LOCAL GOVERNMENT ENERGY AUDIT PROGRAM: ENERGY AUDIT REPORT

PREPARED FOR: **HADDONFIELD SCHOOL DISTRICT**
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I. EXECUTIVE SUMMARY

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

Entity:	Haddonfield Public School District
Facilities:	Central Elementary-Middle School & BOE Office Elizabeth Haddon Elementary School J.F. Tatem Elementary School Haddonfield Memorial High School

District Contact Person:	Dawn Leary, Business Administrator
Facility Contact Person:	Timothy McFerren, Maintenance Supervisor

This audit is performed in connection with the New Jersey Clean Energy - Local Government Energy Audit Program for Haddonfield Public School District facilities. The purpose of this analysis is to provide the district insight into the energy savings potential that exists within their facilities. Energy Efficiency changes and upgrades requires support from the building occupants, operations personnel and the administrators of the district 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.

Overall Assessment:

Overall, the Haddonfield School District is operating comparable to the average Source Energy Intensity of 144 kBtu/square-foot/year for K-12 schools in New Jersey. The District is also paying an average in cost of energy at $1.44 per square-foot below the average costs of $2.00 per square-foot.

On the whole, Concord Engineering recommends the District 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 District to effectively align report recommendations with those outlined in their mid/long range facility plans and financial plans. The District should also review all conventional and unconventional funding, along with all NJCEP funding opportunities for these projects and determine which options fit the District's budget most positively in the short and long term. The combination of this information will enable the District to put together an effective Energy Savings Improvement Strategy that maximizes the received benefits of the selected projects.

Other Considerations:

Renewable Energy Conservation Measures:

Renewable Energy Measures (REMs) were also reviewed for implementation at the District Schools. Concord Engineering utilized roof mounted solar arrays to house PV systems at each facility. There is a total estimated solar system potential of 256 kW DC that could generate 302,960 kilowatt-hours annually offsetting 9.4% of the total energy purchased from the grid. The system's calculated simple payback of 11.5 years is not within the standard 10 year simple payback threshold; however, with alternative funding this payback could be lessened. Concord Engineering recommends the Owner review all funding options available with the implementation of this renewable energy measure.

Energy Procurement Recommendations:

The District is currently contracted with a third party supplier for electric and gas, Concord Engineering recommends they continue to purchase their electric and gas commodity through a third party supplier once the current contract has expired. Furthermore when entering into a new contract it is important the District aggregate all of their facilities into one contract for electric supply and one for natural gas supply in order to maximize commodity price savings. See the Energy Procurement and Purchasing section for further recommendations and details.

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 the District are already performing. The ECMs listed above 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 below 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, further recommendations per building our provided in the building reports:

1. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.
2. Maintain all weather stripping on windows and doors.
3. Clean all light fixtures to maximize light output.
4. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.
5. Verify all control systems are utilizing setback and scheduling capabilities.
6. Replacement of older CRT style monitors with newer LCD/LED style monitors. Older CRT style monitors use up to four times more energy than LCD/LED monitor types.
7. Remind Staff to turn off Classroom Televisions after use and at the end of the day.
8. The District should consider the installation of advanced power strips in classrooms that can be used to charge tablet and laptop computers in order to reduce the amount of idle power draw from these devices. (Smart Power Strips Model LPG3, Price ~$30)
9. The District should consider routine checks of the facilities for personal appliances, and other plug in devices, as a single device does not have a significant impact, in the aggregate these devices can be raising the utility cost. If it is discovered these devices are becoming a problem the District should consider instituting policies to manage the issue.
10. Educate staff and students on awareness of wasteful energy practices such as leaving lights on unnecessarily, leaving on of non-essential computer and/or equipment at the end of the day, leaving of outside doors/windows open as a means to control room temperature, etc.

