Local Government Energy Audit:
Energy Audit Report

David C. Abbott Early Learning Center

171 Tennent Rd

Morganville, New Jersey 07751

Marlboro Township Board of Education

October 23, 2018

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 (TRC) 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 David C. Abbott Early Learning Center.

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 facilities 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 (TRC), as part of a comprehensive effort to assist New Jersey local governments in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

David C. Abbott Early Learning Center is a 39,538 square foot facility comprised of classrooms, office space, a nurse's station, storage, electrical and mechanical space, and other common areas. The building was originally built in 2002, and is in good condition. The building is occupied on weekdays between 8:30 AM and 4:00 PM, and on Sundays between 9:00 AM and 1:00 PM. The building is occupied by approximately 240 students and 71 staff.

This facility is 100% heated and cooled. A majority of the building systems are just over 15 years old, and the mechanical equipment is in fair condition. The lighting primarily consists of fluorescent lamps. Many of the motors are standard efficiency and serve systems which have potential for energy savings through variable speed drive (VFD) control. Building heating is supplied by two natural gas condensing hot water boilers while an electric air-cooled chiller supplies building cooling. A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated and recommends eight measures which together represent an opportunity for David C. Abbott Early Learning Center to reduce annual energy costs by roughly $21,657 and annual greenhouse gas emissions by 159,747 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 5.2 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce David C. Abbott Early Learning Center's annual energy use by 15%.

Figure 1 – Previous 12 Month Utility Costs

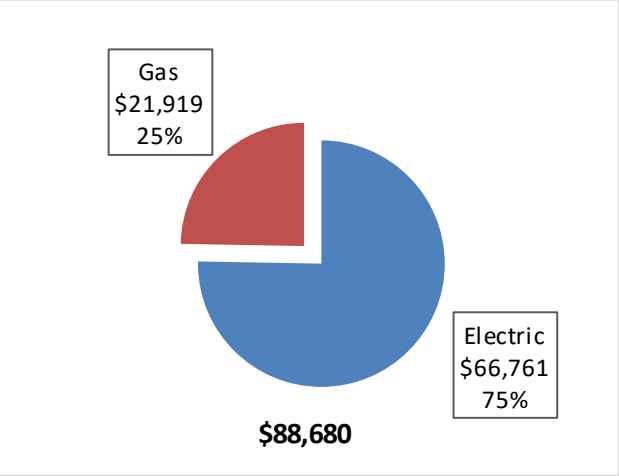
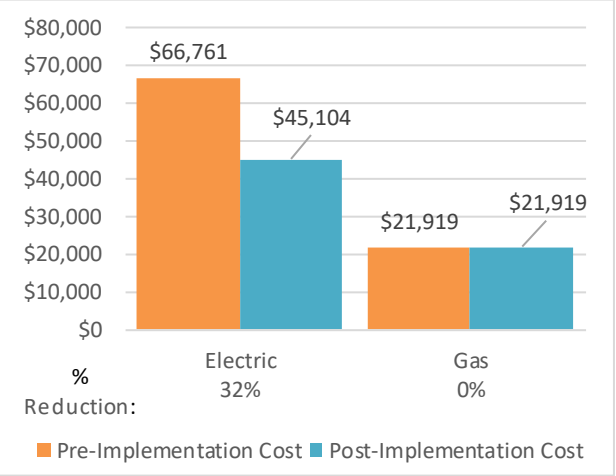


Figure 2 – Potential Post-Implementation Costs



A detailed description of David C. Abbott Early Learning Center's existing energy use can be found in Section 3.

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4.

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	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 Upgrades			**71,779**	**20.6**	**0.0**	**$9,799.24**	**$70,000.86**	**$11,510.00**	**$58,490.86**	**6.0**	**72,281**
ECM 1	Install LED Fixtures	Yes	6,990	0.9	0.0	$954.34	$7,581.33	$1,400.00	$6,181.33	6.5	7,039
ECM 2	Retrofit Fixtures with LED Lamps	Yes	64,788	19.7	0.0	$8,844.90	$62,419.54	$10,110.00	$52,309.54	5.9	65,241
Lighting Control Measures			**14,851**	**4.6**	**0.0**	**$2,027.51**	**$12,824.00**	**$3,430.00**	**$9,394.00**	**4.6**	**14,955**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	14,851	4.6	0.0	$2,027.51	$12,824.00	$3,430.00	$9,394.00	4.6	14,955
Motor Upgrades			**2,884**	**0.7**	**0.0**	**$393.73**	**$9,710.95**	**$0.00**	**$9,710.95**	**24.7**	**2,904**
ECM 4	Premium Efficiency Motors	Yes	2,884	0.7	0.0	$393.73	$9,710.95	$0.00	$9,710.95	24.7	2,904
Variable Frequency Drive (VFD) Measures			**67,169**	**11.1**	**0.0**	**$9,169.95**	**$39,868.25**	**$5,400.00**	**$34,468.25**	**3.8**	**67,639**
ECM 5	Install VFDs on Constant Volume (CV) HVAC	Yes	15,615	5.0	0.0	$2,131.78	$20,647.95	$3,000.00	$17,647.95	8.3	15,724
ECM 6	Install VFDs on Chilled Water Pumps	Yes	42,597	4.8	0.0	$5,815.29	$12,668.60	$2,400.00	$10,268.60	1.8	42,894
ECM 7	Install VFDs on Hot Water Pumps	Yes	8,958	1.3	0.0	$1,222.89	$6,551.70	$0.00	$6,551.70	5.4	9,020
Plug Load Equipment Control - Vending Machine			**1,954**	**0.0**	**0.0**	**$266.81**	**$460.00**	**$0.00**	**$460.00**	**1.7**	**1,968**
ECM 8	Vending Machine Control	Yes	1,954	0.0	0.0	$266.81	$460.00	$0.00	$460.00	1.7	1,968
TOTALS			**158,638**	**37.1**	**0.0**	**$21,657.24**	**$132,864.06**	**$20,340.00**	**$112,524.06**	**5.2**	**159,747**

* - 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 measures 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 not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Motor Upgrades generally involve replacing older standard efficiency motors with high efficiency standard (NEMA Premium®). Motors replacements generally assume the same size motors, just higher efficiency. Although occasionally additional savings can be achieved by downsizing motors to better meet current load requirements. This measure saves energy by reducing the power used by the motors, due to improved electrical efficiency.

Variable Frequency Drives (VFDs) are motor control devices. These measures control the speed of a motor so that the motor spins at peak efficiency during partial load conditions. Sensors adapt the speed to flow, temperature, or pressure settings which is much more efficient that usage a valve or damper to control flow rates, or running the motor at full speed when only partial power is needed. These measures save energy by controlling motor usage more efficiently.

Plug Load Equipment control measures generally involve installing automated devices that limit the power usage or operation of equipment that is plugged into an electric outlet when not in use.

Energy Efficient Practices

TRC also identified seven low cost (or no cost) energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at David C. Abbott Early Learning Center include:

- Perform Proper Lighting Maintenance
- Ensure Lighting Controls Are Operating Properly
- Assess Chillers & Request Tune-Ups
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

For details on these energy efficient practices, please refer to Section 5.

