Local Government Energy Audit:
Energy Audit Report

MUA Administration Office

Willingboro Municipal Utilities Authority

433 John F. Kennedy Way
Willingboro, NJ 08046

November 28, 2017

Final Report by:
TRC Energy Services

Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for the MUA Administration Office.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help tour facility implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services, as part of a comprehensive effort to assist the MUA Administration Office with efforts to control energy costs and protect our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

The MUA Administration Office is a single story 3,600 square foot facility with typical office spaces.

Additional descriptions of the facility and our observations are located in Section 2, "Facility Information and Existing Conditions".

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC Energy Services recommends six (6) ECMs which together represent an opportunity for the MUA Administration Office to reduce its annual energy costs by roughly $4,085 and its annual greenhouse gas emissions by about 29,484 lbs CO_2e. We estimate that the measures would likely pay for themselves in energy savings in about 3.9 years. The breakdown of existing and potential utility costs (before and after installation) is shown in Figure 1 and Figure 2, respectively. These projects represent an opportunity to reduce annual energy usage at the MUA Administration Office by about 30.2%.

Figure 1 – Previous 12 Month Utility Costs

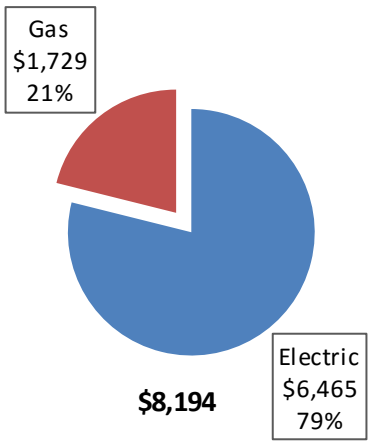
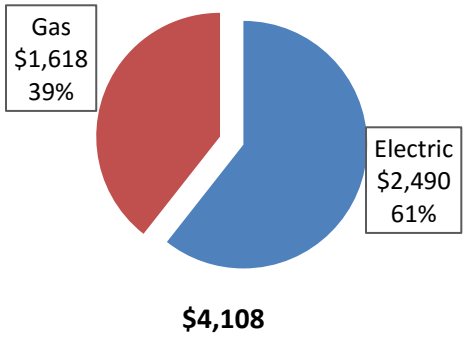


Figure 2 – Potential Post-Implementation Costs



A detailed description of the MUA Administration Office's existing energy use can be found in Section 3, "Site Energy Use and Costs".

The evaluated measures have been listed and grouped into major categories as shown in Figure 3. Brief descriptions of the categories can be found below and descriptions of the individual opportunities can be found in Section 4, "Energy Conservation Measures". Measures in the table below without an "ECM #" have been evaluated, but are not recommended for implementation.

Figure 3 – Summary of Energy Reduction Opportunities

	Energy Conservation Measure	Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Natural Gas Savings (MMBtu)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
			12,621	**3.3**	**0.0**	**0.0**	**$1,805.45**	**$9,773.71**	**$1,055.00**	**$8,718.71**	**4.83**	**12,709**
ECM 1	Install LED Fixtures	Yes	4,261	1.2	0.0	0.0	$609.58	$3,696.62	$985.00	$2,711.62	4.45	4,291
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	5,301	1.5	0.0	0.0	$758.38	$5,332.62	$0.00	$5,332.62	7.03	5,338
ECM 3	Retrofit Fixtures with LED Lamps	Yes	2,115	0.6	0.0	0.0	$302.60	$314.25	$70.00	$244.25	0.81	2,130
ECM 4	Install LED Exit Signs	Yes	943	0.1	0.0	0.0	$134.89	$430.22	$0.00	$430.22	3.19	950
	Lighting Control Measures		**1,093**	**0.3**	**0.0**	**0.0**	**$156.37**	**$1,350.00**	**$175.00**	**$1,175.00**	**7.51**	**1,101**
ECM 5	Install Occupancy Sensor Lighting Controls	Yes	1,093	0.3	0.0	0.0	$156.37	$1,350.00	$175.00	$1,175.00	7.51	1,101
	Electric Unitary HVAC Measures		**1,200**	**0.8**	**0.0**	**0.0**	**$171.67**	**$5,236.77**	**$322.00**	**$4,914.77**	**28.63**	**1,208**
	Install High Efficiency Electric AC	No	1,200	0.8	0.0	0.0	$171.67	$5,236.77	$322.00	$4,914.77	28.63	1,208
	HVAC System Improvements		**12,870**	**0.0**	**12.9**	**12.9**	**$1,951.89**	**$989.61**	**$0.00**	**$989.61**	**0.51**	**14,466**
ECM 6	Install Programmable Thermostats	Yes	12,870	0.0	12.9	12.9	$1,951.89	$989.61	$0.00	$989.61	0.51	14,466
	TOTALS		**27,784**	**4.5**	**12.9**	**12.9**	**$4,085.38**	**$17,350.09**	**$1,552.00**	**$15,798.09**	**3.87**	**29,484**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measure save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when conditions allow. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Electric Unitary HVAC measures generally involve replacing old inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide cooling equivalent to older air condition systems, but use less energy. These measures save energy by reducing the power used by the air condition system due to improved electrical efficiency.

HVAC System Improvements generally involve the installation of automated controls to reduce heating and cooling demand when conditions allow. These measures could encompass changing temperature setpoints, using outside air for free cooling, or limiting excessive outside air during extreme outdoor air temperatures. These measures save energy by reducing the demand on the systems and the amount of time systems operate.

Energy Efficient Practices

TRC Energy Services also identified 12 low (or no) cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral and operational adjustments as well as performing routine maintenance on building systems. Through these practices equipment lifetime can be extended; occupant comfort, health and safety can be improved; and annual energy,

operation, and maintenance costs can be reduced. Opportunities identified at the MUA Administration Office include:

- Reduce Air Leakage
- Close Doors and Windows
- Use Window Treatments/Coverings
- Perform Proper Lighting Maintenance
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Check for and Seal Duct Leakage
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Replace Computer Monitors
- Water Conservation

For details on these Energy Efficient Practices, please refer to Section 5.

Self-Generation Measures

TRC Energy Services evaluated the potential for installing self-generation sources for the MUA Administration Office. Based on the configuration of the site and its loads there is a low potential for installing any PV and combined heat and power self-generation measures.

For details on our evaluation and the self-generation potential, please refer to Section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart (SS)
- Energy Savings Improvement Program (ESIP)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SS incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SS program. More details on this program and others are available in Section 8, as well as the other programs as mentioned below.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.4 for additional information on the ESIP Program.

The Demand Response Energy Aggregator is a (non-NJCEP) program designed to reduce electric loads at commercial facilities, when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. Demand Response (DR) service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability. By enabling grid operators to call upon commercial facilities to reduce their electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and facilities receive payments whether or not they are called upon to curtail their load during times of peak demand. Refer to Section 7 for additional information on this program.

