MONMOUTH COUNTY

FORT MONMOUTH BUILDING #750

ALEXANDER AVENUE
EATONTOWN, NJ 07724

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:	Jersey Central Power & Lighting (JCP&L)
Electric Utility Rate Structure:	Campus Meter (Individual buildings do not contain meters)
Natural Gas Utility Provider:	New Jersey Natural Gas (NJNG)
Utility Rate Structure:	General Service Large (GSL)
Third Party Supplier:	Woodruff

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.

This facility does not contain an electric meter and is instead served by a campus distribution system for electricity. In order to properly analyze the facility electric usage, Concord has utilized Commercial Building Energy Consumption Survey (CBECS) data based on major fuel consumption intensities by end use which is provided by the U.S. Energy Information Administration. Utilizing these fuel intensity values provides an average overall consumption based on each energy consuming category for the selected building use type. This data along with field observed facility conditioned was used to determine a baseline annual electric consumption. (Data source http://www.eia.gov/).

Table 1
Electricity Energy Use Calculation

Fort Monmouth Building 750 is not individually metered for electricity; therefore energy use at the building is estimated based on CBECS data for "Warehouse and Storage". The site intensity column contains the total kBtu/sf/year for a "warehouse and storage" facility as well as a break-down of categories for major energy consumers. The site energy column converts the site intensity to kBtu's for the CBECS typical building. The energy type column is used to identify what categories Building 750 is actually currently utilizing for energy consumption. Lastly, the electric (kWh) column uses the facility square footage along with the site intensity column to estimate the electric consumption for Building 750 based on a building of similar type.

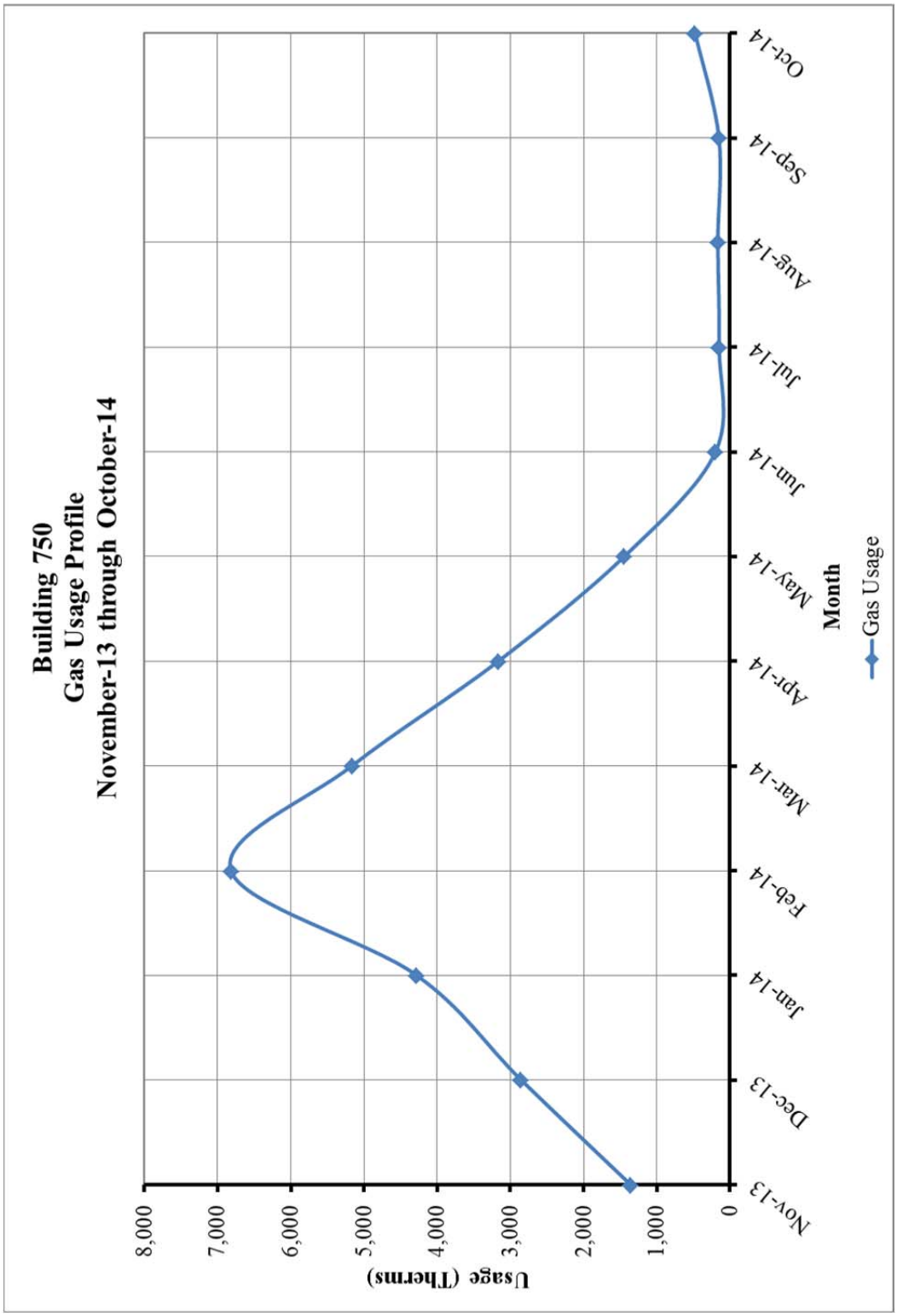
FACILITY ENERGY USAGE CALCULTION				
Description	**Site Intensity (kBtu/sf/yr)**	**Site Energy (kBtu)**	**Energy Type**	**Electric (kWh)**
Total	*77*			*111,771*
Space Heating	35.9	516,637	Gas	0
Cooling	3.8	54,686	Electric	16,027
Ventilation	6	86,346	Electric	25,307
Water Heating	1	14,391	Gas	0
Lighting	15.6	224,500	Electric	65,797
Cooking	N/A	0		0
Refrigeration	2.1	30,221		0
Office Equipment	0.3	4,317	Electric	1,265
Computers	0.8	11,513	Electric	3,374
Other	11.4	164,057	Gas	0
Notes:	Use data was excluded for non observed conditions.			

Table 2
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider: NJNG		
Rate: General Service Large		
Meter No: 913676		
Account No: 22-0014-6976-54		
Third Party Utility Provider: Woodruff		
TPS Meter No: -		
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Nov-13	*1,360.00*	$1,590.98
Dec-13	*2,856.00*	$3,341.06
Jan-14	*4,284.00*	$5,011.60
Feb-14	6,820.23	$7,259.59
Mar-14	5,163.93	$5,564.37
Apr-14	3,162.44	$3,515.84
May-14	1,443.18	$1,756.18
Jun-14	197.17	$480.89
Jul-14	147.80	$430.36
Aug-14	165.87	$448.85
Sep-14	151.96	$434.99
Oct-14	477.79	$850.63
TOTALS	**26,230.37**	**$30,685.34**
AVERAGE RATE:	**$1.17**	**$/THERM**

Note: Consumption for November, December and January has been estimated due to insufficient billing data.