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for David C. Abbott Early Learning Center. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array.

Figure 4 – Photovoltaic Potential

Potential	High	
System Potential	107	kW DC STC
Electric Generation	80,512	kWh/yr
Displaced Cost	$7,000	/yr
Installed Cost	$278,200	

For details on our evaluation and on-site 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
- Direct Install
- Pay for Performance - Existing Building (P4P)
- 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 SmartStart 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 SmartStart program. More details on this program and others are available in Section 8.

This facility may also qualify for the Direct Install program which can provide turnkey installation of multiple measures, through an authorized network of participating contractors. This program can provide substantially higher incentives that SmartStart, up to 70% of the cost of selected measures, although measure eligibility will have to be assessed and be verified by the designated Direct Install contractor and, in most cases, they will perform the installation work.

Larger facilities with an interest in a more comprehensive whole building approach to energy conservation should consider participating in the Pay for Performance (P4P) program. Projects eligible for this project program must meet minimum savings requirements. Final incentives are calculated based on actual measured performance achieved at the end of the project. The application process is more involved, and it requires working with a qualified P4P contractor, but the process may result in greater energy savings overall and more lucrative incentives, up to 50% of project's total cost.

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 8.5 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 information on relevant incentive programs is located in Section 8 or: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Cindy Barr-Rague	Business Administator/Board Secretary	cbarr-rague@mtps.org	732-972-2000 Ext 2010
Michael Crivelli	Supervisor of Building and Grounds	mcrivelli@mtps.org	732-972-2122
Al Giezey	HVAC Maintenance		732-547-9199
TRC Energy Services			
Smruti Srinivasan	Auditor	Ssrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On March 15, 2018, TRC performed an energy audit at David C. Abbott Early Learning Center located in Morganville, New Jersey. TRC's team met with Al Giezey to review the facility operations and help focus our investigation on specific energy-using systems.

David C. Abbott Early Learning Center is a 39,538 square foot facility comprised of classrooms, office space, a nurse's station, storage, electrical and mechanical space, and other common areas. The building was originally built in 2002, and is in good condition. The building is occupied on weekdays between 8:30 AM and 4:00 PM, and on Sundays between 9:00 AM and 1:00 PM. The building is occupied by approximately 240 students and 71 staff.

This facility is 100% heated and cooled. A majority of the building systems are just over 15 years old, and the mechanical equipment is in fair condition. The lighting primarily consists of fluorescent lamps. Many of the motors are standard efficiency and serve systems which have potential for energy savings through variable speed drive (VFD) control. Building heating is supplied by two natural gas condensing hot water boilers while an electric air-cooled chiller supplies building cooling. A thorough description of the facility and our observations are located in Section 2.

2.3 Building Occupancy

The school building is open Monday through Friday and on Sunday morning. The typical schedule is presented in the table below. The entire facility is used year-round. During a typical day, the facility is occupied by approximately 71 staff and 240 students.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
David C Abbott Early Learning Center	Weekday	September - June: 8:30 AM - 4:00 PM July & August: 9:30 AM - 2:00 PM
David C Abbott Early Learning Center	Weekend	Saturday - No Operation Sunday 9:00 AM - 1:00 PM

2.4 Building Envelope

The David C. Abbott Early Learning Center is constructed of structural steel with a brick façade. The building has a pitched metal roof that is in good condition. The building has double paned windows which are in good condition and show little sign of excessive infiltration. The exterior doors are constructed of aluminum with metal framed glass, and are in good condition.

Image 1: Building Envelope

2.5 On-Site Generation

David C. Abbott Early Learning Center does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

Please see Appendix A: Equipment Inventory & Recommendations for an inventory of the facility's equipment.

Lighting System

Lighting is provided mostly by 32-Watt linear fluorescent T8 lamps with electronic ballasts as well as 26-Watt and 13-Watt compact fluorescent lamps (CFL) and a few incandescent lamps. Most of the linear fluorescent fixtures are 4-foot long luminaires. Exit signs are LED fixtures.

Lighting control in most spaces is provided by wall switches. There are a few locations with occupancy sensors that are either wall or ceiling mounted depending on the space layout.

The building's exterior lighting consists primarily of high pressure sodium (HPS), metal halide (MH), and CFL fixtures that are controlled by timers.

Image 2: Lighting Systems

Chilled Water Air Conditioning System (CHW)

The facility is served by a single chilled water plant. The chiller plant consists of a single 170 ton McQuay air cooled screw chiller with two constant flow chilled water pumps. This chiller provides cooling to the entire building. The chiller system is older, but has been well maintained, and is in fair condition. There are ¾ HP Airedale fan units in each classroom providing both cooling and heating to the zones. Three air handler units provide cooling to common area spaces including the administration area, nurse's office, and the northern corridor.

Image 3: Chiller System

Hot Water Heating System

The hot water system consists of two Aerco Benchmark 2.0 condensing boilers. The boilers have a nominal combustion efficiency of 88%. The boilers operate in a lead/lag configuration, and are rotated during non-peak weather. Both boilers may be required during cold weather. The boilers are in good condition and are well maintained. Two constant flow hot water heating pumps provide hot water to the classroom fan units and to the air handling units.

The buildings HVAC systems are controlled using a Johnson Controls building energy management system (BEMS).

Image 4: Heating System

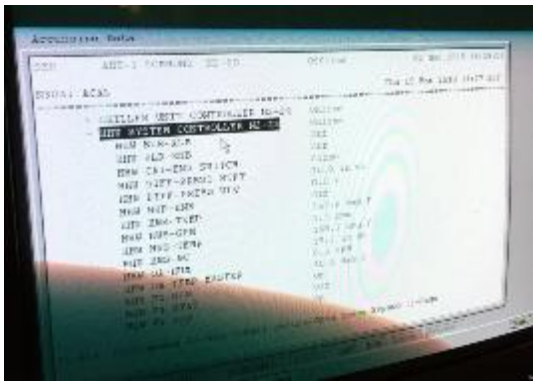


Image 5: Building Energy Management System

Domestic Water Heating System

The domestic hot water heating system for the facility consists of a single A.O. Smith water heater with an input rating of 199 MBh and a nominal efficiency of 80%. The water heater has a 100 gallon storage tank.

Image 6: Domestic Water Heating System

Building Plug Load and Vending Machines

There are roughly 28 computer work stations throughout the facility. Roughly 90% of the computers are desktop units with LCD monitors. There is no centralized PC power management software installed. There are roughly 27 projectors and Smartboards in the classrooms, as well as about nine printers throughout the building.

The facility has two vending machines, one of which is a refrigerated beverage vending machine.

2.7 Water-Using Systems

There are 19 restrooms at this facility. A sampling of restrooms found that the faucets are rated at 2.0 gallons per minute (gpm) or lower, and the toilets and urinals are 1.6 gallons per flush (gpf) or less.

