BERGEN COUNTY
MEDICAL EXAMINER'S BUILDING

351 E RIDGEWOOD AVE
PARAMUS, NJ, 07652

FACILITY ENERGY REPORT

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I. HISTORIC ENERGY CONSUMPTION/COST

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

Electric Utility Provider:	Public Service Electric & Gas
Electric Utility Rate Structure:	Not available
Third Party Supplier:	None

Natural Gas Utility Provider:	Public Service Electric & Gas
Utility Rate Structure:	Not available
Third Party Supplier:	None

The electric usage profile represents the actual electrical usage for the facility. The electric utility measures consumption in kilowatt-hours (KWH) and maximum demand in kilowatts (KW). One KWH usage is equivalent to 1000 watts running for one hour. One KW of electric demand is equivalent to 1000 watts running at any given time. The 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 historical data received for the facility.

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

Table 1
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: PSEG
Rate: N/A
Meter No: 728000148
Account # 65 872 227 06
Third Party Utility None
TPS Meter / Acct No: -

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Mar-10	7,600	29.6	$1,284
Apr-10	7,680	45.6	$1,349
May-10	8,720	48.8	$1,925
Jun-10	14,880	49.6	$2,844
Jul-10	15,280	45.6	$2,864
Aug-10	10,800	44.8	$2,275
Sep-10	8,800	40.0	$1,574
Oct-10	9,600	34.4	$1,551
Nov-10	11,840	29.6	$1,792
Dec-10	13,360	28.8	$1,972
Jan-11	10,000	28.0	$1,609
Feb-11	8,160	28.8	$1,439
Totals	**126,720**	**49.6 Max**	**$22,478**

AVERAGE DEMAND **37.8 KW average**
AVERAGE RATE **$0.177** **$/kWh**

Figure 1
Electricity Usage Profile

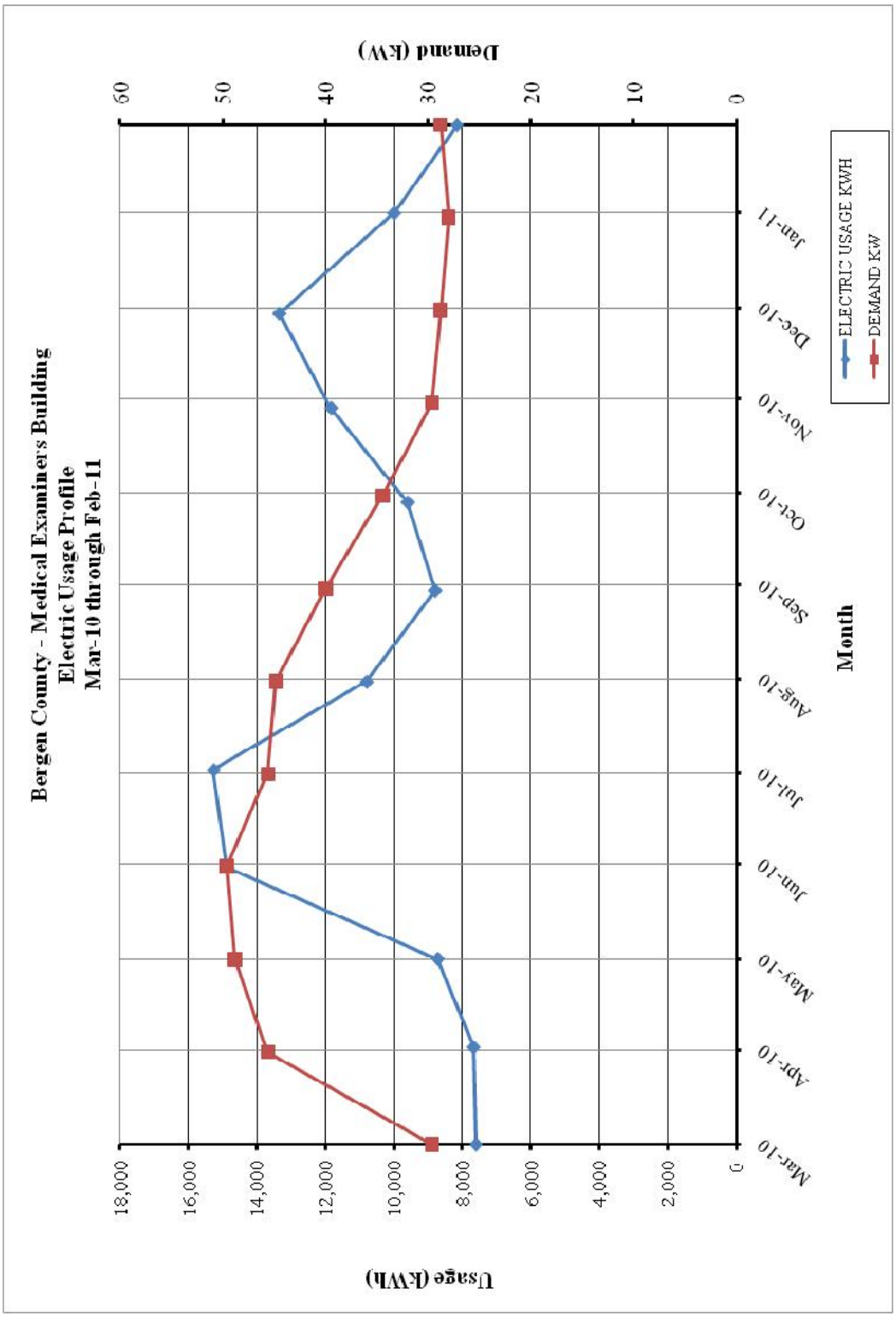
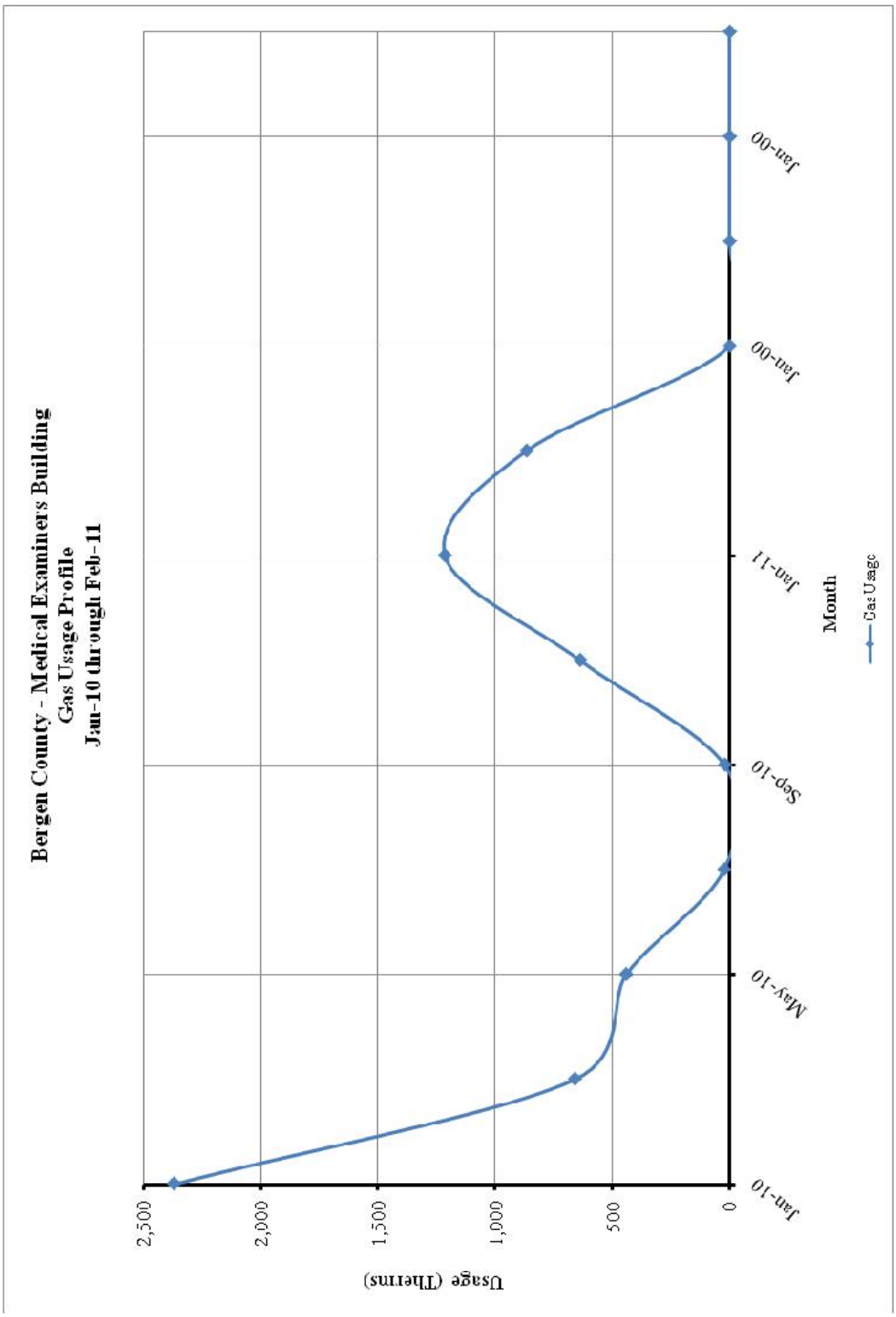


