



ENERGY AUDIT – FINAL REPORT

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I. EXECUTIVE SUMMARY

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

Ocean Township
 Municipal Library
 701 Deal Rd.
 Ocean, NJ 07712

Municipal Contact Person: Andrew Brannen
 Facility Contact Person: Mark Disakias

This audit was performed in connection with the New Jersey Clean Energy Local Government Energy Audit Program. These energy audits are conducted to promote the office of Clean Energy’s mission, 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.

The annual energy costs at this facility are as follows:

Electricity	\$40,131
Natural Gas	\$12,547
Total	\$52,678

The potential annual energy cost savings are shown below in Table 1. Be aware that the measures are not additive because of the interrelation of several of the measures. The cost of each measure for this level of auditing is ± 20% until detailed engineering, specifications, and hard proposals are obtained.

Table 1
Energy Conservation Measures (ECM’s)

ECM NO.	DESCRIPTION	COST ^A	ANNUAL SAVINGS	SIMPLE PAYBACK (YEARS)	SIMPLE ROI
1	Interior Lighting Controls	\$1,361	\$720	1.9	694%
2	HVAC Upgrade	\$25,740	\$485	53.1	(62%)

Note: Net Installation Cost includes applicable incentives.

The estimated demand and energy savings are shown below in Table 2. The information in this table corresponds to the ECM’s in Table 1.

Table 2
Estimated Energy Savings

ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECT DEMAND (KW)	ELECT CONSUMPTION (KWH)	NAT GAS (THERMS)
1	Interior Lighting Controls	-	4,472	-
2	HVAC Upgrade	-	3,944	-

Recommendation:

Concord Engineering Group strongly recommends the implementation of all ECM's that provide a calculated simple payback at or under seven (7) years. The potential energy and cost savings from these ECM's are too great to pass upon. The following Energy Conservation Measures are recommended for the Ocean Township Municipal Library:

- **ECM #1: Interior Lighting Controls**

In addition to the above recommendations, based on the review of the facility's energy bills and discussions with the Township, the energy audit team recommends Retro-Commissioning of this facility to meet the following objectives:

- Bring existing HVAC equipment to its proper operational state including air and water distribution systems
- Reduce energy use and energy costs
- Improve indoor air quality
- Address overall building energy use and demand and identify areas of highest energy use and demand
- Identify the location of the most comfort problems or trouble spots in the building
- Review current O&M practices

Through the implementation of a Retro-Commissioning Plan, the Township will be able to continue with their vision of reducing energy usage and operating efficient facilities.

II. INTRODUCTION

This comprehensive energy audit covers the 12,172 square foot Ocean Township Municipal Library that includes a renovated 18th century 3-story mansion that has been turned into reading lounges, and conference rooms as well as a newly built section consisting of the main library, circulation desks, and bathrooms.

Electrical and natural gas utility information is collected and analyzed for one full year's energy use of the 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/ft²/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

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. If multiple ECM's are recommended to be implemented, the combined savings is calculated and identified appropriately.

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 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:

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

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

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

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

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

Table 3 and Figure 1 represent the electrical usage for the surveyed facility from December-07 to December-08. Jersey Central Power and Light (JCP&L) provides electricity to the facility under the General Service Secondary 3 Phase Rate Schedule. This electric rate has a component for consumption that is measured in kilowatt-hours (kWh). It is calculated by multiplying the wattage of the equipment times the hours that it operates. For example, a 1,000 Watt lamp operating for 5 hours would measure 5,000 Watt-hours. Since one kilowatt is equal to 1,000 Watts, the measured consumption would be 5 kWh. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the most current rate structure available.

Table 4 and Figure 2 show the natural gas energy usage for the surveyed facility from January-08 to December-08. The Ocean Township Municipal Library receives natural gas via New Jersey Natural Gas under the Basic Generation Service (BGS) rate. This rate, combined with a delivery charge, makes up the total cost per therm.

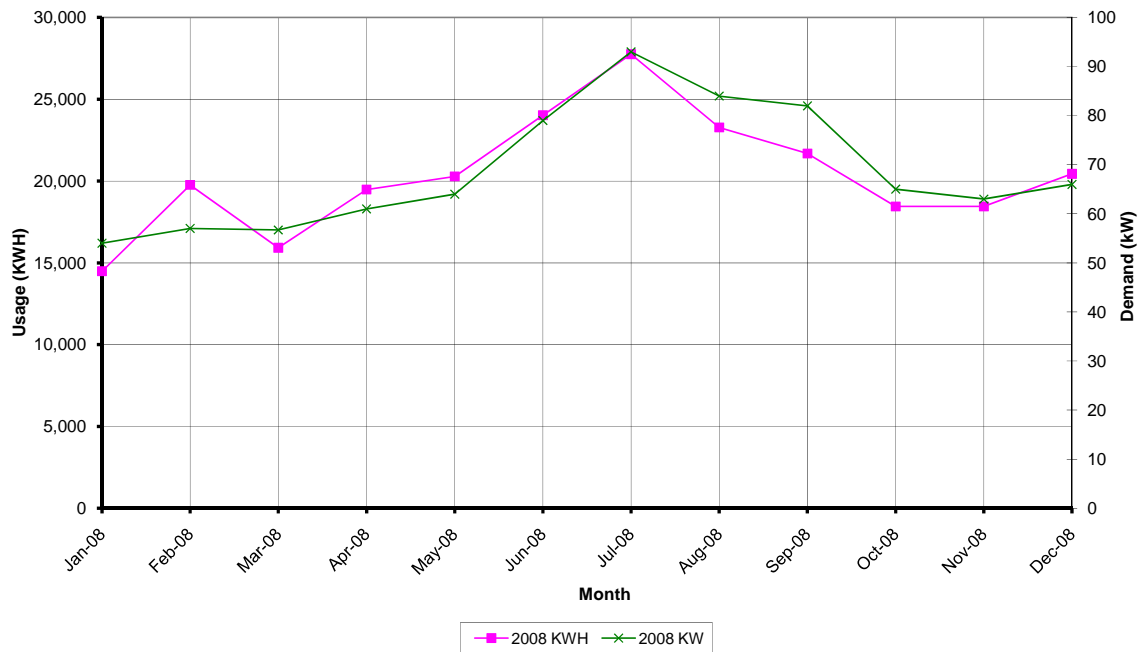
<u>Description</u>	<u>Average</u>
Electricity	16.4¢ / kWh
Natural Gas	\$1.761 / Therm

Table 3
Electricity Billing Data

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
1/08	14,480	54	\$2,284
2/08	19,760	57	\$3,008
3/08	15,920	57	\$2,391
4/08	19,480	61	\$2,850
5/08	20,280	64	\$2,974
6/08	24,020	79	\$4,031
7/08	27,760	93	\$5,088
8/08	23,280	84	\$4,311
9/08	21,680	82	\$3,936
10/08	18,440	65	\$2,931
11/08	18,440	63	\$2,983
12/08	20,440	66	\$3,344
Totals	243,980	93 Max	\$40,131