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

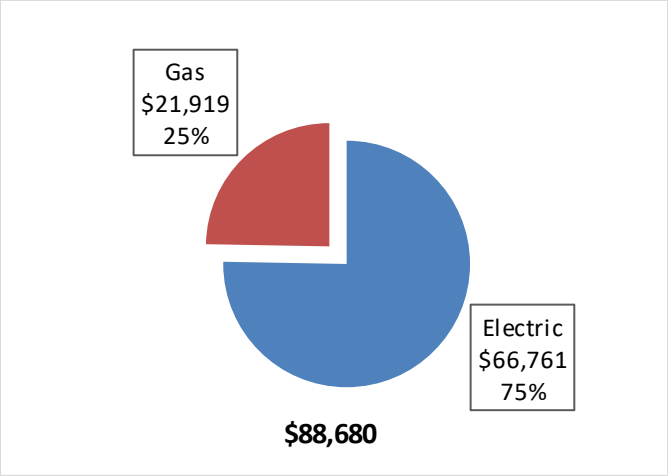
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 7 - Utility Summary

Utility Summary for David C Abbott Early Learning Center		
Fuel	**Usage**	**Cost**
Electricity	489,020 kWh	$66,761
Natural Gas	19,149 Therms	$21,919
Total		**$88,680**

The current annual energy cost for this facility is $88,680 as shown in the chart below.

Figure 8 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.137/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. This facility does pay electrical demand charges for the peak demand. The monthly electricity consumption and peak demand are shown in the chart below. High summer peak demand reflect the use of the building during peak cooling season.

Figure 9 - Electric Usage & Demand

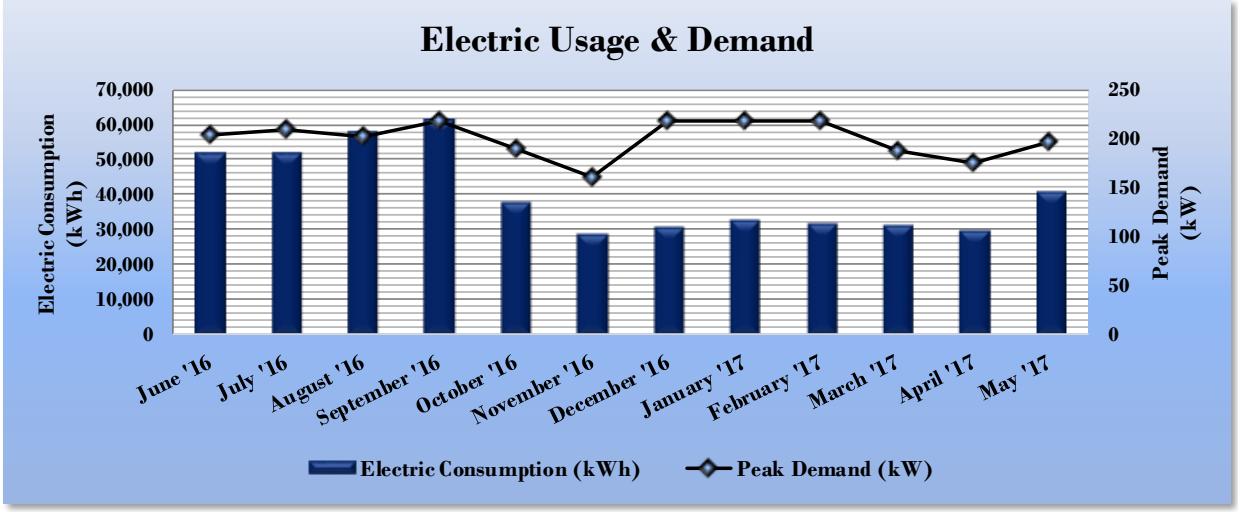


Figure 10 - Electric Usage & Demand

Electric Billing Data for David C Abbott Early Learning Center					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
6/30/16	29	52,160	204		$6,745
7/31/16	31	52,160	210		$6,840
8/31/16	31	58,240	202		$7,440
9/30/16	30	61,440	218		$7,956
10/31/16	31	37,920	189		$5,278
11/30/16	30	28,640	160		$4,179
12/31/16	31	30,720	218		$4,091
1/31/17	31	32,640	218		$4,414
2/28/17	28	32,000	218		$4,375
3/31/17	31	31,200	187		$4,789
4/30/17	30	29,600	174		$4,550
5/31/17	31	40,960	197		$5,920
Totals	**364**	**487,680**	**217.9**	**$0**	**$66,578**
Annual	**365**	**489,020**	**217.9**	**$0**	**$66,761**

3.3 Natural Gas Usage

Natural gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $1.145/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below. High winter use reflects that building heating is the primary use for natural gas

Figure 11 - Natural Gas Usage

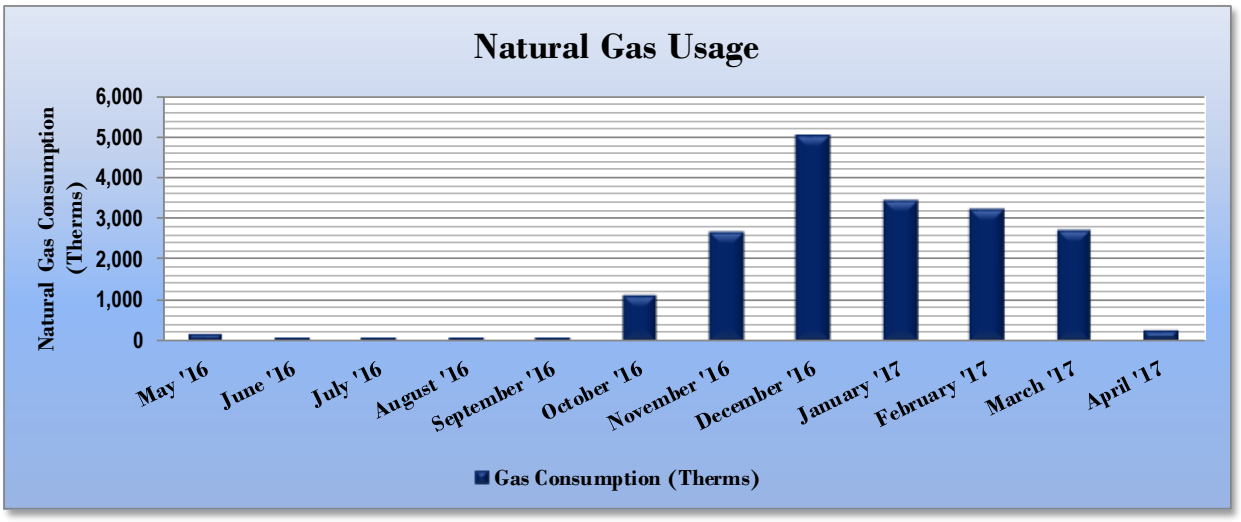


Figure 12 - Natural Gas Usage

Gas Billing Data for David C Abbott Early Learning Center			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
6/10/16	30	171	$468
7/13/16	33	105	$414
8/10/16	28	98	$384
9/8/16	29	90	$400
10/7/16	29	97	$424
11/8/16	32	1,136	$1,378
12/9/16	31	2,706	$2,825
1/11/17	33	5,046	$5,013
2/10/17	30	3,460	$3,623
3/13/17	31	3,245	$3,559
4/11/17	29	2,739	$2,872
5/11/17	30	257	$559
Totals	**365**	**19,149**	**$21,919**
Annual	**365**	**19,149**	**$21,919**

3.4 Benchmarking

This facility was benchmarked using Portfolio Manager®, an online tool created and managed by the United States Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager® analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR® score for select building types.