Table 2
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider:	PSE&G	
Rate:	N/A	
Meter No:	2532886	
Point of Delivery ID:	65 872 227 06	
Third Party Utility Provider:	None	
TPS Meter No:	-	
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Jan-10	2,370.28	$2,766.83
Apr-10	660.61	$692.65
May-10	441.71	$430.98
Aug-10	23.86	$35.91
Sep-10	20.75	$31.97
Nov-10	637.94	$666.17
Jan-11	1,215.10	$1,373.75
Feb-11	866.53	$986.62
TOTALS	**6,236.78**	**$6,984.88**
AVERAGE RATE:	**$1.12**	**$/THERM**

Figure 2
Natural Gas Usage Profile



II. FACILITY DESCRIPTION

The 5,000 SF Municipal Building is a single story facility comprised of an autopsy facility, office spaces, conference room, kitchenette and mechanical spaces. The typical hours of operation for this facility are Monday through Saturday between 9:00 am and 4:30 pm. However, the staff is on-call 24 hours per day including Sunday's and occasionally the staff stay late through the night.

Exterior walls are cinder block construction with brick facade. The amount of insulation within the wall could not be verified. The windows throughout the facility are in good condition and appear to be maintained. Typical windows throughout the facility are double pane, ¼" clear glass with aluminum frames. Blinds are utilized through the facility per occupant comfort. The blinds are valuable because they help to reduce heat loss in the winter and reduce solar heat in the summer. The majority of the roof is constructed of a built-up roof with light color stone covering, where all rooftop HVAC equipment is located. The amount of insulation below the roofing is unknown. The building was built in 1973 with no additions since the original construction.

HVAC Systems

The offices administration area and the autopsy areas are conditioned by two (2) constant volume rooftop heating and air conditioning units made by Lennox. Each packaged rooftop unit includes a gas heat exchanger to pre-heat the primary supply air. Cooling is achieved with multiple scroll compressors for part load staging. Conditioned air is distributed to the spaces through ductwork to ceiling diffusers. Each unit is set to bring in minimum 50% outside air at all times. The units are equipped with 100% outside air economizer cycle. The units are approximately 10 years old, which is within the 15 years expected service life for this type of units defined by ASHRAE.

The facility houses a single bay garage within the building. The garage is heated with two electric unit heaters. Each unit heaters have 12 kW heating capacity. It was noticed there was a large gap over the over-head garage door frame. This causes loss of significant amount of heated air during the heating season and it should be covered.

Exhaust System

Air is exhausted from the toilet rooms, custodial closets, corridors, boiler room, work room and autopsy room through roof exhausters. The exhaust fans are interlocked with the rooftop HVAC units.

HVAC System Controls

Currently there is no central building automation system for the Medical Examiner's Building. Each rooftop HVAC units are controlled with a digital programmable thermostat. The thermostat for the unit feeding the office administration area is located in the conference room while the thermostat for the autopsy area is located within the work room.

The garage electric unit heaters are controlled with remote thermostats within the garage area.

Domestic Hot Water

Domestic hot water for the restrooms and office lounge is provided by a 50 gallon Rheem natural gas fired hot water heater with a heating capacity of 98 MBH, which corresponds to a recovery rate of 95 gallons per hour.

Lighting

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

III. MAJOR EQUIPMENT LIST

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

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

IV. ENERGY CONSERVATION MEASURES

Energy Conservation Measures are developed specifically for this facility. The energy savings and calculations are highly dependent on the information received from the site survey and interviews with operations personnel. The assumptions and calculations should be reviewed by the owner to ensure accurate representation of this facility. The following ECMs were analyzed:

Table 3
ECM Financial Summary

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
ECM #1	Lighting Upgrade	$2,196	$515	4.3	252.0%
ECM #2	Lighting Controls	$945	$433	2.2	587.8%
ECM #3	Demand Controlled Ventilation	$27,000	$922	29.3	-48.8%
ECM #4	AC Unit Replacements	$15,815	$495	32.0	-37.4%
ECM #5	NEMA Premium Eficiency Motors	$1,459	$85	17.2	-12.8%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	Solar Photovoltaic System	$26,910	$1,950	13.8	8.7%

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

Table 4
ECM Energy Summary

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
ECM #1	Lighting Upgrade	1.1	2,912	0
ECM #2	Lighting Controls	0	33,206	0
ECM #3	Demand Controlled Ventilation	0.0	2,067	497
ECM #4	AC Unit Replacements	3.5	2,795	0
ECM #5	NEMA Premium Eficiency Motors	0.1	499	0
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
REM #1	Solar Photovoltaic System	3.0	3,700	0

Table 5
Facility Project Summary

ENERGY SAVINGS IMPROVEMENT PROGRAM - POTENTIAL PROJECT					
ENERGY CONSERVATION MEASURES	**ANNUAL ENERGY SAVINGS ($)**	**PROJECT COST ($)**	**SMART START INCENTIVES**	**CUSTOMER COST**	**SIMPLE PAYBACK**
Lighting Upgrade	$515	$2,216	$20	$2,196	4.3
Lighting Controls	$433	$1,125	$180	$945	2.2
AC Unit Replacements	$495	$17,000	$1,185	$15,815	32.0
NEMA Premium Eficiency Motors	$85	$1,519	$60	$1,459	17.2
Design / Construction Extras (15%)		*$3,279*		*$3,279*	
Total Project	**$1,528**	**$25,139**	**$1,265**	**$23,694**	**15.5**

Design / Construction Extras is shown as an additional cost for the facility project summary. This cost is included to estimate the costs associated with construction management fees for a larger combined project.