Figure 1
Electricity Usage Profile

Municipal Library
Electric Usage Profile
January through December of 2008

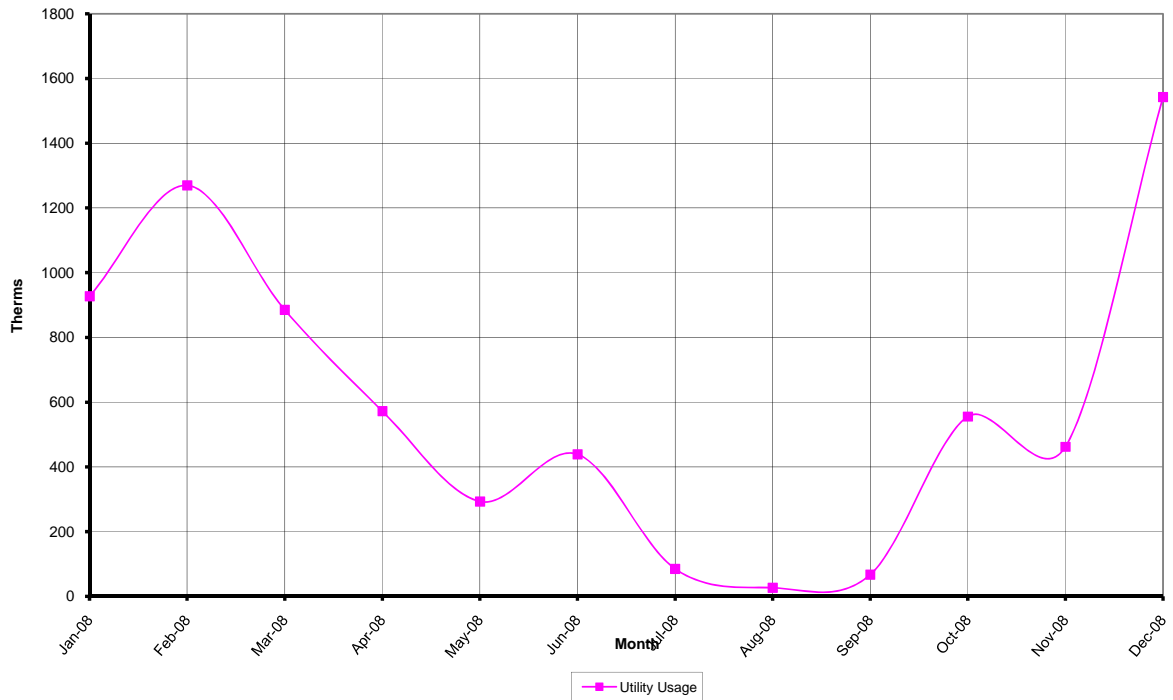


**Table 4
Natural Gas Billing Data**

MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
1/08	927.2	\$1,347
2/08	1,269.5	\$1,839
3/08	885.2	\$1,284
4/08	572.3	\$ 843
5/08	293.0	\$ 429
6/08	438.9	\$ 639
7/08	85.1	\$ 130
8/08	26.5	\$ 45
9/08	67.2	\$ 104
10/08	555.5	\$ 877
11/08	462	\$2,504
12/08	1,542.5	\$2,506
Totals	7,124.5	\$12,547

**Figure 2
Natural Gas Usage Profile**

Municipal Library
Gas Usage Profile
January through December of 2008



B. Energy Use Index (EUI)

Energy Use Index (EUI) is a measure of a building's energy utilization per square foot of building. This calculation is completed by converting all utility usage (gas, electric, oil) consumed by a building over a specified time period, typically 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 amongst building of similar type. The EUI for this facility is calculated as follows:

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

$$\text{Electric} = \frac{(243,980 \text{ kWh} * 1000 \text{ W/kW} * 3.414 \text{ btu/Wh})}{\left(\frac{1000 \text{ Btu}}{1 \text{ kBtu}}\right)}$$

$$= \mathbf{832,947.72 \text{ kBtu}}$$

$$\text{Gas} = \frac{(7,124.5 \text{ therm} * 100,000 \text{ Btu/1 therm})}{\left(\frac{1000 \text{ Btu}}{1 \text{ kBtu}}\right)}$$

$$= \mathbf{712,450 \text{ kBtu}}$$

$$\text{Building EUI} = \frac{(832,947.72 \text{ kBtu} + 712,450 \text{ kBtu})}{12,172 \text{ SF}} = \frac{1,543,397.72 \text{ kBtu}}{12,172 \text{ SF}}$$

Municipal Library EUI = 126.8 kBtu/SF (Site Energy); 289.8 kBtu/SF (Source Energy)

As a comparison, data has been gathered by the US Department of Energy (DOE) for various facilities cataloguing the standard site and source energy utilization. This data has been published in the 2003 Commercial Building Energy Consumption Survey and is noted as follows for facilities of this type:

- Public Assembly (Library):
104 kBtu/SF Site Energy, 246 kBtu/SF Source Energy.

Based on the information compiled for the studied facility, as compared to the national average the energy usage is approximately 22% higher than the baseline data

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 you to track and assess 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 more emphasis is being placed throughout multiple arenas 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. Therefore, it is vital that local government municipalities assess their energy usage, benchmark this usage utilizing Portfolio Manager, set priorities and goals to lessen their energy usage and move forward with these priorities and goals. Saving energy will in-turn save the environment.

In accordance with the Local Government Energy Audit Program, CEG has created an Energy Star account for the facility in order to allow the municipal access to monitoring their yearly energy usage as it compares to facilities of similar type. The following is the user name and password for this account:

User Name: oceantwp
 Password: lgeaceg2009
 Security Question: What is your birth city? ocean township

Utilizing the utility bills and other information gathered during the energy audit process, CEG entered the respective data into Portfolio Manager and the following is a summary of the results:

Table 5
ENERGY STAR Performance Rating

FACILITY DESCRIPTION	ENERGY PERFORMANCE RATING	NATIONAL AVERAGE
Municipal Library	N/A	N/A

Specific building types are detailed on the ENERGY STAR website. Non-typical buildings are covered by an “Other” category. The Municipal Library falls under this “Other” category. The “Other” category is used if your building type or a section of the building is not represented by one of the specific categories. An Energy Performance Rating cannot be calculated if more than 10% of a building is classified as “Other.” Despite this, the Portfolio Manager calculates the building EUI. The EUI is an important tool that can be used to track the energy efficiency of the building.

Baselines for improvement can be set that the municipality can strive to meet. CEG strongly urges Ocean Township to keep their Portfolio Manager account up to date to monitor the performance of the building.

Refer to Appendix F for detailed energy benchmarking report entitled “STATEMENT OF ENERGY PERFORMANCE.”

V. FACILITY DESCRIPTION

The Ocean Township Municipal Library is a 12,172 ft² public library that is occupied for 58 hours per week. Construction for the building finished in 2005 and employs 16 people. The library is an expansion and renovation of an old mansion. The renovated mansion has 2-stories, a basement, and an attic. The 2 floors of the mansion are public, with the first floor housing a lounge and children's area, and the second floor containing conference rooms, and a small kitchen. The basement and attic are used as mechanical rooms for HVAC units. The main library is a single floor, open room with a large skylight directly above the main stacks.

Cooling System

The library is cooled by three (3) split systems consisting of Trane Air-Handlers and Condensing Units.

Two (2) Trane M-series Climate Changer Air-Handlers with 3 HP motors reside in the basement and are coupled with a Trane Odyssey Condensing Units rated at 10 tons capacity each located on the rooftop. A third air-handling unit is located in the attic of the renovated mansion and has a 10 HP fan and corresponding 30 ton condensing unit on the rooftop. All three air-handling units utilize DX cooling. All equipment is original to the building (4 years old.)

Heating System

The same three air-handling units that are responsible for cooling the building also heat the building with the aid of a Lochinvar Natural Gas Boiler. The boiler provides heating hot water to the Trane Air-Handling Units via hot water heating coils and two (2) Taco pumps that each utilize a 1 HP Baldor Motor.

Domestic Hot Water

Domestic hot water for the facility is provided by two (2) A.O. Smith Promax Hot Water Heaters. The water heaters are electric, contain a 1/15 HP circulation pump, and have a capacity of 30 Gallons each.

Lighting

The lighting for the facility is provided by a plethora of different lighting fixtures. These fixtures vary in size and light quantity, but all contain either a T-8 bulb or a compact fluorescent. The lighting is very current.

VI. MAJOR EQUIPMENT LIST

Following the completion of the field survey a detailed equipment list was created. The equipment within this list is considered major energy consuming equipment whose replacement could yield substantial energy savings. In addition, the list shows the major equipment in the facility and all pertinent information utilized in energy savings calculations. An approximate age was assigned to the equipment 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.

