Local Government Energy Audit:
Energy Audit Report

Drummond Central Office Building

Jefferson Township Board of Education

31 Route 181
Lake Hopatcong, NJ 07849

July 18, 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 saving 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 Drummond Central Office Building.

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 school districts in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

The Drummond Central Office Building is a one-story building, constructed in 1950, that totals 12,144 square feet of mostly office spaces. The building has a center flat roof and a front gable roof. Exterior walls are finished with brick masonry and the windows throughout the facility are double paned. Exterior doors are constructed of metal and were found to be in good condition. Interior lighting consists of LED linear tubes and 32-Watt linear fluorescent T8 lamps and fixtures both with electronic ballasts. Lighting control is provided by both occupancy sensors and manual wall switches. Cooling and heating are provided by eight York Packaged roof top units.

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 three measures which together represent an opportunity for Drummond Central Office Building to reduce annual energy costs by $1,400 and annual greenhouse gas emissions by 9,357 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 6 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 Drummond Central Office Building's annual energy use by 2%.

Figure 1 – Previous 12 Month Utility Costs

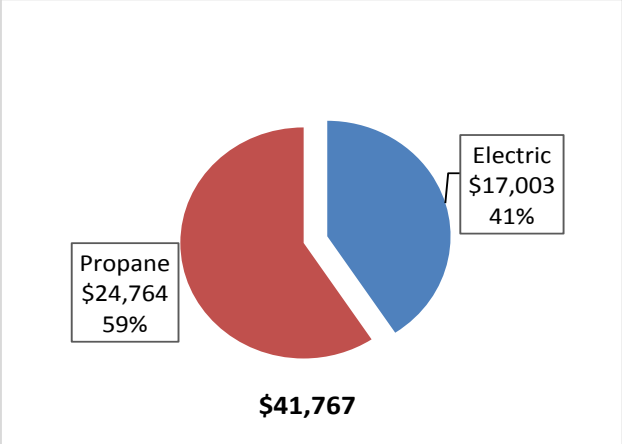
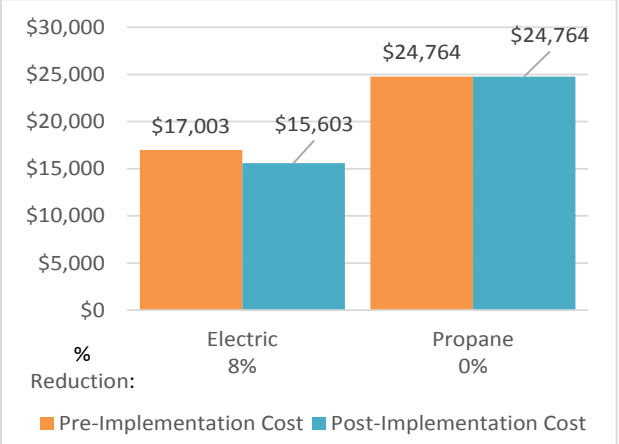


Figure 2 – Potential Post-Implementation Costs



A detailed description of Drummond Central Office Building'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 Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**5,544**	**2.2**	**$835.33**	**$6,695.08**	**$345.00**	**$6,350.08**	**7.6**	**5,582**
ECM 1	Install LED Fixtures	Yes	2,755	1.3	$415.09	$4,879.08	$5.00	$4,874.08	11.7	2,774
ECM 2	Retrofit Fixtures with LED Lamps	Yes	2,789	0.9	$420.24	$1,816.00	$340.00	$1,476.00	3.5	2,808
Lighting Control Measures			**3,749**	**1.2**	**$564.89**	**$2,088.00**	**$360.00**	**$1,728.00**	**3.1**	**3,775**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	3,749	1.2	$564.89	$2,088.00	$360.00	$1,728.00	3.1	3,775
TOTALS			**9,292**	**3.4**	**$1,400.22**	**$8,783.08**	**$705.00**	**$8,078.08**	**5.8**	**9,357**

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

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

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

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when 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.

Energy Efficient Practices

TRC also identified nine 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 Drummond Central Office Building include:

- Reduce Air Leakage
- Close Doors and Windows
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Ensure Economizers are Functioning Properly
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Perform Proper Water Heater Maintenance

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 Drummond Central Office Building. Based on the configuration of the site and its loads there is a low potential for installing any PV and combined heat and power self-generation measures.