The EUI 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 or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "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 includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 13 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	David C Abbott Early Learning Center	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	183.4	141.4
Site Energy Use Intensity (kBtu/ft^2)	90.6	58.2

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the table below:

Figure 14 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	David C Abbott Early Learning Center	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	140.4	141.4
Site Energy Use Intensity (kBtu/ft^2)	76.9	58.2

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. This facility has a current score of 12.

A Portfolio Manager® Statement of Energy Performance (SEP) was generated for this facility, see Appendix B: ENERGY STAR® Statement of Energy Performance.

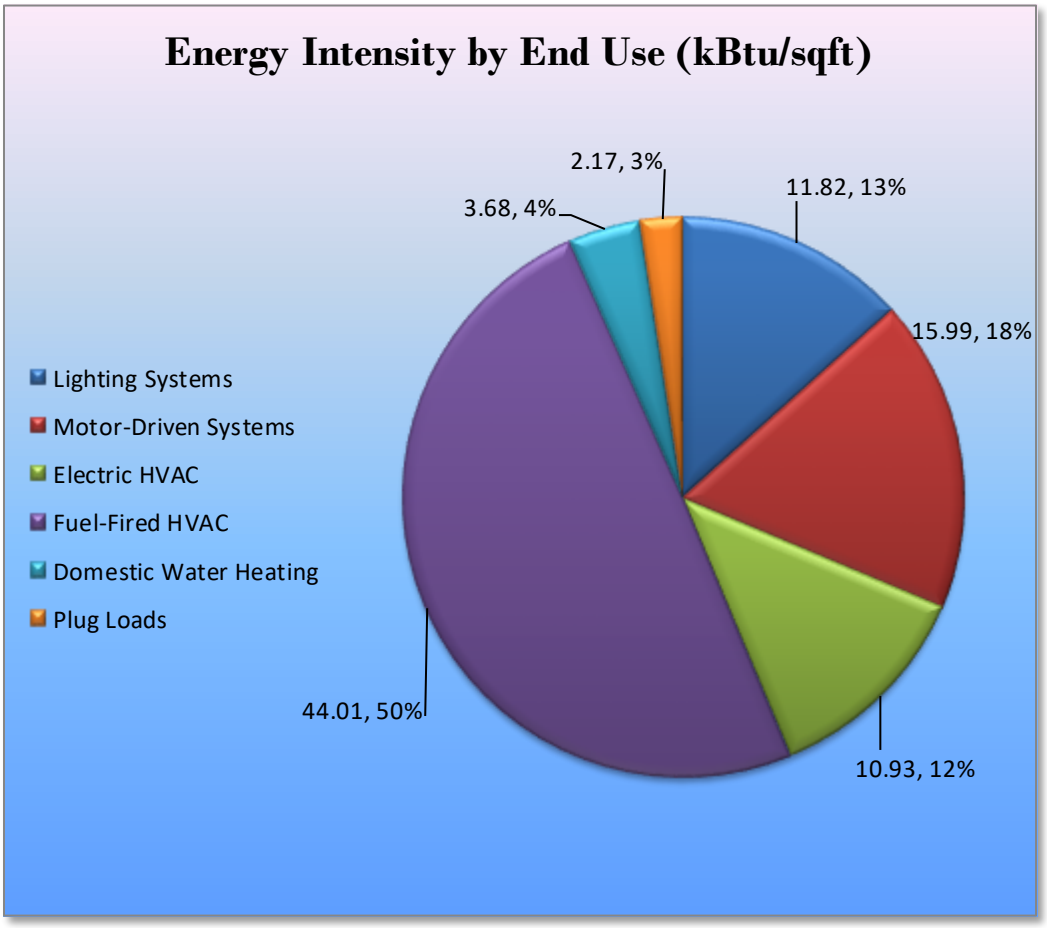
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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 to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 15 - 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 the David C. Abbott Early Learning Center regarding financial incentives for which they may qualify to implement the recommended measures. 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 Section 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 16 – Summary of Recommended 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 Upgrades		**71,779**	**20.6**	**0.0**	**$9,799.24**	**$70,000.86**	**$11,510.00**	**$58,490.86**	**6.0**	**72,281**
ECM 1	Install LED Fixtures	6,990	0.9	0.0	$954.34	$7,581.33	$1,400.00	$6,181.33	6.5	7,039
ECM 2	Retrofit Fixtures with LED Lamps	64,788	19.7	0.0	$8,844.90	$62,419.54	$10,110.00	$52,309.54	5.9	65,241
Lighting Control Measures		**14,851**	**4.6**	**0.0**	**$2,027.51**	**$12,824.00**	**$3,430.00**	**$9,394.00**	**4.6**	**14,955**
ECM 3	Install Occupancy Sensor Lighting Controls	14,851	4.6	0.0	$2,027.51	$12,824.00	$3,430.00	$9,394.00	4.6	14,955
Motor Upgrades		**2,884**	**0.7**	**0.0**	**$393.73**	**$9,710.95**	**$0.00**	**$9,710.95**	**24.7**	**2,904**
ECM 4	Premium Efficiency Motors	2,884	0.7	0.0	$393.73	$9,710.95	$0.00	$9,710.95	24.7	2,904
Variable Frequency Drive (VFD) Measures		**67,169**	**11.1**	**0.0**	**$9,169.95**	**$39,868.25**	**$5,400.00**	**$34,468.25**	**3.8**	**67,639**
ECM 5	Install VFDs on Constant Volume (CV) HVAC	15,615	5.0	0.0	$2,131.78	$20,647.95	$3,000.00	$17,647.95	8.3	15,724
ECM 6	Install VFDs on Chilled Water Pumps	42,597	4.8	0.0	$5,815.29	$12,668.60	$2,400.00	$10,268.60	1.8	42,894
ECM 7	Install VFDs on Hot Water Pumps	8,958	1.3	0.0	$1,222.89	$6,551.70	$0.00	$6,551.70	5.4	9,020
Plug Load Equipment Control - Vending Machine		**1,954**	**0.0**	**0.0**	**$266.81**	**$460.00**	**$0.00**	**$460.00**	**1.7**	**1,968**
ECM 8	Vending Machine Control	1,954	0.0	0.0	$266.81	$460.00	$0.00	$460.00	1.7	1,968
TOTALS		**158,638**	**37.1**	**0.0**	**$21,657.24**	**$132,864.06**	**$20,340.00**	**$112,524.06**	**5.2**	**159,747**

* - 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

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 17 below.

Figure 17 – Summary of Lighting Upgrade 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 Upgrades		**71,779**	**20.6**	**0.0**	**$9,799.24**	**$70,000.86**	**$11,510.00**	**$58,490.86**	**6.0**	**72,281**
ECM 1	Install LED Fixtures	6,990	0.9	0.0	$954.34	$7,581.33	$1,400.00	$6,181.33	6.5	7,039
ECM 2	Retrofit Fixtures with LED Lamps	64,788	19.7	0.0	$8,844.90	$62,419.54	$10,110.00	$52,309.54	5.9	65,241

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	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)
Interior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	6,990	0.9	0.0	$954.34	$7,581.33	$1,400.00	$6,181.33	6.5	7,039

Measure Description

We recommend replacement of the exterior metal halide and high pressure sodium fixtures with new high-performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other 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 high pressure sodium or metal halide source.

