'T5	E	N	5	2	28	16	230	8	320	1177	0	0	0
16	1	Hallway	Recessed Parabolic	E	4'T8	1	2	32	Sw	16	230	10	74	272	C	Recessed Parabolic	4'T8	E	N	1	2	32	16	230	10	74	272	0	0	0
17	1	Exterior	Wall Mounted	S	Inc	1	1	60	Sw	24	230	0	60	331	CFL	Wall Mounted	CFL	S	N	1	1	20	24	230	0	20	110	221	0	221
18	1	Hallway	Wall Mounted	E	Circline - T8	2	1	32	Sw	24	230	5	74	408	C	Wall Mounted	Circline - T8	E	N	2	1	32	24	230	5	74	408	0	0	0
19	Bsmt	Storage Rm	Ceiling Mounted	E	4'T8	4	4	32	Sw	2	230	20	592	272	C	Ceiling Mounted	4'T8	E	N	4	4	32	2	230	20	592	272	0	0	0
20	Bsmt	Storage Rm (Fire Alarm Room)	Ceiling Mounted	E	4'T8	2	2	32	Sw	2	230	10	148	68	C	Ceiling Mounted	4'T8	E	N	2	2	32	2	230	10	148	68	0	0	0
21	2	Kitchen (Kitchenette)	Ceiling Mounted	E	4'T8	1	2	32	Sw	9	230	10	74	153	C	Ceiling Mounted	4'T8	E	OS	1	2	32	7	230	10	74	115	0	38	38
22	2	Hallway	Track	E	Hal	4	1	50	Sw	16	230	11	244	898	CFL	Track	CFL	E	N	4	1	15	16	230	0	60	221	677	0	677
23	2	Hallway	Recessed Parabolic	S	CFL	1	2	18	Sw	16	230	0	36	132	C	Recessed Parabolic	CFL	S	N	1	2	18	16	230	0	36	132	0	0	0
24	2	Bathroom Men	Ceiling Mounted	E	4'T8	1	2	32	Sw	9	230	10	74	153	C	Ceiling Mounted	4'T8	E	N	1	2	32	9	230	10	74	153	0	0	0
25	2	Bathroom Women	Ceiling Mounted	E	4'T8	1	2	32	Sw	9	230	10	74	153	C	Ceiling Mounted	4'T8	E	N	1	2	32	9	230	10	74	153	0	0	0
26	2	Classroom (Upstairs art room 1)	Ceiling Suspended	E	4'T8	26	2	32	Sw	9	230	10	1,924	3,983	C	Ceiling Suspended	4'T8	E	OS	26	2	32	7	230	10	1924	2987	0	996	996
27	2	Office	Ceiling Mounted	E	4'T8	6	2	32	Sw	9	230	10	444	919	C	Ceiling Mounted	4'T8	E	OS	6	2	32	7	230	10	444	689	0	230	230
28	2	Classroom (Upstairs Art Room 2)	Ceiling Suspended	E	4'T8	14	2	32	Sw	9	230	10	1,036	2,145	C	Ceiling Suspended	4'T8	E	OS	14	2	32	7	230	10	1036	1608	0	536	536
29	2	Classroom (Upstairs Art Room 2)	Ceiling Mounted	E	4'T8	9	2	32	Sw	9	230	10	666	1,379	C	Ceiling Mounted	4'T8	E	OS	9	2	32	7	230	10	666	1034	0	345	345
30	2	Storage Closet	Recessed Parabolic	S	CFL	1	1	32	Sw	2	230	0	32	15	C	Recessed Parabolic	CFL	S	N	1	1	32	2	230	0	32	15	0	0	0
31	1	Hallway	Exit Sign	S	LED	13	3	5	N	24	365	2	215	1,879	N/A	Exit Sign	LED	S	N	13	3	5	24	365	2	215	1879	0	0	0
32	Ext	Exterior	ole Mounted Off Buildi	S	HPS	4	1	150	PC	12	365	30	720	3,154	LED	ole Mounted Off Buildi	LED	S	DL	4	1	75	12	365	8	330	1445	1708	0	1708
Totals:						**229**	**58**	**1,232**				**289**	**17,219**	**42,910**						**229**	**58**	**957**			**217**	**14,241**	**27,200**	**9,868**	**5,841**	**15,710**
Rows Highlighed Yellow Indicate an Energy Conservation Measure is recommended for that space																														