II. INTRODUCTION

The comprehensive energy audit covers the following buildings in Haddonfield School District:

ENERGY AUDIT FACILITY SUMMARY		
FACILITY	**AREA (SQ-FT)**	**ADDRESS**
Central Elementary-Middle School - BOE	130,000	1 Lincoln Avenue Haddonfield, NJ 08033
Elizabeth Haddon Elementary	47,000	501 Redman Avenue Haddonfield, NJ 08033
J.F. Tatem Elementary School	46,000	1 Glover Avenue Haddonfield, NJ 08033
Haddonfield Memorial High School	190,000	401 Kings Highway Haddonfield, NJ 08033

This 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 natural gas utility information is collected and analyzed for one full year's energy use of each building. The utility information allows for analysis of the building'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 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
- Facility-specific equipment

The building 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 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 base 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:

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

$$Simple\ Lifetime\ Savings = \left(Yearly\ Savings \times ECM\ \ Lifetime \right)$$

$$Simple\ Lifetime\ ROI = \frac{(Simple\ Lifetime\ Savings - Net\ Cost)}{Net\ Cost}$$

$$Lifetime\ Maintenance\ Savings = \left(Yearly\ Maintenance\ Savings \times ECM\ \ Lifetime \right)$$

$$Internal\ Rate\ of\ \ Return = \sum_{n=0}^{N} \left(\frac{Cash\ Flow\ of\ \ Period}{(1 + IRR)^n} \right)$$

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

Net Present Value calculations based on Discount Rate of 3%.

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage

The energy usage for the facilities is tabulated and plotted in graph form as depicted within each facility report (see the individual facility energy audit reports for details). Each energy source has been identified and monthly consumption and cost noted per the information provided by the Owner. The electric and natural gas utilities are shown below in Table 2 & 3 for all facilities:

Table 2
Electric Utility Summary

ELECTRIC UTILITY USAGE PER FACILITY			
FACILITY	**ANNUAL ELECTRIC UTILITY**		
DESCRIPTION	**USAGE (KWH)**	**COST ($)**	**AVE RATE ($/KWH)**
Central Elementary-Middle School - BOE	1,310,800	$169,903	$0.130
Elizabeth Haddon Elementary	308,400	$44,521	$0.144
J.F. Tatem Elementary School	372,060	$49,099	$0.132
Haddonfield Memorial High School	1,236,400	$155,556	$0.126
Total	**3,227,660**	**$419,079**	**$0.130**

Table 3
Natural Gas Summary

NATURAL GAS UTILTY USAGE PER FACILITY			
FACILITY	**ANNUAL NATURAL GAS UTILITY**		
DESCRIPTION	**USAGE (THERMS)**	**COST ($)**	**AVE RATE ($/THERM)**
Central Elementary-Middle School - BOE	56,673	$49,775	$0.88
Elizabeth Haddon Elementary	24,841	$25,764	$1.04
J.F. Tatem Elementary School	16,656	$15,616	$0.94
Haddonfield Memorial High School	98,283	$84,150	$0.86
Total	**196,453**	**$175,305**	**$0.89**

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:

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

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

Table 4
Energy Use Index Summary

ENERGY USE INDEX PER FACILITY			
FACILITY	**BUILDING AREA**	**ENERGY USE INDEX**	
DESCRIPTION	**(SF)**	**SITE (KBTU/SF/YR)**	**SOURCE (KBTU/SF/YR)**
Central Elementary-Middle School - BOE	130,000	78.0	153.9
Elizabeth Haddon Elementary	47,000	75.3	125.8
J.F. Tatem Elementary School	46,000	63.8	124.7
Haddonfield Memorial High School	190,000	73.9	124.1
Total	413,000	72.8	132.1

See the Appendix C - Statement of Energy Performance for comparason to other facilities

Figure 1 below depicts a national EUI grading for the source energy use of various building types similar to the buildings at Somers Point School District.