For details on our evaluation and 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
- 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 7.

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.

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 7.3 for additional information on the ESIP Program.

Additional information on relevant incentive programs is located in Section 7 or: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Rita Giacchi	Assistant Business Administrator	rgiacchi@jefftwp.org	973-663-3387
Designated Representative			
Joe Yuhas	Supervisor Custodian		(973) 479-9360
TRC Energy Services			
Moussa Traore	Auditor	mtraore@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On February 27, 2017, TRC performed an energy audit at Drummond Central Office Building located in Lake Hopatcong, New Jersey. TRC's auditor met with Joe Yuhas to review the facility operations and help focus our investigation on specific energy-using systems.

The Drummond Central Office Building is a 12,144 square foot single floor facility comprised of offices, conference room, lunch room, copy room, a mid-level basement mechanical space and storage spaces. The building was constructed in 1950.

The foundation consists of cast-in-place concrete perimeter wall footings with concrete foundation walls. Exterior walls are finished with brick masonry. The building has a center flat roof covered with a white membrane, and front gable roof covered with asphalt shingles. The roof appears to be in good condition. The windows throughout the facility are double paned and are also in good condition. Exterior doors are constructed of metal. Overall the building's envelope is in good condition with no signs of outside air infiltration.

The majority of the building already has interior lighting made up of mostly LED linear tubes, and the remaining spaces are lit with 32-Watt linear fluorescent T8 lamps and fixtures. There is a very small number of compact fluorescent and incandescent lamps throughout the facility. Exit signs throughout the building are LED types. Lighting control in most spaces is provided by occupancy sensors and manual wall switches. The facility also has exterior lighting which consists of metal halide lamps, controlled with photocells.

The HVAC system consists of eight York packaged roof top units and one split direct expansion unit (DX). The packaged units use electricity for cooling and propane for heating as the building is located in an area where there is no natural gas service.

2.3 Building Occupancy

The Drummond Central Office building is the main office of the Jefferson Township Board of Education. The building is open Monday through Friday. The typical schedule is presented in the table below.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Drummond Central Office Building	Weekday	7:00 AM - 5:30 PM
Drummond Central Office Building	Weekend	N/A

2.4 Building Envelope

The foundation consists of cast-in-place concrete perimeter wall footings with concrete foundation walls. The building has a mid-level basement which was previously used as a boiler room. Exterior walls are finished with brick masonry. The building has a center flat roof covered with a white membrane, and front gable roof covered with a shingles material. The roof appears to be in good condition. The windows throughout the facility are double paned and are also in good condition. Exterior doors are constructed of metal. Overall the building's envelope is in good condition with no signs of outside air infiltration.

2.5 On-Site Generation

The Drummond Central Office Building does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

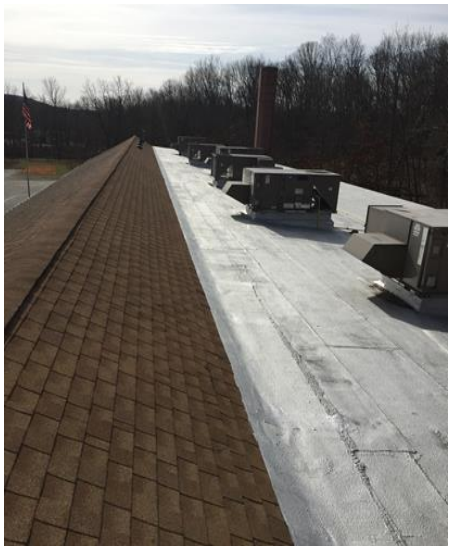
Please see Appendix A: Equipment Inventory & Recommendations for an inventory of the facility's equipment.

Lighting System

As part of a renovation, the district has retrofitted the majority of the building interior lighting with LED linear tubes, and the remaining spaces are lit with 32-Watt linear fluorescent T8 lamps and fixtures, and a very small number of compact fluorescent and incandescent lamps. Exit signs throughout the facility are LED. Lighting control in most spaces is provided by occupancy sensors and manual wall switches. The facility has exterior light which consists of 100-Watt metal halide outdoor wall-mounted fixtures that are controlled with photocells.

