Local Government Energy Audit Report

DEP Headquarters

January 27, 2023

Prepared for:

State of New Jersey
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Trenton, New Jersey 08608

Prepared by:

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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. Hourly labor rates are based on market averages. Contract requirements, such as for prevailing wage, may result in additional labor costs. 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.

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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.

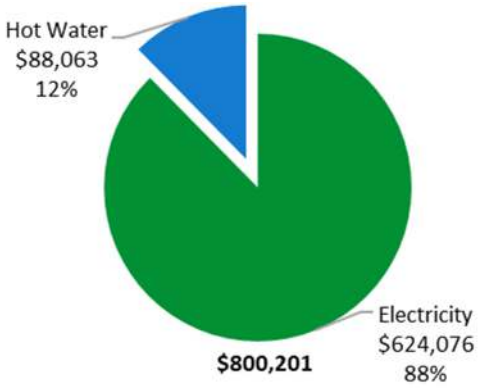
These next generation energy efficiency programs feature new ways of managing and delivering programs historically administered by New Jersey's Clean Energy Program™ (NJCEP). All of the investor-owned gas and electric utility companies will now also offer complementary energy efficiency programs and 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 (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for DEP Headquarters. 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

Annual Utilities	Costs: $712,138 Electricity: 5,107,088 kWh Hot Water: 2,335.8 MMBtu	
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.

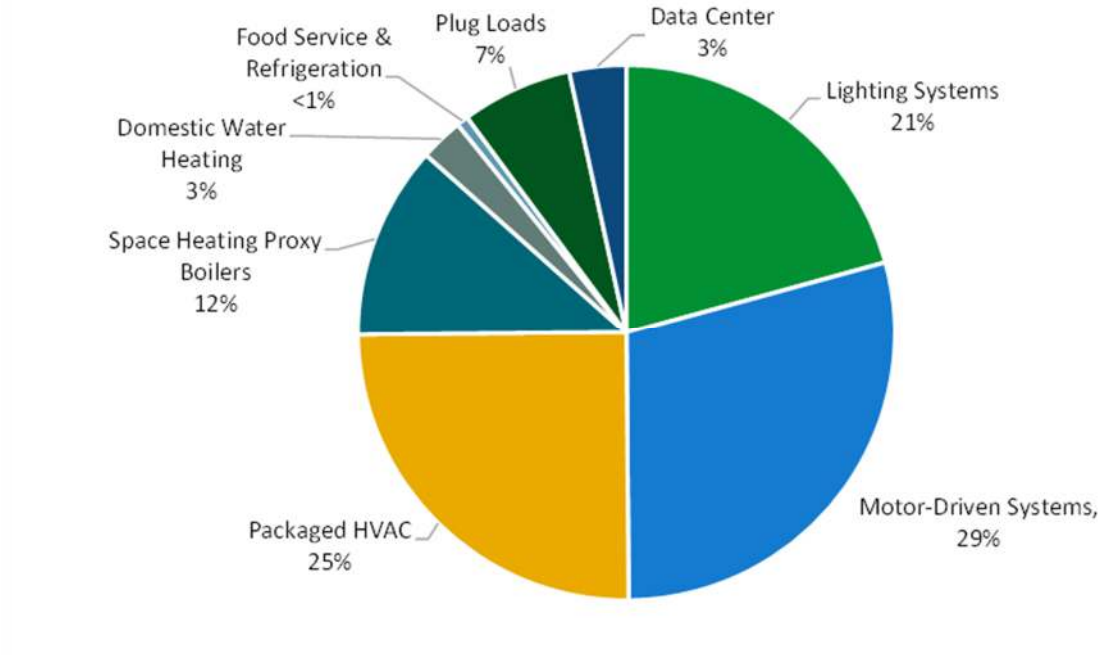


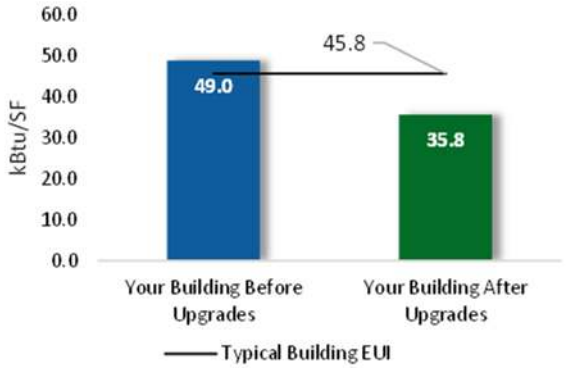
Figure 1 - Energy Use by System

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.

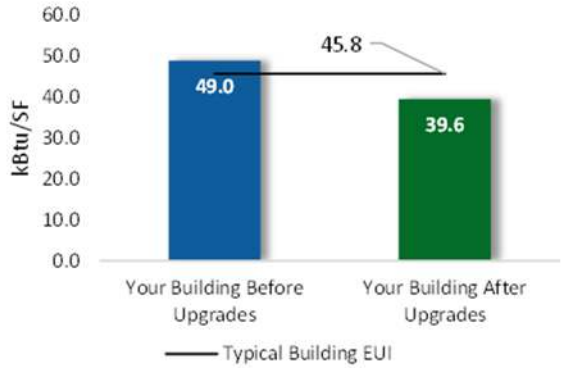
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	$4,253,588
Potential Rebates & Incentives[1]	$180,462
Annual Cost Savings	$199,526
Annual Energy Savings	Electricity: 1,579,637 kWh Hot Water: -60.5 MMBtu
Greenhouse Gas Emission Savings	692 Tons
Simple Payback	20.4 Years
Site Energy Savings (All Utilities)	27%



Scenario 2: Cost Effective Package[2]

Installation Cost	$616,179
Potential Rebates & Incentives	$136,179
Annual Cost Savings	$142,494
Annual Energy Savings	Electricity: 1,167,679 kWh Hot Water: -177.3 MMBtu
Greenhouse Gas Emission Savings	578 Tons
Simple Payback	3.4 Years
Site Energy Savings (all utilities)	19%



On-site Generation Potential

Photovoltaic	Medium
Combined Heat and Power	Additional Scope See Section 7

[1] Incentives are based on previously run state rebate programs. Contact your utility provider for current program incentives that may apply.

[2] 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_2e Emissions Reduction (lbs)
Lighting Upgrades			**668,923**	**236.9**	**-139**	**$80,214**	**$279,821**	**$75,507**	**$204,314**	**2.5**	**657,318**
ECM 1	Install LED Fixtures	Yes	7,126	0.8	-1	$885	$3,903	$400	$3,503	4.0	7,096
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	335	0.6	0	$40	$863	$95	$768	19.1	330
ECM 3	Retrofit Fixtures with LED Lamps	Yes	661,462	235.5	-138	$79,290	$275,055	$75,012	$200,043	2.5	649,893
Lighting Control Measures			**182,734**	**64.2**	**-38**	**$21,904**	**$160,814**	**$29,340**	**$131,474**	**6.0**	**179,538**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	174,083	61.9	-36	$20,867	$144,614	$18,835	$125,779	6.0	171,038
ECM 5	Install High/Low Lighting Controls	Yes	8,652	2.3	-2	$1,037	$16,200	$10,505	$5,695	5.5	8,501
Variable Frequency Drive (VFD) Measures			**200,146**	**68.9**	**0**	**$25,569**	**$151,421**	**$30,900**	**$120,521**	**4.7**	**201,545**
ECM 6	Install VFDs on Constant Volume (CV) Fans	Yes	198,352	68.5	0	$25,340	$144,899	$30,700	$114,199	4.5	199,739
ECM 7	Install VFDs on Heating Water Pumps	No	1,794	0.4	0	$229	$6,522	$200	$6,322	27.6	1,806
Unitary HVAC Measures			**94,336**	**81.4**	**0**	**$12,052**	**$547,937**	**$44,083**	**$503,853**	**41.8**	**94,996**
ECM 8	Install High Efficiency Air Conditioning Units	No	94,336	81.4	0	$12,052	$547,937	$44,083	$503,853	41.8	94,996
HVAC System Improvements			**14,900**	**0.0**	**0**	**$1,904**	**$1,039**	**$360**	**$679**	**0.4**	**15,004**
ECM 9	Install Pipe Insulation	Yes	14,900	0.0	0	$1,904	$1,039	$360	$679	0.4	15,004
Domestic Water Heating Upgrade			**5,561**	**0.0**	**0**	**$710**	**$143**	**$72**	**$72**	**0.1**	**5,600**
ECM 10	Install Low-Flow DHW Devices	Yes	5,561	0.0	0	$710	$143	$72	$72	0.1	5,600
Food Service & Refrigeration Measures			**6,044**	**0.7**	**0**	**$772**	**$920**	**$200**	**$720**	**0.9**	**6,087**
ECM 11	Vending Machine Control	Yes	6,044	0.7	0	$772	$920	$200	$720	0.9	6,087
Custom Measures			**406,992**	**0.0**	**117**	**$56,400**	**$3,111,492**	**$0**	**$3,111,492**	**55.2**	**423,513**
ECM 12	Installation of an Energy Management System	No	315,828	0.0	117	$44,751	$3,082,950	$0	$3,082,950	68.9	331,711
ECM 13	Install Heat Pump Water Heater	Yes	91,164	0.0	0	$11,649	$28,542	$0	$28,542	2.5	91,801
TOTALS (COST EFFECTIVE MEASURES)			**1,167,679**	**370.3**	**-177**	**$142,494**	**$616,179**	**$136,179**	**$480,000**	**3.4**	**1,155,088**
TOTALS (ALL MEASURES)			**1,579,637**	**452.1**	**-60**	**$199,526**	**$4,253,588**	**$180,462**	**$4,073,126**	**20.4**	**1,583,601**

* - 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[3]

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

[3] The ECM Summary tables do not consider prevailing wage as contractors have different ways of biding on projects and pricing varies. While planning your project it is likely that you should consider a 40% increase in labor and material costs, and a 20% increase to take into consideration the design and construction management.

