EAST ORANGE SCHOOL DISTRICT

EDMONSON HIGH SCHOOL

74 HALSTEAD STREET
EAST ORANGE, NEW JERSEY

FACILITY ENERGY REPORT

TABLE OF CONTENTS

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:	PSE&G
Electric Utility Rate Structure:	GLP
Third Party Supplier:	Direct Energy

Natural Gas Utility Provider:	PSE&G
Utility Rate Structure:	GSG (HTG)
Third Party Supplier:	South Energy Co.

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: PSE&G
Rate: GLP
Meter No: 278007727
Account No: 69 592 312 05
Third Party Utility Provider: Direct Energy
TPS Meter / Acct No: -

MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
Apr-14	14,730	46.5	$2,177
May-14	21,450	69.9	$3,849
Jun-14	25,320	66.0	$4,337
Jul-14	15,420	52.5	$2,799
Aug-14	21,600	72.6	$3,908
Sep-14	15,960	55.8	$2,357
Oct-14	15,150	40.8	$2,182
Nov-14	17,520	46.2	$2,518
Dec-14	16,860	47.4	$2,437
Jan-15	16,590	47.4	$2,402
Feb-15	18,300	52.2	$2,649
Mar-15	17,040	47.7	$2,520
Totals	**215,940**	**72.6 Max**	**$34,135**

AVERAGE DEMAND **53.8 KW average**
AVERAGE RATE **$0.158** **$/kWh**

Figure 1
Electricity Usage Profile

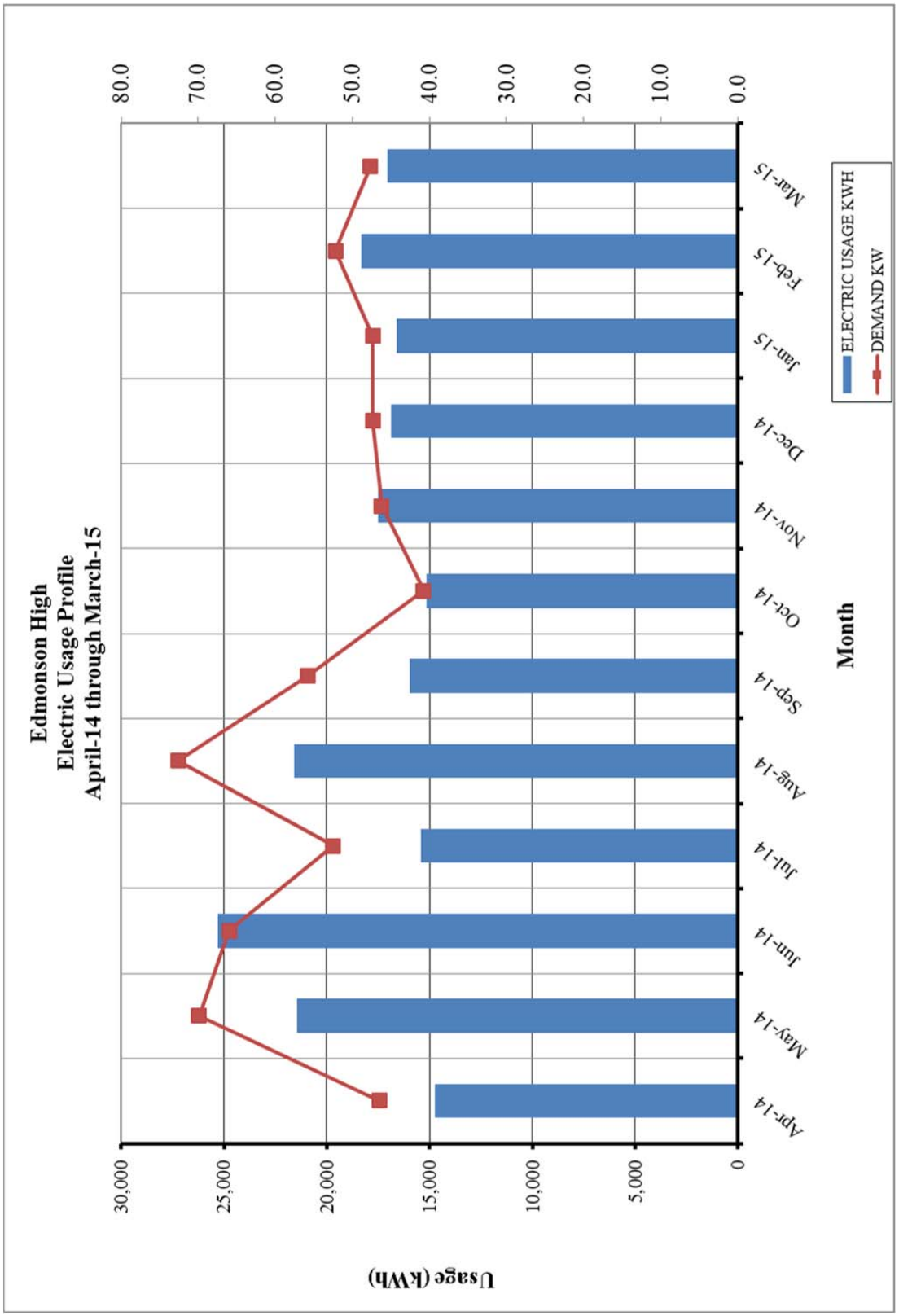
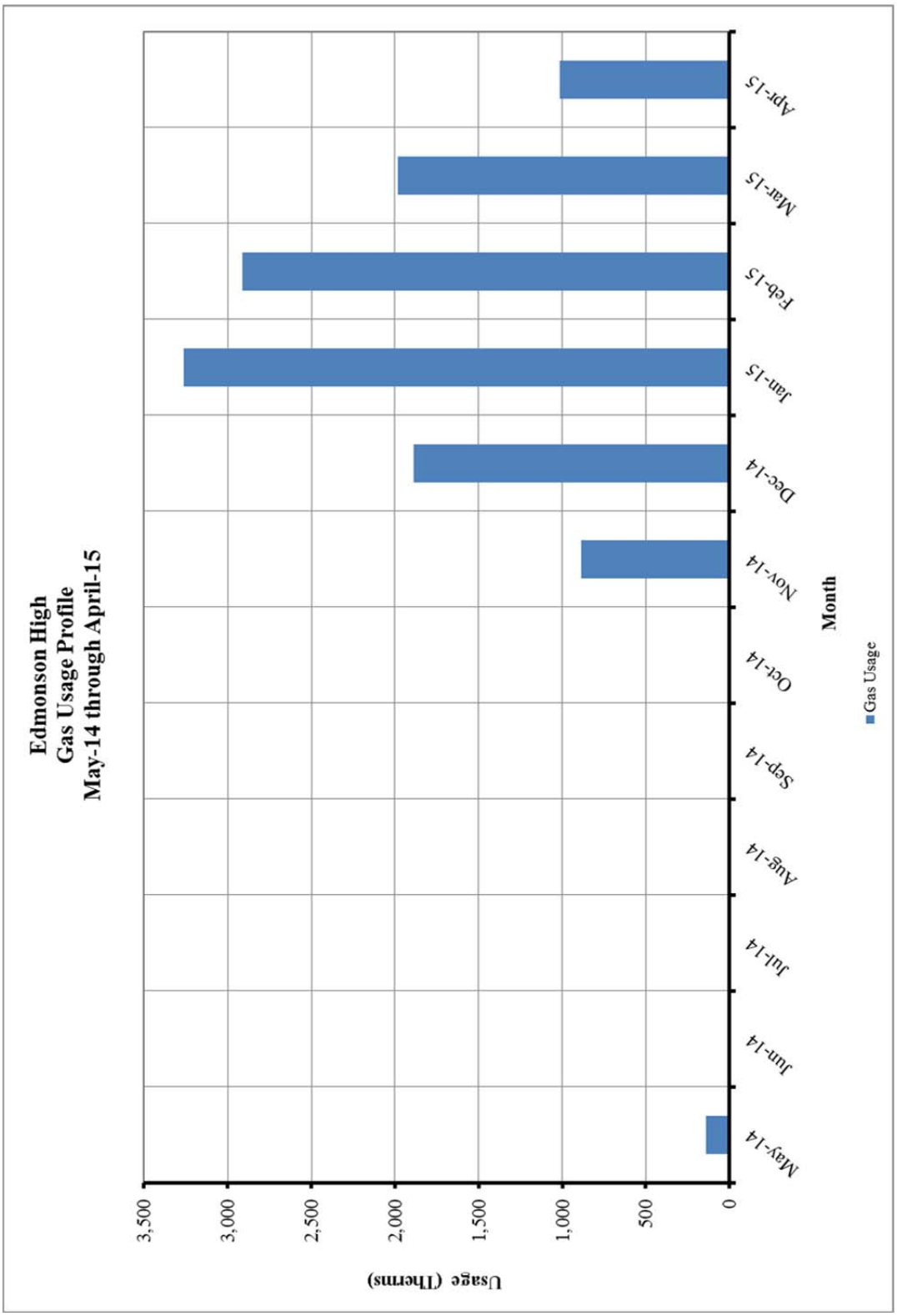


Table 2
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider: PSE&G		
Rate: GSG (HTG)		
Meter No: 2750296		
Account No: 69 592 312 05		
Third Party Utility Provider: South Jersey Energy		
TPS Meter No: -		
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
May-14	139.33	$54.49
Jun-14	0.00	$11.00
Jul-14	0.00	$11.12
Aug-14	0.00	$11.17
Sep-14	0.00	$11.17
Oct-14	0.00	$11.17
Nov-14	889.15	$741.01
Dec-14	1,885.75	$1,671.38
Jan-15	3,264.71	$3,156.20
Feb-15	2,911.41	$2,656.44
Mar-15	1,983.73	$1,764.97
Apr-15	1,011.98	$319.30
TOTALS	**12,086.05**	**$10,419.42**
AVERAGE RATE:	**$0.86**	**$/THERM**

Figure 2
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	215,940.0			737,219	3.140	2,314,868
NATURAL GAS		12,086.0		1,208,605	1.050	1,269,035
TOTAL				1,945,824		3,583,903

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

	AUDITED BUILDING		**PEER COMPARISON**	
BUILDING TYPE	K-12 School		K-12 School	
BUILDING AREA	17,500	SQUARE FEET		
BUILDING SITE EUI	*111.19*	kBtu/SF/YR	58.2	kBtu/SF/YR
BUILDING SOURCE EUI	*204.79*	kBtu/SF/YR	141.4	kBtu/SF/YR

45%	Less Efficient than PEER Comparison

III. FACILITY DESCRIPTION

The Edmonson High School building is a community education center for the school district and is located at 74 Halstead Street in East Orange, New Jersey. This 17,500 SF facility was originally built in 1972. The building is three stories with a parking area at the ground level under the building and a boiler room. The 2nd and 3rd floors consist of a small auditorium, classrooms, library, staff lounge and conference room, restrooms, computer classroom, main office for the staff and various storage/utility rooms.