Figure 1
Source Energy Use Intensity Distributions: Elementary Schools

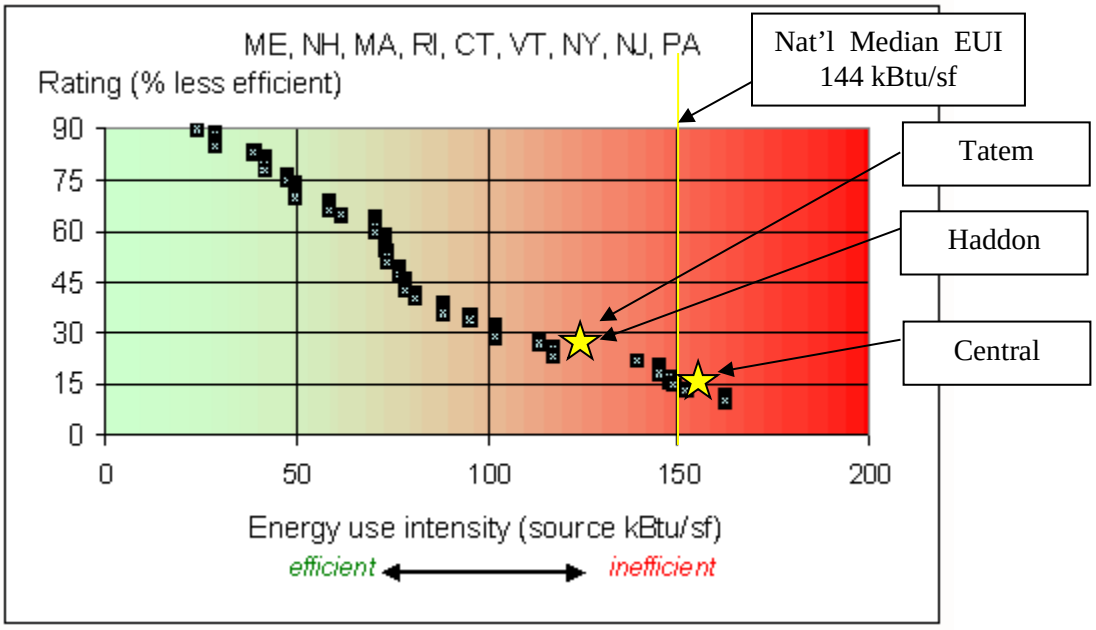
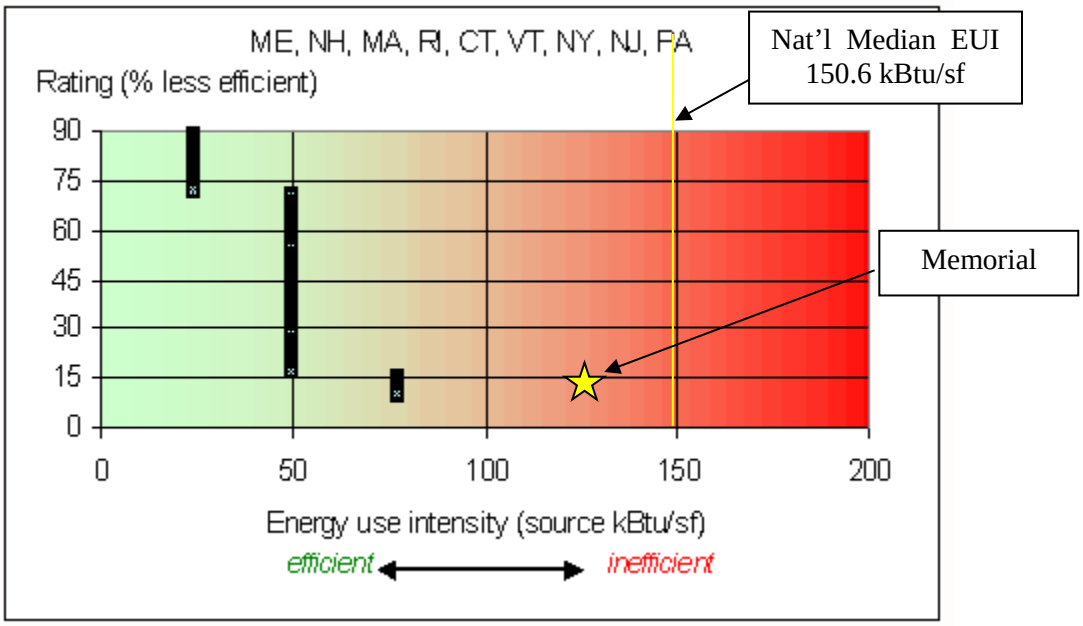


Figure 2
Source Energy Use Intensity Distributions: High Schools



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 municipality to access and monitoring the facility'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

Note: It is recommended once the owner has completed the LGEA process they change the password and security questions to their Portfolio Manager Login.