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 (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for DEP Headquarters. 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

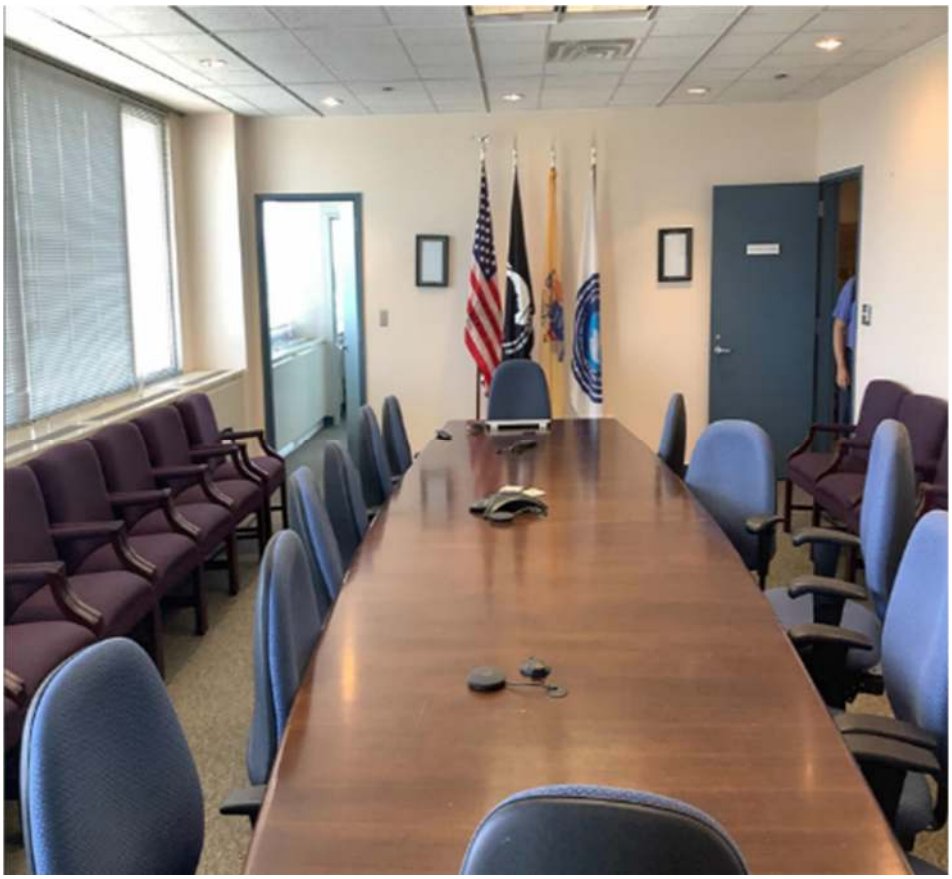
On June 22, 2022, TRC performed an energy audit at DEP Headquarters located in Trenton, New Jersey. TRC met with William Golubinski to review the facility operations and help focus our investigation on specific energy-using systems.

New Jersey Department of Environment Protection (NJDEP) Headquarters is a 7-story, 403,000 square foot high rise building built in 1984. Spaces include main lobby reception area, enclosed and large open offices, cafeteria, conference rooms, central supply room, data center, mail room, penthouse mechanical spaces, mid-size basement, electric and mechanical rooms, telephone rooms, elevator lobbies, restrooms, stairs, storage rooms, and corridors.

Lighting is mainly provided by linear fluorescent T8 fixtures. Heating and cooling are provided by water source heat pumps (WSHPs) and air handling units (AHUs) equipped with semi-hermetic compressors and electric resistance heaters. Hot water supplied from the Vicinity Energy Power Plant provides the WSHPs a supplemental source for heating. The building has six passenger elevators and a freight elevator. There is a diesel power generator to provide emergency power. The loading dock has a Level 2 and two Level 3 electric vehicle charging stations. The building has a solar array comprised of 184 individual roof mounted panels. In 2021, it provided 222,084 kWh of electricity.

Recent improvements include: Lighting retrofit to LED in some selected interior areas. Almost all exterior light fixtures have been replaced with LED fixtures. The site has also replaced many of the semi-hermetic compressors associated with the air handling units (AHUs).

Facility concerns include: AHUs which are operating beyond their useful life and are in poor condition, a non-unified HVAC control system, high maintenance costs, and high electric bills.



Conference Room - DEP Commissioner Office

2.2 Building Occupancy

The facility is occupied year-round, from Monday to Friday except on holidays. Typical weekday occupancy is approximately 1,200 staff. It should be noted that the energy and economic analysis for this building is based on the use of the building during the utility billing period, and that results will vary based on changes to building use patterns.

Building Name	Weekday/Weekend	Operating Schedule
DEP Headquarters	Weekday	5:00 AM - 6:00 PM
	Weekend	Closed

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete block over structural steel. The flat roof is supported with steel trusses and a reinforced concrete deck and is finished with an insulated layer and a covering of white membrane. The roof was replaced 12 years ago and is under warranty. It is in good condition and includes a penthouse housing the passenger and freight elevators, and chilled water pumps.

The windows are double glazed and have aluminum frames. The window weather seals were replaced few years ago and are in good condition, showing no evidence of excessive wear. Windows are typically equipped with solar shades or blinds for glare control.

The north and south front-entry area walls are part of an aluminum-framed storefront style system incorporating two revolving entry doors and three regular entry doors. The entrance doors are fully glazed, and aluminum framed. The exit doors are constructed of metal and are in good condition. Overall, the windows and exterior doors are in good condition with no signs of uncontrolled moisture, air leakage, or other energy-compromising issues.

Building Walls

Main Entrance & Roof

Typical Window & Exit Door

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. There are also several LED screw-based lamps, and a number of LED fixtures. There are a few compact fluorescent lamps (CFLs), and incandescent lamps, primarily in service spaces. Very few linear fluorescent T12 tube fixtures were noted in several closets, presumably overlooked in prior lighting upgrades.

Spaces including conference rooms, emergency center, main lobby, room CW1-003, passenger elevators, corridor 7W-001E, and freight elevator are lit with LED fixtures. The switch gear room on the first floor is lit with LED tube lamps. The DEP Commissioner offices, conference room, loading dock, and first floor elevator lobby are illuminated with LED lamps. A small number of CFLs are found in open office 7E-700, rooms 7E-803, 7E-811, and in the basement restroom. A small number of linear T12 lamps are found in the closets and corridors. There are four metal halide lamps at the loading dock. The remaining building spaces are lit with linear fluorescent T8 fixtures.

Most fixtures are in fair or good condition. Exit signs use LED sources. Interior lighting levels were generally sufficient. Light fixtures in most spaces are controlled by ASCO lighting control panels. There are four control panels on each of the seven floors equipped with timed overrides.

See table below for the typical lighting schedule.

# Floor	Start Time (Weekdays)	Stop Time (Weekdays)	Weekends
1st Floor	6:45 AM	8:30 PM	Closed
2nd, 3rd, 4th, 5th, 6th 7th Floors	6:45 AM	7:00 PM	Closed

Exterior fixtures include parking lot pole, roof, and wall mounted LED fixtures. There are two additional recessed LED fixtures at the front entrance and four metal halide flood lamps mounted at the roofline. Exterior fixtures are controlled by photocells and a timer.

4-Foot Linear Fluorescent Fixtures

Metal Halide Lamp, LED Exit Sign & Ceiling Mounted Occupancy Sensor

LED Fixtures

ASCO Lighting Control Main Display & 1st Floor Area 1A Schedule Display

Exterior Wall Mounted Metal Halide & LED Fixtures

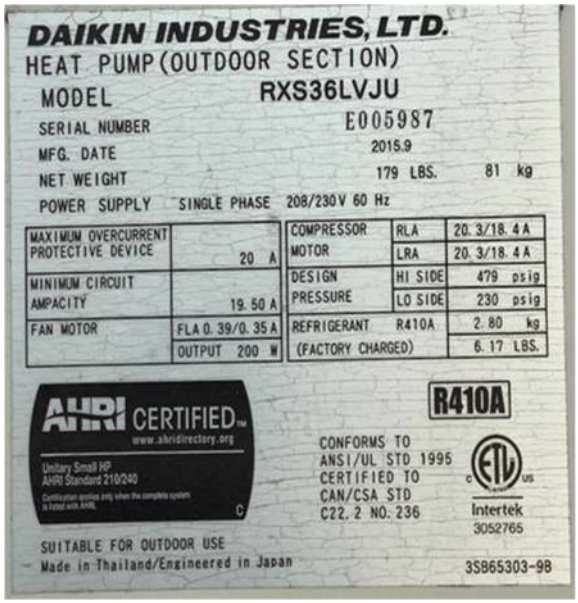
Parking Lot Pole Mounted LED Fixtures

2.5 Air Handling Systems

Unitary Electric HVAC Equipment

The passenger and freight elevator machine rooms, located in the penthouses, are conditioned respectively by two (AC-1 & AC-2) and one (AC-3) Daikin air source heat pumps. Each unit has a 3-ton cooling capacity and a 38 MBh heating capacity. The units are seven years old and in good condition. They are controlled by the Continuum EMS. The parking lot guard gate is cooled by a 0.42-ton window air conditioner (AC).

The data center is cooled by three 30-ton Liebert ACs. Two units are newer and currently run to provide cooling while the old unit is used as a backup unit. It has been evaluated for replacement. The units do not appear in the building EMS schedule; they have their own onboard control system.



Air Source Heat Pump

Data Center Liebert Cooling Units

Unitary Heating Equipment

The main lobby is heated by four electric cabinet heaters that are controlled by local thermostats.

