LOCAL GOVERNMENT ENERGY AUDIT PROGRAM: ENERGY AUDIT REPORT

PREPARED FOR: **MASTRO MONTESSORI ACADEMY**
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I. EXECUTIVE SUMMARY

This report presents the findings of the energy audit conducted for:

Entity: Vincent S. Mastro Montessori Academy

Facility: Mastro Montessori Academy
35 White Road
Shrewsbury, New Jersey 07702

Contact Person: Kristin DeRose, Administrator

This audit is performed in connection with the New Jersey Clean Energy - Local Government Energy Audit Program for the Mastro Montessori Academy. The purpose of this analysis is to provide the owner insight into the energy savings potential that exists within the facility. Energy Efficiency changes and upgrades requires support from the building occupants, operations personnel and the administrators of the building in order to maximize the savings and overall benefit. The efficiency improvement of public buildings provides a benefit for the environment and the residents of New Jersey.

The Energy Conservation Measures (ECMs) identified within the report represent the potential annual savings at the facility. It is recommended to consider all ECMs as part of the owner's initiative to save energy, reduce emissions, and lower operating costs. The Academy should review and be familiar with all measures presented in the report prior to making a decision on which projects to move forward with. This will enable the Academy to effectively align report recommendations with those outlined in their mid/long range facility plans and financial plans. The Academy should also review all conventional and unconventional funding, along with all NJCEP funding opportunities for these projects and determine which options fit their budget most positively in the short and long term. The combination of this information will enable the Academy to put together an effective Energy Savings Improvement Strategy that maximizes the received benefits of the selected projects.

The annual energy costs at this facility are as follows:

Electricity	$ 5,884
Natural Gas	$ 2,614
Total	$ 8,498

The potential annual energy cost savings for each energy conservation measure (ECM) and renewable energy measure (REM) are shown below in Table 1. Be aware that all ECM's and REM's are not additive because of the interrelation of some of the measures. This audit is consistent with an ASHRAE Level 2 energy audit. The cost and savings for each measure is ± 20%. The evaluations are based on engineering estimations and industry standard calculation methods. More detailed analysis would require engineering simulation models, hard equipment specifications, and contractor bid pricing.

Table 1
ECM Summary Table

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
ECM #1	Lighting Upgrade	$7,429	$1,055	7.0	113.0%
ECM #2	Lighting Controls	$1,450	$37	39.2	-61.7%
ECM #3	Domestic Boiler Upgrade	$6,700	$91	73.6	-79.6%
ECM #4	Add Attic Insulation	$2,200	$403	5.5	174.8%
ECM #5	Water Conservation	$300	$84	3.6	320.0%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	30 kW Solar Array	$144,032	$11,954	12.0	24.5%

Notes: A. Cost takes into consideration applicable NJ Smart StartTM incentives.
B. Savings takes into consideration applicable maintenance savings.

The estimated demand and energy savings for each ECM and REM is shown below in Table 2. The descriptions in this table correspond to the ECM's and REM's listed in Table 1.

Table 2
Energy Savings Summary Table

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION			
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)	WATER CONSUMPTION (kGAL)
ECM #1	Lighting Upgrade	3.3	6,168	0	0
ECM #2	Lighting Controls	0.0	219	0	0
ECM #3	Domestic Boiler Upgrade	0.0	0	83	0
ECM #4	Add Attic Insulation	0.0	343	313	0
ECM #5	Water Conservation	0.0	0	18	6
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION			
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)	WATER CONSUMPTION (kGAL)
REM #1	30 kW Solar Array	29.0	37,181	0	0

Table 3
Emissions Summary Table

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	GREENHOUSE GAS EMISSIONS REDUCTION		
		CO_2 EMISSIONS (LBS)	NO_X EMISSIONS (LBS)	SO_2 EMISSIONS (LBS)
ECM #1	Lighting Upgrade	9,375	17	40
ECM #2	Lighting Controls	333	1	1
ECM #3	Domestic Boiler Upgrade	971	1	0
ECM #4	Add Attic Insulation	4,183	4	2
ECM #5	Water Conservation	211	0	0
Notes:	A. Emissions Reduction based on NJCEP published factors for electric & gas.			

Table 4
Facility Project Summary Table

FACILITY PROJECT SUMMARY TABLE					
ENERGY CONSERVATION MEASURES	**ANNUAL ENERGY SAVINGS ($)**	**PROJECT COST ($)**	**SMART START INCENTIVES**	**CUSTOMER COST**	**SIMPLE PAYBACK**
Lighting Upgrade	$1,055	$8,589	$1,160	$7,429	7.0
Lighting Controls	$37	$1,450	$0	$1,450	39.2
Domestic Boiler Upgrade	$91	$7,000	$300	$6,700	73.6
Add Attic Insulation	$403	$2,200	$0	$2,200	5.5
Water Conservation	$84	$300	$0	$300	3.6
Total Project	**$1,670**	**$19,539**	**$1,460**	**$18,079**	**10.8**

This project does not qualify for additional incentives through the Pay for Performance Program since the demand is less than 100 kilowatts.

Overall Assessment:

Overall, the Mastro Montessori Academy is operating more efficiently compared to the National Peer Group Median Source Energy Intensity of 141.4 kBtu/square-foot/year of the closest comparable building type "K-12 Education". The Academy is also paying an average in cost of energy at $1.06 per square-foot, which is well below typical average costs of $2.00 per square-foot.

Other Considerations:

Renewable Energy Conservation Measures:

Renewable Energy Measures (REMs) were also reviewed for implementation at the Mastro Montessori Academy. There is a potential to install solar panels in the parking lot and roof. In total the area could accommodate 30 kW of solar arrays. The solar arrays would produce approximately 37,181 kilowatt-hours annually that could negate the need to purchase electric from the utility. The potential for wind generation was also reviewed for the facility; however based on historical wind speed data, it is not a viable option.

Energy Procurement Recommendations:

It is recommended that the Academy investigate a third party purchasing approach for electric and natural gas for the facility. Furthermore, the Academy should investigate cooperative purchasing groups as this may prove more beneficial then soliciting a third party purchases on their own. Further recommendations are outlined in the Energy Procurement Section of this report that could assist the Academy in finding additional savings through their utility bills.

Maintenance and Operational Recommendations:

In addition to the ECMs and REMs, there are maintenance and operational measures that can provide significant energy savings and provide immediate benefit, many of which facility personnel are already performing. The ECMs listed represent investments that can be made to the facility which are justified by the savings seen over time. However, the maintenance items and small operational improvements described are typically achievable with on-site staff or maintenance contractors and in turn have the potential to provide substantial operational savings compared to the costs associated. The provided additional recommendations section should be considered a priority in achieving an energy efficient building.

II. INTRODUCTION

This comprehensive energy audit covers the entire Mastro Montessori Academy. The audit is performed in connection with the New Jersey Clean Energy - Local Government Energy Audit Program. The energy audit is conducted to promote the mission of the office of Clean Energy, which is to use innovation and technology to solve energy and environmental problems in a way that improves the State's economy. This can be achieved through the wiser and more efficient use of energy.

Electrical and fuel oil utility information is collected and analyzed for one full year's energy use of the building. The utility information allows for analysis of the complex's operational characteristics; calculate energy benchmarks for comparison to industry averages, estimated savings potential, and baseline usage/cost to monitor the effectiveness of implemented measures. A computer spreadsheet is used to calculate benchmarks and to graph utility information (see the utility profiles below).

The Energy Use Index (EUI) is established for the Main Building. Energy Use Index (EUI) is expressed in British Thermal Units/square foot/year (BTU/ft^2/yr), which is used to compare energy consumption to similar building types or to track consumption from year to year in the same building. The EUI is calculated by converting the annual consumption of all energy sources to BTU's and dividing by the area (gross square footage) of the building. Blueprints (where available) are utilized to verify the gross area of the facility. The EUI is a good indicator of the relative potential for energy savings. A low EUI indicates less potential for energy savings, while a high EUI indicates poor building performance therefore a high potential for energy savings.

Existing building architectural and engineering drawings (where available) are utilized for additional background information. The building envelope, lighting systems, HVAC equipment, and controls information gathered from building drawings allow for a more accurate and detailed review of the building. The information is compared to the energy usage profiles developed from utility data. Through the review of the architectural and engineering drawings a building profile can be defined that documents building age, type, usage, major energy consuming equipment or systems, etc. The preliminary audit information is gathered in preparation for the site survey. The site survey provides critical information in deciphering where energy is spent and opportunities exist within a facility. The entire site is surveyed to inventory the following to gain an understanding of how each facility operates:

- Building envelope (roof, windows, etc.)
- Heating, ventilation, and air conditioning equipment (HVAC)
- Lighting systems and controls

The site visit is performed to survey all major building components and systems. The site visit includes detailed inspection of energy consuming components. Summary of building occupancy schedules, operating and maintenance practices, and energy management programs provided by the building manager are collected along with the system and components to determine a more accurate impact on energy consumption.

III. METHOD OF ANALYSIS

This audit is consistent with an ASHRAE Level 2 energy audit. The cost and savings for each measure is ± 20%. The evaluations are based on engineering estimations and industry standard calculation methods. More detailed analyses would require engineering simulation models, hard equipment specifications, and contractor bid pricing.

Post site visit work includes evaluation of the information gathered, researching possible conservation opportunities, organizing the audit into a comprehensive report, and making recommendations on HVAC, lighting and building envelope improvements. Data collected is processed using energy engineering calculations to anticipate energy usage for each of the proposed energy conservation measures (ECMs). The actual building's energy usage is entered directly from the utility bills provided by the owner. The anticipated energy usage is compared to the historical data to determine energy savings for the proposed ECMs. It is pertinent to note, that the savings noted in this report are not additive. The savings for each recommendation is calculated as standalone energy conservation measures. Implementation of more than one ECM may in some cases affect the savings of each ECM. The savings may in some cases be relatively higher if an individual ECM is implemented in lieu of multiple recommended ECMs. For example implementing reduced operating schedules for inefficient lighting will result in a greater relative savings. Implementing reduced operating schedules for newly installed efficient lighting will result in a lower relative savings, because there is less energy to be saved.

The project/entity summary tables are based on the implementation of multiple measures. The analysis is reviewed and determined if the nature of the ECMs will cause a major conflict of the overall savings. When additive measures do not cause a major effect on the overall savings the ECMs are included. Where a major conflict is identified, the combined savings is evaluated appropriately to ensure the overall estimates are ± 20%.

ECMs are determined by identifying the building's unique properties and deciphering the most beneficial energy saving measures available that meet the specific needs of the facility. The building construction type, function, operational schedule, existing conditions, and foreseen future plans are critical in the evaluation and final recommendations. Energy savings are calculated based on industry standard methods and engineering estimations. Energy consumption is calculated based on manufacturer's cataloged information when new equipment is proposed.

Cost savings are calculated based on the actual historical energy costs for the facility. Installation costs include labor and equipment costs to estimate the full up-front investment required to implement a change. Costs are derived from Means Cost Data, industry publications, and local contractors and equipment suppliers. The NJ Smart Start Building® Program incentives savings (where applicable) are included for the appropriate ECM's and subtracted from the installed cost. Maintenance savings are calculated where applicable and added to the energy savings for each ECM. The life-time for each ECM is estimated based on the typical life of the equipment being replaced or altered. The costs and savings are applied and a simple payback, simple lifetime savings, and simple return on investment are calculated. See below for calculation methods:

ECM Calculation Equations:

$$\text{Simple Payback} = \left(\frac{\text{Net Cost}}{\text{Yearly Savings}}\right)$$

$$\text{Simple Lifetime Savings} = (\text{Yearly Savings} \times \text{ECM Lifetime})$$

$$\text{Simple Lifetime Return on Investment (ROI)} = \frac{(\text{Simple Lifetime Savings} - \text{Net Cost})}{\text{Net Cost}}$$

$$\text{Lifetime Maintenance Savings} = (\text{Yearly Maintenance Savings} \times \text{ECM Lifetime})$$

$$\text{Net Present Value} = \sum_{n=0}^{N}\left(\frac{\text{Cash Flow of Period}_n}{(1+\text{DR})^n}\right)$$

$$\text{Internal Rate of Return (IRR)} \rightarrow \text{Net Present Value} = 0 = \sum_{n=0}^{N}(\frac{\text{Cash Flow of Period}_n}{(1+\text{IRR})^n}$$

Net Present Value calculations are based on Discount Rate (DR) of 3%.

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

The energy usage for the facility has been tabulated and plotted in graph form as depicted within this section. Each energy source has been identified and monthly consumption and cost noted per the information provided by the owner.

Electric Utility Provider:	Jersey Central Power & Light (JCP&L)
Electric Utility Rate Structure:	General Service Secondary (GS1)
Third Party Supplier:	N/A

Natural Gas Utility Provider:	New Jersey Natural Gas (NJNG)
Utility Rate Structure:	General Service Gas (GSS)
Third Party Supplier:	N/A

The electric utility measures consumption in kilowatt-hours (KWH) and maximum demand in kilowatts (KW). One KWH usage is equivalent to 1000 watts running for one hour. One KW of electric demand is equivalent to 1000 watts running at any given time.

The gas usage profile within each facility report shows the actual natural gas energy usage for the facility. The gas utility measures consumption in cubic feet x 100 (CCF), and converts the quantity into Therms of energy. One Therm is equivalent to 100,000 BTUs of energy.

The overall cost for utilities is calculated by dividing the total cost by the total usage. Based on the utility history provided, the average cost for utilities at this facility is as follows:

Description	Average
Electricity	17.1¢ / kWh
Natural Gas	$1.10 / therm

Table 5
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: Jersey Central Power & Light
Rate: General Service Secondary (GS1)
Meter No: S307522376
Account No: 100 098 580 002
Third Party Utility Provider: -
TPS Meter / Acct No: -

MONTH OF USE	CONSUMPTION KWH	DEMAND KW		TOTAL BILL
Mar-13	2,603	10.3		$439
Apr-13	1,558	23.8		$331
May-13	2,935	18.6		$485
Jun-13	2,476	22.4		$439
Jul-13	2,177	22.4		$404
Aug-13	2,037	20.5		$376
Sep-13	2,314	27.2		$449
Oct-13	1,936	10.0		$346
Nov-13	1,873	10.0		$337
Dec-13	2,229	27.6		$435
Jan-14	2,472	24.0		$437
Feb-14	3,173	29.3		$552
Mar-14	2,603	10.3		$417
Apr-14	2,804	30.2		$510
May-14	2,714	19.0		$442
Jun-14	2,631	19.6		$436
Jul-14	2,937	15.7		$469
Aug-14	3,281	24.6		$546
Sep-14	3,415	19.2		$501
Oct-14	3,306	19.2		$488
Nov-14	1,938	10.0		$337
Dec-14	3,814	30.1		$625
Jan-15	3,301	30.1		$566
Feb-15	3,358	26.1		$547
Total	**63,885**	**30.2**	**Max**	**$10,916**
Current 12 Months	**36,102**	**30.2**	**Max**	**$5,884**