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 5
Energy Star Performance Summary

ENERGY STAR PERFORMANCE RATING PER FACILITY			
FACILITY	**ENERGY STAR PERFORMANCE RATING**		
DESCRIPTION	**SCORE**	**AVERAGE**	**POTENTIAL CERTIFICATIONS**
Central Elementary-Middle School - BOE	36	50	No
Elizabeth Haddon Elementary	64	50	No
J.F. Tatem Elementary School	67	50	No
Haddonfield Memorial High School	69	50	No
See the Appendix C - Statement of Energy Performance for comparative facilities Score: "N/A" represents facility that could not receive a rating. See Energy Star website for details.			

Refer to **Statement of Energy Performance Appendix** for the detailed energy summary for each facility. Facilities that do not have a rating is a result of one of the following issues:

V. 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 recently 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. CEG has assessed the feasibility of installing renewable energy measures (REM) for the municipality 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). Parking lots can also be utilized for the installation of a solar array. A truss system can be installed that is high enough to park vehicles under the array and no parking lot area is lost.

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 used in our financial calculations is $191 per MWH. This equates to $0.191 per kWh generated.

CEG has reviewed the existing roof, ground, and parking lot area potential of the facilities being audited for the purposes of determining a potential for a photovoltaic system. The facilities were evaluated for the most economical and feasible areas for the installation of solar arrays. It should be noted a structural analysis was not performed on the areas where roof systems were recommended. A depiction of the areas utilized at each facility is shown in **Renewable / Distributed Energy Measures Calculation Appendix**. The system sizes are shown below for each building where installation of a solar PV system is feasible. The total KWH production for all facilities combined is 302,960 kWh annually, reducing the overall utility bill for the District by approximately 9.4% percent. A detailed financial analysis can be found in the **Renewable / Distributed Energy Measures Calculation Appendix** within each facility report. 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.

Table 6
Renewable Energy Summary

POWER PRODUCTION SUMMARY - PHOTOVOLTAIC SYSTEM PER FACILITY			
FACILITY	**PRODUCTION SUMMARY**		
DESCRIPTION	**SYSTEM SIZE (KW_{DC})**	**ELECTRIC PRODUCTION (KWH)**	**% REDUCTION**
Central Elementary-Middle School - BOE	75.12	91,434	7.0%
Elizabeth Haddon Elementary	24.48	28,660	9.3%
J.F. Tatem Elementary School	33.84	39,062	10.5%
Haddonfield Memorial High School	122.64	143,804	11.6%
Total	**256**	**302,960**	9.4%

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 public entity 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 each existing facility. 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 81%. 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 array for each facility is 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 net 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 District 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 per facility is as follows:

Table 7
Renewable Financial Summary

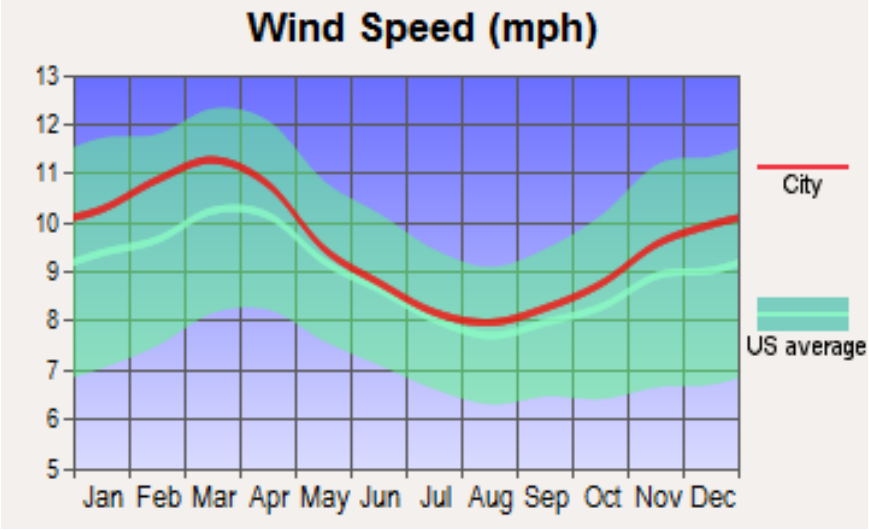
FINANCIAL SUMMARY - PHOTOVOLTAIC SYSTEM PER FACILITY			
FACILITY	**DIRECT PURCHASE FINANCIAL SUMMARY**		
DESCRIPTION	**INSTALATION COST ($)**	**TOTAL SAVINGS ($)**	**INTERNAL RATE OF RETURN**
Central Elementary-Middle School - BOE	$324,342	$29,358	4.1%
Elizabeth Haddon Elementary	$115,696	$9,604	2.9%
J.F. Tatem Elementary School	$157,813	$12,620	2.4%
Haddonfield Memorial High School	$519,293	$45,598	3.7%
Total	**$1,117,144**	**$97,180**	3.5%

Concord Engineering recommends the District review all options available for installation of solar PV systems at their facility 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 District at a reduced rate compared to their existing electric rate. It should be noted that current SREC pricing has significantly impacted the PPA market for public entities 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 public 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 wind speed of 6 meters per second (13.5 mph). Based on the obtained wind data shown in **Figure 4** for Camden the annual average wind speed is 9.4 mph with a peak of 11 mph, making this area unattractive for wind development. Therefore, wind energy is not a viable option to implement.

Figure 4
Camden, New Jersey Average Wind Speeds



VI. ENERGY PURCHASING AND PROCUREMENT STRATEGY

Load Profile:

Load Profile analysis was performed to determine the seasonal energy usage of the facilities. 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 Natural Gas Usage Profiles included within this report to reference the respective electricity and natural gas usage load profiles.

Electricity:

The electricity usage profile demonstrates a relatively flat load profile from winter to summer. The average summer (May-September) consumption is 5% less than the average winter (October-April) consumption. The following table outlines the seasonal average monthly consumption and demand for each facility.

ELECTRIC UTILITY SEASONAL LOAD PROFILE				
FACILITY	**SEASONAL AVERAGES**			
	WINTER (OCT - APR)		**SUMMER (MAY - SEP)**	
DESCRIPTION	**KWH PER MONTH**	**KW PER MONTH**	**KWH PER MONTH**	**KW PER MONTH**
Central Elementary-Middle School - BOE	107,651	348.23	111,448	343.92
Elizabeth Haddon Elementary	28,766	95.66	21,408	108.24
J.F. Tatem Elementary School	33,171	97.04	27,972	116.30
Haddonfield Memorial High School	106,171	256.42	98,640	363.96

The historical usage profile is less than 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 ACE'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 93% 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		
FACILITY	**SEASONAL AVERAGES**	
	WINTER (OCT - APR)	**SUMMER (MAY - SEP)**
DESCRIPTION	**THERM PER MONTH**	**THERM PER MONTH**
Central Elementary-Middle School - BOE	7,574	731
Elizabeth Haddon Elementary	3,445	145
J.F. Tatem Elementary School	2,225	216
Haddonfield Memorial High School	13,540	700

This load profile will yield less than favorable natural gas prices due to the heating dominated profile. Higher winter month consumption will yield higher pricing which will not be offset by the summer month consumption. Nymex commodity pricing is generally higher in the winter months of November – March and lower in the summer months of April – October.

Third Party Supplier (TPS) natural gas commodity contracts that offer a product structure to include a Fixed percentage savings product structure for 100% of the facilities **metered** natural gas requirements is recommended. Several natural gas third party suppliers are offering this product service for end users for a guaranteed savings strategy.