ECM #1: Lighting Equipment Upgrade

Description:

The majority of the interior lighting throughout this facility is provided with fluorescent fixtures with older generation, 700 series 32W T8 lamps and electronic ballasts. Although 700 series T8 lamps are considered fairly efficient, further energy savings can be achieved by replacing the existing T8 lamps with new generation, 800 series 28W T8 lamps without compromising light output. CEG recommends, re-lamping all of the fixtures with 28W T8 lamps. In addition, some of the storage areas, locker room and gym areas, offices, auditorium, classrooms, restrooms and kitchen areas still have a variety of older fluorescent fixtures with magnetic ballasts and incandescent lamps. It is recommended to retrofit or replace all of the older fluorescent fixtures and the incandescent lights in these areas with high efficiency fluorescent T8 or T5 fixtures with electronic ballasts or compact fluorescent lamps.

This ECM includes re-lamping of the existing fluorescent fixtures with 800 series, 28W T8 lamps. The ECM also includes retrofit of all older fluorescent fixtures with T8 or T5 fluorescent fixtures with electronic ballasts in the building. The new, energy efficient T8 fixtures will provide adequate lighting and will save on electrical costs due to better performance of the lamp and ballasts.

The ECM also includes replacement of any incandescent lamps with compact fluorescent lamps. Compact fluorescent lamps (CFL's) were designed to be direct replacements for the standard incandescent lamps which are common to table lamps, spot lights, hi-hats, bathroom vanity lighting, etc. The light output of the CFL has been designed to resemble the incandescent lamp. The color rendering index (CRI) of the CFL is much higher than standard fluorescent lighting, and therefore provides a much "truer" light. The CFL is available in a myriad of shapes and sizes depending on the specific application. Typical replacements are: a 13-Watt CFL for a 60-Watt incandescent lamp, an 18-Watt CFL for a 75-Watt incandescent lamp, and a 26-Watt CFL for a 100-Watt incandescent lamp. The CFL is also available for a number of "brightness colors" that is indicated by the Kelvin rating. A 2700K CFL is the "warmest" color available and is closest in color to the incandescent lamp. CFL's are also available in 3000K, 3500K, and 4100K. The 4100K would be the "brightest" or "coolest" output. A CFL can be chosen to screw right into your existing fixtures, or hardwired into your existing fixtures. Where the existing fixture is controlled by a dimmer switch, the CFL bulb must be compatible with a dimmer switch. In some locations the bulb replacement will need to be tested to make sure the larger base of the CFL will fit into the existing fixture. The energy usage of an incandescent compared to a compact fluorescent approximately 3 to 4 times greater. In addition to the energy savings, compact fluorescent fixtures burn-hours are 8 to 15 times longer than incandescent fixtures ranging from 6,000 to 15,000 burn-hours compared to incandescent fixtures ranging from 750 to 1000 burn-hours. However, the maintenance savings due to reduced lamp replacement is offset by the higher cost of the CFL's compared to the incandescent lamps.

Energy Savings Calculations:

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

Rebates and Incentives:

NJ Smart Start® Program Incentives are calculated using the **Smart Start® Incentive Appendix** as follows:

Retrofit of T-12 fixtures to T-5 or T-8 with electric ballasts	$10 per fixture (1-4 lamp retrofits)

$$\text{SmartStart® Incentive} = (\#\text{ of fixtures} \times \$10) = 2 \times \$10 = \$20$$

Replacement and Maintenance Savings:

There is no significant replacement and maintenance savings due to this ECM.

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,216
NJ Smart Start Equipment Incentive ($):	$20
Net Installation Cost ($):	$2,196
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$515
Total Yearly Savings ($/Yr):	$515
Estimated ECM Lifetime (Yr):	15
Simple Payback	4.3
Simple Lifetime ROI	252.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$7,730
Internal Rate of Return (IRR)	22%
Net Present Value (NPV)	$3,956.34

ECM #2: Lighting Controls Upgrade – Occupancy Sensors

Description:

Some of the lights in this facility are left on unnecessarily. In many cases the lights are left on because of the inconvenience to manually switch lights off when a room is left or on when a room is first occupied. This is common in rooms that are occupied for only short periods and only a few times per day. In some instances lights are left on due to the misconception that it is better to keep the lights on rather than to continuously switch lights on and off. Although increased switching reduces lamp life, the energy savings outweigh the lamp replacement costs. The payback timeframe for when to turn the lights off is approximately two minutes. If the lights are expected to be off for at least a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is adequate to provide reduced lighting levels when full light output is not needed. Occupancy sensors detect motion and will switch the lights on when the room is occupied. Occupancy sensors can either be mounted in place of a current wall switch, or on the ceiling to cover large areas.

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

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

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 25% of the total light energy controlled by occupancy sensors and daylight sensors (The majority of the savings is expected to be after school hours when rooms are left with lights on)

This ECM includes installation of ceiling or switch mount sensors for individual offices, classrooms, large bathrooms, and libraries. Sensors shall be manufactured by Sensorswitch, Watt Stopper or equivalent. The **Investment Grade Lighting Audit Appendix** of this report includes the summary of lighting controls implemented in this ECM and outlines the proposed controls, costs, savings, and payback periods. The calculations adjust the lighting power usage by the applicable percent savings for each area that includes lighting controls.

Energy Savings Calculations:

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

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

Cost and Incentives:

Installation cost per dual-technology sensors (Basis: Sensor switch or equivalent) are as follows:

Dual Technology Occupancy Sensor - Switch Mount	$125 per installation
Dual Technology Occupancy Sensor - Remote Mount	$450 per installation
Dual Tech. Occupancy Sensor w/2 Pole Relay - Remote Mount	$500 per installation

Cost includes material and labor.

From the **NJ Smart Start® Program Incentives Appendix**, the installation of a lighting control device warrants the following incentive:

Occupancy Sensor Fixture Mounted (existing facility only) = $20 per sensor
Occupancy Sensor Remote Mounted (existing facility only) = $35 per sensor

$$\text{SmartStart® Incentive} = (\#\text{ of wall mount} \times \$20) + (\#\text{of ceiling mount} \times \$35)$$
$$\text{SmartStart® Incentive} = (9\text{ wall mount} \times \$20) + (0\text{ ceiling mount} \times \$35) = \$180$$

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,125
NJ Smart Start Equipment Incentive ($):	$180
Net Installation Cost ($):	$945
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$433
Total Yearly Savings ($/Yr):	$433
Estimated ECM Lifetime (Yr):	15
Simple Payback	2.2
Simple Lifetime ROI	587.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$6,499
Internal Rate of Return (IRR)	46%
Net Present Value (NPV)	$4,227.66

ECM #3: Demand Controlled Ventilation

Demand Controlled Ventilation (DCV) is a means to provide active, zone level control of ventilation for spaces within a facility. The basic premise behind DCV is monitoring indoor CO2 levels versus outdoor CO2 levels in order to provide proper ventilation to the spaces within the facility as well as saving costly dollars treating unconditioned ventilation air. Carbon dioxide ventilation control or demand controlled ventilation (DCV) allows for the measurement and control of outside air ventilation levels to a target cfm/person ventilation rate in the space (i.e., 15 cfm/person) based on the number of people in the space. It is a direct measure of ventilation effectiveness and is a method whereby buildings can regain active and automatic zone level ventilation control, without having to open windows. The fixed ventilation approach depends on a set-it-and-forget-it methodology that is completely unresponsive to changes in the way spaces are utilized/occupied or how equipment is maintained. A DCV system utilizes various control algorithms to maintain a base ventilation rate. The system monitors space CO2 levels and the algorithm automatically adjusts the outdoor and return air dampers to provide the quantity of outdoor air to maintain the required CO2 level in the space. System designs are normally designed for maximum occupancy and the ventilation rates are designed for this (maximum) occupancy. In areas where occupancy swings are prevalent there is ample opportunity to reduce outdoor air quantity to satisfy the needs of the actual number of occupants present. By installing the DCV controls, energy savings are realized by the reduced quantities of outdoor air that do not require heating and cooling energy from the steam and chilled water plants.