The penthouses and stairs are heated by electric resistance heaters. The units serving penthouses are suspended units with approximately 5 kW of heating capacity while the stairs are served by linear resistance heaters, each with approximately 2 kW of heating capacity. The units are controlled with onboard local thermostats.

Electric Resistance Heaters

Water Source Heat Pumps (WSHP)

Building perimeter heating and cooling are provided by 559 ductless packaged water source heat pumps (WSHPs). The WSHPs are equipped with high efficiency compressors that use HFC-410A refrigerant, with supply fans ranging from 0.1 to 1.0 hp. There are six sizes of WSHPs that vary between 0.67 and 5 tons in cooling capacity and between 11.4 and 75 MBh in heating capacity. The distribution system is a standard closed loop where the loop piping runs inside the building perimeter and includes a heat adder (hot water), a cooling tower (heat rejecter), pumps, heat exchanger, and controls. The WSHPs operating modes are explained below.

- Cooling Mode (Summer Operation):

Each refrigerant to water heat exchanger transfers the heat from the cooling tower load plus the heat of compression into the common water loop. This process raises the temperature of the loop. When the loop temperature approaches the upper limit of 90 ˚F, the heat rejector (cooling tower) is staged to remove heat from the loop. It will maintain a maximum water temperature of 90 ˚F. Individual WSHP units will cycle on and off to satisfy their respective zone temperatures.

- Heating Mode (Winter Operation):

Each refrigerant to water heat exchanger acts as an evaporator and absorbs heat from the water loop. This lowers the temperature of the loop. When loop temperature approaches the lower limit of about 60 ˚F, the heat adder is staged to add heat to the loop, maintaining a minimum loop water temperature of 60 ˚F. Individual WSHP units cycle on and off to satisfy their respective zone temperatures.

- Intermediate Season:

Some units may be in the cooling mode (adding heat to the common water loop) while others are in the heating mode (absorbing heat from the loop). During this condition, the loop may be in equilibrium and not require heat to be added or rejected. The loop water temperature is allowed to vary within the approximate 60 ˚F to 90 ˚F range.

The units were all installed in 2012 and are in good condition. They are controlled by the Continuum EMS. The building cooling and heating temperature setpoint is 72°F. The following table provides model and capacity information about the water source heat pumps. Refer to Appendix A for detailed information about each unit.

Unit Model	Number of Units	Cooling Capacity (Tons)	Heating Capacity (MBh)	Condition
TRC09BENX	256	0.67	11.4	Good
TRC12BENX	85	0.88	14.3	Good
TRC15BENX	106	1.08	17.7	Good
TRC15BENX	108	1.23	19.6	Good
TSH048CGC	2	3.58	62.0	Good
TSH060CGC	2	5.00	75..0	Good

Water Source Heat Pump

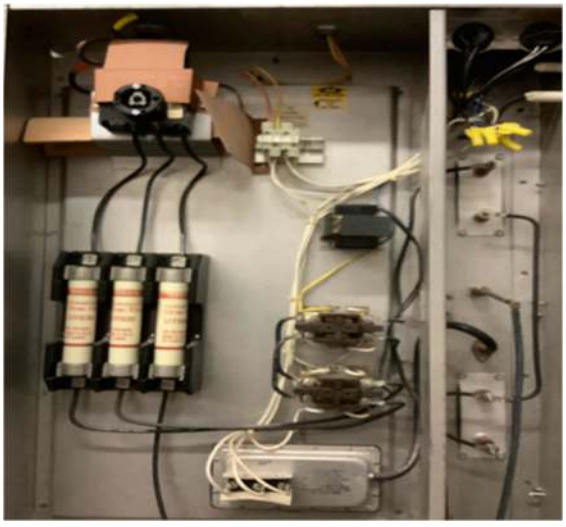
EMS Screenshot – 1st Floor WSHPs

Air Handling Units (AHUs)

The main building spaces are conditioned by 28 air handling units. There are four AHUs per floor. They are equipped with 200 MBh R-22 semi-hermetic compressors, 15 hp supply fan motors, 7.5 hp exhaust fan motors, electric resistance coils, and condenser water pipes. Fifteen AHUs have 20 kW resistance coils while thirteen units have 25 kW resistance coils. The condenser water is supplied by the cooling tower and is used to cool down the semi hermetic compressors.

The AHUs are original to the building and appear in poor condition. The units are controlled by local thermostats using pneumatic control system with two air compressors located in the basement. The AHUs also appear as monitoring points in the second building EMS.

Typical AHU, Compressor & Supply Fan



20 kW Electric Resistance Heater

EMS Screenshot - First Floor AHUs & Local Thermostats

2.6 General Building Exhaust Air Systems

There are three large 5 hp roof mounted exhaust fans that serve the restrooms and numerous fractional horsepower exhaust fans throughout the building; which serve various spaces including fire pump room, penthouses, electrical room, and maintenance shop. The three large units run continuously. Smaller units run when needed and are controlled by local thermostats, except for the units serving penthouse elevator machine rooms which are controlled by the Continuum EMS.

Exhaust Air Fans

2.7 Heating Hot Water Systems

Thermal energy is supplied by boilers at the Vicinity central plant in the form of hot water. Facility perimeter heating is provided using water source heat pump loop. Water source heat pump units are connected to a water distribution loop which circulates water throughout the building to transfer heat from one area to another. This common water loop provides what is essentially a heat-recovery system. Units providing heating extract heat from loop water while units providing cooling reject heat to the loop.

There is a small heat exchanger located in the basement with two 2 hp constant flow pumps that circulate hot water to the loading dock hydronic unit heaters.

Building thermal usage is not significant compared to its size as most of the heating is provided by WSHPs and electric resistance heaters.

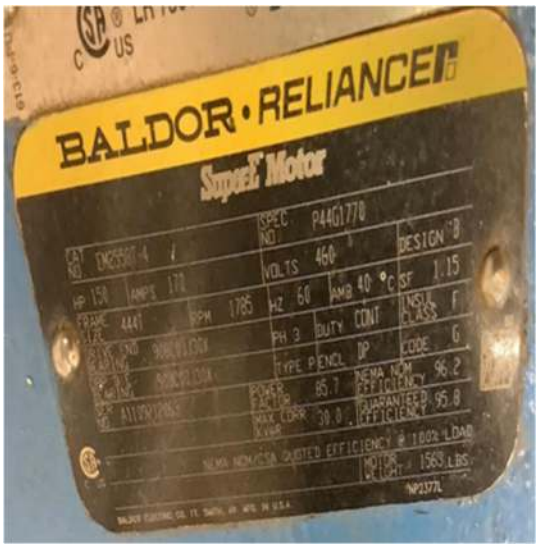
Basement Heat Exchanger & Hot Water Pumps

2.8 Condenser Water Systems

The condenser water system consists of three one-cell cooling towers (CT-1, CT-2, & CT-3). The towers are equipped with valving system that allows towers to operate separately. Each tower has a 15 hp fan equipped with variable frequency drive (VFD). There are two 150 hp variable flow condenser water pumps, a 60 hp variable flow tower water circulating pump, a 15 hp constant flow tower water circulating pump, and two plate heat exchangers all located in the penthouse pump room.

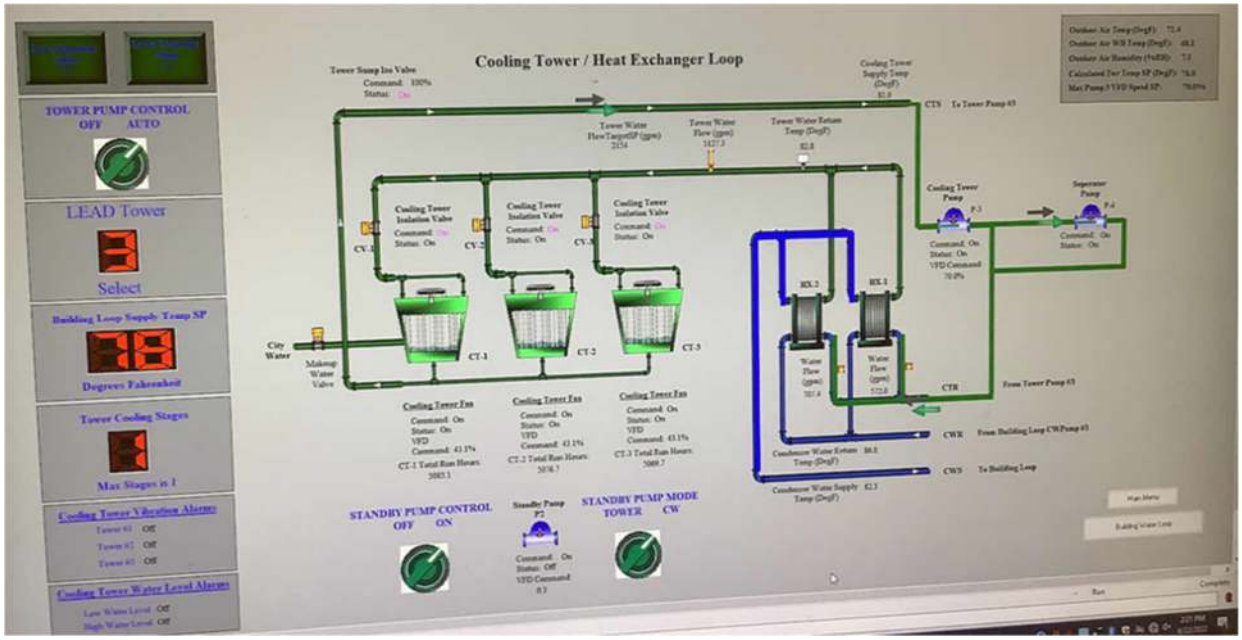
Plate heat exchangers are used to separate condenser water from the distribution loop. Additionally, the first-floor mechanical room 1-3 houses two 5 hp condenser water pumps. Condenser water is supplied to WSHPs and is also used to cool down the AHUs semi-hermetic compressors. The condenser water loop is controlled by a Continuum EMS. At the time of the audit, the building condenser water loop supply temperature was 78°F with an outside air temperature of 72.3°F and a tower water temperature of 75°F.