Air Conditioning System (DX)

One 3-ton Daikin split-system AC is used to condition the server room. Eight York packaged roof top units are used to condition rest of the building. The units are direct-expansion packaged with a propane-fired furnace. They are sized from 3 to 10 tons and provide a constant supply of air. The units are controlled by individual programmable thermostats. The thermostats are set to maintain a heating setpoint around 72°F and a cooling setpoint around 68°F (adjustable by tenants). Overall the HVAC system is relatively new (approximately five years old), and appears to be in good condition.



2.7 Domestic Hot Water Heating System

Domestic hot water for the building consists of one Rheem non-condensing hot water heater. The water heater is electric with an input rating of 6 kW, and has 20 gallons storage tank. The water heater is six years old and appears in good working condition.

3 SITE ENERGY USE AND COSTS

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

3.1 Total Cost of Energy

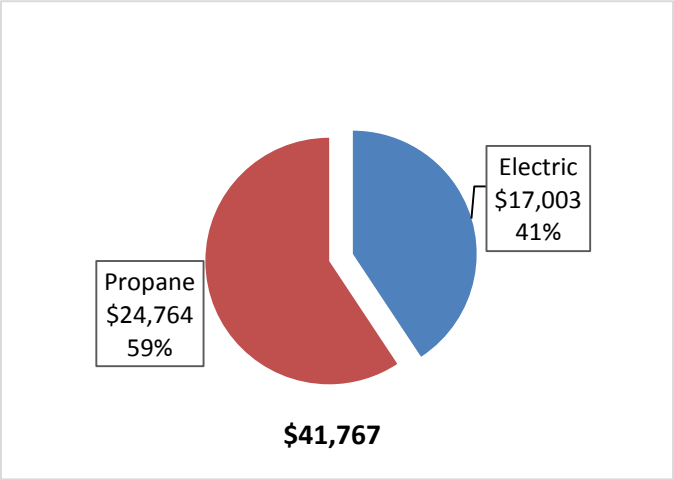
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Drummond Central Office Building		
Fuel	**Usage**	**Cost**
Electricity	112,840 kWh	$17,003
Propane	10,494 Gallons	$24,764
Total		**$41,767**

The current annual energy cost for this facility is $41,767 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.151/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. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Electric Usage & Demand