**Table 6 thru 8
Existing Equipment Listing**

HEATING EQUIPMENT						
Description	Qty	Rated Capacity (MBH)	Fuel Type	Approx. Age (yrs)	ASHRAE Service Life (yrs)	Remaining Life (yrs)
Lochinvar Boilers M/N: CHN651 S/N: A04H00161248	1	650 MBH _{IN} ; 553 MBH _{OUT}	Nat Gas	5	35	30
Taco Pump M/N: N3116T	2	-	Elec.	5	12	7

COOLING EQUIPMENT						
Description	Qty	Cooling Capacity (Tons)	Fuel Type	Approx. Age (yrs)	ASHRAE Service Life (yrs)	Remaining Life (yrs)
Trane Air Handler – Climate Changer / CU M/N: MCCB021UA0COUA CU - M/N: RAUCC304BX0300D	1	30	DX Electric	5	15	10
Trane Air Handler – Climate Changer / CU AHU - M/N: MCCB008UA0COUA CU - M/N: TTA120A400EA	2	10	DX Electric	5	15	10

DOMESTIC HOT WATER SYSTEM						
Description	Qty	Capacity	Fuel Type	Approx. Age (yrs)	ASHRAE Service Life (yrs)	Remaining Life (yrs)
A.O. Smith ProMax - Series M/N ECS30200	2	30 Gallon (4.1 KW)	Elec	11	12	1

Note: Equipment noted as having a negative (#) remaining life is considered past its standard service life as described in 2007 ASHRAE Applications Handbook and is most likely a good candidate for replacement.

VII. ENERGY CONSERVATION MEASURES

ECM #1: Interior Lighting Controls

Description:

In some areas the lighting is left on unnecessarily. Many times this is due to the idea that it is better to keep the lights on rather than to continuously switch them on and off. The on/off dilemma was studied and it was found that the best option is to turn the lights off whenever possible. Although this does reduce the lamp life, the energy savings far outweigh the lamp replacement costs. The cutoff for when to turn the lights off is around two minutes. If the lights can 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 all it would take. Occupancy sensors detect motion and will switch the lights on when the room is occupied. They can either be mounted in place of the current wall switch, or they can be mounted on the ceiling to cover large areas. Lastly, photocells are a lighting control that sense light levels and will turn the lights off when there is adequate daylight. These are mostly used outside, but they are becoming much more popular in energy-efficient office designs as well.

To determine an estimated savings for lighting controls, we used ASHRAE 90.1-2004 (NJ Energy Code). Appendix G of the referenced standard, states that occupancy sensors have a 10% power adjustment factor for daytime occupancies for buildings over 5,000 SF. This ECM requires the installation of dual technology occupancy sensors in all private office rooms, conference rooms, restrooms, storage rooms; file rooms, etc. The main library would include daylight sensors in addition to the occupancy sensors to reduce or eliminate light wattage when day lighting through windows and sky lighting is adequate. The estimated savings for adequately lit daylight occupancy is an additional 10% for the library space only. See Appendix D for details.

CEG recommends wall switches to be replaced with motion sensors for individual rooms and ceiling mount motion sensors for large areas or restrooms. The library shall consist of ceiling mounted daylight sensors in addition to the motion sensors. Sensors shall be by Sensorswitch, Watt Stopper, or equal.

Energy Savings Calculations:

The lighting power usage (kWh) is calculated in Appendix D. The total savings is conservatively estimated to be as shown below. Ten percent of this value is the resultant energy savings due to installation of occupancy sensors and daylight controls:

Light Energy	= 33,526 kWh/Yr. occupancy sensor controlled area = 11,189 kWh/Yr. daylight sensor controlled area
Energy Savings	=10% x kWh usage controlled by occupancy sensors +10% x kWh usage also controlled by daylight sensors

$$= 10\% \times 33,526 \text{ kWh/Yr.} + 10\% \times 11,189 \text{ kWh/Yr.} = 4,472 \text{ kWh/Yr.}$$

$$= 4,472 \text{ kWh/Yr.} \times \$0.161/\text{kWh} = \$720/\text{Yr.}$$

Installation Cost = \$75 x 17 motion sensors + \$238 x 2 Daylight Sensors
 = \$1,751

Installation cost per dual-technology sensor (Basis: Sensorswitch or equivalent) is \$75/unit including material and labor. Installation cost per daylight sensor is \$238/unit

From Appendix C, the installation of a lighting control device warrants the following incentive: occupancy = \$20 per fixture, daylight = \$25 per fixture.

Smart Start® Incentive = (# of wall mount devices × \$ 20) = (17 × \$20) = \$340

Smart Start® Incentive = (# of day light devices × \$ 25) = (2 × \$25) = \$50

Smart Start® Incentive = \$390 Total

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$1,751
NJ Smart Start Equipment Incentive (\$):	(\$390)
Net Installation Cost (\$):	\$1,361
Annual Maintenance Savings (\$ / yr):	-
Annual Energy Savings (\$ / yr):	\$720
Annual Net Savings (\$ / yr):	\$720
Simple Payback (yrs):	1.9
Simple Lifetime Return On Investment (%):	694%
Estimated ECM Lifetime (yr):	15
Simple Lifetime Maintenance Savings (\$)	-
Simple Lifetime Energy Savings (\$):	\$10,800

ECM #2: HVAC Upgrade

Description:

The split systems consisting of air handling units in the building and condensing unit outside are not high efficiency units. The existing units have an energy efficiency ratio (EER) of 11.3.

This measure would replace only the condensing unit portion of the split systems to minimize installation cost while providing efficiency increase. Calculation is based on the following equipment: Rheem RAWE high efficiency commercial condensing unit. The existing units will be replaced with high energy efficient condensing units with capacities typical of the existing units. The ECM only includes the two 10 ton condensing units since the efficiency gain for a high efficiency 30 ton unit is almost negligible. Condensing unit compatibility should be confirmed for the equipment before implementing this ECM.

Total Rated Capacity (2) 10 ton units = 20 Tons

Existing System Efficiency = 11.3 EER

Proposed System Efficiency = 12.6 EER

Cooling Season Hrs. of Operation = 1,800 hrs/yr.

Average Cost of Electricity - \$0.164/kWh

Energy Savings Calculations:

$$\text{Energy Savings} = \frac{[\text{Cooling Tons} \times 12,000 \text{ Btu/ton}]}{[1000 \text{ W/kW}]} \times \left(\frac{1}{\text{EER}_{\text{OLD}}} - \frac{1}{\text{EER}_{\text{NEW}}} \right) \times \text{Ave\% Loading} \times \text{Hrs. of Cooling}$$

$$\begin{aligned} \text{Energy Savings} &= \frac{[20 \text{ Cooling Tons} \times 12,000 \text{ Btu/ton}]}{[1000 \text{ W/kW}]} \times \left(\frac{1}{11.3 \text{ EER}_{\text{OLD}}} - \frac{1}{12.6 \text{ EER}_{\text{NEW}}} \right) \times 0.75 \times 1,800 \text{ hours} \\ &= 2958 \text{ kWh / yr} \end{aligned}$$

$$\text{Cooling Cost Savings} = (3,944 \text{ kWh}) * \$0.164/\text{kWh} = \$485.11 / \text{Yr.}$$

Installation cost for the three (2) 10 ton split system condensing units is estimated at \$13,600. It is pertinent to note that this estimate includes the demolition of the existing units

NJ Smart Start[®] Program Incentives are calculated as follows:

From Appendix C, the condensing unit replacement falls under the category “Split Systems” and warrants an incentive based on efficiency (EER) at a certain cooling tonnage.

$$\begin{aligned} \text{Smart Start}^{\text{®}} \text{ Incentive} &= (\text{Cooling Tons} \times \$ / \text{Ton Incentive}) \\ &= (20 \text{ Tons} \times \$74 / \text{Ton}) = \$1480 \end{aligned}$$

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$27,200
NJ Smart Start Equipment Incentive (\$):	(\$1,460)
Net Installation Cost (\$):	\$25,740
Annual Maintenance Savings (\$ / yr):	-
Annual Energy Savings (\$ / yr):	\$485
Annual Net Savings (\$ / yr):	\$485
Simple Payback (yrs):	53.1
Simple Lifetime Return On Investment (%):	(62%)
Estimated ECM Lifetime (yr):	20
Simple Lifetime Maintenance Savings (\$)	-
Simple Lifetime Energy Savings (\$):	\$9,700

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 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 technologies for Ocean Twp, and concluded that there is potential for solar and wind energy generation.