Tariff Analysis:

Electricity:

All the facilities receive electrical service from Public Service Electric & Gas (PSEG) on rate schedules LPLS (Large Power & Lighting Service) and GLP (General Lighting & Power Service). All facilities have contracted a Third Party Supplier (TPS) to provide electric commodity service. Champion Energy Services has been contracted however; the contract particulars such as product structure, price, term and conditions were not available for review or comments. For electric supply (generation) service, the client has a choice to either use PSEG'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. PSEGE'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 facilities currently receive natural gas distribution service from Public Service Electric & Gas (PSEG) under rate schedules LVG (Large Volume Gas) and GSG (General Service Gas). The facilities have contracted with a Third Party Supplier (TPS), Hess, to provide natural gas commodity service. The current TPS's provider information was not available and contract particulars such as product structure, price, term and conditions were not available for review or comments. For natural gas supply service, the client has a choice to either use PSEG's default service rate BGSS or contract with a Third Party Supplier (TPS) to supply natural gas commodity service.

PSEG 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. PSEG's delivery service rate includes the following charges: Customer Service Charge, Distribution Charge, & Societal Benefits Charge (SBC).

Electric and Natural Gas Commodities Market Overview:

Current electricity and natural gas market pricing has remained relatively stable over the last couple of years. Commodity pricing in 2008 marked historical highs in both natural gas and electricity commodity. Commodity pricing commencing spring of 2009 continuing through 2013, has decreased dramatically over 2008 historic highs and 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. This 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.

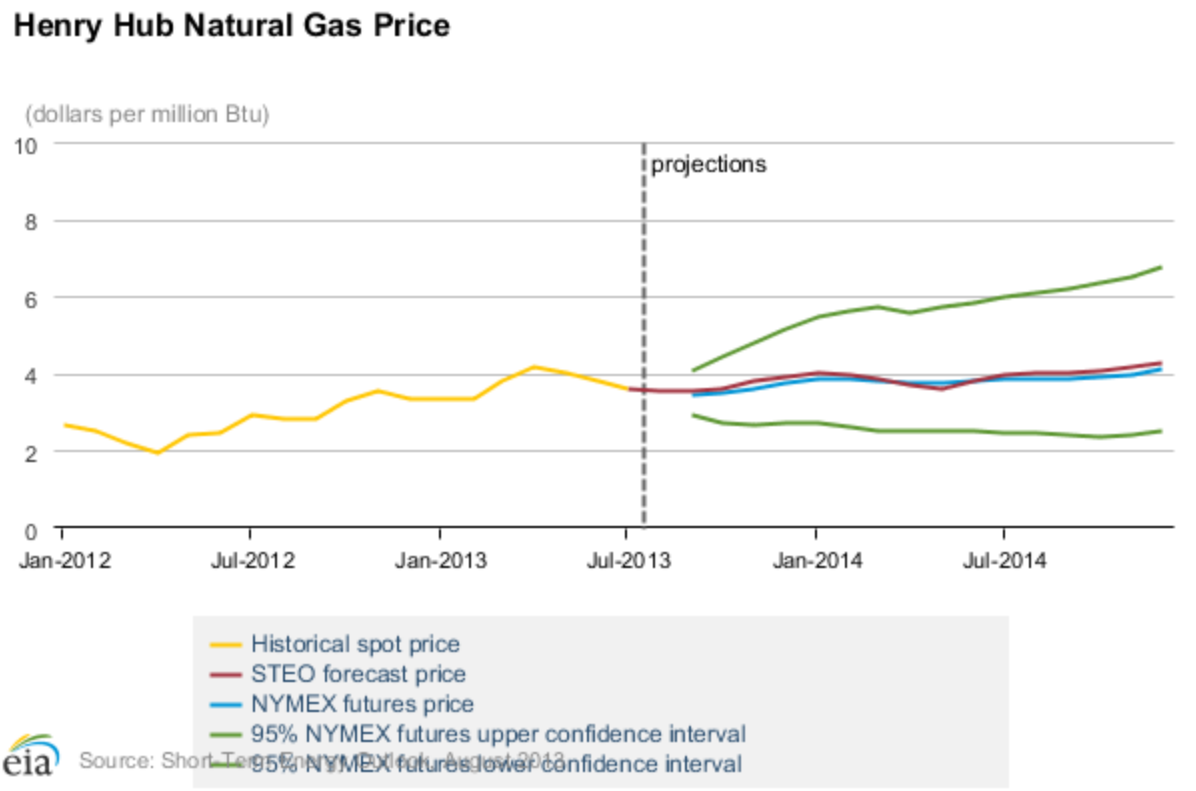
Short Term Energy Outlook - US Energy Information Administration (August 6, 2013):