AVERAGE DEMAND **20.8 KW average**
AVERAGE RATE **0.170868 $/kWh**

Figure 1
Electricity Usage Profile

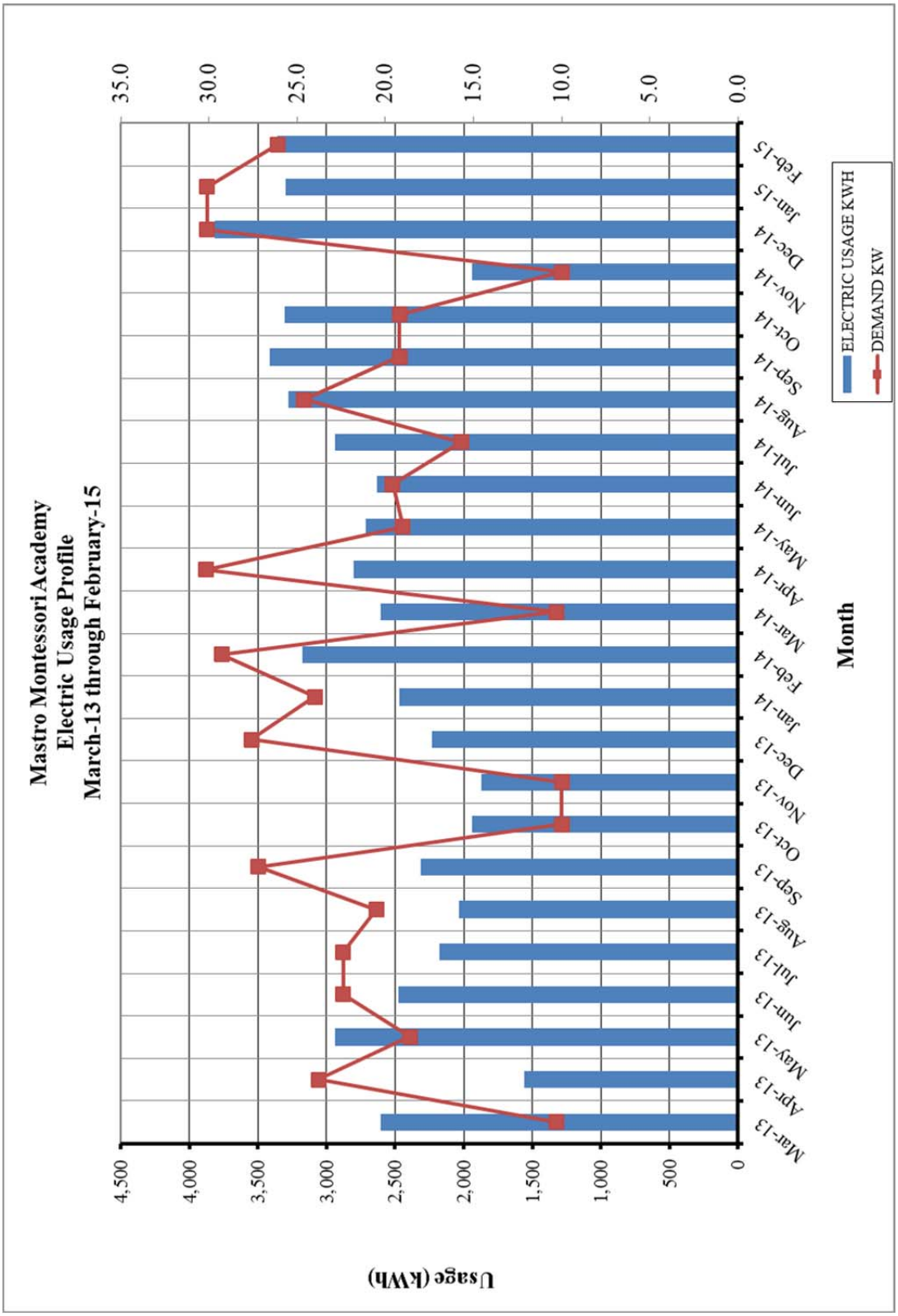
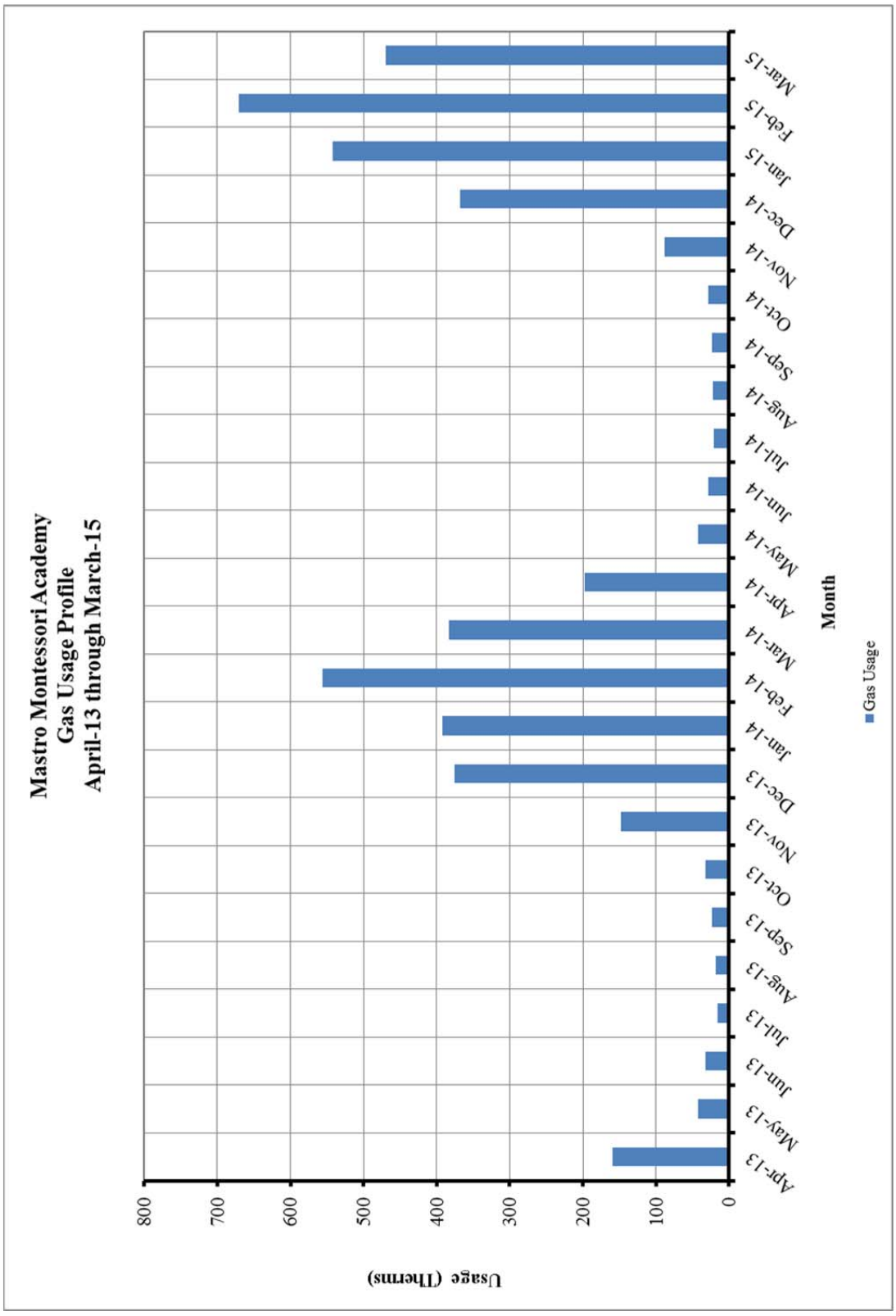


Table 6
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider:	New Jersey Natural Gas	
Rate:	General Service Gas (GSS)	
Meter No:	00889728	
Account No:	22-0014-1910-04	
Third Party Utility Provider:	-	
TPS Meter No:	-	
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Apr-13	159.60	$205.08
May-13	42.74	$73.23
Jun-13	32.17	$60.04
Jul-13	15.24	$36.68
Aug-13	18.51	$45.36
Sep-13	22.82	$50.09
Oct-13	32.33	$60.42
Nov-13	148.06	$184.56
Dec-13	375.03	$413.76
Jan-14	391.79	$421.01
Feb-14	556.73	$586.41
Mar-14	383.70	$411.93
Apr-14	197.99	$224.65
May-14	42.89	$68.25
Jun-14	28.93	$54.18
Jul-14	21.42	$46.60
Aug-14	22.47	$47.66
Sep-14	23.71	$48.91
Oct-14	29.05	$52.86
Nov-14	88.06	$105.10
Dec-14	368.37	$360.07
Jan-15	541.80	$517.83
Feb-15	670.44	$634.84
Mar-15	470.32	$452.81
Total	**4,684.17**	**$5,162.33**
Current 12 Months	**2,505.45**	**$2,613.76**
AVERAGE RATE:	**$1.10**	**$/THERM**

Figure 2
Natural Gas Usage Profile



B. Energy Use Index (EUI)

Energy Use Index (EUI) is a measure of a building's annual energy utilization per square foot of building. This calculation is completed by converting all utility usage consumed by a building for one year, to British Thermal Units (BTU) and dividing this number by the building square footage. EUI is a good measure of a building's energy use and is utilized regularly for comparison of energy performance for similar building types. The Oak Ridge National Laboratory (ORNL) Buildings Technology Center under a contract with the U.S. Department of Energy maintains a Benchmarking Building Energy Performance Program. The ORNL website determines how a building's energy use compares with similar facilities throughout the U.S. and in a specific region or State.

Source use differs from site usage when comparing a building's energy consumption with the national average. Site energy use is the energy consumed by the building at the building site only. Source energy use includes the site energy use as well as all of the losses to create and distribute the energy to the building. Source energy represents the total amount of raw fuel that is required to operate the building. It incorporates all transmission, delivery, and production losses, which allows for a complete assessment of energy efficiency in a building. The type of utility purchased has a substantial impact on the source energy use of a building. The EPA has determined that source energy is the most comparable unit for evaluation purposes and overall global impact. Both the site and source EUI ratings for the building are provided to understand and compare the differences in energy use.

The site and source EUI for this facility is calculated as follows:

$$\text{Building Site EUI} = \frac{(\text{Electric Usage in kBtu} + \text{Fuel Usage in kBtu})}{\text{Building Square Footage}}$$

$$\text{Building Source EUI} = \frac{(\text{Electric Usage in kBtu} \times \text{SS Ratio} + \text{Fuel Usage in kBtu} \times \text{SS Ratio})}{\text{Building Square Footage}}$$

Table 7
Energy Use Index Summary

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	**BUILDING USE**			**SITE ENERGY**	**SITE-SOURCE RATIO**	**SOURCE ENERGY**
	kWh	**Therms**	**Gallons**	**kBtu**		**kBtu**
ELECTRIC	36,102.0			123,252	3.140	387,012
NATURAL GAS		2,505.5		250,545	1.050	263,072
TOTAL				373,797		650,084

*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document.

	AUDITED BUILDING		**PEER COMPARISON**	
BUILDING TYPE	K-12 School		K-12 School	
BUILDING AREA	8,044	SQUARE FEET		
BUILDING SITE EUI	*46.47*	kBtu/SF/YR	58.2	kBtu/SF/YR
BUILDING SOURCE EUI	*80.82*	kBtu/SF/YR	141.4	kBtu/SF/YR

43%	More Efficient than PEER Comparison

The chart above depicts the Site and Source Energy for the facility. The comparable building type in this instance is classified as "K-12 School" with a median Site Energy of 58.2 kBtu/SF and a Source Energy of 141.4 kBtu/SF as obtained from the U.S. National Peer Group Comparison Rating published by Department of Energy in July, 2013. The Median Source Energy Use Intensity is the recommended benchmark metric for all buildings, and is the middle value of the national population meaning half the buildings use more energy, and half use less. The reference source for this data comes from the Department of Energy's Commercial Building Energy Consumption Survey (CBECS).

C. EPA Energy Benchmarking System

The United States Environmental Protection Agency (EPA) in an effort to promote energy management has created a system for benchmarking energy use amongst various end users. The benchmarking tool utilized for this analysis is entitled Portfolio Manager. The Portfolio Manager tool allows tracking and assessment of energy consumption via the template forms located on the ENERGY STAR website (www.energystar.gov). The importance of benchmarking for local government municipalities is becoming more important as utility costs continue to increase and emphasis is being placed on carbon reduction, greenhouse gas emissions and other environmental impacts.

Based on information gathered from the ENERGY STAR website, Government agencies spend more than $10 billion a year on energy to provide public services and meet constituent needs. Furthermore, energy use in commercial buildings and industrial facilities is responsible for more than 50 percent of U.S. carbon dioxide emissions. It is vital that local government municipalities assess facility energy usage, benchmark energy usage utilizing Portfolio Manager, set priorities and goals to lessen energy usage and move forward with priorities and goals.

In accordance with the Local Government Energy Audit Program, CEG has created an ENERGY STAR account for the owner to access and monitoring the complex's yearly energy usage as it compares to facilities of similar type. The login page for the account can be accessed at the following web address; the username and password are also listed below:

https://www.energystar.gov/istar/pmpam/index.cfm?fuseaction=login.login

The above log in information allows the owner to continue to utilize Portfolio Manager to track and monitor their energy performance. For further direction on how to use the Portfolio Manager Tool such as adding properties, entering data, and viewing results, see training material and live training sessions provided by Energy Star that can be found on their website at www.energystar.gov/buildings/training

The utility bills and other information gathered during the energy audit process are entered into the Portfolio Manager. The following is a summary of the results for the facility:

Table 8
ENERGY STAR Performance Rating

ENERGY STAR PERFORMANCE RATING		
FACILITY DESCRIPTION	**ENERGY PERFORMANCE RATING**	**NATIONAL AVERAGE**
Mastro Montessori Academy	95	50

Refer to **Statement of Energy Performance Appendix** for the detailed energy summary for the complex.

V. FACILITY DESCRIPTION

The Mastro Montessori Academy is located at 35 White Road in Shrewsbury, New Jersey. The 8,044 SF building was originally built in 2012 with no additions. The building is a two-story facility comprised of main lobby, four classrooms, kitchenette, office, laundry closet, restrooms, and other utility/storage rooms.

Occupancy Profile

The typical hours of operation for the school are Monday through Friday between 8:00 am and 4:00 pm. The school is closed on weekend. The building is occupied year round with several summer activity camps. The school has an enrollment of approximately 82 students and 13 staff.

Building Envelope

Exterior walls for school are constructed of wood stud construction with vinyl siding exterior, insulation, and gypsum board interior. The windows throughout are in good condition and are double pane, operable, ¼" coated glass with vinyl frames. The roof is an A-Frame style roof with wood truss supports, plywood sheathing, vapor barrier, and tar shingle. Fiberglass insulation is located in the attic space between the ceiling joists and is approximately 4 to 6 inch thick.

HVAC Systems

The school is conditioned by six (6) constant volume split systems with gas-fired furnaces. The furnace, cooling coil, and blower fan are located in the attic space, and the outdoor condensing units are located at grade in the rear of the building. The units are manufactured by Trane with a cooling capacity of 5 tons, and heating capacity of 97 MBH. Four of the air handlers each serve a classroom on the first and second floor, and the remaining two air handlers serve the first and second floor center core areas.

The vestibule and stairs each have a wall mounted electric cabinet heater rated at 4,800 watts. The attic is heated by a single Reznor gas fired unit heater rated at 60 MBH of heating.

The building has one hot water heating boiler that is wall mounted located in the 1st floor utility room. The boiler is manufactured by Prestige with an input rating of 110 MBH and is 90% efficient. This boiler generates heating hot water for the snow melt system on the sidewalks and floor heating located in the first floor classrooms.

Exhaust System

Each restroom has a switch activated exhaust fan with a fractional horsepower motor.

HVAC System Controls

The HVAC systems are controlled by individual Honeywell Digital Programmable Thermostats. These thermostats serve each zone independently and operate a single air handling unit. The

thermostats are currently programed with schedules for day and night setback. It was noted in the field though these schedules varied from unit to unit.

Domestic Hot Water

Domestic hot water is provided by a Bradford White Electric hot water heater rated at 60 MBH natural gas input coupled with a 48 gallon storage tank.

Miscellaneous / Kitchen Equipment

The kitchenette on the second floor is equipped with a 15 cubic-foot residential refrigerator, and under counter GE dishwasher. Each classroom has a 4.5 cubic foot refrigerator. The second floor also has a front loading washing machine and gas dryer manufactured by Frigidaire/Electrolux.

Lighting

Refer to the **Investment Grade Lighting Audit Appendix** for a detailed list of the lighting throughout the facility and estimated operating hours per space.

VI. MAJOR EQUIPMENT LIST

The equipment list contains major energy consuming equipment that through implementation of energy conservation measures could yield substantial energy savings. The list shows the major equipment in the complex and all pertinent information utilized in energy savings calculations. An approximate age was assigned to the equipment in some cases if a manufactures date was not shown on the equipment's nameplate. The ASHRAE service life for the equipment along with the remaining useful life is also shown in the Appendix.

Refer to the **Major Equipment List Appendix** for this facility.

VII. ENERGY CONSERVATION MEASURES

ECM #1: Interior Lighting Upgrades

Description:

The interior lighting throughout the facility is provided by 32W T8 lamps, along with some LED recessed 2x2 fixture. The T8 fixtures can be replaced or retrofitted with new LED type fixtures and lamps.

This ECM includes retrofitting all of the T8 interior lighting with LED linear Tube lamps manufactured by Philips and are part of the Instant Fit Line. These tubes can be installed directly in a T8 fixture with instant start ballast without the need for direct line voltage. It is recommended that the School consult with a lighting engineer prior to retrofitting or replacing interior fixtures to ensure code required minimum light levels will be met.

