



# Local Government Energy Audit Report

Maintenance Shop, Auto Shop & Paint Shop

January 27, 2023

*Prepared for:*

Island Beach State Park  
2401 Central Ave  
Berkeley Township, New Jersey 08752

*Prepared by:*

TRC  
317 George Street  
New Brunswick, New Jersey 08901

## Disclaimer

---

The goal of this audit report is to identify potential energy efficiency opportunities and help prioritize specific measures for implementation. Most energy conservation measures have received preliminary analysis of feasibility that identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to establish a basis for further discussion and to help prioritize energy measures.

TRC reviewed the energy conservation measures and estimates of energy savings for technical accuracy. Actual, achieved energy savings depend on behavioral factors and other uncontrollable variables and, therefore, estimates of final energy savings are not guaranteed. TRC and the New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

TRC bases estimated material and labor costs primarily on RS Means cost manuals as well as on our experience at similar facilities. This approach is based on standard cost estimating manuals and is vendor neutral. Cost estimates include material and labor pricing associated with one for one equipment replacements. Cost estimates do not include demolition or removal of hazardous waste. The actual implementation costs for energy savings projects are anticipated to be significantly higher based on the specific conditions at your site(s). We strongly recommend that you work with your design engineer or contractor to develop actual project costs for your specific scope of work for the installation of high efficiency equipment. We encourage you to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on selected products and installers. TRC and NJBPU do not guarantee cost estimates and shall in no event be held liable should actual installed costs vary from these material and labor estimates.

Incentive values provided in this report are estimated based of previously run state efficiency programs. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. Please review all available utility program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state, and federal requirements.

Copyright ©2023 TRC. All rights reserved.

Reproduction or distribution of the whole, or any part of the contents of this document without written permission of TRC is prohibited. Neither TRC nor any of its employees makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any data, information, method, product or process disclosed in this document, or represents that its use will not infringe upon any privately-owned rights, including but not limited to, patents, trademarks or copyrights.

# Table of Contents

---

<b>1</b>	<b>Executive Summary.....</b>	<b>1</b>
1.1	<b>Planning Your Project .....</b>	<b>4</b>
	Pick Your Installation Approach .....	4
	Options from Around the State.....	5
<b>2</b>	<b>Existing Conditions.....</b>	<b>6</b>
2.1	Site Overview.....	6
2.2	Building Occupancy .....	7
2.3	Building Envelope .....	7
2.4	Lighting Systems.....	10
2.5	Air Handling Systems.....	12
	Unitary Electric HVAC Equipment .....	12
2.6	Heating Hot Water Systems .....	13
2.7	Domestic Hot Water .....	14
2.8	Plug Load and Vending Machines .....	15
2.9	Water-Using Systems .....	16
<b>3</b>	<b>Energy Use and Costs .....</b>	<b>17</b>
3.1	Electricity .....	19
3.2	No. 2 Fuel Oil .....	20
3.3	Benchmarking.....	21
	Tracking Your Energy Performance .....	22
<b>4</b>	<b>Energy Conservation Measures .....</b>	<b>23</b>
4.1	Lighting .....	26
	ECM 1: Install LED Fixtures .....	26
	ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers.....	26
	ECM 3: Retrofit Fixtures with LED Lamps .....	27
4.2	Lighting Controls.....	27
	ECM 4: Install Occupancy Sensor Lighting Controls .....	27
4.3	Motors.....	28
	ECM 5: Premium Efficiency Motors .....	28
4.4	Variable Frequency Drives (VFD).....	28
	ECM 6: Install VFDs on Heating Water Pumps .....	29
4.5	Gas-Fired Heating.....	29
	ECM 7: Install High Efficiency Hot Water Boilers .....	29
4.6	HVAC Improvements .....	30
	ECM 8: Install Pipe Insulation.....	30

4.7	Domestic Water Heating .....	30
	ECM 9: Install Low-Flow DHW Devices.....	30
4.8	Custom Measures.....	31
	ECM 10: Install Heat Pump Water Heater.....	31
4.9	Measures for Future Consideration .....	32
	Window Replacements .....	32
<b>5</b>	<b>Energy Efficient Best Practices.....</b>	<b>33</b>
	Energy Tracking with ENERGY STAR Portfolio Manager.....	33
	Weatherization.....	33
	Doors and Windows.....	33
	Lighting Maintenance.....	34
	Lighting Controls .....	34
	Motor Maintenance .....	34
	Thermostat Schedules and Temperature Resets .....	34
	Boiler Maintenance .....	34
	Water Heater Maintenance .....	34
	Water Conservation .....	35
	Procurement Strategies .....	35
<b>6</b>	<b>On-site Generation .....</b>	<b>36</b>
6.1	Solar Photovoltaic .....	37
6.2	Combined Heat and Power .....	39
<b>7</b>	<b>Project Funding and Incentives.....</b>	<b>40</b>
7.1	Utility Energy Efficiency Programs .....	40
<b>8</b>	<b>New Jersey's Clean Energy Programs .....</b>	<b>41</b>
8.1	Large Energy Users .....	41
8.2	Combined Heat and Power .....	42
8.3	Successor Solar Incentive Program (SuSI) .....	43
8.4	Energy Savings Improvement Program .....	44
<b>9</b>	<b>Project Development .....</b>	<b>45</b>
<b>10</b>	<b>Energy Purchasing and Procurement Strategies .....</b>	<b>46</b>
10.1	Retail Electric Supply Options.....	46
10.2	Retail Natural Gas Supply Options .....	46
	<b>Appendix A: Equipment Inventory &amp; Recommendations .....</b>	<b>A-1</b>
	<b>Appendix B: ENERGY STAR Statement of Energy Performance.....</b>	<b>B-1</b>
	<b>Appendix C: Glossary .....</b>	<b>C-1</b>

## ENERGY EFFICIENCY INCENTIVE & REBATE TRANSITION

---

For the purposes of your LGEA, estimated incentives and rebates are included as placeholders for planning purposes. New Jersey utilities are rolling out their own energy efficiency programs, which your project may be eligible for depending on individual measures, quantities, and size of the building.

In 2018, Governor Murphy signed into law the landmark legislation known as the [Clean Energy Act](#). The law called for a significant overhaul of New Jersey's clean energy systems by building sustainable infrastructure in order to fight climate change and reduce carbon emissions, which will in turn create well-paying local jobs, grow the state's economy, and improve public health while ensuring a cleaner environment for current and future residents.

These next generation energy efficiency programs feature new ways of managing and delivering programs historically administered by New Jersey's Clean Energy Program™ (NJCEP). All of the investor-owned gas and electric utility companies will now also offer complementary energy efficiency programs and incentives directly to customers like you. NJCEP will still offer programs for new construction, renewable energy, the Energy Savings Improvement Program (ESIP), and large energy users.

New utility programs are under development. Keep up to date with developments by visiting the [NJCEP website](#).

# 1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPB) has sponsored this Local Government Energy Audit (LGEA) report for Maintenance Shop, Auto Shop & Paint Shop. This report provides you with information about your facility's energy use, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help make changes in your facility. TRC conducted this study as part of a comprehensive effort to assist New Jersey school districts and local governments in controlling their energy costs and to help protect our environment by reducing statewide energy consumption.

## BUILDING PERFORMANCE REPORT



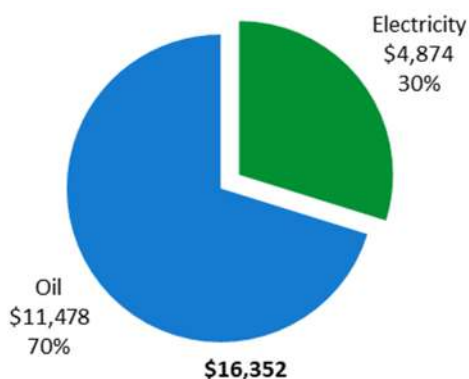
Costs: \$16,352

---

Annual Utilities Electricity:  
35,899 kWh

---

No. 2 Fuel Oil:  
5,261 Gallons



ENERGY STAR®  
Benchmarking Score

N/A  
(1-100 scale)

A standard energy use benchmark is not available for this facility type. This report contains suggestions about how to improve building performance and reduce energy costs.

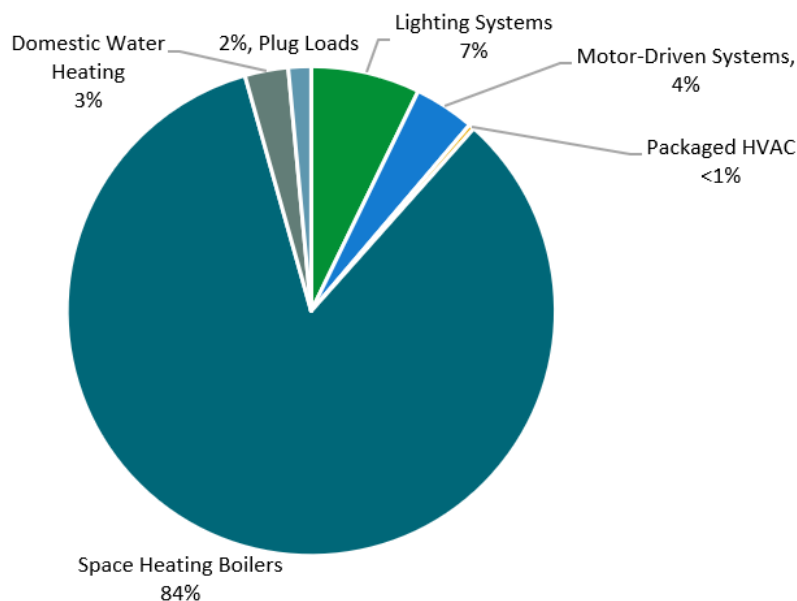


Figure 1 - Energy Use by System

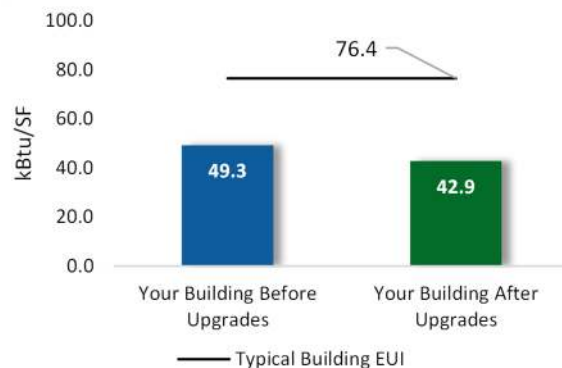
## POTENTIAL IMPROVEMENTS



This energy audit considered a range of potential energy improvements in your building. Costs and savings will vary between improvements. Presented below are two potential scopes of work for your consideration.

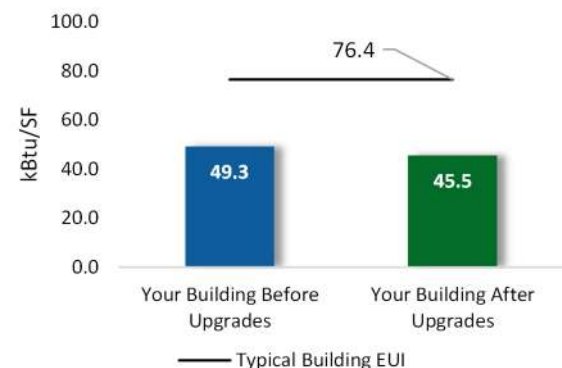
### Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	\$33,159
Potential Rebates & Incentives <sup>1</sup>	\$2,640
Annual Cost Savings	\$2,842
Annual Energy Savings	Electricity: 13,477 kWh No. 2 Fuel Oil: 464 Gallons
Greenhouse Gas Emission Savings	12 Tons
Simple Payback	10.7 Years
Site Energy Savings (All Utilities)	13%



### Scenario 2: Cost Effective Package<sup>2</sup>

Installation Cost	\$10,517
Potential Rebates & Incentives	\$1,325
Annual Cost Savings	\$2,029
Annual Energy Savings	Electricity: 12,364 kWh No. 2 Fuel Oil: 161 Gallons
Greenhouse Gas Emission Savings	8 Tons
Simple Payback	4.5 Years
Site Energy Savings (all utilities)	8%



### On-site Generation Potential

Photovoltaic	None
Combined Heat and Power	None

<sup>1</sup> Incentives are based on previously run state rebate programs. Contact your utility provider for current program incentives that may apply.

<sup>2</sup> A cost-effective measure is defined as one where the simple payback does not exceed two-thirds of the expected proposed equipment useful life. Simple payback is based on the net measure cost after potential incentives.