Additional descriptions of all relevant incentive programs are located in Section 8. You may also check the following website for further information on available rebates and incentives: www.njcleanenergy.com/ci

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Andrew Weber	Executive Director	Andrew@wmua.info	609-877-2900 x 15
James J. Mackie, PE	Director of Operations & Maintenance	jmackie@wmua.info	609-877-2900 x 105
TRC Energy Services			
Moussa Traore	Auditor	MTraore@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On August 2, 2016, TRC Energy Services performed an energy audit at the MUA Administration Office located in Willingboro, NJ. TRC Energy Services' team met with Victor DeMaise to review the facility operations and focus the investigation on specific energy-using systems.

Willingboro MUA Administration Office is a single story 3,600 square foot facility with typical office spaces.

The building was constructed in 1969 and an addition was built in 1994.

2.3 Building Occupancy

The building is open Monday through Friday year round. The typical schedule is presented in the table below. During a typical day, the facility is occupied by approximately seven staff.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Administration Office	Weekday	7:30 am - 7:00 pm
Administration Office	Weekend	unoccupied

2.4 Building Envelope

The building is a mix of wood frame and masonry construction with stucco or brick exterior. The windows are dual pane, metal framed and some are operable double-hung style. Some air infiltration was reported in the building and you can refer to Section 5, "Energy Efficient Practices" for more information.

2.5 On-site Generation

The MUA Administration Office does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

Lighting System

Interior lighting at the facility is provided predominately by 32 Watt fluorescent T8 U-shaped lamps as well as compact fluorescent lamps (CFL). Most of the fixtures are 2'x2' T8 U-Bend fixtures with two lamps each. Lighting control is provided by manual switches.

Exterior lighting is provided by a mix of fixtures using metal halide or compact fluorescent lamps that are controlled with photocell and motion sensor controls.

Please refer to Appendix A: Equipment Inventory & Recommendations for an inventory of your equipment.

Heating System

The hot water system consists of a Weil McLain 117,000 Btu/hour natural draft boiler. The boiler has a nominal combustion efficiency of 83.5%. The boiler is manually turned off during the cooling season. The boilers provide hot water to small air handlers that condition most of the building.

The boiler is reported to be in fair condition.

Please refer to Appendix A: Equipment Inventory & Recommendations for an inventory of your equipment.

Air Conditioning (DX)

Cooling is provided by three split system direct expansion units that serve small air handlers. There is a 4 ton Rheem unit manufactured in 2011, a 3.5 ton Rheem unit manufactured in 2009, and a 3.5 ton York unit manufactured in 1994.

The units are controlled by individual thermostats and are manually turned off during the heating season.

Please refer to Appendix A: Equipment Inventory & Recommendations for an inventory of your equipment.

Domestic Hot Water

Domestic hot water is provided by a 50 gallon A.O. Smith water heater.

Please refer to Appendix A: Equipment Inventory & Recommendations for an inventory of your equipment.

2.7 Water-Using Systems

There are two restrooms and a break room with sinks at this facility. The faucets are rated at 2 gpm.

3 SITE ENERGY USE AND COSTS

Utility data for Electricity and Natural Gas was analyzed to identify opportunities for savings. In addition, data for Electricity and Natural Gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

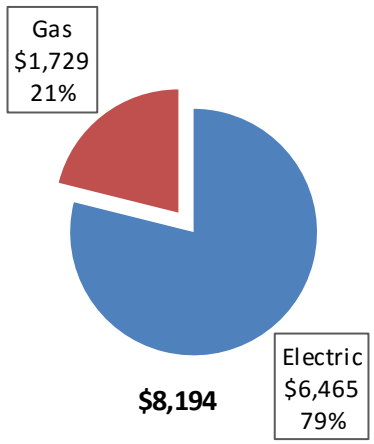
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Willingboro MUA Administration Office		
Fuel	**Usage**	**Cost**
Electricity	45,190 kWh	$6,465
Natural Gas	2,008 Therms	$1,729
Total		**$8,194**

The current utility cost for this site is $8,194 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

The site purchases electricity from Consolidated Edison Solutions and electric delivery is provided by PSE&G. The average electric cost (combined for commodity, transmission and distribution) for the past 12 months is $0.143/kWh, which is the blended rate used throughout the analyses in this report. PSE&G's rate schedule includes charges for energy, annual demand, and summer demand. The monthly electricity consumption and peak demand is represented graphically in the chart below.

Figure 8 - Graph of 12 Months Electric Usage & Demand

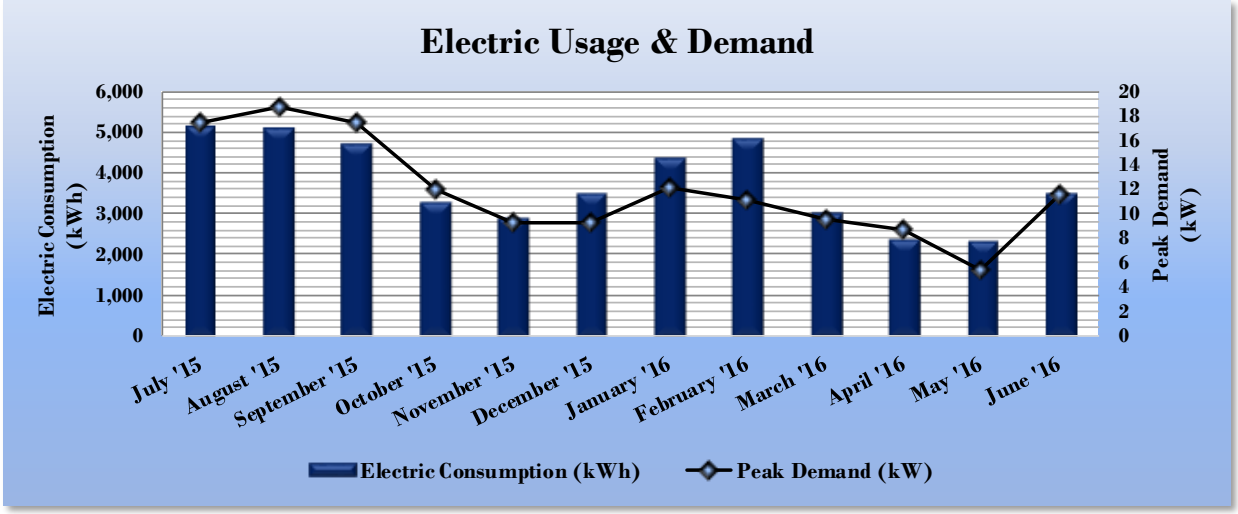


Figure 9 - Table of 12 Months Electric Usage & Demand

Electric Billing Data for Willingboro MUA Administration Office				
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Total Electric Cost
7/23/15	30	5,150	17.5	$888
8/21/15	29	5,100	18.8	$883
9/21/15	31	4,720	17.5	$815
10/21/15	30	3,280	12.0	$445
11/19/15	29	2,920	9.3	$389
12/22/15	33	3,520	9.3	$443
1/22/16	31	4,380	12.1	$537
2/23/16	32	4,830	11.1	$571
3/23/16	29	3,040	9.6	$371
4/22/16	30	2,400	8.7	$299
5/23/16	31	2,340	5.4	$278
6/22/16	30	3,510	11.5	$547
Totals	**365**	**45,190**	**18.8**	**$6,465**
Annual	**365**	**45,190**	**18.8**	**$6,465**

3.3 Natural Gas Usage

Natural Gas is provided by PSE&G. The average gas cost for the past 12 months is $0.861/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is represented graphically in the chart below.