Figure 1
Natural Gas Usage Profile



II. FACILITY ENERGY USE INDEX (EUI)

Energy Use Index (EUI) is a measure of a building's annual energy utilization per square foot of building. This calculation is completed by converting all utility usage consumed by a building for one year, to British Thermal Units (BTU) and dividing this number by the building square footage. EUI is a good measure of a building's energy use and is utilized regularly for comparison of energy performance for similar building types. Building Benchmarking data is collected and analyzed within the Commercial Building Energy Consumption Survey (CBECS), performed by the Energy and Information Administration (EIA). Building data is grouped by function types and tabulated, from which a median site and source energy intensity is determined. The national median or PEER Group Comparable in this instance is the middle value of the national population meaning half the buildings use more energy, and half use less. The PEER Group EUI allows us to compare the relative efficiency of the audited building to that of an average building with the same or similar primary function (i.e. group type).

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

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

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

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

Table 3
Energy Use Index Summary

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	**BUILDING USE**			**SITE ENERGY**	**SITE-SOURCE RATIO**	**SOURCE ENERGY**
	kWh	**Therms**	**Gallons**	**kBtu**		**kBtu**
ELECTRIC	111,770.7			381,585	3.140	1,198,177
NATURAL GAS		26,230.4		2,623,037	1.050	2,754,189
TOTAL				3,004,622		3,952,366

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

	AUDITED BUILDING		**PEER COMPARISON**	
BUILDING TYPE	Other - Public Services		CBECS - Other	
BUILDING AREA	14,391	SQUARE FEET		
BUILDING SITE EUI	*208.78*	kBtu/SF/YR	*78.80*	kBtu/SF/YR
BUILDING SOURCE EUI	*274.64*	kBtu/SF/YR	*123.10*	kBtu/SF/YR

	123%	Less Efficient than PEER Comparison

III. FACILITY DESCRIPTION

The Fort Monmouth Building #750 is located within Fort Monmouth base on Alexander Avenue in Eatontown, New Jersey. The 14,391 SF facility was built in 1980's with no addition. This facility is a single-story structure with offices, restrooms, mechanical room and six bays of vehicle maintenance area.

Occupancy Profile

The typical hours of operation for this facility are Monday through Friday between 8:00 am and 4:00 pm. The building may be utilized occasionally during times of inclement weather. The building is occupied at peak times with at most 12 people.

Building Envelope

The facility is a concrete block construction and single pane windows. The perimeter walls are concrete block construction with little to no insulation. The windows, man doors, and overhead doors are in poor condition. Typical windows throughout the facility are single pane, operable, 1/4" clear glass with aluminum frames.

HVAC Systems

The office and storage/workshop areas are heated by a Weil-McLain Model 380 gas-fired, boiler rated at 346 MBH input and 278 MBH output for a thermal efficiency of 75%. The gas-fired boiler serves baseboard fin-tube along the exterior walls, a hot water heating and ventilation unit in the garage and a Trane air handling unit for the offices. Additionally, the garage has supplemental heating in the form of fifteen (15) Modine gas-fired infra-red radiant unit heaters rated at 60 and 30 MBH each and a thermal efficiency of 86%. The office area is also cooled by a Carrier portable air conditioner rated at 12,000 BTUH and an efficiency of 8.8 EER. There are also several window air conditioners throughout the facility that condition office areas.

Exhaust System

Air is exhausted from various areas through a roof exhauster or wall-mounted exhaust fan.

HVAC System Controls

Baseboard heat and any hot water heat supplied from the boiler to the building is controlled by an individual wall thermostats. The garage gas-fired unit heaters are controlled by individual thermostats set to 60°F

Domestic Hot Water

Domestic hot water for the restroom/sink is provided by an A.O. Smith Model GCV 40 300 gas-fired, 40-gallon capacity, water heater with a 40 MBH input capacity.

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.

IV. 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.

V. 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 1
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 - Indoor	$11,035	$860	12.8	16.9%
ECM #2	Lighting Controls Upgrade	$1,480	$91	16.3	-7.8%
ECM #3	Lighting Upgrade - Garage	$5,000	$989	5.1	196.6%
ECM #4	Lighting Upgrade - Exterior	$2,100	$492	4.3	251.8%
ECM #5	High Efficiency Transformer	$7,700	$533	14.4	3.9%
ECM #6	NEMA Premium Motors	$3,730	$69	54.1	-66.7%
ECM #7	Window Replacement	$20,000	$332	60.2	-75.1%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	75.12 kW PV System	$339,000	$23,568	14.4	4.3%

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

Table 2
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 - Indoor	4.3	7,167	0
ECM #2	Lighting Controls Upgrade	0.0	758	0
ECM #3	Lighting Upgrade - Garage	2.1	8,240	0
ECM #4	Lighting Upgrade - Exterior	1.0	4,104	0
ECM #5	High Efficiency Transformer	0.8	4,444	0
ECM #6	NEMA Premium Motors	0.2	577	0
ECM #7	Window Replacement	0.0	0	332
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	75.12 kW PV System	75.1	86,805	0

Table 3
ECM Emissions Summary

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	GREENHOUSE GAS EMISSIONS REDUCTION		
		CO_2 EMISSIONS (LBS)	NO_X EMISSIONS (LBS)	SO_2 EMISSIONS (LBS)
ECM #1	Lighting Upgrade - Indoor	10,894	20	47
ECM #2	Lighting Controls Upgrade	1,152	2	5
ECM #3	Lighting Upgrade - Garage	12,525	23	54
ECM #4	Lighting Upgrade - Exterior	6,238	11	27
ECM #5	High Efficiency Transformer	6,755	12	29
ECM #6	NEMA Premium Motors	877	2	4
ECM #7	Window Replacement	3,884	3	0

Notes: A. Emissions Reduction based on NJCEP published factors for electric & gas.

Table 4
Facility Project Summary

FACILITY PROJECT SUMMARY TABLE					
ENERGY CONSERVATION MEASURES	**ANNUAL ENERGY SAVINGS ($)**	**PROJECT COST ($)**	**SMART START INCENTIVES**	**CUSTOMER COST**	**SIMPLE PAYBACK**
Lighting Upgrade - Indoor	$860	$11,035	$0	$11,035	12.8
Lighting Controls Upgrade	$91	$1,600	$120	$1,480	16.3
Lighting Upgrade - Garage	$989	$6,500	$1,500	$5,000	5.1
Lighting Upgrade - Exterior	$492	$2,100	$0	$2,100	4.3
High Efficiency Transformer	$533	$7,700	$0	$7,700	14.4
NEMA Premium Motors	$69	$3,730	$0	$3,730	54.1
Window Replacement	$332	$20,000	$0	$20,000	60.2
Total Project	**$3,366**	**$52,665**	**$1,620**	**$51,045**	**15.2**

Note the measure totals in this table do not take into account interactive effects of measures; see Method of Analysis Section III in Executive Report for further explanation.

This project does not qualify for additional incentives through the Pay for Performance Program; please see the Installation Funding Options section for additional program options.