Proposed Lighting Summary Table			
Total Gross Floor Area (SF)	8,325		
Average Power Cost ($/kWh)	0.1810		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	3,154	1,445	**1,708**
Exterior Power (watts)	720	330	**390**
Total Interior Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	39,756	25,755	**14,001**
Lighting Power (watts)	16,499	13,911	**2,588**
Lighting Power Density (watts/SF)	1.98	1.67	**0.31**
Estimated Cost of Fixture Replacement ($)	4,028		
Estimated Cost of Controls Improvements ($)	2,595		
Total Consumption Cost Savings ($)	**3,401**		

LEGEND

Lamp Type		**Controls**	
CFL	Compact Fluorescent	T	Autom. Timer
Inc	Incadescent	BL	Bi-Level
LED	Light Emitting Diode	Ct	Contact
MH	Metal Halide	M	Daylight & Motion
MV	Mercury Vapor	DLSw	Daylight & Switch
PSMH	Pulse Start Metal Halide	DL	Daylight Sensor
HPS	High Pressure Sodium	DSw	Delay Switch
LPS	Low Pressure Sodium	D	Dimmer
Fl	Fluorescent	MS	Motion Sensor
4'T8	4 Feet long T8 Linear Lamp	MSw	Motion& Switch
4'T8 U-shaped	4 Feet long T8 U-shaped Lamp	N	None
4'T5	4 Feet long T5 Linear Lamp	OS	Occupancy Sensor
Ballast Type		OSCM	Occupancy Sensor Ceiling Mounted
E	Electronic	PC	Photocell
M	Magnetic	Sw	Switch
S	Self		

APPENDIX C: UPCOMING EQUIPMENT PHASEOUTS

LIGHTING:

- As of **July 1, 2010** magnetic ballasts most commonly used for the operation of T12 lamps are no longer being produced for commercial and industrial applications.

- As of **January 1, 2012** 100 watt incandescent bulbs have been phased out in accordance with the Energy Independence and Security Act of 2007.

- As of **July 2012** many non energy saver model T12 lamps have been phased out of production.

- As of **January 1, 2013** 75 watt incandescent bulbs have been phased out in accordance with the Energy Independence and Security Act of 2007.

- Starting **January 1, 2014** 60 and 40 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.

- Energy Independence and Security Act of 2007 incandescent lamp phase-out exclusions:
  1. Appliance lamp (e.g. refrigerator or oven light)
  2. Black light lamp
  3. Bug lamp
  4. Colored lamp
  5. Infrared lamp
  6. Left-hand thread lamp
  7. Marine lamp
  8. Marine signal service lamp
  9. Mine service lamp
  10. Plant light lamp
  11. Reflector lamp
  12. Rough service lamp
  13. Shatter-resistant lamp (including a shatter-proof lamp and a shatter-protected lamp)
  14. Sign service lamp
  15. Silver bowl lamp
  16. Showcase lamp
  17. 3-way incandescent lamp
  18. Traffic signal lamp
  19. Vibration service lamp
  20. Globe shaped “G” lamp (as defined in ANSI C78.20-2003 and C79.1-2002 with a diameter of 5 inches or more
  21. T shape lamp (as defined in ANSI C78.20-2003 and C79.1-2002) and that uses not more than 40 watts or has a length of more than 10 inches
  22. A B, BA, CA, F, G16-1/2, G-25, G30, S, or M-14 lamp (as defined in ANSI C79.1-2002 and ANSI C78.20-2003) of 40 watts or less
  23. Candelabra incandescent and other lights not having a medium Edison screw base.

- When installing compact fluorescent lamps (CFLs), be advised that they contain a very small amount of mercury sealed within the glass tubing and EPA guidelines concerning cleanup and safe disposal of compact fluorescent light bulbs should be followed. Additionally, all lamps to be disposed should be recycled in accordance with EPA guidelines through state or local government collection or exchange programs instead.

HCFC (Hydro chlorofluorocarbons):

- As of **January 1, 2010,** no production and no importing of R-142b and R-22, except for use in equipment manufactured before January 1, 2010, in accordance with adherence to the Montreal Protocol.

- As of **January 1, 2015,** No production and no importing of any HCFCs, except for use as refrigerants in equipment manufactured before January 1, 2010.

- As of **January 1, 2020** No production and no importing of R-142b and R-22.