Cooling Tower & Fan's VFDs

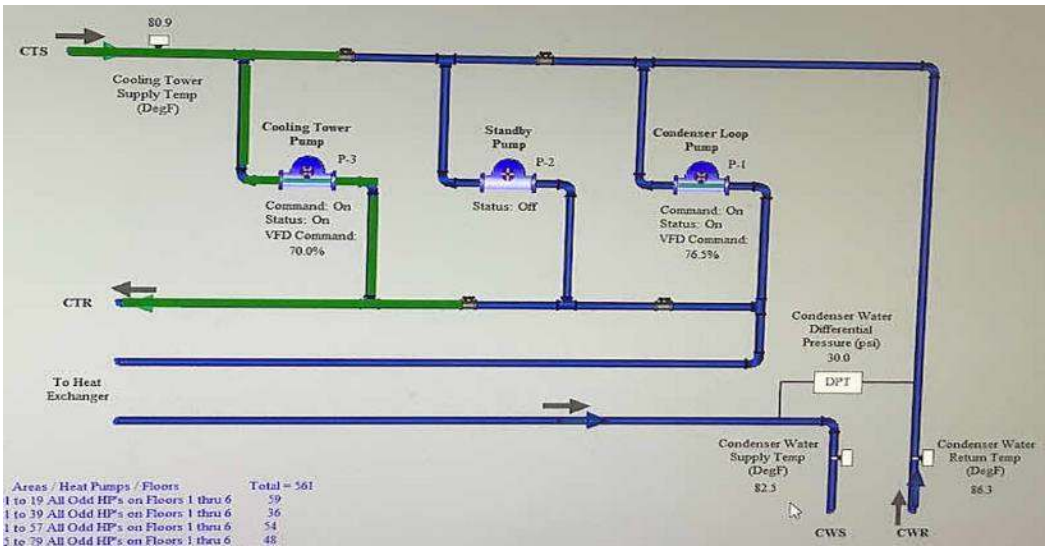


Tower & Circulating Water Pumps

Plate Heat Exchanger



Condenser Water Loop



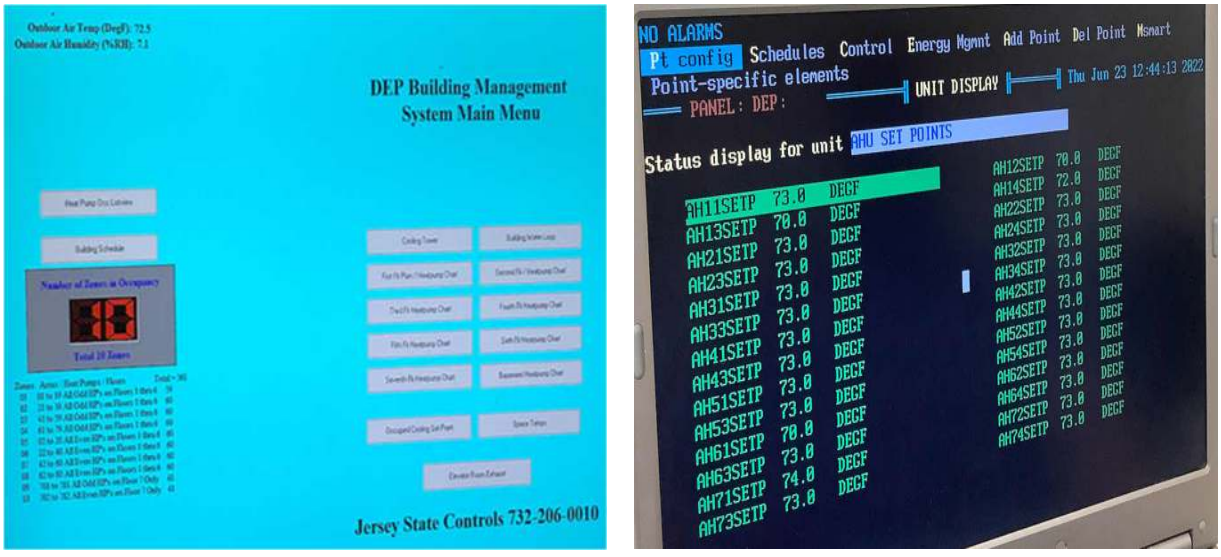
Condenser Water & Tower Water Loops

2.9 Building Energy Management Systems (EMS)

The facility has two control systems for mechanical systems and one for lighting. A Continuum EMS controls the WSHPs, building water loop, elevator machine room exhaust fans, and air source heat pumps. This EMS provides equipment scheduling control and monitors and controls space temperatures, condenser water loop temperatures, humidity, and outside air temperature.

The AHUs are controlled by a pneumatic control system powered by two air compressors that operate under a manual lead/lag scheme. The interior lighting system is controlled by ASCO controllers. The AHUs and interior lighting are tied into the same outdated EMS platform, separate from the Continuum system.

The site staff expressed an interest in expanding and integrating the building HVAC equipment and lighting systems into one single platform and receiving additional training on operating the EMS.



Screenshot – Continuum EMS & Pneumatic Control EMS

2.10 Domestic Hot Water

Hot water is produced by twelve 9 kW and three 4.5 kW electric storage water heaters. The heater's storage capacities vary from 30 to 80 gallons. There are two sets of restrooms in each of the seven floors and each set is served by a water heater. The heaters are located in the closets. The cafeteria has a small kitchen with a dedicated 80-gallon storage tank. The domestic hot water pipes for most heaters are partially insulated.

Electric Storage Tank Water Heaters

2.11 Food Service Equipment

The DEP Headquarters has a cafeteria with a small all electric kitchen that is used to prepare light breakfast and lunches for the staff. The cafeteria is run by the New Jersey Commission for the blind and visually impaired.

Visit https://www.energystar.gov/products/commercial_food_service_equipment for the latest information on high efficiency food service equipment.

Kitchen Electric Cooking Equipment

2.12 Refrigeration

The cafeteria and the kitchen have three stand-up refrigerators with glass doors and six stand-up refrigerators with solid doors. The units vary in volume between 17.7 and 66 cubic feet. There are eight under counter refrigerator chests. All equipment is standard efficiency and in good condition.

There is a self-contained ice machine in the dishwasher room that is in good condition.

Visit https://www.energystar.gov/products/commercial_food_service_equipment for the latest information on high efficiency food service equipment.

Stand-Up Solid & Glass Doors Refrigerators

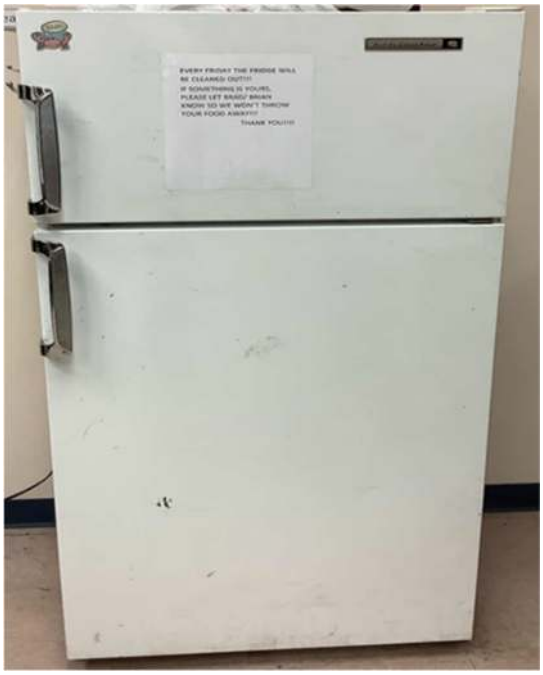
2.13 Plug Load and Vending Machines

There are approximately 1,200 computer workstations throughout the facility. Plug loads include general café and office equipment including copiers, printers, microwaves, coffee machines, paper shredders, mini refrigerators, televisions, water coolers, and other miscellaneous plug load equipment. There are approximately 12 residential style refrigerators throughout the building that are used to store food and beverages. These vary in condition and efficiency.

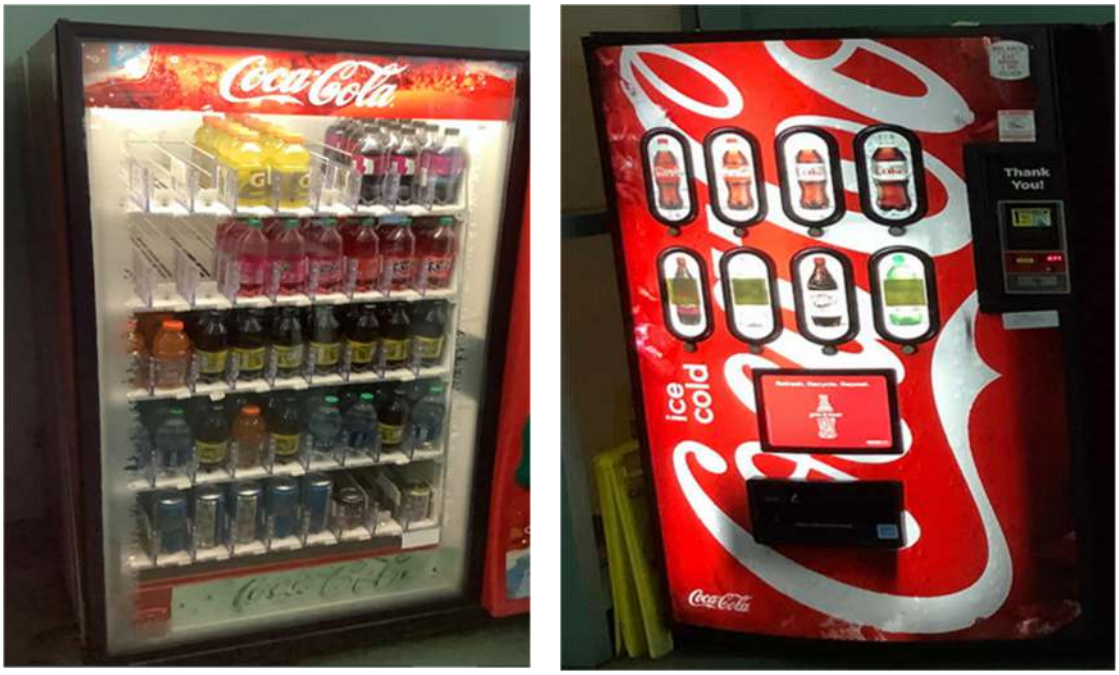
The facility loading dock houses two Level 3 and one Level 2 electric vehicle charging stations. The cafeteria has four refrigerated vending machines and three non-refrigerated vending machines. The building overall plug load equipment electric consumption is estimated to be 7% of its yearly electric consumption.