Occupancy Profile

The community education center is in use 8:00 am till 4:30 pm, 5 days a week.

Building Envelope

Exterior walls for the building are masonry brick faced with a concrete block construction. The windows throughout the facility are in average condition. Typical windows are single-pane with aluminum frames. The roofing system is a built-up roof consisting of a light colored gravel topping, asphalt sheets, cover board, and 2-inch rigid roof insulation over concrete decking.

HVAC Systems

The Edmonson High School is centrally heated, but does not have a central air conditioning system. Air conditioning is supplied in select areas of the building through split air handling systems and packaged rooftop units.

The main boiler plant consists of a 10 year old, gas-fired, cast iron sectional hot water boiler manufactured by Weil-McLain rated at 1,040 MBH input, 842.4 MBH output and a thermal efficiency of 81%. The heating hot water is distributed to unit ventilators and fin-tube radiators via two (2) Bell & Gossett ¾ HP pipe-mounted pumps.

The small Auditorium is conditioned by a Goodman Model A90-00 split DX air handler with a rated capacity of 7.5 tons of cooling and a 1.5 HP supply fan. The split air-cooled condensing unit on the roof is a Weather King Model RAWD-075CAZ with a cooling efficiency of 8.5 EER.

The Library is conditioned by a Trane Model TWE060 split DX air handling unit with a rated capacity of 5 tons of cooling and a ¾ HP supply fan. The split air-cooled condensing unit on the roof is also a Trane unit with an efficiency of approximately 9.5 EER.

A Sanyo Model CH3632 split air-cooled condensing unit serves an indoor ductless split unit Model KHS3632 with a system efficiency of 10.0 EER.

The 3rd Floor of the facility is conditioned by a Carrier Model 50TFF012 packaged rooftop unit rated at 10 tons of cooling with a 3 HP supply fan motor and an efficiency of 9.0 EER. The 2nd floor is conditioned by a Trane Model TCH120 packaged rooftop unit rated at 10 tons of cooling with a 3 HP supply fan motor and an efficiency of 8.7 EER.

The classrooms and offices are heated by unit ventilators with hot water heating coils.

The offices are cooled by window air conditioning units that range in size from 9,000 to 12,000 BTUH with efficiencies of from 10.4 to 10.8 EER.

Exhaust System

The school facility has some general exhaust fans located on the roof with fractional horsepower motors.

HVAC System Controls

The two (2) packaged rooftop units are controlled by wall-mounted thermostats. The window air conditioners and split systems are controlled through on board controls, or separate thermostats.

Domestic Hot Water

Domestic hot water for the building is supplied by a single Rheem Model ES50-9-G electric water heater with an input of 9 kW and 50 gallon storage capacity.

Plumbing System

The Edmonson High utilizes sinks rated at 2.2 gallons per minute. Additionally, water closets and urinals located in the restroom areas have a rating of 1.6 and 1.0 gallons per flush, respectively.

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	Interior Lighting Upgrade	$23,581	$5,344	4.4	239.9%
ECM #2	Exterior Lighting Upgrade	$3,000	$818	3.7	309.0%
ECM #3	Lighting Controls	$760	$75	10.1	48.0%
ECM #4	Boiler Replacement	$92,000	$1,356	67.8	-70.5%
ECM #5	DHW Heater Replacement	$14,600	$3,483	4.2	257.8%
ECM #6	Window AC Unit Replacement	$1,565	$32	48.9	-69.3%
ECM #7	CRT Monitor Replacement	$3,045	$211	14.4	3.9%
ECM #8	Replace Split Condensing Units	$34,568	$847	40.8	-51.0%
ECM #9	Packaged Rooftop Unit Replacement	$38,540	$1,548	24.9	-39.8%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	41 kW Solar Array	$189,875	$13,066	14.5	3.2%

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	Interior Lighting Upgrade	12.8	33,824	0
ECM #2	Exterior Lighting Upgrade	1.7	5,175	0
ECM #3	Lighting Controls	0.0	477	0
ECM #4	Boiler Replacement	0.0	0	1,576
ECM #5	DHW Heater Replacement	0.0	27,207	-948
ECM #6	Window AC Unit Replacement	0.1	205	0
ECM #7	CRT Monitor Replacement	0.7	1,334	0
ECM #8	Replace Split Condensing Units	3.2	5,358	0
ECM #9	Packaged Rooftop Unit Replacement	8.7	9,800	0
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
REM #1	41 kW Solar Array	37.3	48,125	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	Interior Lighting Upgrade	51,412	95	220
ECM #2	Exterior Lighting Upgrade	7,866	14	34
ECM #3	Lighting Controls	725	1	3
ECM #4	Boiler Replacement	18,439	14	0
ECM #5	DHW Heater Replacement	30,263	67	177
ECM #6	Window AC Unit Replacement	312	1	1
ECM #7	CRT Monitor Replacement	2,028	4	9
ECM #8	Replace Split Condensing Units	8,144	15	35
ECM #9	Packaged Rooftop Unit Replacement	14,896	27	64
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**
Interior Lighting Upgrade	$5,344	$26,461	$2,880	$23,581	4.4
Exterior Lighting Upgrade	$818	$3,375	$375	$3,000	3.7
Lighting Controls	$75	$800	$40	$760	10.1
Boiler Replacement	$1,356	$94,000	$2,000	$92,000	67.8
DHW Heater Replacement	$3,483	$16,000	$1,400	$14,600	4.2
Window AC Unit Replacement	$32	$1,565	$0	$1,565	48.9
CRT Monitor Replacement	$211	$3,045	$0	$3,045	14.4
Replace Split Condensing Units	$847	$35,700	$1,132	$34,568	40.8
Packaged Rooftop Unit Replacement	$1,548	$40,000	$1,460	$38,540	24.9
Total Project	**$13,714**	**$220,946**	**$9,287**	**$211,659**	**15.4**

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: Interior Lighting Upgrades

Description:

The majority of the interior lighting throughout Edmonson High School is provided by 1x4 and 2x4 fluorescent fixtures with newer generation 700 Series 32W T8 lamps and T12 lamps in addition to various incandescent A-lamp bulbs. It is recommended that all fixtures within the building be replaced with LED equivalent tube lamps and screw-in bulbs due to their efficiency and low power usage.

This ECM includes replacing and retrofitting all of the interior lighting throughout the school with new LED type lamps and fixtures. It is recommended that the School District consult with a lighting engineer prior to retrofitting or replacing interior fixtures to ensure code required minimum light levels will be met.

Energy Savings Calculations:

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

LIGHTING UPGRADE SAVINGS SUMMARY	
DESCRIPTION	**SAVINGS**
Electric Demand Savings (kW)	12.8
Electric Usage Savings (kWh)	33,824
Electric Cost Savings ($)	$5,344

Maintenance Savings and Project Costs:

No maintenance cost savings were estimated for this measure.

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

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$26,461
NJ Smart Start Equipment Incentive ($):	$2,880
Net Installation Cost ($):	$23,581
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$5,344
Total Yearly Savings ($/Yr):	$5,344
Estimated ECM Lifetime (Yr):	15
Simple Payback	4.4
Simple Lifetime ROI	239.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$80,160
Internal Rate of Return (IRR)	21%
Net Present Value (NPV)	$40,215.83

ECM #2: Exterior Lighting Upgrade

Description:

The exterior lighting at the school includes exterior building lighting only. The exterior of the building is currently lit by 2x4 recessed fixtures with newer generation 700 Series 32W T8 lamps.

Concord Engineering recommends upgrading all of the exterior lighting to an energy-efficient lighting system that includes LED tube lamps and reflectors.

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 UPGRADE SAVINGS SUMMARY	
DESCRIPTION	**SAVINGS**
Electric Demand Savings (kW)	1.7
Electric Usage Savings (kWh)	5,175
Electric Cost Savings ($)	$818

Maintenance Savings and Project Costs:

No maintenance cost savings were estimated for this measure.

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

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$3,375
NJ Smart Start Equipment Incentive ($):	$375
Net Installation Cost ($):	$3,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$818
Total Yearly Savings ($/Yr):	$818
Estimated ECM Lifetime (Yr):	15
Simple Payback	3.7
Simple Lifetime ROI	309.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$12,270
Internal Rate of Return (IRR)	26%
Net Present Value (NPV)	$6,765.23

ECM #3: Interior Lighting Controls Upgrade

Description:

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

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

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

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

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

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

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

Energy Savings Calculations:

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

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

LIGHTING CONTROLS SAVINGS SUMMARY	
DESCRIPTION	**SAVINGS**
Electric Demand Savings (kW)	0.0
Electric Usage Savings (kWh)	477
Electric Cost Savings ($)	$75

Maintenance Savings and Project Costs:

No maintenance cost savings were estimated for this measure.

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

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$800
NJ Smart Start Equipment Incentive ($):	$40
Net Installation Cost ($):	$760
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$75
Total Yearly Savings ($/Yr):	$75
Estimated ECM Lifetime (Yr):	15
Simple Payback	10.1
Simple Lifetime ROI	48.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,125
Internal Rate of Return (IRR)	5%
Net Present Value (NPV)	$135.35

ECM #4: Boiler Replacement

Description:

Edmonson High School has one (1) Weil McLain, gas-fired, cast-iron sectional hot water boiler that is 10 years old. While the unit still has many years on its ASHRAE service life, the efficiency can be greatly improved. The boiler has a rated input capacity of approximately 1,040 MBH with an estimated thermal efficiency of 80%.

This ECM would replace the existing boiler with one (1) modular, condensing style boiler rated at 1,000 MBH with an average thermal efficiency of 92%. The new boiler will come with hot water reset and outdoor air reset controls to reduce heating water temperature during low load periods.