APPENDIX D: THIRD PARTY ENERGY SUPPLIERS

http://www.state.nj.us/bpu/commercial/shopping.html

Third Party Electric Suppliers for JCPL Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
BOC Energy Services, Inc. 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.boc.com
Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 www.commerceenergy.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 www.fes.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Integrys Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com
Liberty Power Delaware, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 www.libertypowercorp.com
Liberty Power Holdings, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 www.libertypowercorp.com
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com

Suez Energy Resources NA, Inc. 333 Thornall Street, 6th Floor Edison, NJ 08837	(888) 644-1014 www.suezenergyresources.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com

Third Party Gas Suppliers for Elizabethtown Gas Co. Service Territory	Telephone & Web Site
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 www.cooperativenet.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com
Great Eastern Energy 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greateastern.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
Metromedia Energy, Inc. 6 Industrial Way Eatontown, NJ 07724	(877) 750-7046 www.metromediaenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 www.mxenergy.com
NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	(800) 840-4427 www.natgasco.com

Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com

APPENDIX E: GLOSSARY AND METHOD OF CALCULATIONS

Net ECM Cost: The net ECM cost is the cost experienced by the customer, which is typically the total cost (materials + labor) of installing the measure minus any available incentives. Both the total cost and the incentive amounts are expressed in the summary for each ECM.

Annual Energy Cost Savings (AECS): This value is determined by the audit firm based on the calculated energy savings (kWh or Therm) of each ECM and the calculated energy costs of the building.

Lifetime Energy Cost Savings (LECS): This measure estimates the energy cost savings over the lifetime of the ECM. It can be a simple estimation based on fixed energy costs. If desired, this value can factor in an annual increase in energy costs as long as the source is provided.

Simple Payback: This is a simple measure that displays how long the ECM will take to break-even based on the annual energy and maintenance savings of the measure.

ECM Lifetime: This is included with each ECM so that the owner can see how long the ECM will be in place and whether or not it will exceed the simple payback period. Additional guidance for calculating ECM lifetimes can be found below. This value can come from manufacturer's rated lifetime or warranty, the ASHRAE rated lifetime, or any other valid source.

Operating Cost Savings (OCS): This calculation is an annual operating savings for the ECM. It is the difference in the operating, maintenance, and / or equipment replacement costs of the existing case versus the ECM. In the case where an ECM lifetime will be longer than the existing measures (such as LED lighting versus fluorescent) the operating savings will factor in the cost of replacing the units to match the lifetime of the ECM. In this case or in one where one-time repairs are made, the total replacement / repair sum is averaged over the lifetime of the ECM.

Return on Investment (ROI): The ROI is expresses the percentage return of the investment based on the lifetime cost savings of the ECM. This value can be included as an annual or lifetime value, or both.

Net Present Value (NPV): The NPV calculates the present value of an investment's future cash flows based on the time value of money, which is accounted for by a discount rate (assumes bond rate of 3.2%).

Internal Rate of Return (IRR): The IRR expresses an annual rate that results in a break-even point for the investment. If the owner is currently experiencing a lower return on their capital than the IRR, the project is financially advantageous. This measure also allows the owner to compare ECMs against each other to determine the most appealing choices.

Gas Rate and Electric Rate ($/therm and $/kWh): The gas rate and electric rate used in the financial analysis is the total annual energy cost divided by the total annual energy usage for the 12 month billing period studied. The graphs of the monthly gas and electric rates reflect the total monthly energy costs divided by the monthly usage, and display how the average rate fluctuates throughout the year. The average annual rate is the only rate used in energy savings calculations.