Natural Gas

A heat wave in the Northeast in mid-July contributed to spikes in the price of wholesale natural gas and electric power, as well as near-record consumption of natural gas for power generation in the Northeast. Although recent pipeline capacity additions have helped ease movement of natural gas supplies in the area, constraints continue to limit gas flow to the region, particularly in times of high demand. The day-ahead price of natural gas at the Algonquin Citygate, which serves Boston consumers, rose to $8.09 per million British thermal units (MMBtu) at the end of trading on July 16. This was its highest level since March 2013, and more than $4 per MMBtu greater than the benchmark Henry Hub price ($3.69 per MMBtu) in Louisiana. Additionally, on New York's independent system operator's trading platform, real-time hourly wholesale power prices spiked to more than $800 per megawatt hour on July 17.

Natural gas spot prices averaged $3.62 per MMBtu at the Henry Hub in July 2013, down 21 cents from the previous month's price. EIA expects the Henry Hub price will increase from an average of $2.75 per MMBtu in 2012 to $3.71 per MMBtu in 2013 and $3.95 per MMBtu in 2014. Despite declines in prices over the past few months, prices still remain substantially above their year-ago levels. (Henry Hub prices last July averaged $2.95 per MMBtu, and the average spot prices at most other major trading hubs over the first 6 months of 2013 increased by 40 percent to 60 percent from the same period last year.)

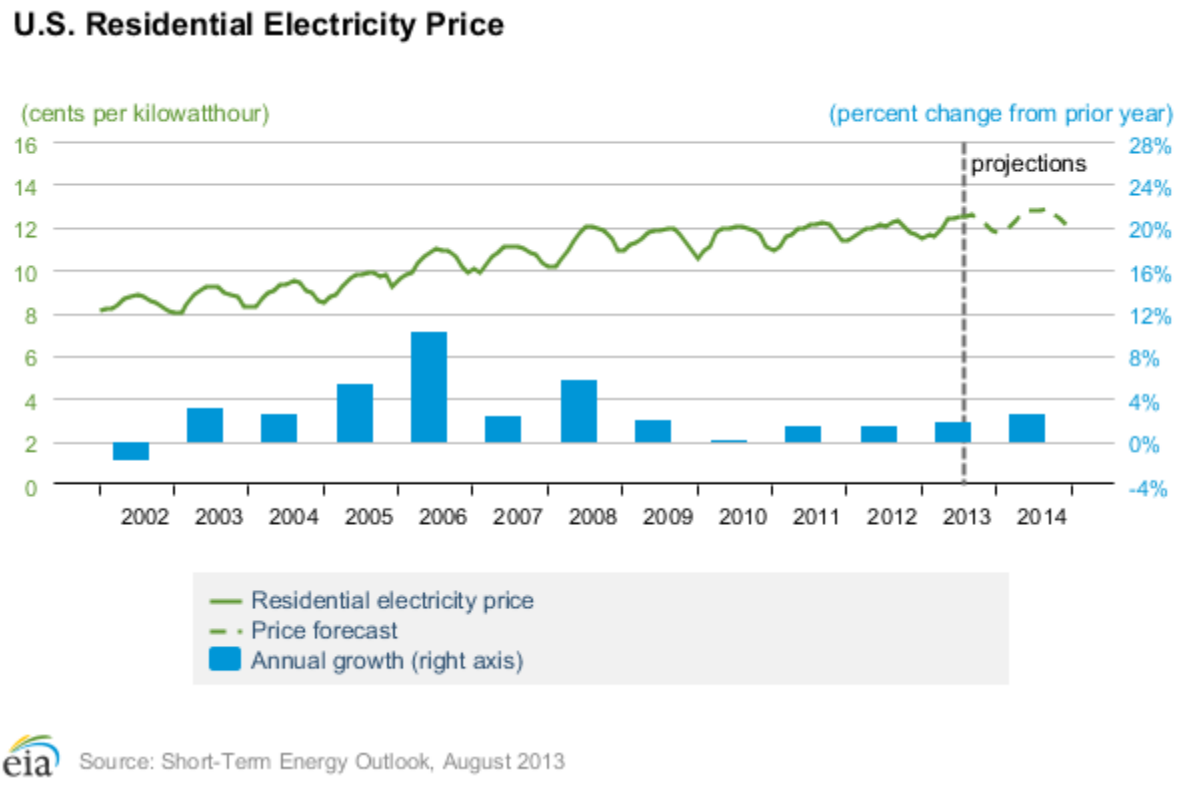
Natural gas futures prices for November 2013 delivery (for the five-day period ending August 1, 2013) averaged $3.58 per MMBtu. Current options and futures prices imply that market participants place the lower and upper bounds for the 95-percent confidence interval for November 2013 contracts at $2.68 per MMBtu and $4.79 per MMBtu, respectively. At this time a year ago, the natural gas futures contract for November 2012 averaged $3.26 per MMBtu and the corresponding lower and upper limits of the 95-percent confidence interval were $2.13 per MMBtu and $4.98 per MMBtu.