The rooftop air conditioning unit serving the administrative office areas is standard air conditioning systems with a minimum outside air setup. When these units are on unoccupied mode, the outside air dampers shut. The outside air volume is typically based on the maximum occupancy of the space conditioned. When a given space is not fully occupied the outside air quantity delivered to the space is greater than the amount actually needed for adequate ventilation, which results in waste of heating or air conditioning energy.

This ECM includes the installation integrated demand control ventilation systems with CO2 sensors, for the units mentioned above. This system allows the air handling unit to respond to changes in occupancy and therefore reduce the amount of outside air that has to be conditioned. Outside air accounts for a large portion of the energy consumption in the HVAC system, especially in high occupancy spaces. The U.S. Department of Energy sponsored a study to analyze energy savings achieved through various types of building system controls. The referenced savings is based on the "Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways," document posted for public use April 2005. The study has found that commercial buildings have the potential to achieve significant energy savings through the use of building controls. The average energy savings are as follows based on the report:

- Demand Control Ventilation - 10% - 15%.

Energy savings achieved through "Demand Control Ventilation" average 10%-15%. Savings resulting from the implementation of this ECM for energy management controls are estimated to be 15% of the total HVAC energy cost for this system.

The components included to install for a demand control ventilation system include damper actuators (if not exist), Variable Frequency Drives (if not exist), CO2 sensors, wiring, Energy Management System equipment expansion and programming. Each occupied zone would require minimum one CO_2 sensor installed to monitor occupancy levels.

IMPLEMENTATION SUMMARY						
INPUTS	**HVAC Unit**	**Service**	**Total Flow Capacity CFM**	**Min # of CO2 SENSORS**	**Cooling Capaity, Tons**	**Heating Capacity, MBH**
DCV-1	RTU-2	Administrative Offices	3,280	7	12.9	260
Total				**7**	**12.9**	**260**

Energy Savings Calculations:

$$\text{Cooling EnergyUsage} = \frac{\text{Cooling(Tons)} \times 12{,}000\left(\frac{\text{Btu}}{\text{Ton hr}}\right) \times \text{Annual Full Load Cooling Hrs.}}{1000\left(\frac{\text{Wh}}{\text{kWh}}\right) \times \text{EER}\left(\frac{\text{Btu}}{\text{Wh}}\right)}$$

$$\text{EnergySavings} = \text{CoolingEnergy(kwh)} \times 15\%$$

$$\text{Cooling Cost} = \text{Energy Usage(kWh)} \times \text{Ave Electric Cost}\left(\frac{\$}{\text{kWh}}\right)$$

$$\text{Heating Energy (Therms)} = \frac{\text{Heating Capacity}\left(\frac{\text{Btu}}{\text{Hr.}}\right) \times \text{HDD(Day °F)} \times 24\left(\frac{\text{Hr.}}{\text{Day}}\right) \times (0.60)}{65(°\text{F}) \times \text{Fuel Heat Value}\left(\frac{\text{Btu}}{\text{Therms}}\right) \times \text{Heating Efficiency (\%)}}$$

$$\text{Heating Cost} = \text{Heating Energy(Therms)} \times \text{Ave Fuel Cost}\left(\frac{\$}{\text{Therms}}\right)$$

$$\text{EnergySavings} = \text{HeatingEnergy(Therms)} \times 15\%$$

Results of the energy savings calculations are summarized in the table below:

DEMAND CONTROLLED VENTILATION	
ECM INPUTS	**DCV-1**
Equipment	RTU-2
Total Cooling Capacity, Tons	12.9
Efficiency (EER)	9
Annual Full Load Cooling Hours	800
Total Heating Capacity, MBh	260
Heating Efficiency (Gas)	80%
Heating Degree Days (65°F)	4599
Estimated Energy Savings	15%
Elec Cost ($/kWh)	$0.177
Natural Gas Cost ($/Therm)	$1.12
ENERGY SAVINGS	
ECM RESULTS	**DCV-1**
Cooling Energy Cnsmption, kWh	13,778
Heating Energy (Therms)	3,311
Cooling Energy Savings kWh	2,067
Heating Energy Savings (Therms)	497
Electric Energy Cost Savings ($)	$366
Total Gas Cost Savings ($)	$556
Total Cost Savings ($)	$922
COMMENTS:	HDD estimated based on Newark,NJ.

Cost and Incentives:

Estimated installed cost for demand controlled ventilation for the air handling units serving the lobby areas, theatres and the concession areas is $27,000. Estimated cost includes CO2 sensors, control wiring, electrical wiring, VFDs, control system equipment expansion and programming. There are currently no Smart Start ® incentives available for a Demand Control Ventilation System.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$27,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$27,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$922
Total Yearly Savings ($/Yr):	$922
Estimated ECM Lifetime (Yr):	15
Simple Payback	29.3
Simple Lifetime ROI	-48.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$13,831
Internal Rate of Return (IRR)	-7%
Net Present Value (NPV)	($15,992.09)

ECM #4: Air Conditioning Unit Upgrades

Description:

Air conditioning for the Bergen County Medical Examiner's Office is provided with two main rooftop air conditioning units. RTU #1 is a standard efficiency 15-Ton Lennox rooftop air conditioning unit feeding the Autopsy room. RTU #2 is a higher efficiency 13 Ton unit feeding the offices. Both units are approximately 10 years old, which is within the ASHRAE recommended service life.

RTU #1 can be replaced with new high efficiency units for energy savings. New air conditioners provide higher full load and part load efficiencies due to advances in inverter motor technologies, heat exchangers and refrigerants.

This ECM includes one-for-one replacement of the older air conditioning units with new higher efficiency systems. It is recommended to fully evaluate the capacity needed for all new systems prior to moving forward with this ECM. A summary of the unit replacements for this ECM can be found in the table below:

IMPLEMENTATION SUMMARY					
ECM INPUTS	**SERVICE FOR**	**NUMBER OF UNITS**	**COOLING CAPACITY, BTU/HR**	**TOTAL CAPACITY, TONS**	**REPLACE UNIT WITH**
RTU-1 Lennox LGA180	Autopsy Lap	1	180,000	15.0	Aaon RN-15Ton
Total		**1**	**180,000**	**15.0**	

The manufacturer used for the design basis is Aaon. The units are one for one style replacements with matching capacity of the new units to the old units.

Energy Savings Calculations:

Cooling Energy Savings:

Seasonal energy consumption of the air conditioners at the cooling mode is calculated with the equation below:

$$\text{Energy Savings, kWh} = \text{Cooling Capacity,} \frac{\text{BTU}}{\text{Hr}} \times \left(\frac{1}{\text{SEER}_{\text{Old}}} - \frac{1}{\text{SEER}_{\text{New}}} \right) \times \frac{\text{Operation Hours}}{1000 \frac{\text{W}}{\text{kWh}}}$$

$$\text{Demand Savings, kW} = \frac{\text{Energy Savings (kWh)}}{\text{Hours of Cooling}}$$

$$\text{Cooling Cost Savings} = \text{Energy Savings, kWh} \times \text{Cost of Electricity} \left(\frac{\$}{\text{kWh}} \right)$$

ENERGY SAVINGS CALCULATIONS							
ECM INPUTS	**COOLING CAPACITY, BTU/Hr**	**ANNUAL COOLING HOURS**	**EXISTING UNITS (S)EER**	**SPLIT UNITS (S)EER**	**# OF UNITS**	**ENERGY SAVINGS kWh**	**DEMAND SAVINGS kW**
RTU-1 Trane YCD300	300,000	800	9.7 EER	11.5 EER	1	3,873	4.8
RTU-3 Trane YCD180	180,000	800	8.6 EER	11.2 EER	1	3,887	4.9
Total					2	7,760	9.7