The building has its own data center with a UPS system. Based on our assessment, the data center is using 3% of the building total electric consumption. To better track the date center electricity consumption, it's recommended to install a sub meter to record the electricity usage.

Notes: The estimated plug load and data center end use percentage is only for the electric consumption not the overall end use building energy consumption as in Figure 4 which is the combined of the electric and hot water consumption.



Scanner/Copier & Residential Style refrigerator



Vending Machines

2.14 Water-Using Systems

There are several restrooms with toilets, urinals, and sinks. Faucet flow rates are at 2.2 gallons per minute (gpm) or higher. Toilets are rated at 2.5 gallons per flush (gpf) and urinals are rated at 2.5 gpf.

The basement has restrooms with showers, and showerheads are rated as low flow.

Typical Restroom Sinks

2.15 On-Site Generation

NJ DEP Headquarters has roof mounted photovoltaic (PV) arrays with approximately 184 panels that provided 222,084 kWh of electricity during 2021. The panels cover over 85% of the flat roof spaces. The solar PV provides approximately 4% electricity used at the facility in this analysis.

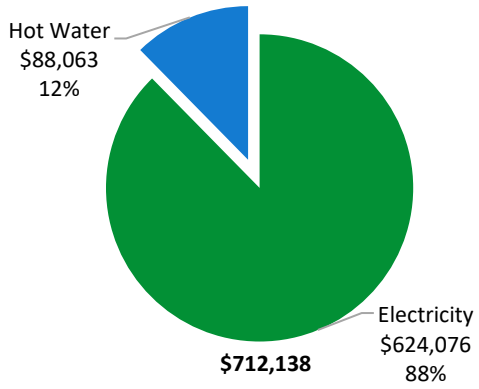
The facility has a large diesel backup generator that is used to power the data center and the building emergency lights during power outage.

Solar PV Arrays & DEP Headquarters Diesel Generator

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	5,107,088 kWh	$624,076
Hot Water	2,335.8 MMBtu	$88,063
Total		**$712,138**



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.

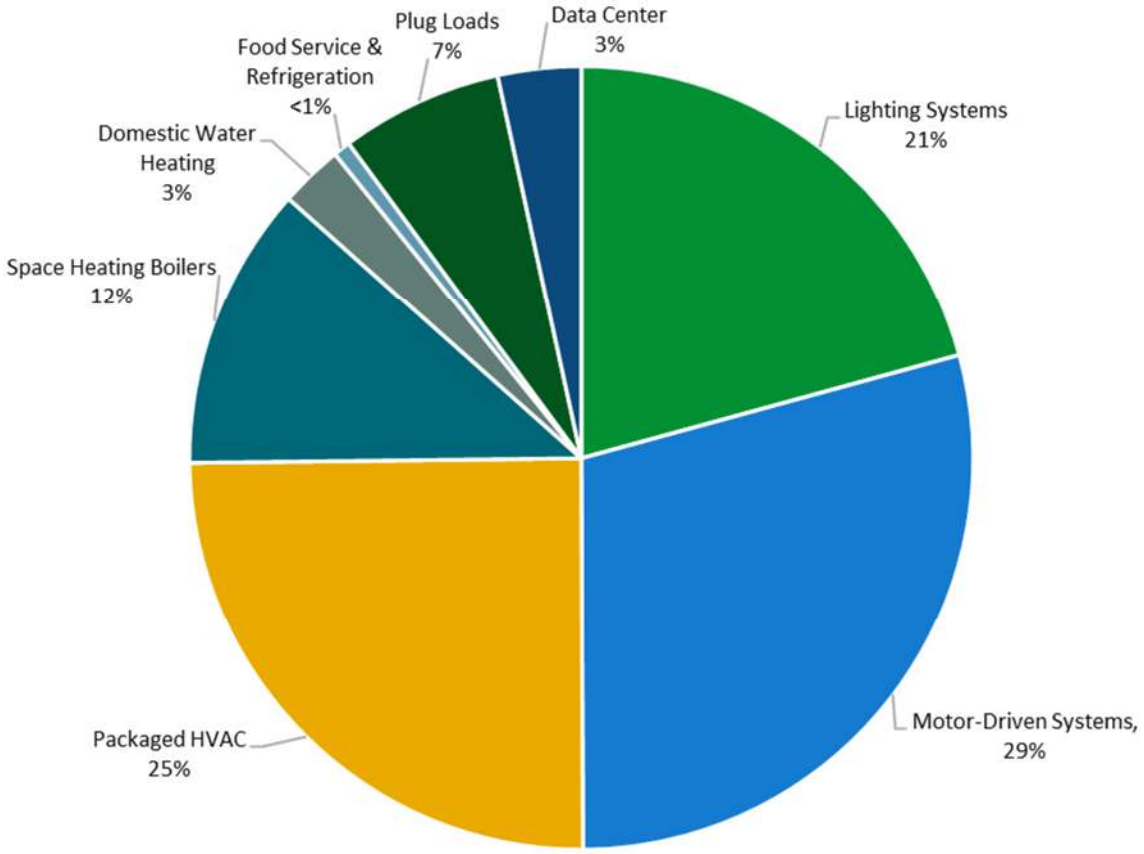
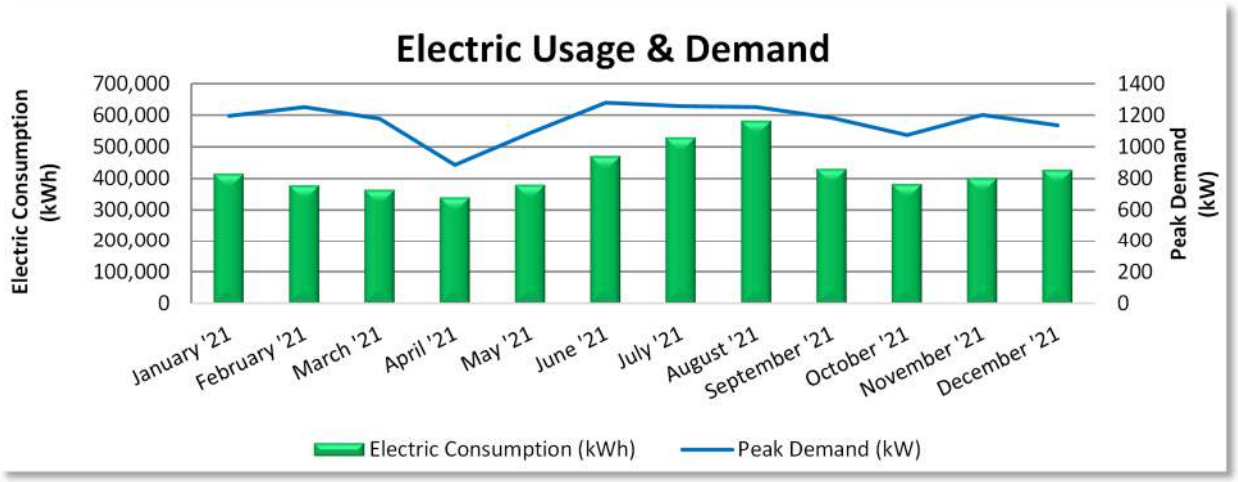


Figure 4 - Energy Balance

3.1 Electricity

PSE&G delivers electricity under rate class Large Power & Lighting Secondary, with electric production provided by Direct Energy, a third-party supplier.