Energy Savings Calculations:

Energy Savings were calculated utilizing the New Jersey Board of Public Utilities Protocols to Measure Resource Savings.

$$\text{Bldg Heat Required} = \text{Existing Fuel Use (Units)} \times \text{Heating Eff.(\%)} \times \text{Fuel HeatValue} \left(\frac{\text{BTU}}{\text{Units}} \right)$$

$$\text{Proposed Heating Gas Usage} = \frac{\text{Bldg Heat Required (BTU)}}{\text{Heating Eff.(\%)} \times \text{Fuel Heat Value} \left(\frac{\text{BTU}}{\text{Therm}} \right)}$$

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

CONDENSING BOILER CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Cast-Iron Sectional (Water)	New Condensing Boiler	
Existing Nat Gas (Therms)	12,086		
Boiler Efficiency (%)	80.0%	92.0%	12%
Nat Gas Heat Value (BTU/Therm)	100,000	100,000	
Equivalent Building Heat Usage (MMBTUs)	967	967	
Gas Cost ($/Therm)	$0.86	$0.86	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Natural Gas Usage (Therms)	12,086	10,510	1,576
Energy Cost ($)	$10,394	$9,038	$1,356
COMMENTS:	Boiler Efficiency Based on age of boiler and IBR Rating		

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$94,000
NJ Smart Start Equipment Incentive ($):	$2,000
Net Installation Cost ($):	$92,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,356
Total Yearly Savings ($/Yr):	$1,356
Estimated ECM Lifetime (Yr):	20
Simple Payback	67.8
Simple Lifetime ROI	-70.5%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$27,120
Internal Rate of Return (IRR)	-10%
Net Present Value (NPV)	($71,826.14)

ECM #5: Domestic Hot Water Heater Replacement

Description:

Domestic hot water for Edmonson High School is provided by a single Rheem Model ES50-9-G, 50-gallon, electric hot water heater rated at 9 kW. This unit has a rated thermal efficiency of 98% and an estimated recovery of 50 gallons per hour.

This ECM will replace this existing electric, domestic water heater with a gas water heater with a 96% thermal efficiency or equal.

Energy Savings Calculations:

DOM. HOT WATER HEATER CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Electric Hot Water Heater	High Efficiency Heater	
Building Type	Education		
Building Square-foot	17,500	17,500	
Domestic Water Usage, kBtu	91,000.00	91,000.00	
DHW Heating Fuel Type	Electric	Gas	
Heating Efficiency	98%	96%	-2%
Total Usage (kBTU)	92,857	94,792	-1,935
Electric Cost ($/kWh)	$ 0.158	$ -	
Nat Gas Cost ($/Therm)		$ 0.860	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Usage (kWh)	27,207	0	27,207
Natural Gas Usage (Therms)	0	948	-948
Energy Cost ($)	$4,299	$815	$3,483
COMMENTS:	Savings are based on Energy Information Administration Commercial Building Energy Consumption Survey 2003 Information		

Energy Density for "Other" type building = 1.0 kBtu / SF / year

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

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

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

Maintenance Savings and Project Costs:

No maintenance cost savings were estimated for this measure.

Project Costs are based off RS Means Unit Cost data.

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$16,000
NJ Smart Start Equipment Incentive ($):	$1,400
Net Installation Cost ($):	$14,600
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$3,483
Total Yearly Savings ($/Yr):	$3,483
Estimated ECM Lifetime (Yr):	15
Simple Payback	4.2
Simple Lifetime ROI	257.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$52,245
Internal Rate of Return (IRR)	23%
Net Present Value (NPV)	$26,979.83

ECM #6: Window A/C Unit Replacement

Description:

Edmonson High School has several window air conditioning units located through the offices. Many of these units are old and less efficient than newer models.

This ECM includes replacement of select Window Air Conditioners that were designated for replacement based on the age and if the efficiency could be upgraded.

Existing Equipment Information					
Unit Tag	**Unit Location**	**Unit Type**	**Number of Units**	**Cooling Capacity, Btu/hr**	**Manufacturer**
Offices	Offices	Window AC	5	10,000	Friedrich
Total			**5**	**10,000**	

This ECM includes replacement of twenty window air conditioning units of like size and type. The equipment list below is the basis of design and represents the efficiency and capacity minimum requirements for this ECM implementation:

Energy Savings Calculations:

Cooling Energy Savings:

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

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

$$\text{Demand Savings, kW} = \text{Cooling Capacity,} \frac{\text{BTU}}{\text{Hr}} \times \left(\frac{1}{\text{SEER}_{\text{Old}}} - \frac{1}{\text{SEER}_{\text{New}}} \right) \times \text{Coincidence Factor}$$

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

ENERGY SAVINGS CALCULATIONS - UNIT REPLACEMENT							
ECM INPUTS	**COOLING CAPACITY, BTU/Hr**	**ANNUAL COOLING HOURS**	**EXISTING UNITS (S)EER**	**NEW UNITS (S)EER**	**# OF UNITS**	**ENERGY SAVINGS kWh**	**DEMAND SAVINGS kW**
Offices	10,000	1,000	10.8 EER	11.3 EER	5	205	0.1
Total					5	205	0.1

Project Cost, Incentives and Maintenance Savings:

Project costs are based on vendor quote data for new units.

There are not SmartStart incentives available for window air conditioning unit replacement.

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

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,565
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$1,565
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$32
Total Yearly Savings ($/Yr):	$32
Estimated ECM Lifetime (Yr):	15
Simple Payback	48.9
Simple Lifetime ROI	-69.3%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$480
Internal Rate of Return (IRR)	-12%
Net Present Value (NPV)	($1,182.99)

ECM #7: CRT Monitor Replacement

Description:

Edmonson High School utilizes CRT Monitors for use by its staff and students. Typical CRT monitors throughout the building consist of 15 inch displays. These computer monitors are outdated and have several disadvantages such as; significantly higher energy consumption in operating and idle mode, use a large amount of desk space, poor picture quality, distortions and flickering image, secular glare problems, and high weight, and electromagnetic emissions. Many of the drawbacks are difficult to quantify except for the energy use. CRT monitors use considerably more energy than an alternative flat panel LCD/LED monitor. Replacement of the existing CRT monitors with LCD/LED monitors saves considerable energy as well as provides other ergonomic benefits as well.

This ECM will replace the estimated fifteen (15) existing CRT monitors with new 19" Dell LCD/LED. It is expected District IT Staff will purchase and install new monitors, therefore no labor costs were taken into account for this measure.

Energy Savings Calculations:

Savings calculations were based on operating occupied hours per week of operating staff and students, and estimated idle time of monitors per week outside occupied hours. Power consumption data is based on actual monitor characteristics for a Dell CRT, and Dell LCD/LED.

$$\text{Energy Savings} = \text{Quantity} \times \text{Operating Hours} \times P_o \times + \text{Quantity} \times \text{Idle Hours} \times P_I$$

Qty = Quantity

Op Hrs = Operating Hours per Year

Idle Hrs = Idle Hours per Year

P_O = Operating Power Consumption Watts

P_I = Idle Power Consumption Watts

CRT MONITOR REPLACEMENT CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	17" CRT	19" LCD	
# of Monitors	15	15	
Power Cons. (W)	71	23	48
Idle Power Cons. (W)	5	0.5	4.5
Operating Hrs per Week	33	33	
Operating Weeks per Yr	41	41	
Idle Hrs per Week	136	136	
Idle Weeks per Yr	41	41	
Elec Cost ($/kWh)	0.158	0.158	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Demand (kW)	1.065	0.345	0.72
Electric Usage (kWh)	1,836	501	1,334
Energy Cost ($)	$290	$79	$211
COMMENTS:	Savings Based on Dell 17: CRT Monitor Compared with Dell 19 " LCD Model P1911 w/ AX510 Soundbar		

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$3,045
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$3,045
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$211
Total Yearly Savings ($/Yr):	$211
Estimated ECM Lifetime (Yr):	15
Simple Payback	14.4
Simple Lifetime ROI	3.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$3,165
Internal Rate of Return (IRR)	0%
Net Present Value (NPV)	($526.10)

ECM #8: Replace Split Condensing Units

Description:

Edmonson High School has three (3) split system air conditioning only units which serve various spaces. These units have surpassed their ASHRAE service life expectancy of 20 years. Replacing these units with newer more efficient units could result in significant energy savings.

The units currently installed are lower efficiency compared to modern units. The units can be replaced with new high-efficiency units. New units provide higher full load and part load efficiencies due to advances in inverter motor technologies, higher efficiency refrigerants such as R410A which would be used in place of R22 that is currently used in two of the existing units.

This ECM includes one-for-one replacement of the three (3) older split system units with new higher efficiency systems as well as replacing the indoor unit or indoor coil. 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 replacement for this ECM can be found in the table below:

IMPLEMENTATION SUMMARY				
ECM INPUTS	**NUMBER OF UNITS**	**COOLING CAPACITY, BTU/HR**	**TOTAL CAPACITY, TONS**	**REPLACE UNIT WITH**
SS	1	90,000	7.5	Trane High Efficiency Unit
SS	1	60,000	5.0	Daikin High Efficiency Unit
SS	1	36,000	3.0	Trane High Efficiency Unit
Total	**3**	**186,000**	**15.50**	

Energy Savings Calculations:

Cooling Energy Savings:

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

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

$$\text{Demand Savings, kW} = \text{Cooling Capacity,} \frac{\text{BTU}}{\text{Hr}} \times \left(\frac{1}{\text{SEER}_{\text{Old}}} - \frac{1}{\text{SEER}_{\text{New}}}\right) \times \text{Coincidence Factor}$$

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

ENERGY SAVINGS CALCULATIONS							
ECM INPUTS	**COOLING CAPACITY, BTU/Hr**	**ANNUAL COOLING HOURS**	**EXISTING UNITS EFFICIENCY**	**NEW UNITS EFFICIENCY**	**# OF UNITS**	**ENERGY SAVINGS kWh**	**DEMAND SAVINGS kW**
SS	90,000	1,131	8.5 EER	11.6 EER	1	3,200	1.9
SS	60,000	1,131	9.5 EER	11.7 EER	1	1,343	0.8
SS	36,000	1,131	10 EER	12.5 EER	1	814	0.5
Total					3	5,358	3.2

Project Cost, Incentives and Maintenance Savings

The manufacturer used as the basis for the calculation is Trane. The unit pricing and install cost were estimated based on RS Means unit cost data and vendor quotes. The payback may change based on actual unit pricing and install costs if the ECM is implemented.

COST & SAVINGS SUMMARY							
ECM INPUTS	**INSTALLED COST PER UNIT**	**# OF UNITS**	**TOTAL COST**	**REBATES**	**NET COST**	**ENERGY SAVINGS**	**PAY BACK YEARS**
SS	$16,500	1	$16,500	$548	$15,953	$506	31.5
SS	$12,000	1	$12,000	$365	$11,635	$212	54.8
SS	$7,200	1	$7,200	$219	$6,981	$129	54.3
Total	$35,700	3	$35,700	$1,132	$34,569	$847	40.8

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:

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

AC UNITS REBATE SUMMARY			
UNIT DESCRIPTION	**REBATE $/TON**	**PROPOSED CAPACITY TONS**	**TOTAL REBATE $**
Between 5.4 and 11.25 Tons	$73	15.5	$1,132
TOTAL		**15.5**	**$1,132**

No maintenance savings were estimated for this measure.