Figure 10 - Graph of 12 Months Natural Gas Usage

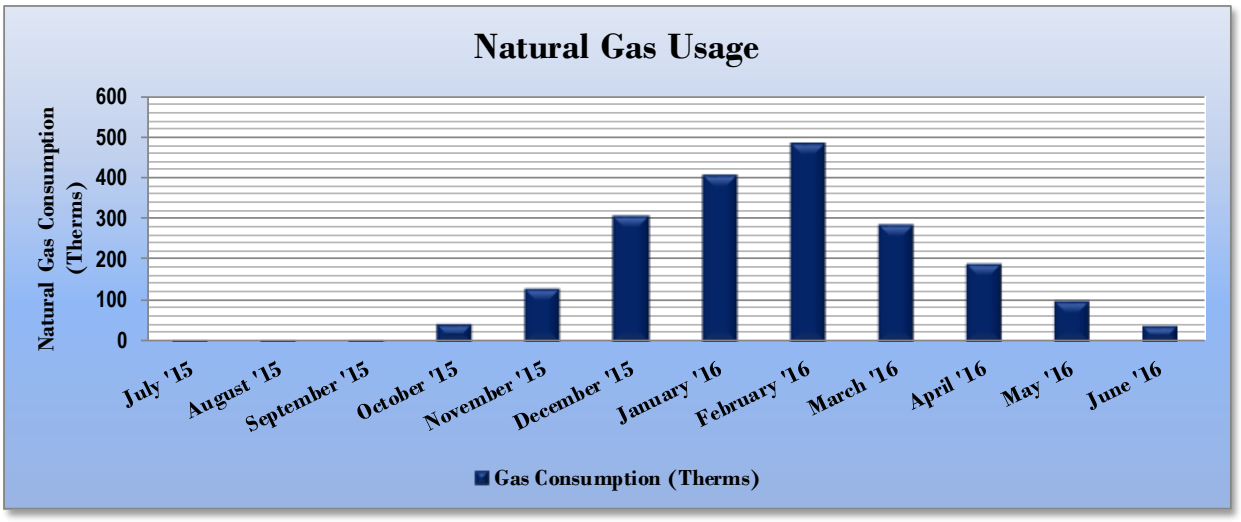


Figure 11 - Table of 12 Months Natural Gas Usage

Gas Billing Data for Willingboro MUA Administration Office			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
7/23/15	30	7	$17
8/21/15	29	5	$15
9/21/15	31	7	$17
10/21/15	30	44	$44
11/19/15	29	131	$116
12/22/15	33	308	$263
1/22/16	31	406	$348
2/23/16	32	484	$404
3/23/16	29	286	$233
4/22/16	30	189	$147
5/23/16	31	101	$85
6/22/16	30	39	$40
Totals	**365**	**2,008**	**$1,729**
Annual	**365**	**2,008**	**$1,729**

3.4 Benchmarking

This facility was benchmarked through Portfolio Manager, an online tool created and managed by the United State Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager analyzes your building's consumption data, cost information, and operational use details and compares its performance against a yearly baseline, national medians, or similar buildings in your portfolio. Metrics used in this comparison are the energy use intensity (EUI) and ENERGY STAR® Score.

Energy use intensity is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more energy than similar buildings on a square foot basis or if that building performs better than the median. EUI is presented in both site energy and source energy. Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy is the raw fuel consumed to generate the energy consumed at the site, factoring in energy production and distribution losses.

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Willingboro MUA Administration Office	National Median Building Type: Office
Source Energy Use Intensity (kBtu/ft^2)	193.1	148.1
Site Energy Use Intensity (kBtu/ft^2)	98.6	67.3

By implementing all recommended measures covered in this report, the Project's estimated post-implementation EUI improves as shown in the Table below:

Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Willingboro MUA Administration Office	National Median Building Type: Office
Source Energy Use Intensity (kBtu/ft^2)	110.2	148.1
Site Energy Use Intensity (kBtu/ft^2)	69.8	67.3

Many types of commercial buildings are also eligible to receive an ENERGY STAR™ score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. Your building is not is one of the building categories that are eligible to receive a score. **ENERGY STAR™ Portfolio Manager only provides scores for office buildings over 5,000 SF. Therefore, a score is not available for this building.**

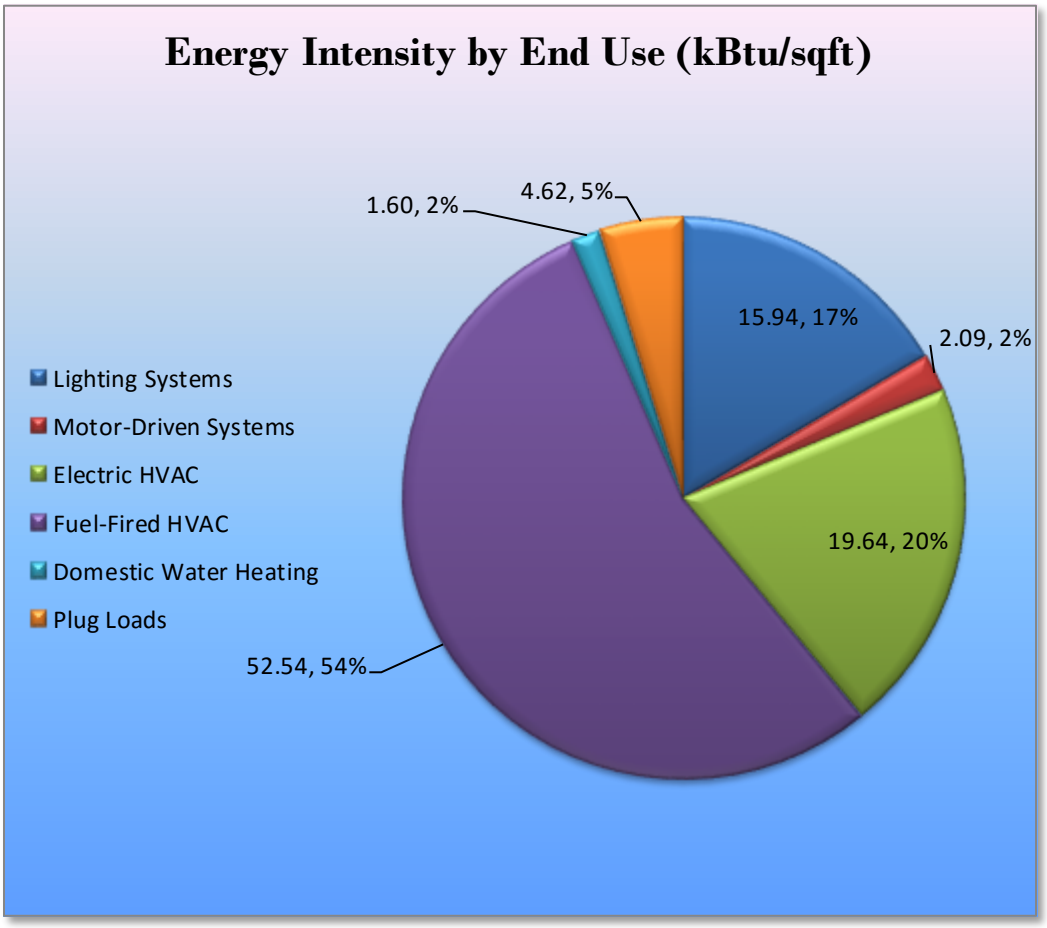
In place of Appendix B there is a document from Portfolio Manage titled "ENERGY STAR™ Data Trends in Offices" and will be helpful when trying to make comparisons to other offices.