#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Lighting Upgrades</b>			<b>8,124</b>	<b>1.6</b>	<b>-2</b>	<b>\$1,068</b>	<b>\$4,824</b>	<b>\$968</b>	<b>\$3,856</b>	<b>3.6</b>	<b>7,814</b>
ECM 1	Install LED Fixtures	Yes	3,241	0.0	0	\$440	\$2,061	\$500	\$1,561	3.5	3,264
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	2,490	1.0	-1	\$320	\$2,047	\$320	\$1,727	5.4	2,320
ECM 3	Retrofit Fixtures with LED Lamps	Yes	2,393	0.6	-1	\$308	\$716	\$148	\$568	1.8	2,230
<b>Lighting Control Measures</b>			<b>2,218</b>	<b>0.5</b>	<b>-1</b>	<b>\$285</b>	<b>\$3,126</b>	<b>\$290</b>	<b>\$2,836</b>	<b>9.9</b>	<b>2,066</b>
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	2,218	0.5	-1	\$285	\$3,126	\$290	\$2,836	9.9	2,066
<b>Motor Upgrades</b>			<b>124</b>	<b>0.0</b>	<b>0</b>	<b>\$17</b>	<b>\$909</b>	<b>\$0</b>	<b>\$909</b>	<b>54.1</b>	<b>125</b>
ECM 5	Premium Efficiency Motors	No	124	0.0	0	\$17	\$909	\$0	\$909	54.1	125
<b>Variable Frequency Drive (VFD) Measures</b>			<b>990</b>	<b>0.1</b>	<b>0</b>	<b>\$134</b>	<b>\$3,010</b>	<b>\$75</b>	<b>\$2,935</b>	<b>21.8</b>	<b>997</b>
ECM 6	Install VFDs on Heating Water Pumps	No	990	0.1	0	\$134	\$3,010	\$75	\$2,935	21.8	997
<b>Gas Heating (HVAC/Process) Replacement</b>			<b>0</b>	<b>0.0</b>	<b>42</b>	<b>\$662</b>	<b>\$18,722</b>	<b>\$1,240</b>	<b>\$17,482</b>	<b>26.4</b>	<b>6,879</b>
ECM 7	Install High Efficiency Hot Water Boilers	No	0	0.0	42	\$662	\$18,722	\$1,240	\$17,482	26.4	6,879
<b>HVAC System Improvements</b>			<b>0</b>	<b>0.0</b>	<b>25</b>	<b>\$387</b>	<b>\$264</b>	<b>\$60</b>	<b>\$204</b>	<b>0.5</b>	<b>4,019</b>
ECM 8	Install Pipe Insulation	Yes	0	0.0	25	\$387	\$264	\$60	\$204	0.5	4,019
<b>Domestic Water Heating Upgrade</b>			<b>0</b>	<b>0.0</b>	<b>1</b>	<b>\$15</b>	<b>\$14</b>	<b>\$7</b>	<b>\$7</b>	<b>0.5</b>	<b>155</b>
ECM 9	Install Low-Flow DHW Devices	Yes	0	0.0	1	\$15	\$14	\$7	\$7	0.5	155
<b>Custom Measures</b>			<b>2,022</b>	<b>0.0</b>	<b>0</b>	<b>\$275</b>	<b>\$2,289</b>	<b>\$0</b>	<b>\$2,289</b>	<b>8.3</b>	<b>2,036</b>
ECM 10	Install Heat Pump Water Heater	Yes	2,022	0.0	0	\$275	\$2,289	\$0	\$2,289	8.3	2,036
<b>TOTALS (COST EFFECTIVE MEASURES)</b>			<b>12,364</b>	<b>2.1</b>	<b>22</b>	<b>\$2,029</b>	<b>\$10,517</b>	<b>\$1,325</b>	<b>\$9,192</b>	<b>4.5</b>	<b>16,091</b>
<b>TOTALS (ALL MEASURES)</b>			<b>13,477</b>	<b>2.3</b>	<b>64</b>	<b>\$2,842</b>	<b>\$33,159</b>	<b>\$2,640</b>	<b>\$30,518</b>	<b>10.7</b>	<b>24,091</b>

\* - All incentives presented in this table are included as placeholders for planning purposes and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

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

Figure 2 – Evaluated Energy Improvements

For more detail on each evaluated energy improvement and a break out of cost-effective improvements, see **Section 4: Energy Conservation Measures**.



## 1.1 Planning Your Project

Careful planning makes for a successful energy project. When considering this scope of work, you will have some decisions to make, such as:

- ◆ How will the project be funded and/or financed?
- ◆ Is it best to pursue individual ECMs, groups of ECMs, or use a comprehensive approach where all ECMs are installed together?
- ◆ Are there other facility improvements that should happen at the same time?

### Pick Your Installation Approach

Utility-run energy efficiency programs, such as New Jersey's Clean Energy Programs, give you the flexibility to do a little or a lot. Rebates, incentives, and financing are available to help reduce both your installation costs and your energy bills. If you are planning to take advantage of these programs, make sure to review incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives before purchasing materials or starting installation.

For details on these programs please visit [New Jersey's Clean Energy Program website](#) or contact your utility provider.



## **Options from Around the State**

### *Financing and Planning Support with the Energy Savings Improvement Program (ESIP)*

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the 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. You have already taken the first step as an LGEA customer, because this report is required to participate in ESIP.

### *Resiliency with Return on Investment through Combined Heat and Power (CHP)*

The CHP program provides incentives for combined heat and power (i.e., cogeneration) and waste heat to power projects. Combined heat and power systems generate power on-site and recover heat from the generation system to meet on-site thermal loads. Waste heat to power systems use waste heat to generate power. You will work with a qualified developer who will design a system that meets your building's heating and cooling needs.

### *Successor Solar Incentive Program (SuSI)*

New Jersey is committed to supporting solar energy. Solar projects help the state reach the renewable goals outlined in the state's Energy Master Plan. The SuSI program is used to register and certify solar projects in New Jersey. Rebates are not available, but certified solar projects are able to earn one SREC II (Solar Renewable Energy Certificates II) for each megawatt-hour of solar electricity produced from a qualifying solar facility.

### *Ongoing Electric Savings with Demand Response*

The Demand Response Energy Aggregator program reduces 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. By enabling commercial facilities to reduce electric demand 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 demand response (DR) programs. Program participation is voluntary, and facilities receive payments regardless of whether they are called upon to curtail their load during times of peak demand.

### *Large Energy User Program (LEUP)*

LEUP designed to promote self-investment in energy efficiency and combined heat and power or fuel cell projects. It incentivizes owners/users of buildings to upgrade or install energy conserving measures in existing buildings to help offset the capital costs associated with the project. The efficiency upgrades are customized to meet the requirements of the customers' existing facilities, while advancing the State's energy efficiency, conservation, and greenhouse gas reduction goals.

## 2 EXISTING CONDITIONS

---

The New Jersey Board of Public Utilities (NJBPUB) has sponsored this Local Government Energy Audit (LGEA) Report for Maintenance Shop, Auto Shop & Paint Shop. This report provides information on how your facility uses energy, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help you implement the ECMs.

TRC conducted this study as part of a comprehensive effort to assist New Jersey educational and local government facilities in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

### 2.1 Site Overview

On September 19, 2022, TRC performed an energy audit for the Maintenance, Auto, and Paint Shops located in Berkeley Township, New Jersey at Island Beach State Park. TRC met with Jenifer Clayton and Douglas Brown to review the facility operations and help focus our investigation on specific energy-using systems.

The maintenance, auto, and paint shops are three separate buildings, with building area and construction dates provided in the table below. The buildings share a fuel oil tank, with one electric meter serving the Maintenance shop and another serving the auto and paint shops. Spaces include offices, lounges, garages, shops, kitchen, locker room, corridors, stairwells, restrooms, storage rooms, electrical and mechanical space.

Lighting for the maintenance shop is provided mainly by fluorescent fixtures, while lighting for the auto and paint shops is provided mainly by LED fixtures. Two boilers provide heating to the maintenance and auto shops, while window air conditioning (AC) units provide cooling to some areas. The paint shop is unconditioned.

Building Name	Size of Building (Square Feet)	Year Built	# of Floors
Maintenance Shop	5,615	1930	2
Auto Shop	11,077	1987	1
Paint Shop	600	1987	1

## 2.2 Building Occupancy

The facility is occupied year-round with a typical occupancy of 27 staff. During the summer the facility closes at 7:30PM, and the facility closes at 2:30PM the rest of the year. Summer hours are as shown below.

Building Name	Weekday/Weekend	Operating Schedule
Maintenance Shop	Weekday	6:00 AM - 7:30 PM
	Weekend	6:00 AM - 7:30 PM
Auto Shop	Weekday	6:00 AM - 7:30 PM
	Weekend	6:00 AM - 7:30 PM
Paint Shop	Weekday	6:00 AM - 7:30 PM
	Weekend	6:00 AM - 7:30 PM

*Figure 3 - Building Occupancy Schedule*

## 2.3 Building Envelope

Maintenance shop building walls are wood structure with a wood shingle facade. The roof is pitched, covered with wooden shingles, and in fair condition. The windows are single glazed and have wooden frames with thermal breaks.

Auto and pain shops walls are concrete block over structural steel with a stone facade. The roof areas are pitched, covered with asphalt shingles, and in fair condition. Most of the windows are single glazed and have aluminum frames with thermal breaks.

The glass-to-frame seals are in fair condition. The operable window weather seals are in fair condition, showing little evidence of excessive wear. Exterior doors have wooden frames and are in fair condition with worn door seals. Degraded window and door seals increase drafts and outside air infiltration. Overall, the building envelopes appear in fair condition.



*Maintenance Shop*



*Auto Shop*





*Building Windows*



*Building Doors*

## 2.4 Lighting Systems

The primary interior lighting systems throughout the facility incorporate 32-watt linear fluorescent T8 lamps for the maintenance shop, and LED sources for the auto and paint shops

LED linear tube lamps have been installed as replacement fluorescent lamps in some areas. Additionally, there are some incandescent and T12 fluorescent lamps used in some spaces. Typically, incandescent lamps at this site draw between 60 and 72 watts, and T12 fluorescent lamps are rated at 40 watts.

Interior light fixtures are controlled by manual wall switches. All light fixtures are in good condition. Interior lighting levels were generally sufficient. Maintenance shop exterior fixtures use LED lamps, and auto shop exterior fixtures use HPS lamps. Exterior fixtures are controlled by a mixture of photocells and timers.



*Fluorescent T8 & LED Lamps*





*Incandescent & LED Lamps*



*Exterior LED & HPS Fixtures*

## 2.5 Air Handling Systems

### Unitary Electric HVAC Equipment

The maintenance shop's kitchen, locker room, and office, and the auto shop's office are all conditioned using window air conditioning (AC) units. The window ACs range in cooling capacity from 0.4 to 0.8 tons, with efficiencies ranging from 9.7 to 12.0 EER. The units are in fair to good condition.



*Window AC Unit*

## 2.6 Heating Hot Water Systems

The facility's heating systems consist of one HB Smith oil-fired hot water boiler with an output capacity of 217.4 MBh located at the maintenance shop, and one Weil McLain oil-fired hot water boiler with an output capacity of 480.0 MBh located at the auto shop. The burners are fully modulating with nominal efficiencies of 80 percent. The boilers are configured in a manual control scheme. The boilers are in fair condition and are operating beyond their normal useful life.

Fuel oil is drawn from the oil tank and supplied to each boiler using dedicated fractional hp oil pumps, and each boiler is equipped with a combustion air fan. The boilers are configured in a constant flow primary distribution with two fractional hp constant speed hot water pumps distributing water throughout the maintenance shop, and a 1 hp constant speed hot water pump distributing water throughout the auto shop. The boilers provide hot water to radiators and unit heaters throughout the buildings.



*Hot Water Boilers – Maintenance Shop & Auto Shop*



## 2.7 Domestic Hot Water

Hot water for the maintenance shop is produced by a 105 MBh Bradford White oil-fired storage water heater with a 32-gallon capacity, and hot water for the Auto Shop is produced by a 5.5 kW State Industries electric storage water heater with a 47-gallon capacity. The units are in fair condition. The domestic hot water pipes are partially insulated, and the insulation is in fair condition.



*Water Heaters*

## 2.8 Plug Load and Vending Machines

The location is doing a great job managing their electrical plug loads. This report makes additional suggestions for ECMs in this area as well as energy efficient best practices.

There are approximately three computer workstations throughout the facility. Plug loads include general cafe and office equipment, and there are typical office loads such as printers, microwaves, coffee machines, and a television. Additionally, there is an electric stove at the maintenance shop, as well as a vehicle lift and welding machines located at the Auto Shop.

There are two residential style refrigerators within the maintenance shop that are used to store food and drinks. These vary in condition and efficiency.



*Welding Machine & Residential Style Refrigerator*

## 2.9 Water-Using Systems

There are two restrooms with toilets and sinks. Faucet flow rates are at 2.2 gallons per minute (gpm) or higher.

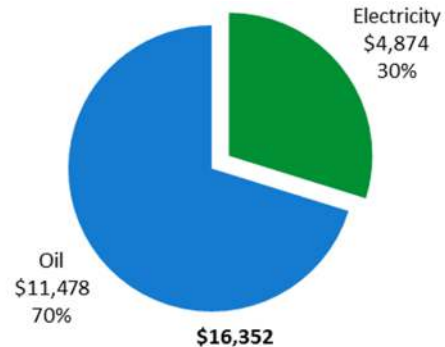


*Typical Restroom Sinks*

### 3 ENERGY USE AND COSTS

Twelve months of utility billing data are used to develop annual energy consumption and cost data. This information creates a profile of the annual energy consumption and energy costs.