Energy Savings Summary:

ECM #8 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$35,700
NJ Smart Start Equipment Incentive ($):	$1,132
Net Installation Cost ($):	$34,568
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$847
Total Yearly Savings ($/Yr):	$847
Estimated ECM Lifetime (Yr):	20
Simple Payback	40.8
Simple Lifetime ROI	-51.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$16,940
Internal Rate of Return (IRR)	-6%
Net Present Value (NPV)	($21,966.78)

ECM #9: Replace Rooftop Unit with High Efficiency Unit

Description:

Edmonson High's second and third floors are conditioned by two (2) 10 ton packaged rooftop units manufactured by Carrier and Trane with an EER of 9 and 8.7, respectively, each with direct expansion cooling only.

The units in operation are not high efficiency units, and have either surpassed or are approaching the end of its ASHRAE service life.

The units currently installed are at a lower efficiency compared to modern units. The unit can be replaced with a new high efficiency unit. New units provide higher full load and part load efficiencies due to advances in inverter motor technologies, heat exchangers and higher efficiency refrigerants such as R410A.

This ECM includes one-for-one replacement of the older rooftop 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 replacement 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	RTU-1	1	120,000	10.0	Carrier - WeatherExpert 48LC - 10 Ton
RTU	RTU-2	1	120,000	10.0	Carrier - WeatherExpert 48LC - 10 Ton
Total		**2**	**240,000**	**20.0**	

The manufacturers used as the basis for the calculation is Carrier. The unit pricing and install cost were estimated based on current rates quotes and labor rates. The payback may change based on actual unit pricing and install costs if the ECM is implemented.

Energy Savings Calculations:

Cooling Energy Savings:

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

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

$$\text{Demand Savings, kW} = \text{Cooling Capacity,} \frac{\text{BTU}}{\text{Hr}} \times \left(\frac{1}{\text{SEER}_{\text{Old}}} - \frac{1}{\text{SEER}_{\text{New}}}\right) \times \text{Coincidence Factor}$$

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

ENERGY SAVINGS CALCULATIONS							
ECM INPUTS	**COOLING CAPACITY, BTU/Hr**	**ANNUAL COOLING HOURS**	**EXISTING UNITS EER**	**SPLIT UNITS EER**	**# OF UNITS**	**ENERGY SAVINGS kWh**	**DEMAND SAVINGS kW**
RTU	120,000	1,131	9 EER	13 EER	1	4,640	4.1
RTU	120,000	1,131	8.7 EER	13 EER	1	5,160	4.6
Total					2	9,800	8.7

Project Cost, Incentives and Maintenance Savings

From the NJ Smart Start® Program appendix, the rebate is $73 ton for a 10 ton unit.

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	$20,000	1	$20,000	$730	$19,270	$733	26.3
RTU	$20,000	1	$20,000	$730	$19,270	$815	23.6
Total	$40,000	2	$40,000	$1,460	$38,540	$1,548	24.9

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

Energy Savings Summary:

ECM #9 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$40,000
NJ Smart Start Equipment Incentive ($):	$1,460
Net Installation Cost ($):	$38,540
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,548
Total Yearly Savings ($/Yr):	$1,548
Estimated ECM Lifetime (Yr):	15
Simple Payback	24.9
Simple Lifetime ROI	-39.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$23,220
Internal Rate of Return (IRR)	-6%
Net Present Value (NPV)	($20,060.08)

REM #1: 41 kW Solar System

Description:

Edmonson High School has available roof space that could accommodate solar arrays. Based on the available area a 41 kilowatt solar array could be installed. The array will produce approximately 48,125 kilowatt-hours annually that will reduce the overall electric usage of the facility by 22%. 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 ($):	$189,875
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$189,875
SREC Revenue ($/Yr):	$7,291
Energy Savings ($/Yr):	$5,775
Total Yearly Savings ($/Yr):	$13,066
Estimated ECM Lifetime (Yr):	15
Simple Payback	14.5
Simple Lifetime ROI	3.2%
Simple Lifetime Maintenance Savings	$109,367
Simple Lifetime Savings	$195,992
Internal Rate of Return (IRR)	0.4%
Net Present Value (NPV)	($33,893.08)

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

East Orange School District - Edmonson High School

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)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^{n_i}}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^{n_i}}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM #1	Interior Lighting Upgrade	$17,153	$9,308	$2,880	$23,581	$5,344	$0	$5,344	15	$80,160	$0	239.9%	4.4	21.43%	$40,215.83
ECM #2	Exterior Lighting Upgrade	$2,250	$1,125	$375	$3,000	$818	$0	$818	15	$12,270	$0	309.0%	3.7	26.46%	$6,765.23
ECM #3	Lighting Controls	$350	$450	$40	$760	$75	$0	$75	15	$1,125	$0	48.0%	10.1	5.36%	$135.35
ECM #4	Boiler Replacement	$50,000	$44,000	$2,000	$92,000	$1,356	$0	$1,356	20	$27,120	$0	-70.5%	67.8	-9.59%	($71,826.14)
ECM #5	DHW Heater Replacement	$9,500	$6,500	$1,400	$14,600	$3,483	$0	$3,483	15	$52,245	$0	257.8%	4.2	22.75%	$26,979.83
ECM #6	Window AC Unit Replacement	$1,250	$315	$0	$1,565	$32	$0	$32	15	$480	$0	-69.3%	48.9	-12.10%	($1,182.99)
ECM #7	CRT Monitor Replacement	$3,045	$0	$0	$3,045	$211	$0	$211	15	$3,165	$0	3.9%	14.4	0.49%	($526.10)
ECM #8	Replace Split Condensing Units	$20,500	$15,200	$1,132	$34,568	$847	$0	$847	20	$16,940	$0	-51.0%	40.8	-6.01%	($21,966.78)
ECM #9	Packaged Rooftop Unit Replacement	$25,000	$15,000	$1,460	$38,540	$1,548	$0	$1,548	15	$23,220	$0	-39.8%	24.9	-5.75%	($20,060.08)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	41 kW Solar Array	$113,925	$75,950	$0	$189,875	$5,775	$7,291	$13,066	15	$195,992	$109,367	3.2%	14.5	0.40%	($33,893.08)

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

APPENDIX B

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SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives from July 1, 2015 to June 30, 2016, further details including how to apply, forms, and calculated incentive values can be found the Clean Energy Website. (www.njcleanenergy.com)

Electric Chillers

Water-Cooled Chillers	Constant Speed: Base: $8 - $30 per ton Performance Add: $2 - $2.25 per ton Variable Speed: Base: $12 - $44 per ton Performance Add: $2 - $4.00 per ton
Air-Cooled Chillers	Constant Speed: Base: $20 per ton Performance Add: $3.50 per ton Variable Speed: Base: $90 - $92 per ton Performance Add: $4.00 per ton

Energy Efficiency must comply with ASHRAE 90.1-2013

Gas Cooling

Gas Absorption Chillers (Indirect & Direct-Fired)	$185 - $450 per ton

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

Hot Water Gas Fired Boilers < 300 MBH	Non-Condensing: $0.95 per MBH, Minimum $400 per unit Condensing: $2.00 per MBH, Minimum $1000 per unit
Hot Water Gas Fired Boilers ≥ 300 - 1500 MBH	Non-Condensing: $1.75 per MBH Condensing: $2.20 per MBH Minimum $1000 per unit
Hot Water Gas Fired Boilers >1500 - ≤ 2500 MBH	Non-Condensing: $1.50 per MBH Condensing: $2.20 per MBH
Hot Water Gas Fired Boilers >2500 - ≤ 4000 MBH	Non-Condensing: $1.30 per MBH Condensing: $2.00 per MBH
Steam, Except Natural Draft, Gas fired Boilers < 300 MBH	$1.40 per MBH, Minimum $400 per unit
Steam, Except Natural Draft, Gas fired Boilers ≥ 300 – 1500 MBH	$1.20 per MBH
Steam, Except Natural Draft, Gas fired Boilers > 1500 – 2500 MBH	$1.20 per MBH
Steam, Except Natural Draft, Gas fired Boilers > 2500 – 4000 MBH	$1.00 per MBH
Steam, Natural Draft < 300 MBH	$1.40 per MBH, Minimum $300 per unit
Steam, Natural Draft ≥ 300 - 1500 MBH	$1.00 per MBH
Steam, Natural Draft >1500 - ≤ 2500 MBH	$0.90 per MBH
Steam, Natural Draft >2500 - ≤ 4000 MBH	$0.70 per MBH
All Types 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

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

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

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)	$5 per fixture
T-5 and T-8 High Bay Fixtures	$25 - $150 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 Architectural Floor and Spot Luminaires	$50 per fixture
LED Bollard Fixtures	$50 per fixture
LED Display Case Lighting	$30 per display case
LED Fuel Pump Canopy	$100 per fixture
LED High-Bay and Low-Bay Fixtures for Commercial & Industrial Bldgs.	$150 per fixture
LED High-Bay-Aisle Lighting	$150 per fixture
LED Linear Ambient Luminaires (Indirect, Indirect/Direct, Direct/Indirect, Direct)	2’ Fixtures - $20/fixture 3’ Fixtures - $30/fixture 4’ Fixtures - $45/fixture 6’ Fixtures - $60/fixture 8’ Fixtures - $75/fixture
LED Linear Replacement Lamps (2’ & 4’ only)	$5 per lamp
Luminaires for Ambient Lighting of Interior Commercial Spaces (1x4, 2x2, 2x4 New Fixtures and Retrofit Kits)	1x4 LED - $15 per fixture 2x2 LED - $15 per fixture 2x4 LED - $25 per fixture
LED Outdoor Pole/Arm-Mounted Area and Roadway Luminaries	$100 per fixture
LED Outdoor Pole/Arm-Mounted Decorative Luminaries	$50 per fixture
LED Outdoor Wall-Mounted Area Luminaries	$100 per fixture
LED Parking Garage Luminaries	$100 per fixture
LED Retrofit Kits for Large Outdoor Pole / Arm-Mounted Area and Roadway Luminaires	$150 per fixture
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 Shelf-Mtd. Display & Task Lights	$15 per linear foot

LED Stairwell and Passageway Luminaires	$40 per fixture
LED Track or Mono-Point Directional Lighting Fixtures	$30 per fixture
LED Wall-Wash Lights	$30 per fixture
EnergyStar Commercial Lighting Fixtures	$5 to $10 per fixture
EnergyStar Screw and Pine-Based Bulbs	$5 to $10 per lamp

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 High-Bay (Existing Facilities Only)	$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

Refrigerator / Freezer Case Premium Efficiency Motors

Fraction ECM Motor < 1 HP	$40 per ECM for replacement of existing shaded-pole motor