Project Cost, Incentives and Maintenance Savings

From the NJ Smart Start® Program appendix, the replacement of split system AC units and unitary systems with high efficiency AC systems falls under the category "Unitary HVAC Split System" and warrants an incentive based on efficiency (EER/SEER). The program incentives are calculated as follows:

$$\text{SmartStart® Incentive} = (\text{Cooling Tons} \times \$/\text{Ton Incentive})$$

UNITARY / SPLIT SYSTEM AC UNITS REBATE SUMMARY				
UNIT DESCRIPTION	**UNIT EFFICIENCY**	**REBATE $/TON**	**PROPOSED CAPACITY TONS**	**TOTAL REBATE $**
≥20 to 30 tons	10.5 EER	79	0	$0
≥ 11.25 to < 20 tons	11.5 EER	79	15	$1,185
≥ 5.4 to < 11.25 tons	11.5 EER	73	0	$0
5.4 tons or less Unitary AC and Split System	≥14 SEER	$92	0	$0
TOTAL			**15**	**$1,185**

Summary of cost, savings and payback for this ECM is below.

COST & SAVINGS SUMMARY							
ECM INPUTS	**INSTALLED COST**	**# OF UNITS**	**TOTAL COST**	**REBATES**	**NET COST**	**ENERGY SAVING**	**PAY BACK YEARS**
RTU-1 Lennox LGA180	$17,000	1	$17,000	$1,185	$15,815	$495	32.0
Total		1	$17,000	$1,185	$15,815	$495	32.0

There is no significant maintenance savings due to implementation of this ECM.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$17,000
NJ Smart Start Equipment Incentive ($):	$1,185
Net Installation Cost ($):	$15,815
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$495
Total Yearly Savings ($/Yr):	$495
Estimated ECM Lifetime (Yr):	20
Simple Payback	32.0
Simple Lifetime ROI	-37.4%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$9,894
Internal Rate of Return (IRR)	-4%
Net Present Value (NPV)	($8,454.81)

ECM #5: Install NEMA Premium® Efficiency Motors

Description:

The improved efficiency of the NEMA Premium® efficient motors is primarily due to better designs with use of better materials to reduce losses. Surprisingly, the electricity used to power a motor represents 95 % of its total lifetime operating cost. Because many motors operate continuously 24 hours a day, even small increases in efficiency can yield substantial energy and dollar savings.

The electric motors driving the rooftop unit supply fan motors are the candidates for replacing with premium efficiency motors. These standard efficiency motors run considerable amount of time over a year.

This energy conservation measure replaces existing electric motors over 5 HP or more with NEMA Premium® efficiency motors. NEMA Premium® is the most efficient motor designation in the marketplace today.

IMPLEMENTATION SUMMARY					
EQMT ID	**FUNCTION**	**MOTOR HP**	**HOURS OF OPERATION**	**EXISTING EFFICIENCY**	**NEMA PREMIUM EFFICIENCY**
RTU #1	Rooftop Unit Supply Fan	5	4,320	*87.5%*	90.2%
** Motor efficiency N/A. Estimated based on EPAct of 1992*					

Energy Savings Calculations:

$$\text{Electric usage, kWh} = \frac{\text{HP} \times \text{LF} \times 0.746 \times \text{Hours of Operation}}{\text{Motor Efficiency}}$$

where, HP = Motor Nameplate Horsepower Rating

LF = Load Factor Motor Efficiency = Motor Nameplate Efficiency

$$\text{Electric Usage Savings, kWh} = \text{Electric Usage}_{\text{Existing}} - \text{Electric Usage}_{\text{Proposed}}$$

$$\text{Electric Usage Savings, kWh} = \text{Electric Usage}_{\text{Existing}} - \text{Electric Usage}_{\text{Proposed}}$$

$$\text{Electric cost savings} = \text{Electric Usage Savings} \times \text{Electric Rate} \left(\frac{\$}{\text{kWh}}\right)$$

The calculations were carried out and the results are tabulated in the table below:

PREMIUM EFFICIENCY MOTOR CALCULATIONS							
EQMT ID	MOTOR HP	LOAD FACTOR	EXISTING EFFICIENCY	NEMA PREMIUM EFFICIENCY	POWER SAVINGS kW	ENERGY SAVINGS kWH	COST SAVINGS
RTU #1	5	90%	87.5%	90.2%	0.11	499	$85
TOTAL					**0.1**	**499**	**$85**

Equipment Cost and Incentives

Below is a summary of SmartStart Building® incentives for premium efficiency motors on chilled water pumps:

INCENTIVES	
HORSE POWER	NJ SMART START INCENTIVE
5	$60
7.5	$90
10	$100
15	$115
20	$125
25	$130

The following table outlines the summary of motor replacement costs and incentives:

MOTOR REPLACEMENT SUMMARY						
EQMT ID	MOTOR POWER HP	INSTALLED COST	SMART START INCENTIVE	NET COST	TOTAL SAVINGS	SIMPLE PAYBACK
RTU #1	5	$1,519	$60	$1,459	$85	17.2
TOTAL	**Totals:**	**$1,519**	**$60**	**$1,459**	**$85**	**17.2**

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,519
NJ Smart Start Equipment Incentive ($):	$60
Net Installation Cost ($):	$1,459
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$85
Total Yearly Savings ($/Yr):	$85
Estimated ECM Lifetime (Yr):	15
Simple Payback	17.2
Simple Lifetime ROI	-12.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,272
Internal Rate of Return (IRR)	-2%
Net Present Value (NPV)	($446.76)

REM #1: 2.9 kW Rooftop Solar Array

Description:

The Bergen County Medical Examiner's Building has approximately 200 square-foot of available roof space that can accommodate a 2.9 kilowatt solar array, assuming the existing roof structure is capable of supporting an array.

The array will produce approximately 3,700 kilowatt-hours annually that will reduce the overall electric usage of the facility by 3%.

Energy Savings Calculations:

See **Renewable / Distributed Energy Measures Calculations Appendix** for detailed financial summary and proposed solar layout areas.

Energy Savings Summary:

REM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$26,910
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$26,910
Maintenance Savings ($/Yr):	$1,295
Energy Savings ($/Yr):	$655
Total Yearly Savings ($/Yr):	$1,950
Estimated ECM Lifetime (Yr):	15
Simple Payback	13.8
Simple Lifetime ROI	8.7%
Simple Lifetime Maintenance Savings	$19,425
Simple Lifetime Savings	$29,249
Internal Rate of Return (IRR)	1%
Net Present Value (NPV)	($3,632.22)

V. 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. Clean all light fixtures to maximize light output.

D. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.

E. Turn off computers when not in use. Ensure computers are not running in screen saver mode which saves the monitor screen not energy.

F. Ensure outside air dampers are functioning properly and only open during occupied mode.

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Bergen County Medical Examiner's Building

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM #1	Lighting Upgrade	$886	$1,330	$20	$2,196	$515	$0	$515	15	$7,730	$0	252.0%	4.3	22.33%	$3,956.34
ECM #2	Lighting Controls	$450	$675	$180	$945	$433	$0	$433	15	$6,499	$0	587.8%	2.2	45.69%	$4,227.66
ECM #3	Demand Controlled Ventilation	$27,000	$0	$0	$27,000	$922	$0	$922	15	$13,831	$0	-48.8%	29.3	-7.39%	($15,992.09)
ECM #4	AC Unit Replacements	$11,000	$6,000	$1,185	$15,815	$495	$0	$495	20	$9,894	$0	-37.4%	32.0	-4.10%	($8,454.81)
ECM #5	NEMA Premium Eficiency Motors	$1,519	$0	$60	$1,459	$85	$0	$85	15	$1,272	$0	-12.8%	17.2	-1.67%	($446.76)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	Solar Photovoltaic System	$26,910	$0	$0	$26,910	$655	$1,295	$1,950	15	$29,249	$19,425	8.7%	13.8	1.06%	($3,632.22)

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

Concord Engineering Group, Inc.