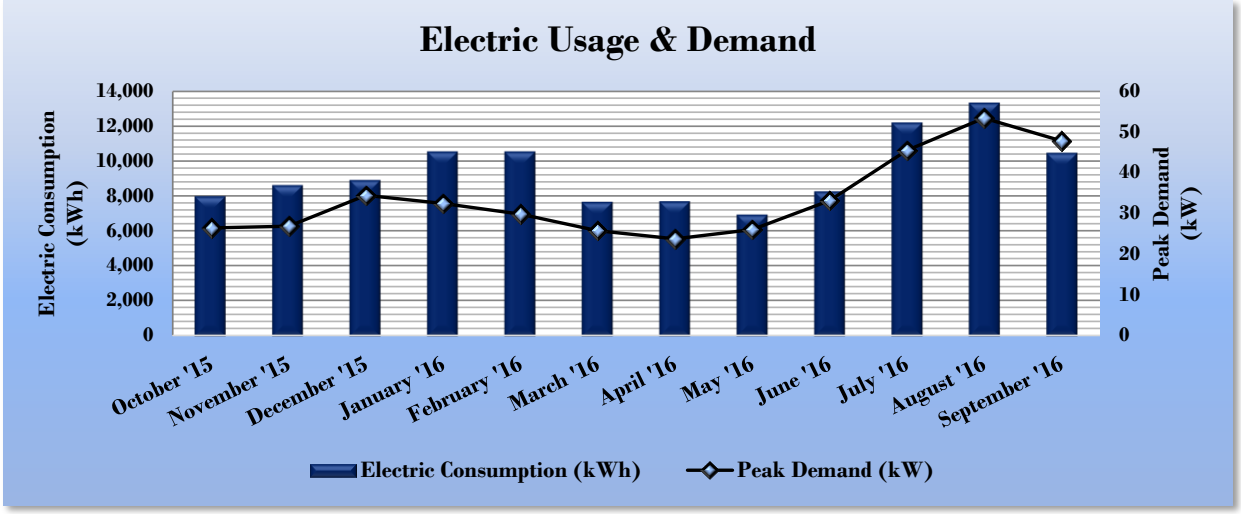


Figure 9 -Electric Usage & Demand

Electric Billing Data for Drummond Central Office Building					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
11/3/15	32	7,960	26		$1,200
12/4/15	31	8,600	27		$1,272
1/5/16	32	8,880	34		$1,322
2/3/16	29	10,520	32		$1,496
3/3/16	30	10,520	30		$1,495
4/1/16	30	7,640	26		$1,180
5/3/16	32	7,680	24		$1,185
6/2/16	30	6,920	26		$1,122
6/30/16	28	8,240	33		$1,285
8/1/16	32	12,160	46		$1,816
8/31/16	30	13,280	53		$1,998
9/28/16	29	10,440	48		$1,632
Totals	**365**	**112,840**	**53.4**	**$0**	**$17,003**
Annual	**365**	**112,840**	**53.4**	**$0**	**$17,003**

3.3 Propane Usage

Propane service is provided by Suburban Propane. The average cost for the past 12 months is $2.360/Gallon, which is the blended rate used throughout the analyses in this report. The propane consumption is shown in the table below.

Figure 10 –Propane Usage

Propane Billing Data for Drummond Central Office Building				
Period Ending	Days in Period	Propane Usage (Gallons)	Fuel Cost	TRC Estimated Usage?
9/22/15	30	492	$1,139	Yes
10/21/15	30	400	$920	No
11/20/15	31	595	$1,377	No
12/22/15	30	867	$2,006	No
1/23/16	31	1,076	$2,674	No
2/22/16	30	964	$2,237	No
3/21/16	30	1,096	$2,565	No
4/22/16	30	861	$1,993	Yes
5/23/16	31	722	$1,670	Yes
6/22/16	30	899	$2,080	Yes
7/20/16	32	1,199	$2,774	Yes
8/22/16	30	1,324	$3,327	Yes
Totals	**365**	**10,494**	**$24,764**	6
Annual	**365**	**10,494**	**$24,764**	

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 11 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Drummond Central Office Building	National Median Building Type: Office
Source Energy Use Intensity (kBtu/ft^2)	179.5	148.1
Site Energy Use Intensity (kBtu/ft^2)	110.9	67.3

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

Figure 12 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Drummond Central Office Building	National Median Building Type: Office
Source Energy Use Intensity (kBtu/ft^2)	171.3	148.1
Site Energy Use Intensity (kBtu/ft^2)	108.2	67.3

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has a current score of 59.