A Portfolio Manager account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. Free online training is available to help you use Energy Star Portfolio Manager to track your building's performance at: https://www.energystar.gov/buildings/training

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building and determine their proportional contribution to overall building energy usage. This visual representation of energy end uses highlights systems that may benefit most from energy efficiency projects.

Figure 14 - Energy Balance (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to Willingboro MUA regarding financial incentives for which they may qualify to implement the recommended measures at the Administration Office. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016, approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Natural Gas Savings (MMBtu)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
			12,621	**3.3**	**0.0**	**0.0**	**$1,805.45**	**$9,773.71**	**$1,055.00**	**$8,718.71**	**4.83**	**12,709**
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ECM 5	Install Occupancy Sensor Lighting Controls	Yes	1,093	0.3	0.0	0.0	$156.37	$1,350.00	$175.00	$1,175.00	7.51	1,101
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	Install High Efficiency Electric AC	No	1,200	0.8	0.0	0.0	$171.67	$5,236.77	$322.00	$4,914.77	28.63	1,208
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ECM 6	Install Programmable Thermostats	Yes	12,870	0.0	12.9	12.9	$1,951.89	$989.61	$0.00	$989.61	0.51	14,466
TOTALS			**27,784**	**4.5**	**12.9**	**12.9**	**$4,085.38**	**$17,350.09**	**$1,552.00**	**$15,798.09**	**3.87**	**29,484**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

4.1.1 Lighting Upgrades

Recommended upgrades to existing lighting fixtures are summarized in Figure 16 below.

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
		12,621	**3.3**	**$1,805.45**	**$9,773.71**	**$1,055.00**	**$8,718.71**	**4.83**	**12,709**
ECM 1	Install LED Fixtures	4,261	1.2	$609.58	$3,696.62	$985.00	$2,711.62	4.45	4,291
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	5,301	1.5	$758.38	$5,332.62	$0.00	$5,332.62	7.03	5,338
ECM 3	Retrofit Fixtures with LED Lamps	2,115	0.6	$302.60	$314.25	$70.00	$244.25	0.81	2,130
ECM 4	Install LED Exit Signs	943	0.1	$134.89	$430.22	$0.00	$430.22	3.19	950

ECM 1: Install LED Fixtures

Measure Description

We recommend replacing existing fluorescent and HID exterior lighting fixtures with new high performance LED lighting fixtures. This measure saves energy by installing LED fixtures which use less than half as much power as other most other lighting technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of fluorescent tubes and more than 10 times longer than many incandescent lamps.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Measure Description

We recommend replacing linear fluorescent lamps, ballasts, and reflectors with LED tube lamps, reflectors, and drivers specifically designed for existing linear fluorescent fixtures. The retrofit uses the existing fixture housing but replaces the rest of the components with an efficient source and reflectors designed for LEDs. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Maintenance savings are anticipated since LED sources have burn hours which are more than twice that of a fluorescent tube. Maintenance savings may be partially offset by the higher material costs associated with LED sources.

Please refer to Appendix A: Equipment Inventory & Recommendations for a detailed list of the locations and light fixtures affected by this measure.

ECM 3: Retrofit Fixtures with LED Lamps

Measure Description

We recommend replacing incandescent screw-in lamps with LED lamps. Screw-in or plug-in LED lamps can be used as a direct replacement for most types of screw-in or plug-in lamps. This measure saves energy by installing LED sources which use less power than other technologies with a comparable light output.

Maintenance savings are anticipated since LEDs have rated lifetimes which are more than 10 times that of an incandescent bulb.

Please refer to Appendix A: Equipment Inventory & Recommendations for a detailed list of the locations and light fixtures affected by this measure.

ECM 4: Install LED Exit Signs

Measure Description

We recommend replacing incandescent and compact fluorescent lighting in exit signs with LEDs. LEDs require virtually no maintenance and LED exit signs have a life expectancy of at least 20 years. Many manufacturers can provide retrofit kits that meet fire and safety code requirements. Retrofit kits are less expensive and simpler to install than replacement signs, however, new fixtures would have a longer useful life and are therefore recommended.

Please refer to Appendix A: Equipment Inventory & Recommendations for a detailed list of the locations and light fixtures affected by this measure.

4.1.2 Lighting Control Measures

Recommend lighting control measures are summarized in Figure 17 below.

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**1,121**	**0.3**	**0.0**	**$160.30**	**$1,350.00**	**$175.00**	**$1,175.00**	**7.33**	**1,128**
ECM 4	Install Occupancy Sensor Lighting Controls	1,121	0.3	0.0	$160.30	$1,350.00	$175.00	$1,175.00	7.33	1,128

ECM 5: Install Occupancy Sensor Lighting Controls

Measure Description

We recommend installing occupancy sensors to control light fixtures that are currently manually controlled in conference rooms and offices. Sensors detect occupancy using ultrasonic and/or infrared wave technologies. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Occupants will also be able to manually turn off fixtures. Energy savings result from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. Ceiling-mounted or remote-mounted sensors require the use of low voltage switching relays or a wireless signal to the switch. In general, use wall switch replacement sensors for single occupant offices and other small rooms. Install ceiling-mounted or remote mounted sensors in locations without local switching, in situations where the existing wall switches are not in the line-of-sight of the main work area, and in large spaces. We recommend a holistic design approach that considers both the technology of the lighting sources and how they are controlled.

Please refer to Appendix A: Equipment Inventory & Recommendations for a detailed list of the locations and light fixtures affected by this measure.

4.1.3 HVAC System Improvements

Recommended HVAC system improvement measures are summarized in Figure 18 below.

Figure 18 - Summary of HVAC System Improvement ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**12,870**	**0.0**	**12.9**	**$1,951.89**	**$989.61**	**$0.00**	**$989.61**	**0.51**	**14,466**
ECM 5	Install Programmable Thermostats	12,870	0.0	12.9	$1,951.89	$989.61	$0.00	$989.61	0.51	14,466

ECM 6: Install Programmable Thermostats

Measure Description

We recommend replacing manual thermostats with programmable thermostats. Manual thermostats are generally adjusted to a single heating and cooling setpoint and left at that setting regardless of occupancy in the area served by the HVAC equipment. As a result, the same level of heating and cooling is provided regardless of the occupancy in the space. Programmable thermostats can be set to maintain different temperature settings for different times of day and days of the week. By setting the heating temperature setpoint down and the cooling temperature setpoint up, for times that the conditioned space is not occupied, the operation of the HVAC equipment is reduced while still maintaining reasonable space temperatures during unoccupied periods.