Energy Savings Calculations:

The **Investment Grade Lighting Audit Appendix** outlines the hours of operation, proposed new fixtures/retrofits, costs, savings, and payback periods for each set of interior fixtures in the school.

LIGHTING UPGRADE SAVINGS SUMMARY	
DESCRIPTION	**SAVINGS**
Electric Demand Savings (kW)	3.3
Electric Usage Savings (kWh)	6,168
Electric Cost Savings ($)	$1,055

Maintenance Savings and Project Costs:

No maintenance cost savings were estimated for this measure.

Project Costs are based off Vendor quotes data.

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$8,589
NJ Smart Start Equipment Incentive ($):	$1,160
Net Installation Cost ($):	$7,429
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,055
Total Yearly Savings ($/Yr):	$1,055
Estimated ECM Lifetime (Yr):	15
Simple Payback	7.0
Simple Lifetime ROI	113.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$15,825
Internal Rate of Return (IRR)	11%
Net Present Value (NPV)	$5,165.52

ECM #2: Interior Lighting Controls Upgrade

Description:

Some of the lights in rooms that have intermittent occupancy, such as restrooms and offices, could benefit from the installation of automatic lighting occupancy controls. In many cases the lights are left on because of the inconvenience to manually switch lights off when a room is left or on when a room is first occupied. In some instances lights are left on due to the misconception that it is better to keep the lights on rather than to continuously switch lights on and off. Although increased switching reduces lamp life, the energy savings outweigh the lamp replacement costs. The payback timeframe for when to turn the lights off is approximately two minutes. If the lights are expected to be off for at least a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is adequate to provide reduced lighting levels when full light output is not needed. Occupancy sensors detect motion and will switch the lights on when the room is occupied. Occupancy sensors can either be mounted in place of a current wall switch, or on the ceiling to cover large areas. In addition, daylight control systems can be implemented using daylighting control systems that dim the electric lighting in response to interior daylight levels. The light output of the fluorescent lamps (T8) is varied by using electronic dimming ballasts. Photosensors, typically mounted in the ceiling, are used to measure the quantity of daylight in the space then determine the amount of dimming required to maintain adequate lighting levels in the total space.

The U.S. Department of Energy sponsored a study to analyze energy savings achieved through various types of building system controls. The referenced savings is based on the "Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways," document posted for public use April 2005. The study has found that buildings have the potential to achieve significant energy savings through the use of building controls. The average energy savings are as follows based on the report:

- Occupancy Sensors for Lighting Control 20% - 28% energy savings.

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 20% of the total light energy controlled by occupancy sensors.

This ECM includes installation of ceiling or switch-mount sensors for the restrooms, offices, etc. Sensors shall be manufactured by Sensorswitch, Watt Stopper or equivalent.

The **Investment Grade Lighting Audit Appendix** of this report includes the summary of lighting controls which can be implemented in this ECM and outlines the proposed lighting/daylighting controls, costs, savings, and payback periods. The calculations adjust the lighting power usage by the applicable percent savings for each area that includes lighting controls.

Energy Savings Calculations:

$$\text{Energy Savings} = (\%\ \text{Savings} \times \text{Controlled Light Energy (kWh/Yr)})$$

$$\text{Savings.} = \text{Energy Savings (kWh)} \times \text{Ave Elec Cost}\left(\frac{\$}{\text{kWh}}\right)$$

LIGHTING CONTROLS SAVINGS SUMMARY	
DESCRIPTION	**SAVINGS**
Electric Demand Savings (kW)	0.0
Electric Usage Savings (kWh)	219
Electric Cost Savings ($)	$37

Maintenance Savings and Project Costs:

No maintenance cost savings were estimated for this measure.

Project Costs are based off RS Means Unit Cost Data and Vendor quotes.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,450
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$1,450
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$37
Total Yearly Savings ($/Yr):	$37
Estimated ECM Lifetime (Yr):	15
Simple Payback	39.2
Simple Lifetime ROI	-61.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$555
Internal Rate of Return (IRR)	-10%
Net Present Value (NPV)	($1,008.30)

ECM #3: High Efficiency Gas Hot Water Heater

Description:

The Mastro Academy has an existing gas-fired hot water heater with storage, which is located on the first floor in a utility closet. While the unit is fairly new, it's rated at a standard efficiency of 80%. Savings could be realized by installing a condensing style water heater, as well as being tank-less to eliminate storage losses.

This ECM will replace the gas domestic water heater with a 95.0% thermal efficient Bradford White Infiniti Tank-less Series Natural Gas fired 199 MBH.

Energy Savings Calculations:

Energy Density for "Education" type building = 5.2 kBtu / SF / year

$$DHW\ \ Heat\ Usage = Energy\ Density\left(\frac{kBtu\ yr}{SF}\right) \times Building\ Square\ Footage\ (SF)$$

$$DHW\ Total\ Usage = \frac{Dom\ HW\ \ Heat\ Cons.(Btu)}{Heating\ \ Eff.(\%) \times Fuel\ \ Heat\ Value\left(\frac{BTU}{Fuel\ Unit}\right)}$$

$$Energy\ Cost = Heating\ \ Fuel\ Usage(Fuel\ Units) \times Ave\ Fuel\ Cost\left(\frac{\$}{Fuel\ Unit}\right)$$

TANKLESS DOM. HOT WATER HEATER CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Hot Water Heater	Bradford White High Efficiency	
Building Type	Education		
Building Square-foot	8,044	8,044	
Domestic Water Usage, kBtu	41,828.80	41,828.80	
DHW Heating Fuel Type	Gas	Gas	
Fuel Heat Value Electricity(BTU/KWH)	*3,413*	*3,413*	
Fuel Heat Value Nat Gas (Btu/Therms)	*100,000*	*100,000*	
Heating Efficiency	80%	95%	15%
Total Usage (kBTU)	52,286	44,030	8,256
Nat Gas Cost ($/Therm)	$ 1.100	$ 1.100	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Natural Gas Usage (Therms)	523	440	83
Energy Cost ($)	$575	$484	$91
COMMENTS:	Savings are based on Energy Information Administration Commercial Building Energy Consumption Survey 2003 Information		

Maintenance Savings and Project Costs:

No maintenance cost savings were estimated for this measure.

Project Costs are based off RS Means Unit Cost data.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$7,000
NJ Smart Start Equipment Incentive ($):	$300
Net Installation Cost ($):	$6,700
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$91
Total Yearly Savings ($/Yr):	$91
Estimated ECM Lifetime (Yr):	15
Simple Payback	73.6
Simple Lifetime ROI	-79.6%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,365
Internal Rate of Return (IRR)	-15%
Net Present Value (NPV)	($5,613.65)

ECM #4 – Add Insulation

Description:

The Academy currently has approximately 6 inches of lay-in insulation in the attic space. While the insulation is in good condition, some areas have pieces removed, or that are pulled out from in between the rafters. By improving the insulation in the space, thermal losses during the winter and summer will be reduced drastically, and improve comfort conditions for occupants.

This ECM would install blow-in insulation overtop the existing insulation into the attic space. The blow insulation is manufactured by GreenFiber, and is Energy Star Rated.

Energy Savings Calculations:

Heating Savings Calculations

$$\text{Heat Loss (kbtu)} = \text{Area (SF)} \times \left(\frac{1}{\text{R} - \text{Value}}\right) \times \text{HDD} \times 24\frac{\text{Hr}}{\text{day}}$$

$$\text{Natural Gas Usage (therm)} = \text{Heat Loss (kBtu)} \times \frac{1\ \text{therm}}{100\ \text{kBtu}} \times \frac{1}{\text{Heating Efficiency}}$$

Cooling Savings Calculations

$$\text{Heat Gain (kbtu)} = \text{Area (SF)} \times \left(\frac{1}{\text{R} - \text{Value}}\right) \times \text{CDD} \times 24\frac{\text{Hr}}{\text{day}}$$

$$\text{Electric Usage (kWh)} = \text{Heat Loss (kBtu)} \times \frac{1}{\text{SEER } (\frac{\text{Btu}}{\text{W}})}$$

ADD INSULATION TO ROOF ATTIC			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Description	Insulation	Add Blown Insulation	
Roof Area (SF)	4,000	4,000	
Existing Insulation R-Value	15	15	
Added Insulation R-Value	-	60	
Heating Degree Days	5,198	5,198	
Cooling Degree Days	870	870	
Hour per Day	24	24	
Heat Loss (kBtu)	33,267	6,653	26,614
Heating System Efficiency	85%	85%	
Heat Gain (kBtu)	5,568	1,114	4,454
Cooling System Efficiency (S/EER)	13.0	13.0	
Electric ($/kWh)	$0.171	$0.171	
Natural Gas ($/therm)	$1.100	$1.100	
ENERGY SAVINGS CALCULATIONS			
Electric Usage (kWh)	428	86	343
Natural Gas Usage (Therm)	391	78	313
Energy Cost ($)	$504	$101	$403
COMMENTS:			

Maintenance Savings and Project Costs:

No maintenance cost savings were estimated for this measure.

Project Costs are based off RS Means Unit Cost Data and Vendor quotes.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,200
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$2,200
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$403
Total Yearly Savings ($/Yr):	$403
Estimated ECM Lifetime (Yr):	15
Simple Payback	5.5
Simple Lifetime ROI	174.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$6,045
Internal Rate of Return (IRR)	16%
Net Present Value (NPV)	$2,610.99

ECM #5: Water Conservation

Description:

The Academy utilizes standard plumbing fixtures in its staff and public restrooms; and kitchenette. The typical water faucet consumption is only slightly below minimum federal required standards for water efficiency. New fixtures are available that use less water than today's requirements and can add up to significant water reduction over a long period.

This ECM includes the retrofitting of the existing faucets within the facility with new low flow 0.5 GPM aerators. The number of plumbing fixtures to be replaced is based on observations of the facility. When water consumption information was not available, the GPF values were estimated for the existing fixtures. Toilets were not recommended for replacement as they are already efficient with a rating of 1.6 GPF, and lower flow options produce minimal savings.

Energy Savings Calculations:

Faucets:

$$\text{Water Usage} = \text{Occupancy}\left(\frac{\text{Days}}{\text{yr}}\right) \times \frac{\text{Uses}}{\text{Day}} \times \text{Duration}\left(\frac{\text{min}}{\text{Use}}\right) \times \text{Fixture}\left(\frac{\text{Gal}}{\text{Min}}\right)$$

$$\begin{aligned}\text{Natural Gas (Therm)} &= \text{Faucet Water Usage (Gal)} \times 50\% \frac{\text{Hot}}{\text{Cold}} \text{Mix} \times 8.33 \frac{\text{lbs}}{\text{Gal}} \times \text{Specific Heat (1)} \\ &\times\ \Delta\text{T} \times \frac{\text{Therm}}{100{,}000\ \text{Btu}} \times \frac{1}{\text{HWH Efficiency}}\end{aligned}$$

The cost for installation and materials is based on 5 faucet aerators. There are no Smart Start rebates for installation of low flow plumbing fixtures.

LOW FLOW WATER SAVING DEVICES			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Quantity of Sinks	5	5	
Flow Rate (GPM)	1.5	0.5	
Device Usage (min per day)	5	5	
Facility Operation (days / year)	230	230	
Heat Content of Water (Btu/gal/°F)	8.33	8.33	
Temperature Rise (°F)	60.0	60.0	
Efficiency of Heating System (%)	80%	80%	
Conversion Factor for Gas	100000	100000	
Natural Gas Rate ($/therm)	$1.100	$1.100	
Water Rate ($/1000gal)	$11.230	$11.230	
ENERGY SAVINGS CALCULATIONS			
Natural Gas Usage (Therm)	27	9	18
Water Usage (gallons)	8,625	2,875	5,750
Energy Cost ($)	$126	$42	$84
COMMENTS:	Heating Savings based on 50% Hot Cold Mix		

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$300
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$300
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$84
Total Yearly Savings ($/Yr):	$84
Estimated ECM Lifetime (Yr):	15
Simple Payback	3.6
Simple Lifetime ROI	320.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,260
Internal Rate of Return (IRR)	27%
Net Present Value (NPV)	$702.79

VIII. RENEWABLE/DISTRIBUTED ENERGY MEASURES

Globally, renewable energy has become a priority affecting international and domestic energy policy. The State of New Jersey has taken a proactive approach, and has adopted in its Energy Master Plan a goal of 30% renewable energy by 2020. To help reach this goal, New Jersey created the Office of Clean Energy under the direction of the Board of Public Utilities and instituted a Renewable Energy Incentive Program to provide additional funding to private and public entities for installing qualified renewable technologies. A renewable energy source can greatly reduce a building's operating expenses while producing clean environmentally friendly energy. Concord Engineering has assessed the feasibility of installing renewable energy measures (REM) for the facility utilizing renewable technologies and concluded that there is potential for solar energy generation.

Solar Generation

Solar energy produces clean energy and reduces a building's carbon footprint. This is accomplished via photovoltaic panels which are mounted on all south and southwestern facades of the building. Flat roof, as well as sloped areas can be utilized; flat areas will have the panels turned to an optimum solar absorbing angle. (A structural survey of the roof would be necessary before the installation of PV panels is considered). The state of NJ has instituted a program in which one Solar Renewable Energy Certificate (SREC) is given to the Owner for every 1000 kWh of generation. SREC's can be sold anytime on the market at their current market value. The value of the credit varies upon the current need of the power companies. The average value per credit is around $152, this value was used in our financial calculations. This equates to $0.152 per kWh generated.

CEG has reviewed the existing roof, ground, and parking lot area potential of the facility for the purposes of determining a potential for a photovoltaic system. The facility was evaluated for the most economical and feasible areas for the installation of a solar array, which included a parking lot array, and roof mounted array. A depiction of the area utilized at the facility is shown in **Renewable / Distributed Energy Measures Calculation Appendix**. Note this analysis did not include a structural evaluation to determine if the roof could accommodate the additional loading, which would be required to be performed prior to implementation. The total KWH production for the system is 37,181 kWh annually, which results in an over production of electricity of 3% based on the most recent 12 months of bills. While the site has the potential to over generate, we recommend installing a slightly smaller system, as state net metering guidelines do not want net metered systems to over generate on a consistent basis. A detailed financial analysis can be found in the **Renewable / Distributed Energy Measures Calculation Appendix**. This analysis illustrates the payback of the system over a 15 year period. The eventual degradation of the solar panels and the price of accumulated SREC's are factored into the payback.

The proposed photovoltaic array layout is designed based on the specifications for the Sharp Model ND-240QCJ panel. This panel has a "DC" rated full load output of 240 watts, and has a total panel conversion efficiency of 14.4%. Although panels rated at higher wattages are available through Sharp and other various manufacturers, in general most manufacturers who

produce commercially available solar panels produce a similar panel in the 200 to 250 watt range. This provides more manufacturer options to the owner if they wish to pursue the proposed solar recommendation without losing significant system capacity.

The array system capacity was sized based on available roof space, ground area, or parking canopy style system area available at the existing complex. Estimated solar array generation is calculated based on the National Renewable Energy Laboratory PVWatts Version 1.0 Calculator. In order to calculate the array generation an appropriate location with solar data on file must be selected. In addition the system DC rated kilowatt (kW) capacity must be inputted, a DC to AC de-rate factor, panel tilt angle, and array azimuth angle. The DC to AC de-rate factor is based on the panel nameplate DC rating, inverter and transformer efficiencies (95%), mismatch factor (98%), diodes and connections (100%), dc and ac wiring(98%, 99%), soiling, (95%), system availability (95%), shading (if applicable), and age(new/100%). The overall DC to AC de-rate factor has been calculated at an overall rating of 86%. The PVWatts Calculator program then calculates estimated system generation based on average monthly solar irradiance and user provided inputs. The monthly energy generation and offset electric costs from the PVWatts calculator is shown in the **Renewable/Distributed Energy Measures Calculation Appendix**.