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

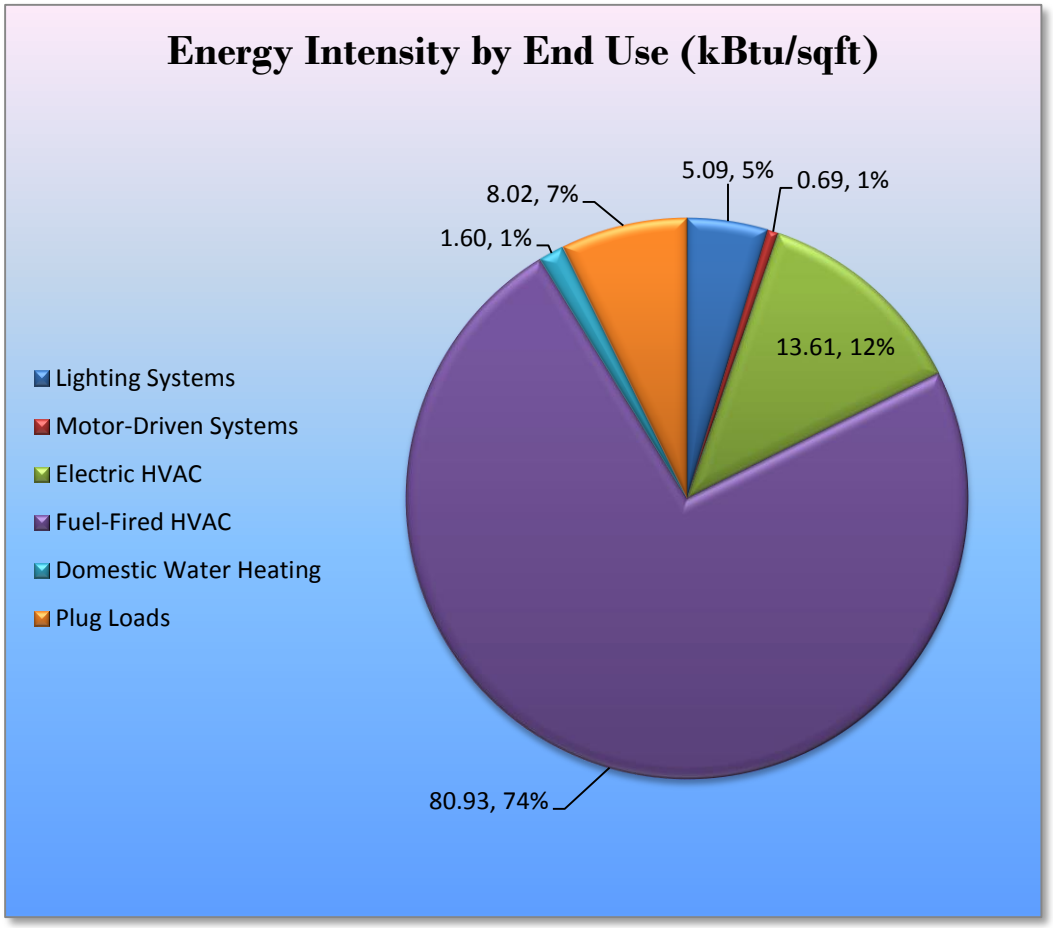
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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 13 - 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 Drummond Central Office Building 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 7.

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 14 – 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		**5,544**	**2.2**	**0.0**	**$835.33**	**$6,695.08**	**$345.00**	**$6,350.08**	**7.6**	**5,582**
ECM 1	Install LED Fixtures	2,755	1.3	0.0	$415.09	$4,879.08	$5.00	$4,874.08	11.7	2,774
ECM 2	Retrofit Fixtures with LED Lamps	2,789	0.9	0.0	$420.24	$1,816.00	$340.00	$1,476.00	3.5	2,808
Lighting Control Measures		**3,749**	**1.2**	**0.0**	**$564.89**	**$2,088.00**	**$360.00**	**$1,728.00**	**3.1**	**3,775**
ECM 3	Install Occupancy Sensor Lighting Controls	3,749	1.2	0.0	$564.89	$2,088.00	$360.00	$1,728.00	3.1	3,775
TOTALS		**9,292**	**3.4**	**0.0**	**$1,400.22**	**$8,783.08**	**$705.00**	**$8,078.08**	**5.8**	**9,357**

* - 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 15 below.

Figure 15 – 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		**5,544**	**2.2**	**0.0**	**$835.33**	**$6,695.08**	**$345.00**	**$6,350.08**	**7.6**	**5,582**
ECM 1	Install LED Fixtures	2,755	1.3	0.0	$415.09	$4,879.08	$5.00	$4,874.08	11.7	2,774
ECM 2	Retrofit Fixtures with LED Lamps	2,789	0.9	0.0	$420.24	$1,816.00	$340.00	$1,476.00	3.5	2,808

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	174	0.1	0.0	$26.19	$190.95	$5.00	$185.95	7.1	175
Exterior	2,581	1.3	0.0	$388.89	$4,688.12	$0.00	$4,688.12	12.1	2,599

Measure Description

We recommend replacing existing fixtures containing fluorescent, HID, or incandescent lamps 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 a fluorescent tubes and more than 10 times longer than many incandescent lamps.

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	2,789	0.9	0.0	$420.24	$1,816.00	$340.00	$1,476.00	3.5	2,808
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing incandescent, HID or other 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 tubes 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 16 below.