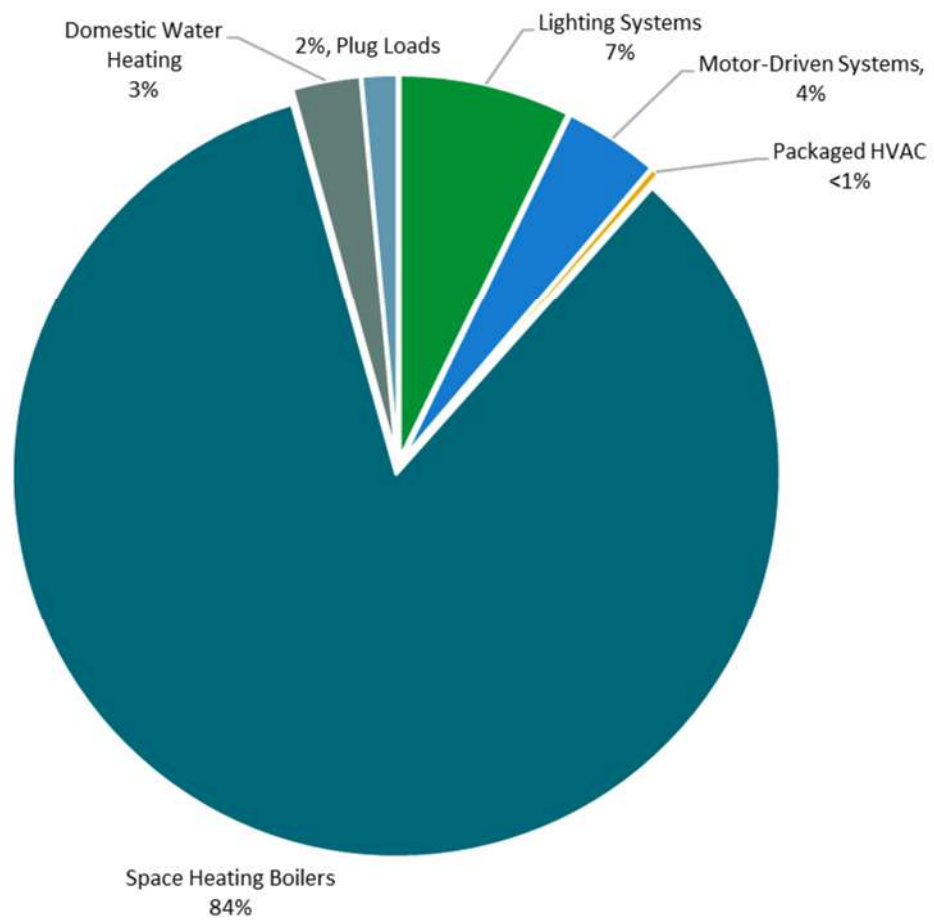
Utility Summary		
Fuel	Usage	Cost
Electricity	35,899 kWh	\$4,874
No. 2 Fuel Oil	5,261 Gallons	\$11,478
<b>Total</b>		<b>\$16,352</b>



An energy balance identifies and quantifies energy use in your various building systems. This can highlight areas with the most potential for improvement. This energy balance was developed using calculated energy use for each of the end uses noted in the figure.

The energy auditor collects information regarding equipment operating hours, capacity, efficiency, and other operational parameters from facility staff, drawings, and on-site observations. This information is used as the inputs to calculate the existing conditions energy use for the site. The calculated energy use is then compared to the historical energy use and the initial inputs are revised, as necessary, to balance the calculated energy use to the historical energy use.

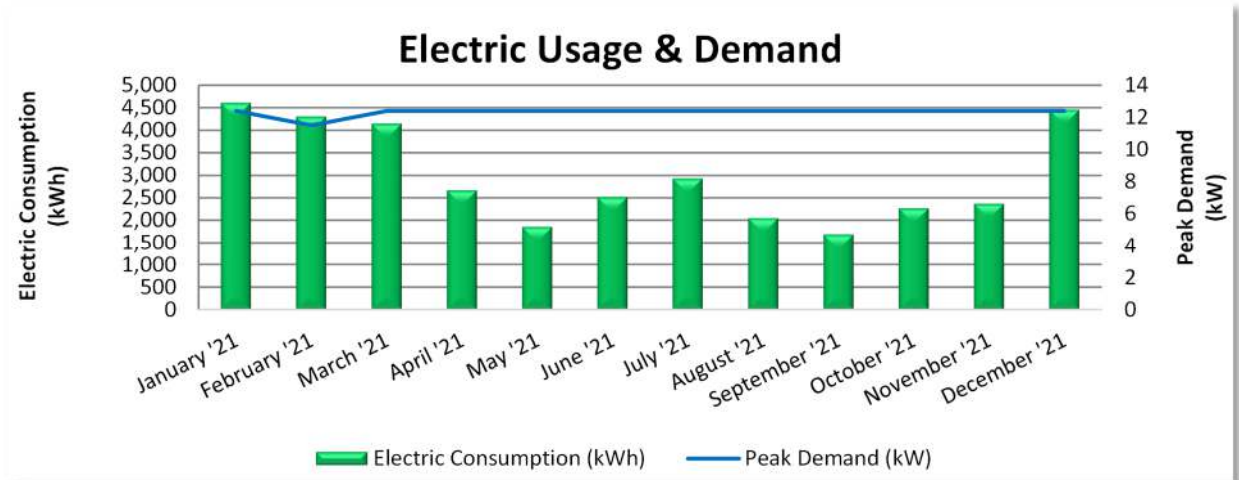




*Figure 4 - Energy Balance*

### 3.1 Electricity

JCP&L delivers electricity under rate class General Service Secondary (GSS), with electric production provided by Champion Energy, a third-party supplier.



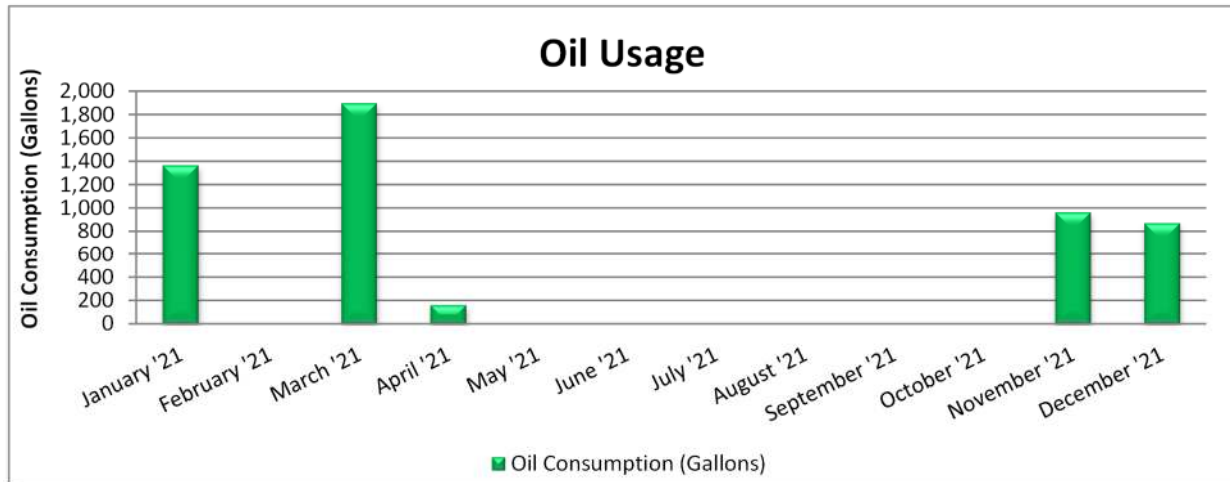
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
2/10/21	29	4,612	12	\$15	\$557
3/10/21	28	4,304	12	\$9	\$519
4/12/21	33	4,150	12	\$15	\$514
5/12/21	30	2,673	12	\$7	\$361
6/11/21	30	1,860	12	\$7	\$295
7/13/21	32	2,522	12	\$7	\$367
8/11/21	29	2,936	12	\$7	\$408
9/13/21	33	2,053	12	\$7	\$319
10/12/21	29	1,692	12	\$7	\$263
11/10/21	29	2,270	12	\$8	\$319
12/9/21	29	2,372	12	\$8	\$337
1/12/22	34	4,455	12	\$8	\$615
<b>Totals</b>	<b>365</b>	<b>35,899</b>	<b>12</b>	<b>\$105</b>	<b>\$4,874</b>
<b>Annual</b>	<b>365</b>	<b>35,899</b>	<b>12</b>	<b>\$105</b>	<b>\$4,874</b>

Notes:

- Peak demand of 12 kW occurred in January '21.
- Average demand over the past 12 months was 12 kW.
- The average electric cost over the past 12 months was \$0.136/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

### 3.2 No. 2 Fuel Oil

Majestic Oil Company, Inc. delivers No. 2 fuel oil to the project site.



No. 2 Fuel Oil Billing Data			
Period Ending	Days in Period	Oil Usage (Gallons)	Fuel Cost
2/1/21	31	1,367	\$2,505
3/1/21	28	0	\$0
4/1/21	31	1,898	\$3,809
5/1/21	30	160	\$351
6/1/21	31	0	\$0
7/1/21	30	0	\$0
8/1/21	31	0	\$0
9/1/21	31	0	\$0
10/1/21	30	0	\$0
11/1/21	31	0	\$0
12/1/21	30	966	\$2,564
1/1/22	31	870	\$2,249
<b>Totals</b>	<b>365</b>	<b>5,261</b>	<b>\$11,478</b>
<b>Annual</b>	<b>365</b>	<b>5,261</b>	<b>\$11,478</b>

Notes:

- The average no. 2 fuel oil cost for the past 12 months is \$2.182/Gallon, which is the blended rate used throughout the analysis.
- Fuel deliveries do not necessarily correspond to periods of use.

### 3.3 Benchmarking

Your building was benchmarked using the United States Environmental Protection Agency's (EPA) *Portfolio Manager*® software. Benchmarking compares your building's energy use to that of similar buildings across the country, while neutralizing variations due to location, occupancy, and operating hours. Some building types can be scored with a 1-100 ranking of a building's energy performance relative to the national building market. A score of 50 represents the national average and a score of 100 is best.

This ENERGY STAR benchmarking score provides a comprehensive snapshot of your building's energy performance. It assesses the building's physical assets, operations, and occupant behavior, which is compiled into a quick and easy-to-understand score.

#### Benchmarking Score

N/A

Due to its unique characteristics, this building type is not able to receive a benchmarking score. This report contains suggestions about how to improve building performance and reduce energy costs.

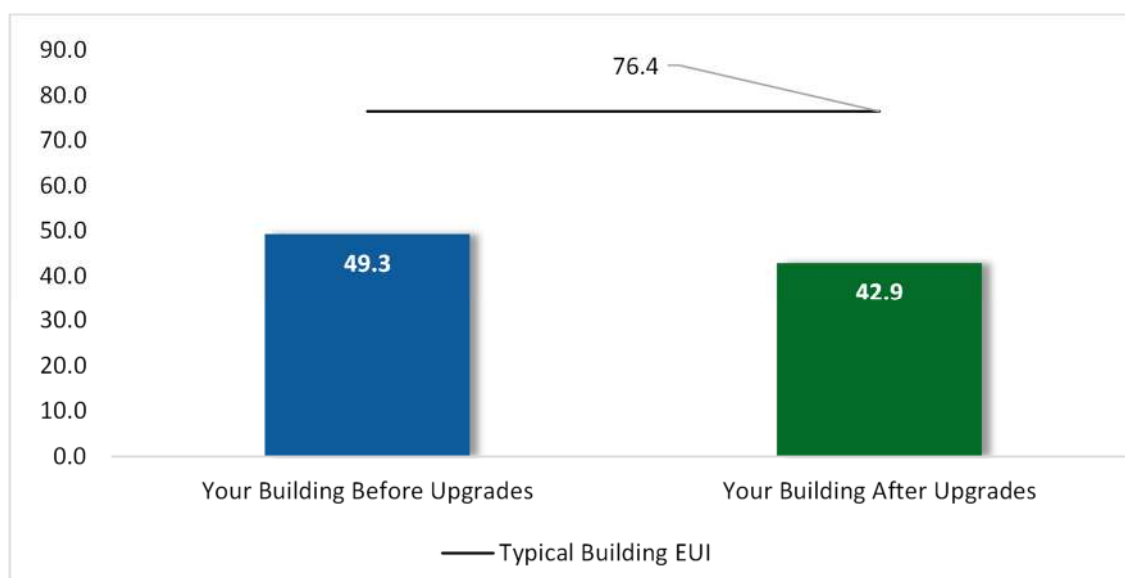


Figure 5 - Energy Use Intensity Comparison<sup>3</sup>

Energy use intensity (EUI) measures energy consumption per square foot and is the standard metric for comparing buildings' energy performance. A lower EUI means better performance and less energy consumed. Several factors can cause a building to vary from typical energy usage. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and occupant behavior all contribute to a building's energy use and the benchmarking score.

<sup>3</sup> Based on all evaluated ECMs

### **Tracking Your Energy Performance**

Keeping track of your energy use on a monthly basis is one of the best ways to keep energy costs in check. Update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance.

**We have created a Portfolio Manager account for your facility, and we have already entered the monthly utility data shown above for you. Account login information for your account will be sent via email.**

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>.

For more information on ENERGY STAR and Portfolio Manager, visit their [website](#).

## 4 ENERGY CONSERVATION MEASURES

---

The goal of this audit report is to identify and evaluate potential energy efficiency improvements and provide information about the cost effectiveness of those improvements. Most energy conservation measures have received preliminary analysis of feasibility, which identifies expected ranges of savings. This level of analysis is typically sufficient to demonstrate project cost-effectiveness and help prioritize energy measures.

Calculations of energy use and savings are based on the current version of the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings*, which is approved by the NJBPU. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances.

Operation and maintenance costs for the proposed new equipment will generally be lower than the current costs for the existing equipment—especially if the existing equipment is at or past its normal useful life. We have conservatively assumed there to be no impact on overall maintenance costs over the life of the equipment.

Financial incentives are based on previously run state rebate programs. New utility programs are expected to start rolling out in the spring and summer of 2021. Keep up to date with developments by visiting the [NJCEP website](#). Some measures and proposed upgrades may be eligible for higher incentives than those shown below.

For a detailed list of the locations and recommended energy conservation measures for all inventoried equipment, see **Appendix A: Equipment Inventory & Recommendations**.