The proposed solar arrays for the complex are qualified by the New Jersey Board of Public Utilities Net Metering Guidelines as a Class I Renewable Energy Source. These guidelines allow onsite customer generation using renewable energy sources such as solar and wind with a capacity of 2 megawatts (MW) or less. This limits a customer system design capacity to being a net user and not a net generator of electricity on an annual basis. Although these guidelines state that if a customer does not generate (produce more electricity than they use), the customer will be credited those kilowatt-hours generated to be carried over for future usage on a month to month basis. Then, on an annual basis if the customer is a net generator the customer will then be compensated by the utility the average annual PJM Grid LMP price per kilowatt-hour for the over generation. Due to the aforementioned legislation, the customer is at limited risk if they generate more than they use at times throughout the year. With the inefficiency of today's energy storage systems, such as batteries, the added cost of storage systems is not warranted and was not considered in the proposed design.

Direct purchase involves the owner paying for 100% of the total project cost upfront in lieu of one of the methods noted in the Installation Funding Options section below. Calculations include a utility inflation rate as well as the degradation of the solar panels over time. The financial summary for the complex is as follows:

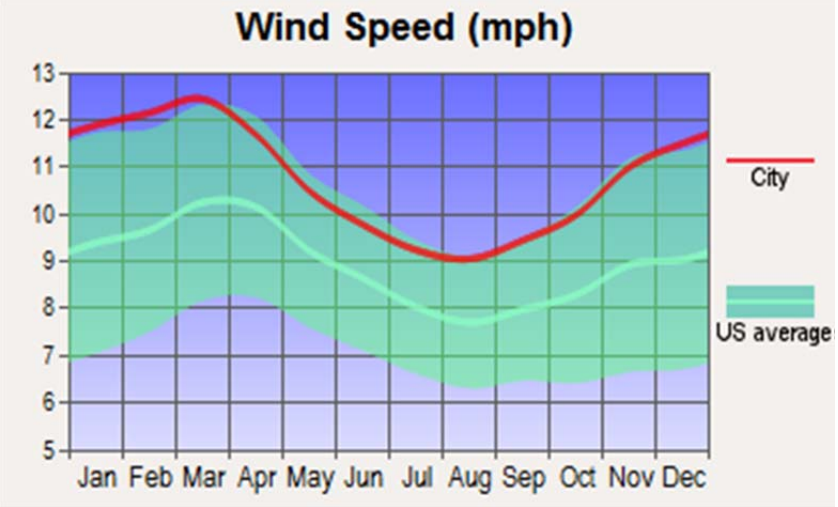
REM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$144,032
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$144,032
SREC Revenue ($/Yr):	$5,633
Energy Savings ($/Yr):	$6,321
Total Yearly Savings ($/Yr):	$11,954
Estimated ECM Lifetime (Yr):	15
Simple Payback	12.0
Simple Lifetime ROI	24.5%
Simple Lifetime Maintenance Savings	$84,496
Simple Lifetime Savings	$179,309
Internal Rate of Return (IRR)	2.9%
Net Present Value (NPV)	($1,327.05)

Concord Engineering recommends that the owner review all options available for installation of solar PV systems at Montessori Academy including a Power Purchase Agreement (PPA). This option utilizes providers who will own, operate, and maintain the system for a period of 15 years. During this time the PPA Provider would sell all of the electric generated by Solar Array to the facility at a reduced rate compared to their existing electric rate. It should be noted that current SREC pricing has significantly impacted the PPA market in addition to the end of the 30% grant in lieu of the investment tax credit. These recent market changes have made it more difficult for entities to secure low cost power purchase price options.

Wind Generation

In addition to the Solar Analysis, CEG also conducted a review of the applicability of wind energy for the facility. Wind energy production is another option available through the Renewable Energy Incentive Program. Wind turbines of various types can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. CEG investigated the potential for smaller building mountable wind turbines, and horizontal turbines to maximize the available free space. In order to be economically viable a site requires a minimum average speed of 6 meters per second (13.5 mph). Based on the obtained wind data shown in **Figure 3** for Shrewsbury, NJ the annual average wind speed is 10.6 mph with a peak of 12.5 mph. While the wind speed is higher than the average U.S. City and may support a smaller turbine, the site has limited space available to support a turbine. Therefore, wind energy is not a viable option for implementation.

Figure 3
Shrewsbury, New Jersey Average Wind Speeds



IX. ENERGY PURCHASING AND PROCUREMENT STRATEGY

Load Profile:

Load Profile analysis was performed to determine the seasonal energy usage of the facility. Irregularities in the load profile will indicate potential problems within the facilities. Consequently based on the profile a recommendation will be made to remedy the irregularity in energy usage. For this report, the facilities energy consumption data was gathered in table format and plotted in graph form to create the load profile. Refer to The Electric and Fuel Oil Usage Profiles included within this report to reference the respective electricity and natural gas usage load profiles.

Electricity:

The electricity usage profile demonstrates a summer cooling dominated load profile from winter to summer. The average summer (May-September) consumption is 6% more than the average winter (October-April) consumption.. The following table outlines the seasonal average monthly consumption and demand for the facility.

ELECTRIC UTILITY SEASONAL LOAD PROFILE		
DESCRIPTION	SEASONAL AVERAGES	
	KWH PER MONTH	KW PER MONTH
Summer (May to September)	2,764	21
Winter (October to April)	2,600	21
Avg. Load Increase Winter to Summer	6.3%	1.0%

The historical usage profile is somewhat favorable as typically winter commodity rates are lower due to reduced demand on the grid, compared with summer. Third Party Supplier (TPS) electric commodity contracts that offer a firm, fixed price for 100% of the facilities electric requirements and are lower than the JCP&L's BGS-FP default rate are recommended.

Natural Gas:

The Natural Gas Usage Profile demonstrates a heating load dominated profile, with minimal consumption being contributed by domestic hot water and other gas consumers. The average summer (May – September) consumption is 91% less than the average winter (October- April) consumption. The follow table outlines the seasonal average monthly consumption for each facility.

NATURAL GAS UTILITY SEASONAL LOAD PROFILE		
DESCRIPTION	SEASONAL AVERAGES	
	THERM PER MONTH	
Summer (May to September)	27.1	
Winter (October to April)	315.2	
Avg. Load Decrease Winter to Summer	91.4%	

Typically natural gas pricing is higher during the peak winter heating season, meaning this profile would yield less than favorable prices.

Tariff Analysis:

Electricity:

The facility receives electrical service from Jersey Central Power & Light (JCP&L) under commercial rate classifications General Service Secondary (GS1). The facility has not contracted a Third Party Supplier (TPS) to provide electric commodity service. For electric supply (generation) service, the client has a choice to either use JCP&L's default service rate BGS or contract with a Third Party Supplier (TPS) to supply electricity.

Each year since 2002, the four New Jersey Electric Distribution Companies (EDCs) - Public Service Gas & Electric Company (PSE&G), Atlantic City Electric Company (ACE), Jersey Central Power & Light Company (JCP&L), and Rockland Electric Company (RECO) - have procured several billion dollars of electric supply to serve their Basic Generation Service (BGS) customers through a statewide auction process held in February.

BGS refers to the service of customers who are not served by a third party supplier or competitive retailer. This service is sometimes known as Standard Offer Service, Default Service, or Provider of Last Resort Service.

The Auction Process has consisted of two auctions that are held concurrently, one for larger customers on an hourly price plan (BGS-CIEP) and one for smaller commercial and residential customers on a fixed-price plan (BGS-FP). This facility's rate structure is based on the fixed-price plan (BGS-FP).

The utility will continue to be responsible for maintaining the existing network of wires, pipes and poles that make up the delivery system, which will serve all consumers, regardless of whom they choose to purchase their electricity or natural gas from. JCP&L's delivery service rate includes the following charges: Customer Service Charge, Distribution Charge (kWh and Demand), Societal Benefits Charge (SBC), and Securitization Transition Charge.

Natural Gas:

The facility currently receives natural gas distribution service from New Jersey Natural Gas (NJNG) under rate schedules GSS (General Service Gas Small). The facility has not contracted with a Third Party Supplier (TPS). For natural gas supply service, the client has a choice to either use NJNG's default service rate BGSS or contract with a Third Party Supplier (TPS) to supply natural gas commodity service.

NJNG provides basic gas supply service (BGSS) to customers who choose not to shop from a Third Party Supplier (TPS) for natural gas commodity. The option is essential to protect the reliability of service to consumers as well as protecting consumers if a third party supplier defaults or fails to provide commodity service.

The utilities are responsible for maintaining the existing network of wires, pipes and poles that make up the delivery system, which will serve all consumers, regardless of whom they choose to purchase their electricity or natural gas from. NJNG's delivery service rate includes the following charges: Customer Service Charge, Distribution Charge, & Societal Benefits Charge (SBC).

Electric and Natural Gas Commodities Market Overview:

Winter 2014 proved to be one for the record books. Across the United States, temperatures plunged and states that rarely see snow have been paralyzed by icy conditions. The energy market was not spared. Market rates have been fluctuating wildly, reaching as much as $1,765 per MWh ($1.765/kWh) in PJM-West Hub when winter storms swept much of the northern half of the nation in January.

In our region, electricity is produced by natural gas, nuclear, coal and renewables. Much of the recent electricity increases are in relation to very high spot natural gas pricing on generation that produces electricity and the retirement of coal plants. Currently in PJM (PJM is the independent operating system that provides power to Pennsylvania, DC, New Jersey, Delaware and Maryland states) the severe cold in January 2014 led to the temporary lift of the $1000/mWh cap on electric market based pricing. This cap is lifted thru March 31, 2014. Many natural gas generators were not hedged on natural gas and the natural gas spot market on January 24th reached over $124.00/dth or $12.40/therm. Unfortunately, these costs are now being passed on to clients who were not in a fixed price contract.

Commodity pricing in 2008 and winter of 2014 marked historical highs in both natural gas and electricity commodity. Commodity pricing commencing spring of 2014 although higher than previous years continues to be favorable for locking in long term (2-5 year) contracts with 3rd Party Supplier's for both natural gas and electricity supply requirements.

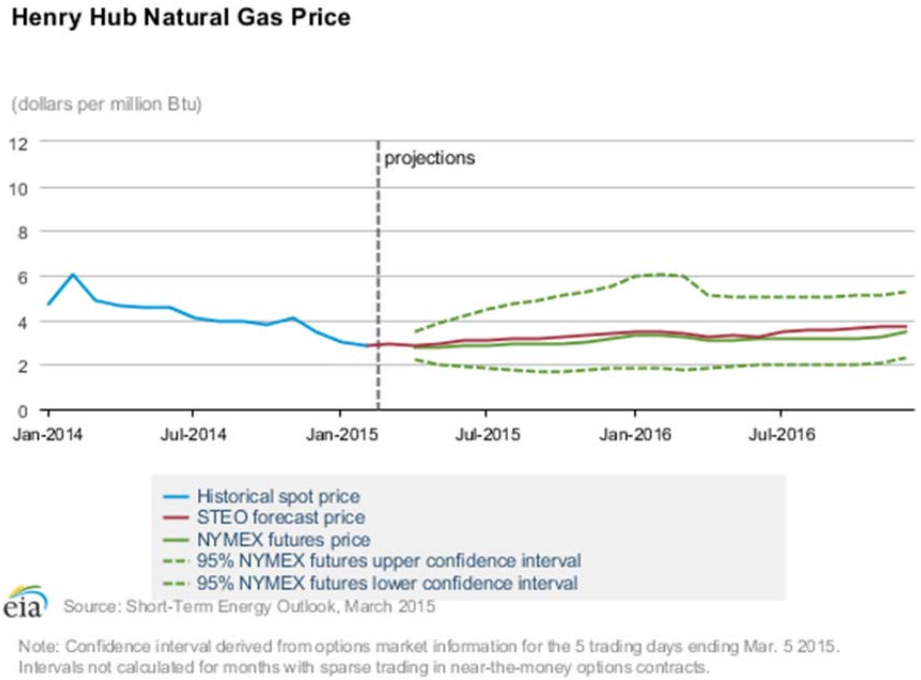
It is important to note that both natural gas and electric commodity market prices are moved by supply and demand, political conditions, market technicals and trader sentiment. The market is continuously changing Energy commodity pricing is also correlated to weather forecasts.

Because weather forecasts are dependable only in the short-term, prolonged temperature extremes can really cause extreme price swings.

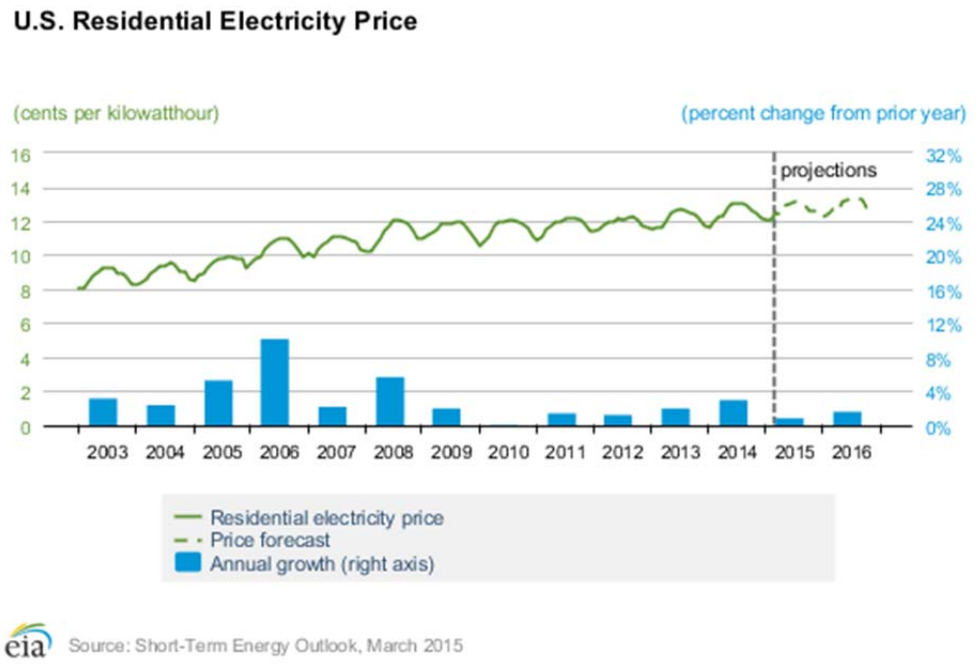
Short Term Energy Outlook - US Energy Information Administration (March 2015):

U.S. Natural Gas Prices. Natural gas spot prices averaged $2.87/MMBtu at the Henry Hub in February, a decline of $0.12/MMBtu from January. At the end of February, spot prices are expected to remain less than $3/MMBtu through May, and less than $4/Mmbtu thorugh the remainder of the forecast. Projected Henry Hub natural gas prices average $3.07/MMBtu in 2015 and $3.48/MMBtu in 2016.

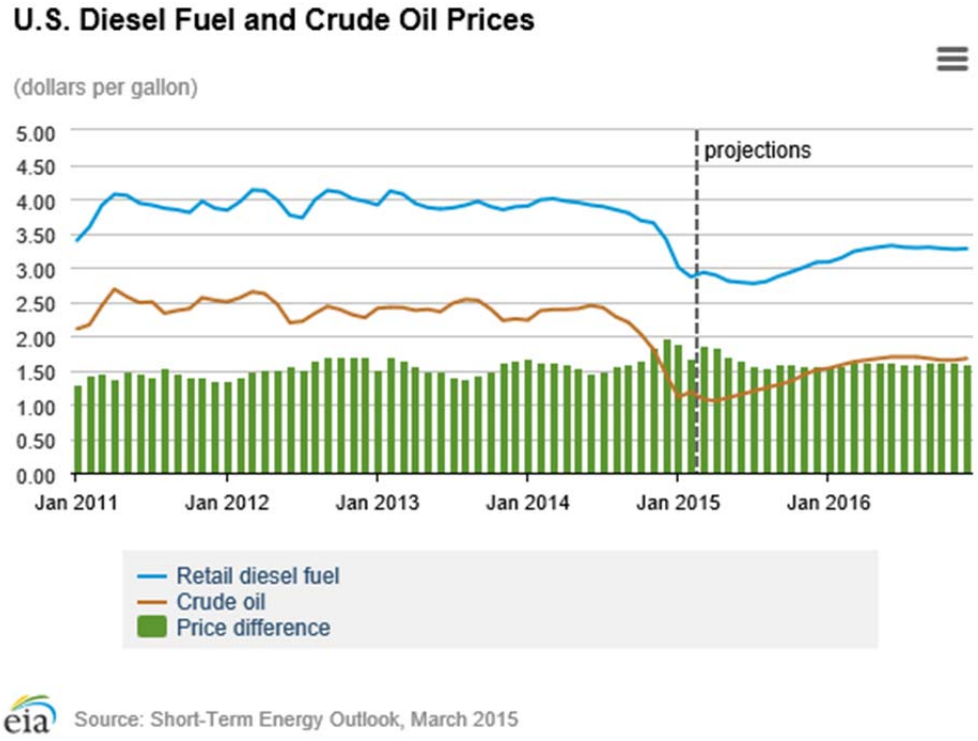
Natural gas futures prices for June 2015 delivery (for the five-day period ending March 5, 2015) averaged $2.83/MMBtu. Current options and futures prices imply that market participants place the lower and upper bounds for the 95% confidence interval for June 2015 contracts at around $1.92/MMBtu and $4.18/MMBtu, respectively.