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	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)
Interior	61,635	19.3	0.0	$8,414.37	$58,549.32	$10,110.00	$48,439.32	5.8	62,066
Exterior	3,154	0.4	0.0	$430.53	$3,870.22	$0.00	$3,870.22	9.0	3,176

Measure Description

We recommend retrofitting existing fluorescent and incandescent lighting technologies with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

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

4.1.2 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 18 below.

Figure 18 – 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		**14,851**	**4.6**	**0.0**	**$2,027.51**	**$12,824.00**	**$3,430.00**	**$9,394.00**	**4.6**	**14,955**
ECM 3	Install Occupancy Sensor Lighting Controls	14,851	4.6	0.0	$2,027.51	$12,824.00	$3,430.00	$9,394.00	4.6	14,955

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 3: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

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)
14,851	4.6	0.0	$2,027.51	$12,824.00	$3,430.00	$9,394.00	4.6	14,955

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in selected restrooms, storage rooms, classrooms, offices areas, and hallways. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results 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. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

4.1.3 Motor Upgrades

Our recommendations for motor upgrades are summarized in Figure 19 below.

Figure 19-Summary of Motor Upgrade 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)
Motor Upgrades		**2,884**	**0.7**	**0.0**	**$393.73**	**$9,710.95**	**$0.00**	**$9,710.95**	**24.7**	**2,904**
ECM 4	Premium Efficiency Motors	2,884	0.7	0.0	$393.73	$9,710.95	$0.00	$9,710.95	24.7	2,904

ECM 4: Premium Efficiency Motors

Summary of Measure Economics

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)
2,884	0.7	0.0	$393.73	$9,710.95	$0.00	$9,710.95	24.7	2,904

Measure Description

We recommend replacing standard efficiency motors with NEMA Premium® efficiency motors. Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Although occasionally additional savings can be achieved by downsizing motors to better meet the motor's current load requirements. The base case motor efficiencies are estimated from nameplate information and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings (2016)*. Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

The overall savings from motor replacements are relatively small, but this measure is meant to be implemented in conjunction with variable frequency drive (VFD) installations recommended below. VFD's require inverter rated motors, and it is highly likely that replacement motors will be needed to meet this requirement. Project cost effectiveness should be considered on the basis the two types of measures taken together.

4.1.4 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 20 below.

Figure 20 – Summary of Variable Frequency Drive 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)
Variable Frequency Drive (VFD) Measures		**67,169**	**11.1**	**0.0**	**$9,169.95**	**$39,868.25**	**$5,400.00**	**$34,468.25**	**3.8**	**67,639**
ECM 5	Install VFDs on Constant Volume (CV) HVAC	15,615	5.0	0.0	$2,131.78	$20,647.95	$3,000.00	$17,647.95	8.3	15,724
ECM 6	Install VFDs on Chilled Water Pumps	42,597	4.8	0.0	$5,815.29	$12,668.60	$2,400.00	$10,268.60	1.8	42,894
ECM 7	Install VFDs on Hot Water Pumps	8,958	1.3	0.0	$1,222.89	$6,551.70	$0.00	$6,551.70	5.4	9,020

ECM 5: Install VFDs on Constant Volume (CV) HVAC

Summary of Measure Economics

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)
15,615	5.0	0.0	$2,131.78	$20,647.95	$3,000.00	$17,647.95	8.3	15,724

Measure Description

We recommend installing variable frequency drives (VFDs) to control supply fan motor speeds to convert a constant-volume, single-zone air handling system into a variable-air-volume (VAV) system. A separate VFD is usually required to control the return fan motor or dedicated exhaust fan motor, if the air handler has one. Zone thermostats will cause the VFD to modulate fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature. Energy savings results from reducing fan speed (and power) when there is a reduced load required for the zone. The magnitude of energy savings is based on the estimated amount of time that fan motors operate at partial load. The targeted systems for this measure are the three air handling units.

ECM 6: Install VFDs on Chilled Water Pumps

Summary of Measure Economics

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)
42,597	4.8	0.0	$5,815.29	$12,668.60	$2,400.00	$10,268.60	1.8	42,894

Measure Description

We recommend installing variable frequency drives (VFD) to control the chilled water pumps. This measure requires that chilled water coils be served by 2-way valves and that a differential pressure sensor be installed in the chilled water loop. As the chilled water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as chilled water valves close. The magnitude of energy savings is based on the estimated amount of time that the system operates at reduced loads.

For systems with variable chilled water flow through the chiller, the minimum flow to prevent the chiller from tripping off will have to be determined during the final project design. The control system should be programmed to maintain the minimum flow through the chiller and to prevent pump cavitation.

ECM 7: Install VFDs on Hot Water Pumps

Summary of Measure Economics

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)
8,958	1.3	0.0	$1,222.89	$6,551.70	$0.00	$6,551.70	5.4	9,020

Measure Description

We recommend installing variable frequency drives (VFD) to control the hot water pumps. This measure requires that the majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

4.1.5 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment controls are summarized in Figure 21 below.

Figure 21-Summary of Plug Load Equipment 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)
Plug Load Equipment Control - Vending Machine		**1,954**	**0.0**	**0.0**	**$266.81**	**$460.00**	**$0.00**	**$460.00**	**1.7**	**1,968**
ECM 8	Vending Machine Control	1,954	0.0	0.0	$266.81	$460.00	$0.00	$460.00	1.7	1,968

ECM 8: Vending Machine Control

Summary of Measure Economics

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)
1,954	0.0	0.0	$266.81	$460.00	$0.00	$460.00	1.7	1,968

Measure Description

Vending machines operate continuously, even during non-business hours. It is recommended to install occupancy sensor controls to reduce the energy use. These controls power down vending machines when the vending machine area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the product cool. Energy savings are a dependent on vending machine and activity level in the area surrounding the machines.

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 many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M 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.

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.

Ensure Lighting Controls Are Operating Properly

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

Assess Chillers & Request Tune-Ups

Chillers are responsible for a substantial portion of a commercial building's overall energy usage. When components of a chiller are not optimized, this can quickly result in a noticeable increase in energy bills. Chiller diagnostics can produce a 5% to 10% cost avoidance potential from discovery and implementation of low/no cost optimization strategies.

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.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

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 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.

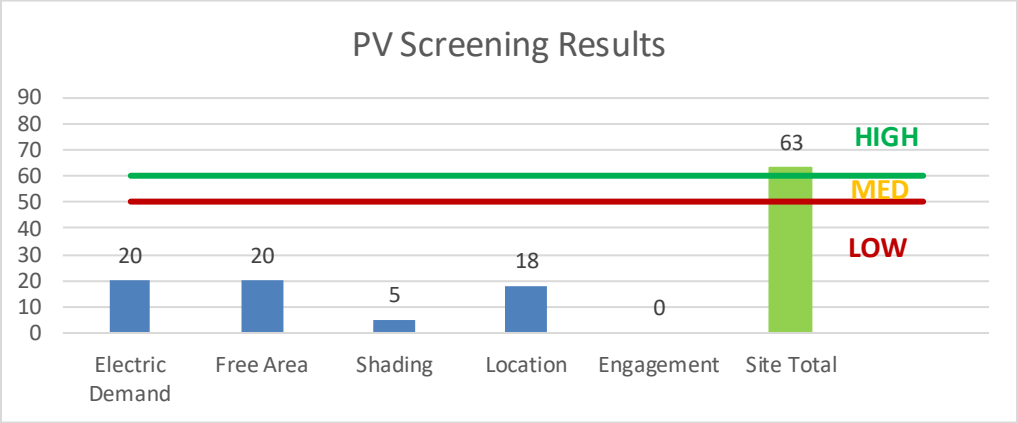
6.1 Photovoltaic

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.