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SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of February 15, 2011:

Electric Chillers

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

Energy Efficiency must comply with ASHRAE 90.1-2007

Gas Cooling

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

Desiccant Systems

$1.00 per cfm – gas or electric

Electric Unitary HVAC

Unitary AC and Split Systems	$73 - $92 per ton
Air-to-Air Heat Pumps	$73 - $92 per ton
Water-Source Heat Pumps	$81 per ton
Packaged Terminal AC & HP	$65 per ton
Central DX AC Systems	$40- $72 per ton
Dual Enthalpy Economizer Controls	$250
Occupancy Controlled Thermostat (Hospitality & Institutional Facility)	$75 per thermostat

Energy Efficiency must comply with ASHRAE 90.1-2007

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, AFUE ≥ 92%

Ground Source Heat Pumps

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

Energy Efficiency must comply with ASHRAE 90.1-2007

Variable Frequency Drives

Variable Air Volume	$65 - $155 per hp
Chilled-Water Pumps	$60 per VFD rated hp
Compressors	$5,250 to $12,500 per drive
Cooling Towers ≥ 10 hp	$60 per VFD rated hp

Natural Gas Water Heating

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

Prescriptive Lighting

Retro fit of T12 to T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities	$10 per fixture (1-4 lamps)
Replacement of T12 with new T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities	$25 per fixture (1-4 lamps)
Replacement of incandescent with screw-in PAR 38 or PAR 30 (CFL) bulb	$7 per bulb
T-8 reduced Wattage (28w/25w 4', 1-4 lamps) Lamp & ballast replacement	$10 per fixture
Hard-Wired Compact Fluorescent	$25 - $30 per fixture
Metal Halide w/Pulse Start Including Parking Lot	$25 per fixture
T-5 and T-8 High Bay Fixtures	$16 - $200 per fixture
HID ≥ 100w Retrofit with induction lamp, power coupler and generator (must be 30% less watts/fixture than HID system)	$50 per fixture
HID ≥ 100w Replacement with new HID ≥ 100w	$70 per fixture

Prescriptive Lighting - LED

LED New Exit Sign Fixture Existing Facility < 75 kw Existing Facility > 75 kw	 $20 per fixture $10 per fixture
LED Display Case Lighting	$30 per display case
LED Shelf-Mtd. Display & Task Lights	$15 per linear foot
LED Portable Desk Lamp	$20 per fixture
LED Wall-wash Lights	$30 per fixture
LED Recessed Down Lights	$35 per fixture
LED Outdoor Pole/Arm-Mounted Area and Roadway Luminaries	$175 per fixture
LED Outdoor Pole/Arm-Mounted Decorative Luminaries	$175 per fixture
LED Outdoor Wall-Mounted Area Luminaries	$100 per fixture
LED Parking Garage Luminaries	$100 per fixture
LED Track or Mono-Point Directional Lighting Fixtures	$50 per fixture
LED High-Bay and Low-Bay Fixtures for Commercial & Industrial Bldgs.	$150 per fixture
LED High-Bay-Aisle Lighting	$150 per fixture
LED Bollard Fixtures	$50 per fixture
LED Linear Panels (2x2 Troffers only)	$100 per fixture
LED Fuel Pump Canopy	$100 per fixture
LED Refrigerator/Freezer case lighting replacement of fluorescent in medium and low temperature display case	$42 per 5 foot $65 per 6 foot

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
Daylight Dimming - office	$50 per fixture controlled

Premium Motors

Three-Phase Motors	$45 - $700 per motor
Fractional HP Motors Electronic Communicated Motors (replacing shaded pole motors in refrigerator/freezer cases)	$40 per electronic communicated motor

Other Equipment Incentives

Performance Lighting	$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2007 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive
Custom Measures	$0.16 KWh and $1.60/Therm of 1st year savings, or a buy down to a 1 year payback on estimated savings. Minimum required savings of 75,000 KWh or 1,500 Therms and a IRR of at least 10%.
Multi Measures Bonus	15%

STATEMENT OF ENERGY PERFORMANCE

Medical Examiner’s Building

Not able to generate report due to incomplete natural gas data.

MAJOR EQUIPMENT LIST

Concord Engineering Group

Bergen County - Medical Examiner's Building

Rooftop / AC Units

Tag	RTU-1	RTU-2	
Unit Type	Gas fired rooftop unit	Gas fired rooftop unit	
Qty	1	1	
Location	Roof	Roof	
Area Served	North side	North side	
Manufacturer	Lennox	Lennox	
Model #	LGA180SS2Y	LGC156HS1Y	
Serial #	5601L 04002	5601L 04030	
Cooling Type	Direct expansion	Direct expansion	
Cooling Capacity (Tons)	15	12.9	
Cooling Efficiency (SEER/EER)	9.2 EER 10 IPLV	11.5 EER 12.6 IPLV	
Heating Type	Natural Gas	Natural Gas	
Heating Input (MBH)	260 MBH	260 MBH	
Efficiency	80%	80%	
Approx Age	10	10	
ASHRAE Service Life	15	15	
Remaining Life	5	5	
Comments	5 HP standard supply fan motor. 100% OA economizer based on differential enthalpy	3 HP standard supply fan motor. 100% OA economizer based on differential enthalpy	

MAJOR EQUIPMENT LIST

Concord Engineering Group

Bergen County - Medical Examiner's Building

Domestic Water Heaters

Tag	HWH-1		
Unit Type	Tank style, gas fired		
Qty	1		
Location	Custodial Room		
Area Served	Entire facility		
Manufacturer	Rheem		
Model #	G50 - 98		
Serial #	URNG0906G01240		
Size (Gallons)	50		
Input Capacity (MBH/KW)	98 MBH		
Recovery (Gal/Hr)	95 GPH		
Efficiency %	80%		
Fuel	Natural gas		
Approx Age	5		
ASHRAE Service Life	12		
Remaining Life	7		
Comments			