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)	$200/vat
Fryer (Natural Gas)	$749/vat
Large Vat Fryer (Electric)	$200/vat
Large Vat Fryer (Natural Gas)	$500/vat
Griddle (Electric)	$300/griddle
Griddle (Natural Gas)	$125/griddle
Steam Cooker (Electric)	$1,250/steamer
Steam Cooker (Natural Gas)	$2,000/steamer
Insulated Holding Cabinets	$200 to $300/unit
Glass Door Refrigerators	$75 to $150/unit
Solid Door Refrigerators	$50 to $200/unit
Glass Door Freezers	$200 to $1,000/unit
Solid Door Freezers	$100 to $600/unit
Ice Machines	$50 to $500/unit
Dishwashers	$400 to $1,500/unit

Other Equipment Incentives

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

APPENDIX C

ENERGY STAR® Data Verification Checklist

24

ENERGY STAR ® Score[1]

Edmonson High School

Registry Name: Edmonson High School
Primary Function: K-12 School
Gross Floor Area (ft²): 17,500
Built: 1970

For Year Ending: 04/30/2015
Date Generated: 08/13/2015

1. The ENERGY STAR score is a 1-to-100 assessment of a building's energy efficiency as compared with similar building nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address
Edmonson High School
74 Halstead Street
East Orange, New Jersey 07018

Property ID: 4440656

Property Owner
East Orange School District
199 4th Avenue, 5th Floor
East Orange, NJ 07017
(____)____-_____

Primary Contact
Racquel Ferguson
199 4th Avenue, 5th Floor
East Orange, NJ 07017
(973) 266-5742
racquel.ferguson@eastorange.k12.nj.us

1. Review of Whole Property Characteristics

Basic Property Information

1) **Property Name:** Edmonson High School ☐ Yes ☐ No

Is this the official name of the property?

If "No", please specify: _____

2) **Primary Function:** K-12 School ☐ Yes ☐ No

Is this an accurate description of the primary use of this property?

3) **Location:** ☐ Yes ☐ No

74 Halstead Street
East Orange, New Jersey 07018

Is this correct and complete?

4) **Gross Floor Area:** 17,500 ft² ☐ Yes ☐ No

Does this represent the entire property? (i.e., no part of the building/property was excluded/subtracted from the total) If “no” please specify what space has been excluded.

5) **Average Occupancy:** 90

Is this occupancy accurate for the entire 12 month period being assessed? ☐ Yes ☐ No

6) **Number of Buildings:** 1

Does this number accurately represent all structures? ☐ Yes ☐ No

Notes:

Indoor Environmental Standards

1) **Ventilation for Acceptable Indoor Air Quality**

Does this property meet the ASHRAE Standard 62 for ventilation for acceptable indoor air quality? ☐ Yes ☐ No

2) **Acceptable Thermal Environmental Conditions**

Does this property meet the ASHRAE Standard 55 for thermal comfort? ☐ Yes ☐ No

3) **Adequate Illumination**

Does this property adhere to the IESNA Lighting Handbook for lighting quality? ☐ Yes ☐ No

Notes:

2. Review of Property Use Details

K-12 School: Building Use

1) **Gross Floor Area:** 17,500 ft²

Is this the total size, as measured between the principal exterior surfaces of the enclosing fixed walls of the building(s)? This includes all areas inside the building(s) such as: occupied tenant areas, common areas, meeting areas, break rooms, restrooms, elevator shafts, mechanical equipment areas, and storage rooms. Gross ☐ Yes ☐ No

Floor Area should not include interstitial plenum space between floors, which may house pipes and ventilation. Gross Floor Area is not the same as rentable, but rather includes all area inside the building(s). Leasable space would be a sub-set of Gross Floor Area. In the case where there is an atrium, you should count the Gross Floor Area at the base level only. Do not increase the size to accommodate open atrium space at higher levels. The Gross Floor Area should not include any exterior spaces such as balconies or exterior loading docks and driveways.

2) Gymnasium Floor Area: 0 ft²

Does the gymnasium floor area include all areas devoted to a gymnasium, including gymnasium/athletic areas, spectator areas, locker rooms, and other associated spaces? ☐ **Yes** ☐ **No**

3) High School: 100% Yes

Is the property a high school (teaching grades 10, 11, and/or 12)? If the property teaches to high school students at all, the user should check 'yes' to 'high school'. For example, if the school teaches to grades K-12 (elementary/middle and high school), the user should check 'yes' to 'high school'. ☐ **Yes** ☐ **No**

4) Number of Workers on Main Shift: 23

Is this the number of workers present during the main shift? Note that this is not a total count of workers, but rather a count of workers who are present at the same time. For example, if there are two daily eight hour shifts of 100 workers each, the Number of Workers on Main Shift value is 100. Number of Workers on Main Shift may include employees of the property, sub-contractors who are onsite regularly, and volunteers who perform regular onsite tasks. Number of Workers should not include visitors to the buildings such as clients, customers, or patients. ☐ **Yes** ☐ **No**

5) Student Seating Capacity: 40

Is this the maximum number of students for which the school was designed? This should include the seating capacity of the entire school. If portable classrooms have been added to the school, include the capacity of these classrooms, as they expand the overall capacity of the school. ☐ **Yes** ☐ **No**

6) Months in Use: 10

Is this the total number of months that the property is open for standard activities? ☐ **Yes** ☐ **No**

7) Weekend Operation: No

Does the property include regular activities on the weekend beyond the scope of maintenance, cleaning, and security personnel? Weekend activity could include any time when the property is used for classes, performances, or other school or community activities. The Yes selection is appropriate for any property that is open on one or both days of the weekend during one or more seasons of the year. ☐ **Yes** ☐ **No**

8) Number of Computers: 118

Is this the total number of desktop computers, laptops, and data servers at the property? This number should not include tablet computers, such as iPads, or any other types of office equipment. The count should only reflect computers that are owned by the school. It should not include any computers that are brought onsite by students or staff. ☐ **Yes** ☐ **No**

9) Cooking Facilities: No

Does the property have a commercial cooking area designed to provide and serve food to occupants and/or visitors? This may include restaurants and cafeterias. If the property contains only employee break room kitchens, this field should be marked No. ☐ **Yes** ☐ **No**

10) Number of Walk-in Refrigeration/Freezer Units: 0

Is this the total count of walk-in units at the property? Walk-in Refrigeration/Freezers are typically very large units located in storage areas or commercial kitchens that would not be accessible to all building occupants. This count should only include large storage units that a person actually walks into in order to store or retrieve perishable goods. ☐ **Yes** ☐ **No**

11) Percent That Can Be Heated: 100

Is this the total percentage of the property that can be heated by mechanical equipment? ☐ **Yes** ☐ **No**

12) Percent That Can Be Cooled: 10

Is this the total percentage of the property that can be cooled by mechanical equipment? This includes all types of cooling from central air to individual window units. ☐ **Yes** ☐ **No**

13) School District: East Orange

Is this the administrative school district in which the property is located? ☐ **Yes** ☐ **No**

Notes:

3. Review of Energy Consumption

Data Overview

Site Energy Use Summary	
Electric - Grid (kBtu)	740,458.1 (38%)
Natural Gas (kBtu)	1,211,211.4 (62%)
Total Energy (kBtu)	1,951,669.5
Energy Intensity	
Site (kBtu/ft²)	111.5
Source (kBtu/ft²)	205.5

National Median Comparison	
National Median Site EUI (kBtu/ft²)	87.8
National Median Source EUI (kBtu/ft²)	161.9
% Diff from National Median Source EUI	27%
Emissions (based on site energy use)	
Greenhouse Gas Emissions (Metric Tons CO2e)	163.5

Power Generation Plant or Distribution Utility:
Public Service Electric & Gas Co

Note: All values are annualized to a 12-month period. Source Energy includes energy used in generation and transmission to enable an equitable assessment.

Summary of All Associated Meters

The following meters are associated with the property, meaning that they are added together to get the total energy use for the property. Please see additional tables in this checklist for the exact meter consumption values.

Meter Name	Fuel Type	Start Date	End Date	Associated With
Electric Grid Meter	Electric	12/19/2013	In Use	Edmonson High School

Meter Name	Fuel Type	Start Date	End Date	Associated With
Natural Gas	Natural Gas	12/19/2013	In Use	Edmonson High School

Total Energy Use

☐ Yes ☐ No

Do the meters shown above account for the total energy use of this property during the reporting period of this application?

Additional Fuels

☐ Yes ☐ No

Do the meters above include all fuel *types* at the property? That is, no additional fuels such as district steam, generator fuel oil have been excluded.

On-Site Solar and Wind Energy

☐ Yes ☐ No

Are all on-site solar and wind installations reported in this list (if present)? All on-site systems must be reported.

Notes:

Electric Meter: Electric Grid Meter (kWh (thousand Watt-hours))

Associated With: Edmonson High School

Start Date	End Date	Usage	Green Power?
04/21/2014	05/20/2014	14,730	No
05/20/2014	06/19/2014	21,450	No
06/19/2014	07/23/2014	25,320	No
07/23/2014	08/19/2014	15,420	No
08/19/2014	09/18/2014	21,600	No
09/18/2014	10/17/2014	15,960	No
10/17/2014	11/17/2014	15,150	No
11/17/2014	12/19/2014	17,520	No
12/19/2014	01/21/2015	16,860	No
01/21/2015	02/19/2015	16,590	No
02/19/2015	03/20/2015	18,300	No
03/20/2015	04/21/2015	17,040	No

Start Date	End Date	Usage	Green Power?
04/21/2015	05/20/2015	17,850	No
	Total Consumption (kWh (thousand Watt-hours)):		233,790
	Total Consumption (kBtu (thousand Btu)):		797,691.5

Total Energy Consumption for this Meter ☐ **Yes** ☐ **No**

Do the fuel consumption totals shown above include consumption of all energy tracked through this meter that affect energy calculations for the reporting period of this application (i.e., do the entries match the utility bills received by the property)?

Notes:

Natural Gas Meter: Natural Gas (therms)

Associated With: Edmonson High School

Start Date	End Date	Usage
04/21/2014	05/20/2014	139.33
05/20/2014	06/19/2014	0
06/19/2014	07/23/2014	0
07/23/2014	08/19/2014	0
08/19/2014	09/18/2014	0
09/18/2014	10/17/2014	0
10/17/2014	11/17/2014	889.15
11/17/2014	12/18/2014	1,885.75 ← estimate
12/18/2014	01/21/2015	3,264.71
01/21/2015	02/19/2015	2,911.41 ← estimate
02/19/2015	03/20/2015	1,983.73
03/20/2015	04/21/2015	1,011.98
04/21/2015	05/20/2015	214.89
	Total Consumption (therms):	12,300.95
	Total Consumption (kBtu (thousand Btu)):	1,230,095

Total Energy Consumption for this Meter ☐ **Yes** ☐ **No**

Do the fuel consumption totals shown above include consumption of all energy tracked through this meter that affect energy calculations for the reporting period of this application (i.e., do the entries match the utility bills received by the property)?
Notes:

4. Signature & Stamp of Verifying Licensed Professional

_____ (Name) visited this site on _____ (Date). Based on the conditions observed at the time of the visit to this property, I verify that the information contained within this application is accurate and in accordance with the Licensed Professional Guide.