U.S. Electricity Retail Prices. EIA expects the U.S. residential price of electricity to average 13.0 cents per kilowatthour during 2014, an increase of 3.1% from 2013. Residential electricity prices are expected to increase 1.0% during 2015, 1.8% in 2016.



U.S. Petroleum Product Prices. EIA expected even with the recent cold weather that heating oil prices will be lower than last winter, due to lower projected crude oil prices compared to last winter. Compared to last winter retail heating oil prices are expected to average $30.2/Gal this winter, a decline $0.86/Gal compared to last winter.



Contracting with Third Party Suppliers and BGS Bidding Options

Cooperative Purchasing:

Cooperative Purchasing agreements allow multiple parties to come together under the premise of using purchasing power in order to reduce the price for goods and services. In this instance the Cooperative is under the unified goal of reducing energy prices for its members. As such members of the cooperative pool their respective energy consumption together into a single bid to obtain low cost energy pricing.

Many Cooperatives have a formal bidding process and insure all suppliers provide the required documentation and paperwork necessary per New Jersey Administrative Code and Procurement Law. In addition, a Master Agreement is incorporated into the bid specifications with terms and conditions for the energy supply award protecting Local Government Entities. Concord does not recommend signing any Third Party Supplier contract or agreement unless it has been heavily vetted by an attorney that understands commodity law and regulation. Many government clients that have signed third party supplier contracts are now experiencing regulatory pass-thru charges due to vague or inadvertently agreed terms and conditions.

Important information can be found on DCA's website regarding Cooperative Purchasing.
Please visit web link:
http://www.state.nj.us/dca/divisions/dlgs/programs/lpcl_docs/Procuring_Power_Supply_through_a_Cooperative_Purchasing_System.pdf
It is important with any commodity procurement undertaking that you incorporate a rational, defensible strategy for purchasing commodity in volatile markets based upon the following:

- Budgets that reflect sound market intelligence
- An understanding of historical prices and trends
- Awareness of seasonal opportunities (e.g. shoulder months)
- Negotiation of fair contractual terms
- An aggressive, market based price

Bidding Practices and Processes:

Different bid processes and methodologies can create different objectives, but transparency is always a primary goal. Closed bid competitive purchase RFBs, online bid receipt or online reverse auctions can be utilized. Firms which can provide online bidding and reverse auctions are approved by the New Jersey Division of Local Government Services pursuant to the Local Unit Electronic Technology Program, (P.L.2001, c. 30). Approved firms can be found on the website at: http://www.state.nj.us/dca/divisions/dlgs/programs/lpcl.html. The Board of Public Utilities also offers a list of energy suppliers available for each service territory that can be found on the website at: http://www.bpu.state.nj.us/bpu/commercial/shopping.html#nbr1

Over the last decade, Concord has been involved with numerous approaches to bidding including the Traditional Sealed Bid format and Online Reverse Auction methods. In our experience, Online Reverse Auctions do not always produce optimum results for retail commodity purchases. The procurement consultant with the Client should determine a bidding practice that

will yield optimum results and create a robust competitive environment. Many factors will come into consideration to determine whether the Online Bidding and/or Reverse Auction method is appropriate. Factors such as annual consumption, number and complexity of accounts, potential supplier participation as well as rate tariffs must be taken into consideration.

LGE's Purchasing Options:

Per DCA's paper entitled "Taking Advantage of Lower Electric Rates for your Government Agency" they state, "First, it is important to emphasize that procurement of power supply *must* be consistent with the Local Public Contracts Law (LPCL) or for boards of education, the Public School Contracts Law (PSCL). Bottom line: When the estimated amount of spending for *power supply* is above the contracting unit's bid threshold, power supply must be publicly bid or purchased subject to an exception to the bid law. "Full text can be found via web link: http://www.state.nj.us/dca/divisions/dlgs/programs/lpcl_docs/Taking_Advantage_of_Lower_Electric_Rates_for_your_Government_Agency.pdf

1. Cooperative Purchasing

"When local governments put aside provincial interests in exchange for the broader benefits to be achieved through Cooperative Purchasing, they can secure the provision and performance of goods and services at a lower cost. Cooperative Purchasing has demonstrated a strong ability to serve as an effective tool to assist local officials save taxpayer dollars. Cooperative Purchasing represents viable alternatives to the conventional "go-it-alone" bidding process. " Many Cooperatives in the state utilize online bidding to secure attractive electricity and natural gas supply service. Utilizing a Cooperative is highly recommended.

Benefits can include:

- Increase staff effectiveness
- Reduce duplication of bidding and contract processing
- Reduce time, effort and costs associated with developing and managing the bid process
- Leverage established and large volume pricing of contracted products
- Great alternative contract option to save time, money and ensure quality products & services

2. Online Reverse Auctions and Online Sealed Bids

"For local government entities, the requirement to bid does not mean the solicitation of quotes; it means a formal process where there is a bid specification, notice to bidders, and a level playing field for all potential bidders. The Division's E-Procurement Pilot program (authorized under P.L. 2001, c. 30) allows local units to purchase commodities and services, including energy supply, through online bidding and reverse auctions programs approved by the Division. Any online organization participating in the online pilot program must be approved by the Division. Once the Division has approved an online service, any local unit can take advantage of the service. When conducted through an online service, however, the local unit is responsible to ensure that the online service is operating consistent with procurement laws for an individual procurement."

Both online reverse auctions and online sealed bids can produce significant cost savings results. The process is transparent and seamless. Many platforms are very flexible allowing for full customization to meet the Client's needs.

All providers of online reverse auction and online bidding charge a fee indirectly to LGE's. The fee is included in the bid pricing shown by suppliers as a $/kWh or $/therm charge and paid directly by the supplier to the vendor. Although LGE's do not have to formally bid for this type of service should they utilize a DCA pre-approved vendor, we would recommend that any and all fees paid by the supplier to the vendor be disclosed prior to any engagement of services.

An overview of both the Online Reverse Auction vs Sealed bid format was published in the NJBIZ Spring of 2007. To view this article, please go to web link:
http://www.nbizmag.com/magarticles/sealedbidvsreverseauction.pdf

Benefits can include:

- Provides full transparency during the procurement process with unbiased decision making
- Drives prices down through real-time competition
- Allows client to actively participate during the entire auction or online bidding process
- Execution of contracts are completed within hours of the auction's close
- Places the focus for suppliers solely on price, since all other factors and related contracting documentation is received and pre-qualified before the final auction bid due date
- Full audit and archival capabilities to substantiate award decisions
- Improves knowledge capture, transfer and re-use capabilities

3. Traditional Sealed Bid Format

This type of bid format is not endorsed by the Division of Local Government Services for the bidding of power supply. However, in a recent review of bidding methodologies and which methodology would likely to produce lower cost results, a NJ Government Agency allowed suppliers to choose the bidding format. The bidding options allowed were either via an Online Reverse Auction or via a Traditional Sealed Bid. The Agency understood that many suppliers will not participate in an online auction format or methodology and wanted to allow all NJBPU suppliers to participate. The Agency is the 2nd largest Cooperative in the state which includes participants from five Counties and over 200 municipalities. After the online reverse auction bid was closed and the traditional sealed bids opened and reviewed, the Agency awarded the electricity contract to a bidder that was the lowest price and submitted their bid via the Traditional Sealed Bid Format.

The below recommendations presented by Concord Engineering are based on current information provided by the owner for their facilities historical energy usage. Any savings presented with these recommendations are estimates only based on that information. It is

recommended that further analysis and review of more recent utility data and actual TPS electricity and natural gas supply contracts and historical billings be performed prior to performing any of the presented recommendations.

Recommendations:

1. Concord recommends the owner investigate using a 3rd party commodity supplier for purchase of electricity and natural gas. By purchasing from a third party the owner may be able to achieve a lower price point then available from the utility company. Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive and contract terms longer than 12 months are desirable.

2. After review of the utility consumption report and current commodity pricing outlook, Concord recommends that the owner utilize the advisement of a 3rd party unbiased Energy Consulting Firm licensed by the State of New Jersey Board of Public Utilities that is experienced in the procurement of commodities, New Jersey procurement laws, aggregation of facilities and energy supply risk and commodity management. This firm should be able to provide full service advisement over the term of the contract, provide market watch opportunities and identify any additional opportunities that may further reduce costs. Many of these opportunities may include: energy rates; utility bill auditing; energy data analytics; and efficiency improvements.

   It is important that a rational, defensible strategy for purchasing commodity in volatile markets is incorporated. Examples include:

   - Budgets that reflect sound market intelligence
   - An understanding of utility and market historical prices and trends
   - Awareness of seasonal opportunities (e.g. shoulder months)
   - Negotiation of fair contractual terms
   - An aggressive, market based price

3. Concord also recommends that the owner consider utilizing a third party utility billing-auditing service to further analyze historical utility invoices such as water, sewer, natural gas, electricity and fuel oil for incorrect billings and rate tariff optimization services. *This service can be based on a shared savings model with no direct cost. The service* could provide refunds on potential incorrect billings that may have been passed through by the utilities and paid by the owner.

PJM Demand Response Programs

Demand response programs may not fit or be applicable to all clients, however if there is an opportunity to shed load, typically above 100 kilowatts, while not having significant impacts on operations and comfort conditions it could warrant consideration. Concord recommends the owner review the program description below from PJM to see if there is a potential fit, as it can become a substantial revenue source dependent on your ability to curtail.

What is PJM?

PJM Interconnection is a regional transmission organization that coordinates the movement of wholesale electricity in all parts of 13 states and the District of Columbia. As an independent party, PJM operates a competitive wholesale electricity market and manages the high-voltage electricity grid to ensure reliability for more than 51 million people. PJM's long-term planning process take a broad, interstate perspective that identifies the most effective and cost efficient improvements to the grid to ensure reliability and economic benefits on the system as a whole.

PJM's "Wholesale" market is focused on entities that buy and sell the electricity, but are not the end consumers of the electricity. The retail market is focused on entities that buy electricity from the wholesale market or produce the electricity, and then sell the electricity to a customer that physically consumes it. PJM does not interact directly with the electricity consumers, but with the companies (or Utility) that provides the electricity to consumers.

What is Demand Response?

Demand Response is a consumer's ability to reduce electricity consumption at their location when wholesale prices are high or the reliability of the electric grid is threatened. Common examples of demand response include: raising the temperature of the thermostat so the air conditioner does not run as frequently, slowing down or stopping production at an industrial operation or dimming/shutting off lights, basically any explicit action taken to reduce load in response to short-term high prices or a signal from PJM.

Demand Response 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.

Retail Customer Program Offerings:

PJM's demand response opportunities enables retail electricity consumers to earn a revenue stream for reducing electricity consumption when either wholesale prices are high or the reliability of the electric grid is threatened. Demand response participation is broken in two broad classifications, Economic and Emergency. An electricity consumer may participate in either or both depending on the circumstances.

Emergency Demand Response primarily represents a mandatory commitment to reduce load or only consume electricity up to a certain level when PJM needs assistance to maintain reliability under supply shortage or expected emergency operation conditions. This is considered a mandatory commitment to which penalties will be applied for non-compliance. The consumer's resources must be available to respond to PJM's request to reduce load where the availability depends on the product selected, as follows:

- *Limited DR* – resource is available for up to 10 weekdays from June through September, where each request may be up to six hours in duration.
- *Extended Summer DR* – resources is available for all days from May through October, where each request may be up to ten hours in duration
- *Annual DR* - resources is available for all days from June through May of following year, where each request may be up to ten hours in duration

PJM considers these resources similar to a generator and fully expects them to perform at the time when the grid most needs it to avoid brownouts and/or rolling blackouts within the PJM service territory. The revenue stream derived from participation is largely driven by the "Capacity" market as defined under the Reliability Pricing Model (RPM). The revenue earned is a function of the relevant RPM price and the load reduction commitment. The resource is paid to be "available" during expected emergency conditions on a monthly basis for a commitment that is made for one year, which starts on June 1 and ends on May 31 of the following year.

Emergency demand response also has the opportunity to participate on a voluntary basis. Under this option, the resources have the option to participate when an emergency is called and will be compensated based on the amount of energy reduced during the emergency. Such resources will not receive revenue from the capacity market.

Economic Demand Response primarily represents a voluntary commitment to reduce load in the energy market when the wholesale price is higher than the published monthly PJM net benefits price. The net benefit price represents the price at which the benefits incurred by a reduction in wholesale prices from the economic demand response will exceed the cost to pay for the economic demand response. The economic demand response will be used to displace a generation resource and PJM expect the resource to perform and will assess deviation charges if the amount of load reductions realized is significantly different than the amount of load reductions dispatched by PJM.

An economic demand response resource may also provide Ancillary Services to the wholesale market with the appropriate infrastructure and qualification by PJM. There are three Ancillary Services markets in which economic demand response resources may participate: Synchronized Reserves (the ability to reduce electricity consumption within 10 minutes of PJM dispatch), Day Ahead Scheduling Reserves (the ability to reduce electricity consumption within 30 minutes of

PJM dispatch) and Regulation (the ability to follow PJM's regulation and frequency response signal). Participation in the market is voluntary; however, if a resource clears, performance is mandatory.

How to Participate?

The first step for a consumer interested in demand response is to contact a Curtailment Service Provider(s) to get a more in-depth understanding of the opportunities and determine whether you have the capability to participate. A list of Curtailment Service Providers is available on PJM's Web site at Markets & Operations > Demand Response > Curtailment Service Providers (www.pjm.com/markets-and-operations/demand-response/csps.aspx). The list includes contact names at the firms; it also indicates in what states the firms do business. PJM also posts on its website the training materials developed for its members who are interested in the rules and requirements for demand response activity at http://www.pjm.com/training/training-material.aspx, along with a variety of demand response information at http://www.pjm.com/markets-and-operations/demand-response.aspx.

X. INSTALLATION FUNDING OPTIONS

CEG has reviewed various funding options for the owner to utilize in subsidizing the costs for installing the energy conservation measures noted within this report. Below are a few alternative funding methods:

A. Incentive Programs:

Pay For Performance
(www.njcleanenergy.com/commercial-industrial/programs/pay-performance)

The New Jersey Smart Start Pay for Performance Program includes incentives based on savings resulted from implemented ECMs. The program is available for all buildings that were audited as part of the NJ Clean Energy's Local Government Energy Audit Program. The facility's participation in the program is assisted by an approved program partner. An "Energy Reduction Plan" is created with the facility and approved partner to shown at least 15% reduction in the building's current energy use. Multiple energy conservation measures implemented together are applicable toward the total savings of at least 15%. No more than 50% of the total energy savings can result from lighting upgrades / changes.

Total incentive is capped at 50% of the project cost. The program savings is broken down into three benchmarks; Energy Reduction Plan, Project Implementation, and Measurement and Verification. Each step provides additional incentives as the energy reduction project continues. The benchmark incentives are as follows:

1. Energy Reduction Plan – Upon completion of an energy reduction plan by an approved program partner, the incentive will grant $0.10 per square foot between $5,000 and $50,000, and not to exceed 50% of the facility's annual energy expense. (Benchmark #1 is capped at 50% of this value if the entity has completed a local government energy audit.)

2. Project Implementation – Upon installation of the recommended measures along with the "Substantial Completion Construction Report," the incentive will grant savings per KWH or Therm based on the program's rates. Minimum saving must be 15%. (Example $0.11 / kWh for 15% savings, $0.12/ kWh for 17% savings, … and $1.10 / Therm for 15% savings, $1.20 / Therm for 17% saving, …) Increased incentives result from projected savings above 15%.