Investment Grade Lighting Audit

CEG Job #: 9C10085

Project: Medical Examiners Building
351 E Ridgewood Ave
Paramus, NJ

Bldg. Sq. Ft. 5,000

Medical Examiners Building

KWH COST: $0.177

ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
232.22	2nd Assistant	2600	4	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.34	894.4	$158.31	4	3	Relamp - Sylvania Lamp FO28/841/SS/ECO	72	0.29	748.8	$132.54	$21.00	$84.00	0.06	145.6	$25.77	3.26
232.22	Medical Examiner	2600	6	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.52	1,341.6	$237.46	6	3	Relamp - Sylvania Lamp FO28/841/SS/ECO	72	0.43	1123.2	$198.81	$21.00	$126.00	0.08	218.4	$38.66	3.26
232.22	Assistant Examiner	2600	4	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.34	894.4	$158.31	4	3	Relamp - Sylvania Lamp FO28/841/SS/ECO	72	0.29	748.8	$132.54	$21.00	$84.00	0.06	145.6	$25.77	3.26
232.22	Office	2600	6	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.52	1,341.6	$237.46	6	3	Relamp - Sylvania Lamp FO28/841/SS/ECO	72	0.43	1123.2	$198.81	$21.00	$126.00	0.08	218.4	$38.66	3.26
232.22	Restroom	1200	1	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.09	103.2	$18.27	1	3	Relamp - Sylvania Lamp FO28/841/SS/ECO	72	0.07	86.4	$15.29	$21.00	$21.00	0.01	16.8	$2.97	7.06
221.21	Restroom	1200	1	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	74.4	$13.17	1	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.05	60	$10.62	$14.00	$14.00	0.01	14.4	$2.55	5.49
242.21	Viewing Room	1200	2	4	2x4, 4 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	256.8	$45.45	2	4	Relamp - Sylvania Lamp FO28/841/SS/ECO	98	0.20	235.2	$41.63	$28.00	$56.00	0.02	21.6	$3.82	14.65
221.21	Back Hall	3000	4	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.25	744.0	$131.69	4	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.20	600	$106.20	$14.00	$56.00	0.05	144	$25.49	2.20
602		8760	1	2	Incandescent Exit Sign	20	0.02	175.2	$31.01	1	1	LED Exit Sign	2	0.00	17.52	$3.10	$65.00	$65.00	0.02	157.68	$27.91	2.33
227.22	Lockerroom Restroom	1200	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt.,	58	0.06	69.6	$12.32	1	2	Sylvania Lamp FBO30/841XP/6//SS/ECO	49	0.05	58.8	$10.41	$24.00	$24.00	0.01	10.8	$1.91	12.55
221.21	Shower	1200	1	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	74.4	$13.17	1	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.05	60	$10.62	$14.00	$14.00	0.01	14.4	$2.55	5.49
221.21	Locker Room	2600	3	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	483.6	$85.60	3	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.15	390	$69.03	$14.00	$42.00	0.04	93.6	$16.57	2.54
242.21	Work Room	2600	10	4	2x4, 4 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed	107	1.07	2,782.0	$492.41	10	4	Relamp - Sylvania Lamp FO28/841/SS/ECO	98	0.98	2548	$451.00	$28.00	$280.00	0.09	234	$41.42	6.76
221.21	X-Ray	1200	2	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed	62	0.12	148.8	$26.34	2	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.10	120	$21.24	$14.00	$28.00	0.02	28.8	$5.10	5.49
242.21		1200	1	4	2x4, 4 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.11	128.4	$22.73	1	4	Relamp - Sylvania Lamp FO28/841/SS/ECO	98	0.10	117.6	$20.82	$28.00	$28.00	0.01	10.8	$1.91	14.65
227.21	Autopsy Room	2600	15	2	2x2, 2 Lamp, 32w 700 series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.98	2,535.0	$448.70	15	2	Sylvania Lamp FBO30/841XP/6//SS/ECO	49	0.74	1911	$338.25	$24.00	$360.00	0.24	624	$110.45	3.26
242.21		2600	9	4	2x4, 4 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed	107	0.96	2,503.8	$443.17	9	4	Relamp - Sylvania Lamp FO28/841/SS/ECO	98	0.88	2293.2	$405.90	$28.00	$252.00	0.08	210.6	$37.28	6.76
242.21	Storage	1200	1	4	2x4, 4 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed	107	0.11	128.4	$22.73	1	4	Relamp - Sylvania Lamp FO28/841/SS/ECO	98	0.10	117.6	$20.82	$28.00	$28.00	0.01	10.8	$1.91	14.65
649	Garage	2600	7	2	1x1 Surface Mount, Prismatic Lens, (2) 13w CFL Lamp	26	0.18	473.2	$83.76	7	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
602		8760	1	2	Incandescent Exit Sign	20	0.02	175.2	$31.01	1	1	LED Exit Sign	2	0.00	17.52	$3.10	$65.00	$65.00	0.02	157.68	$27.91	2.33

Investment Grade Lighting Audit

ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
121.34	Mech Room	1200	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Pendant Mnt., No Lens	78	0.16	187.2	$33.13	2	2	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	50	0.10	120	$21.24	$80.00	$160.00	0.06	67.2	$11.89	13.45
242.21	Storage	1800	2	4	2x4, 4 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	385.2	$68.18	2	4	Relamp - Sylvania Lamp FO28/841/SS/ECO	98	0.20	352.8	$62.45	$28.00	$56.00	0.02	32.4	$5.73	9.76
242.21	Files	2600	4	4	2x4, 4 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.43	1,112.8	$196.97	4	4	Relamp - Sylvania Lamp FO28/841/SS/ECO	98	0.39	1019.2	$180.40	$28.00	$112.00	0.04	93.6	$16.57	6.76
242.21	Observation Room	2600	2	4	2x4, 4 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	556.4	$98.48	2	4	Relamp - Sylvania Lamp FO28/841/SS/ECO	98	0.20	509.6	$90.20	$28.00	$56.00	0.02	46.8	$8.28	6.76
222.21	Vestibule	3000	1	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	186.0	$32.92	1	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.05	150	$26.55	$14.00	$14.00	0.01	36	$6.37	2.20
602		8760	1	2	Incandescent Exit Sign	20	0.02	175.2	$31.01	1	1	LED Exit Sign	2	0.00	17.52	$3.10	$65.00	$65.00	0.02	157.68	$27.91	2.33
	Totals		92	73				17,931	$3,174	92	68			6.0	14,546	$2,575		$2,216	1.1	2,912	$515	4.30

CEG Job #: 9C10085
Project: Medical Examiners Building
Address: 351 E Ridgewood Ave
Paramus, NJ
Building SF: 5,000

Medical Examiners Building

KWH COST: $0.177

FALSE

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS											SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
232.22	2nd Assistant	2600	4	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.34	894.4	$158.31	4	1	Dual Technology Occupancy Sensor - Switch Mnt.	86	0.26	25%	670.8	$118.73	$150.00	$125.00	0.09	223.6	$39.58	3.16
232.22	Medical Examiner	2600	6	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.52	1341.6	$237.46	6	1	Dual Technology Occupancy Sensor - Switch Mnt.	86	0.39	25%	1006.2	$178.10	$150.00	$125.00	0.13	335.4	$59.37	2.11
232.22	Assistant Examiner	2600	4	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.34	894.4	$158.31	4	1	Dual Technology Occupancy Sensor - Switch Mnt.	86	0.26	25%	670.8	$118.73	$150.00	$125.00	0.09	223.6	$39.58	3.16
232.22	Office	2600	6	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.52	1341.6	$237.46	6	1	Dual Technology Occupancy Sensor - Switch Mnt.	86	0.39	25%	1006.2	$178.10	$150.00	$125.00	0.13	335.4	$59.37	2.11
232.22	Restroom	1200	1	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.09	103.2	$18.27	1	0	No Change	86	0.09	0%	103.2	$18.27	$0.00	$0.00	0.00	0	$0.00	0.00
221.21	Restroom	1200	1	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	74.4	$13.17	1	0	No Change	62	0.06	0%	74.4	$13.17	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Viewing Room	1200	2	4	2x4, 4 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	256.8	$45.45	2	0	No Change	107	0.21	0%	256.8	$45.45	$0.00	$0.00	0.00	0	$0.00	0.00
221.21	Back Hall	3000	4	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.25	744	$131.69	4	0	No Change	62	0.25	0%	744	$131.69	$0.00	$0.00	0.00	0	$0.00	0.00
602		8760	1	2	Incandescent Exit Sign	20	0.02	175.2	$31.01	1	0	No Change	20	0.02	0%	175.2	$31.01	$0.00	$0.00	0.00	0	$0.00	0.00
227.22	Lockerroom Restroom	1200	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.06	69.6	$12.32	1	0	No Change	58	0.06	0%	69.6	$12.32	$0.00	$0.00	0.00	0	$0.00	0.00
221.21	Shower	1200	1	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	74.4	$13.17	1	0	No Change	62	0.06	0%	74.4	$13.17	$0.00	$0.00	0.00	0	$0.00	0.00
221.21	Locker Room	2600	3	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	483.6	$85.60	3	1	Dual Technology Occupancy Sensor - Switch Mnt.	62	0.14	25%	362.7	$64.20	$150.00	$125.00	0.05	120.9	$21.40	5.84
242.21	Work Room	2600	10	4	2x4, 4 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.07	2782	$492.41	10	1	Dual Technology Occupancy Sensor - Switch Mnt.	107	0.80	25%	2086.5	$369.31	$150.00	$125.00	0.27	695.5	$123.10	1.02
221.21	X-Ray	1200	2	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	148.8	$26.34	2	0	No Change	62	0.12	0%	148.8	$26.34	$0.00	$0.00	0.00	0	$0.00	0.00
242.21		1200	1	4	2x4, 4 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.11	128.4	$22.73	1	0	No Change	107	0.11	0%	128.4	$22.73	$0.00	$0.00	0.00	0	$0.00	0.00