The thermostat measure provides savings by reducing heating and cooling energy when a room is unoccupied.

Please refer to Appendix A: Equipment Inventory & Recommendations for more information about the equipment affected by this measure.

4.2 ECMs Evaluated But Not Recommended

The measures below have been evaluated by the auditor but are not recommended for implementation at the facility. Reasons for exclusion can be found in the measure description section below.

Figure 19 – Summary of ECMs Evaluated but Not Recommended

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**1,200**	**0.8**	**0.0**	**$171.67**	**$5,236.77**	**$322.00**	**$4,914.77**	**28.63**	**1,208**
	Install High Efficiency Electric AC	1,200	0.8	0.0	$171.67	$5,236.77	$322.00	$4,914.77	28.63	1,208
TOTALS		**1,200**	**0.8**	**0.0**	**$171.67**	**$5,236.77**	**$322.00**	**$4,914.77**	**28.63**	**1,208**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Install High Efficiency Electric AC

Measure Description

This measure evaluates replacing the York package air conditioner with a high efficiency package air conditioner. There have been significant improvements in both compressor and fan motor efficiencies in the past several years. Therefore, electricity savings can be achieved by replacing old units with new high

efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the old and new unit, the cooling load, and the annual operating hours.

Please refer to Appendix A: Equipment Inventory & Recommendations for more information about the equipment affected by this measure.

Reasons for not Recommending

This measure is not recommended based on energy savings due to the long simple payback period (SPP=28.6 yrs). However, the unit is approaching the end of its useful life. When it is due for replacement, we recommend replacing it with a high efficiency unit.

5 ENERGY EFFICIENT PRACTICES

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of low or no-cost efficiency strategies. By employing certain behavioral and operational adjustments as well as performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and annual energy, operation, and maintenance costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Reduce Air Leakage

Air leakage, or infiltration, occurs when outside air enters a building uncontrollably through cracks and openings. Properly sealing such cracks and openings can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. This includes caulking or installing weather stripping around leaky doors and windows allowing for better control of indoor air quality through controlled ventilation.

Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

Use Window Treatments/Coverings

A substantial amount of heat gain can occur through uncovered or untreated windows, especially older single pane windows and east or west-facing windows. Treatments such as high-reflectivity films or covering windows with shades or shutters can reduce solar heat gain and, consequently, cooling load and can reduce internal heat loss and the associated heating load.

Perform Proper Lighting Maintenance

In order to sustain optimal lighting levels, lighting fixtures should undergo routine maintenance. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust on lamps, fixtures and reflective surfaces. Together, these factors can reduce total illumination by 20% - 60% or more, while operating fixtures continue drawing full power. To limit this reduction, lamps, reflectors and diffusers should be thoroughly cleaned of dirt, dust, oil, and smoke film buildup approximately every 6 – 12 months.

Practice Proper Use of Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5-10 °F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Clean Evaporator/Condenser Coils on AC Systems

Dirty evaporators and condensers coils cause a restriction to air flow and restrict heat transfer. This results in increased evaporator and condenser fan load and a decrease in cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

Clean and/or Replace HVAC Filters

Air filters work to reduce the amount of indoor air pollution and increase occupant comfort. Over time, filters become less and less effective as particulate buildup increases. In addition to health concerns related to clogged filters, filters that have reached saturation also restrict air flow through the facility's air conditioning or heat pump system, increasing the load on the distribution fans and decreasing occupant comfort levels. Filters should be checked monthly and cleaned or replaced when appropriate.

Check for and Seal Duct Leakage

Duct leakage in commercial buildings typically accounts for 5 to 25 percent of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building, significantly increasing cooling and heating costs. By sealing sources of leakage, cooling, heating, and ventilation energy use can be reduced significantly, depending on the severity of air leakage.

Perform Proper Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

Replace Computer Monitors

Replacing old computer monitors or displays with efficient monitors will reduce energy use. ENERGY STAR® rated monitors have specific requirements for on mode power consumption as well as idle and sleep mode power. According to the ENERGY STAR® website monitors that have earned the ENERGY STAR® label are 25% more efficient than standard monitors.

Water Conservation

Installing low flow faucets or faucet aerators, low flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low flow toilets and low flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

6 On-Site Generation Measures

On-Site Generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

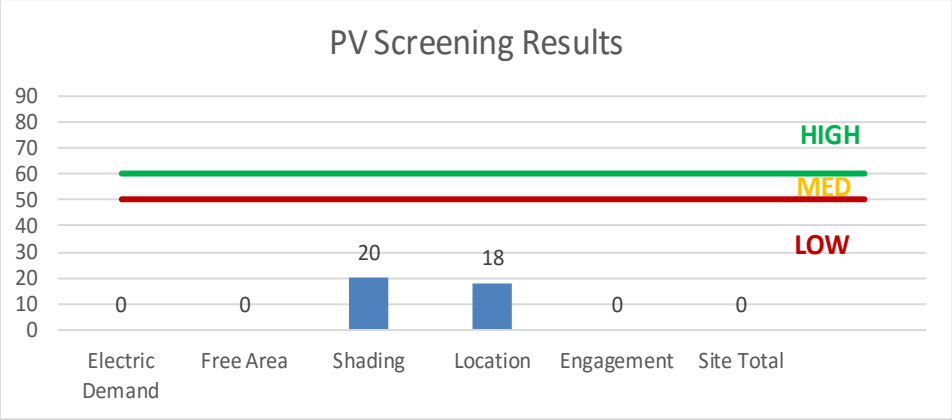
6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a **High** potential for installing a PV array.

In order to be cost-effective though, a solar PV array generally needs a minimum of 4,000 SF of flat or south-facing rooftop, or other unshaded space, on which to place the PV panels. In our opinion, the facility does not appear meet the minimum criteria necessary for a cost-effective PV installation.

Figure 20 - Photovoltaic Screening



Owners of solar projects must register their projects in the SREC Registration Program prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing. Refer to Section 8.3 for additional information.

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

6.2 Combined Heat and Power

In non-industrial settings, combined heat and power (CHP) is the on-site generation of electricity and recovery of heat which is put to beneficial use. Common prime movers in CHP applications include reciprocating engines, microturbines, fuel cells, and (at large facilities) gas turbines. Electricity is typically interconnected to the sites local distribution system. Heat is recovered from the exhaust stream and the ancillary cooling system and interconnected to the existing hot water (or steam) distribution system.