3. Measurement and Verification – Upon verification 12 months after implementation of all recommended measures, that actual savings have been achieved, based on a completed verification report, the incentive will grant additional savings per kWh or Therm based on the program's rates. Minimum savings must be 15%. (Example $0.07 / kWh for 15% savings, $0.08/ kWh for 17% savings, … and $0.70 / Therm for 15% savings, $0.80 / Therm for 17% saving, …) Increased incentives result from verified savings above 15%.

Direct Install Program
(www.njcleanenergy.com/commercial-industrial/programs/direct-install)

The New Jersey Clean Energy's Direct Install Program is a state funded program that targets small commercial and industrial facilities with peak demand of less than 200 kW. This turnkey program is aimed at providing owners a seamless, comprehensive process for analysis, equipment replacement and financial incentives to reduce consumption, lower utility costs and improve profitability. The program covers up to 70% of the cost for eligible upgrades including lighting, lighting controls, refrigeration, HVAC, motors, variable speed drives, natural gas and food service. Participating contractors (refer to www.njcleanenergy.com) conduct energy assessments in addition to your standard local government energy audit and install the cost-effective measures.

The Academy does qualify for the Direct Install Program based on current program criteria.

Smart Start Program
(www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings)

Prescriptive Measures - The New Jersey Clean Energy's Smart Start prescriptive measures incentives include unit pricing incentives for installation of energy efficient equipment and controls. Proposed equipment and controls must meet the minimum efficiency requirements as well as other application requirements. The Smart Start prescriptive incentives applicable for new construction, renovations, remodeling and equipment replacements, for a wide range of equipment including:

- Electric Chillers
- Gas Cooling
- Electric Unitary HVAC
- Ground Source Heat Pumps
- Gas Heating
- Variable Frequency Drives
- Gas Water Heating
- Premium Motors
- Prescriptive Lighting
- Lighting Controls
- Technical Studies

Custom Measures - The New Jersey Clean Energy's Smart Start prescriptive measures incentives include all measures not identified in the prescriptive measures category or measures that must have savings verified through additional analysis such as energy model simulations. Custom measures are intended to include savings as a result of unique energy efficiency measures, which are typically facility specific such as waste heat recovery. Custom incentives are provided based on the amount of energy saved and minimum internal rate of return in order to be eligible.

B. Financing Options:

The following section outlines various funding mechanisms available to fund energy efficiency projects. It is the local government unit's responsibility to verify these funding sources adhere to all required federal, state, and local finance laws.

Municipal Bonds

Municipal bonds are a bond issued by a city or other local government, or their agencies. Potential issuers of municipal bonds include cities, counties, redevelopment agencies, school districts, publicly owned airports and seaports, and any other governmental entity (or group of governments) below the state level. Municipal bonds may be general obligations of the issuer or secured by specified revenues. Interest income received by holders of municipal bonds is often exempt from the federal income tax and from the income tax of the state in which they are issued, although municipal bonds issued for certain purposes may not be tax exempt.

Municipal Lease Purchase (Long-term Municipal Lease Agreements)

A Municipal Lease is a contract that has many of the characteristics of a standard commercial lease, with three primary differences. In a Municipal Lease, the intent of the lessee is to purchase and take title to the equipment. The financing is a full payout contract with no significant residual or balloon payments at the end of the lease term. The lease payments include the return of principal and interest, with the interest being exempt from Federal income taxation to the recipient. Typically, a tax-exempt interest transaction will be financed at interest rates lower than equivalent commercial financing. The Municipal Lease provides for termination for non-appropriation of funds by the Government Agency. A Municipal Lease offers several advantages over alternative methods of financing such as simplicity, speed of delivery, non-appropriation, buyout terms, and cost. Under most state statutes, municipal contracts with terms of over one year require significant investments in time and money in order to comply with municipal debt restrictions. Since a Municipal Lease is, in effect, a year-to-year obligation, many of these requirements do not apply. The ease of executing a Municipal Lease minimizes the elapsed time and the expenses associated with issuing any kind of certificate of indebtedness or bond.

Lease to Own (Leaseback)

A lease to own arrangement is where the seller of an asset (i.e. building, equipment, etc.) leases back the same asset from the purchaser. In a leaseback arrangement, the specifics of the arrangement are made immediately after the sale of the asset, with the amount of the payments and the time period specified. Essentially, the seller of the asset becomes the lessee and the purchaser becomes the lessor in this arrangement. A leaseback arrangement is useful when entities need to un-tie the cash invested in an asset for other investments, but the asset is still needed in order to operate. Leaseback deals can also provide the seller with additional tax deductions. The lessor benefits in that they will receive stable payments for a specified period of time.

Power Purchase Agreement

Public Law 2008, Chapter 3 authorizes contracts of up to fifteen (15) years for energy purchase contracts commonly known as "power purchase agreements." These are programs where the contracting unit (Owner) procures a contract for, in most cases, a third party to install, maintain, and own a renewable energy system. These renewable energy systems are typically solar panels, windmills or other systems that create renewable energy. In exchange for the third party's work of installing, maintaining and owning the renewable energy system, the contracting unit (Owner) agrees to purchase the power generated by the renewable energy system from the third party at agreed upon energy rates.

On-Bill Financing

On-bill financing allows a loan for energy efficiency measures to be repaid over time via an additional line item on the recipient's utility bill, which decreases repayment risk for the lender. The lender in "classic" utility on-bill financing has traditionally been the utility itself. Hybrid models have also emerged in which public and private funds are pooled to offer low-interest loans, with repayment similarly attached to the utility bill. The utility then collects the payment and returns it to the lender, which lowers the lender's administrative costs. The utility customer benefits from lower energy costs after retrofits, and typically pays loans back over a period of about 2–5 years. This model has also recently become available with Third Party Commodity Suppliers allowing for energy efficiency project funding to be rolled into their bill for the customer. If the owner is interested in this funding mechanism they should contact their local utility or third party supplier if any such program is offered. Alternatively if the owner's current third party supply contract is expiring this could be included as an option when bidding for new suppliers.

Public-Private Partnerships

A public-private partnership is a business relationship between a public entity and a private-sector company for the purpose of completing a project that will serve the public. These types of partnerships can be used to finance, build, and operate various types of projects such as public transportation networks, new buildings, parks, and convention centers. In lieu the traditional path of a public entity funding the project, a private enterprise would fund it in exchange for receiving some type of financial benefit from the project once complete.

Energy Savings Improvement Program (ESIP):

Public Law 2009, Chapter 4 authorizes government entities to make energy related improvements to their facilities and pay for the costs using the value of energy savings that result from the improvements. The "Energy Savings Improvement Program (ESIP)" law provides a flexible approach that can allow all government agencies in New Jersey to improve and reduce energy usage with minimal expenditure of new financial resources. This program provides public entities to make valuable facility infrastructure improvements that are associated with energy savings. All energy savings projects are eligible as long as the financing period does not extend beyond 15 years. The financing can be utilized for all aspects of energy efficiency project

implementation including, energy savings plan development, engineering, construction management, construction management, commissioning, and measurement and verification.

This program provides the much needed financing for energy efficiency projects without the burden of increased debt. The program allows for procurement of financing without voter approval or extending existing debt. The program requires evaluation to ensure a positive cash-flow through the entire 15 year financing period. The first phase of implementing an ESIP is the development of an Energy Savings Plan (ESP) to verify the energy savings, construction costs, and overall financial model.

XI. ADDITIONAL RECOMMENDATIONS

In addition to the ECMs and REMs, there are maintenance and operational measures that can provide significant energy savings and provide immediate benefit, many of which facility's staff are already performing. Maintenance items and small operational improvements are typically achievable with on-site staff or maintenance contractors and in turn have the potential to provide substantial operational savings compared to the costs associated. The following are recommendations which should be considered a priority in achieving an energy efficient building.

A. Maintain all weather stripping on windows and doors.

B. Clean all light fixtures to maximize light output.

C. Provide more frequent air filter changes to decrease overall system power usage and maintain better Indoor Air Quality (IAQ).

D. Shutdown all non-essential equipment during unoccupied periods.

E. Optimize thermostat programing to most closely match occupancy patters in the building, and setback temperatures to aggressive but also reasonable levels to ensure indoor environment qualify.

F. Regularly check programmable thermostats to verify they are operating in program mode and not on hold temperature settings.

XII. ENERGY AUDIT ASSUMPTIONS

The assumptions utilized in this energy audit include but are not limited to following:

A. Cost Estimates noted within this report are based on industry accepted costing data such as RS Means™ Cost Data, contractor pricing and engineering estimates. All cost estimates for this level of auditing are +/- 20%. Prevailing wage rates for the specified region has been utilized to calculate installation costs. The cost estimates indicated within this audit should be utilized by the owner for prioritizing further project development post the energy audit. Project development would include investment grade auditing and detailed engineering.
B. Energy savings noted within this audit are calculated utilizing industry standard procedures and accepted engineering assumptions. For this level of auditing, energy savings are not guaranteed.
C. Information gathering for each facility is strongly based on interviews with operations personnel. Information dependent on verbal feedback is used for calculation assumptions including but not limited to the Operating Hours, Equipment Type, Control Strategies, and Scheduling.
D. Information contained within the major equipment list is based on the existing owner documentation where available (drawings, O&M manuals, etc.). If existing owner documentation is not available, catalog information is utilized to populate the required information.
E. Equipment incentives and energy credits are based on current pricing and status of rebate programs. Rebate availability is dependent on the individual program funding and applicability. It is the owner's responsibility to ensure installed measure equipment meets NJOCE program rules and requirements to receive incentives.
F. Equipment (HVAC, Plumbing, Electrical, & Lighting) noted within an ECM recommendation is strictly noted as a **basis for calculation** of energy savings. The owner should use this equipment information as a benchmark when pursuing further investment grade project development and detailed engineering for specific energy conservation measures.
G. Utility bill annual averages are utilized for calculation of all energy costs unless otherwise noted. Accuracy of the utility energy usage and costs are based on the information provided. Utility information including usage and costs is estimated where incomplete data is provided.
H. Greenhouse Gas Emissions are calculated for each ECM, the basis for these emissions reductions are NJCEP published standard emissions factors, which are the following:.
    a. Electric Savings:
        1. CO_2: 1.52 lbs/kWh
        2. NO_X: 0.0028 lbs/kWh
        3. SO_2: 0.0065 lbs/kWh
    b. Natural Gas Savings:
        1. CO_2: 11.7 lbs/therm
        2. NO_X: 0.0092 lbs/therm

APPENDIX A

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING

Vincent S. Mastro Montessori Academy

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM #1	Lighting Upgrade	$6,936	$1,653	$1,160	$7,429	$1,055	$0	$1,055	15	$15,825	$0	113.0%	7.0	11.38%	$5,165.52
ECM #2	Lighting Controls	$950	$500	$0	$1,450	$37	$0	$37	15	$555	$0	-61.7%	39.2	-10.14%	($1,008.30)
ECM #3	Domestic Boiler Upgrade	$3,500	$3,500	$300	$6,700	$91	$0	$91	15	$1,365	$0	-79.6%	73.6	-15.44%	($5,613.65)
ECM #4	Add Attic Insulation	$1,200	$1,000	$0	$2,200	$403	$0	$403	15	$6,045	$0	174.8%	5.5	16.45%	$2,610.99
ECM #5	Water Conservation	$200	$100	$0	$300	$84	$0	$84	15	$1,260	$0	320.0%	3.6	27.25%	$702.79
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	30 kW Solar Array	$86,419	$57,613	$0	$144,032	$6,321	$5,633	$11,954	15	$179,309	$84,496	24.5%	12.0	2.87%	($1,327.05)

Notes: 1) The variable Cn in the formulas for Internal Rate of Return and Net Present Value stands for the cash flow during each period.
2) The variable DR in the NPV equation stands for Discount Rate
3) For NPV and IRR calculations: From n=0 to N periods where N is the *lifetime of ECM* and Cn is the *cash flow during each period* .

APPENDIX B

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SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives from July 1, 2014 to June 30, 2015:

Electric Chillers

Water-Cooled Chillers	$16 - $170 per ton
Air-Cooled Chillers	$8 - $52 per ton

Energy Efficiency must comply with ASHRAE 90.1-2007

Gas Cooling

Gas Absorption Chillers	$185 - $450 per ton
Gas Engine-Driven Chillers	Calculated through custom measure path)

Desiccant Systems

$1.00 per cfm – gas or electric

Electric Unitary HVAC

Unitary AC and Split Systems	$73 - $92 per ton
Air-to-Air Heat Pumps	$73 - $92 per ton
Water-Source Heat Pumps	$81 per ton
Packaged Terminal AC & HP	$65 per ton
Central DX AC Systems	$40- $72 per ton
Dual Enthalpy Economizer Controls	$250
Occupancy Controlled Thermostat (Hospitality & Institutional Facility)	$75 per thermostat
A/C Economizing Controls	≤ 5 tons $85/unit; >5 tons $170/unit

Energy Efficiency must comply with ASHRAE 90.1-2007

Gas Heating

Gas Fired Boilers < 300 MBH	$2.00 per MBH, but not less than $300 per unit
Gas Fired Boilers ≥ 300 - 1500 MBH	$1.75 per MBH
Gas Fired Boilers ≥1500 - ≤ 4000 MBH	$1.00 per MBH
Gas Fired Boilers > 4000 MBH	(Calculated through Custom Measure Path)
Gas Furnaces	$400 per unit, AFUE ≥ 95%
Boiler Economizing Controls	$1,200 - $2,700
Low Intensity Infrared Heating	$300 - $500 per unit

Ground Source Heat Pumps

Closed Loop	$450 per ton, EER ≥ 16 $600 per ton, EER ≥ 18 $750 per ton, EER ≥ 20

Energy Efficiency must comply with ASHRAE 90.1-2007

Variable Frequency Drives

Variable Air Volume	$65 - $155 per hp
Chilled-Water Pumps ≥ 20 hp	$60 per VFD rated hp
Rotary Screw Air Compressors ≥ 25 hp	$5,250 to $12,500 per drive
Centrifugal Fan Applications on Constant Volume HVAC Systems	$80 per VFD rated hp, maximum $6,000 per drive
Cooling Towers ≥ 10 hp	$60 per VFD rated hp
Boiler Fans ≥ 5 HP	$65 to $155 per hp
Boiler Feed Water Pumps ≥ 5 HP	$60 to $155 per hp
Commercial Kitchen Hood up to 50 HP	Retrofit $55 – $300 per hp New Hood $55 - $250 per hp

Natural Gas Water Heating

Gas Water Heaters ≤ 50 gallons, 0.67 energy factor or better	$50 per unit
Gas-Fired Water Heaters > 50 gallons	$1.00 - $2.00 per MBH
Gas-Fired Booster Water Heaters	$17 - $35 per MBH
Gas Fired Tankless Water Heaters	$300 per unit

Prescriptive Lighting

T-8 reduced Wattage (28w/25w 4', 1-4 lamps) Lamp & ballast replacement	$10 per fixture
For retrofit of T-8 fixtures by permanent de-lamping & new reflectors (Electronic ballast replacement required)	$15 per fixture
T-5 and T-8 High Bay Fixtures	$16 - $200 per fixture
HID ≥ 100w Replace with new induction fixture. (must be 30% less watts/fixture than HID system)	$70 per fixture
HID ≥ 100w Retrofit with induction lamp, power coupler and generator (must be 30% less watts/fixture than HID system)	$50 per fixture

Prescriptive Lighting - LED

LED Display Case Lighting	$30 per display case
LED Shelf-Mtd. Display & Task Lights	$15 per linear foot
LED Portable Desk Lamp	$20 per fixture
LED Wall-wash Lights	$30 per fixture
LED Recessed Down Lights	$35 per fixture
LED Architectural Flood and Spot Luminaires	$50 per fixture
LED Outdoor Pole/Arm-Mounted Area and Roadway Luminaries	$175 per fixture
LED Outdoor Pole/Arm-Mounted Decorative Luminaries	$175 per fixture
LED Outdoor Wall-Mounted Area Luminaries	$100 per fixture
LED Parking Garage Luminaries	$100 per fixture
LED Track or Mono-Point Directional Lighting Fixtures	$30 per fixture
LED High-Bay and Low-Bay Fixtures for Commercial & Industrial Bldgs.	$150 per fixture
LED High-Bay-Aisle Lighting	$150 per fixture
LED Linear Ambient Luminaires (Indirect, Indirect/Direct, Direct/Indirect, Direct)	2’ Fixtures - $20/fixture 3’ Fixtures - $30/fixture 4’ Fixtures - $45/fixture 6’ Fixtures - $60/fixture 8’ Fixtures - $75/fixture
LED Linear Replacement Lamps (2’ & 4’ only)	$5 per lamp
LED Stairwell and Passageway Luminaires	$40 per fixture
LED Bollard Fixtures	$50 per fixture
Luminaires for Ambient Lighting of Interior Commercial Spaces (1x4, 2x2, 2x4)	$50 per fixture
LED Fuel Pump Canopy	$100 per fixture
LED Screw-based & Pin-based (PAR, MR, BR, R) Standards (A-Style) and Decorative Lamps	$5 per lamp for R/PAR20, MR/PAR16,Globe,Candelabra or Misc $10 per lamp for LED R/BR/PAR 30, R/BR/PAR 38-40, A-Lamp