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Lighting Upgrades</b>			<b>8,124</b>	<b>1.6</b>	<b>-2</b>	<b>\$1,068</b>	<b>\$4,824</b>	<b>\$968</b>	<b>\$3,856</b>	<b>3.6</b>	<b>7,814</b>
ECM 1	Install LED Fixtures	Yes	3,241	0.0	0	\$440	\$2,061	\$500	\$1,561	3.5	3,264
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	2,490	1.0	-1	\$320	\$2,047	\$320	\$1,727	5.4	2,320
ECM 3	Retrofit Fixtures with LED Lamps	Yes	2,393	0.6	-1	\$308	\$716	\$148	\$568	1.8	2,230
<b>Lighting Control Measures</b>			<b>2,218</b>	<b>0.5</b>	<b>-1</b>	<b>\$285</b>	<b>\$3,126</b>	<b>\$290</b>	<b>\$2,836</b>	<b>9.9</b>	<b>2,066</b>
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	2,218	0.5	-1	\$285	\$3,126	\$290	\$2,836	9.9	2,066
<b>Motor Upgrades</b>			<b>124</b>	<b>0.0</b>	<b>0</b>	<b>\$17</b>	<b>\$909</b>	<b>\$0</b>	<b>\$909</b>	<b>54.1</b>	<b>125</b>
ECM 5	Premium Efficiency Motors	No	124	0.0	0	\$17	\$909	\$0	\$909	54.1	125
<b>Variable Frequency Drive (VFD) Measures</b>			<b>990</b>	<b>0.1</b>	<b>0</b>	<b>\$134</b>	<b>\$3,010</b>	<b>\$75</b>	<b>\$2,935</b>	<b>21.8</b>	<b>997</b>
ECM 6	Install VFDs on Heating Water Pumps	No	990	0.1	0	\$134	\$3,010	\$75	\$2,935	21.8	997
<b>Gas Heating (HVAC/Process) Replacement</b>			<b>0</b>	<b>0.0</b>	<b>42</b>	<b>\$662</b>	<b>\$18,722</b>	<b>\$1,240</b>	<b>\$17,482</b>	<b>26.4</b>	<b>6,879</b>
ECM 7	Install High Efficiency Hot Water Boilers	No	0	0.0	42	\$662	\$18,722	\$1,240	\$17,482	26.4	6,879
<b>HVAC System Improvements</b>			<b>0</b>	<b>0.0</b>	<b>25</b>	<b>\$387</b>	<b>\$264</b>	<b>\$60</b>	<b>\$204</b>	<b>0.5</b>	<b>4,019</b>
ECM 8	Install Pipe Insulation	Yes	0	0.0	25	\$387	\$264	\$60	\$204	0.5	4,019
<b>Domestic Water Heating Upgrade</b>			<b>0</b>	<b>0.0</b>	<b>1</b>	<b>\$15</b>	<b>\$14</b>	<b>\$7</b>	<b>\$7</b>	<b>0.5</b>	<b>155</b>
ECM 9	Install Low-Flow DHW Devices	Yes	0	0.0	1	\$15	\$14	\$7	\$7	0.5	155
<b>Custom Measures</b>			<b>2,022</b>	<b>0.0</b>	<b>0</b>	<b>\$275</b>	<b>\$2,289</b>	<b>\$0</b>	<b>\$2,289</b>	<b>8.3</b>	<b>2,036</b>
ECM 10	Install Heat Pump Water Heater	Yes	2,022	0.0	0	\$275	\$2,289	\$0	\$2,289	8.3	2,036
<b>TOTALS</b>			<b>13,477</b>	<b>2.3</b>	<b>64</b>	<b>\$2,842</b>	<b>\$33,159</b>	<b>\$2,640</b>	<b>\$30,518</b>	<b>10.7</b>	<b>24,091</b>

\* - All incentives presented in this table are included as placeholders for planning purposes and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

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

Figure 6 – All Evaluated ECMs



#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Lighting Upgrades</b>		<b>8,124</b>	<b>1.6</b>	<b>-2</b>	<b>\$1,068</b>	<b>\$4,824</b>	<b>\$968</b>	<b>\$3,856</b>	<b>3.6</b>	<b>7,814</b>
ECM 1	Install LED Fixtures	3,241	0.0	0	\$440	\$2,061	\$500	\$1,561	3.5	3,264
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	2,490	1.0	-1	\$320	\$2,047	\$320	\$1,727	5.4	2,320
ECM 3	Retrofit Fixtures with LED Lamps	2,393	0.6	-1	\$308	\$716	\$148	\$568	1.8	2,230
<b>Lighting Control Measures</b>		<b>2,218</b>	<b>0.5</b>	<b>-1</b>	<b>\$285</b>	<b>\$3,126</b>	<b>\$290</b>	<b>\$2,836</b>	<b>9.9</b>	<b>2,066</b>
ECM 4	Install Occupancy Sensor Lighting Controls	2,218	0.5	-1	\$285	\$3,126	\$290	\$2,836	9.9	2,066
<b>HVAC System Improvements</b>		<b>0</b>	<b>0.0</b>	<b>25</b>	<b>\$387</b>	<b>\$264</b>	<b>\$60</b>	<b>\$204</b>	<b>0.5</b>	<b>4,019</b>
ECM 8	Install Pipe Insulation	0	0.0	25	\$387	\$264	\$60	\$204	0.5	4,019
<b>Domestic Water Heating Upgrade</b>		<b>0</b>	<b>0.0</b>	<b>1</b>	<b>\$15</b>	<b>\$14</b>	<b>\$7</b>	<b>\$7</b>	<b>0.5</b>	<b>155</b>
ECM 9	Install Low-Flow DHW Devices	0	0.0	1	\$15	\$14	\$7	\$7	0.5	155
<b>Custom Measures</b>		<b>2,022</b>	<b>0.0</b>	<b>0</b>	<b>\$275</b>	<b>\$2,289</b>	<b>\$0</b>	<b>\$2,289</b>	<b>8.3</b>	<b>2,036</b>
ECM 10	Install Heat Pump Water Heater	2,022	0.0	0	\$275	\$2,289	\$0	\$2,289	8.3	2,036
<b>TOTALS</b>		<b>12,364</b>	<b>2.1</b>	<b>22</b>	<b>\$2,029</b>	<b>\$10,517</b>	<b>\$1,325</b>	<b>\$9,192</b>	<b>4.5</b>	<b>16,091</b>

\* - All incentives presented in this table are included as placeholders for planning purposes and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

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

Figure 7 – Cost Effective ECMs

## 4.1 Lighting

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Lighting Upgrades</b>		<b>8,124</b>	<b>1.6</b>	<b>-2</b>	<b>\$1,068</b>	<b>\$4,824</b>	<b>\$968</b>	<b>\$3,856</b>	<b>3.6</b>	<b>7,814</b>
ECM 1	Install LED Fixtures	3,241	0.0	0	\$440	\$2,061	\$500	\$1,561	3.5	3,264
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	2,490	1.0	-1	\$320	\$2,047	\$320	\$1,727	5.4	2,320
ECM 3	Retrofit Fixtures with LED Lamps	2,393	0.6	-1	\$308	\$716	\$148	\$568	1.8	2,230

When considering lighting upgrades, we suggest using a comprehensive design approach that simultaneously upgrades lighting fixtures and controls to maximize energy savings and improve occupant lighting. Comprehensive design will also consider appropriate lighting levels for different space types to make sure that the right amount of light is delivered where needed. If conversion to LED light sources is proposed, we suggest converting all of a specific lighting type (e.g., linear fluorescent) to LED lamps to minimize the number of lamp types in use at the facility, which should help reduce future maintenance costs.

### **ECM 1: Install LED Fixtures**

Replace existing fixtures containing high-intensity discharge (HID) lamps with new LED light fixtures. This measure saves energy by installing LEDs, which use less power than other technologies with a comparable light output.

In some cases, HID fixtures can be retrofit with screw-based LED lamps. Replacing an existing HID fixture with a new LED fixture will generally provide better overall lighting optics; however, replacing the HID lamp with a LED screw-in lamp is typically a less expensive retrofit. We recommend you work with your lighting contractor to determine which retrofit solution is best suited to your needs and will be compatible with the existing fixtures.

Maintenance savings may also be achieved since LED lamps last longer than other light sources and therefore do not need to be replaced as often.

**Affected Building Areas:** exterior HPS fixtures.

### **ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers**

Retrofit fluorescent fixtures by removing the fluorescent tubes and ballasts and replacing them with LED tubes and LED drivers (if necessary), which are designed to be used in retrofitted fluorescent fixtures.

The measure uses the existing fixture housing but replaces the electric components with more efficient lighting technology, which use less power than other lighting technologies but provides equivalent lighting output. Maintenance savings may also be achieved since LED tubes last longer than fluorescent tubes and, therefore, do not need to be replaced as often.

**Affected Building areas:** all areas with fluorescent fixtures with T12 tubes.

### **ECM 3: Retrofit Fixtures with LED Lamps**

Replace fluorescent and incandescent lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps can be used in existing fixtures as a direct replacement for most other lighting technologies. Be sure to specify replacement lamps that are compatible with existing dimming controls, where applicable. In some circumstances, you may need to upgrade your dimming system for optimum performance.

This measure saves energy by installing LEDs, which use less power than other lighting technologies yet provide equivalent lighting output for the space. Maintenance savings may also be available, as longer-lasting LEDs lamps will not need to be replaced as often as the existing lamps.

**Affected Building Areas:** all areas with incandescent lamps, and fluorescent fixtures with T8 tubes.

## 4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Lighting Control Measures</b>		<b>2,218</b>	<b>0.5</b>	<b>-1</b>	<b>\$285</b>	<b>\$3,126</b>	<b>\$290</b>	<b>\$2,836</b>	<b>9.9</b>	<b>2,066</b>
ECM 4	Install Occupancy Sensor Lighting Controls	2,218	0.5	-1	\$285	\$3,126	\$290	\$2,836	9.9	2,066

Lighting controls reduce energy use by turning off or lowering lighting fixture power levels when not in use. A comprehensive approach to lighting design should upgrade the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

### **ECM 4: Install Occupancy Sensor Lighting Controls**

Install occupancy sensors to control lighting fixtures in areas that are frequently unoccupied, even for short periods. For most spaces, we recommend that lighting controls use dual technology sensors, which reduce the possibility of lights turning off unexpectedly.

Occupancy sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Most occupancy sensor lighting controls allow users to manually turn fixtures on/off, as needed. Some controls can also provide dimming options.

Occupancy sensors can be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are best suited to single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in large spaces, locations without local switching, and where wall switches are not in the line-of-sight of the main work area.

This measure provides energy savings by reducing the lighting operating hours.

**Affected Building Areas:** offices, garages, woodshop, restrooms, and storage rooms.

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Motor Upgrades</b>		<b>124</b>	<b>0.0</b>	<b>0</b>	<b>\$17</b>	<b>\$909</b>	<b>\$0</b>	<b>\$909</b>	<b>54.1</b>	<b>125</b>
ECM 5	Premium Efficiency Motors	124	0.0	0	\$17	\$909	\$0	\$909	54.1	125

### ECM 5: Premium Efficiency Motors

We evaluated replacing standard efficiency motors with IHP 2014 efficiency motors. This evaluation assumes that existing motors will be replaced with motors of equivalent size and type. In some cases, additional savings may be possible by downsizing motors to better meet the motor's current load requirements.

#### Affected Motors:

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Additional Motor Description
Mechanical Basement - Maintenance Shop	Heating System	1	Heating Hot Water Pump	0.3	Heating Hot Water Pump
Mechanical - Boiler - Auto Shop	Boiler - Auto Shop	1	Combustion Air Fan	0.3	Combustion Air Fan

Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours. The base case motor energy consumption is estimated using the efficiencies found on nameplates or estimated based on the age of the motor and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the current *New Jersey's Clean Energy Program Protocols to Measure Resource Savings*.

## 4.4 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Variable Frequency Drive (VFD) Measures</b>		<b>990</b>	<b>0.1</b>	<b>0</b>	<b>\$134</b>	<b>\$3,010</b>	<b>\$75</b>	<b>\$2,935</b>	<b>21.8</b>	<b>997</b>
ECM 6	Install VFDs on Heating Water Pumps	990	0.1	0	\$134	\$3,010	\$75	\$2,935	21.8	997

Variable frequency drives control motors for fans, pumps, and process equipment based on the actual output required of the driven equipment. Energy savings result from more efficient control of motor energy usage when equipment operates at partial load. The magnitude of energy savings depends on the estimated amount of time that the motor would operate at partial load. For equipment with proposed VFDs, we have included replacing the controlled motor with a new inverter duty rated motor to conservatively account for the cost of an inverter duty rated motor.

## ECM 6: Install VFDs on Heating Water Pumps

We evaluated installing variable frequency drives (VFD) to control heating water pumps. Two-way valves must serve the hot water coils, and the hot water loop must have a differential pressure sensor installed. If three-way valves or a bypass leg are used in the hot water distribution, they will need to be modified when this measure is implemented. As the hot water valves close, the differential pressure increases and the VFD modulates the pump speed to maintain a differential pressure setpoint.

Energy savings result 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.