The amount of free area, ease of installation, and the lack of shading elements contribute to the high potential for PV at the site. A PV array located on the roof of the building or on the ground next to the building may be feasible. If the David C. Abbott Early Learning Center is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 22 - Photovoltaic Screening



Potential	High	
System Potential	107	kW DC STC
Electric Generation	80,512	kWh/yr
Displaced Cost	$7,000	/yr
Installed Cost	$278,200	

Solar projects must register their projects in the SREC (Solar Renewable Energy Certificate) Registration Program (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 developed new solar projects and insight into future SREC pricing. Refer to Section 8.4 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

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

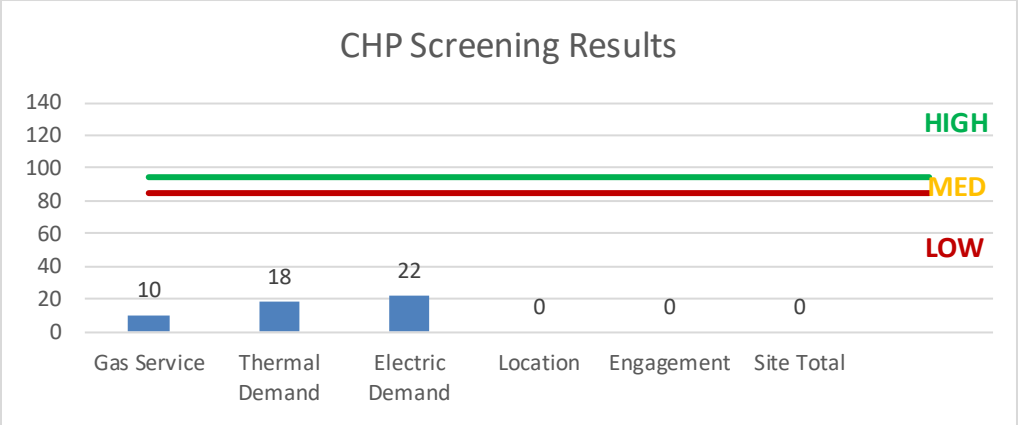
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste 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.

The low or infrequent thermal load is the most significant factor contributing to the minimal potential for CHP at this 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 New Jersey 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 23 - Combined Heat and Power Screening



7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response 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 Curtailment Service Providers and commercial facilities 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 receive payments whether or not their facility is called upon to curtail their electric usage.

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 programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric 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 curtailment event. DR program participants may need to install smart meters or 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 (http://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 (http://www.pjm.com/training/training%20material.aspx), along with a variety of other DR 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 program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

In our opinion, this site is not a good candidate for DR.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 24 for a list of the eligible programs identified for each recommended ECM.

Figure 24 - 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	x
ECM 2	Retrofit Fixtures with LED Lamps	x		x	x
ECM 3	Install Occupancy Sensor Lighting Controls	x		x	x
ECM 4	Premium Efficiency Motors			x	x
ECM 5	Install VFDs on Constant Volume (CV) HVAC	x			x
ECM 6	Install VFDs on Chilled Water Pumps	x			x
ECM 7	Install VFDs on Hot Water Pumps				x
ECM 8	Vending Machine Control				x

SmartStart is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, 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. It 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. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SmartStart program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: www.njcleanenergy.com/ci.

8.1 SmartStart

Overview

The SmartStart program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently 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

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The SmartStart prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SmartStart program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

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 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less). 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

Direct Install is a turnkey program available to existing small to medium-sized facilities with an average peak electric demand that does not exceed 200 kW over the recent 12-month period. You work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and provide a clear scope of work for installation of selected 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. Each entity is limited to incentives up to $250,000 per fiscal year.

How to Participate

To participate in Direct Install, you will need to contact the participating contractor assigned to the region of the state where your facility is located. A complete list of Direct Install program partners is provided on the Direct Install website linked below. The contractor will be paid the measure incentives directly by the program 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 and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

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

8.3 Pay for Performance - Existing Buildings

Overview

The Pay for Performance – Existing Buildings (P4P EB) program is designed for larger customers with a peak demand over 200 kW in any of the preceding 12 months. Under this program the minimum installed scope of work must include at least two unique measures resulting in at least 15% energy savings, where lighting cannot make up the majority of the savings. The recommended ECM's from this study are right at the 15% energy savings threshold. Therefore, to qualify for the P4P incentives, all recommended ECM's must be included for the scope of work, or additional ECM's must be added to the scope of work.

P4P is a generally a good option for medium to large sized facilities looking to implement as many measures as possible under a single project in order to achieve deep energy savings. This program has an added benefit of evaluating a broad spectrum of measures that may not otherwise qualify under other programs. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also utilize the P4P program.

Incentives

Incentives are calculated based on estimated and achieved energy savings ranging from $0.18-$0.22/kWh and $1.80-$2.50/therm, capped at the lesser of 50% total project cost, or $1 million per electric account and $1 million per natural gas account, per fiscal year, not to exceed $2 million per project. An incentive of $0.15/square foot is also available to offset the cost of developing the Energy Reduction Plan (see below) contingent on the project moving forward with measure installation.

How to Participate

To participate in the P4B EB program you will need to contact one of the pre-approved consultants and contractors ("Partners"). Under direct contract to you, the Partner will help further evaluate the measures identified in this report through development of the Energy Reduction Plan (ERP), assist you in implementing selected measures, and verify actual savings one year after the installation. At each of these three milestones your Partner will also facilitate securing program incentives.

Approval of the final scope of work is required by the program prior to installation completion. Although installation can be accomplished by a contractor of your choice (some P4P Partners are also contractors) or by internal personnel, the Partner must remain involved to ensure compliance with the program guidelines and requirements.

Detailed program descriptions, instructions for applying, applications and list of Partners can be found at: www.njcleanenergy.com/P4P.

8.4 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) 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.