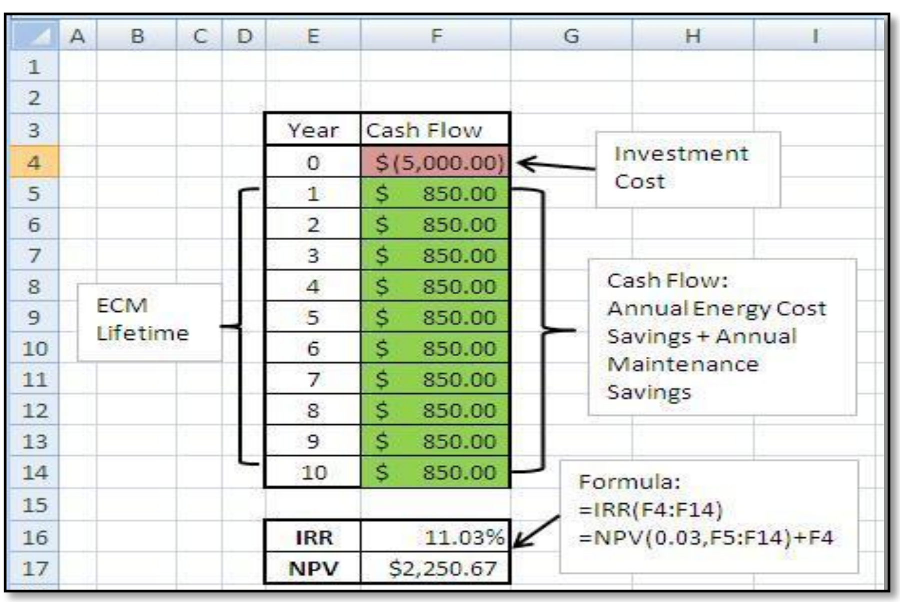
Calculation References

Term	Definition
ECM	Energy Conservation Measure
AOCS	Annual Operating Cost Savings
AECS	Annual Energy Cost Savings
LOCS*	Lifetime Operating Cost Savings
LECS	Lifetime Energy Cost Savings
LCS	Lifetime Cost Savings
NPV	Net Present Value
IRR	Internal Rate of Return
DR	Discount Rate
Net ECM Cost	Total ECM Cost – Incentive
LECS	AECS X ECM Lifetime
AOCS	LOCS / ECM Lifetime
LCS	LOCS+LECS
Simple Payback	Net ECM Cost / (AECS + AOCS)
Lifetime ROI	(LECS + LOCS – Net ECM Cost) / Net ECM Cost
Annual ROI	(Lifetime ROI / Lifetime) = [(AECS + OCS) / Net ECM Cost – (1 / Lifetime)]

* The lifetime operating cost savings are all avoided operating, maintenance, and/or component replacement costs over the lifetime of the ECM. This can be the sum of any annual operating savings, recurring or bulk (i.e. one-time repairs) maintenance savings, or the savings that comes from avoiding equipment replacement needed for the existing measure to meet the lifetime of the ECM (e.g. lighting change outs).

Excel NPV and IRR Calculation

In Excel, function =IRR (values) and =NPV (rate, values) are used to quickly calculate the IRR and NPV of a series of annual cash flows. The investment cost will typically be a negative cash flow at year 0 (total cost - incentive) with years 1 through the lifetime receiving a positive cash flow from the annual energy cost savings and annual maintenance savings. The calculations in the example below are for an ECM that saves $850 annually in energy and maintenance costs (over a 10 year lifetime) and takes $5,000 to purchase and install after incentives:



Solar PV ECM Calculation

There are several components to the calculation:

Costs:	Material of PV system including panels, mounting and net-metering + Labor
Energy Savings:	Reduction of kWh electric cost for life of panel, 25 years Solar Renewable Energy Credits (SRECs) – Market-rate incentive. Calculations assume $608/Megawatt hour consumed per year for a maximum of 15 years; added to annual energy cost savings for a period of 15 years. (Megawatt hour used is rounded to nearest 1,000 kWh)
Assumptions:	A Solar Pathfinder device is used to analyze site shading for the building and determine maximum amount of full load operation based on available sunlight. When the Solar Pathfinder device is not implemented, amount of full load operation based on available sunlight is assumed to be 1,180 hours in New Jersey.

Total lifetime PV energy cost savings =
kWh produced by panel * [$/kWh cost * 25 years + $608/Megawatt hour /1000 * 15 years]

ECM and Equipment Lifetimes

Determining a lifetime for equipment and ECM's can sometimes be difficult. The following table contains a list of lifetimes that the NJCEP uses in its commercial and industrial programs. Other valid sources are also used to determine lifetimes, such as the DOE, ASHRAE, or the manufacturer's warranty.

Lighting is typically the most difficult lifetime to calculate because the fixture, ballast, and bulb can all have different lifetimes. Essentially the ECM analysis will have different operating cost savings (avoided equipment replacement) depending on which lifetime is used.

When the bulb lifetime is used (rated burn hours / annual burn hours), the operating cost savings is just reflecting the theoretical cost of replacing the existing case bulb and ballast over the life of the recommended bulb. Dividing by the bulb lifetime will give an annual operating cost savings.