Figure 16 – 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		**3,749**	**1.2**	**0.0**	**$564.89**	**$2,088.00**	**$360.00**	**$1,728.00**	**3.1**	**3,775**
ECM 3	Install Occupancy Sensor Lighting Controls	3,749	1.2	0.0	$564.89	$2,088.00	$360.00	$1,728.00	3.1	3,775

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)
3,749	1.2	0.0	$564.89	$2,088.00	$360.00	$1,728.00	3.1	3,775

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all restrooms, storage rooms, and offices areas. 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.

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

Close Doors and Windows

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

Develop a Lighting Maintenance Schedule

In addition to routine fixture cleaning, development of a maintenance schedule can both ensure maintenance is performed regularly and can reduce the overall cost of fixture re-lamping and re-ballasting. By re-lamping and re-ballasting fixtures in groups, lighting levels are better maintained and the number of site visits by a lighting technician or contractor can be minimized, decreasing the overall cost of maintenance.

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.

Practice Proper Use of Thermostat Schedules and Temperature Resets

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

Ensure Economizers are Functioning Properly

Economizers, when properly configured, can be used to significantly reduce mechanical cooling. However, if the outdoor thermostat or enthalpy control is malfunctioning or the damper is stuck or improperly adjusted, benefits from the economizer may not be fully realized. As such, periodic inspection and maintenance is required to ensure proper operation. This maintenance should be scheduled with maintenance of the facility's air conditioning system and should include proper setting of the outdoor thermostat/enthalpy control, inspection of control and damper operation, lubrication of damper connections, and adjustment of minimum damper position. A malfunctioning economizer can significantly increase the amount of heating and mechanical cooling required by introducing excess amounts of cold or hot outside air.

Clean Evaporator/Condenser Coils on AC Systems

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

Clean and/or Replace HVAC Filters

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

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.

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.

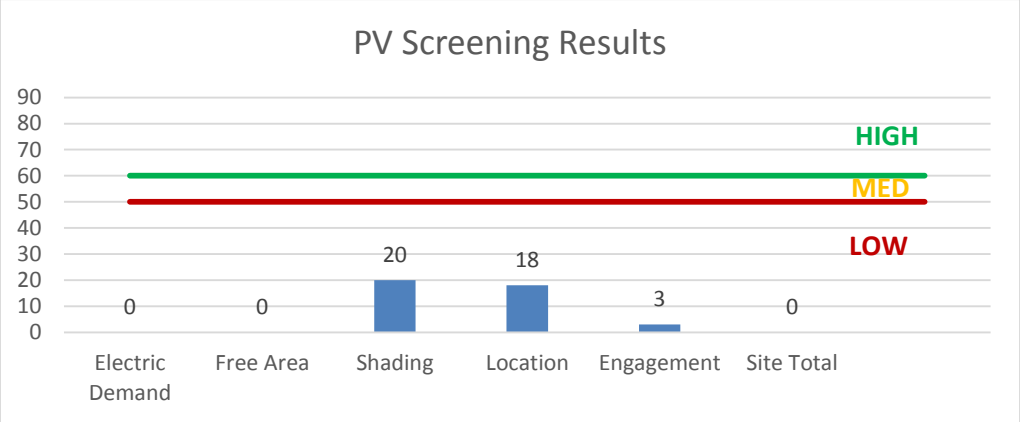
6.1 Photovoltaic

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 Low potential for installing a PV array.

In order to be cost-effective, a solar PV array needs certain minimum criteria, such as flat or south-facing rooftop or other unshaded space on which to place the PV panels. In our opinion, the facility does appear not meet these minimum criteria for cost-effective PV installation.

Figure 17 - Photovoltaic Screening



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.