Solar energy produces clean energy and reduces a building's carbon footprint. This is accomplished via photovoltaic panels which will be 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 \$350, this value was used in our financial calculations. This equates to \$0.35 per kWh generated.

CEG has reviewed the existing roof area of the building being audited for the purposes of determining a potential for a roof mounted photovoltaic system. A roof area of 1,933 S.F. can be utilized for a PV system on the Municipal Library. A depiction of the area utilized is shown in Appendix E. Using this square footage it was determined that a system size of 10.81 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 16,870 KWh annually, reducing the overall utility bill by 6.9% percent. A detailed financial analysis can be found in Appendix E. This analysis illustrates the payback of the system over a 25 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 Sun Power SPR-230 panel. This panel has a "DC" rated full load output of 230 watts, and has a total panel conversion efficiency of 18%. Although panels rated at higher wattages are available through Sun Power 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 proposed solar array 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.

CEG has reviewed financing options for the owner. Two options were studied and they are as follows: Self-financed and direct purchase without finance. Self-finance was calculated with 95% of the total project cost financed at a 7% interest rate over 25 years. Direct purchase involves the local government paying for 100% of the total project cost upfront. Both of these calculations include a utility inflation rate as well as the degradation of the solar panels over time. Based on our calculations the following are the payback periods for the respective method of payment:

PAYMENT TYPE	SIMPLE PAYBACK	SIMPLE ROI	INTERNAL RATE OF RETURN
Self-Finance	11.3 Years	8.9%	12.3%
Direct Purchase	11.3 Years	8.9%	8.0%

The resultant Internal Rate of Return indicates that if the Owner was able to “self-finance” the solar project, the project would be slightly more beneficial to the Owner. However, if the Owner was able to work out a Power Purchase Agreement with a third-party and agree upon a decent base energy rate for kilowatt hour production, the “direct purchase” option could also, prove to be a beneficial route.

Wind energy production is another option available through the Renewable Energy Incentive Program. Small wind turbines can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. CEG has reviewed the applicability of wind energy for City Hall and has determined it is not a viable option. There is not enough free land available on the site to accommodate the installation of a wind turbine.

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 facility. Consequently based on the profile a recommendation will be made to remedy the irregularity in energy usage. For this report, the facility's energy consumption data was gathered in table format and plotted in graph form to create the load profile. Refer to Section IV, Figures 1 and 2 included within this report to reference the respective electricity and natural gas usage load profile for Jan 2008 through Dec 2008.

Electricity:

Section IV, Figure 1 demonstrates flat load usage profile. The load profile is relatively flat with some summertime increase, which is typical for a cooling load or air-conditioning load. The Trane air-handlers and motors are probably adding to the summertime load. The balance of the year is slightly lower in use but consistent all the same. One contributor to the added year long electric load is the presence of electric hot-water heaters. Base-load shaping is important because a flat consumption profile will yield more competitive pricing when shopping for alternative energy solutions.

Natural Gas:

Section IV, Figure 2 demonstrates a typical heating load (November –March), and complimentary cooling load (April –October). Consequently there is a clear separation between summer and winter loads consistent with the manner in which energy is traded on the New York Mercantile Exchange. There are some anomalies in the load shape with spikes in June and October. But the winter load is strong (November –March) as expected with heating loads. Heating loads carry a much higher average cost because of the higher demand for natural gas during the winter season.

Tariff Analysis:

Electricity:

This facility receives electrical service through Jersey Central Power & Light (JCP&L) on a GSS (General Service Secondary) rate. Service classification GS is available for general service purposes on secondary voltages not included under Service Classifications RS, RT, RGT or GST. This is a single or three phase service at secondary voltages. For electric supply (generation), the customer will use the utilities Basic Generation Service (BGS) or a Third Party Supplier (TPS). If they use the utility BGS then they will pay according to the BGS default service. The Delivery Service includes the following charges: Customer Charge, Supplemental Customer Charge, Distribution Charge (kW Demand), kWh Charge, Non-utility Generation Charge, TEFA, SBC, SCC, Standby Fee and RGGI

Natural Gas:

This Municipal Library receives natural gas service through Public Service Electric and Gas Company (PSE&G) on a LVG (Large Volume Gas Service) rate class, when not receiving commodity by a Third Party Supplier. The utility tariff rate (LVG) is for firm delivery service for

general purposes. Customers may either purchase gas supply from a Third Party (TPS) or from Public Services Basic Gas Supply Service default service as detailed in the rate schedule.

This rate schedules have a Delivery Charge Mechanism which includes: Balancing Charge, Societal Benefits Charge, Realignment Adjustment Charge, Margin Adjustment Charge, RGGI Charge and Customer Account Service Charge. The customer can elect to have the Supply Charge (Commodity Charge) serviced through the utility or by a Third Party Supplier (TPS). It is pertinent to note, should the TPS not deliver, the customer may receive service from PSE&G under Emergency Sales Service. Emergency Sales Service carries an extremely high penalty cost of service.

Imbalances occur when Third Party Suppliers are used to supply natural gas, full-delivery is not made, and when a new supplier is contracted or the customer returns to the utility. It is important when utilizing a Third Party Supplier, that an experienced regional supplier is used. Otherwise, imbalances can occur, jeopardizing economics and scheduling.

Recommendations:

CEG recommends a global approach that will be consistent with all facilities within The Township of Ocean. CEG's observations are seen in both commodities. The average price per kWh (kilowatt hour) for all buildings is \$.134/kWh (kWh is the common unit of electric measure). The average price per decatherm for natural gas is \$11.52/dth (dth is the common unit of measure). Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. Ocean Township could realize significant savings if it were to take advantage of these current market prices quickly, before energy increases. Based on last year's historical consumption (January –December 2008) and current fixed electric rates, the Township could see an improvement of 20%. (Note: Savings were calculated using Ocean Townships Average Annual Consumption of 1,382,755 kWh and an Average fixed one-year commodity contract). CEG recommends aggregating the entire electric load to gain the most optimal energy costs. CEG recommends advisement for alternative sourcing and supply of energy on a "managed approach".

CEG's other recommendation coincides with the natural gas cost. CEG recognized that the Township could also see improvement in its natural gas costs by a factor of over 20%. And CEG recommends further advisement on these prices. The Township should consider procuring energy (natural gas) on its own. CEG recommends alternative sourcing strategies through energy advisement.

CEG recommends that the town schedule a meeting with their current utility providers to review their utility charges and current tariff structures for electricity and natural gas. This meeting would provide insight regarding alternative procurement options that are currently available. Through its meeting with the Local Distribution Company (LDC), the town will learn more about the competitive supply process. The utility can provide a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu, and should also consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the data to manage ongoing demand-side management projects. Furthermore, CEG recommends special attention to credit mechanisms, imbalances, balancing charges and commodity charges

when meeting with their utility representative. In addition, Ocean Township should also ask the utility representative about alternative billing options. Some utilities allow for consolidated billing options when utilizing the service of a Third Party Supplier.

Finally, if Ocean frequently changes its supplier for energy (natural gas), it needs to closely monitor balancing, particularly when the contract is close to termination.

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:

- i. *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.
- ii. *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.
- iii. *Power Purchase Agreement* – Public Law 2008, Chapter 3 authorizes contractor of up to fifteen (15) years for 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.

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.