Electricity

The northeastern United States experienced a strong heat wave during mid-July. In response, many customers ran their air conditioners more than usual. EIA estimates the average residential customer in New England will use about 1.0 percent more electricity during the summer of 2013 (June-August) compared with last summer, while customers in the Middle Atlantic states are expected to use about 0.5 percent less electricity. In addition to increased electricity demand, the heat wave also caused temporary spikes in wholesale power prices. State retail rate regulations shield many residential customers from price swings in the wholesale power market, but EIA expects summer electricity prices in the Northeast to average about 2.7 percent higher than summer 2012, primarily as a result of higher fuel costs paid by generators.

Generation fuel costs and wholesale electricity prices have increased this year after a considerable decline in 2012. During the first half of 2013, EIA estimates the price of natural gas delivered to electric generators averaged $4.46 per MMBtu, 44 percent higher than the same period last year. Changes in the costs of providing electricity are not immediately reflected on retail customer bills because state regulatory commissions must approve rate changes in many areas of the country. EIA expects the residential retail price of electricity in 2013 will average 12.1 cents per kilowatthour, about 1.9 percent higher than the price last year.



The below recommendations presented by Concord Engineering are based on current information provided by the Borough 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 district continue its aggregation approach for 3rd party commodity supply procurement strategies for the purchase of electricity and natural gas. Aggregating the usage of all facilities for both electricity and natural gas supply service, allows the District to continue to achieve lower prices in commodity supply costs over the utility default service programs. 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. Contracts due to expire in the near term would continue to yield very favorable pricing. It is important to aggregate usage where available and take advantage of these current market prices quickly, before energy increases.

2. After review of the utility consumption report and current commodity pricing outlook, Concord recommends that the District 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 recommends that the District review their current situation regarding third party purchasing for all of their facilities. They can then have the existing Third Party Supplier for electricity and natural gas enroll any facilities that are not currently enrolled in third party purchasing contracts.

4. Concord also recommends that the District consider utilizing a third party utility billing-auditing service to further analyze historical utility invoices such as water, sewer, natural gas, electricity and solar 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 District.

VII. INSTALLATION FUNDING OPTIONS

CEG has reviewed various funding options for the facility 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

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 not provided in addition to the local government energy audit program incentive.)

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

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 150 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.

Smart Start Program

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.

CEG recommends the Owner review the use of the above-listed funding options in addition to utilizing their standard method of financing for facilities upgrades in order to fund the proposed energy conservation measures.

B. Financing Options:

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.

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.

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 dept. 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.

VIII. 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 following:
    a. operating hours
    b. equipment type
    c. control strategies
    d. 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.
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