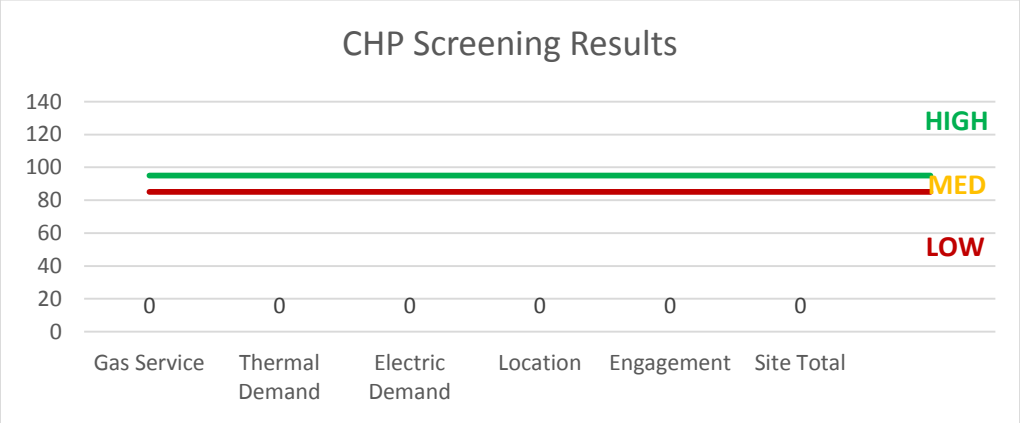
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste 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 facility has no boilers or thermal load that can contribute to the potential for CHP.

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 18 - Combined Heat and Power Screening



7 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 19 for a list of the eligible programs identified for each recommended ECM.

Figure 19 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install
ECM 1	Install LED Fixtures	x		x
ECM 2	Retrofit Fixtures with LED Lamps	x		x
ECM 3	Install Occupancy Sensor Lighting Controls	x		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.

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.

7.1 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.

7.2 Direct Install

Overview

Direct Install is a turnkey program available to existing small to medium-sized facilities with a peak electric demand that does not exceed 200 kW for any recent 12-month period. You will 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. Direct Install participants will also be held to a fiscal year cap of $250,000 per entity.

How to Participate

To participate in the Direct Install program you will need to contact the participating contractor who 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.

Since DI offers a free assessment of eligible measures, Direct Install is also available to small businesses and other commercial facilities too that may not be eligible for the more detailed facility audits provided by LGEA.

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

7.3 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.

8 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

8.1 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.

8.2 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
Conference Room	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,210	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,547	0.60	1,941	0.0	$292.45	$1,018.40	$200.00	2.80
Front Entrance	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,210	None	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,547	0.03	101	0.0	$15.25	$116.00	$20.00	6.29
Front Entrance	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Main Corridor	27	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,210	None	Yes	27	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,547	0.19	607	0.0	$91.52	$232.00	$40.00	2.10
Main Corridor	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Faculty & Transportation Office	14	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,210	None	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,547	0.10	315	0.0	$47.46	$116.00	$20.00	2.02
Faculty & Transportation Office	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,210	None	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,547	0.06	180	0.0	$27.12	$116.00	$20.00	3.54
Restroom	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,911	None	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,911	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Restroom	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,911	None	No	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,911	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Copy Room	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,911	None	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,911	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Human Ressources	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,210	None	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,547	0.06	180	0.0	$27.12	$116.00	$20.00	3.54
Human Ressources	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,210	None	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,547	0.03	101	0.0	$15.25	$116.00	$20.00	6.29
Business Administration Office	17	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,210	None	Yes	17	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,547	0.12	382	0.0	$57.63	$116.00	$20.00	1.67
Assistant Business Administration Office	11	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,210	None	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,547	0.08	247	0.0	$37.29	$116.00	$20.00	2.57
Assistant Superintendent Office	17	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,210	None	Yes	17	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,547	0.12	382	0.0	$57.63	$116.00	$20.00	1.67
Superintendent Office	13	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,210	None	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,547	0.09	292	0.0	$44.07	$116.00	$20.00	2.18
Superintendent Office	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,210	None	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,547	0.02	67	0.0	$10.17	$116.00	$20.00	9.44
Custodian Closet	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,950	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,950	0.01	37	0.0	$5.50	$48.20	$10.00	6.94
Women's Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,911	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,911	0.12	332	0.0	$50.03	$225.60	$45.00	3.61
Men's Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,911	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,911	0.12	332	0.0	$50.03	$225.60	$45.00	3.61
Copy Room	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,911	None	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,911	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Copy Room	1	Compact Fluorescent: 14W CFL Sreen in	Occupancy Sensor	14	1,911	Fixture Replacement	No	1	LED - Fixtures: Downlight Solid State Retrofit	Occupancy Sensor	7	1,911	0.01	16	0.0	$2.36	$63.65	$5.00	24.87
Storage Room	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,080	None	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,456	0.01	42	0.0	$6.38	$116.00	$20.00	15.05
Server Room	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,080	None	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.02	64	0.0	$9.57	$116.00	$20.00	10.03
Special Services	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,080	None	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,456	0.06	191	0.0	$28.71	$116.00	$20.00	3.34