When a fixture lifetime is used (e.g. 15 years) the operating cost savings reflects the avoided bulb and ballast replacement cost of the existing case over 15 years minus the projected bulb and ballast replacement cost of the proposed case over 15 years. This will give the difference of the equipment replacement costs between the proposed and existing cases and when divided by 15 years will give the annual operating cost savings.

New Jersey Clean Energy Program Commercial Equipment Life Span

Measure	Life Span
Commercial Lighting — New	15
Commercial Lighting — Remodel/Replacement	15
Commercial Custom — New	18
Commercial Chiller Optimization	18
Commercial Unitary HVAC — New - Tier 1	15
Commercial Unitary HVAC — Replacement - Tier 1	15
Commercial Unitary HVAC — New - Tier 2	15
Commercial Unitary HVAC — Replacement Tier 2	15
Commercial Chillers — New	25
Commercial Chillers — Replacement	25
Commercial Small Motors (1-10 HP) — New or Replacement	20
Commercial Medium Motors (11-75 HP) — New or Replacement	20
Commercial Large Motors (76-200 HP) — New or Replacement	20
Commercial VSDs — New	15
Commercial VSDs — Retrofit	15
Commercial Comprehensive New Construction Design	18
Commercial Custom — Replacement	18
Industrial Lighting — New	15
Industrial Lighting — Remodel/Replacement	15
Industrial Unitary HVAC — New - Tier 1	15
Industrial Unitary HVAC — Replacement - Tier 1	15
Industrial Unitary HVAC — New - Tier 2	15
Industrial Unitary HVAC — Replacement Tier 2	15
Industrial Chillers — New	25
Industrial Chillers — Replacement	25
Industrial Small Motors (1-10 HP) — New or Replacement	20
Industrial Medium Motors (11-75 HP) — New or Replacement	20
Industrial Large Motors (76-200 HP) — New or Replacement	20
Industrial VSDs — New	15
Industrial VSDs — Retrofit	15
Industrial Custom — Non-Process	18
Industrial Custom — Process	10
Small Commercial Gas Furnace — New or Replacement	20
Small Commercial Gas Boiler — New or Replacement	20
Small Commercial Gas DHW — New or Replacement	10
C&I Gas Absorption Chiller — New or Replacement	25
C&I Gas Custom — New or Replacement (Engine Driven Chiller)	25
C&I Gas Custom — New or Replacement (Gas Efficiency Measures)	18
O&M savings	3
Compressed Air (GWh participant)	8

APPENDIX F: STATEMENT OF ENERGY PERFORMANCE FROM ENERGY STAR®

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Dwight-Englewood - Swartley Art Center

Building ID: 3425109
For 12-month Period Ending: November 30, 2012[1]
Date SEP becomes Ineligible: N/A

Date SEP Generated: January 28, 2013

Facility
Dwight-Englewood - Swartley Art Center
297 East Palisade Avenue
Englewood, NJ 07631

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1910
Gross Floor Area (ft²): 8,325

Energy Performance Rating[2] (1-100) 68

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	259,459
Natural Gas (kBtu)[4]	225,707
Total Energy (kBtu)	485,166

Energy Intensity[4]	
Site (kBtu/ft²/yr)	58
Source (kBtu/ft²/yr)	132

Emissions (based on site energy use)	
Greenhouse Gas Emissions (MtCO₂e/year)	49

Electric Distribution Utility
Public Service Electric & Gas Co

National Median Comparison	
National Median Site EUI	69
National Median Source EUI	158
% Difference from National Median Source EUI	-16%
Building Type	K-12 School

Stamp of Certifying Professional

Based on the conditions observed at the time of my visit to this building, I certify that the information contained within this statement is accurate.

Meets Industry Standards[5] for Indoor Environmental Conditions:

Ventilation for Acceptable Indoor Air Quality	N/A
Acceptable Thermal Environmental Conditions	N/A
Adequate Illumination	N/A

Certifying Professional
N/A

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Values represent energy intensity, annualized to a 12-month period.
5. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

The government estimates the average time needed to fill out this form is 6 hours (includes the time for entering energy data, Licensed Professional facility inspection, and notarizing the SEP) and welcomes suggestions for reducing this level of effort. Send comments (referencing OMB control number) to the Director, Collection Strategies Division, U.S., EPA (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

EPA Form 5900-16

APPENDIX G: INCENTIVE PROGRAMS

New Jersey Clean Energy Pay for Performance

The NJ Clean Energy Pay for Performance (P4P) Program relies on a network of Partners who provide technical services to clients. LGEA participating clients who are not receiving Direct Energy Efficiency and Conservation Block Grants are eligible for P4P. SWA is an eligible Partner and can develop an Energy Reduction Plan for each project with a whole-building traditional energy audit, a financial plan for funding the energy measures and an installation construction schedule.