XI. ADDITIONAL RECOMMENDATIONS

The following recommendations include no cost/low cost measures, Operation & Maintenance (O&M) items, and water conservation measures with attractive paybacks. These measures are not eligible for the Smart Start Buildings incentives from the office of Clean Energy but save energy none the less.

- A. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.
- B. Maintain all weather stripping on windows and doors.
- C. Use cog-belts instead of v-belts on all belt-driven fans, etc. These can reduce electrical consumption of the motor by 2-5%.
- D. Provide more frequent air filter changes to decrease overall fan horsepower requirements and maintain better IAQ.
- E. Install a Vending Miser system to turn off the vending machines in the lunch room when not in use.
- F. Clean all light fixtures to maximize light output.

Electric Cost Summary

Jersey Central Power and Light
Municipal Library

701 Deal Rd, Ocean NJ, 07712

2008

Account # 10 00 51 1330 4 7
Meter # G23633007

Month	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Total
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31	0
KWH	14,480	19,760	15,920	19,480	20,280	24,020	27,760	23,280	21,680	18,440	18,440	20,440	243,980
KW	54	57	57	61	64	79	93	84	82	65	63	66	825
Monthly Load Factor	36%	52%	38%	44%	43%	42%	40%	37%	37%	38%	41%	42%	41%
Electric Delivery, \$	\$ 703	\$ 857	\$ 656	\$ 729	\$ 767	\$ 964	\$ 1,161	\$ 1,016	\$ 867	\$ 654	\$ 643	\$ 806	\$ 9,823
Delivery \$/kwh	\$0.049	\$0.043	\$0.041	\$0.037	\$0.038	\$0.040	\$0.042	\$0.044	\$0.040	\$0.035	\$0.035	\$0.039	\$0.040
Electric Supply, \$	\$ 1,581	\$ 2,151	\$ 1,735	\$ 2,121	\$ 2,207	\$ 3,067	\$ 3,927	\$ 3,295	\$ 3,069	\$ 2,277	\$ 2,340	\$ 2,538	\$ 30,308
Supply \$/kwh	\$0.109	\$0.109	\$0.109	\$0.109	\$0.109	\$0.128	\$0.141	\$0.142	\$0.142	\$0.123	\$0.127	\$0.124	\$0.124
Total Cost, \$	\$2,284	\$3,008	\$2,391	\$2,850	\$2,974	\$4,031	\$5,088	\$4,311	\$3,936	\$2,931	\$2,983	\$3,344	\$40,131
\$/KWH	\$0.158	\$0.152	\$0.150	\$0.146	\$0.147	\$0.168	\$0.183	\$0.185	\$0.182	\$0.159	\$0.162	\$0.164	\$0.164

Summary of Natural Gas Cost

PSE&G - LVG Multi Family

Municipal Library

701 Deal Rd, Ocean NJ, 07712

2008

Account # 22-0007-7285-04

Meter # 00746293

Month	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Total
Total MCF	31	28	31	30	31	30	31	31	30	31	30	31	
BTU Factor	883	1,209	843	545	279	418	81	25	64	529	440	1,469	
Therms (Burner Tip)	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.06	1.05	1.05	1.05	1.05	
Total Distribution Cost	927.2	1269.5	885.2	572.3	293.0	438.9	85.1	26.5	67.2	555.5	462.0	1542.5	7124.5
Cost per Therm	\$1,340	\$1,832	\$1,277	\$836	\$422	\$632	\$123	\$38	\$97	\$869	\$2,496	\$2,496	
Total Commodity Cost	\$1,445	\$1,443	\$1,443	\$1,461	\$1,441	\$0,000	\$0,000	\$1,434	\$1,443	\$37,340	\$5,403	\$1,618	\$0,000
Cost per Therm	\$7	\$7	\$7	\$7	\$7	\$7	\$7	\$7	\$7	\$8	\$8	\$10	
Total Cost	\$0.01	\$0.01	\$0.01	\$0.01	\$0.02	\$0.00	\$0.00	\$0.26	\$0.10	\$0.01	\$0.02	\$0.01	\$0.00
Cost per Therm	\$1,347	\$1,839	\$1,284	\$843	\$429	\$639	\$130	\$45	\$104	\$877	\$2,504	\$2,506	\$12,547
Cost per Therm	\$1,453	\$1,449	\$1,451	\$1,473	\$1,464	\$0,000	\$0,000	\$1,698	\$1,548	\$1,579	\$5,420	\$1,625	\$1,761

CONSTRUCTION COST AND REBATES

CONCORD ENGINEERING GROUP

Ocean Township - Municipal Library

ECM 1: INTERIOR LIGHTING CONTROLS

	<u>Qty</u>	<u>Unit Cost \$</u>	<u>Material \$</u>	<u>Labor \$</u>	<u>Total \$</u>
Dual - Technology Sensor	17	\$32	\$544	\$731	\$1,275
Daylight Sensor	2	119.00	\$238	\$238	\$476
Utility Incentive - NJ Smart Start					<u>(\$390)</u>
Total Cost Less Incentive					\$1,361

ECM 2: HVAC UPGRADE

	<u>Qty</u>	<u>Unit Cost \$</u>	<u>Material \$</u>	<u>Labor \$</u>	<u>Total \$</u>
10 Ton CU replacement	2	\$8,000	<u>\$16,000</u>	<u>\$11,200</u>	<u>\$27,200</u>
Utility Incentive - NJ Smart Start					<u>(\$1,460)</u>
Total Cost Less Incentive					<u>\$25,740</u>



Concord Engineering Group, Inc.

520 BURNT MILL ROAD
VOORHEES, NEW JERSEY 08043
PHONE: (856) 427-0200
FAX: (856) 427-6508

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 as of January, 2009:

Electric Chillers

Water-Cooled Chillers	\$12 - \$170 per ton
Air-Cooled Chillers	\$8 - \$52 per ton

Gas Cooling

Gas Absorption Chillers	\$185 - \$400 per ton
Gas Engine-Driven Chillers	Calculated through custom measure path)

Desiccant Systems

Desiccant Systems	\$1.00 per cfm – gas or electric
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Electric Unitary HVAC

Unitary AC and Split Systems	\$73 - \$93 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

Ground Source Heat Pumps

Closed Loop & Open Loop	\$370 per ton
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Gas Heating

Gas Fired Boilers < 300 MBH	\$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	\$300 - \$400 per unit

Variable Frequency Drives

Variable Air Volume	\$65 - \$155 per hp
Chilled-Water Pumps	\$60 per hp
Compressors	\$5,250 to \$12,500 per drive

Natural Gas Water Heating

Gas Water Heaters ≤ 50 gallons	\$50 per unit
Gas-Fired Water Heaters >50 gallons	\$1.00 - \$2.00 per MBH
Gas-Fired Booster Water Heaters	\$17 - \$35 per MBH

Premium Motors

Three-Phase Motors	\$45 - \$700 per motor
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Prescriptive Lighting

T-5 and T-8 Lamps w/Electronic Ballast in Existing Facilities	\$10 - \$30 per fixture, (depending on quantity)
Hard-Wired Compact Fluorescent	\$25 - \$30 per fixture
Metal Halide w/Pulse Start	\$25 per fixture
LED Exit Signs	\$10 - \$20 per fixture
T-5 and T-8 High Bay Fixtures	\$16 - \$284 per fixture

Lighting Controls – Occupancy Sensors

Wall Mounted	\$20 per control
Remote Mounted	\$35 per control
Daylight Dimmers	\$25 per fixture
Occupancy Controlled hi- low Fluorescent Controls	\$25 per fixture controlled

Lighting Controls – HID or Fluorescent Hi-Bay Controls

Occupancy hi-low	\$75 per fixture controlled
Daylight Dimming	\$75 per fixture controlled

Other Equipment Incentives

Performance Lighting	\$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2004 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

CEG Job #: 9C09048
 Project: Ocean Twp.
 Address: 701 Deal Rd.
 City: Ocean, NJ 07712
 Building SF: 12,172