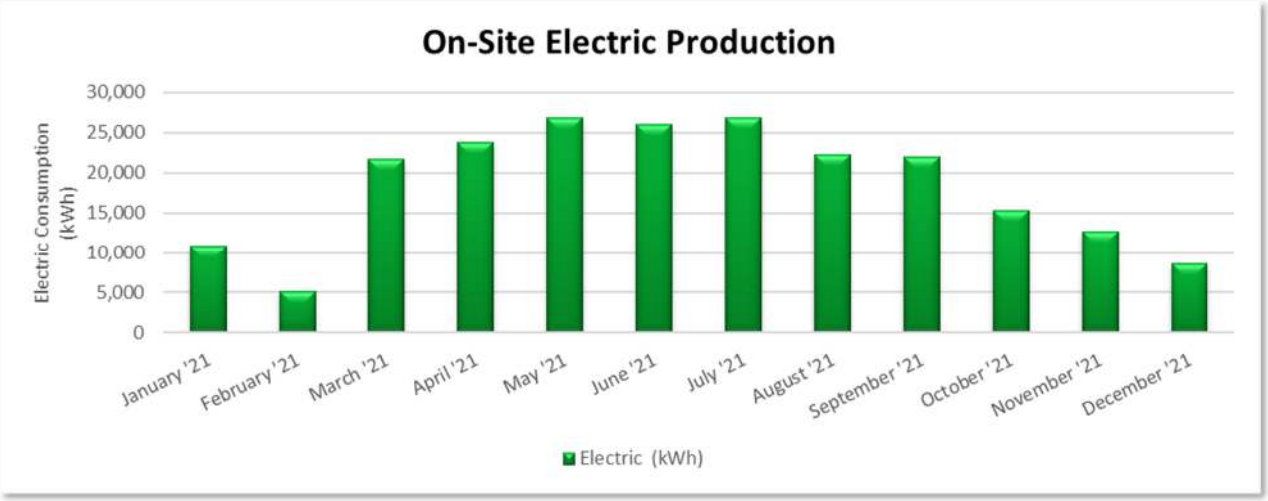


Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
1/31/21	31	415,641	1,195	$4,497	$47,310
2/28/21	28	378,677	1,252	$4,710	$44,365
3/31/21	31	364,743	1,178	$4,430	$40,890
4/30/21	30	341,128	887	$3,336	$37,069
5/31/21	31	380,513	1,089	$4,123	$41,704
6/30/21	30	471,504	1,280	$16,378	$63,598
7/31/21	31	529,656	1,258	$16,097	$69,318
8/31/21	31	582,782	1,253	$16,022	$75,255
9/30/21	30	430,798	1,184	$15,128	$58,327
10/31/21	31	383,114	1,076	$4,072	$43,339
11/30/21	30	401,474	1,202	$4,555	$46,023
12/31/21	31	427,058	1,136	$4,299	$56,878
Totals	**365**	**5,107,088**	**1,280**	**$97,646**	**$624,076**
Annual	**365**	**5,107,088**	**1,280**	**$97,646**	**$624,076**

Notes:

- Peak demand of 1,280 kW occurred in June '21.
- Average demand over the past 12 months was 1,166 kW.
- The average electric cost over the past 12 months was $0.128/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.
- On-site generation is owned by the facility. All of the electricity generated on-site is used on-site.

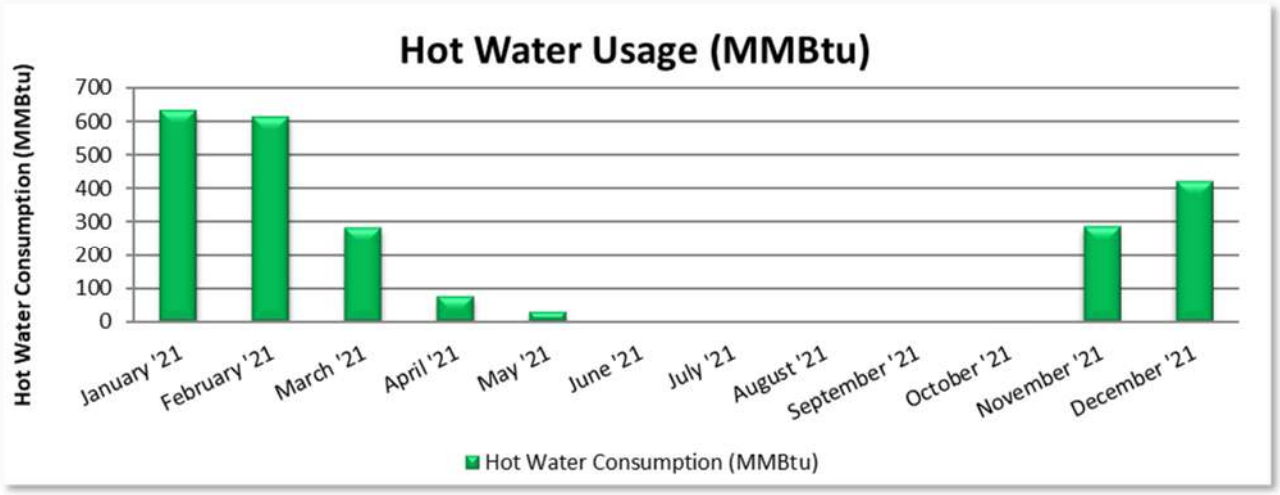
3.2 Solar Production



Electric Billing Data for DEP Headquarters		
Period Ending	**Days in Period**	**Electric Usage (kWh)**
1/31/21	31	10,771
2/28/21	28	5,176
3/31/21	31	21,719
4/30/21	30	23,837
5/31/21	31	26,846
6/30/21	30	25,982
7/31/21	31	26,897
8/31/21	31	22,305
9/30/21	30	21,916
10/31/21	31	15,318
11/30/21	30	12,682
12/31/21	31	8,635
Totals	**365**	**222,084**
Annual	**365**	**222,084**

3.3 Hot Water

Hot water is supplied by the Vicinity Energy Trenton, L.P. owned central plant. A new thermal energy agreement between the Vicinity Energy and the State of NJ Department of Treasury has been in effect since June 1, 2021.



Hot Water Billing Data			
Period Ending	**Days in Period**	**Hot Water Usage (MMBtu) Usage**	**Fuel Cost**
1/31/21	31	632	$13,489
2/28/21	28	610	$13,297
3/31/21	31	283	$8,331
4/30/21	30	77	$5,249
5/31/21	31	30	$5,474
6/30/21	30	0	$4,097
7/31/21	31	0	$4,121
8/31/21	31	0	$4,121
9/30/21	30	0	$4,121
10/31/21	31	0	$4,128
11/30/21	30	285	$9,483
12/31/21	31	420	$12,153
Totals	**365**	**2,336**	**$88,063**
Annual	**365**	**2,336**	**$88,063**

Notes:

- The average hot water cost for the past 12 months is $37.701/MMBtu, which is the blended rate used throughout the analysis.
- The utility profile indicates no hot water was taken during summer months. This is consistent with proper operation of the heat pump loop system.

3.4 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**

The data center monthly IT output meter readings were not available for our analysis. We have estimated the IT data based on the kWh/day value found on the UPS readout during the audit. This value likely fluctuates each day. As a result, we could not produce a statement of energy performance score for the building. This report contains suggestions about how to improve building performance and reduce energy costs.

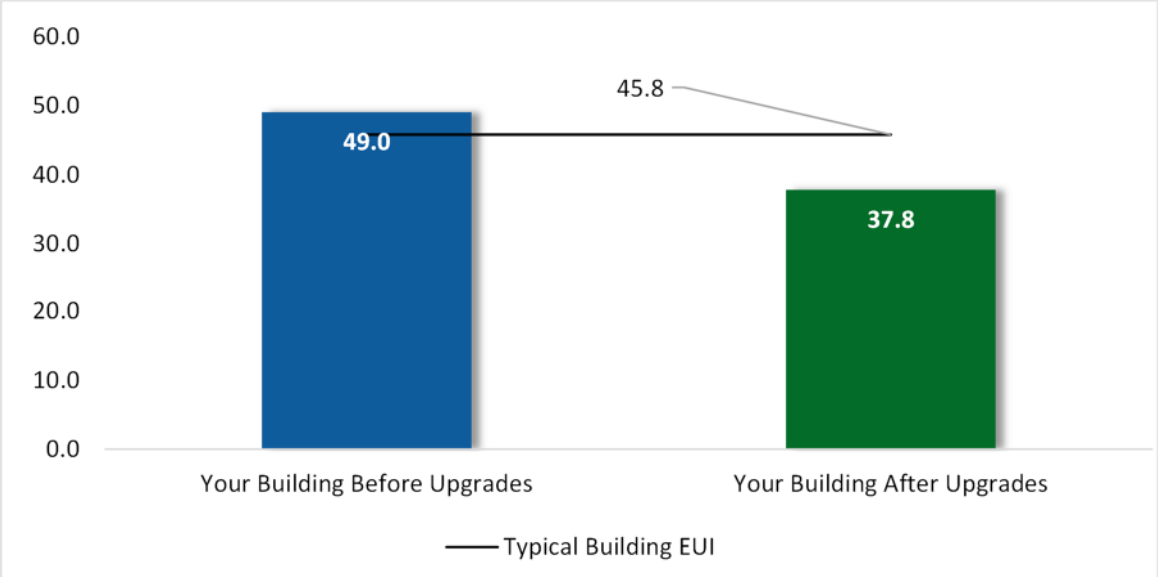


Figure 5 - Energy Use Intensity Comparison[4]

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.