8.5 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 NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

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
Womens Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.05	152	0.0	$20.79	$387.00	$20.00	17.65
Guidance Office Suite	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,826	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,278	0.48	1,541	0.0	$210.42	$1,221.33	$235.00	4.69
Guidance Office	14	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,826	Relamp	Yes	14	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,278	0.67	2,158	0.0	$294.59	$1,601.87	$315.00	4.37
Door 12	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.16	525	0.0	$71.73	$500.80	$200.00	4.19
Door 12	6	Compact Fluorescent: 26 W Comp. Fluorescent	Wall Switch	52	1,826	Relamp	Yes	6	LED Screw-In Lamps: LED A19 Bulb	Occupancy Sensor	32	1,278	0.12	373	0.0	$50.91	$845.04	$210.00	12.47
Door 12 Vestibule	4	Compact Fluorescent: 26 W Comp. Fluorescent	Wall Switch	52	1,826	Relamp	Yes	4	LED Screw-In Lamps: LED A19 Bulb	Occupancy Sensor	32	1,278	0.08	249	0.0	$33.94	$700.02	$35.00	19.59
Faculty Room	13	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,826	Relamp	Yes	13	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,278	0.63	2,004	0.0	$273.55	$1,506.73	$295.00	4.43
CR 113	32	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	32	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	1.31	4,203	0.0	$573.81	$2,676.40	$515.00	3.77
CR 113	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.05	175	0.0	$23.91	$387.00	$55.00	13.89
CR 113 Mech	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 113 Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 113 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 109	32	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	32	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	1.31	4,203	0.0	$573.81	$2,676.40	$515.00	3.77
CR 109	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.05	175	0.0	$23.91	$387.00	$55.00	13.89
CR 109 Mech	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 109 Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 109 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
Speech 112	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.05	175	0.0	$23.91	$233.00	$40.00	8.07
Speech 110	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.05	175	0.0	$23.91	$233.00	$40.00	8.07
CR 111	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.98	3,152	0.0	$430.36	$2,074.80	$395.00	3.90
CR 111	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.05	175	0.0	$23.91	$387.00	$55.00	13.89
CR Mechanical	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 113 Hallway	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.37	1,182	0.0	$161.39	$1,076.80	$450.00	3.88

	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
Student Commons	25	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	25	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	1.03	3,284	0.0	$448.29	$2,150.00	$410.00	3.88
Student Commons	33	Compact Fluorescent: 26 W Comp. Fluorescent	Wall Switch	52	1,826	Relamp	Yes	33	LED Screw-In Lamps: LED A19 Bulb	Occupancy Sensor	32	1,278	0.64	2,051	0.0	$280.03	$4,087.70	$70.00	14.35
Office OT/PT	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.11	350	0.0	$47.82	$350.00	$60.00	6.06
Student Commons Hall	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.22	701	0.0	$95.64	$868.00	$360.00	5.31
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
Elec. Closet	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.15	485	0.0	$66.22	$409.50	$70.00	5.13
Door 7 Vestibule	4	Compact Fluorescent: 26 W Comp. Fluorescent	Wall Switch	52	1,826	Relamp	No	4	LED Screw-In Lamps: LED A19 Bulb	Wall Switch	32	1,826	0.05	168	0.0	$22.93	$430.02	$0.00	18.75
CR 101	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.86	2,758	0.0	$376.57	$1,849.20	$350.00	3.98
CR 101	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.05	175	0.0	$23.91	$117.00	$55.00	2.59
CR 101	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.08	263	0.0	$35.86	$291.50	$50.00	6.73
CR 103	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.86	2,758	0.0	$376.57	$1,849.20	$350.00	3.98
CR 103	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.05	175	0.0	$23.91	$117.00	$55.00	2.59
CR 103	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.08	263	0.0	$35.86	$291.50	$50.00	6.73
CR 102	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.86	2,758	0.0	$376.57	$1,849.20	$350.00	3.98
CR 102	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.05	175	0.0	$23.91	$117.00	$55.00	2.59
CR 102	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.08	263	0.0	$35.86	$291.50	$50.00	6.73
CR 104	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.86	2,758	0.0	$376.57	$1,849.20	$350.00	3.98
CR 104	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.05	175	0.0	$23.91	$117.00	$55.00	2.59
CR 104	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.08	263	0.0	$35.86	$291.50	$50.00	6.73
Wall Packs	7	Metal Halide: (1) 100W Lamp	Wall Switch	128	4,380	Fixture Replacement	No	7	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	20	4,380	0.50	3,808	0.0	$519.86	$2,734.74	$700.00	3.91
Canopy Fixtures	36	Compact Fluorescent: 26 W Comp. Fluorescent-	Wall Switch	52	4,380	Relamp	No	36	LED Screw-In Lamps: LED A19 Bulb	Wall Switch	32	4,380	0.47	3,627	0.0	$495.11	$3,870.22	$0.00	7.82
Pole Fixture Parking (fix)	14	High-Pressure Sodium: (1) 70W Lamp	Wall Switch	95	4,380	Fixture Replacement	No	14	LED - Fixtures: Outdoor Pole/Arm-Mounted Decorative Fixture	Wall Switch	35	4,380	0.55	4,231	0.0	$577.63	$4,846.59	$700.00	7.18
Boiler Room	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.19	624	0.0	$85.14	$526.50	$90.00	5.13
Attic	4	Incandescent: 26 W Incandescent	Wall Switch	52	1,826	Relamp	No	4	LED Screw-In Lamps: LED A19 Bulb	Wall Switch	32	1,826	0.05	168	0.0	$22.93	$430.02	$40.00	17.01
Electric Room Hall	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.25	788	0.0	$107.59	$926.50	$405.00	4.85

	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
Electric Closet	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.09	277	0.0	$37.84	$234.00	$40.00	5.13
CR 138	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.86	2,758	0.0	$376.57	$1,849.20	$350.00	3.98
CR 138	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.04	139	0.0	$18.92	$117.00	$20.00	5.13
CR 138 Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 138 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 138 Mech	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 135	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.86	2,758	0.0	$376.57	$1,849.20	$350.00	3.98
CR 135 Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.04	139	0.0	$18.92	$117.00	$20.00	5.13
CR 135 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 135 Mech	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 135	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 139	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.86	2,758	0.0	$376.57	$1,849.20	$350.00	3.98
CR 139	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.04	139	0.0	$18.92	$117.00	$20.00	5.13
CR 139 Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 139 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 139 Mech	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 137	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.86	2,758	0.0	$376.57	$1,849.20	$350.00	3.98
CR 137	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.04	139	0.0	$18.92	$117.00	$20.00	5.13
CR 137 Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 137 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 137 Mech	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 138 exit vestibule	4	Compact Fluorescent: 26 W Comp. Fluorescent	Wall Switch	52	1,826	Relamp	Yes	4	LED Screw-In Lamps: LED A19 Bulb	Occupancy Sensor	32	1,278	0.08	249	0.0	$33.94	$700.02	$35.00	19.59
Data Closet 132	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 131	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.86	2,758	0.0	$376.57	$1,849.20	$350.00	3.98
CR 131	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.04	139	0.0	$18.92	$117.00	$20.00	5.13

	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
CR 131 Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 131 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 131 Mech	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 129	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.86	2,758	0.0	$376.57	$1,849.20	$350.00	3.98
CR 129	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.04	139	0.0	$18.92	$117.00	$20.00	5.13
CR 129 Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 129 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 129 Mech	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 125	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.86	2,758	0.0	$376.57	$1,849.20	$350.00	3.98
CR 125	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.04	139	0.0	$18.92	$117.00	$20.00	5.13
CR 125 Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 125 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 125 Mech	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 123	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.86	2,758	0.0	$376.57	$1,849.20	$350.00	3.98
CR 123	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.04	139	0.0	$18.92	$117.00	$20.00	5.13
CR 123 Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 123 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 123 Mech	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 124	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.86	2,758	0.0	$376.57	$1,849.20	$350.00	3.98
CR 124	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.04	139	0.0	$18.92	$117.00	$20.00	5.13
CR 124 Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 124 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 124 Mech	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 121	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.86	2,758	0.0	$376.57	$1,849.20	$350.00	3.98
CR 121	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.04	139	0.0	$18.92	$117.00	$20.00	5.13