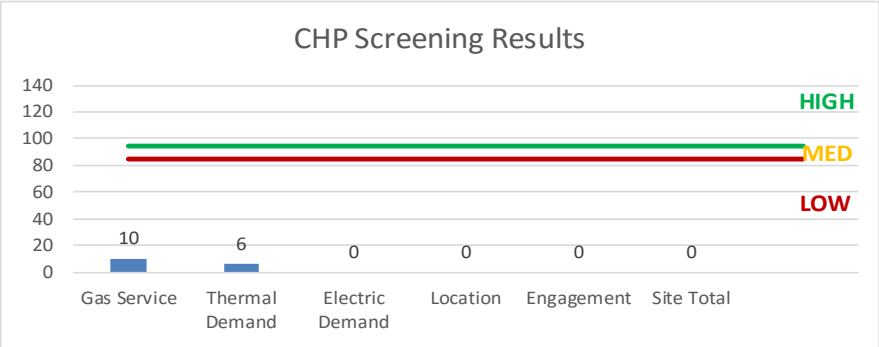
CHP systems are typically used to produce a portion of the electricity needed by a facility, with the balance of electric needs satisfied by purchase from the grid. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a **Low** potential for installing a cost-effective CHP system.

Low or infrequent thermal load, and lack of space near the existing thermal generation are the most significant factors contributing to the low potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in NJ specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/

Figure 21 - Combined Heat and Power Screening



7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce consumer electric load when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. DR service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability locally.

By enabling grid operators to call upon Curtailment Service Providers and energy consumers to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants will receive payments whether or not their facility is called upon to curtail their load.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR program often find it to be a valuable source of revenue for their facility(ies) because the payments can significantly offset annual utility costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats so that air conditioning units run less frequently or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR event cycle. DR program participants often have to install smart meters and may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (www.pjm.com/training/trainingmaterial.aspx), along with a variety of other program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding the program rules and requirements for metering and controls, a facility's ability to temporarily reduce electric load, as well as the payments involved in participating in the program. Also, these providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment to help ensure compliance of all terms and conditions of a DR contract.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and others, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's 1999 Electricity Restructuring Law which requires all customers of investor-owned electric and gas utilities to pay this charge on their monthly energy bills. As a contributor to the fund you were able to participate in the LGEA program and are also eligible to utilize the equipment incentive programs. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 22 for a list of the eligible programs identified for each recommended ECM.

Figure 22 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings
ECM 1	Install LED Fixtures	X		X	
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers			X	
ECM 3	Retrofit Fixtures with LED Lamps	X		X	
ECM 4	Install LED Exit Signs			X	
ECM 5	Install Occupancy Sensor Lighting Controls	X		X	
ECM 6	Install Programmable Thermostats			X	

SmartStart (SS) is generally well suited for implementation of individual or small sets of measures, with the flexibility to install projects at your own pace using in-house staff or a preferred contractor. Direct Install (DI) caters to small to mid-size facilities to bundle measures and simplify participation, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities and requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption; applicants can use in-house staff or preferred contractor.

Generally, the incentive values provided throughout the report assume the SS program is utilized because it provides a consistent comparison of available incentives.

Brief descriptions of all relevant alternative financing and incentive programs are located in the sections below. You may also check the following website for further information, including most current program availability, requirements, and incentive levels: www.njcleanenergy.com/ci

8.1 SmartStart

Overview

The SmartStart (SS) program is comprised of New Construction and Retrofit components that offer incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives for various energy efficiency equipment based on national/market trends, new technologies or changes in efficiency baselines.

Prescriptive Equipment Incentives Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

All customer sizes and types may be served by this program. This program provides an effective mechanism for securing incentives for individual projects that may be completed at once or over several years.

Incentives

The prescriptive path provides fixed incentives for specific energy efficiency measures whereas the custom measure path provides incentives for unique or specialized technologies that are not addressed through prescriptive offerings.

Since your facility is an existing building, only the Retrofit incentives have been applied in this report. Custom Measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at the lesser of 50% of the total installed incremental project cost, or a buy down to a one year payback. Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB

8.2 Direct Install

Overview

Direct Install (DI) is a turnkey program available to existing small to mid-sized facilities with a peak electric demand that did not exceed 200 kW in any of the preceding 12 months. You will work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and install those measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives and controls.

Incentives

The program pays up to 70% of the total installed cost of eligible measures, up to $125,000 per project. Direct Install participants will also be held to a fiscal year cap of $250,000 per entity.

How to Participate

To participate in the DI program you will need to contact the participating contractor assigned to the county where your facility is located; a complete list is provided on the DI website identified below. The contractor will be paid the program incentive directly which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps mentioned above, and the remaining 30% of the cost is your responsibility to the contractor.

Since DI offers a free assessment, LGEA applicants that do not meet the audit program eligibility requirements, but do meet the DI requirements, may be moved directly into this program.

Detailed program descriptions and applications can be found at: www.njcleanenergy.com/DI

8.3 SREC Registration Program

The SREC Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number which enables it to generate New Jersey SRECs. SREC's are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SREC's to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar RPS. One way they can meet the RPS requirements is by purchasing SRECs. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period can and will fluctuate depending on supply and demand.

Information about the SRP can be found at: www.njcleanenergy.com/srec

8.4 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract", whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure

of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an Energy Services Company or "ESCO";
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations;
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize the incentive programs to help further reduce costs when compiling the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

8.5 Demand Response Energy Aggregator

The first step toward participation in a Demand Response (DR) program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (www.pjm.com/training/trainingmaterial.aspx), along with a variety of other program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding the program rules and requirements for metering and controls, a facility's ability to temporarily reduce electric load, as well as the payments involved in participating in the program. Also, these providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment to help ensure compliance of all terms and conditions of a DR contract.

See Section 7 for additional information.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e. non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: **www.state.nj.us/bpu/commercial/shopping.html**.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a Third Party Supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: **www.state.nj.us/bpu/commercial/shopping.html**.

APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Hallway	4	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	2,300	LED Retrofit	No	4	LED - Linear Tubes: (2) U-Lamp	Wall Switch	32	2,300	0.13	431	0.0	$61.59	$453.84	$0.00	7.37
Conf Room	18	LED Screw-In Lamps: recessed	Wall Switch	11	2,300	None	Yes	18	LED Screw-In Lamps: recessed	Occupancy Sensor	11	1,610	0.05	160	0.0	$22.87	$270.00	$35.00	10.28
Conf Room	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,300	None	Yes	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,610	0.02	55	0.0	$7.85	$0.00	$0.00	0.00
Office	6	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	2,300	LED Retrofit	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	32	1,610	0.24	801	0.0	$114.57	$950.76	$35.00	7.99
Reception	9	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	2,875	LED Retrofit	No	9	LED - Linear Tubes: (2) U-Lamp	Wall Switch	32	2,875	0.29	1,211	0.0	$173.23	$1,021.14	$0.00	5.89
Office	14	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	2,300	LED Retrofit	Yes	14	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	32	1,610	0.55	1,869	0.0	$267.32	$1,858.44	$35.00	6.82
Womens RR	5	Incandescent: general	Wall Switch	100	2,300	LED Retrofit	No	5	LED Screw-In Lamps: screw in LED	Wall Switch	16	2,300	0.33	1,130	0.0	$161.69	$133.75	$50.00	0.52
Office	8	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	2,300	LED Retrofit	Yes	8	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	32	1,610	0.32	1,068	0.0	$152.75	$1,177.68	$35.00	7.48
Exec Director	6	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	2,300	LED Retrofit	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	32	1,610	0.24	801	0.0	$114.57	$950.76	$35.00	7.99
Restroom	2	Incandescent: general	Wall Switch	100	2,300	LED Retrofit	No	2	LED Screw-In Lamps: screw in LED	Wall Switch	16	2,300	0.13	452	0.0	$64.67	$53.50	$20.00	0.52
Exit Sign	4	Exit Signs: Incandescent	None	25	8,760	Fixture Replacement	No	4	LED Exit Signs: 2 W Lamp	None	2	8,760	0.07	943	0.0	$134.89	$430.22	$0.00	3.19
Exterior	7	Compact Fluorescent: recessed	Occupancy Sensor	32	2,190	LED Retrofit	No	7	LED - Fixtures: Downlight Recessed	Occupancy Sensor	17	2,190	0.08	269	0.0	$38.49	$402.57	$35.00	9.55
Exterior	8	Metal Halide: (1) 150W Lamp	Occupancy Sensor	190	2,190	Fixture Replacement	No	8	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Occupancy Sensor	40	2,190	0.95	3,075	0.0	$439.86	$2,670.32	$800.00	4.25
Exterior	4	Compact Fluorescent: Pole	Daylight Dimming	43	4,380	Relamp	No	4	LED Screw-In Lamps: 17W LED bulbs	Daylight Dimming	17	4,380	0.08	533	0.0	$76.24	$127.00	$0.00	1.67
Exterior	1	Metal Halide: (1) 50W Lamp	Occupancy Sensor	72	2,190	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Occupancy Sensor	14	2,190	0.05	149	0.0	$21.26	$277.54	$100.00	8.35
Exterior	1	Metal Halide: (1) 150W Lamp	Daylight Dimming	190	4,380	Fixture Replacement	No	1	LED - Fixtures: Outdoor Pole/Arm-Mounted Decorative Fixture	Daylight Dimming	40	4,380	0.12	769	0.0	$109.97	$346.19	$50.00	2.69

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
AHU Attic	Conference Room	3	Supply Fan	0.3	78.2%	No	3,120	No	78.2%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Outside	Conference Room	1	Split-System AC	4.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Outside	Two Offices	1	Split-System AC	3.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Outside	Older part of Building	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	0.80	1,200	0.0	$171.67	$5,236.77	$322.00	28.63
Break Room	Break Room	1	Electric Resistance Heat		20.48	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rest room	Rest room	1	Electric Resistance Heat		20.48	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mech Room	Building	1	Non-Condensing Hot Water Boiler	117.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Programmable Thermostat Recommendations

		Recommendation Inputs				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	Thermostat Quantity	Cooling Capacity of Controlled System (Tons)	Electric Heating Capacity of Controlled System (kBtu/hr)	Output Heating Capacity of Controlled System (MBh)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Building	Air Handlers	3	11.00		117.00	0.00	12,870	12.9	$1,951.89	$989.61	$0.00	0.51

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Basement	Building	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Offices	5	Desktop computers	250.0	Yes
Offices	7	Computer printers	50.0	Yes
Break Room	1	Refrigerator	180.0	No

APPENDIX B: PORTFOLIO MANAGER OFFICE DATA TRENDS

ENERGY STAR® PortfolioManager®

DataTrends

Energy Use in Offices

Offices Using Portfolio Manager

60,848 Properties

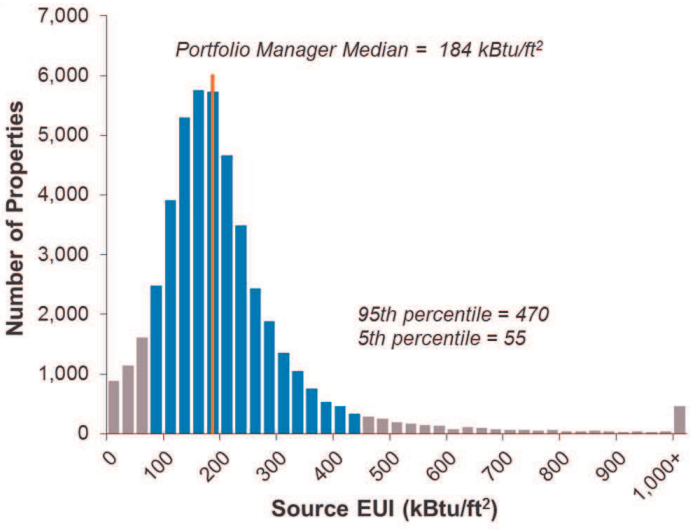
8.7 Billion ft²

63 Average ENERGY STAR Score

The U.S. Environmental Protection Agency's (EPA) ENERGY STAR Portfolio Manager is changing the way organizations track and manage energy. Because of this widespread market adoption, EPA has prepared the DataTrends series to examine benchmarking and trends in energy and water consumption in Portfolio Manager. To learn more, visit www.energystar.gov/DataTrends.

What is a typical operating profile?

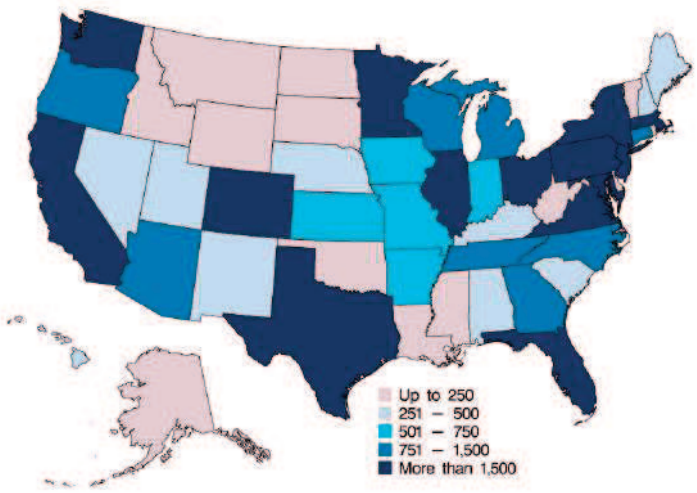
Energy use intensity (EUI) ranges from less than 100 to more than 1,000 kBtu/ft² across all offices, with those at the 95th percentile using almost 9 times the energy of those at the 5th percentile. The distribution has a negative skew, which means the most energy intensive properties are further away from the median than the most efficient. Properties may use more or less energy for many reasons, including variable equipment efficiency and energy management practices, as well as variations in climate and business activities.



The median office in Portfolio Manager is about 63,000 square feet and operates 60 hours per week. But the typical property use patterns observed in Portfolio Manager vary just as much as energy. As you can see, there are offices of all shapes and sizes benchmarking in Portfolio Manager.