ECM #1: Lighting Upgrade

Description:

The majority of the interior lighting throughout the Fort Monmouth Building 750 is provided with fluorescent fixtures with older generation, 32W T8 lamps with electronic ballasts or 34W T12 lamps with magnetic ballasts. Additionally, there are several areas that still contain compact fluorescents and incandescent lamps. These fixtures can be replaced and retrofit with new LED type fixtures and lamps.

This ECM includes replacing and retrofitting the interior lighting with new LED type lamps and fixtures. It is recommended the County consult with a professional engineer prior to retrofitting or replacing fixtures to ensure code required minimum light levels will be met.

Energy Savings Calculations:

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

LIGHTING UPGRADE SAVINGS SUMMARY	
DESCRIPTION	**SAVINGS**
Electric Demand Savings (kW)	4.3
Electric Usage Savings (kWh)	7,167
Electric Cost Savings ($)	$860

No maintenance cost savings were estimated for this measure.

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$11,035
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$11,035
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$860
Total Yearly Savings ($/Yr):	$860
Estimated ECM Lifetime (Yr):	15
Simple Payback	12.8
Simple Lifetime ROI	16.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$12,900
Internal Rate of Return (IRR)	2%
Net Present Value (NPV)	($768.18)

ECM #2: Lighting Controls Upgrade

Description:

Some of the lights in the Fort Monmouth Building 750 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 20% of the total light energy controlled by occupancy sensors.

This ECM includes installation of ceiling or switch mount sensors for the Fort Monmouth Building 750. 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:

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

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

LIGHTING CONTROLS SAVINGS SUMMARY	
DESCRIPTION	**SAVINGS**
Electric Usage Savings (kWh)	758
Electric Cost Savings ($)	$91

Rebates and Incentives:

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

Smart Start Incentive
= (# Wall mount sensors × $20 per sensor)
+ (# Ceiling mount sensors × $35 per sensor)

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,600
NJ Smart Start Equipment Incentive ($):	$120
Net Installation Cost ($):	$1,480
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$91
Total Yearly Savings ($/Yr):	$91
Estimated ECM Lifetime (Yr):	15
Simple Payback	16.3
Simple Lifetime ROI	-7.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,364
Internal Rate of Return (IRR)	-1%
Net Present Value (NPV)	($394.58)

ECM #3: Lighting Upgrade – Garage

Description:

The garage lighting at the Fort Monmouth Building 750 is currently lit by 250w high pressure sodium hi-bay fixtures. The garage would be better served with more efficient LED lighting system. Concord Engineering recommends upgrading the lighting to an energy-efficient LED lighting system that includes LED lamps and fixtures for the existing garage lighting.

This ECM would replace the existing garage lamps and fixtures with equivalent LED lamps and fixtures.

Energy Savings Calculations:

A detailed Investment Grade Lighting Audit can be found in **Investment Grade Lighting Audit Appendix** that outlines the proposed retrofits, costs, savings, and payback periods.

LIGHTING UPGRADE SAVINGS SUMMARY	
DESCRIPTION	**SAVINGS**
Electric Demand Savings (kW)	2.1
Electric Usage Savings (kWh)	8,240
Electric Cost Savings ($)	$989

No maintenance cost savings were estimated for this measure.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$6,500
NJ Smart Start Equipment Incentive ($):	$1,500
Net Installation Cost ($):	$5,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$989
Total Yearly Savings ($/Yr):	$989
Estimated ECM Lifetime (Yr):	15
Simple Payback	5.1
Simple Lifetime ROI	196.6%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$14,832
Internal Rate of Return (IRR)	18%
Net Present Value (NPV)	$6,804.23

ECM #4: Lighting Upgrade – Exterior Lighting

Description:

The exterior lighting at the Fort Monmouth Building 750 is currently lit by 175w metal halide wall pack fixtures. The exterior would be better served with more efficient LED lighting system. Concord Engineering recommends upgrading the lighting to an energy-efficient LED lighting system that includes LED lamps and fixtures for the existing exterior lighting.

This ECM would replace the existing exterior lamps and fixtures with equivalent LED lamps and fixtures.

Energy Savings Calculations:

A detailed Investment Grade Lighting Audit can be found in **Investment Grade Lighting Audit Appendix** that outlines the proposed retrofits, costs, savings, and payback periods.

LIGHTING CONTROLS SAVINGS SUMMARY	
DESCRIPTION	**SAVINGS**
Electric Demand Savings (kW)	1.0
Electric Usage Savings (kWh)	4,104
Electric Cost Savings ($)	$492

No maintenance cost savings were estimated for this measure.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,100
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$2,100
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$492
Total Yearly Savings ($/Yr):	$492
Estimated ECM Lifetime (Yr):	15
Simple Payback	4.3
Simple Lifetime ROI	251.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$7,387
Internal Rate of Return (IRR)	22%
Net Present Value (NPV)	$3,779.19

ECM #5: High Efficiency Transformers

Description:

Electrical distribution transformers play a key role in delivering electrical power to buildings as all the electrical power supplied to the building flows through them. Whether equipment is plugged in and turned on or not transformers continue to operate. Consider their impact on electricity consumption. Some transformers waste as much as 20% of billed electricity.

Older transformers in existing buildings may not have been built to meet the load requirements of today. Over the years electrical distribution has changed very little, however the connected equipment has changed dramatically. This dramatic change is derived from both the type of equipment (mostly electronic in nature) and the density of installed equipment. The impact of this change has had a direct impact on power quality and transformer efficiency.

When newer electronic equipment is introduced into buildings with older electrical systems power quality and transformer efficiency can suffer. According to a Department of Energy study performed in 1996 electronic equipment can increase losses by as much as 2.7 times. In real terms this would mean that a transformer that has a name- plate efficiency of 97% in reality is operating closer to 90% or lower. The difference represents additional costs to operate the transformer. Replacing your older transformers with Power smiths energy efficient E-Saver-C3 or T1000-C3 transformers can improve the reliability of your electronic equipment and significantly reduce electricity waste.

Power smith's energy efficient transformers have substantially lower losses (higher efficiency) than other transformers. These energy savings mean less kilowatt-hours (kWh) consumed and lower energy bills. Electricity demand charges also decline, thanks to reduced energy losses. These savings pay for the transformer many times over its installed life.

The Fort Monmouth Building 750 has one GE 30 kVA rated dry type transformers located in mechanical room. This ECM would replace one transformer with a new Power Smith energy efficient unit.

Energy Savings Calculations:

See **Appendix** for Manufacturers Transformer Calculation Spreadsheet.

TRANSFORMER SAVINGS SUMMARY	
DESCRIPTION	**SAVINGS**
Electric Demand Savings (kW)	0.8
Electric Usage Savings (kWh)	4,444
Electric Cost Savings ($)	$533

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$7,700
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$7,700
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$533
Total Yearly Savings ($/Yr):	$533
Estimated ECM Lifetime (Yr):	15
Simple Payback	14.4
Simple Lifetime ROI	3.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$7,999
Internal Rate of Return (IRR)	0%
Net Present Value (NPV)	($1,333.74)

ECM #6: 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 pumps are 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 inefficient electric motors with NEMA Premium® efficiency motors.