	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
CR 121 Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 121 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 121 Mech	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 122	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.86	2,758	0.0	$376.57	$1,849.20	$350.00	3.98
CR 122	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.04	139	0.0	$18.92	$117.00	$20.00	5.13
CR 122 Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 122 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 122 Mech	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 130	23	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	23	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.94	3,021	0.0	$412.43	$1,999.60	$380.00	3.93
CR 130	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.04	139	0.0	$18.92	$117.00	$20.00	5.13
CR 130 Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 130 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 130 Mech	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
CR 129 Hall	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.25	788	0.0	$107.59	$651.20	$300.00	3.26
CR 129 Hall	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.08	263	0.0	$35.86	$375.50	$135.00	6.71
ESL	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,826	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,278	0.08	263	0.0	$35.86	$266.40	$50.00	6.03
Main Entrance	16	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,826	Relamp	No	16	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,826	0.18	588	0.0	$80.27	$574.40	$80.00	6.16
Main Entrance Vestibule	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,826	Relamp	No	8	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,826	0.09	294	0.0	$40.13	$287.20	$40.00	6.16
Sky Lights	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.04	139	0.0	$18.92	$117.00	$20.00	5.13
Mech. Room Hall	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.11	350	0.0	$47.82	$434.00	$180.00	5.31
Mech. Room Vestibule	4	Compact Fluorescent: 26 W Comp. Fluorescent	Wall Switch	52	1,826	Relamp	No	4	LED Screw-In Lamps: LED A19 Bulb	Wall Switch	32	1,826	0.05	168	0.0	$22.93	$430.02	$0.00	18.75
Cust. Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.11	350	0.0	$47.82	$504.00	$75.00	8.97
Main Office Suite	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,278	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.17	388	0.0	$52.98	$468.00	$80.00	7.32
Secure Waiting Area	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,278	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.04	97	0.0	$13.24	$117.00	$20.00	7.32
Secure Vestibule	2	Incandescent: 26 W Incandescent	Occupancy Sensor	52	1,278	Relamp	No	2	LED Screw-In Lamps: LED A19 Bulb	Occupancy Sensor	32	1,278	0.03	59	0.0	$8.03	$215.01	$20.00	24.29

	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
Principals Office	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,826	Relamp	No	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,826	0.04	134	0.0	$18.35	$192.80	$40.00	8.33
Conference Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,826	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,278	0.19	617	0.0	$84.17	$650.53	$115.00	6.36
Conference Room Hall	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.36	1,138	0.0	$155.41	$1,160.50	$585.00	3.70
Custodians Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
FRR-W	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
FRR-M	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,278	0.05	175	0.0	$23.91	$233.00	$40.00	8.07
Nurse's Office	7	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,826	Relamp	Yes	7	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,278	0.34	1,079	0.0	$147.30	$935.93	$175.00	5.17
Nureses Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,826	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,826	0.02	69	0.0	$9.46	$58.50	$10.00	5.13
Nurse's Closet	1	Compact Fluorescent: 13 W Comp. Fluorescent	Wall Switch	13	1,826	Relamp	No	1	LED Screw-In Lamps: LED A19 Bulb	Wall Switch	9	1,826	0.00	8	0.0	$1.15	$53.75	$0.00	46.88
Various	17	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	17	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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
Atttic	AHU 1,2,3	3	Supply Fan	7.5	88.5%	No	3,052	Yes	91.7%	Yes	3	3.30	11,419	0.0	$1,558.88	$14,281.77	$1,800.00	8.01
Atttic	AHU 1,2,3	3	Return Fan	5.0	87.5%	No	2,471	Yes	89.5%	Yes	3	2.17	6,036	0.0	$824.09	$12,228.66	$1,200.00	13.38
Boiler Room	Chiller	1	Chilled Water Pump	20.0	93.0%	No	3,052	No	93.0%	Yes	1	2.42	21,298	0.0	$2,907.64	$6,334.30	$1,200.00	1.77
Boiler Room	Chiller	1	Chilled Water Pump	20.0	91.0%	No	3,052	Yes	93.0%	Yes	1	2.59	22,025	0.0	$3,006.81	$8,582.03	$1,200.00	2.46
Boiler Room	Boiler	2	Heating Hot Water Pump	5.0	87.5%	No	2,471	Yes	89.5%	Yes	2	1.35	9,275	0.0	$1,266.26	$8,152.44	$0.00	6.44
Various Classrooms	Classrooms- HVAC Fan	19	Supply Fan	0.8	70.0%	No	2,471	No	70.0%	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
Principal's Office	Principal's Office	1	Split-System Air-Source HP	1.00	13.60	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric Chiller Inventory & Recommendations

		Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/ Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	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
Boiler Room	All School	1	Air-Cooled Screw Chiller	170.00	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
Boiler Room	All School	2	Condensing Hot Water Boiler	1,760.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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
Boiler Room	Kitchen and Restroom	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?
Various	26	Computer	75.0	No
Various	2	Laptops	40.0	No
Various	4	Small Printer/ Copier	20.0	No
Various	3	Medium Printer/ Copier	240.0	No
Various	2	Large Printer/ Copier	515.0	No
Various	14	Projector	200.0	No
Various	5	Microwave	1,000.0	No
Various	3	Medium Refrigerator	50.0	No
Various	3	Large Refrigerator	600.0	No
Various	2	Coffee Machine	400.0	No
Various	1	Toaster	850.0	No
Various	2	Toaster Oven	1,200.0	No
Various	1	Wall Mount Fan	100.0	No
Various	13	Smart Board	316.0	No
Cafeteria	1	Reach in Refrigerated Case	600.0	No

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	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
Commons	1	Refrigerated	Yes	0.00	1,612	0.0	$220.05	$230.00	$0.00	1.05
Commons	1	Non-Refrigerated	Yes	0.00	343	0.0	$46.76	$230.00	$0.00	4.92

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

David C. Abbott Early Learning Center

Primary Property Type: K-12 School
Gross Floor Area (ft²): 39,538
Built: 2002

For Year Ending: April 30, 2017
Date Generated: April 06, 2018

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	Property Owner	Primary Contact
David C. Abbott Early Learning Center 171 Tennent Road Morganville, New Jersey 07751	Marlboro Township Board of Education 1980 Township Drive Marlboro, NJ 07746 (732) 972-2000	Cindy Barr-Rague 1980 Township Drive Marlboro, NJ 07746 (732) 972-2000 Ext. 2010 cbarr-rague@mtps.org

Property ID: 6275899

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
89.4 kBtu/ft²

Source EUI
179.1 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	1,612,102 (46%)
Natural Gas (kBtu)	1,924,297 (54%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	62.1
National Median Source EUI (kBtu/ft²)	124.4
% Diff from National Median Source EUI	44%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	281

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)