Benchmarking by State

Number of Offices

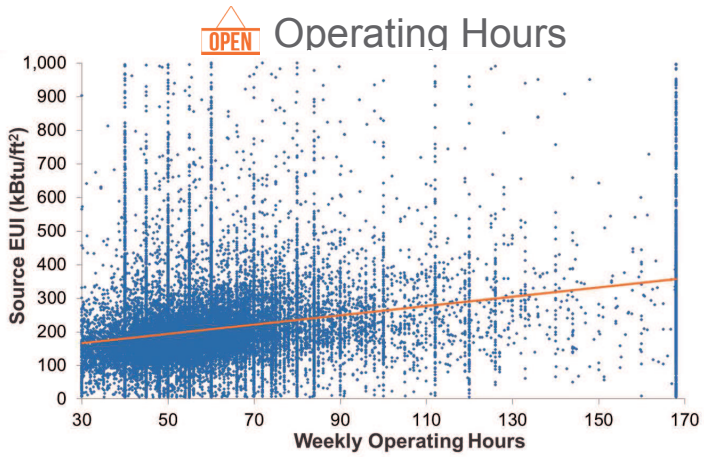


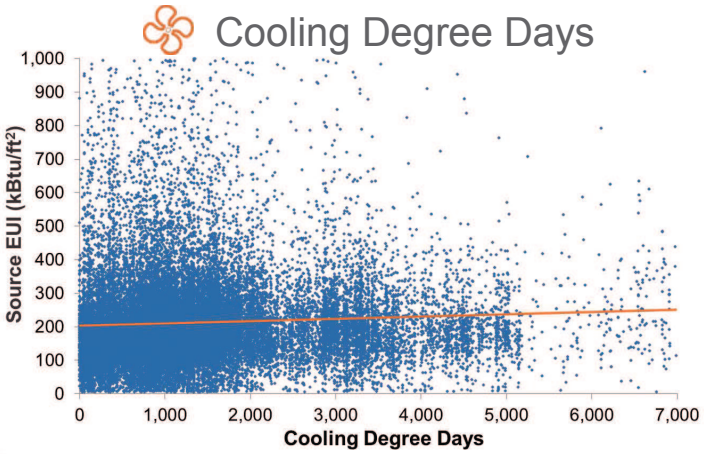
Property Characteristic	Range of Values: 5th percentile	Median	95th percentile
Square Feet	7,381	63,463	522,173
Operating Hours	40	60	105
Workers per 1,000 ft²	0.6	2.3	5.5
Computers per 1,000 ft²	0.6	2.3	6.5
Heating Degree Days	738	4,215	7,360
Cooling Degree Days	124	1,108	3,643

What is Source Energy? Source energy is the amount of raw fuel required to operate your property. In addition to what you use on site, source energy includes losses from generation, transmission, and distribution of energy. Source energy enables the most complete and equitable energy assessment. Learn more at: www.energystar.gov/SourceEnergy.

What characteristics affect energy use in offices?

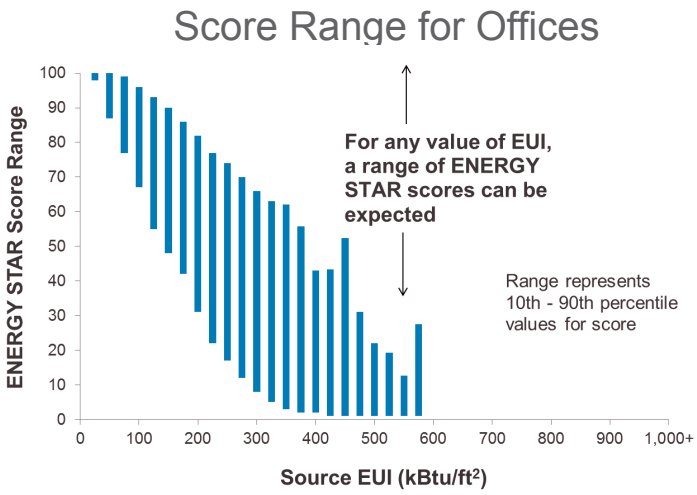
Business activity and climate are often correlated with energy consumption. For example, offices that are open longer hours, have more workers per square foot, and/or experience more cooling degree days (CDD) use more energy, on average. The orange trend lines in the graphs below are steeper for hours and workers, meaning that these characteristics have a stronger effect on energy than CDD. While these trends hold true on average, two properties with the same hours could have very different energy, as shown by the range in the blue dots. Similar trends can be seen for other indicators of business activity, such as number of computers.



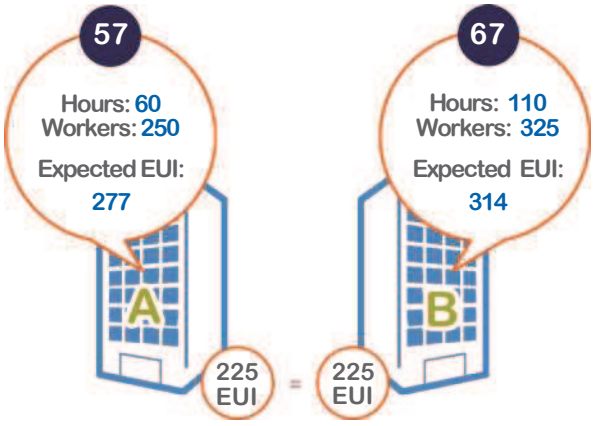


How does EPA's ENERGY STAR score vary with energy use?

EPA's ENERGY STAR score normalizes for the effects of operation. While properties with lower EUI generally earn higher scores on the 1-100 scale, an individual property's result depends on its business activities. For any given EUI, a range of scores is possible.



Let's look at two offices, Office A and Office B. They have the same EUI of 225 kBtu per square foot, and are identical except that Office B is open longer hours and has more workers per square foot. Because Office B has more intensive activities, it is expected to have a higher EUI than Office A, based on ENERGY STAR scoring models. Since Office B is *expected* to use more energy, but *actually* uses the same energy, it earns a higher score.



Note: *Total number and floor area of properties benchmarked reflects cumulative data through 2013. Analysis of energy use and operational characteristics includes 46,306 properties benchmarked in the most recent 5 years. The data is self reported and has been filtered to exclude outliers, incomplete records, and test facilities. Portfolio Manager is not a randomly selected sample and is not the basis of the ENERGY STAR score. To learn more, visit: www.energystar.gov/DataTrends.*

EPA United States Environmental Protection Agency

Energy Performance

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Number of properties in report: 1

Property Id	Property Name	Year Ending	City	State/Province	Postal Code	Property GFA - EPA Calculated (Buildings) (ft^2)	Site EUI ($kBtu/ft^2$)	Source EUI ($kBtu/ft^2$)	Weather Normalized Site EUI ($kBtu/ft^2$)	Weather Normalized Source EUI ($kBtu/ft^2$)	Site EUI - Adjusted to Current Year ($kBtu/ft^2$)	Source EUI - Adjusted to Current Year ($kBtu/ft^2$)	National Median Site EUI ($kBtu/ft^2$)	National Median Source EUI ($kBtu/ft^2$)	% Difference from National Median Source EUI	Energy Cost ($)
5765282	Willingboro MUA Administration Office	5/31/2016	Willingboro Township	New Jersey	08046	3600	98.6	194.5	106.1	205.3	Not Available	Not Available	75.1	148.1	31.4	Not Available