**Affected Pumps:** HWP serving the auto shop.

## 4.5 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
	Gas Heating (HVAC/Process) Replacement	0	0.0	42	\$662	\$18,722	\$1,240	\$17,482	26.4	6,879
ECM 7	Install High Efficiency Hot Water Boilers	0	0.0	42	\$662	\$18,722	\$1,240	\$17,482	26.4	6,879

## ECM 7: Install High Efficiency Hot Water Boilers

We evaluated replacing older inefficient hot water boilers with high efficiency hot water boilers. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

For the purposes of this analysis, we evaluated the replacement of boilers on a one-for-one basis with equipment of the same capacity. We recommend that you work with your mechanical design team to select boilers that are sized appropriately for the heating load. In many cases installing multiple modular boilers, rather than one or two large boilers, will result in higher overall plant efficiency while providing additional system redundancy.

Replacing the boilers has a long payback and may not be justifiable based simply on energy considerations. However, the boilers have reached the end of their normal useful life. Typically, the marginal cost of purchasing high efficiency boilers can be justified by the marginal savings from the improved efficiency. When the boiler is eventually replaced, consider purchasing boilers that exceed the minimum efficiency required by building codes. We also recommend working with your mechanical design team to determine whether the heating system can operate with return water temperatures below 130°F, which would allow the use of condensing boilers.

**Affected Boilers:** boiler serving maintenance shop; boiler serving the auto shop.



## 4.6 HVAC Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>HVAC System Improvements</b>		<b>0</b>	<b>0.0</b>	<b>25</b>	<b>\$387</b>	<b>\$264</b>	<b>\$60</b>	<b>\$204</b>	<b>0.5</b>	<b>4,019</b>
ECM 8	Install Pipe Insulation	0	0.0	25	\$387	\$264	\$60	\$204	0.5	4,019

### ECM 8: Install Pipe Insulation

Install insulation on heating water system piping. Distribution system losses are dependent on system fluid temperature, the size of the distribution system, and the level of insulation of the piping. Significant energy savings can be achieved when insulation has not been well maintained. When the insulation is exposed to water, when the insulation has been removed from some areas of the pipe, or when valves have not been properly insulated system efficiency can be significantly reduced. This measure saves energy by reducing heat transfer in the distribution system.

**Affected Systems:** domestic hot water piping at the maintenance shop.

## 4.7 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Domestic Water Heating Upgrade</b>		<b>0</b>	<b>0.0</b>	<b>1</b>	<b>\$15</b>	<b>\$14</b>	<b>\$7</b>	<b>\$7</b>	<b>0.5</b>	<b>155</b>
ECM 9	Install Low-Flow DHW Devices	0	0.0	1	\$15	\$14	\$7	\$7	0.5	155

### ECM 9: Install Low-Flow DHW Devices

Install low-flow devices to reduce overall hot water demand. The following low-flow devices are recommended to reduce hot water usage:

Device	Flow Rate
Faucet aerators (lavatory)	0.5 gpm
Faucet aerator (kitchen)	1.5 gpm
Showerhead	2.0 gpm
Pre-rinse spray valve (kitchen)	1.28 gpm

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing. Additional cost savings may result from reduced water usage.

## 4.8 Custom Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Custom Measures</b>		<b>2,022</b>	<b>0.0</b>	<b>0</b>	<b>\$275</b>	<b>\$2,289</b>	<b>\$0</b>	<b>\$2,289</b>	<b>8.3</b>	<b>2,036</b>
ECM 10	Install Heat Pump Water Heater	2,022	0.0	0	\$275	\$2,289	\$0	\$2,289	8.3	2,036

### **ECM 10: Install Heat Pump Water Heater**

A typical electric water heater uses electric resistance coils to heat water at a coefficient of performance (COP) of 1. Heat pump water heaters (HPWH) use a refrigeration cycle to transfer heat from the air to the domestic water. The typical average COP for a HPWH is about 2.5, so they require significantly less electricity to produce the same amount of hot water as a traditional electric water heater. HPWH also reject cold air. As such, they need to be in an unconditioned space with good ventilation. Ideal locations are garages or large enclosed, unconditioned storage areas.

Most HPWH operate effectively down to an air temperature of 40 °F. Below that temperature, an electric resistance booster heater is typically required to achieve full heating capacity. It is critical that the HPWH controls are set up so that the electric resistance heat only engages when the air temperature is too cold for the HPWH to extract heat from it. HPWHs have a slow recovery. During periods of high demand, the recommended electric resistance heating element, if enabled, may be energized to maintain set point, thus reducing the overall efficiency of the unit. It is recommended that a careful analysis of the hot water demand be conducted to determine if the application makes economic sense, and the HPWH heating capacity and storage are properly sized.

HPWH operate most effectively when the temperature difference between the incoming and outgoing water is high. Generally, this means that cold make-up water should be piped to the bottom of the tank and return water should be piped to the top of the tank in order to maintain stratification within the storage tank. Water should be drawn from the bottom of the tank to be heated. If there is a DHW recirculation pump, it should only be operated during high hot water demand periods.

**Affected DHW System:** electric water heater serving auto shop.

## 4.9 Measures for Future Consideration

There are additional opportunities for improvement that Island Beach State Park may wish to consider. These potential upgrades typically require further analysis, involve substantial capital investment, and/or include significant system reconfiguration. These measures are therefore beyond the scope of this energy audit. These measures are described here to support a whole building approach to energy efficiency and sustainability.

Island Beach State Park may wish to consider the Energy Savings Improvement Program (ESIP) or other whole building approach. With interest in implementing comprehensive, largescale and/or complex system wide projects, these measures may be pursued during development of a future energy savings plan. We recommend that you work with your energy service company (ESCO) and/or design team to:

- Evaluate these measures further.
- Develop firm costs.
- Determine measure savings.
- Prepare detailed implementation plans.

Other modernization or capital improvement funds may be leveraged for these types of refurbishments. As you plan for capital upgrades, be sure to consider the energy impact of the building systems and controls being specified.

### **Window Replacements**

Energy efficient windows are an important consideration when improving the building envelope. The heat transfer through the glass panes are responsible for a significant portion of the facility's heating and cooling energy consumption. We recommend replacing single-pane windows with double-pane windows, and we recommend models that are gas-filled with low-e coatings to reduce heat loss. Windows should be selected with low U-factors to maximize energy savings. The U-factor is the rate at which the window conducts non-solar heat flow and is a key indicator of performance. The lower the U-factor, the higher the efficiency of the window. Window frames and sashes should be efficient as well. If metal frames are specified or required by code, the frame extrusions should have a thermal break to reduce conduction through the frame. As part of the installation, the window frames should be properly sealed with caulk materials to ensure the mitigation of air infiltration. Building envelopes that limit air infiltration and that have adequate fenestrations play a key role in optimizing heating and cooling efficiency, controlling moisture, and providing occupant comfort. Window system replacement is an expensive upgrade that generally involves architectural elements. We recommend this as a measure for further study.

## 5 ENERGY EFFICIENT BEST PRACTICES

---

A whole building maintenance plan will extend equipment life; improve occupant comfort, health, and safety; and reduce energy and maintenance costs.

Operation and maintenance (O&M) plans enhance the operational efficiency of HVAC and other energy intensive systems and could save 5%–20% of the energy usage in your building without substantial capital investment. A successful plan includes your records of energy usage trends and costs, building equipment lists, current maintenance practices, and planned capital upgrades, and it incorporates your ideas for improved building operation. Your plan will address goals for energy-efficient operation, provide detail on how to reach the goals, and outline procedures for measuring and reporting whether goals have been achieved.

You may already be doing some of these things—see our list below for potential additions to your maintenance plan. Be sure to consult with qualified equipment specialists for details on proper maintenance and system operation.

### **Energy Tracking with ENERGY STAR Portfolio Manager**



You've heard it before—you cannot manage what you do not measure. ENERGY STAR Portfolio Manager is an online tool that you can use to measure and track energy and water consumption, as well as greenhouse gas emissions<sup>4</sup>. Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

### **Weatherization**

Caulk or weather strip leaky doors and windows to reduce drafts and loss of heated or cooled air. Sealing cracks and openings can reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. Materials used may include caulk, polyurethane foam, and other weather-stripping materials. There is an energy savings opportunity by reducing the uncontrolled air exchange between the outside and inside of the building. Blower door assisted comprehensive building air sealing will reduce the amount of air exchange, which will in turn reduce the load on the buildings heating and cooling equipment, providing energy savings and increased occupant comfort.

### **Doors and Windows**

Close exterior doors and windows in heated and cooled areas. Leaving doors and windows open leads to a loss of heat during the winter and chilled air during the summer. Reducing air changes per hour can lead to increased occupant comfort as well as heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

---

<sup>4</sup> <https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager>.

## **Lighting Maintenance**



- Clean lamps, reflectors and lenses of dirt, dust, oil, and smoke buildup every six to twelve months. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust. Together, this can reduce total light output by up to 60% while still drawing full power.

• In addition to routine cleaning, developing a maintenance schedule can ensure that maintenance is performed regularly, and it can reduce the overall cost of fixture re-lamping and re-ballasting. Group re-lamping and re-ballasting maintains lighting levels and minimizes the number of site visits by a lighting technician or contractor, decreasing the overall cost of maintenance.

## **Lighting Controls**

As part of a lighting maintenance schedule, test lighting controls to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight and photocell sensors, maintenance involves cleaning sensor lenses and confirming that setpoints and sensitivity are configured properly. Adjust exterior lighting time clock controls seasonally as needed to match your lighting requirements.

## **Motor Maintenance**

Motors have many moving parts. As these parts degrade over time, the efficiency of the motor is reduced. Routine maintenance prevents damage to motor components. Routine maintenance should include cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

## **Thermostat Schedules and Temperature Resets**



Use thermostat setback temperatures and schedules to reduce heating and cooling energy use during periods of low or no occupancy. 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 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.

## **Boiler Maintenance**

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to keeping the heating system running efficiently and preventing expensive repairs. Annual tune-ups should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely and efficiently. Boilers should be cleaned according to the manufacturer's instructions to remove soot and scale from the boiler tubes to improve heat transfer.

## **Water Heater Maintenance**

The lower the supply water temperature that is used for hand washing sinks, the less energy is needed to heat the water. Reducing the temperature results in energy savings and the change is often unnoticeable to users. Be sure to review the domestic water temperature requirements for sterilizers and dishwashers as you investigate reducing the supply water temperature.



Also, preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. At least once a year, follow manufacturer instructions to 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. Annual checks should include checks for:

- Leaks or heavy corrosion on the pipes and valves.
- 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 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 more than three years old, have a technician inspect the sacrificial anode annually.

### **Water Conservation**



Installing dual flush or low-flow toilets and low-flow/waterless urinals are ways to reduce water use. The EPA WaterSense® ratings for urinals is 0.5 gallons per flush (gpf) and for flush valve toilets is 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

For more information regarding water conservation go to the EPA's WaterSense website<sup>5</sup> or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"<sup>6</sup> to get ideas for creating a water management plan and best practices for a wide range of water using systems.

Water conservation devices that do not reduce hot water consumption will not provide energy savings at the site level, but they may significantly affect your water and sewer usage costs. 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.

If the facility has detached buildings with a master water meter for the entire campus, check for unnatural wet areas in the lawn or water seeping in the foundation at water pipe penetrations through the foundation. Periodically check overnight meter readings when the facility is unoccupied, and there is no other scheduled water usage.

Manage irrigation systems to use water more effectively outside the building. Adjust spray patterns so that water lands on intended lawns and plantings and not on pavement and walls. Consider installing an evapotranspiration irrigation controller that will prevent over-watering.

### **Procurement Strategies**

Purchasing efficient products reduces energy costs without compromising quality. Consider modifying your procurement policies and language to require ENERGY STAR or WaterSense products where available.

---

<sup>5</sup> <https://www.epa.gov/watersense>.

<sup>6</sup> <https://www.epa.gov/watersense/watersense-work-0>.

## 6 ON-SITE GENERATION

---

You don't have to look far in New Jersey to see one of the thousands of solar electric systems providing clean power to homes, businesses, schools, and government buildings. On-site generation includes both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) technologies that generate power to meet all or a portion of the facility's electric energy needs. Also referred to as distributed generation, these systems contribute to greenhouse gas (GHG) emission reductions, demand reductions, and reduced customer electricity purchases, which results in improved electric grid reliability through better use of transmission and distribution systems.

Preliminary screenings were performed to determine if an on-site generation measure could be a cost-effective solution for your facility. Before deciding to install an on-site generation system, we recommend conducting a feasibility study to analyze 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 Solar Photovoltaic

Photovoltaic (PV) panels convert sunlight into electricity. Individual panels are combined into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is then connected to the building's electrical distribution system.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has no potential for installing a PV array.

This facility does not appear to meet the minimum criteria for a cost-effective solar PV installation. To be cost-effective, a solar PV array needs certain minimum criteria, such as sufficient and sustained electric demand and sufficient flat or south-facing rooftop or other unshaded space on which to place the PV panels.

The graphic below displays the results of the PV potential screening conducted as a part of this audit. The position of each slider indicates the potential (potential increases to the right) that each factor contributes to the overall site potential.