[4] 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_2e Emissions Reduction (lbs)
Lighting Upgrades			**668,923**	**236.9**	**-139**	**$80,214**	**$279,821**	**$75,507**	**$204,314**	**2.5**	**657,318**
ECM 1	Install LED Fixtures	Yes	7,126	0.8	-1	$885	$3,903	$400	$3,503	4.0	7,096
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	335	0.6	0	$40	$863	$95	$768	19.1	330
ECM 3	Retrofit Fixtures with LED Lamps	Yes	661,462	235.5	-138	$79,290	$275,055	$75,012	$200,043	2.5	649,893
Lighting Control Measures			**182,734**	**64.2**	**-38**	**$21,904**	**$160,814**	**$29,340**	**$131,474**	**6.0**	**179,538**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	174,083	61.9	-36	$20,867	$144,614	$18,835	$125,779	6.0	171,038
ECM 5	Install High/Low Lighting Controls	Yes	8,652	2.3	-2	$1,037	$16,200	$10,505	$5,695	5.5	8,501
Variable Frequency Drive (VFD) Measures			**200,146**	**68.9**	**0**	**$25,569**	**$151,421**	**$30,900**	**$120,521**	**4.7**	**201,545**
ECM 6	Install VFDs on Constant Volume (CV) Fans	Yes	198,352	68.5	0	$25,340	$144,899	$30,700	$114,199	4.5	199,739
ECM 7	Install VFDs on Heating Water Pumps	No	1,794	0.4	0	$229	$6,522	$200	$6,322	27.6	1,806
Unitary HVAC Measures			**94,336**	**81.4**	**0**	**$12,052**	**$547,937**	**$44,083**	**$503,853**	**41.8**	**94,996**
ECM 8	Install High Efficiency Air Conditioning Units	No	94,336	81.4	0	$12,052	$547,937	$44,083	$503,853	41.8	94,996
HVAC System Improvements			**14,900**	**0.0**	**0**	**$1,904**	**$1,039**	**$360**	**$679**	**0.4**	**15,004**
ECM 9	Install Pipe Insulation	Yes	14,900	0.0	0	$1,904	$1,039	$360	$679	0.4	15,004
Domestic Water Heating Upgrade			**5,561**	**0.0**	**0**	**$710**	**$143**	**$72**	**$72**	**0.1**	**5,600**
ECM 10	Install Low-Flow DHW Devices	Yes	5,561	0.0	0	$710	$143	$72	$72	0.1	5,600
Food Service & Refrigeration Measures			**6,044**	**0.7**	**0**	**$772**	**$920**	**$200**	**$720**	**0.9**	**6,087**
ECM 11	Vending Machine Control	Yes	6,044	0.7	0	$772	$920	$200	$720	0.9	6,087
Custom Measures			**406,992**	**0.0**	**117**	**$56,400**	**$3,111,492**	**$0**	**$3,111,492**	**55.2**	**423,513**
ECM 12	Installation of an Energy Management System	No	315,828	0.0	117	$44,751	$3,082,950	$0	$3,082,950	68.9	331,711
ECM 13	Install Heat Pump Water Heater	Yes	91,164	0.0	0	$11,649	$28,542	$0	$28,542	2.5	91,801
TOTALS			**1,579,637**	**452.1**	**-60**	**$199,526**	**$4,253,588**	**$180,462**	**$4,073,126**	**20.4**	**1,583,601**

* - 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_2e Emissions Reduction (lbs)
Lighting Upgrades		**668,923**	**236.9**	**-139**	**$80,214**	**$279,821**	**$75,507**	**$204,314**	**2.5**	**657,318**
ECM 1	Install LED Fixtures	7,126	0.8	-1	$885	$3,903	$400	$3,503	4.0	7,096
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	335	0.6	0	$40	$863	$95	$768	19.1	330
ECM 3	Retrofit Fixtures with LED Lamps	661,462	235.5	-138	$79,290	$275,055	$75,012	$200,043	2.5	649,893
Lighting Control Measures		**182,734**	**64.2**	**-38**	**$21,904**	**$160,814**	**$29,340**	**$131,474**	**6.0**	**179,538**
ECM 4	Install Occupancy Sensor Lighting Controls	174,083	61.9	-36	$20,867	$144,614	$18,835	$125,779	6.0	171,038
ECM 5	Install High/Low Lighting Controls	8,652	2.3	-2	$1,037	$16,200	$10,505	$5,695	5.5	8,501
Variable Frequency Drive (VFD) Measures		**198,352**	**68.5**	**0**	**$25,340**	**$144,899**	**$30,700**	**$114,199**	**4.5**	**199,739**
ECM 6	Install VFDs on Constant Volume (CV) Fans	198,352	68.5	0	$25,340	$144,899	$30,700	$114,199	4.5	199,739
HVAC System Improvements		**14,900**	**0.0**	**0**	**$1,904**	**$1,039**	**$360**	**$679**	**0.4**	**15,004**
ECM 9	Install Pipe Insulation	14,900	0.0	0	$1,904	$1,039	$360	$679	0.4	15,004
Domestic Water Heating Upgrade		**5,561**	**0.0**	**0**	**$710**	**$143**	**$72**	**$72**	**0.1**	**5,600**
ECM 10	Install Low-Flow DHW Devices	5,561	0.0	0	$710	$143	$72	$72	0.1	5,600
Food Service & Refrigeration Measures		**6,044**	**0.7**	**0**	**$772**	**$920**	**$200**	**$720**	**0.9**	**6,087**
ECM 11	Vending Machine Control	6,044	0.7	0	$772	$920	$200	$720	0.9	6,087
Custom Measures		**91,164**	**0.0**	**0**	**$11,649**	**$28,542**	**$0**	**$28,542**	**2.5**	**91,801**
ECM 13	Install Heat Pump Water Heater	91,164	0.0	0	$11,649	$28,542	$0	$28,542	2.5	91,801
TOTALS		**1,167,679**	**370.3**	**-177**	**$142,494**	**$616,179**	**$136,179**	**$480,000**	**3.4**	**1,155,088**

* - 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_2e Emissions Reduction (lbs)
Lighting Upgrades		**668,923**	**236.9**	**-139**	**$80,214**	**$279,821**	**$75,507**	**$204,314**	**2.5**	**657,318**
ECM 1	Install LED Fixtures	7,126	0.8	-1	$885	$3,903	$400	$3,503	4.0	7,096
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	335	0.6	0	$40	$863	$95	$768	19.1	330
ECM 3	Retrofit Fixtures with LED Lamps	661,462	235.5	-138	$79,290	$275,055	$75,012	$200,043	2.5	649,893

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 metal halide 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: loading dock and roof mounted metal halide lamps.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Retrofit fluorescent fixtures T12 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: small supply closets and corridors.

ECM 3: Retrofit Fixtures with LED Lamps

Replace fluorescent T8, CFL 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 fluorescent fixtures with T8 tubes, CFL, and incandescent lamps.

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_2e Emissions Reduction (lbs)
Lighting Control Measures		**182,734**	**64.2**	**-38**	**$21,904**	**$160,814**	**$29,340**	**$131,474**	**6.0**	**179,538**
ECM 4	Install Occupancy Sensor Lighting Controls	174,083	61.9	-36	$20,867	$144,614	$18,835	$125,779	6.0	171,038
ECM 5	Install High/Low Lighting Controls	8,652	2.3	-2	$1,037	$16,200	$10,505	$5,695	5.5	8,501

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, conference rooms, mail room, restrooms, and storage rooms.

ECM 5: Install High/Low Lighting Controls

Install occupancy sensors to provide dual level lighting control for lighting fixtures in spaces that are infrequently occupied but may require some level of continuous lighting for safety or security reasons.

Lighting fixtures with these controls operate at default low levels when the area is unoccupied to provide minimal lighting to meet security or safety code requirements for egress. Sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Fixtures automatically switch back to low level after a predefined period of vacancy. In parking lots and parking garages with significant ambient lighting, this control can sometimes be combined with photocell controls to turn the lights off when there is sufficient daylight.

The controller lowers the light level by dimming the fixture output. Therefore, the controlled fixtures need to have a dimmable ballast or driver. This will need to be considered when selecting retrofit lamps and bulbs for the areas proposed for high/low control.

For this type of measure the occupancy sensors will generally be ceiling or fixture mounted. Sufficient sensor coverage must be provided to ensure that lights turn on in each area as occupants approach the area.

This measure provides energy savings by reducing the light fixture power draw when reduced light output is appropriate.

Affected Building Areas: corridors, stairs, and lobbies.

4.3 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_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**200,146**	**68.9**	**0**	**$25,569**	**$151,421**	**$30,900**	**$120,521**	**4.7**	**201,545**
ECM 6	Install VFDs on Constant Volume (CV) Fans	198,352	68.5	0	$25,340	$144,899	$30,700	$114,199	4.5	199,739
ECM 7	Install VFDs on Heating Water Pumps	1,794	0.4	0	$229	$6,522	$200	$6,322	27.6	1,806

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 Constant Volume (CV) Fans

Install VFDs to control constant volume fan motor speeds. This converts a constant-volume, single-zone air handling system into a variable-air-volume (VAV) system. A separate VFD is usually required to control the return fan motor or dedicated exhaust fan motor if the air handler has one.

Zone thermostats signal the VFD to adjust fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature.

For air handlers with direct expansion (DX) cooling systems, the minimum air flow across the cooling coil required to prevent the coil from freezing must be determined during the final project design. The control system programming should maintain the minimum air flow whenever the compressor is operating. Prior to implementation, verify minimum fan speed in cooling mode with the manufacturer. Note that savings will vary depending on the operating characteristics of each AHU.

Energy savings result from reducing the fan speed (and power) when conditions allow for reduced air flow.

Affected Air Handlers: large exhaust fans.

ECM 7: 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: 2 hp constant flow hot water pumps in the basement.

4.4 Unitary HVAC

#	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_2e Emissions Reduction (lbs)
Unitary HVAC Measures		**94,336**	**81.4**	**0**	**$12,052**	**$547,937**	**$44,083**	**$503,853**	**41.8**	**94,996**
ECM 8	Install High Efficiency Air Conditioning Units	94,336	81.4	0	$12,052	$547,937	$44,083	$503,853	41.8	94,996

Replacing the unitary HVAC units has a long payback period and may not be justifiable based simply on energy considerations. However, most of the units are nearing or have reached the end of their normal useful life. Typically, the marginal cost of purchasing a high efficiency unit can be justified by the marginal savings from the improved efficiency. When the HVAC units are eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

ECM 8: Install High Efficiency Air Conditioning Units

We evaluated replacing standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

Affected Units: all 28 AHUs.

4.5 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_2e Emissions Reduction (lbs)
HVAC System Improvements		**14,900**	**0.0**	**0**	**$1,904**	**$1,039**	**$360**	**$679**	**0.4**	**15,004**
ECM 9	Install Pipe Insulation	14,900	0.0	0	$1,904	$1,039	$360	$679	0.4	15,004

ECM 9: Install Pipe Insulation

Install insulation on domestic hot 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.