	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
Supervisor Office	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,080	None	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,456	0.03	106	0.0	$15.95	$116.00	$20.00	6.02
Lunch Room	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,080	None	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,456	0.03	85	0.0	$12.76	$116.00	$20.00	7.52
Lunch Room	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,080	0.02	71	0.0	$10.63	$63.20	$0.00	5.94
Lunch Room	1	Incandescent: 60W A lamp	Wall Switch	60	2,080	Fixture Replacement	No	1	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	2,080	0.04	124	0.0	$18.70	$63.65	$0.00	3.40
Boiler Room	1	Compact Fluorescent: 23W CFL Screen in	Wall Switch	23	2,080	Fixture Replacement	No	1	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	2,080	0.01	34	0.0	$5.13	$63.65	$0.00	12.40
Boiler Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,080	0.16	482	0.0	$72.61	$351.00	$60.00	4.01
Exterior Perimeter	10	Metal Halide: (1) 150W Lamp	Daylight Dimming	190	1,365	Fixture Replacement	No	10	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	45	1,365	1.15	2,316	0.0	$348.94	$3,906.77	$0.00	11.20
Exterior Perimeter	2	Metal Halide: (1) 100W Lamp	Daylight Dimming	128	1,365	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	45	1,365	0.13	265	0.0	$39.95	$781.35	$0.00	19.56

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
Roof Top	Restroom	2	Exhaust Fan	0.3	68.0%	No	2,745	No	68.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Hallway	2	Exhaust Fan	0.3	69.0%	No	2,745	No	69.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Hallway	1	Exhaust Fan	0.5	75.0%	No	2,745	No	75.0%	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
Server Room	Server Room	1	Split-System AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Office Building (RTU1, RTU7, RTU8)	3	Packaged AC	4.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Office Building (RTU2)	1	Packaged AC	6.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Office Building (RTU3, RTU5)	2	Packaged AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Office Building (RTU6)	1	Packaged AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Office Building (RTU4)	1	Packaged AC	10.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof Top	Office Building (RTU1, RTU7, RTU8)	3	Furnace	65.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Office Building (RTU2)	1	Furnace	96.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Office Building (RTU3, RTU5)	2	Furnace	65.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Office Building (RTU6)	1	Furnace	65.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Office Building (RTU4)	1	Furnace	144.00	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	Office Building	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Offices	29	Desktop with LCD Computer	191.0	Yes
Offices	23	Small Printer	46.0	Yes
Offices	2	Copy Machine	1,400.0	Yes
Offices	1	Small freezer	56.0	Yes
Offices	1	Water Fountain	275.0	Yes
Offices	1	Electric Range	1,500.0	Yes
Offices	1	Microwave	1,000.0	No
Offices	2	Coffee machine	1,050.0	No
Offices	2	Refrigerator	265.0	Yes
Boiler Room	1	Elecrtic Unit heater	10,000.0	No

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Drummond Central Office Building

Primary Property Type: Office
Gross Floor Area (ft²): 12,144
Built: 1950

For Year Ending: August 31, 2016
Date Generated: April 25, 2017

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
Drummond Central Office Building 31 Route 181 Hopatcong, New Jersey 07439	Jefferson Township Pubic Schools 31 Route 181 Lake Hopatcong, NJ 07849 (____)____-_____	Rita Giacchi 31 Route 181 Lake Hopatcong, NJ 07849 (973) 663-3387 rgiacchi@jefftwp.org

Property ID: 5864838

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
87.5 kBtu/ft²

Source EUI
156.4 kBtu/ft²

Annual Energy by Fuel	
Propane (kBtu)	674,075 (64%)
Electric - Grid (kBtu)	388,022 (36%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	97.6
National Median Source EUI (kBtu/ft²)	174.6
% Diff from National Median Source EUI	-10%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	88

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)