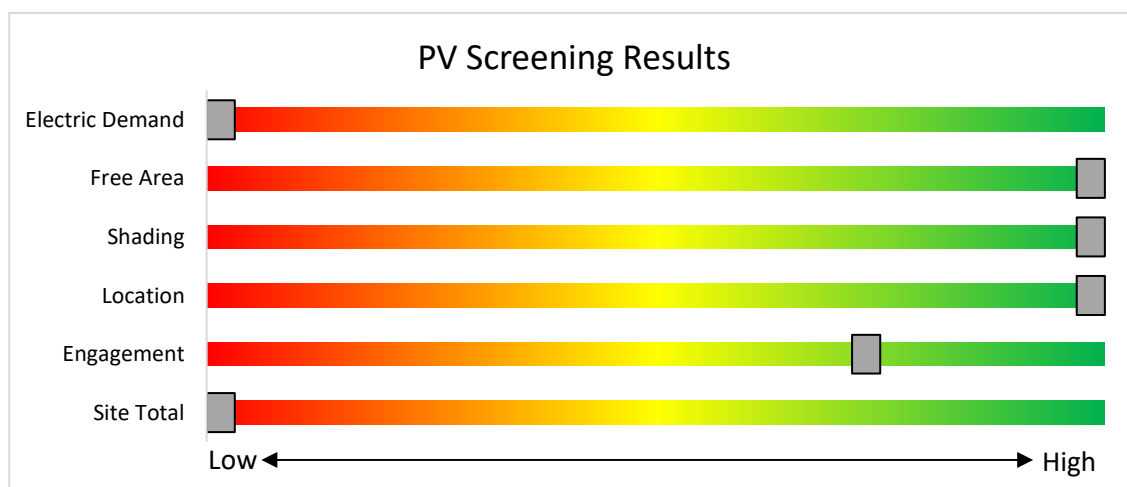


Figure 8 - Photovoltaic Screening

### **Successor Solar Incentive Program (SuSI)**

The SuSI program replaces the SREC Registration Program (SRP) and the Transition Incentive (TI) program. The SuSI program is used to register and certify solar projects in New Jersey. Rebates are not available for solar projects. Solar projects may qualify to earn SREC- IIs (Solar Renewable Energy Certificates-II), however, the project owners *must* register their solar projects prior to the start of construction to establish the project's eligibility.

Get more information about solar power in New Jersey or find a qualified solar installer who can help you decide if solar is right for your building:

**Successor Solar Incentive Program (SuSI):** <https://www.njcleanenergy.com/renewable-energy/programs/susi-program>

- **Basic Info on Solar PV in NJ:** [www.njcleanenergy.com/whysolar](http://www.njcleanenergy.com/whysolar)
- **NJ Solar Market FAQs:** [www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/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:** [www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved\\_vendorsearch/?id=60&start=1](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) generates electricity at the facility and puts waste heat energy to good use. Common types of CHP systems are reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines.

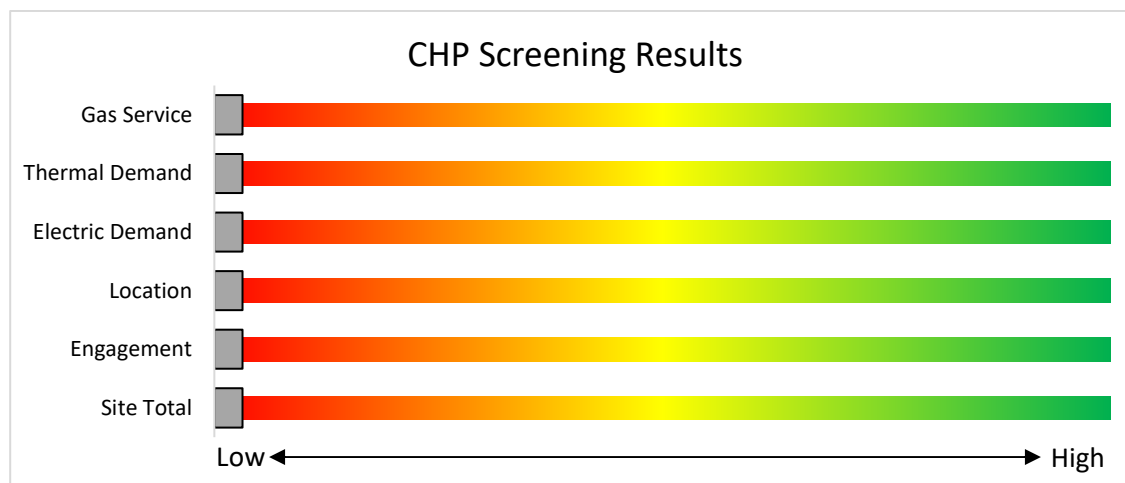
CHP systems typically produce a portion of the electric power used on-site, with the balance of electric power needs supplied by the local utility company. The heat is used to supplement (or replace) existing boilers and provide space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for space cooling.

The key criteria used for screening is the amount of time that the CHP system would operate at full load and the facility's ability to use the recovered heat. Facilities with a continuous need 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 no potential for installing a cost-effective CHP system.

Based on a preliminary analysis, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation. The lack of gas service, low or infrequent thermal load, and lack of space for siting the equipment are the most significant factors contributing to the lack of CHP potential.

The graphic below displays the results of the CHP potential screening conducted as a part of this audit. The position of each slider indicates the potential (potential increases to the right) that each factor contributes to the overall site potential.



*Figure 9 - Combined Heat and Power Screening*

Find a qualified firm that specializes in commercial CHP cost assessment and installation:  
[http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved\\_vendorsearch/](http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/)



## 7 PROJECT FUNDING AND INCENTIVES

Ready to improve your building's performance? Your utility provider may be able to help.

### 7.1 Utility Energy Efficiency Programs

The Clean Energy Act, signed into law by Governor Murphy in 2018, requires New Jersey's investor-owned gas and electric utilities to reduce their customers' use by set percentages over time. To help reach these targets the New Jersey Board of Public Utilities approved a comprehensive suite of energy efficiency programs to be run by the utility companies.



The infographic features logos for six utilities: Atlantic City Electric, Jersey Central Power & Light, PSEG, Rockland Electric Company, Elizabethtown Gas, and South Jersey Gas. Below the logos, the text reads: "Program areas to be served by the Utilities:" followed by a bulleted list: "Existing Buildings (residential, commercial, industrial, government)", "Efficient Products", and "HVAC", "Appliance Rebates", "Appliance Recycling". To the right, a box titled "Proposed New Programs & Features:" lists "Dedicated multi-family program", "More financing options", and "Quick home energy check-ups".

These new utility programs are rolling out in the spring and summer of 2021. Keep up to date with developments by visiting:

<https://www.njcleanenergy.com/transition>

## 8 NEW JERSEY'S CLEAN ENERGY PROGRAMS

New Jersey's Clean Energy Program will continue to offer some energy efficiency programs.



### 8.1 Large Energy Users

The Large Energy Users Program (LEUP) is designed to foster self-directed investment in energy projects. This program is offered to New Jersey's largest energy customers that annually contribute at least \$200,000 to the NJCEP aggregate of all buildings/sites. This equates to roughly \$5 million in energy costs in the prior fiscal year.

#### Incentives

Incentives are based on the specifications below. The maximum incentive per entity is the lesser of:

- \$4 million
- 75% of the total project(s) cost
- 90% of total NJCEP fund contribution in previous year
- \$0.33 per projected kWh saved; \$3.75 per projected Therm saved annually

#### How to Participate

To participate in LEUP, you will first need submit an enrollment application. This program requires all qualified and approved applicants to submit an energy plan that outlines the proposed energy efficiency work for review and approval. Applicants may submit a Draft Energy Efficiency Plan (DEEP), or a Final Energy Efficiency Plan (FEEP). Once the FEEP is approved, the proposed work can begin.

Detailed program descriptions, instructions for applying, and applications can be found at [www.njcleanenergy.com/LEUP](http://www.njcleanenergy.com/LEUP).

## 8.2 Combined Heat and Power

The Combined Heat & Power (CHP) program provides incentives for eligible CHP or waste heat to power (WHP) projects. Eligible CHP or WHP projects must achieve an annual system efficiency of at least 65% (lower heating value, or LHV), based on total energy input and total utilized energy output. Mechanical energy may be included in the efficiency evaluation.

### Incentives

Eligible Technologies	Size (Installed Rated Capacity) <sup>1</sup>	Incentive (\$/kW)	% of Total Cost Cap per Project <sup>3</sup>	\$ Cap per Project <sup>3</sup>		
Powered by non-renewable or renewable fuel source <sup>4</sup>	≤500 kW	\$2,000	30-40% <sup>2</sup>	\$2 million		
Gas Internal Combustion Engine	>500 kW - 1 MW	\$1,000				
Gas Combustion Turbine	> 1 MW - 3 MW	\$550	30%	\$3 million		
Microturbine	>3 MW					
Fuel Cells with Heat Recovery						
Waste Heat to Power*	<1 MW	\$1,000	30%	\$2 million		
	> 1MW	\$500		\$3 million		

\*Waste Heat to Power: Powered by non-renewable fuel source, heat recovery or other mechanical recovery from existing equipment utilizing new electric generation equipment (e.g. steam turbine).

Check the NJCEP website for details on program availability, current incentive levels, and requirements.

### How to Participate

You will work with a qualified developer or consulting firm to complete the CHP application. Once the application is approved the project can be installed. Information about the CHP program can be found at [www.njcleanenergy.com/CHP](http://www.njcleanenergy.com/CHP).

## 8.3 Successor Solar Incentive Program (SuSI)

The SuSI program replaces the SREC Registration Program (SRP) and the Transition Incentive (TI) program. The program is used to register and certify solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects *must* register their projects prior to the start of construction to establish the project's eligibility to earn SREC-IIs (Solar Renewable Energy Certificates-II). SuSI consists of two sub-programs. The Administratively Determined Incentive (ADI) Program and the Competitive Solar Incentive (CSI) Program.

### Administratively Determined Incentive (ADI) Program

The ADI Program provides administratively set incentives for net metered residential projects, net metered non-residential projects 5 MW or less, and all community solar projects.

After the registration is accepted, construction is complete, and a complete final as-built packet has been submitted, the project is issued a New Jersey certification number, which enables it to generate New Jersey SREC- IIs.

Market Segments	Size MW dc	Incentive Value (\$/SREC II)	Public Entities Incentive Value - \$20 Adder (\$/SRECII)
Net Metered Residential	All types and sizes	\$90	N/A
Small Net Metered Non-Residential located on Rooftop, Carport, Canopy and Floating Solar	Projects smaller than 1 MW	\$100	\$120
Large Net Metered Non-Residential located on Rooftop, Carport, Canopy and Floating Solar	Projects 1 MW to 5 MW	\$90	\$110
Small Net Metered Non-Residential Ground Mount	Projects smaller than 1 MW	\$85	\$105
Large Net Metered Non-Residential Ground Mount	Projects 1 MW to 5 MW	\$80	\$100
LMI Community Solar	Up to 5 MW	\$90	N/A
Non-LMI Community Solar	Up to 5 MW	\$70	N/A
Interim Subsection (t)	All types and sizes	\$100	N/A

Eligible projects may generate SREC-IIs for 15 years following the commencement of commercial operations which is defined as permission to operate (PTO) from the Electric Distribution Company. After 15 years, projects may be eligible for a NJ Class I REC.

SREC-IIs will be purchased monthly by the SREC-II Program Administrator who will allocate the SREC-IIs to the Load Serving Entities (BGS Providers and Third-Party Suppliers) annually based on their market share of retail electricity sold during the relevant Energy Year.

The ADI Program online portal is now open to new registrations effective August 28, 2021.

### Competitive Solar Incentive Program

The Competitive Solar Incentive (CSI) Program will provide competitively set incentives for grid supply projects and net metered non-residential projects greater than 5MW. The program is currently under development with the goal of holding the first solicitation by early-to-mid 2022. For updates, please continue to check the [Solar Proceedings](#) page on the New Jersey's Clean Energy Program website.

Solar projects help the State of New Jersey reach renewable energy goals outlined in the state's Energy Master Plan.

If you are considering installing solar photovoltaics on your building, visit the following link for more information: <https://njcleanenergy.com/renewable-energy/programs/susi-program>.

## 8.4 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) serves New Jersey's government agencies by financing energy projects. 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. Annual payments are lower than the savings projected from the energy conservation measures (ECMs), ensuring that ESIP projects are cash flow positive for the life of the contract.

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 described above can also be used to help further reduce the total project cost of eligible measures.

### How to Participate

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 used 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 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.