IMPLEMENTATION SUMMARY					
EQMT ID	**FUNCTION**	**MOTOR HP**	**HOURS OF OPERATION**	**EXISTING EFFICIENCY**	**NEMA PREMIUM EFFICIENCY**
M-1	Compressor	10	3,391	89.5%	91.7%
M-2	Pump	1	2,745	82.5%	85.5%

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	QTY	MOTOR HP	LOAD FACTOR	EXISTING EFFICIENCY	PROPOSED EFFICIENCY	POWER SAVINGS kW	ENERGY SAVINGS kWH	COST SAVINGS
M-1	1	10	75%	89.5%	91.7%	0.15	511	$61
M-2	1	1	75%	82.5%	85.5%	0.02	66	$8
TOTAL						**0.2**	**577**	**$69**

There are no longer incentives available through NJ Smart Start for premium efficiency motors.

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$3,730
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$3,730
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$69
Total Yearly Savings ($/Yr):	$69
Estimated ECM Lifetime (Yr):	18
Simple Payback	54.1
Simple Lifetime ROI	-66.7%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$1,242
Internal Rate of Return (IRR)	-10%
Net Present Value (NPV)	($2,781.01)

ECM #7: Window Replacement

Description:

The buildings envelope consists of single pane windows with aluminum frames. The total area of single pane windows is estimated at 250 SF. This area was used as the basis for calculating energy savings and formulating a cost estimate.

Older inefficient windows can account for significant energy use through leakage heat loss and conductive heat loss. The age and condition of the windows contribute to the leakage rate of the building. The single pane construction allows higher thermal (conductive) energy loss. These factors lead to increased energy use in the heating season. The heating loss due to single pane glass is combined with heat loss due to poor seals at each operable window. New double pane windows with low E glazing offer a substantial improvement in thermal performance throughout the year.

This ECM includes the replacement of all single pane glass in the office areas with double pane windows with low emissivity glass. The proposed windows include reduced outside air leakage. In addition the double pane structure will significantly increase the insulation value compared to the existing single pane window structure.

The basis for this ECM is an ASHRAE 90.1-2007 equivalent window. The windows will be replaced throughout the office areas.

Energy Savings Calculations:

Thermal Loss values were calculated for each month based on the average monthly temperature obtained for 2013/2014. The heating period used was October to April.

$$\text{Thermal Loss Savings (kBtu)} = (U_E - U_P) \times \text{Window Area} \times \left(T_{\text{Indoor}} - T_{\text{Avg Outdoor}}\right) \times \frac{\text{Hours}}{\text{Month}} \times \frac{1\ \text{kBtu}}{1{,}000\ \text{Btu}}$$

$$\text{Heating Savings (Therm)} = \text{Thermal Loss Savings (Heating)} \times \frac{1}{\text{Efficiency}} \times \frac{1\ \text{Therm}}{100\ \text{kBtu}}$$

WINDOW REPLACEMENT CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Description:	Existing Single Pane Windows	Double Pane Low-E Windows	
Window (SF)	250	250	
U-Value (BTU/HR/SF*°F)	1.0	0.45	0.55
Infiltration Rate (CFM/SF)	0.6	0.4	0.20
Indoor Temperature Heating (°F)	70	70	
Average Thermal Loss Rate Heating (BTU/HR)	6,250	2,813	3,438
Heating Degree Days (65°F)	5599	5599	
Thermal Losses Heating (kBtu)	41,310	18,590	22,721
Heating System Efficiency (%)	80.0%	80.0%	
Natural Gas Cost ($/Therm)	$1.17	$1.17	-
Electric Cost ($/kWh)	$0.120	$0.120	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Natural Gas Usage (Therm)	516	232	284
Energy Cost Savings ($)	$604	$272	$332
Comments:	1. Proposed window U-value Based on ASHRAE 90.1 - 2007 2. Savings Based on Avg. Monthly Temperature for 2013/2014		

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$20,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$20,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$332
Total Yearly Savings ($/Yr):	$332
Estimated ECM Lifetime (Yr):	15
Simple Payback	60.2
Simple Lifetime ROI	-75.1%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$4,980
Internal Rate of Return (IRR)	-14%
Net Present Value (NPV)	($16,036.61)

REM #1: 75.12 kW Solar System

Description:

The Fort Monmouth building 750 has available roof space that could accommodate solar arrays. Based on the available area a 75.12 kilowatt solar array could be installed. The array will produce approximately 86,805 kilowatt-hours annually. The owner should consult a structural engineer prior to installing any solar array to insure the roof can accommodate the additional weight.

Energy Savings Calculations:

See **Renewable / Distributed Energy Measures Calculations Appendix** for detailed financial summary and proposed solar layout areas. Financial results in table below are based on 100% financing of the system over a fifteen year period.

Energy Savings Summary:

REM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$339,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$339,000
Maintenance Savings ($/Yr):	$13,151
Energy Savings ($/Yr):	$10,417
Total Yearly Savings ($/Yr):	$23,568
Estimated ECM Lifetime (Yr):	15
Simple Payback	14.4
Simple Lifetime ROI	4.3%
Simple Lifetime Maintenance Savings	$197,269
Simple Lifetime Savings	$353,518
Internal Rate of Return (IRR)	0.5%
Net Present Value (NPV)	($57,648.65)

VI. 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.

F. Replace any old CRT Monitors with LED/LCD Type Monitors, which can draw as much as a quarter the power of an equivalent CRT monitor.

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

APPENDIX A

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Monmouth County - Fort Monmouth Building 750

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY														
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 #1	Lighting Upgrade - Indoor	$7,850	$3,185	$0	$11,035	$860	$0	$860	15	$12,900	$0	16.9%	12.8	2.02%	($768.18)
ECM #2	Lighting Controls Upgrade	$1,050	$550	$120	$1,480	$91	$0	$91	15	$1,364	$0	-7.8%	16.3	-1.00%	($394.58)
ECM #3	Lighting Upgrade - Garage	$5,000	$1,500	$1,500	$5,000	$989	$0	$989	15	$14,832	$0	196.6%	5.1	18.16%	$6,804.23
ECM #4	Lighting Upgrade - Exterior	$1,200	$900	$0	$2,100	$492	$0	$492	15	$7,387	$0	251.8%	4.3	22.31%	$3,779.19
ECM #5	High Efficiency Transformer	$6,200	$1,500	$0	$7,700	$533	$0	$533	15	$7,999	$0	3.9%	14.4	0.48%	($1,333.74)
ECM #6	NEMA Premium Motors	$2,476	$1,254	$0	$3,730	$69	$0	$69	18	$1,242	$0	-66.7%	54.1	-9.66%	($2,781.01)
ECM #7	Window Replacement	$15,000	$5,000	$0	$20,000	$332	$0	$332	15	$4,980	$0	-75.1%	60.2	-13.84%	($16,036.61)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	75.12 kW PV System	$339,000	$0	$0	$339,000	$10,417	$13,151	$23,568	15	$353,518	$197,269	4.3%	14.4	0.53%	($57,648.65)

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

APPENDIX B

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 from July 1, 2014 to June 30, 2015:

Electric Chillers

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

Energy Efficiency must comply with ASHRAE 90.1-2007

Gas Cooling

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

Desiccant Systems

$1.00 per cfm – gas or electric

Electric Unitary HVAC

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

Energy Efficiency must comply with ASHRAE 90.1-2007

Gas Heating

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

Ground Source Heat Pumps

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

Energy Efficiency must comply with ASHRAE 90.1-2007

Variable Frequency Drives

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

Natural Gas Water Heating

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

Prescriptive Lighting

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

Prescriptive Lighting - LED

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

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

Lighting Controls – Occupancy Sensors

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

Refrigeration Doors/Covers

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

Refrigeration Controls

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

Food Service Equipment

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

Other Equipment Incentives

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

APPENDIX C

MAJOR EQUIPMENT LIST

Concord Engineering Group

Building 750

AC Units

Tag			
Unit Type	Air Cooled After-cooler	Vertical Unit Ventilator	Portable Air Conditioner
Qty	1	1	1
Location	Mechanical Room	Office Storage	Office
Area Served	-	Office	Office
Manufacturer	Russell	Trane	Friedrich
Model #	AAC#3115	-	P12B-A
Serial #	F85 88660-13	-	ADBA00876
Cooling Type		DX, R-22	DX,
Cooling Capacity (Tons)	Unknown	5	1
Cooling Efficiency (SEER/EER)	Unknown	9 EER	8.8 EER
Heating Type	N/A	N/A	N/A
Heating Input (MBH)	N/A	N/A	N/A
Efficiency	N/A	N/A	N/A
Fuel	N/A	N/A	N/A
Approx Age	18	15	1
ASHRAE Service Life	15	15	15
Remaining Life	(3)	0	14
Comments	Removes moisture from compressor		

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

Building 750

AHUs

Tag	H&V-1		
Unit Type	Heating & Ventilation Unit		
Qty	1		
Location	Garage		
Area Served	Garage		
Manufacturer	Could not read equipment tag		
Model #	Could not read equipment tag		
Serial #	Could not read equipment tag		
Cooling Type	N/A		
Cooling Capacity (Tons)	N/A		
Cooling Efficiency (SEER/EER)	N/A		
Heating Type	Hot Water		
Heating Input (MBH)	-		
Efficiency	See Boiler		
Fuel	Hot Water		
Approx Age	25		
ASHRAE Service Life	15		
Remaining Life	(10)		
Comments			

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

Building 750

Boilers

Tag	B-1		
Unit Type	Cast Iron Sectional		
Qty	1		
Location	Mechanical Room		
Area Served	Hot Water Loop (bldg 750)		
Manufacturer	Weil-McLain		
Model #	380		
Serial #	-		
Input Capacity	346 MBH		
Rated Output Capacity	278 MBH		
Approx. Efficiency %	75.0%		
Fuel	Natural Gas		
Approx Age	7		
ASHRAE Service Life	35		
Remaining Life	28		
Comments	RW Becket Burner - MN:CG10 SN:070531-98105		

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

Building 750

Domestic Water Heaters

Tag	DHW-1		
Unit Type	Automatic Storage Water Heater		
Qty	1		
Location	Mechanical Room		
Area Served	Domestic Hot Water Loop		
Manufacturer	A.O. Smith		
Model #	GCV 40 300		
Serial #	1248A019225		
Size (Gallons)	40		
Input Capacity (MBH/KW)	40 MBH		
Recovery (Gal/Hr)	40.94		
Efficiency	0.59 EF		
Fuel	Natural Gas		
Approx Age	2		
ASHRAE Service Life	12		
Remaining Life	10		
Comments			

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

Building 750

Transformers

Tag			
Unit Type	Dry Transformer		
Qty	1		
Location	Mechanical Room		
Manufacturer	General Electric		
Catalog #	9T23B3872		
Serial #	303B728AAP001		
Rating (kVA)	30		
Electrical (V/H/P)	480/208X		
Impedance (%)	5.4%		
Comments			

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

Building 750

Motors

Tag			
Unit Type	Motor	Motor	
Qty	1	1	
Location	Mechanical Room	Mechanical Room	
Area Served	Compressor	Pump	
Manufacturer	Westinghouse Motors	Emerson	
Catalog #	ASGANE010-4-2/4	138-119	
Horse Power	10.0	1.0	
Enclosure Type	ODP (215T Frame)	-	
Electrical Power	208-230/460/3/60	115/230/1/60	
RPM	1740	1725	
Efficiency %	89.5%	82.5%	
Approx Age	5	10	
ASHRAE Service Life	18	18	
Remaining Life	13	8	
Comments			

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

Building 750

Unit Heater

Tag	UH-1	UH-1-11	UH-12-15
Unit Type	Propeller Unit Heater	Infra-red Radiant Unit Heater	Infra-red Radiant Unit Heater
Qty	1	11	4
Location	Clean Room	Garage	Garage
Area Served	Clean Room	Garage	Garage
Manufacturer	Trane	Modine	Modine
Model #	UHSA-186S-8C-AAM	MHR 30S 47	MHR 60S
Serial #	D86C04849	-	-
Input Capacity (MBH)	Hot Water	30 MBH	60 MBH
CFM	2808 CFM	N/A	N/A
Fuel	Natural Gas	Natural Gas	Natural Gas
Approx. Efficiency %	80.0%	86.0%	86.0%
Approx Age	28	5	5
ASHRAE Service Life	13	13	13
Remaining Life	(15)	8	8
Comments			

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

Building 750

Window AC

Tag			
Unit Type	Window AC	Window AC	Window AC
Qty	1	1	1
Location	Office	Break Room	Office
Area Served	Office	Break Room	Office
Manufacturer	Thermal Zone	Frigidaire	Thermal Zone
Model #	WAC410115R	FAM187Q2A2	WAC18230R
Serial #	1046210000262	KK60500851	-
Cooling Type	DX, R-410A	DX, R-22	DX, R-22
Cooling Capacity (Tons)	10,200 Btu/hr	18,500 Btu/hr	18,000 Btu/hr
Cooling Efficiency (SEER/EER)	9.8 EER	10.7 EER	9.7 EER
Approx Age	4	8	4
ASHRAE Service Life	15	15	15
Remaining Life	11	7	11
Comments			

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

Window AC

Tag			
Unit Type	Window AC		
Qty	1		
Location	Office		
Area Served	Office		
Manufacturer	Thermal Zone		
Model #	WAC46115R		
Serial #	1465520000165		
Cooling Type	DX, R-410A		
Cooling Capacity (Tons)	6,000 Btu/hr		
Cooling Efficiency (SEER/EER)	9.7 EER		
Approx Age	1		
ASHRAE Service Life	15		
Remaining Life	14		
Comments			

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

APPENDIX D

CEG Project #: 1C14167
Facility Name: Building 750
Address: Alexander Ave
City, State, Zip Eatontown, NJ 07724

			EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT							RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS					LIGHTING RETROFIT COSTS					LIGHTING CONTROLS COST				
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Total Materials	Total Labor	Total All	Smart Start Incentive	Simple Payback
1	Garage	4000	250w HPS HiBay	1	295	10	2.95	11,800	Replace Fixture	RAB Lighting - BAYLED78W Hi-bay	1	89	10	0.89	3,560	2.06	8,240	$989	0	No New Controls	0	0.0%	0	$0	$5,000.00	$1,500.00	$6,500.00	$1,500.00	5.06	$0.00	$0.00	$0.00	FALSE	-
10	Lounge	2000	2x4 3-Lamp 34w T12 Magnetic Recessed Primatic Lens	3	102	8	0.82	1,632	LED Retrofit Kit	Install Philips LED Evo 2x4 Retrofit Kit	1	39	8	0.31	624	0.50	1,008	$121	6	Dual Technology Occupancy Sensor - Switch Mnt.	0.5	20.0%	125	$15	$880.00	$280.00	$1,160.00	$0.00	9.59	$25.00	$25.00	$50.00	$20.00	2.00
13		2000	2x4 3-Lamp 34w T12 Electronic Recessed Primatic Lens	3	92	1	0.09	184	LED Retrofit Kit	Install Philips LED Evo 2x4 Retrofit Kit	1	39	1	0.04	78	0.05	106	$13	6	Dual Technology Occupancy Sensor - Switch Mnt.	0.5	20.0%	16	$2	$110.00	$35.00	$145.00	$0.00	11.40	$25.00	$25.00	$50.00	FALSE	26.71
10	Office	2000	2x4 3-Lamp 34w T12 Magnetic Recessed Primatic Lens	3	102	4	0.41	816	LED Retrofit Kit	Install Philips LED Evo 2x4 Retrofit Kit	1	39	4	0.16	312	0.25	504	$60	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	62	$7	$440.00	$140.00	$580.00	$0.00	9.59	$50.00	$50.00	$100.00	$20.00	10.68
10	Locker Room	2000	2x4 3-Lamp 34w T12 Magnetic Recessed Primatic Lens	3	102	2	0.20	408	LED Retrofit Kit	Install Philips LED Evo 2x4 Retrofit Kit	1	39	2	0.08	156	0.13	252	$30	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	31	$4	$220.00	$70.00	$290.00	$0.00	9.59	$50.00	$50.00	$100.00	$20.00	21.37
9	Restroom	2000	2' 2-Lamp 20w T12 Magnetic Surface wrap	2	42	2	0.08	168	Bypass Ballast & Install LED Tube Lamp	Install 10w 2' LED Tube Lamp	1	10	2	0.02	40	0.06	128	$15	0	No New Controls	0	0.0%	0	$0	$50.00	$70.00	$120.00	$0.00	7.81	$0.00	$0.00	$0.00	FALSE	-
8	Janitor Closet	800	2x2 2-Lamp 20w T12 Magnetic Recessed Primatic Lens	2	42	1	0.04	34	LED Retrofit Kit	Install Philips LED Evo 2x2 Retrofit Kit	1	31	1	0.03	25	0.01	9	$1	0	No New Controls	0	0.0%	0	$0	$110.00	$35.00	$145.00	$0.00	137.31	$0.00	$0.00	$0.00	FALSE	-
7	Small Restroom	600	4' 2-Lamp 34w T12 Magnetic Surface Strip	2	62	1	0.06	37	Bypass Ballast & Install LED Tube Lamp	Install 18w 4' LED Tube Lamp	2	36	1	0.04	22	0.03	16	$2	0	No New Controls	0	0.0%	0	$0	$80.00	$45.00	$125.00	$0.00	66.77	$0.00	$0.00	$0.00	FALSE	-
11	Mechanical Room	800	4' 2-Lamp 34w T12 Magnetic Pendant No Lens	2	72	4	0.29	230	Bypass Ballast & Install LED Tube Lamp	Install 18w 4' LED Tube Lamp	2	36	4	0.14	115	0.14	115	$14	0	No New Controls	0	0.0%	0	$0	$320.00	$180.00	$500.00	$0.00	36.17	$0.00	$0.00	$0.00	FALSE	-
5	Main Corridor	2600	4' 2-Lamp 34w T12 Magnetic Recessed	2	72	6	0.43	1,123	Bypass Ballast & Install LED Tube Lamp	Install 18w 4' LED Tube Lamp	2	36	6	0.22	562	0.22	562	$67	0	No New Controls	0	0.0%	0	$0	$480.00	$270.00	$750.00	$0.00	11.13	$0.00	$0.00	$0.00	FALSE	-
6		2600	4' 2-Lamp 32w T8 Electronic Recessed	2	62	2	0.12	322	Bypass Ballast & Install LED Tube Lamp	Install 18w 4' LED Tube Lamp	2	36	2	0.07	187	0.05	135	$16	0	No New Controls	0	0.0%	0	$0	$160.00	$90.00	$250.00	$0.00	15.41	$0.00	$0.00	$0.00	FALSE	-
4	Water Treatment Room	800	4' 2-Lamp 34w T12 Magnetic Vapor Tight, Pendant	2	72	10	0.72	576	Bypass Ballast & Install LED Tube Lamp	Install 18w 4' LED Tube Lamp	2	36	10	0.36	288	0.36	288	$35	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	58	$7	$800.00	$450.00	$1,250.00	$0.00	36.17	$50.00	$50.00	$100.00	$20.00	11.57
2	Large Open Office	2000	2x4 4-Lamp 32w T8 Electronic Recessed Primatic Lens	4	114	14	1.60	3,192	LED Retrofit Kit	Install Philips LED Evo 2x4 Retrofit Kit	1	39	14	0.55	1,092	1.05	2,100	$252	4	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	1	20.0%	218	$26	$1,540.00	$490.00	$2,030.00	$0.00	8.06	$300.00	$50.00	$350.00	FALSE	13.35
3	Office Storage	600	2x4 4-Lamp 34w T12 Magnetic Recessed Primatic Lens	4	144	2	0.29	173	LED Retrofit Kit	Install Philips LED Evo 2x4 Retrofit Kit	1	39	2	0.08	47	0.21	126	$15	0	No New Controls	0	0.0%	0	$0	$220.00	$70.00	$290.00	$0.00	19.18	$0.00	$0.00	$0.00	FALSE	-
2	Small Office Break Room	2000	2x4 4-Lamp 32w T8 Electronic Recessed Primatic Lens	4	114	1	0.11	228	LED Retrofit Kit	Install Philips LED Evo 2x4 Retrofit Kit	1	39	1	0.04	78	0.08	150	$18	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	16	$2	$110.00	$35.00	$145.00	$0.00	8.06	$50.00	$50.00	$100.00	FALSE	53.42
11	Large Storage	600	4' 2-Lamp 34w T12 Magnetic Pendant No Lens	2	72	6	0.43	259	Bypass Ballast & Install LED Tube Lamp	Install 18w 4' LED Tube Lamp	2	36	6	0.22	130	0.22	130	$16	6	Dual Technology Occupancy Sensor - Switch Mnt.	0.5	20.0%	26	$3	$480.00	$270.00	$750.00	$0.00	48.23	$25.00	$25.00	$50.00	FALSE	16.08
12		600	1x4 4-Lamp 34w T12 Magnetic Pendant Primatic Lens	4	144	2	0.29	173	Bypass Ballast & Install LED Tube Lamp	Install 18w 4' LED Tube Lamp	4	72	2	0.14	86	0.14	86	$10	6	Dual Technology Occupancy Sensor - Switch Mnt.	0.5	20.0%	17	$2	$320.00	$90.00	$410.00	$0.00	39.54	$25.00	$25.00	$50.00	FALSE	24.11
11	Storage	600	4' 2-Lamp 34w T12 Magnetic Pendant No Lens	2	72	4	0.29	173	Bypass Ballast & Install LED Tube Lamp	Install 18w 4' LED Tube Lamp	2	36	4	0.14	86	0.14	86	$10	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	17	$2	$320.00	$180.00	$500.00	$0.00	48.23	$50.00	$50.00	$100.00	FALSE	48.23
10	Meeting Room	2000	2x4 3-Lamp 34w T12 Magnetic Recessed Primatic Lens	3	102	6	0.61	1,224	LED Retrofit Kit	Install Philips LED Evo 2x4 Retrofit Kit	1	39	6	0.23	468	0.38	756	$91	4	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	0.5	20.0%	94	$11	$660.00	$210.00	$870.00	$0.00	9.59	$150.00	$25.00	$175.00	FALSE	15.58
13		2000	2x4 3-Lamp 34w T12 Electronic Recessed Primatic Lens	3	92	1	0.09	184	LED Retrofit Kit	Install Philips LED Evo 2x4 Retrofit Kit	1	39	1	0.04	78	0.05	106	$13	4	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	0.5	20.0%	16	$2	$110.00	$35.00	$145.00	$0.00	11.40	$150.00	$25.00	$175.00	FALSE	93.48
10	Small Office 1	2000	2x4 3-Lamp 34w T12 Magnetic Recessed Primatic Lens	3	102	2	0.20	408	LED Retrofit Kit	Install Philips LED Evo 2x4 Retrofit Kit	1	39	2	0.08	156	0.13	252	$30	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	31	$4	$220.00	$70.00	$290.00	$0.00	9.59	$50.00	$50.00	$100.00	$20.00	21.37
10	Small Office 2	2000	2x4 3-Lamp 34w T12 Magnetic Recessed Primatic Lens	3	102	2	0.20	408	LED Retrofit Kit	Install Philips LED Evo 2x4 Retrofit Kit	1	39	2	0.08	156	0.13	252	$30	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	31	$4	$220.00	$70.00	$290.00	$0.00	9.59	$50.00	$50.00	$100.00	$20.00	21.37
14	Exterior	4000	175w MH Wallpack	1	210	6	1.26	5,040	Replace Fixture	RAB 42w LED Wallpack	1	39	6	0.23	936	1.03	4,104	$492	0	No New Controls	0	0.0%	0	$0	$1,200.00	$900.00	$2,100.00	$0.00	4.26	$0.00	$0.00	$0.00	FALSE	-
	TOTAL					**97**	**12**	**28,792**					**97**	**4**	**9,282**	**7**	**19,511**	**$2,341**			**11**	**3**	**758**	**$91**	**$14,050**	**$5,585**	**$19,635**	**$1,500**	**7.7457101**	**$1,050**	**$550**	**$1,600**	**$120.00**	**$16.28**