Signature: _____ Date: _____

Licensed Professional

____ _____
,
(____)____-_____
_____

NOTE: When applying for the ENERGY STAR, the signature of the Verifying Professional must match the stamp.

Professional Engineer Stamp
(if applicable)

ENERGY STAR® Statement of Energy Performance

24

ENERGY STAR® Score[1]

Edmonson High School

Primary Property Function: K-12 School
Gross Floor Area (ft²): 17,500
Built: 1970

For Year Ending: April 30, 2015
Date Generated: August 13, 2015

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address
Edmonson High School
74 Halstead Street
East Orange, New Jersey 07018

Property Owner
East Orange School District
199 4th Avenue, 5th Floor
East Orange, NJ 07017
(____)____-_____

Primary Contact
Racquel Ferguson
199 4th Avenue, 5th Floor
East Orange, NJ 07017
(973) 266-5742
racquel.ferguson@eastorange.k12.nj.us

Property ID: 4440656

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
111.5 kBtu/ft²

Source EUI
205.5 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	740,458 (38%)
Natural Gas (kBtu)	1,211,211 (62%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	87.8
National Median Source EUI (kBtu/ft²)	161.9
% Diff from National Median Source EUI	27%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	164

Signature & Stamp of Verifying Professional

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

Signature: _____Date: _____

Licensed Professional

____ _____
,
(____)____-_____
_____

Professional Engineer Stamp (if applicable)

APPENDIX D

MAJOR EQUIPMENT LIST

Concord Engineering

Rooftop Units

Tag	RTU-1	RTU-2
Unit Type	Packaged RTU	Packaged RTU
Qty	1	1
Location	Roof	Roof
Area Served	3rd Floor	2nd Floor
Manufacturer	Carrier	Trane
Model No.	50TFF012---501	TCH120B300DA
Serial No.	1001G30425	J191435B60
Cooling Type	Packaged DX	Packaged DX
Cooling Capacity (Tons)	10	10
Cooling Efficiency (SEER/EER)	9.0 EER	8.7 EER
Heating Type	No Heating	No Heating
Heating Input (MBH)	N/A	N/A
Efficiency	-	-
Supply Fan (HP)	3	3
Supply Fan VFD	☐ Yes ☑ No ☐ N/A	☑ Yes ☑ No ☐ N/A
Return/Exhaust Fan (HP)	N/A	N/A
Return/Exhaust Fan VFD	☐ Yes ☑ No ☐ N/A	☐ Yes ☑ No ☐ N/A
Approx Age	14	21
ASHRAE Service Life	15	15
Remaining Life	1	0
Comments		

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

MAJOR EQUIPMENT LIST

Concord Engineering

Condensing Units

Tag	CU-1	CU-2	CU-3
Unit Type	Standard Air-Cooled	Standard Air-Cooled	Standard Air-Cooled
Qty	1	1	1
Location	Roof	Roof	Roof
Area/Unit Served	AHU-1	AHU-2	Indoor Ductless Split
Manufacturer	Weatherking	Trane	Sanyo
Model No.	RAWD-075CAZ	-	CH3632
Serial No.	8104 G2998 00229	-	18404
Refrigerant Type	R-22	R-22	R-410a
Cooling Capacity (Tons)	7.5	5 Tons	34.5 MBH
Cooling Efficiency	8.5 EER	9.5 EER	10.0 EER
Volts / Phase / Hz	208/230V 3 Ph	208/230V 3 Ph	208/230V 1 Ph
Approx Age	17	14	15
ASHRAE Service Life	20	20	20
Remaining Life	3	6	5
Comments			Indoor Unit Model KHS3632

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering

Air Handler Units

Tag	AHU-1	AHU-2
Unit Type	Split System AHU	Split System AHU
Qty	1	1
Location	Auditorium Closet	Library Closet
Area Served	Auditorium (Second Fl)	Library (Second Fl)
Manufacturer	Goodman	Trane
Model No.	A90-00	TWE060
Serial No.	9608140837	22934P51V
Cooling Type	Split System DX	Split System DX
Cooling Capacity (Tons)	7.5	5
Heating Type	No Heating	No Heating
Heating Input (MBH)	-	-
Supply Fan (HP)	1.5	3/4
Supply Fan VFD	☐ Yes ☑ No ☐ N/A	☐ Yes ☑ No ☐ N/A
Return Fan (HP)	N/A	N/A
Return Fan VFD	☐ Yes ☐ No ☑ N/A	☐ Yes ☐ No ☑ N/A
Approx Age	18	14
ASHRAE Service Life	20	20
Remaining Life	2	6
Comments		

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering

Terminal Units

Tag	UV	Window AC
Unit Type	Unit Ventilator	Window Unit
Qty	12	5
Location	Classrooms	Office Windows
Area Served	Classrooms	Offices
Manufacturer	Nesbittaire	Friedrich
Model No.	-	CP10F10
Serial No.	-	Varies
Cooling Type	No Cooling	Packaged DX
Cooling Capacity (Tons)	N/A	10,000 Btuh
Cooling Efficiency	N/A	10.8 EER
Heating Type	Hot Water	No Heating
Heating Input (MBH)	-	N/A
Heating Efficiency	-	N/A
Approx Age	25	10
ASHRAE Service Life	20	20
Remaining Life	0	10
Comments		

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering

Boilers

Tag	B-1
Unit Type	Cast-Iron Sectional (Water)
Qty	1
Location	Boiler Room
Manufacturer	Weil-Mclain
Model No.	LGB-9
Serial No.	CP4874782
Input Capacity (Btu/h)	1,040,000
Output Capacity (Btu/h)	842,400
Approx. Efficiency %	80.0%
Fuel Type	Natural Gas
Approx Age	10
ASHRAE Service Life	35
Remaining Life	25
Comments	

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

MAJOR EQUIPMENT LIST

Concord Engineering

Domestic Water Heaters

Tag	DWH-1
Unit Type	Storage
Qty	1
Location	Boiler Room
Area Served	Building DHW
Manufacturer	Rheem
Model #	ES50-9-G
Serial #	RR 0789E00460
Storage Size (Gal)	50
Input Capacity (MBH/KW)	9 KW
Recovery (Gal/Hr)	-
Efficiency %	100%
Fuel	Electric
Approx Age	17
ASHRAE Service Life	15
Remaining Life	0
Comments	

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering

Pumps

Tag	HWP-1,2
Unit Type	Pipe-mounted
Qty	2
Location	Boiler Room
System Served	Heating Hot Water
Manufacturer	Bell and Gossett
Model #	-
Serial #	-
Horse Power	3/4
Flow Rate (GPM)	-
Head Pressure (FTHD)	-
Motor Manufacturer	Bell and Gossett
Motor Frame	48Y
Electrical Power (V/P/HZ)	208-230/460V 3 Ph
Motor RPM	1725
Motor Efficiency %	82.0%
Pump VFD	☐ Yes ☑ No ☐ N/A
Approx Age	10
ASHRAE Service Life	18
Remaining Life	8
Comments	

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

APPENDIX E

CEG Project #: 1C15143
Facility Name: Edmonson High School
Address: 74 Halsted St.
City, State, Zip East Orange, NJ 07018

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
122	1 - Meter Room	400	2-Lamp T12 Magnetic 2x4 Surface Mount Prismatic Lens	2	82	1	0.08	33	Re-Lamp	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	2	30	1	0.03	12	0.05	21	$3	0	No New Controls	0	0.0%	0	$0	$60.00	$45.00	$105.00	$10.00	28.91	$0.00	$0.00	$0.00	YES	-
123	1 - Entry	3000	2-Lamp U T8 Magnetic 2x2 Recessed Prismatic Lens	2	69	2	0.14	414	Re-Lamp/Reflector	Seesmart LED U-Tube 18W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	2	36	2	0.07	216	0.07	198	$31	0	No New Controls	0	0.0%	0	$0	$140.00	$90.00	$230.00	$20.00	6.71	$0.00	$0.00	$0.00	FALSE	-
3	1 - Entry	3000	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	1	0.11	342	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	1	0.05	135	0.07	207	$33	0	No New Controls	0	0.0%	0	$0	$90.00	$45.00	$135.00	$15.00	3.67	$0.00	$0.00	$0.00	FALSE	-
69	1 - Entry	3000	3-Lamp T8 Electronic 2x2 Recessed Prismatic	3	53	1	0.05	159	Re-Lamp / Reflector	Seesmart LED 2' Tube 9W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	27	1	0.03	81	0.03	78	$12	0	No New Controls	0	0.0%	0	$0	$60.00	$45.00	$105.00	$15.00	7.30	$0.00	$0.00	$0.00	FALSE	-
31	1 - Boiler Room	400	2-Lamp T12 Magnetic 1x4 Surface Mount Prismatic Lens	2	82	1	0.08	33	Re-Lamp	Seesmart LED Tube 15W 4K bypass ballast and provide new tombstones	2	30	1	0.03	12	0.05	21	$3	0	No New Controls	0	0.0%	0	$0	$60.00	$45.00	$105.00	$10.00	28.91	$0.00	$0.00	$0.00	FALSE	-
124	1- Storage	400	2-Lamp T12 Magnetic 1x4 Recessed Prismatic Lens	2	82	2	0.16	66	Re-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	2	30	2	0.06	24	0.10	42	$7	0	No New Controls	0	0.0%	0	$0	$120.00	$90.00	$210.00	$20.00	28.91	$0.00	$0.00	$0.00	FALSE	-
3	1 - Student Waiting Room	4000	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	2	0.23	912	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	2	0.09	360	0.14	552	$87	0	No New Controls	0	0.0%	0	$0	$180.00	$90.00	$270.00	$30.00	2.75	$0.00	$0.00	$0.00	FALSE	-
123	1 - Foyer	3000	2-Lamp U T8 Magnetic 2x2 Recessed Prismatic Lens	2	69	1	0.07	207	Re-Lamp/Reflector	Seesmart LED U-Tube 18W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	2	36	1	0.04	108	0.03	99	$16	0	No New Controls	0	0.0%	0	$0	$70.00	$45.00	$115.00	$10.00	6.71	$0.00	$0.00	$0.00	FALSE	-
31	1 - Front Stairwell	3000	2-Lamp T12 Magnetic 1x4 Surface Mount Prismatic Lens	2	82	3	0.25	738	Re-Lamp	Seesmart LED Tube 15W 4K bypass ballast and provide new tombstones	2	30	3	0.09	270	0.16	468	$74	0	No New Controls	0	0.0%	0	$0	$180.00	$135.00	$315.00	$30.00	3.85	$0.00	$0.00	$0.00	FALSE	-
11	1 - Front Stairwell	3000	Incandescent (100W) Surface Mounted Direct	1	100	1	0.10	300	Replace	Philips 18W LED A-Lamp	1	18	1	0.02	54	0.08	246	$39	0	No New Controls	0	0.0%	0	$0	$15.00	$27.50	$42.50	$10.00	0.84	$0.00	$0.00	$0.00	FALSE	-
125	1 - Front Stairwell	3000	2-Lamp T8 Electronic .5x4 Recessed Prismatic Lens	2	62	2	0.12	372	Re-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	2	30	2	0.06	180	0.06	192	$30	0	No New Controls	0	0.0%	0	$0	$120.00	$90.00	$210.00	$20.00	6.26	$0.00	$0.00	$0.00	FALSE	-
3	1 - Front Stairwell	3000	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	1	0.11	342	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	1	0.05	135	0.07	207	$33	0	No New Controls	0	0.0%	0	$0	$90.00	$45.00	$135.00	$15.00	3.67	$0.00	$0.00	$0.00	FALSE	-
3	2 - Staff Lounge	2600	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	3	0.34	889	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	3	0.14	351	0.21	538	$85	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	70	$11	$270.00	$135.00	$405.00	$45.00	4.23	$50.00	$50.00	$100.00	FALSE	9.02
3	2 - Conference Room	4000	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	2	0.23	912	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	2	0.09	360	0.14	552	$87	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	72	$11	$180.00	$90.00	$270.00	$30.00	2.75	$50.00	$50.00	$100.00	FALSE	8.79
3	2 - Boys Bathroom	400	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	2	0.23	91	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	2	0.09	36	0.14	55	$9	0	No New Controls	1	0.0%	0	$0	$180.00	$90.00	$270.00	$30.00	27.52	$0.00	$50.00	$50.00	FALSE	-
3	2 - Girls Bathroom	400	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	2	0.23	91	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	2	0.09	36	0.14	55	$9	0	No New Controls	1	0.0%	0	$0	$180.00	$90.00	$270.00	$30.00	27.52	$0.00	$50.00	$50.00	FALSE	-

			EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT						RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS						LIGHTING RETROFIT COSTS					LIGHTING CONTROLS COST				
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Total Materials	Total Labor	Total All	Smart Start Incentive	Simple Payback
6	2 - Supply Closet	2600	2-Lamp T8 Electronic 1x4 Surface Mount Prismatic Lens	2	62	1	0.06	161	Re-Lamp	Seesmart LED Tube 15W 4K bypass ballast and provide new tombstones	2	30	1	0.03	78	0.03	83	$13	0	No New Controls	0	0.0%	0	$0	$60.00	$45.00	$105.00	$10.00	7.23	$0.00	$0.00	$0.00	FALSE	-
36	2 - Hallway	3000	2-Lamp T8 Electronic 1x4 Recessed Prismatic Lens	2	62	19	1.18	3,534	Re-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	2	30	19	0.57	1,710	0.61	1,824	$288	0	No New Controls	0	0.0%	0	$0	$1,140.00	$855.00	$1,995.00	$190.00	6.26	$0.00	$0.00	$0.00	FALSE	-
6	2 - Staff Bathroom	1200	2-Lamp T8 Electronic 1x4 Surface Mount Prismatic Lens	2	62	1	0.06	74	Re-Lamp	Seesmart LED Tube 15W 4K bypass ballast and provide new tombstones	2	30	1	0.03	36	0.03	38	$6	0	No New Controls	0	0.0%	0	$0	$60.00	$45.00	$105.00	$10.00	15.66	$0.00	$0.00	$0.00	FALSE	-
3	2 - Nurse's Office	4000	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	2	0.23	912	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	2	0.09	360	0.14	552	$87	0	No New Controls	0	0.0%	0	$0	$180.00	$90.00	$270.00	$30.00	2.75	$0.00	$0.00	$0.00	FALSE	-
6	2 - Nurse's Office Bathroom	1200	2-Lamp T8 Electronic 1x4 Surface Mount Prismatic Lens	2	62	1	0.06	74	Re-Lamp	Seesmart LED Tube 15W 4K bypass ballast and provide new tombstones	2	30	1	0.03	36	0.03	38	$6	0	No New Controls	0	0.0%	0	$0	$60.00	$45.00	$105.00	$10.00	15.66	$0.00	$0.00	$0.00	FALSE	-
3	2 - Classroom 203	2600	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	8	0.91	2,371	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	8	0.36	936	0.55	1,435	$227	0	No New Controls	0	0.0%	0	$0	$720.00	$360.00	$1,080.00	$120.00	4.23	$0.00	$0.00	$0.00	FALSE	-
25	2 - Classroom 203	2600	Incandescent (60W) Surface Mounted Direct	1	26	1	0.03	68	Replace	Philips LED A19 10.5W	1	10.5	1	0.01	27	0.02	40	$6	0	No New Controls	0	0.0%	0	$0	$13.00	$27.50	$40.50	$10.00	4.79	$0.00	$0.00	$0.00	FALSE	-
10	2 - Auditorium	2600	4-Lamp T8 Electronic 2x4 Recessed Direct	4	114	23	2.62	6,817	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	23	1.04	2,691	1.59	4,126	$652	0	No New Controls	0	0.0%	0	$0	$2,070.00	$1,035.00	$3,105.00	$345.00	4.23	$0.00	$0.00	$0.00	FALSE	-
3	2 - Auditorium Conference Room	4000	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	6	0.68	2,736	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	6	0.27	1,080	0.41	1,656	$262	0	No New Controls	0	0.0%	0	$0	$540.00	$270.00	$810.00	$90.00	2.75	$0.00	$0.00	$0.00	FALSE	-
3	2 - Equipment Room	400	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	2	0.23	91	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	2	0.09	36	0.14	55	$9	0	No New Controls	0	0.0%	0	$0	$180.00	$90.00	$270.00	$30.00	27.52	$0.00	$0.00	$0.00	FALSE	-
11	2 - Equipment Closet	400	Incandescent (100W) Surface Mounted Direct	1	100	1	0.10	40	Replace	Philips 18W LED A-Lamp	1	18	1	0.02	7	0.08	33	$5	0	No New Controls	0	0.0%	0	$0	$15.00	$27.50	$42.50	$10.00	6.27	$0.00	$0.00	$0.00	FALSE	-
3	2 - Library	2600	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	12	1.37	3,557	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	12	0.54	1,404	0.83	2,153	$340	0	No New Controls	0	0.0%	0	$0	$1,080.00	$540.00	$1,620.00	$180.00	4.23	$0.00	$0.00	$0.00	FALSE	-
3	2 - Classroom	2600	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	6	0.68	1,778	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	6	0.27	702	0.41	1,076	$170	0	No New Controls	0	0.0%	0	$0	$540.00	$270.00	$810.00	$90.00	4.23	$0.00	$0.00	$0.00	FALSE	-
3	3 - Art Classroom	2600	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	9	1.03	2,668	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	9	0.41	1,053	0.62	1,615	$255	0	No New Controls	0	0.0%	0	$0	$810.00	$405.00	$1,215.00	$135.00	4.23	$0.00	$0.00	$0.00	FALSE	-
3	3 - Computer Classroom	2600	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	9	1.03	2,668	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	9	0.41	1,053	0.62	1,615	$255	0	No New Controls	0	0.0%	0	$0	$810.00	$405.00	$1,215.00	$135.00	4.23	$0.00	$0.00	$0.00	FALSE	-
3	3 - Computer Storage Room	400	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	2	0.23	91	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	2	0.09	36	0.14	55	$9	0	No New Controls	0	0.0%	0	$0	$180.00	$90.00	$270.00	$30.00	27.52	$0.00	$0.00	$0.00	FALSE	-
123	3 - Computer Storage Room 2	400	2-Lamp U T8 Magnetic 2x2 Recessed Prismatic Lens	2	69	1	0.07	28	Re-Lamp/Reflector	Seesmart LED U-Tube 18W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	2	36	1	0.04	14	0.03	13	$2	0	No New Controls	0	0.0%	0	$0	$70.00	$45.00	$115.00	$10.00	50.35	$0.00	$0.00	$0.00	FALSE	-

			EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT						RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS						LIGHTING RETROFIT COSTS					LIGHTING CONTROLS COST				
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Total Materials	Total Labor	Total All	Smart Start Incentive	Simple Payback
126	3 - Boys Bathroom	2600	4-Lamp T12 Magnetic 2x4 Surface Mounted Prismatic Lens	4	164	1	0.16	426	Re-Lamp / De-Lamp	Seesmart LED Tube 15W 4K bypass ballast and provide new tombstones	3	45	1	0.05	117	0.12	309	$49	0	No New Controls	0	0.0%	0	$0	$90.00	$45.00	$135.00	$15.00	2.45	$0.00	$0.00	$0.00	FALSE	-
127	3 - Boys Bathroom	2600	2-Lamp T8 Electronic .5x4 Surface Mounted Prismatic Lens	2	62	1	0.06	161	Re-Lamp	Seesmart LED Tube 15W 4K bypass ballast and provide new tombstones	2	30	1	0.03	78	0.03	83	$13	0	No New Controls	0	0.0%	0	$0	$60.00	$45.00	$105.00	$10.00	7.23	$0.00	$0.00	$0.00	FALSE	-
21	3 - Girls Bathroom	2600	4-Lamp T8 Electronic 2x4 Surface Mount Prismatic Lens	4	114	1	0.11	296	Re-Lamp / De-Lamp	Seesmart LED Tube 15W 4K bypass ballast and provide new tombstones	3	45	1	0.05	117	0.07	179	$28	0	No New Controls	0	0.0%	0	$0	$90.00	$45.00	$135.00	$15.00	4.23	$0.00	$0.00	$0.00	FALSE	-
128	3 - Girls Bathroom	2600	2-Lamp T12 Magnetic .5x4 Surface Mounted Prismatic	2	82	1	0.08	213	Re-Lamp	Seesmart LED Tube 15W 4K bypass ballast and provide new tombstones	2	30	1	0.03	78	0.05	135	$21	0	No New Controls	0	0.0%	0	$0	$60.00	$45.00	$105.00	$10.00	4.45	$0.00	$0.00	$0.00	FALSE	-
6	3 - Storage Room 1	400	2-Lamp T8 Electronic 1x4 Surface Mount Prismatic Lens	2	62	1	0.06	25	Re-Lamp	Seesmart LED Tube 15W 4K bypass ballast and provide new tombstones	2	30	1	0.03	12	0.03	13	$2	0	No New Controls	0	0.0%	0	$0	$60.00	$45.00	$105.00	$10.00	46.97	$0.00	$0.00	$0.00	FALSE	-
3	3 - Classroom 302	2600	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	15	1.71	4,446	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	15	0.68	1,755	1.04	2,691	$425	0	No New Controls	0	0.0%	0	$0	$1,350.00	$675.00	$2,025.00	$225.00	4.23	$0.00	$0.00	$0.00	FALSE	-
3	3 - Library	2600	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	13	1.48	3,853	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	13	0.59	1,521	0.90	2,332	$368	0	No New Controls	0	0.0%	0	$0	$1,170.00	$585.00	$1,755.00	$195.00	4.23	$0.00	$0.00	$0.00	FALSE	-
3	3 - Book Room	400	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	3	0.34	137	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	3	0.14	54	0.21	83	$13	0	No New Controls	0	0.0%	0	$0	$270.00	$135.00	$405.00	$45.00	27.52	$0.00	$0.00	$0.00	FALSE	-
3	3 - A/V Storage	400	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	4	0.46	182	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	4	0.18	72	0.28	110	$17	0	No New Controls	0	0.0%	0	$0	$360.00	$180.00	$540.00	$60.00	27.52	$0.00	$0.00	$0.00	FALSE	-
3	3 - Storage Room 2	400	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	2	0.23	91	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	2	0.09	36	0.14	55	$9	0	No New Controls	0	0.0%	0	$0	$180.00	$90.00	$270.00	$30.00	27.52	$0.00	$0.00	$0.00	FALSE	-
36	3 - Storage Room 3	400	2-Lamp T8 Electronic 1x4 Recessed Prismatic Lens	2	62	1	0.06	25	Re-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	2	30	1	0.03	12	0.03	13	$2	0	No New Controls	0	0.0%	0	$0	$60.00	$45.00	$105.00	$10.00	46.97	$0.00	$0.00	$0.00	FALSE	-
3	3 - Office 1	4000	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	1	0.11	456	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	1	0.05	180	0.07	276	$44	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	36	$6	$90.00	$45.00	$135.00	$15.00	2.75	$50.00	$50.00	$100.00	FALSE	17.58
3	3 - Main Office	4000	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	9	1.03	4,104	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	9	0.41	1,620	0.62	2,484	$392	0	No New Controls	0	0.0%	0	$0	$810.00	$405.00	$1,215.00	$135.00	2.75	$0.00	$0.00	$0.00	FALSE	-
36	3 - Main Office	4000	2-Lamp T8 Electronic 1x4 Recessed Prismatic Lens	2	62	1	0.06	248	Re-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	2	30	1	0.03	120	0.03	128	$20	0	No New Controls	0	0.0%	0	$0	$60.00	$45.00	$105.00	$10.00	4.70	$0.00	$0.00	$0.00	FALSE	-
3	3 - Conference Room	4000	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	1	0.11	456	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	1	0.05	180	0.07	276	$44	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	36	$6	$90.00	$45.00	$135.00	$15.00	2.75	$50.00	$50.00	$100.00	FALSE	17.58
3	3 - Main Office 2	4000	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	5	0.57	2,280	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	5	0.23	900	0.35	1,380	$218	0	No New Controls	0	0.0%	0	$0	$450.00	$225.00	$675.00	$75.00	2.75	$0.00	$0.00	$0.00	FALSE	-
3	3 - Nurse's Station	4000	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	2	0.23	912	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	2	0.09	360	0.14	552	$87	0	No New Controls	0	0.0%	0	$0	$180.00	$90.00	$270.00	$30.00	2.75	$0.00	$0.00	$0.00	FALSE	-

			EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT						RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS						LIGHTING RETROFIT COSTS					LIGHTING CONTROLS COST				
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Total Materials	Total Labor	Total All	Smart Start Incentive	Simple Payback
21	3 - Nurse's Bathroom	1200	4-Lamp T8 Electronic 2x4 Surface Mount Prismatic Lens	4	114	1	0.11	137	Re-Lamp / De-Lamp	Seesmart LED Tube 15W 4K bypass ballast and provide new tombstones	3	45	1	0.05	54	0.07	83	$13	0	No New Controls	0	0.0%	0	$0	$90.00	$45.00	$135.00	$15.00	9.17	$0.00	$0.00	$0.00	FALSE	-
3	3 - Office 2	4000	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	3	0.34	1,368	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	3	0.14	540	0.21	828	$131	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	108	$17	$270.00	$135.00	$405.00	$45.00	2.75	$50.00	$50.00	$100.00	FALSE	5.86
3	3 - Break Room	2600	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	2	0.23	593	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	2	0.09	234	0.14	359	$57	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	47	$7	$180.00	$90.00	$270.00	$30.00	4.23	$50.00	$50.00	$100.00	$20.00	10.82
125	Fire Stairwell	3000	2-Lamp T8 Electronic .5x4 Recessed Prismatic Lens	2	62	5	0.31	930	Re-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	2	30	5	0.15	450	0.16	480	$76	0	No New Controls	0	0.0%	0	$0	$300.00	$225.00	$525.00	$50.00	6.26	$0.00	$0.00	$0.00	FALSE	-
3	Fire Stairwell	3000	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	1	0.11	342	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	1	0.05	135	0.07	207	$33	0	No New Controls	0	0.0%	0	$0	$90.00	$45.00	$135.00	$15.00	3.67	$0.00	$0.00	$0.00	FALSE	-
3	2 -Principal's Office	4000	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	3	0.34	1,368	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	3	0.14	540	0.21	828	$131	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	108	$17	$270.00	$135.00	$405.00	$45.00	2.75	$50.00	$50.00	$100.00	$20.00	4.69
3	1 - Parking Lot	3000	4-Lamp T8 Electronic 2x4 Recessed Prismatic Lens	4	114	25	2.85	8,550	Re-Lamp / De-Lamp / Reflector	Seesmart LED Tube 15W 4K with semi Specular Reflector Kit bypass ballast and provide new tombstones	3	45	25	1.13	3,375	1.73	5,175	$818	0	No New Controls	0	0.0%	0	$0	$2,250.00	$1,125.00	$3,375.00	$375.00	3.67	$0.00	$0.00	$0.00	FALSE	-
	TOTAL					**233**	**24.3**	**65,169**					**233**	**10**	**26,170**	**14.6**	**38,999**	**$6,162**			**9**	**1**	**477**	**$75**	**$19,403**	**$10,433**	**$29,836**	**$3,255**	**4.31**	**$350**	**$450**	**$800**	**$40.00**	**10.08**

APPENDIX F

Location Description	Area (Sq FT)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW_{DC}	Total Annual kWh	Total KW_{AC}	Panel Weight (41.9 lbs)	W/SQFT
Edmonson High School	4206	SHARP ND-240QCJ	171	17.5	2,999	41.04	48,125	37.3	7,165	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 - Edmonson High School
Location: East Orange, NJ
Description: Photovoltaic System 100% Financing - 15 year

Simple Payback Analysis

	Photovoltaic System 100% Financing - 15 year
Total Construction Cost	$189,875
Annual kWh Production	48,125
Annual Energy Cost Reduction	$5,775
Average Annual SREC Revenue	$7,291

Simple Payback: **14.53** 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	48,125	$5,775	$0	$12,031	$11,173	$8,054	($1,421)	($1,421)
2	$0	47,884	$5,948	$0	$11,971	$10,677	$8,551	($1,308)	($2,729)
3	$0	47,645	$6,127	$0	$11,911	$10,149	$9,078	($1,189)	($3,918)
4	$0	47,407	$6,310	$0	$9,481	$9,589	$9,638	($3,435)	($7,354)
5	$0	47,170	$6,500	$486	$9,434	$8,995	$10,232	($3,779)	($11,133)
6	$0	46,934	$6,695	$483	$9,387	$8,364	$10,863	($3,629)	($14,763)
7	$0	46,699	$6,896	$481	$7,005	$7,694	$11,534	($5,808)	($20,570)
8	$0	46,466	$7,103	$479	$6,970	$6,982	$12,245	($5,634)	($26,204)
9	$0	46,233	$7,316	$476	$6,935	$6,227	$13,000	($5,453)	($31,657)
10	$0	46,002	$7,535	$474	$4,600	$5,425	$13,802	($7,566)	($39,223)
11	$0	45,772	$7,761	$471	$4,577	$4,574	$14,653	($7,360)	($46,583)
12	$0	45,543	$7,994	$469	$4,554	$3,670	$15,557	($7,148)	($53,731)
13	$0	45,316	$8,234	$467	$2,266	$2,711	$16,517	($9,195)	($62,926)
14	$0	45,089	$8,481	$464	$2,254	$1,692	$17,535	($8,957)	($71,882)
15	$0	44,864	$8,735	$462	$2,243	$611	$18,617	($8,711)	($80,593)
	Totals:	697,149	$107,409	$5,213	$105,621	$98,534	$189,875	($80,593)	($474,688)

Net Present Value (NPV) **($56,669)**

PVWatts: Monthly PV Performance Data — Rooftop Array

Requested Location:	74 Halsted St., East Orange, NJ
Location:	NEWARK, NJ
Lat (deg N):	40.7
Long (deg W):	74.17
Elev (m):	9
DC System Size (kW):	41.04
Module Type:	Standard
Array Type:	Fixed (roof mount)
Array Tilt (deg):	10
Array Azimuth (deg):	225
System Losses:	14
Invert Efficiency:	96
DC to AC Size Ratio:	1.1
Average Cost of Electricity	0.16
Initial Cost	No initial cost defined
Cost of Electricity Generate	not determined

Month	AC System Output(kWh)	Solar Radiation (kWh/m^2/day)	Plane of Array Irradiance (W/m^2)	DC array Output (kWh)	Value ($)
1	2,483	2.28	70.61	2,616	392.26
2	2,964	3.03	84.78	3,112	468.33
3	4,197	3.95	122.49	4,397	663.10
4	4,727	4.75	142.60	4,951	746.79
5	5,628	5.65	175.12	5,887	889.26
6	5,528	5.89	176.70	5,789	873.47
7	5,509	5.74	178.02	5,767	870.45
8	5,051	5.31	164.51	5,286	798.07
9	4,294	4.54	136.06	4,497	678.52
10	3,489	3.47	107.45	3,661	551.33
11	2,231	2.21	66.21	2,357	352.56
12	2,023	1.90	58.75	2,142	319.61
Total	48,125	48.70	1483.33	50,462	7603.75