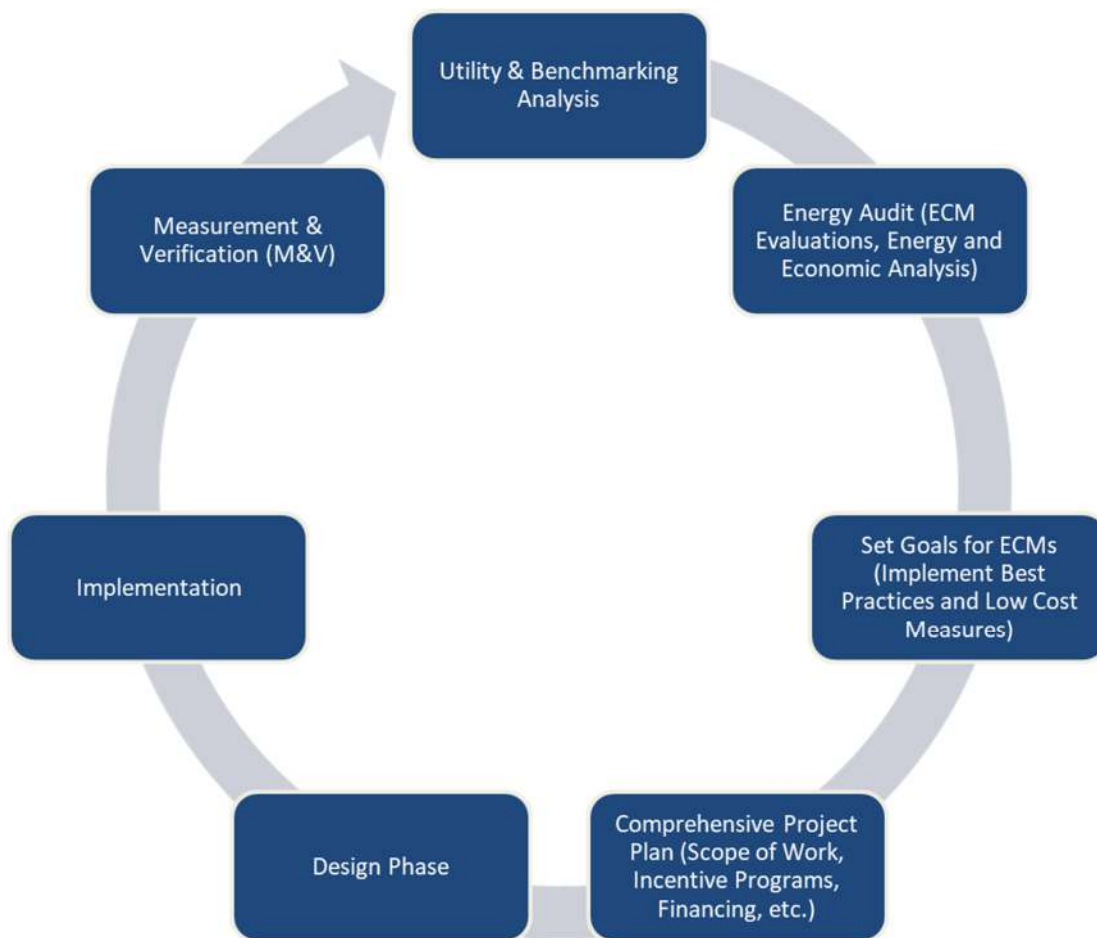
The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Carefully consider all alternatives to develop an approach that best meets your needs. A detailed program descriptions and application can be found at [www.njcleanenergy.com/ESIP](http://www.njcleanenergy.com/ESIP).

*ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you can use NJCEP incentive programs to help further reduce costs when developing the energy savings plan. Refer to the ESIP guidelines at the link above for further information and guidance on next steps.*



## 9 PROJECT DEVELOPMENT

Energy conservation measures (ECMs) have been identified for your site, and their energy and economic analyses are provided within this LGEA report. Note that some of the identified projects may be mutually exclusive, such as replacing equipment versus upgrading motors or controls. The next steps with project development are to set goals and create a comprehensive project plan. The graphic below provides an overview of the process flow for a typical energy efficiency or renewable energy project. We recommend implementing as many ECMs as possible prior to undertaking a feasibility study for a renewable project. The cyclical nature of this process flow demonstrates the ongoing work required to continually improve building energy efficiency over time. If your building(s) scope of work is relatively simple to implement or small in scope, the measurement and verification (M&V) step may not be required. It should be noted through a typical project cycle, there will be changes in costs based on specific scopes of work, contractor selections, design considerations, construction, etc. The estimated costs provided throughout this LGEA report demonstrate the unburdened turn-key material and labor cost only. There will be contingencies and additional costs at the time of implementation. We recommend comprehensive project planning that includes the review of multiple bids for project work, incorporates potential operations and maintenance (O&M) cost savings, and maximizes your incentive potential.



*Figure 10 – Project Development Cycle*

## 10 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

---

### 10.1 Retail Electric Supply Options

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. 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 already buys electricity from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party electric suppliers is available at the NJBPU website<sup>7</sup>.

### 10.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey is also deregulated. Most customers that remain with the utility for natural gas service pay rates that are market based and fluctuate monthly. The utility provides basic gas supply service 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 typically depends on whether a customer prefers 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 does not already purchase natural gas from a third-party supplier, consider shopping for a reduced rate from third-party natural gas suppliers. If your facility already purchases natural gas from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party natural gas suppliers is available at the NJBPU website<sup>8</sup>.

---

<sup>7</sup> [www.state.nj.us/bpu/commercial/shopping.html](http://www.state.nj.us/bpu/commercial/shopping.html).

<sup>8</sup> [www.state.nj.us/bpu/commercial/shopping.html](http://www.state.nj.us/bpu/commercial/shopping.html).

## APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

### Lighting Inventory & Recommendations

Location	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Corridor - Storage - Maintenance Shop	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	3,444	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,444	0.0	55	0	\$7	\$33	\$6	3.7
Corridor - Storage - Maintenance Shop	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,444	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,444	0.0	114	0	\$15	\$37	\$10	1.8
Kitchen - Maintenance Shop	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,444	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,444	0.0	193	0	\$25	\$73	\$20	2.1
Locker Room - Maintenance Shop	1	Incandescent: (3) 60W Screw-in Lamps	Wall Switch	S	180	3,444	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	27	3,444	0.1	527	0	\$68	\$52	\$3	0.7
Lounge - Break Room - Maintenance Shop	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,444		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,444	0.0	0	0	\$0	\$0	\$0	0.0
Main Entrance - Maintenance Shop	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	3,444	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,444	0.0	55	0	\$7	\$33	\$6	3.7
Office - #1 - Maintenance Shop	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,444	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,444	0.0	193	0	\$25	\$73	\$20	2.1
Restroom - Locker Room - Maintenance Shop	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,444	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,444	0.0	114	0	\$15	\$37	\$10	1.8
Storage - Kitchen - Maintenance Shop	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,092	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,092	0.0	17	0	\$2	\$33	\$6	11.8
Storage - Plumbing - Maintenance Shop	1	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	S	176	1,092	2	Relamp & Reballast	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,092	0.1	129	0	\$17	\$118	\$20	5.9
Storage - Power Tools - Maintenance Shop	1	LED - Fixtures: Ceiling Mount	Wall Switch	S	12	1,092		None	No	1	LED - Fixtures: Ceiling Mount	Wall Switch	12	1,092	0.0	0	0	\$0	\$0	\$0	0.0
Storage - Shovels - Maintenance Shop	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,092	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,092	0.0	61	0	\$8	\$73	\$20	6.7
Storage - Supplies - Maintenance Shop	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,092	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,092	0.0	17	0	\$2	\$33	\$6	11.8
Storage - Woodshop #1 - Maintenance Shop	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	1,092		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,092	0.0	0	0	\$0	\$0	\$0	0.0
Storage - Woodshop #2 - Maintenance Shop	1	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	S	72	1,092		None	No	1	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	1,092	0.0	0	0	\$0	\$0	\$0	0.0
Woodshop - Maintenance Shop	2	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	3,444	3, 4	Relamp	Yes	2	LED Lamps: A19 Lamps	Occupancy Sensor	9	2,376	0.1	371	0	\$48	\$304	\$37	5.6
Woodshop - Maintenance Shop	3	LED Lamps: (1) 22W Corn Bulb Screw-In Lamp	Wall Switch	S	22	3,444	4	None	Yes	3	LED Lamps: (1) 22W Corn Bulb Screw-In Lamp	Occupancy Sensor	22	2,376	0.0	70	0	\$9	\$270	\$35	25.9
Woodshop - Maintenance Shop	1	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	S	158	3,444	2, 4	Relamp & Reballast	Yes	1	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	2,376	0.1	373	0	\$48	\$129	\$20	2.3
Woodshop - Maintenance Shop	5	Linear Fluorescent - T12: 8' T12 (75W) - 4L	Wall Switch	S	316	1,722	2, 4	Relamp & Reballast	Yes	5	LED - Linear Tubes: (4) 8' Lamps	Occupancy Sensor	144	1,188	0.7	1,865	-1	\$240	\$1,557	\$235	5.5
Woodshop - Maintenance Shop	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	3,444	2, 4	Relamp & Reballast	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,376	0.0	234	0	\$30	\$69	\$10	2.0
Electrical Room - Maintenance Shop	2	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	S	158	1,092	2, 4	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	753	0.1	237	0	\$30	\$373	\$60	10.3
Storage - Attic - Maintenance Shop	3	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	1,092	3, 4	Relamp	Yes	3	LED Lamps: A19 Lamps	Occupancy Sensor	9	753	0.1	176	0	\$23	\$322	\$3	14.1

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis							
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years	
Storage - Closet 2nd - Maintenance Shop	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	1,092		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	1,092	0.0	0	0	\$0	\$0	\$0	0.0	
Storage 2nd #1 - Maintenance Shop	1	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	S	176	1,092	2	Relamp & Reballast	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,092	0.1	129	0	\$17	\$118	\$20	5.9	
Mechanical Basement - Maintenance Shop	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	1,092	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,092	0.0	64	0	\$8	\$69	\$10	7.1	
Mechanical Basement - Maintenance Shop	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,092	3	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,092	0.1	108	0	\$14	\$110	\$30	5.7	
Exterior - Maintenance Shop	2	LED - Fixtures: Wall Pack	Photocell		40	4,380		None	No	2	LED - Fixtures: Wall Pack	Photocell	40	4,380	0.0	0	0	\$0	\$0	\$0	0.0	
Dry Storage - Auto Shop	6	LED Lamps: (1) 22W Corn Bulb Screw-In Lamp	Wall Switch	S	22	3,444	4	None	Yes	6	LED Lamps: (1) 22W Corn Bulb Screw-In Lamp	Occupancy Sensor	22	2,376	0.0	141	0	\$18	\$270	\$0	14.9	
Sign Storage - Auto Shop	2	Incandescent: (1) 72W PAR30 Screw-In Lamp	Wall Switch	S	72	3,444	3, 4	Relamp	Yes	2	LED Lamps: PAR30 Lamps	Occupancy Sensor	11	2,376	0.1	444	0	\$57	\$162	\$6	2.7	
Garage - East - Auto Shop	2	LED Lamps: (1) 22W Corn Bulb Screw-In Lamp	Wall Switch	S	22	3,444	4	None	Yes	2	LED Lamps: (1) 22W Corn Bulb Screw-In Lamp	Occupancy Sensor	22	2,376	0.0	47	0	\$6	\$116	\$20	15.9	
Garage - South - Auto Shop	6	LED Lamps: (1) 22W Corn Bulb Screw-In Lamp	Wall Switch	S	22	3,444	4	None	Yes	6	LED Lamps: (1) 22W Corn Bulb Screw-In Lamp	Occupancy Sensor	22	2,376	0.0	141	0	\$18	\$270	\$35	13.0	
Garage - West - Auto Shop	3	LED Lamps: (1) 22W Corn Bulb Screw-In Lamp	Wall Switch	S	22	3,444	4	None	Yes	3	LED Lamps: (1) 22W Corn Bulb Screw-In Lamp	Occupancy Sensor	22	2,376	0.0	70	0	\$9	\$270	\$35	25.9	
Mechanical - Boiler - Auto Shop	1	LED Lamps: (1) 22W Corn Bulb Screw-In Lamp	Wall Switch	S	22	1,092		None	No	1	LED Lamps: (1) 22W Corn Bulb Screw-In Lamp	Wall Switch	22	1,092	0.0	0	0	\$0	\$0	\$0	0.0	
Office - Shop - Auto Shop	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,444	4	None	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,376	0.0	62	0	\$8	\$116	\$20	12.1	
Restroom - Shop - Auto Shop	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	3,444	4	None	Yes	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Occupancy Sensor	9	2,376	0.0	19	0	\$2	\$116	\$20	38.9	
Shop / Garage - Auto Shop	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,444	4	None	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,376	0.0	31	0	\$4	\$0	\$0	0.0	
Shop / Garage - Auto Shop	13	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	S	72	3,444	4	None	Yes	13	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	2,376	0.2	999	0	\$128	\$270	\$35	1.8	
Storage - Office - Auto Shop	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	1,092		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,092	0.0	0	0	\$0	\$0	\$0	0.0	
Storage - West Garage - Auto Shop	2	LED Lamps: (1) 22W Corn Bulb Screw-In Lamp	Wall Switch	S	22	1,092	4	None	Yes	2	LED Lamps: (1) 22W Corn Bulb Screw-In Lamp	Occupancy Sensor	22	753	0.0	15	0	\$2	\$116	\$0	60.6	
Exterior - Auto Shop	10	High-Pressure Sodium: (1) 70W Lamp	Timeclock		95	4,380	1	Fixture Replacement	No	10	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	21	4,380	0.0	3,241	0	\$440	\$2,061	\$500	3.5	
Storage - Paint Shop	3	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	3,444	4	None	Yes	3	LED Lamps: (1) 9W A19 Screw-In Lamp	Occupancy Sensor	9	2,376	0.0	29	0	\$4	\$270	\$0	72.9	