APPENDIX E

Location Description	Area (Sq FT)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW_{DC}	Total Annual kWh	Total KW_{AC}	Panel Weight (41.9 lbs)	W/SQFT
Building 750	7675	SHARP ND-240QCJ	313	17.5	5,490	75.12	86,805	60.8	13,115	13.68

= Proposed PV Roof Layout

= Proposed PV Parking Layout

Notes:

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

Project Name: **LGEA Solar PV Project - Building 750**
Location: **Eatontown, New Jersey**
Description: **Photovoltaic System 100% Financing - 15 year**

Simple Payback Analysis

	Photovoltaic System 100% Financing - 15 year
Total Construction Cost	$339,000
Annual kWh Production	86,805
Annual Energy Cost Reduction	$10,417
Average Annual SREC Revenue	$13,151

Simple Payback: **14.38** Years

Life Cycle Cost Analysis

Analysis Period (years):	15	Financing %:	100%
Discount Rate:	3%	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.120**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	6.00%	Average SREC Value ($/kWh)	$0.152

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$0	0	0	0	$0	0	0	0	0
1	$0	86,805	$10,417	$0	$21,701	$19,949	$14,379	($2,210)	($2,210)
2	$0	86,371	$10,729	$0	$21,593	$19,062	$15,266	($2,006)	($4,217)
3	$0	85,939	$11,051	$0	$21,485	$18,120	$16,208	($1,792)	($6,009)
4	$0	85,509	$11,383	$0	$17,102	$17,121	$17,207	($5,844)	($11,853)
5	$0	85,082	$11,724	$876	$17,016	$16,059	$18,269	($6,464)	($18,317)
6	$0	84,656	$12,076	$872	$16,931	$14,933	$19,395	($6,193)	($24,510)
7	$0	84,233	$12,438	$868	$12,635	$13,736	$20,592	($10,123)	($34,633)
8	$0	83,812	$12,811	$863	$12,572	$12,466	$21,862	($9,808)	($44,441)
9	$0	83,393	$13,195	$859	$12,509	$11,118	$23,210	($9,483)	($53,924)
10	$0	82,976	$13,591	$855	$8,298	$9,686	$24,642	($13,294)	($67,218)
11	$0	82,561	$13,999	$850	$8,256	$8,167	$26,162	($12,923)	($80,141)
12	$0	82,148	$14,419	$846	$8,215	$6,553	$27,775	($12,540)	($92,682)
13	$0	81,738	$14,852	$842	$4,087	$4,840	$29,488	($16,232)	($108,913)
14	$0	81,329	$15,297	$838	$4,066	$3,021	$31,307	($15,802)	($124,715)
15	$0	80,922	$15,756	$833	$4,046	$1,090	$33,238	($15,359)	($140,075)
	Totals:	1,257,475	$193,737	$9,402	$190,512	$175,922	$339,000	($140,075)	($813,857)

Net Present Value (NPV) **($98,256)**

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:	Newark
State:	New_Jersey
Latitude:	40.70° N
Longitude:	74.17° W
Elevation:	9 m
PV System Specifications	
DC Rating:	75.1 kW
DC to AC Derate Factor:	0.810
AC Rating:	60.8 kW
Array Type:	Fixed Tilt
Array Tilt:	10.0°
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	2.39	4507	504.78
2	3.17	5464	611.97
3	4.07	7647	856.46
4	4.83	8473	948.98
5	5.70	10080	1128.96
6	5.94	9850	1103.20
7	5.77	9773	1094.58
8	5.38	9052	1013.82
9	4.65	7788	872.26
10	3.61	6411	718.03
11	2.35	4089	457.97
12	2.01	3669	410.93
Year	4.16	86805	9722.16

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)

APPENDIX F

POWERSMITHS

Toll Free : 1-800-747-9627 or (905) 791-1493

The ESP Calculator™

Energy Savings Payback Calculator

Project Description Fort Monmouth bldg 750

Date 12-Nov-14

Data Entry

Transformers on Project

QTY	kVA
0	15
1	30
0	45
0	75
0	112.5
0	150
	225
	300
	500
	750
	1000
	1500
	2000
	7.5

Available Full Load kW	**30**
Average kVA (calc)	**30**
equipment operating hrs/ day	**9**
equipment operating days/yr	**245**
Load during normal operating hours	**26%**
Load outside operating hours	**5%**