The Energy Reduction Plan must define a comprehensive package of measures capable of reducing a building's energy consumption by 15+%. P4P incentives are awarded upon the satisfactory completion of three program milestones: submittal of an Energy Reduction Plan prepared by an approved Program Partner, installation of the recommended measures, and completion of a Post-Construction Benchmarking Report. The incentives for electricity and natural gas savings will be paid based on actual savings, provided that the minimum 15% performance threshold savings has been achieved.

Energy Provider Incentives

- **South Jersey Gas** - Offers financing up to $100,000 on the customer's portion of project cost through private lender. In addition to available financing, it provides matching incentive on gas P4P incentives #2 and #3 up to $100,000 (not to exceed total project cost).

For further information, please see: http://www.njcleanenergy.com/commercial-industrial/programs/pay-performance/existing-buildings .

Direct Install 2011 Program*

Direct Install is a division of the New Jersey Clean Energy Programs' Smart Start Buildings. It is a turn-key program for small to mid-sized facilities to aid in upgrading equipment to more efficient types. It is designed to cut overall energy costs by upgrading lighting, HVAC, and other equipment with energy efficient alternatives. The program pays **up to 70%** of the retrofit costs, including equipment cost and installation costs. Each project is limited to $75,000 in incentives.

Eligibility:

- Existing small and mid-sized commercial and industrial facilities with peak electrical demand **below 150 kW** within 12 months of applying (the 150 kW peak demand threshold has been waived for local government entities who receive and utilize their Energy Efficiency and Conservation Block Grant in conjunction with Direct Install)
- Must be located in New Jersey
- Must be served by one of the state's public, regulated or natural gas companies

Energy Provider Incentives

- **South Jersey Gas** – Program offers financing up to $25,000 on customer's 40% portion of the project and combines financing rate based on portion of the project devoted to gas and electric measures. All gas measures financed at 0%, all electric measures financed at normal rate. Does not offer financing on projects that only include electric measures.

- **Atlantic City Electric –** Provides a free audit, and additional incentives up to 20% of the current incentive up to a maximum of $5,000 per customer.

For the most up to date information on contractors in New Jersey who participate in this program, go to: http://www.njcleanenergy.com/commercial-industrial/programs/direct-install or visit the utility web sites.

Smart Start

New Jersey's SmartStart Building Program is administered by New Jersey's Office of Clean Energy. The program also offers design support for larger projects and technical assistance for smaller projects. If your project specifications do not fit into anything defined by the program, there are even incentives available for custom projects.

There are a number of improvement options for commercial, industrial, institutional, government, and agricultural projects throughout New Jersey. Alternatives are designed to enhance quality while building in energy efficiency to save money. Project categories included in this program are New Construction and Additions, Renovations, Remodeling and Equipment Replacement.

Energy Provider Incentives

- **South Jersey Gas –** Program to finance projects up to $25,000 not covered by incentive
- **New Jersey Natural Gas** – Will match SSB incentives on gas equipment
  PSE&G - Provides funding for site-specific uses of emerging technology. The incentives are determined on a case by case basis.

For the most up to date information on how to participate in this program, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings.

Renewable Energy Incentive Program*

The Renewable Energy Incentive Program (REIP) provides incentives that reduce the upfront cost of installing renewable energy systems, including solar, wind, and sustainable biomass. Incentives vary depending upon technology, system size, and building type. Current incentive levels, participation information, and application forms can be found at the website listed below.

Solar Renewable Energy Credits (SRECs) represent all the clean energy benefits of electricity generated from a solar energy system. SRECs can be sold or traded separately from the power, providing owners a source of revenue to help offset the cost of installation. All solar project owners in New Jersey with electric distribution grid-connected systems are eligible to generate SRECs. Each time a system generates 1,000 kWh of electricity an SREC is earned and placed in the customer's account on the web-based SREC tracking system.

For the most up to date information on how to participate in this program, go to: http://www.njcleanenergy.com/renewable-energy/home/home.