# 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?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	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	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Woodshop - Maintenance Shop	Woodshop - Maintenance Shop	3	Supply Fan	0.1	60.0%	No			W	2,745		No	60.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Storage - Woodshop #2 - Maintenance Shop	Air Compressor	1	Air Compressor	1.5	84.0%	No	Dewalt		W	200		No	84.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Mechanical Basement - Maintenance Shop	Domestic Hot Water	1	Combustion Air Fan	0.2	60.0%	No	AO Smith		B	2,745		No	60.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Mechanical Basement - Maintenance Shop	Boiler	1	Combustion Air Fan	0.2	60.0%	No	AO Smith		B	2,745		No	60.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Mechanical Basement - Maintenance Shop	Heating System	1	Heating Hot Water Pump	0.1	60.0%	No	Taco		B	2,745		No	60.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Mechanical Basement - Maintenance Shop	Heating System	1	Heating Hot Water Pump	0.3	62.5%	No			B	2,745	5	Yes	69.5%	No		0.0	62	0	\$8	\$400	\$0	47.6
Mechanical Basement - Maintenance Shop	Oil Pump	1	Process Pump	0.5	75.0%	No			W	2,745		No	75.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior - Maintenance Shop	Gasoline Pump	1	Process Pump	0.8	78.0%	No			W	400		No	78.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Dry Storage - Auto Shop	Dry Storage - Auto Shop	1	Supply Fan	0.1	60.0%	No			W	2,745		No	60.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Mechanical - Boiler - Auto Shop	Mechanical - Boiler - Auto Shop	1	Supply Fan	0.1	60.0%	No			W	2,745		No	60.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Shop / Garage - Auto Shop	Shop / Garage - Auto Shop	4	Supply Fan	0.1	60.0%	No			W	2,745		No	60.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Dry Storage - Auto Shop	Air Compressor	1	Air Compressor	5.0	82.5%	No	Marathon		B	200		No	82.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Mechanical - Boiler - Auto Shop	Boiler - Auto Shop	1	Combustion Air Fan	0.3	62.5%	No	Carlin		B	2,745	5	Yes	69.5%	No		0.0	62	0	\$8	\$509	\$0	60.6
Mechanical - Boiler - Auto Shop	Heating System	1	Heating Hot Water Pump	1.0	82.5%	No	Century		W	2,745	6	No	85.5%	Yes	1	0.1	990	0	\$134	\$3,010	\$75	21.8
Dry Storage - Auto Shop	Oil Pump	1	Process Pump	0.5	75.0%	No			W	2,745		No	75.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Shop / Garage - Auto Shop	Garage Door	4	Other	0.3	62.5%	No			W	400		No	62.5%	No		0.0	0	0	\$0	\$0	\$0	0.0

Packaged 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 (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen - Maintenance Shop	Kitchen - Maintenance Shop	1	Window AC	0.83		10.80		Frigidaire	LRA107CV1	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Locker Room - Maintenance Shop	Locker Room - Maintenance Shop	1	Window AC	0.84		11.30		GE	AHL10ASQ1	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Office - #1 - Maintenance Shop	Office - #1 - Maintenance Shop	1	Window AC	0.67		12.00		LG		W		No							0.0	0	0	\$0	\$0	\$0	0.0
Office - Shop - Auto Shop	Office - Shop - Auto Shop	1	Window AC	0.42		9.70		Maytag	M3X05F2A	B		No							0.0	0	0	\$0	\$0	\$0	0.0

Space Heating Boiler 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)	Manufacturer	Model	Remaining Useful Life	ECM #	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	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Basement - Maintenance Shop	Maintenance Shop	1	Non-Condensing Hot Water Boiler	217	HB Smith	BB14A-S/W-5	B	7	Yes	1	Non-Condensing Hot Water Boiler	217	85.00%	AFUE	0.0	0	13	\$206	\$7,953	\$400	36.6
Mechanical - Boiler - Auto Shop	Auto Shop	1	Non-Condensing Hot Water Boiler	480	Weil McLain	BL-776-SW	B	7	Yes	1	Non-Condensing Hot Water Boiler	480	85.00%	Et	0.0	0	29	\$456	\$10,769	\$840	21.8

Pipe Insulation Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Basement - Maintenance Shop	Heating System - Maintenance Shop	8	30	2.00	0.0	0	25	\$387	\$264	\$60	0.5



DHW Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Manufacturer	Model	Remaining Useful Life	ECM #	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	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Basement - Maintenance Shop	Maintenance Shop	1	Storage Tank Water Heater (≤ 50 Gal)	Bradford White	CF32T	B		No						0.0	0	0	\$0	\$0	\$0	0.0
Shop / Garage - Auto Shop	Auto Shop	1	Storage Tank Water Heater (≤ 50 Gal)	State Industries	SSX 50 1LS1 W	B		No						0.0	0	0	\$0	\$0	\$0	0.0

Low-Flow Device Recommendations

		Recommendation Inputs				Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Maintenance Shop	9	1	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	0	\$7	\$7	\$4	0.5
Auto Shop	9	1	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	0	\$7	\$7	\$4	0.5

Plug Load Inventory

Existing Conditions						
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified ?	Manufacturer	Model
Maintenance Shop	2	Coffee Machine	500	No		
Maintenance Shop	1	Desktop	120	No		
Maintenance Shop	1	Fan (Ceiling)	200	No		
Maintenance Shop	1	Fan (Large)	200	No		
Maintenance Shop	3	Microwave	1,000	No		
Maintenance Shop	1	Electric Stove	1,500	No		
Maintenance Shop	8	Power Tools	1,000	No		
Maintenance Shop	2	Refrigerator (Residential)	340	No		
Maintenance Shop	1	Television	224	No		
Maintenance Shop	1	Toaster	600	No		
Maintenance Shop	2	Toaster Oven	600	No		
Auto Shop	1	Coffee Machine	500	No		
Auto Shop	2	Desktop	120	No		
Auto Shop	6	Power Tools	1,000	No		
Auto Shop	1	Vehicle Lift	9,660	No		
Auto Shop	2	Welder Machine	3,910	No		
Auto Shop	1	Printer (Medium/Small)	450	No		

Custom (High Level) Measure Analysis

Heat Pump Water Heater

Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis										
Description	Area(s)/System(s) Served	SF of Area Served	Fuel Type	Input Capacity per Unit (kW)	Tank Capacity per Unit (Gal)	Description	COP	Tank Capacity per Unit (Gal)	Estimated Unit Cost	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Base Incentives	Enhanced Incentives	Total Incentives	Total Net Cost	Payback w/o Incentives in Years	Payback w/ Incentives in Years
Storage Tank Water Heater (≤50 Gal)	Auto Shop	5,000	Electric	5.5	47	Heat Pump Water Heater	2.5	47	\$2,289.19	0.00	2,022	0	\$275	\$2,289	\$0	\$0	\$0	\$2,289	8.32	8.32

## APPENDIX B: ENERGY STAR STATEMENT OF ENERGY PERFORMANCE

Energy use intensity (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.



### ENERGY STAR® Statement of Energy Performance



**ENERGY STAR®  
Score<sup>1</sup>**

**Maintenance Shop, Auto Shop & Paint Shop**

**Primary Property Type:** Repair Services (Vehicle, Shoe, Locksmith, etc.)

**Gross Floor Area (ft²):** 17,292

**Built:** 1930

**For Year Ending:** December 31, 2021

**Date Generated:** September 28, 2022

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			
<b>Property Address</b> Maintenance Shop, Auto Shop & Paint Shop 2401 Central Avenue South Seaside Park Berkeley Township, New Jersey 08752	<b>Property Owner</b> State of NJ - Island Beach State Park 428 East State Street Trenton, NJ 08625 (609) 940-4129	<b>Primary Contact</b> New Jersey Board of Public Utilities State Energy Services 44 South Clinton Ave Trenton, NJ 08625 (609) 633-9666 BPU.EnergyServices@bpu.nj.gov	
<b>Property ID:</b> 21642169			
Energy Consumption and Energy Use Intensity (EUI)			
<b>Site EUI</b> 49.1 kBtu/ft²	<b>Annual Energy by Fuel</b> Electric - Grid (kBtu) 122,636 (14%) Fuel Oil (No. 2) (kBtu) 726,046 (86%)	<b>National Median Comparison</b> National Median Site EUI (kBtu/ft²) 76.4 National Median Source EUI (kBtu/ft²) 96.9 % Diff from National Median Source EUI -36%	
<b>Source EUI</b> 62.3 kBtu/ft²	<b>Annual Emissions</b> Greenhouse Gas Emissions (Metric Tons CO2e/year) 65		

### Signature & Stamp of Verifying Professional

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

LP Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**Licensed Professional**

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



**Professional Engineer or Registered Architect Stamp  
(if applicable)**

## APPENDIX C: GLOSSARY

TERM	DEFINITION
<b>Blended Rate</b>	Used to calculate fiscal savings associated with measures. The blended rate is calculated by dividing the amount of your bill by the total energy use. For example, if your bill is \$22,217.22, and you used 266,400 kilowatt-hours, your blended rate is 8.3 cents per kilowatt-hour.
<b>Btu</b>	<i>British thermal unit</i> : a unit of energy equal to the amount of heat required to increase the temperature of one pound of water by one-degree Fahrenheit.
<b>CHP</b>	<i>Combined heat and power</i> . Also referred to as cogeneration.
<b>COP</b>	<i>Coefficient of performance</i> : a measure of efficiency in terms of useful energy delivered divided by total energy input.
<b>Demand Response</b>	Demand response reduces or shifts electricity usage at or among participating buildings/sites during peak energy use periods in response to time-based rates or other forms of financial incentives.
<b>DCV</b>	<i>Demand control ventilation</i> : a control strategy to limit the amount of outside air introduced to the conditioned space based on actual occupancy need.
<b>US DOE</b>	<i>United States Department of Energy</i>
<b>EC Motor</b>	<i>Electronically commutated motor</i>
<b>ECM</b>	<i>Energy conservation measure</i>
<b>EER</b>	<i>Energy efficiency ratio</i> : a measure of efficiency in terms of cooling energy provided divided by electric input.
<b>EUI</b>	<i>Energy Use Intensity</i> : measures energy consumption per square foot and is a standard metric for comparing buildings' energy performance.
<b>Energy Efficiency</b>	Reducing the amount of energy necessary to provide comfort and service to a building/area. Achieved through the installation of new equipment and/or optimizing the operation of energy use systems. Unlike conservation, which involves some reduction of service, energy efficiency provides energy reductions without sacrifice of service.
<b>ENERGY STAR</b>	ENERGY STAR is the government-backed symbol for energy efficiency. The ENERGY STAR program is managed by the EPA.
<b>EPA</b>	<i>United States Environmental Protection Agency</i>
<b>Generation</b>	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
<b>GHG</b>	<i>Greenhouse gas</i> gases that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving Earth's atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet's surface.
<b>gpf</b>	<i>Gallons per flush</i>

<b>gpm</b>	<i>Gallon per minute</i>
<b>HID</b>	<i>High intensity discharge:</i> high-output lighting lamps such as high-pressure sodium, metal halide, and mercury vapor.
<b>hp</b>	<i>Horsepower</i>
<b>HPS</b>	<i>High-pressure sodium:</i> a type of HID lamp.
<b>HSPF</b>	<i>Heating seasonal performance factor:</i> a measure of efficiency typically applied to heat pumps. Heating energy provided divided by seasonal energy input.
<b>HVAC</b>	<i>Heating, ventilating, and air conditioning</i>
<b>IHP 2014</b>	US DOE Integral Horsepower rule. The current ruling regarding required electric motor efficiency.
<b>IPLV</b>	<i>Integrated part load value:</i> a measure of the part load efficiency usually applied to chillers.
<b>kBtu</b>	One thousand British thermal units
<b>kW</b>	<i>Kilowatt:</i> equal to 1,000 Watts.
<b>kWh</b>	<i>Kilowatt-hour:</i> 1,000 Watts of power expended over one hour.
<b>LED</b>	<i>Light emitting diode:</i> a high-efficiency source of light with a long lamp life.
<b>LGEA</b>	<i>Local Government Energy Audit</i>
<b>Load</b>	The total power a building or system is using at any given time.
<b>Measure</b>	A single activity, or installation of a single type of equipment, that is implemented in a building system to reduce total energy consumption.
<b>MH</b>	<i>Metal halide:</i> a type of HID lamp.
<b>MBh</b>	<i>Thousand Btu per hour</i>
<b>MBtu</b>	<i>One thousand British thermal units</i>
<b>MMBtu</b>	<i>One million British thermal units</i>
<b>MV</b>	<i>Mercury Vapor:</i> a type of HID lamp.
<b>NJBPU</b>	<i>New Jersey Board of Public Utilities</i>
<b>NJCEP</b>	<i>New Jersey's Clean Energy Program:</i> NJCEP is a statewide program that offers financial incentives, programs and services for New Jersey residents, business owners and local governments to help them save energy, money, and the environment.
<b>psig</b>	<i>Pounds per square inch gauge</i>
<b>Plug Load</b>	Refers to the amount of power used in a space by products that are powered by means of an ordinary AC plug.
<b>PV</b>	<i>Photovoltaic:</i> refers to an electronic device capable of converting incident light directly into electricity (direct current).

<b>SEER</b>	<i>Seasonal energy efficiency ratio:</i> a measure of efficiency in terms of annual cooling energy provided divided by total electric input.
<b>SEP</b>	<i>Statement of energy performance:</i> a summary document from the ENERGY STAR Portfolio Manager.
<b>Simple Payback</b>	The amount of time needed to recoup the funds expended in an investment or to reach the break-even point between investment and savings.
<b>SREC</b>	<i>Solar renewable energy credit:</i> a credit you can earn from the state for energy produced from a photovoltaic array.
<b>TREC</b>	<i>Transition Incentive Renewable Energy Certificate:</i> a factorized renewable energy certificate you can earn from the state for energy produced from a photovoltaic array.
<b>T5, T8, T12</b>	A reference to a linear lamp diameter. The number represents increments of 1/8 <sup>th</sup> of an inch.
<b>Temperature Setpoint</b>	The temperature at which a temperature regulating device (thermostat, for example) has been set.
<b>therm</b>	100,000 Btu. Typically used as a measure of natural gas consumption.
<b>tons</b>	A unit of cooling capacity equal to 12,000 Btu/hr.
<b>Turnkey</b>	Provision of a complete product or service that is ready for immediate use.
<b>VAV</b>	<i>Variable air volume</i>
<b>VFD</b>	<i>Variable frequency drive:</i> a controller used to vary the speed of an electric motor.
<b>WaterSense®</b>	The symbol for water efficiency. The WaterSense® program is managed by the EPA.
<b>Watt (W)</b>	Unit of power commonly used to measure electricity use.