Calc Load kW	Calc Annual kWh
8	17,199
2	9,833
Total Annual Load kWh:	**27,032**

Annual Cost to Operate Load Only

kWh rate	**$ 0.120**	Annual Consumption:	$	3,244
demand rate ($/kW/mo) ex. $10.00		Annual Demand:	$	-
		Total Cost to run load	**$**	**3,244**

Annual Cost of Status Quo Transformer Losses & Associated Air Conditioning (A/C) burden

Nameplate Linear efficiency (normal op hrs)	**90.0%**	% electronics or current THD	**0.0%**
Calculated operating efficiency	90.0%		
Transformer kW Losses (Normal Operation)	0.9 kW		
Status quo Efficiency (Outside op. hrs)	**75.0%**		
Transformer kW Losses (Outside op. hrs)	0.5 kW		
Annual addititional kWh from transformers	5,189 kWh		
Annual Cost of Transformer Losses	$ 623		
A/C System Performance (kW/ton)	**-**		
Additional Tons of Cooling (on peak)	- tons		
Annual addititional kWh from A/C	- kWh		
Annual Cost of Associated A/C	$ -		

Summary with Status Quo Transformer

Annual Cost of feeding Building Load	$	3,244
Annual Cost of Transformer Losses	$	623
Annual Cost of Associated A/C	$	-
Electrical Bill (Status Quo Transformer)	**$**	**3,866**

POWERSMITHS

Using Powersmiths instead of status quo transformers

Powersmiths Efficiency (Normal Operation)	98.7%	
Powersmiths kW Losses (Normal Operation)	0.1	kW
Powersmiths Efficiency (Outside op. hrs)	95.0%	
Transformer kW Losses (Outside op. hrs)	0.1	kW
Annual addititional kWh from transformers	744	kWh
Annual Cost of Powersmiths Losses	$ 89	
Additional Tons of Cooling (on peak)	-	tons
Annual addititional kWh from A/C	-	kWh
Annual Cost of Associated A/C	$ -	

Comparing Status Quo & Powersmiths

	Status Quo	Powersmiths	
Annual Cost of feeding Building Load	$ 3,244	$ 3,244	
Annual Cost of Transformer Losses	$ 623	$ 89	
Annual Cost of Associated A/C	$ -	$ -	**Reduction**
Annual estimated Electrical Bill	$ 3,866	$ 3,333	**14%**

Peak kW reduction (normal op hours)	**0.8**	**kW**
Annual kWh reduction	**4,444**	**kWh**
Reduction in Air Conditioning Load (on peak)	**-**	**tons**

Cost Analysis (calc)

Energy Cost Escalation (above inflation)	0.0%
Annual Power Quality Benefit	$ -

	Annual Operating Cost	Life Cycle Operating Cost & Savings	
		20 years	32 years
Status Quo Transformers	$623	$12,452	$19,924
Powersmiths Transformers	$89	$1,786	$2,857
Savings with Powersmiths	**$533**	**$10,667**	**$17,067**

Cost

	Cost
Powersmiths Transformers	$0
Status Quo Transformers	$4,022

Payback on total cost	-7.54	years	current kWh rate:
Cost of Energy Savings	$ (0.028)	**/kWh**	**$0.120**
Cost - Benefit Ratio	-4.2	**times less to save a kWh than to buy a kWh**	

Leasing Option	60 Month Term	48 Month Term	36 Month Term
Total Annual Leasing Payments	**$1,017**	**$1,240**	**$1,578**
Net Annual Cost with savings	$484	$707	$1,045

Summary of Environmental Benefits

Annual Reduction in Greenhouse Gases (per EPA)		Equivalence	
3	tons of CO2	1	Acres trees planted
11	tons of Coal	0	Car Emissions
26	kgs of SO2	0	homes heated
11	kgs of NOx		

IMPORTANT: By using the ESP Calculator™, you are agreeing the TERMS OF USE section on page 3
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Status Quo Transformer (Normal Operation)

Enter the average efficiency of the transformers. This data is supplied by manufacturers and is based on linear load test.
Typical values for efficiency are in the 93-95% range for 15-45kVA, 95-97% range for 75-112.5kVA
and smaller, and 96-97.5% for 150 to 300kVA, and 97-98% for 300-500kVA transformers.

Status Quo Transformer (Outside Op. hours)

Transformer efficiency is typically lower than normal when lightly loaded (86-89% when 10-15% loaded for most sizes)

A/C Performance (kW/ton)

Varies widely depending on age and technology of cooling system. As low as 0.5 to over 2kW/ton (1.25-1.5 is often tp)
Unlike most substation transformers that are vented to the exterior, most building distribution transformers
are ventilated within the building, and their heat losses therefore add to the cooling load.

Powersmiths Efficiency (Normal Operation) & (Outside Op. hours)

Available on Powersmiths product data sheet

Energy Cost escalation (above inflation)

It is well recognized that energy rates are increasing much faster than inflation. Enter the % over inflation

Annual Power Quality Benefit

Savings attributable to reduced downtime, equipment locks & failures associated with poor power quality

Cost of Energy Savings

In its simplest form, the cost of energy savings represents the cost to save
a kWh as opposed to paying for it according to the prevailing kWh rate.

The equation is: Cost of Energy Savings = (Incremental Product Cost / Lifetime kWh saved)
This does not include any additional savings as energy rates go up over the installed product life

Transformer Operating Losses

Transformer Losses = kW load/net efficiency - kW load.

% load left ON, outside of normal operating hours

Typically 50-70% of normal load remains on during off-hours operation, also transformer remains energized 24hrs/day.

Cost

Cost of transformers. Enter dollar figure for transformers under consideration. If the interest is to look at the justification
for replacing existing transformers, enter $0 in the conventional transformer cost field.

Energy Operating Cost

Energy OPERATING COST (normal op) = (transformer + cooling) kW losses x kWh rate x hrs/day x days/yr + demand charge
Demand charge is not included in the calculation of losses outside normal hours to be conservative.

Return on Investment (ROI)

ROI on Incremental Cost is based on dividing the Incremental Investment in Powersmiths by the Annual Savings
ROI on Total Transformer Cost is based on dividing the Total Transformer Cost by the Annual Savings

Leasing

Powersmiths Leasing has many benefits, including avoiding the use of capital, offsetting monthly leasing payment with
the reduction in monthly energy bill from using Powersmiths

Environmental Benefits

Conversion rates from kWh to emission reduction and equivalent benefits are published by the EPA,
and reflect environmental benefits derived from reduced emissions associated with reduced power generation.

TERMS OF USE

Power Quality Institute has used its best efforts in developing the ESP Calculator ™ with the intent of providing an easy
to use and useful calculation tool. However, data entered and assumptions made may not accurately reflect all variables
that apply in a given facility. The results are therefore estimates only and may differ from actual measurements.
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POWERSMITHS