"Municipal Library"

DATE: 9/29/2009
 KWH COST: \$0.164

EXISTING LIGHTING		PROPOSED LIGHTING CONTROLS										SAVINGS								
Line No.	Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	KWh/Yr Fixtures	Yearly \$ Cost	No. eFixts	Retro-Unit rDescription	Watts Used	Total kW	KWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Payback
a	Child Activity Rooms	6	Wall Sconce, 277 V, 1-Lamp, 26 W CFL, High Hat	3,016	26	0.16	470.5	\$77.16	6	Same Fixture	26	0.16	423.4	\$69.45	\$75.00	\$75.00	0.00	47.0	\$7.72	9.72
b		4	1-Lamp, 26 W CFL, High Hat	3,016	28	0.11	337.8	\$55.40	4	Same Fixture	28	0.11	304.0	\$49.86	\$0.00	\$0.00	0.00	33.8	\$5.54	0.00
e	Basement	20	4'2-Lamp T-8, No Lens, Electronic Ballast, 32 W Lamp	3,016	58	1.16	3498.6	\$573.76	20	Same Fixture	58	1.16	3148.7	\$516.39	\$75.00	\$75.00	0.00	349.9	\$57.38	1.31
f	Stairwell 1	5	4'2-Lamp T-8, Cloudy Lens, Electronic Ballast	3,016	58	0.29	874.6	\$143.44	5	Same Fixture	58	0.29	787.2	\$143.44	\$0.00	\$0.00	0.00	87.5	\$0.00	#DIV/0!
j	Stairwell 2	1	2' x 4'2-Lamp T-8, Prism Lens, Electronic Ballast	3,016	58	0.06	174.9	\$28.69	1	Same Fixture	58	0.06	157.4	\$28.69	\$0.00	\$0.00	0.00	17.5	\$0.00	#DIV/0!
g	2nd Floor Hall	4	Ceiling Light, 4 26 W CFL	3,016	112	0.45	1351.2	\$221.59	4	Same Fixture	112	0.45	1216.1	\$199.43	\$75.00	\$75.00	0.00	135.1	\$22.16	3.38
h		6	Ceiling Light, 2 26 W CFL	3,016	56	0.34	1013.4	\$166.19	6	Same Fixture	56	0.34	912.0	\$149.57	\$75.00	\$75.00	0.00	101.3	\$16.62	4.51
b		8	1-Lamp, 26 W CFL, High Hat	3,016	28	0.22	675.6	\$110.80	8	Same Fixture	28	0.22	608.0	\$99.72	\$0.00	\$0.00	0.00	67.6	\$11.08	0.00
a	Room 202	2	Wall Sconce, 277 V, 1-Lamp, 26 W, 4-Pin	3,016	26	0.05	156.8	\$25.72	2	Same Fixture	26	0.05	141.1	\$23.15	\$0.00	\$0.00	0.00	15.7	\$2.57	0.00
f		4	4'2-Lamp T-8, Cloudy Lens, Electronic Ballast	3,016	58	0.23	699.7	\$114.75	4	Same Fixture	58	0.23	629.7	\$103.28	\$0.00	\$0.00	0.00	70.0	\$11.48	0.00
h	Room 205	2	Ceiling Light, 2 26 W CFL	3,016	56	0.11	337.8	\$55.40	2	Same Fixture	56	0.11	304.0	\$49.86	\$75.00	\$75.00	0.00	33.8	\$5.54	13.54
b		14	1-Lamp, 26 W CFL, High Hat	3,016	28	0.39	1182.3	\$193.89	14	Same Fixture	28	0.39	1064.0	\$174.50	\$0.00	\$0.00	0.00	118.2	\$19.39	0.00
j	Room 203	4	2' x 4'2-Lamp T-8, Prism Lens, Electronic Ballast	3,016	58	0.23	699.7	\$114.75	4	Same Fixture	58	0.23	629.7	\$103.28	\$75.00	\$75.00	0.00	70.0	\$11.48	6.54
j	2nd Floor Bathroom	4	2' x 4'2-Lamp T-8, Prism Lens, Electronic Ballast	3,016	58	0.23	699.7	\$114.75	4	Same Fixture	58	0.23	629.7	\$103.28	\$75.00	\$75.00	0.00	70.0	\$11.48	6.54
j	Kitchen	2	2' x 4'2-Lamp T-8, Prism Lens, Electronic Ballast	3,016	58	0.12	349.9	\$57.38	2	Same Fixture	58	0.12	314.9	\$51.64	\$75.00	\$75.00	0.00	35.0	\$5.74	13.07
e	Attic	5	4'2-Lamp T-8, No Lens, Electronic Ballast, 32 W Lamp	3,016	58	0.29	874.6	\$143.44	5	Same Fixture	58	0.29	787.2	\$129.10	\$75.00	\$75.00	0.00	87.5	\$14.34	5.23
i	Room 106	4	2' x 2'2-Lamp U-tube T-8, Prism Lens, Electronic Ballast	3,016	73	0.29	880.7	\$144.43	4	Same Fixture	73	0.29	792.6	\$129.99	\$75.00	\$75.00	0.00	88.1	\$14.44	5.19
h	Room 111	2	Ceiling Light, 2 26 W CFL	3,016	56	0.11	337.8	\$55.40	2	Same Fixture	56	0.11	304.0	\$49.86	\$75.00	\$75.00	0.00	33.8	\$5.54	13.54
b	Janitors Closet	1	2-Lamp 2' T-8	3,016	58	0.06	174.9	\$28.69	1	Same Fixture	58	0.06	157.4	\$28.69	\$0.00	\$0.00	0.00	17.5	\$0.00	#DIV/0!
b		34	1-Lamp, 26 W CFL, High Hat	3,016	28	0.95	2871.2	\$470.88	34	Same Fixture	28	0.95	2584.1	\$423.79	\$75.00	\$150.00	0.00	287.1	\$47.09	3.19
h	Teener House Gallery	3	Ceiling Light, 2 26 W CFL	3,016	56	0.17	506.7	\$83.10	3	Same Fixture	56	0.17	456.0	\$74.79	\$0.00	\$0.00	0.00	50.7	\$8.31	0.00

21	a	2	Wall Sconce, 277 V, 1-Lamp, 26 W, 4-Pin, 3,016	26	0.05	156.8	\$25.72	2	Same Fixture	26	0.05	141.1	\$23.15	\$0.00	\$0.00	0.00	15.7	\$2.57	0.00
22	h	2	Ceiling Light, 2 26 W CFL, 3,016	56	0.11	337.8	\$55.40	2	Same Fixture	56	0.11	304.0	\$49.86	\$75.00	\$75.00	0.00	33.8	\$5.54	13.54
23	f	6	4' 2-Lamp T-8, Cloudy Lens, Electronic Ballast, 3,016	58	0.35	1049.6	\$172.13	6	Same Fixture	58	0.35	944.6	\$154.92	\$0.00	\$0.00	0.00	105.0	\$17.21	0.00
24	d	53	Hang-in Fixture 8 Lamp (4 T24bx-brex, 4 T40/30 bx) w/ CFL, 3,016	52	2.76	8312.1	\$1,363.18	53	Same Fixture	52	2.76	6649.7	\$1,090.55	\$238.00	\$476.00	0.00	1662.4	\$272.64	1.75
25	a	27	Wall Sconce, 277 V, 1-Lamp, 26 W CFL, 3,016	26	0.70	2117.2	\$347.23	27	Same Fixture	26	0.70	1693.8	\$277.78	\$75.00	\$75.00	0.00	423.4	\$69.45	1.08
26	b	9	1-Lamp, 26 W CFL, High Hat, 3,016	28	0.25	760.0	\$124.65	9	Same Fixture	28	0.25	608.0	\$99.72	\$0.00	\$0.00	0.00	152.0	\$24.93	0.00
27	j	2	2' x 4' 2-Lamp T-8, Prism Lens, Electronic Ballast, 3,016	58	0.12	349.9	\$57.38	2	Same Fixture	58	0.12	314.9	\$51.64	\$75.00	\$75.00	0.00	35.0	\$5.74	13.07
28	f	4	4' 2-Lamp T-8, Cloudy Lens, Electronic Ballast, 3,016	58	0.23	699.7	\$114.75	4	Same Fixture	58	0.23	629.7	\$103.28	\$0.00	\$0.00	0.00	70.0	\$11.48	0.00
29	f	5	4' 2-Lamp T-8, Cloudy Lens, Electronic Ballast, 3,016	58	0.29	874.6	\$143.44	5	Same Fixture	58	0.29	787.2	\$129.10	\$75.00	\$75.00	0.00	87.5	\$14.34	5.23
30	j	4	2' x 4' 2-Lamp T-8, Prism Lens, Electronic Ballast, 3,016	58	0.23	699.7	\$114.75	4	Same Fixture	58	0.23	629.7	\$103.28	\$75.00	\$75.00	0.00	70.0	\$11.48	6.54
		243			11.12	33525.9	\$5,498.24	249			11.12	29054.3	\$4,784.99	\$1,826.00	\$1,826.00	0.00	4471.5	\$713.25	2.56
			Totals																