Combined Heat and Power (CHP)

Energy Provider Incentives

- South Jersey Gas - Provides additional incentive of $1.00/watt up to $1,000,000 on top of NJCEP incentive.

Utility Sponsored Programs

Check with your local utility companies for further opportunities that may be available.

Energy Efficiency and Conservation Block Grant Rebate Program

The Energy Efficiency and Conservation Block Grant (EECBG) Rebate Program provides supplemental funding up to $20,000 for eligible New Jersey local government entities to lower the cost of installing energy conservation measures. Funding for the EECBG Rebate Program is provided through the American Recovery and Reinvestment Act (ARRA).

For the most up to date information on how to participate in this program, go to: http://njcleanenergy.com/EECBG.

Other Federal and State Sponsored Programs

Other federal and state sponsored funding opportunities may be available, including BLOCK and R&D grant funding. For more information, please check http://www.dsireusa.org/.

*Subject to availability. Incentive program timelines might not be sufficient to meet the 25% in 12 months spending requirement outlined in the LGEA program.

APPENDIX H: ENERGY CONSERVATION MEASURES

ECM #	ECM description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
1	Install 1 Daylight sensor	220	25	195	1,445	0	0	0.6	1,086	1,348	15	20,214	0.1	10,266	684	691	15,177	2,588
2	Upgrade (36) Incandescent to CFL	353	0	353	8,160	2	0	3.3	40	1,517	5	7,583	0.2	2,047	409	429	6,350	14,611
3	Replace (1) Electric DHW Heater with Energy Star Natural Gas Model	1,900	100	1,800	13,472	0	0	5.5	18	2,459	12	29,508	0.7	1,539	128	137	21,693	24,122
4	Install 12 occupancy sensors	2,640	240	2,400	5,841	1	0	2.4	0	1,057	15	15,859	2.3	561	37	44	9,729	10,459
5	Retro-commissioning	10,406	none at this time	10,406	4,495	0	118	3.3	1,820	2,756	12	33,070	3.8	218	18	25	16,183	9,347
6	Replace 3 Window Air Conditioning Unit With 2 Ton Energy Star Efficient Type	570	none at this time	570	224	0	0	0.1	105	146	15	2,184	3.9	283	19	25	1,108	401

Assumptions: Discount Rate: 3.2%; Energy Price Escalation Rate: 0%

Note: A 0.0 electrical demand reduction/month indicates that it is very low/negligible

APPENDIX I: METHOD OF ANALYSIS

Assumptions and tools

Cost estimates:	RS Means 2012 (Facilities Maintenance & Repair Cost Data) RS Means 2012 (Building Construction Cost Data) RS Means 2012 (Mechanical Cost Data) Published and established specialized equipment material and labor costs Cost estimates also based on utility bill analysis and prior experience with similar projects

Disclaimer

This engineering audit was prepared using the most current and accurate fuel consumption data available for the site. The estimates that it projects are intended to help guide the owner toward best energy choices. The costs and savings are subject to fluctuations in weather, variations in quality of maintenance, changes in prices of fuel, materials, and labor, and other factors. Although we cannot guarantee savings or costs, we suggest that you use this report for economic analysis of the building and as a means to estimate future cash flow.

THE RECOMMENDATIONS PRESENTED IN THIS REPORT ARE BASED ON THE RESULTS OF ANALYSIS, INSPECTION, AND PERFORMANCE TESTING OF A SAMPLE OF COMPONENTS OF THE BUILDING SITE. ALTHOUGH CODE-RELATED ISSUES MAY BE NOTED, SWA STAFF HAVE NOT COMPLETED A COMPREHENSIVE EVALUATION FOR CODE-COMPLIANCE OR HEALTH AND SAFETY ISSUES. THE OWNER(S) AND MANAGER(S) OF THE BUILDING(S) CONTAINED IN THIS REPORT ARE REMINDED THAT ANY IMPROVEMENTS SUGGESTED IN THIS SCOPE OF WORK MUST BE PERFORMED IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS THAT APPLY TO SAID WORK. PARTICULAR ATTENTION MUST BE PAID TO ANY WORK WHICH INVOLVES HEATING AND AIR MOVEMENT SYSTEMS, AND ANY WORK WHICH WILL INVOLVE THE DISTURBANCE OF PRODUCTS CONTAINING MOLD, ASBESTOS, OR LEAD.