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS										SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
227.21	Autopsy Room	2600	15	2	2x2, 2 Lamp, 32w 700 series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.98	2535	$448.70	15	0	No Change	65	0.98	0%	2535	$448.70	$0.00	$0.00	0.00	0	$0.00	0.00
242.21		2600	9	4	2x4, 4 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.96	2503.8	$443.17	9	0	No Change	107	0.96	0%	2503.8	$443.17	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Storage	1200	1	4	2x4, 4 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.11	128.4	$22.73	1	0	No Change	107	0.11	0%	128.4	$22.73	$0.00	$0.00	0.00	0	$0.00	0.00
649	Garage	2600	7	2	1x1 Surface Mount, Prismatic Lens, (2) 13w CFL Lamp	26	0.18	473.2	$83.76	7	0	No Change	26	0.18	0%	473.2	$83.76	$0.00	$0.00	0.00	0	$0.00	0.00
602		8760	1	2	Incandescent Exit Sign	20	0.02	175.2	$31.01	1	0	No Change	20	0.02	0%	175.2	$31.01	$0.00	$0.00	0.00	0	$0.00	0.00
121.34	Mech Room	1200	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Pendant Mnt., No Lens	78	0.16	187.2	$33.13	2	0	No Change	78	0.16	0%	187.2	$33.13	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Storage	1800	2	4	2x4, 4 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	385.2	$68.18	2	1	Dual Technology Occupancy Sensor - Switch Mnt.	107	0.16	25%	288.9	$51.14	$150.00	$125.00	0.05	96.3	$17.05	7.33
242.21	Files	2600	4	4	2x4, 4 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.43	1112.8	$196.97	4	1	Dual Technology Occupancy Sensor - Switch Mnt.	107	0.32	25%	834.6	$147.72	$150.00	$125.00	0.11	278.2	$49.24	2.54
242.21	Observation Room	2600	2	4	2x4, 4 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	556.4	$98.48	2	1	Dual Technology Occupancy Sensor - Switch Mnt.	107	0.16	25%	417.3	$73.86	$150.00	$125.00	0.05	139.1	$24.62	5.08
222.21	Vestibule	3000	1	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	186	$32.92	1	0	No Change	62	0.06	0%	186	$32.92	$0.00	$0.00	0.00	0	$0.00	0.00
602		8760	1	2	Incandescent Exit Sign	20	0.02	175.2	$31.01	1	0	No Change	20	0.02	0%	175.2	$31.01	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		92	73			7.3	17,930.8	$3,174	92	9			6.3		15,482.8	$2,740.46		$1,125	0.96	2,448	$433	2.60

Project Name: LGEA Solar PV Project - Medical Examiner's Building
Location: Paramus, NJ
Description: Photovoltaic System - Direct Purchase

Simple Payback Analysis

	Photovoltaic System - Direct Purchase
Total Construction Cost	$26,910
Annual kWh Production	3,700
Annual Energy Cost Reduction	$655
Annual SREC Revenue	$1,295
First Cost Premium	**$26,910**
Simple Payback:	**13.80** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.177**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$26,910	0	0	0	$0	(26,910)	0
1	$0	3,700	$655	$0	$1,295	$1,950	($24,960)
2	$0	3,682	$675	$0	$1,289	$1,963	($22,997)
3	$0	3,663	$695	$0	$1,282	$1,977	($21,020)
4	$0	3,645	$716	$0	$1,276	$1,991	($19,029)
5	$0	3,627	$737	$37	$1,269	$1,969	($17,060)
6	$0	3,608	$759	$37	$1,263	$1,985	($15,075)
7	$0	3,590	$782	$37	$1,257	$2,002	($13,073)
8	$0	3,572	$805	$37	$1,250	$2,019	($11,054)
9	$0	3,555	$830	$37	$1,244	$2,037	($9,017)
10	$0	3,537	$854	$36	$1,238	$2,056	($6,961)
11	$0	3,519	$880	$36	$1,232	$2,076	($4,886)
12	$0	3,502	$907	$36	$1,226	$2,096	($2,790)
13	$0	3,484	$934	$36	$1,219	$2,117	($672)
14	$0	3,467	$962	$36	$1,213	$2,139	$1,467
15	$0	3,449	$991	$36	$1,207	$2,162	$3,629
16	$0	3,432	$1,020	$35	$1,201	$2,186	$5,815
17	$0	3,415	$1,051	$35	$1,195	$2,211	$8,026
18	$0	3,398	$1,082	$35	$1,189	$2,237	$10,263
19	$0	3,381	$1,115	$35	$1,183	$2,263	$12,526
20	$0	3,364	$1,148	$35	$1,177	$2,291	$14,818
21	$1	3,347	$1,183	$34	$1,171	$2,320	$17,137
22	$2	3,330	$1,218	$34	$1,166	$2,350	$19,487
23	$3	3,314	$1,255	$34	$1,160	$2,381	$21,867
24	$4	3,297	$1,293	$34	$1,154	$2,413	$24,280
25	$5	3,281	$1,331	$34	$1,148	$2,446	$26,726
Totals:		87,157	$23,877	$746	$30,505	$53,636	($2,551)
				Net Present Value (NPV)		**$26,751**	
				Internal Rate of Return (IRR)		**5.9%**	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW_{DC}	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
Medical Examiner's Building	200	Sunpower SPR230	13	14.7	191	2.99	3,700	429	15.64

.= Proposed PV Layout

Notes:

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

PVWatts

AC Energy & Cost Savings

Cautions for Interpreting the Results

(Type comments here to appear on printout; maximum 1 row of 80 characters.)

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	3.0 kW
DC to AC Derate Factor:	0.810
AC Rating:	2.4 kW
Array Type:	Fixed Tilt
Array Tilt:	12.0°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	11.2 ¢/kWh

Results			
Month	Solar Radiation ($kWh/m^2/day$)	AC Energy (kWh)	Energy Value ($)
1	2.67	202	22.62
2	3.41	236	26.43
3	4.37	325	36.40
4	5.24	367	41.10
5	5.86	417	46.70
6	6.13	405	45.36
7	6.06	410	45.92
8	5.56	378	42.34
9	4.91	328	36.74
10	3.84	271	30.35
11	2.74	192	21.50
12	2.32	169	18.93
Year	4.43	3700	414.40

Output Hourly Performance Data

About the Hourly Performance Data

Output Results as Text

Saving Text from a Browser

Run PVWATTS v.1 for another US location or an International location
Run PVWATTS v.2 (US only)

Please send questions and comments regarding PVWATTS to Webmaster

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