Project Name: LGEA Solar PV Project - Ocean Twp Library									
Location: 701 Deal Rd, Ocean NJ									
Description: Photovoltaic System 95% Financing - 20 year									
Simple Payback Analysis									
		Photovoltaic System 95% Financing - 20 year							
Total Construction Cost		\$97,290							
Annual kWh Production		16,870							
Annual Energy Cost Reduction		\$2,733							
Annual SREC Revenue		\$5,904							
First Cost Premium:		\$97,290							
Simple Payback:		11.26 Years							
Life Cycle Cost Analysis									
Analysis Period (years):	25							Financing %:	95%
Financing Term (mths):	240							Maintenance Escalation Rate:	3.0%
Average Energy Cost (\$/kWh):	\$0.162							Energy Cost Escalation Rate:	3.0%
Financing Rate:	7.00%							SREC Value (\$/kWh):	\$0.350
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	\$4,865	0	0	0	\$0	0	0	(4,865)	0
1	\$0	16,870	\$2,733	\$0	\$5,904	\$6,400	\$2,199	\$38	(\$4,826)
2	\$0	16,785	\$2,815	\$0	\$5,875	\$6,241	\$2,358	\$91	(\$4,735)
3	\$0	16,701	\$2,899	\$0	\$5,845	\$6,071	\$2,528	\$146	(\$4,590)
4	\$0	16,618	\$2,986	\$0	\$5,816	\$5,888	\$2,711	\$204	(\$4,386)
5	\$0	16,535	\$3,076	\$170	\$5,787	\$5,692	\$2,907	\$94	(\$4,292)
6	\$0	16,452	\$3,168	\$169	\$5,758	\$5,482	\$3,117	\$158	(\$4,134)
7	\$0	16,370	\$3,263	\$169	\$5,729	\$5,257	\$3,342	\$225	(\$3,909)
8	\$0	16,288	\$3,361	\$168	\$5,701	\$5,015	\$3,584	\$295	(\$3,614)
9	\$0	16,206	\$3,462	\$167	\$5,672	\$4,756	\$3,843	\$368	(\$3,246)
10	\$0	16,125	\$3,566	\$166	\$5,644	\$4,478	\$4,121	\$445	(\$2,801)
11	\$0	16,045	\$3,673	\$165	\$5,616	\$4,180	\$4,419	\$524	(\$2,277)
12	\$0	15,965	\$3,783	\$164	\$5,588	\$3,861	\$4,738	\$607	(\$1,670)
13	\$0	15,885	\$3,896	\$164	\$5,560	\$3,518	\$5,081	\$694	(\$976)
14	\$0	15,805	\$4,013	\$163	\$5,532	\$3,151	\$5,448	\$783	(\$193)
15	\$0	15,726	\$4,134	\$162	\$5,504	\$2,757	\$5,842	\$877	\$684
16	\$0	15,648	\$4,258	\$161	\$5,477	\$2,335	\$6,264	\$974	\$1,659
17	\$0	15,569	\$4,385	\$160	\$5,449	\$1,882	\$6,717	\$1,075	\$2,734
18	\$0	15,492	\$4,517	\$160	\$5,422	\$1,396	\$7,203	\$1,181	\$3,915
19	\$0	15,414	\$4,653	\$159	\$5,395	\$876	\$7,723	\$1,290	\$5,205
20	\$0	15,337	\$4,792	\$158	\$5,368	\$317	\$8,282	\$1,403	\$6,608
21	\$0	15,260	\$4,936	\$157	\$5,341	\$269	\$7,613	\$2,237	\$8,845
22	\$0	15,184	\$5,084	\$156	\$5,314	\$184	\$6,265	\$3,793	\$12,638
23	\$0	15,108	\$5,236	\$156	\$5,288	\$0	\$0	\$10,369	\$23,007
24	\$0	15,033	\$5,394	\$155	\$5,261	\$0	\$0	\$10,500	\$33,507
25	\$0	14,957	\$5,555	\$154	\$5,235	\$0	\$0	\$10,636	\$44,143
Totals:		321,835	\$73,433	\$2,625	\$112,642	\$79,552	\$92,425	\$106,304	\$97,296
Net Present Value (NPV)							\$6,326		
Internal Rate of Return (IRR)							12.3%		

Project Name: LGEA Solar PV Project - Ocean Twp Library							
Location: 701 Deal Rd, Ocean NJ							
Description: Photovoltaic System - Direct Purchase							
Simple Payback Analysis							
	Photovoltaic System - Direct Purchase						
Total Construction Cost	\$97,290						
Annual kWh Production	16,870						
Annual Energy Cost Reduction	\$2,733						
Annual SREC Revenue	\$5,904						
First Cost Premium	\$97,290						
Simple Payback:	11.26						Years
Life Cycle Cost Analysis							
Analysis Period (years):	25			Financing %:	0%		
Financing Term (mths):	0			Maintenance Escalation Rate:	3.0%		
Average Energy Cost (\$/kWh)	\$0.162			Energy Cost Escalation Rate:	3.0%		
Financing Rate:	0.00%			SREC Value (\$/kWh)	\$0.350		
Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Net Cash Flow	Cumulative Cash Flow
0	\$97,290	0	0	0	\$0	(97,290)	0
1	\$0	16,870	\$2,733	\$0	\$5,904	\$8,637	(\$88,653)
2	\$0	16,785	\$2,815	\$0	\$5,875	\$8,690	(\$79,963)
3	\$0	16,701	\$2,899	\$0	\$5,845	\$8,745	(\$71,218)
4	\$0	16,618	\$2,986	\$0	\$5,816	\$8,802	(\$62,416)
5	\$0	16,535	\$3,076	\$170	\$5,787	\$8,693	(\$53,723)
6	\$0	16,452	\$3,168	\$169	\$5,758	\$8,757	(\$44,966)
7	\$0	16,370	\$3,263	\$169	\$5,729	\$8,824	(\$36,142)
8	\$0	16,288	\$3,361	\$168	\$5,701	\$8,894	(\$27,248)
9	\$0	16,206	\$3,462	\$167	\$5,672	\$8,967	(\$18,281)
10	\$0	16,125	\$3,566	\$166	\$5,644	\$9,044	(\$9,238)
11	\$0	16,045	\$3,673	\$165	\$5,616	\$9,123	(\$115)
12	\$0	15,965	\$3,783	\$164	\$5,588	\$9,206	\$9,092
13	\$0	15,885	\$3,896	\$164	\$5,560	\$9,292	\$18,384
14	\$0	15,805	\$4,013	\$163	\$5,532	\$9,382	\$27,766
15	\$0	15,726	\$4,134	\$162	\$5,504	\$9,476	\$37,242
16	\$0	15,648	\$4,258	\$161	\$5,477	\$9,573	\$46,815
17	\$0	15,569	\$4,385	\$160	\$5,449	\$9,674	\$56,490
18	\$0	15,492	\$4,517	\$160	\$5,422	\$9,779	\$66,269
19	\$0	15,414	\$4,653	\$159	\$5,395	\$9,889	\$76,158
20	\$0	15,337	\$4,792	\$158	\$5,368	\$10,002	\$86,160
21	\$1	15,260	\$4,936	\$157	\$5,341	\$10,120	\$96,280
22	\$2	15,184	\$5,084	\$156	\$5,314	\$10,242	\$106,522
23	\$3	15,108	\$5,236	\$156	\$5,288	\$10,369	\$116,890
24	\$4	15,033	\$5,394	\$155	\$5,261	\$10,500	\$127,391
25	\$5	14,957	\$5,555	\$154	\$5,235	\$10,636	\$138,027
Totals:		321,835	\$73,433	\$2,625	\$112,642	\$235,317	\$183,450
Net Present Value (NPV)						\$138,052	
Internal Rate of Return (IRR)						8.0%	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
Ocean Twp. Library	684	Sunpower SPR230	47	14.7	691	10.81	16,870	1,551	15.64