LED Refrigerator/Freezer case lighting replacement of fluorescent in medium and low temperature display case	$30 per 4 foot $42 per 5 foot $65 per 6 foot
LED Retrofit Kits	To be evaluated through the customer measure path

Lighting Controls – Occupancy Sensors

Wall Mounted (Existing Facilities Only)	$20 per control
Remote Mounted (Existing Facilities Only)	$35 per control
Daylight Dimming Controls	$45 per fixture controlled
Occupancy Based hi-low Dimming Control	$35 per fixture controlled
Occupancy Sensor Remote Mounted	$35 per control

Refrigeration Doors/Covers

Energy-Efficient Doors/Covers for Installation on Open Refrigerated Cases	$100 per door
Aluminum Night Curtains for Installation on Open Refrigerated Cases	$3.50 per linear foot

Refrigeration Controls

Door Heater Controls	$50 per control
Electric Defrost Controls	$50 per control
Evaporator Fan Controls	$75 per control
Novelty Cooler Shutoff	$50 per control

Food Service Equipment

Combination Oven/Steamer (Electric)	$1,000/oven
Combination Oven/Steamer (Natural Gas)	$750/oven
Convection Oven (Electric)	$350/oven
Convection Oven (Natural Gas)	$500/oven
Rack Oven (Natural Gas)	$1,000/single oven, $2,000/double oven
Conveyor Oven (Natural Gas)	$500/small deck $750/large deck
Fryer (Electric)	$250/vat
Fryer (Natural Gas)	$749/vat
Large Vat Fryer (Electric)	$200/vat
Large Vat Fryer (Natural Gas)	$500/vat
Griddle (Electric)	$300/griddle
Griddle (Natural Gas)	$125/griddle
Steam Cooker (Electric)	$1,250/steamer
Steam Cooker (Natural Gas)	$2,000/steamer
Insulated Holding Cabinets	$200 to $300/unit
Glass Door Refrigerators	$75 to $150/unit
Solid Door Refrigerators	$50 to $200/unit
Glass Door Freezers	$200 to $1,000/unit
Solid Door Freezers	$100 to $600/unit
Ice Machines	$50 to $500/unit
Dishwashers	$400 to $1,500/unit

Other Equipment Incentives

Performance Lighting	$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2007 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive
Custom Measures	$0.16 KWh and $1.60/Therm of 1st year savings, or a buy down to a 1 year payback on estimated savings. Minimum required savings of 75,000 KWh or 1,500 Therms and an IRR of at least 10%.

APPENDIX C

ENERGY STAR® Statement of Energy Performance

95

ENERGY STAR® Score[1]

Mastro Montessori Academy

Primary Property Function: K-12 School
Gross Floor Area (ft²): 8,044
Built: 2012

For Year Ending: February 28, 2015
Date Generated: May 15, 2015

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
Mastro Montessori Academy 35 White Road Shrewsbury, New Jersey 07702	Mastro Montessori Academy 35 White Road Shrewsbury, NJ 07702 (____)____-_____	Kristin DeRose 35 White Road Shrewsbury, NJ 07702 7322195400 info@mastromontessori.org

Property ID: 4410180

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
45.3 kBtu/ft²

Source EUI
79.4 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	242,306 (66%)
Electric - Grid (kBtu)	122,278 (34%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	85.3
National Median Source EUI (kBtu/ft²)	149.3
% Diff from National Median Source EUI	-47%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	29

Signature & Stamp of Verifying Professional

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

Signature: _____Date: _____

Licensed Professional

____ _____
,
(____)____-_____
_____

Professional Engineer Stamp (if applicable)

APPENDIX D

MAJOR EQUIPMENT LIST

Concord Engineering

Air Handler Units

Tag	AHU-5	AHU-6
Unit Type	Spit Gas Furnace	Spit Gas Furnace
Qty	1	1
Location	Attic	Attic
Area Served	Classroom #215	Music Room, Office, Breakroom, Main Hallway
Manufacturer	Trane	Trane
Model No.	TUH1D100A9601AA	TUH1D100A9601AA
Serial No.	12074XF35G	12034MLP7G
Cooling Type	Split System DX	Split System DX
Cooling Capacity (Tons)	5	5
Heating Type	Gas Furnace	Gas Furnace
Heating Input (MBH)	97	97
Supply Fan (HP)	1	1
Supply Fan VFD	☐ Yes ☐ No ☑ N/A	☐ Yes ☐ No ☑ N/A
Return Fan (HP)	N/A	N/A
Return Fan VFD	☐ Yes ☐ No ☑ N/A	☐ Yes ☐ No ☑ N/A
Approx Age	4	4
ASHRAE Service Life	20	20
Remaining Life	16	16
Comments	95% AFUE Furnace	95% AFUE Furnace

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering

Air Handler Units

Tag	AHU-1	AHU-4
Unit Type	Spit Gas Furnace	Spit Gas Furnace
Qty	1	1
Location	Attic	Attic
Area Served	Classroom #114	Classroom #212
Manufacturer	Trane	Trane
Model No.	TUH1D100A9601AA	TUH1D100A9601AA
Serial No.	-	1152510007G
Cooling Type	Split System DX	Split System DX
Cooling Capacity (Tons)	5	5
Heating Type	Gas Furnace	Gas Furnace
Heating Input (MBH)	97	97
Supply Fan (HP)	1	1
Supply Fan VFD	☐ Yes ☐ No ☑ N/A	☐ Yes ☐ No ☑ N/A
Return Fan (HP)	N/A	N/A
Return Fan VFD	☐ Yes ☐ No ☑ N/A	☐ Yes ☐ No ☑ N/A
Approx Age	4	4
ASHRAE Service Life	20	20
Remaining Life	16	16
Comments	Gas Furnace and Controls are inaccessible for maintenance.	95% AFUE Furnace

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering

Air Handler Units

Tag	AHU-2	AHU-3
Unit Type	Spit Gas Furnace	Spit Gas Furnace
Qty	1	1
Location	Attic	Attic
Area Served	Admin, Main Corridor	Classroom #117
Manufacturer	Trane	Trane
Model No.	TUH1D100A9601AA	TUH1D100A9601AA
Serial No.	1207254B7G	12034MKN7G
Cooling Type	Split System DX	Split System DX
Cooling Capacity (Tons)	5	5
Heating Type	Gas Furnace	Gas Furnace
Heating Input (MBH)	97	97
Supply Fan (HP)	1	1
Supply Fan VFD	☐ Yes ☐ No ☑ N/A	☐ Yes ☐ No ☑ N/A
Return Fan (HP)	N/A	N/A
Return Fan VFD	☐ Yes ☐ No ☑ N/A	☐ Yes ☐ No ☑ N/A
Approx Age	4	4
ASHRAE Service Life	20	20
Remaining Life	16	16
Comments	95% AFUE Furnace	95% AFUE Furnace

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering

Condensing Units

Tag	CU-1 to 6
Unit Type	Standard Air-Cooled
Qty	6
Location	On Grade Building Rear
Area/Unit Served	AHU-1 to 6
Manufacturer	Trane
Model No.	4TTA3060D3000CA
Serial No.	122418734
Refrigerant Type	R-410a
Cooling Capacity	5
Cooling Efficiency	13 SEER
Volts / Phase / Hz	208/230/3/60
Approx Age	3
ASHRAE Service Life	20
Remaining Life	17
Comments	

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering

Terminal Units

Tag	UH-1	CUH-1, 2
Unit Type	Unit Heater	Unit Heater
Qty	1	2
Location	Attic	Stair #1 & 2
Area Served	Attic	Stairwell 1st floor
Manufacturer	Reznor	Qmark
Model No.	UAS068-2	CWH3508B
Serial No.	BLB79Y8N43660X	-
Cooling Type	No Cooling	No Cooling
Cooling Capacity (Tons)	N/A	N/A
Cooling Efficiency	N/A	N/A
Heating Type	Gas Furnace	Electric
Heating Input (MBH)	60	4800 W
Heating Efficiency	82%	N/A
Approx Age	3	3
ASHRAE Service Life	20	20
Remaining Life	17	17
Comments		

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering

Boilers

Tag	B-1
Unit Type	Condensing (Water)
Qty	1
Location	#111 Utility Room
Manufacturer	Prestige
Model No.	Solo 110
Serial No.	-
Input Capacity (Btu/h)	110,000
Output Capacity (Btu/h)	99,000
Approx. Efficiency %	90.0%
Fuel Type	Natural Gas
Approx Age	4
ASHRAE Service Life	24
Remaining Life	20
Comments	Supplies Snow Melt and Radiant Floor Heating

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering

Domestic Water Heaters

Tag	HWH-1
Unit Type	Gas w/ Storage
Qty	1
Location	#111 Utility Room
Area Served	Whole Building
Manufacturer	Bradford White
Model #	PDX250T6FBN
Serial #	JC16376168
Storage Size (Gal)	48
Input Capacity (MBH/KW)	60 MBH
Recovery (Gal/Hr)	80
Efficiency %	80%
Fuel	Natural Gas
Approx Age	4
ASHRAE Service Life	15
Remaining Life	11
Comments	

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

Kitchen / Misc.

Tag	#1	#2	#3
Unit Type	Residential Refrigerator	Dishwasher	Clothes Washer
Qty	1	1	1
Location	#202 Breakroom	#202 Breakroom	#208 Closet
Manufacturer	Admiral	GE	Frigidaire / Electrolux
Model No.	AT15M4A	GLDA690P02WW	FAFW3921NW0
Serial No.	10120051HB	GZ800269C	4C22503655
Fuel	Electric	Electric	Electric
Comments	15 cuft	Undercounter Residential	

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

Kitchen / Misc.

Tag	#4	#5
Unit Type	Clothes Dryer	Residential Refrigerator
Qty	1	4
Location	#208 Closet	Classrooms
Manufacturer	Frigidaire / Electrolux	Frigidaire
Model No.	FASG7021NW0	-
Serial No.	4D22302654	-
Fuel	Natural Gas	Electric
Comments	20,000 Btu/h Input	4.5 cuft

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

APPENDIX E

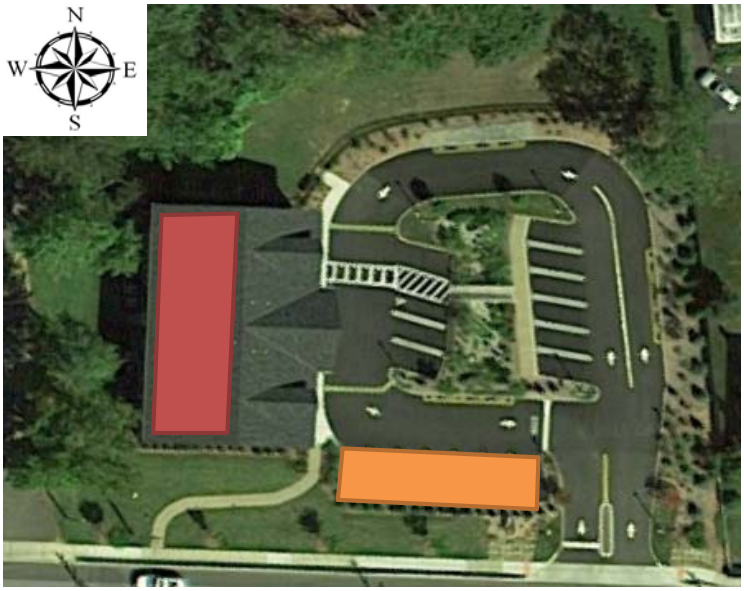
CEG Project #: 1C14473
Facility Name: Mastro Montessori Academy
Address: 35 White Road
City, State, Zip Shrewsbury, NJ 07702

EXISTING FIXTURES									PROPOSED FIXTURE RETROFIT							RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS						LIGHTING RETROFIT COSTS					LIGHTING CONTROLS COST				
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Total Materials	Total Labor	Total All	Smart Start Incentive	Simple Payback
1	Attic 3rd Floor	400	2-Lamp T8 32w 1x4 Surface Mount Prismatic Wrap	2	62	1	0.06	25	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 16.5w 4000K	2	33	1	0.03	13	0.03	12	$2	0	No New Controls	0	0.0%	0	$0	$60.00	$14.25	$74.25	$10.00	32.39	$0.00	$0.00	$0.00	YES	-
2	#201 Office	1800	2-Lamp T8 32w 4' Pendant Mount Direct/Indirect	2	62	2	0.12	223	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 16.5w 4000K	2	33	2	0.07	119	0.06	104	$18	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	24	$4	$120.00	$28.50	$148.50	$20.00	7.20	$200.00	$50.00	$250.00	FALSE	61.53
3	#201A Closet	400	Recessed 6" Can with LED	1	9.5	1	0.01	4	Existing to Remain	N/A	1	9.5	0	0.01	4	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
2	#202 Breakroom	1800	2-Lamp T8 32w 4' Pendant Mount Direct/Indirect	2	62	4	0.25	446	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 16.5w 4000K	2	33	4	0.13	238	0.12	209	$36	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	48	$8	$240.00	$57.00	$297.00	$40.00	7.20	$200.00	$50.00	$250.00	FALSE	30.77
4	#208 Closet/Laundry	400	2-Lamp T8 17w 1x2 Surface mount Prismatic	2	33	1	0.03	13	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 8.5w 4000K	2	17	1	0.02	7	0.02	6	$1	0	No New Controls	0	0.0%	0	$0	$54.00	$14.25	$68.25	$10.00	53.23	$0.00	$0.00	$0.00	FALSE	-
2	#209 Music room	1800	2-Lamp T8 32w 4' Pendant Mount Direct/Indirect	2	62	8	0.50	893	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 16.5w 4000K	2	33	8	0.26	475	0.23	418	$71	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	95	$16	$480.00	$114.00	$594.00	$80.00	7.20	$200.00	$50.00	$250.00	FALSE	15.38
3	#203 Restroom	1000	Recessed 6" Can with LED	1	9.5	1	0.01	10	Existing to Remain	N/A	1	9.5	0	0.01	10	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	2	$0	$0.00	$0.00	$0.00	$0.00	-	$50.00	$50.00	$100.00	FALSE	307.79
2	#204 Corridor	1800	2-Lamp T8 32w 4' Pendant Mount Direct/Indirect	2	62	6	0.37	670	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 16.5w 4000K	2	33	6	0.20	356	0.17	313	$54	0	No New Controls	0	0.0%	0	$0	$360.00	$85.50	$445.50	$60.00	7.20	$0.00	$0.00	$0.00	FALSE	-
5	Stair #2	1800	2-Lamp T8 32w 1x4 Wall Mount Opaque Wrap	2	62	3	0.19	335	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 16.5w 4000K	2	33	3	0.10	178	0.09	157	$27	0	No New Controls	0	0.0%	0	$0	$180.00	$42.75	$222.75	$30.00	7.20	$0.00	$0.00	$0.00	FALSE	-
5	Stair #1	1800	2-Lamp T8 32w 1x4 Wall Mount Opaque Wrap	2	62	3	0.19	335	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 16.5w 4000K	2	33	3	0.10	178	0.09	157	$27	0	No New Controls	0	0.0%	0	$0	$180.00	$42.75	$222.75	$30.00	7.20	$0.00	$0.00	$0.00	FALSE	-
2	#215 Classroom	1800	2-Lamp T8 32w 4' Pendant Mount Direct/Indirect	2	62	15	0.93	1,674	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 16.5w 4000K	2	33	15	0.50	891	0.44	783	$134	0	No New Controls	0	0.0%	0	$0	$900.00	$213.75	$1,113.75	$150.00	7.20	$0.00	$0.00	$0.00	FALSE	-
3		1800	Recessed 6" Can with LED	1	9.5	7	0.07	120	Existing to Remain	N/A	1	9.5	0	0.07	120	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
6	#215 CR Under Counter Lights	1800	LED Strip Light (~5' ea.) 1.5 W/LF	1	7.5	1	0.01	14	Existing to Remain	N/A	1	7.5	0	0.01	14	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
7	#211 Restroom	1000	LED 30w 4-Panel 2x2 Recessed Prismatic	4	30	1	0.03	30	Existing to Remain	N/A	4	30	0	0.03	30	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	0	20.0%	6	$1	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	0.00
7	#210 Restroom	400	LED 30w 4-Panel 2x2 Recessed Prismatic	4	30	1	0.03	12	Existing to Remain	N/A	4	30	0	0.03	12	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	0	20.0%	2	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	0.00
7	#215 CR Closet	400	LED 30w 4-Panel 2x2 Recessed Prismatic	4	30	1	0.03	12	Existing to Remain	N/A	4	30	0	0.03	12	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
2	#212 Classroom	2600	2-Lamp T8 32w 4' Pendant Mount Direct/Indirect	2	62	18	1.12	2,902	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 16.5w 4000K	2	33	18	0.59	1,544	0.52	1,357	$232	0	No New Controls	0	0.0%	0	$0	$1,080.00	$256.50	$1,336.50	$180.00	4.98	$0.00	$0.00	$0.00	FALSE	-
3		1800	Recessed 6" Can with LED	1	9.5	9	0.09	154	Existing to Remain	N/A	1	9.5	0	0.09	154	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
4	#212 CR Closet	400	2-Lamp T8 17w 1x2 Surface mount Prismatic	2	33	1	0.03	13	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 8.5w 4000K	2	17	1	0.02	7	0.02	6	$1	0	No New Controls	0	0.0%	0	$0	$54.00	$14.25	$68.25	$10.00	53.23	$0.00	$0.00	$0.00	FALSE	-
7	#217 Restroom	1000	LED 30w 4-Panel 2x2 Recessed Prismatic	4	30	1	0.03	30	Existing to Remain	N/A	4	30	0	0.03	30	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	6	$1	$0.00	$0.00	$0.00	$0.00	-	$50.00	$50.00	$100.00	FALSE	97.47
7	#216 Restroom	1000	LED 30w 4-Panel 2x2 Recessed Prismatic	4	30	1	0.03	30	Existing to Remain	N/A	4	30	0	0.03	30	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	6	$1	$0.00	$0.00	$0.00	$0.00	-	$50.00	$50.00	$100.00	FALSE	97.47
6	#212 CR Under Counter Lights	1800	LED Strip Light (~5' ea.) 1.5 W/LF	1	7.5	1	0.01	14	Existing to Remain	N/A	1	7.5	0	0.01	14	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
8	#111 Utility Room	400	LED Vaportight Surface Mount 4'	1	26	1	0.03	10	Existing to Remain	N/A	1	26	0	0.03	10	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
7	#109 Electric Closet	400	LED 30w 4-Panel 2x2 Recessed Prismatic	4	30	1	0.03	12	Existing to Remain	N/A	4	30	0	0.03	12	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-

			EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT						RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS						LIGHTING RETROFIT COSTS					LIGHTING CONTROLS COST				
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Total Materials	Total Labor	Total All	Smart Start Incentive	Simple Payback
4	#106 Custodian	400	2-Lamp T8 17w 1x2 Surface mount Prismatic	2	33	1	0.03	13	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 8.5w 4000K	2	17	1	0.02	7	0.02	6	$1	0	No New Controls	0	0.0%	0	$0	$54.00	$14.25	$68.25	$10.00	53.23	$0.00	$0.00	$0.00	FALSE	-
7	#107 Closet	400	LED 30w 4-Panel 2x2 Recessed Prismatic	4	30	1	0.03	12	Existing to Remain	N/A	4	30	0	0.03	12	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
7	#103 Restroom	1000	LED 30w 4-Panel 2x2 Recessed Prismatic	4	30	1	0.03	30	Existing to Remain	N/A	4	30	0	0.03	30	0.00	0	$0	1	Existing Occupancy Controls	1	20.0%	6	$1	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	0.00
2	#102 Front Desk	1800	2-Lamp T8 32w 4' Pendant Mount Direct/Indirect	2	62	4	0.25	446	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 16.5w 4000K	2	33	4	0.13	238	0.12	209	$36	0	No New Controls	0	0.0%	0	$0	$240.00	$57.00	$297.00	$40.00	7.20	$0.00	$0.00	$0.00	FALSE	-
3		1800	Recessed 6" Can with LED	1	9.5	6	0.06	103	Existing to Remain	N/A	1	9.5	0	0.06	103	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
2	#104 Rear Exit Hallway	1800	2-Lamp T8 32w 4' Pendant Mount Direct/Indirect	2	62	4	0.25	446	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 16.5w 4000K	2	33	4	0.13	238	0.12	209	$36	0	No New Controls	0	0.0%	0	$0	$240.00	$57.00	$297.00	$40.00	7.20	$0.00	$0.00	$0.00	FALSE	-
2	1st Floor Hallway	1800	2-Lamp T8 32w 4' Pendant Mount Direct/Indirect	2	62	4	0.25	446	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 16.5w 4000K	2	33	4	0.13	238	0.12	209	$36	0	No New Controls	0	0.0%	0	$0	$240.00	$57.00	$297.00	$40.00	7.20	$0.00	$0.00	$0.00	FALSE	-
2	#117 Classroom	1800	2-Lamp T8 32w 4' Pendant Mount Direct/Indirect	2	62	20	1.24	2,232	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 16.5w 4000K	2	33	20	0.66	1,188	0.58	1,044	$179	0	No New Controls	0	0.0%	0	$0	$1,200.00	$285.00	$1,485.00	$200.00	7.20	$0.00	$0.00	$0.00	FALSE	-
6	#117 CR Under Counter Lights	1800	LED Strip Light (~5' ea.) 1.5 W/LF	1	7.5	1	0.01	14	Existing to Remain	N/A	1	7.5	0	0.01	14	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
7	#119 Restroom	1000	LED 30w 4-Panel 2x2 Recessed Prismatic	4	30	1	0.03	30	Existing to Remain	N/A	4	30	0	0.03	30	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	6	$1	$0.00	$0.00	$0.00	$0.00	-	$50.00	$50.00	$100.00	FALSE	97.47
7	#118 Restroom	1000	LED 30w 4-Panel 2x2 Recessed Prismatic	4	30	1	0.03	30	Existing to Remain	N/A	4	30	0	0.03	30	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	6	$1	$0.00	$0.00	$0.00	$0.00	-	$50.00	$50.00	$100.00	FALSE	97.47
1	#108 Closet	400	2-Lamp T8 32w 1x4 Surface Mount Prismatic Wrap	2	62	1	0.06	25	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 16.5w 4000K	2	33	1	0.03	13	0.03	12	$2	0	No New Controls	0	0.0%	0	$0	$60.00	$14.25	$74.25	$10.00	32.39	$0.00	$0.00	$0.00	FALSE	-
2	#114 Classroom	1800	2-Lamp T8 32w 4' Pendant Mount Direct/Indirect	2	62	18	1.12	2,009	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 16.5w 4000K	2	33	18	0.59	1,069	0.52	940	$161	0	No New Controls	0	0.0%	0	$0	$1,080.00	$256.50	$1,336.50	$180.00	7.20	$0.00	$0.00	$0.00	FALSE	-
6	#114 CR under Counter Lights	1800	LED Strip Light (~5' ea.) 1.5 W/LF	1	7.5	2	0.02	27	Existing to Remain	N/A	1	7.5	0	0.02	27	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
7	#112 Restroom	1000	LED 30w 4-Panel 2x2 Recessed Prismatic	4	30	1	0.03	30	Existing to Remain	N/A	4	30	0	0.03	30	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	6	$1	$0.00	$0.00	$0.00	$0.00	-	$50.00	$50.00	$100.00	FALSE	97.47
7	#113 Restroom	1000	LED 30w 4-Panel 2x2 Recessed Prismatic	4	30	1	0.03	30	Existing to Remain	N/A	4	30	0	0.03	30	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	6	$1	$0.00	$0.00	$0.00	$0.00	-	$50.00	$50.00	$100.00	FALSE	97.47
4	#115 Closet	400	2-Lamp T8 17w 1x2 Surface mount Prismatic	2	33	1	0.03	13	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 8.5w 4000K	2	17	1	0.02	7	0.02	6	$1	0	No New Controls	0	0.0%	0	$0	$54.00	$14.25	$68.25	$10.00	53.23	$0.00	$0.00	$0.00	FALSE	-
1	#110 Closet	400	2-Lamp T8 32w 1x4 Surface Mount Prismatic Wrap	2	62	1	0.06	25	Re-lamp w/ LED	Install Philips InstantFit LED T8 Lamp 16.5w 4000K	2	33	1	0.03	13	0.03	12	$2	0	No New Controls	0	0.0%	0	$0	$60.00	$14.25	$74.25	$10.00	32.39	$0.00	$0.00	$0.00	FALSE	-
7	Main Entry Vestibule	1800	LED 30w 4-Panel 2x2 Recessed Prismatic	4	30	1	0.03	54	Existing to Remain	N/A	4	30	0	0.03	54	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
3	Exterior Front Entry	1820	Recessed 6" Can with LED	1	9.5	5	0.05	86	Existing to Remain	N/A	1	9.5	0	0.05	86	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
11	Exterior Wall Light Over Doors	1820	Wall Mount Downlight 2-Lamp CFL	2	36	2	0.07	131	Existing to Remain	N/A	2	36	0	0.07	131	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
9	Pathway Bollards	1820	Pathway Bollard 1L CFL 42w	1	42	3	0.13	229	Existing to Remain	N/A	1	42	0	0.13	229	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
10	Parking Lot Pole Lamps	1820	15' Polelamp Decorative 1L 175w MH	1	205	6	1.23	2,239	Existing to Remain	N/A	1	205	0	1.23	2,239	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
	TOTAL					**175**	**9.2**	**16,679**					**116**	**6**	**10,511**	**3.3**	**6,168**	**$1,055**			**11**		**219**	**$37**	**$6,936**	**$1,653**	**$8,589**	**$1,160**	**7.04**	**$950**	**$500**	**$1,450**	**$0.00**	**38.79**

APPENDIX F

Location Description	Area (Sq FT)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW_{DC}	Total Annual kWh	Total KW_{AC}	Panel Weight (41.9 lbs)	W/SQFT
Mastro Montessori	2975	SHARP ND-240QCJ	128	17.5	2,245	30.72	37,181	29.5	5,363	13.68



= Proposed PV Roof Layout
= 17.5 kWDC

= Proposed PV Parking Layout
= 13.2 kWDC

Notes:

1. Estimated kWH based on the National Renewable Energy Laboratory PVWatts Version 1 Calculator Program.

Project Name: LGEA Solar PV Project - Mastro Montessori
Location: Shrewsbury, NJ
Description: Photovoltaic System 100% Financing - 15 year

Simple Payback Analysis

	Photovoltaic System 100% Financing - 15 year
Total Construction Cost	$144,032
Annual kWh Production	37,181
Annual Energy Cost Reduction	$6,321
Average Annual SREC Revenue	$5,633

Simple Payback: **12.05** Years

Life Cycle Cost Analysis

Analysis Period (years):	15	Financing %:	100%
Discount Rate:	3%	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.170**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	6.00%	Average SREC Value ($/kWh)	$0.152

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$0	0	0	0	$0	0	0	0	0
1	$0	37,181	$6,321	$0	$9,295	$8,476	$6,109	$1,031	$1,031
2	$0	36,995	$6,510	$0	$9,249	$8,099	$6,486	$1,174	$2,205
3	$0	36,810	$6,706	$0	$9,203	$7,699	$6,886	$1,323	$3,528
4	$0	36,626	$6,907	$0	$7,325	$7,274	$7,311	($353)	$3,175
5	$0	36,443	$7,114	$375	$7,289	$6,823	$7,762	($558)	$2,618
6	$0	36,261	$7,328	$373	$7,252	$6,344	$8,241	($379)	$2,239
7	$0	36,080	$7,547	$372	$5,412	$5,836	$8,749	($1,997)	$241
8	$0	35,899	$7,774	$370	$5,385	$5,297	$9,289	($1,796)	($1,555)
9	$0	35,720	$8,007	$368	$5,358	$4,724	$9,861	($1,588)	($3,143)
10	$0	35,541	$8,247	$366	$3,554	$4,115	$10,470	($3,150)	($6,293)
11	$0	35,363	$8,495	$364	$3,536	$3,470	$11,115	($2,918)	($9,211)
12	$0	35,187	$8,749	$362	$3,519	$2,784	$11,801	($2,679)	($11,891)
13	$0	35,011	$9,012	$361	$1,751	$2,056	$12,529	($4,183)	($16,074)
14	$0	34,836	$9,282	$359	$1,742	$1,284	$13,302	($3,920)	($19,994)
15	$0	34,661	$9,561	$357	$1,733	$463	$14,122	($3,648)	($23,642)
	Totals:	538,615	$117,560	$4,027	$81,602	$74,745	$144,032	($23,642)	($76,764)

Net Present Value (NPV) **($15,223)**

PVWatts: Monthly PV Performance Data	**Rooftop Array**
Requested Location:	35 White Road, Shrewsbury, NJ
Location:	BELMAR ASC, NJ
Lat (deg N):	40.18
Long (deg W):	74.07
Elev (m):	26
DC System Size (kW):	17.52
Module Type:	Standard
Array Type:	Fixed (roof mount)
Array Tilt (deg):	22.6
Array Azimuth (deg):	270
System Losses:	14
Invert Efficiency:	96
DC to AC Size Ratio:	1.1
Average Cost of Electricity	0.17
Initial Cost	No initial cost defined
Cost of Electricity Generate	not determined

Month	AC System Output(kWh)	Solar Radiation (kWh/m^2/day)	Plane of Array Irradiance (W/m^2)	DC array Output (kWh)	Value ($)
1	893	1.90	58.96	944	152.76
2	1,186	2.83	79.34	1,243	202.75
3	1,772	3.85	119.21	1,855	303.05
4	1,984	4.67	140.19	2,076	339.25
5	2,304	5.38	166.64	2,410	393.98
6	2,444	6.09	182.82	2,557	417.98
7	2,448	6.02	186.64	2,557	418.59
8	2,262	5.52	170.99	2,366	386.82
9	1,720	4.22	126.66	1,801	294.12
10	1,435	3.28	101.79	1,504	245.43
11	1,075	2.51	75.34	1,129	183.78
12	824	1.82	56.35	869	140.89
Total	20,347	48.09	1464.93	21,310	3479.4

PVWatts: Monthly PV Performance Data **Parking Lot Array**

Requested Location:	35 White Road, Shrewsbury, NJ
Location:	BELMAR ASC, NJ
Lat (deg N):	40.18
Long (deg W):	74.07
Elev (m):	26
DC System Size (kW):	13.2
Module Type:	Standard
Array Type:	Fixed (open rack)
Array Tilt (deg):	7.5
Array Azimuth (deg):	180
System Losses:	14
Invert Efficiency:	96
DC to AC Size Ratio:	1.1
Average Cost of Electricity	0.17
Initial Cost	No initial cost defined
Cost of Electricity Generate	not determined

Month	AC System Output(kWh)	Solar Radiation (kWh/m^2/day)	Plane of Array Irradiance (W/m^2)	DC array Output (kWh)	Value ($)
1	794	2.28	70.60	836	135.86
2	1,012	3.24	90.70	1,058	172.97
3	1,487	4.31	133.49	1,555	254.30
4	1,632	5.10	153.05	1,705	278.99
5	1,809	5.59	173.43	1,892	309.39
6	1,939	6.40	191.90	2,026	331.56
7	1,953	6.33	196.20	2,039	333.96
8	1,834	5.91	183.09	1,916	313.58
9	1,425	4.64	139.30	1,490	243.73
10	1,236	3.76	116.58	1,292	211.33
11	959	2.96	88.89	1,005	164.02
12	754	2.21	68.52	792	128.88
Total	16,834	52.73	1605.77	17,607	2878.57