 = Proposed PV Layout

Notes:

1. Estimated kWh based on 4.68 hours full output per day per 365 day year. Actual kWh will vary day to day.



STATEMENT OF ENERGY PERFORMANCE Municipal Library

Building ID: 1774691
For 12-month Period Ending: December 31, 2008¹
Date SEP becomes ineligible: N/A

Date SEP Generated: August 03, 2009

Facility
Municipal Library
701 Deal Rd
Ocean, NJ 07712

Facility Owner
Township of Ocean
399 Monmouth Rd.
Oakhurst, NJ 07755

Primary Contact for this Facility
Andrew Brennan
399 Monmouth Rd.
Oakhurst, NJ 07755

Year Built: 2005
Gross Floor Area (ft²): 12,172

Energy Performance Rating² (1-100) N/A

Site Energy Use Summary³

Natural Gas (kBtu) ⁴	712,490
Electricity (kBtu)	832,460
Total Energy (kBtu)	1,544,950

Energy Intensity⁵

Site (kBtu/ft ² /yr)	127
Source (kBtu/ft ² /yr)	290

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	165
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Electric Distribution Utility

Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	104
National Average Source EUI	246
% Difference from National Average Source EUI	18%
Building Type	Library

Stamp of Certifying Professional

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

Meets Industry Standards⁶ for Indoor Environmental Conditions:

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

Certifying Professional

Raymond Johnson
520 S. Burnt Mill Rd
Voorhees, NJ 08043

Notes:

1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) must validate the accuracy of the data underlying the building's energy performance rating. This checklist is designed to provide an at-a-glance summary of a property's physical and operating characteristics, as well as its total energy consumption, to assist the PE in double-checking the information that the building owner or operator has entered into Portfolio Manager.

Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.

NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	<input checked="" type="checkbox"/>
Building Name	Municipal Library	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		<input type="checkbox"/>
Type	Library	Is this an accurate description of the space in question?		<input type="checkbox"/>
Location	701 Deal Rd, Ocean, NJ 07712	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		<input type="checkbox"/>
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		<input type="checkbox"/>

Library (Other)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	<input checked="" type="checkbox"/>
Gross Floor Area	12,172 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		<input type="checkbox"/>
Number of PCs	6 (Optional)	Is this the number of personal computers in the space?		<input type="checkbox"/>
Weekly operating hours	58 Hours(Optional)	Is this the total number of hours per week that the space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		<input type="checkbox"/>
Workers on Main Shift	16 (Optional)	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100.		<input type="checkbox"/>

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: Jersey Central Power & Lt Co

Fuel Type: Electricity		
Meter: Electric (kWh (thousand Watt-hours)) Space(s): Entire Facility		
Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
12/01/2008	12/31/2008	20,440.00
11/01/2008	11/30/2008	18,440.00
10/01/2008	10/31/2008	18,440.00
09/01/2008	09/30/2008	21,680.00
08/01/2008	08/31/2008	23,280.00
07/01/2008	07/31/2008	27,760.00
06/01/2008	06/30/2008	24,020.00
05/01/2008	05/31/2008	20,280.00
04/01/2008	04/30/2008	19,480.00
03/01/2008	03/31/2008	15,920.00
02/01/2008	02/29/2008	19,760.00
01/01/2008	01/31/2008	14,480.00
Electric Consumption (kWh (thousand Watt-hours))		243,980.00
Electric Consumption (kBtu)		832,459.76
Total Electricity Consumption (kBtu)		832,459.76
Is this the total Electricity consumption at this building including all Electricity meters?		<input type="checkbox"/>

Fuel Type: Natural Gas		
Meter: Gas (therms) Space(s): Entire Facility		
Start Date	End Date	Energy Use (therms)
12/01/2008	12/31/2008	1,542.50
11/01/2008	11/30/2008	462.00
10/01/2008	10/31/2008	555.50
09/01/2008	09/30/2008	67.20
08/01/2008	08/31/2008	26.50
07/01/2008	07/31/2008	85.10
06/01/2008	06/30/2008	438.90
05/01/2008	05/31/2008	293.00
04/01/2008	04/30/2008	572.30

03/01/2008	03/31/2008	885.20
02/01/2008	02/29/2008	1,269.50
01/01/2008	01/31/2008	927.20
Gas Consumption (therms)		7,124.90
Gas Consumption (kBtu)		712,490.00
Total Natural Gas Consumption (kBtu)		712,490.00
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		<input type="checkbox"/>

Additional Fuels	
Do the fuel consumption totals shown above represent the total energy use of this building? Please confirm there are no additional fuels (district energy, generator fuel oil) used in this facility.	<input type="checkbox"/>

Certifying Professional

(When applying for the ENERGY STAR, this must be the same PE that signed and stamped the SEP.)

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

Please keep this Facility Summary for your own records; do not submit it to EPA. Only the Statement of Energy Performance (SEP), Data Checklist and Letter of Agreement need to be submitted to EPA when applying for the ENERGY STAR.

Facility
Municipal Library
701 Deal Rd
Ocean, NJ 07712

Facility Owner
Township of Ocean
399 Monmouth Rd.
Oakhurst, NJ 07755

Primary Contact for this Facility
Andrew Brennan
399 Monmouth Rd.
Oakhurst, NJ 07755

General Information

Municipal Library	
Gross Floor Area Excluding Parking: (ft ²)	12,172
Year Built	2005
For 12-month Evaluation Period Ending Date:	December 31, 2008

Facility Space Use Summary

Library	
Space Type	Other - Library
Gross Floor Area(ft ²)	12,172
Number of PCs ^o	6
Weekly operating hours ^o	58
Workers on Main Shift ^o	16

Energy Performance Comparison

Performance Metrics	Evaluation Periods		Comparisons		
	Current (Ending Date 12/31/2008)	Baseline (Ending Date 12/31/2008)	Rating of 75	Target	National Average
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
<i>Site (kBtu/ft²)</i>	127	127	0	N/A	104
<i>Source (kBtu/ft²)</i>	290	290	0	N/A	246
Energy Cost					
<i>\$/year</i>	\$ 52,626.00	\$ 52,626.00	N/A	N/A	\$ 43,119.07
<i>\$/ft²/year</i>	\$ 4.32	\$ 4.32	N/A	N/A	\$ 3.54
Greenhouse Gas Emissions					
MtCO ₂ e/year	165	165	0	N/A	135
kgCO ₂ e/ft ² /year	14	14	0	N/A	11

More than 50% of your building is defined as Library. This building is currently ineligible for a rating. Please note the National Average column represents the CBECS national average data for Library. This building uses X% less energy per square foot than the CBECS national average for Library.

Notes:

- o - This attribute is optional.
- d - A default value has been supplied by Portfolio Manager.