4.6 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_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**5,561**	**0.0**	**0**	**$710**	**$143**	**$72**	**$72**	**0.1**	**5,600**
ECM 10	Install Low-Flow DHW Devices	5,561	0.0	0	$710	$143	$72	$72	0.1	5,600

ECM 10: 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.

4.7 Food Service & Refrigeration 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_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**6,044**	**0.7**	**0**	**$772**	**$920**	**$200**	**$720**	**0.9**	**6,087**
ECM 11	Vending Machine Control	6,044	0.7	0	$772	$920	$200	$720	0.9	6,087

ECM 11: Vending Machine Control

Vending machines operate continuously, even during unoccupied hours. Install occupancy sensor controls to reduce energy use. These controls power down vending machines when the vending machine area has been vacant for some time, and they power up the machines at necessary regular intervals or when the surrounding area is occupied. Energy savings are dependent on the vending machine and activity level in the area surrounding the machines.

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_2e Emissions Reduction (lbs)
Custom Measures		**406,992**	**0.0**	**117**	**$56,400**	**$3,111,492**	**$0**	**$3,111,492**	**55.2**	**423,513**
ECM 12	Installation of an Energy Management System	315,828	0.0	117	$44,751	$3,082,950	$0	$3,082,950	68.9	331,711
ECM 13	Install Heat Pump Water Heater	91,164	0.0	0	$11,649	$28,542	$0	$28,542	2.5	91,801

ECM 12: Installation of an Energy Management System

The facility currently has two control systems, one for mechanical systems and one for lighting. The site staff expressed interest in integrating the building HVAC equipment and lighting systems into one single platform. It is recommended to work with a HVAC engineer or contractor to see if the installation of a new Energy Management System (EMS) is the best option.

Most larger facilities have some type of EMS, which provides for centralized, remote control and monitoring of HVAC equipment, and sometimes lighting or other building systems. An EMS utilizes a system of temperature and pressure sensors that obtain feedback about field conditions and provide signals to control systems that adjust HVAC system operation for optimal functioning. Thirty years ago, most control systems were pneumatic systems driven by compressed air, with pneumatic thermostats and air driven actuators for valves and dampers. Pneumatic controls have largely been replaced by direct digital control (DDC) systems, but many pneumatic systems remain. Contemporary DDC systems afford tighter controls and enhanced monitoring and trending capabilities as compared to the older systems.

Often smaller facilities are not equipped with central controls. For many small sites, it has been less costly to install distributed local controls, such as programmable thermostats and timeclocks, rather than centralized DDC. Local controls do a reasonably good job of scheduling equipment and maintaining operating conditions by relying on controls integral to HVAC units, such as logic for compressor staging, to manage the equipment operating algorithms.

Even for smaller sites, inefficiencies arise when temperature sensors and thermostat schedules are not maintained, when there are separate systems for heating and cooling, and especially when equipment is added, or the facility is reconfigured or repurposed.

Based on our survey, it appears that the installation of a new EMS at your site could increase the efficiency of your building HVAC system operation.

A controls upgrade would enable automated equipment start and stop times, temperature setpoints, lockouts and deadbands to be programmed remotely using a graphic interface. Controls can be configured to optimize ventilation and outside air intake by adjusting economizer position, damper function, and fan speed. Existing chilled and hot water distribution system controls are typically tied in, including associated pumps and valves. Coordinated control of HVAC systems is dependent on a network of sensors and status points. A comprehensive building control system provides monitoring and control for all HVAC systems, so operators can adjust system programming for optimal comfort and energy savings.

It is recommended that an HVAC engineer or contractor who specializes in EMS be contacted for a detailed evaluation and implementation costs. For the purposes of this report, the potential energy savings and measure costs were estimated based on industry standards and previous project experience. Further analysis should be conducted for the feasibility of this measure. This is not an investment grade analysis nor should be used as a basis for design and construction.

A high-level evaluation of potential savings and costs is provided for demonstration purposes only. It is a screening evaluation for the potential in installing an EMS. Based on industry standards and previous project experience, the potential energy savings may be up to 20% of existing HVAC energy use. The average cost for installing and EMS may be between $2 and $9 per square foot. Actual savings and costs will need to be outlined by the specific contractor engaged to implement the system. For the purposes of this report, we have conservatively estimated savings to be 10% of the HVAC energy consumption baseline.

An alternative approach would be to investigate expanding the existing Continuum system to incorporate the pneumatic control points and potentially the lighting controls. This approach would be less costly but might not afford the flexibility afforded by a new system architecture.

ECM 13: 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 HPHW 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.

The scope of this evaluation includes all of the electric storage tank water heaters.

Please note that the current locations (janitorial closets) of the electric water heaters are not ideal for the implementation of this measure. The facility will work with the contractor to find ideal locations for the implementation of the measure, and this may incur additional costs.

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[5] . 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.

[5] 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 Controls

Electric motors often run unnecessarily, and this is an overlooked opportunity to save energy. These motors should be identified and turned off when appropriate. For example, exhaust fans often run unnecessarily when ventilation requirements are already met. Whenever possible, use automatic devices such as twist timers or occupancy sensors to turn off motors when they are not needed.

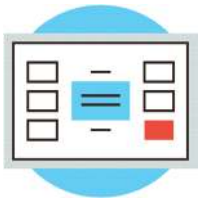
Motor Maintenance

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.

Fans to Reduce Cooling Load

Install ceiling fans to supplement your cooling system. Thermostat settings can typically be increased by 4°F with no change in overall occupant comfort due to the wind chill effect of moving air.

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.

AC System Evaporator/Condenser Coil Cleaning

Dirty evaporator and condenser coils restrict air flow and restrict heat transfer. This increases the loads on the evaporator and condenser fan and decreases overall cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

HVAC Filter Cleaning and Replacement

Air filters should be checked regularly (often monthly) and cleaned or replaced when appropriate. Air filters reduce indoor air pollution, increase occupant comfort, and help keep equipment operating efficiently. If the building has a building management system, consider installing a differential pressure switch across filters to send an alarm about premature fouling or overdue filter replacement. Over time, filters become less and less effective as particulate buildup increases. Dirty filters also restrict air flow through the air conditioning or heat pump system, which increases the load on the distribution fans.

Ductwork Maintenance

Duct maintenance has two primary goals: keep the ducts clean to avoid air quality problems and seal leaks to save energy. Check for cleanliness, obstructions that block airflow, water damage, and leaks. Ducts should be inspected at least every two years.

The biggest symptoms of clogged air ducts are differing temperatures throughout the building and areas with limited airflow from supply registers. If a particular air duct is clogged, then air flow will only be cut off to some rooms in the building—not all of them. The reduced airflow will make it more difficult for those areas to reach the temperature setpoint, which will cause the HVAC system to run longer to cool or heat that area properly. If you suspect clogged air ducts, ensure that all areas in front of supply registers are clear of items that may block or restrict air flow, and you should check for fire dampers or balancing dampers that have failed closed.

Duct leakage in commercial buildings can account for 5%–25% of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building wasting conditioned air. Check ductwork for leakage. Eliminating duct leaks can improve ventilation system performance and reduce heating and cooling system operation.

Distribution system losses are dependent on air system temperature, the size of the distribution system, and the level of insulation of the ductwork. Significant energy savings can be achieved when insulation has not been well maintained. When the insulation is missing or worn, the system efficiency can be significantly reduced. This measure saves energy by reducing heat transfer in the distribution system.

Optimize HVAC Equipment Schedules

Energy management systems (EMS) typically provide advanced controls for building HVAC systems, including chillers, boilers, air handling units, rooftop units and exhaust fans. The EMS monitors and reports operational status, schedules equipment start and stop times, locks out equipment operation based on outside air or space temperature, and often optimizes damper and valve operation based on complex algorithms. These EMS features, when in proper adjustment, can improve comfort for building occupants and save substantial energy.

Know your EMS scheduling capabilities. Regularly monitor HVAC equipment operating schedules and match them to building operating hours in order to eliminate unnecessary equipment operation and save energy. Monitoring should be performed often at sites with frequently changing usage patterns – daily in some cases. We recommend using the *optimal start* feature of the EMS (if available) to optimize the building warmup sequence. Most EMS scheduling programs provide for holiday schedules, which can be used during reduced use or shutdown periods. Finally, many systems are equipped with a one-time override function, which can be used to provide additional space conditioning due to a one-time, special event. When available this override feature should be used rather than changing the base operating schedule.

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.

Compressed Air System Maintenance

Compressed air systems require periodic maintenance to operate at peak efficiency. A maintenance plan for compressed air systems should include:

- Inspection, cleaning, and replacement of inlet filter cartridges.
- Cleaning of drain traps.
- Daily inspection of lubricant levels to reduce unwanted friction.
- Inspection of belt condition and tension.
- Check for leaks and adjust loose connections.
- Overall system cleaning.

Contact a qualified technician for help with setting up periodic maintenance schedule.

Refrigeration Equipment Maintenance

Preventative maintenance keeps commercial refrigeration equipment running reliably and efficiently. Commercial refrigerators and freezers are mission-critical equipment that can cost a fortune when they go down. Even when they appear to be working properly, refrigeration units can be consuming too much energy. Have walk-in refrigeration and freezer and other commercial systems serviced at least annually. This practice will allow systems to perform to their highest capabilities and will help identify system issues if they exist.

Maintaining your commercial refrigeration equipment can save between five and ten percent on energy costs. When condenser coils are dirty, your commercial refrigerators and freezers work harder to maintain the temperature inside. Worn gaskets, hinges, door handles or faulty seals cause cold air to leak from the unit, forcing the unit to run longer and use more electricity.

Regular cleaning and maintenance also help your commercial refrigeration equipment to last longer.

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[6] or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"[7] 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.

[6] https://www.epa.gov/watersense.

[7] 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.

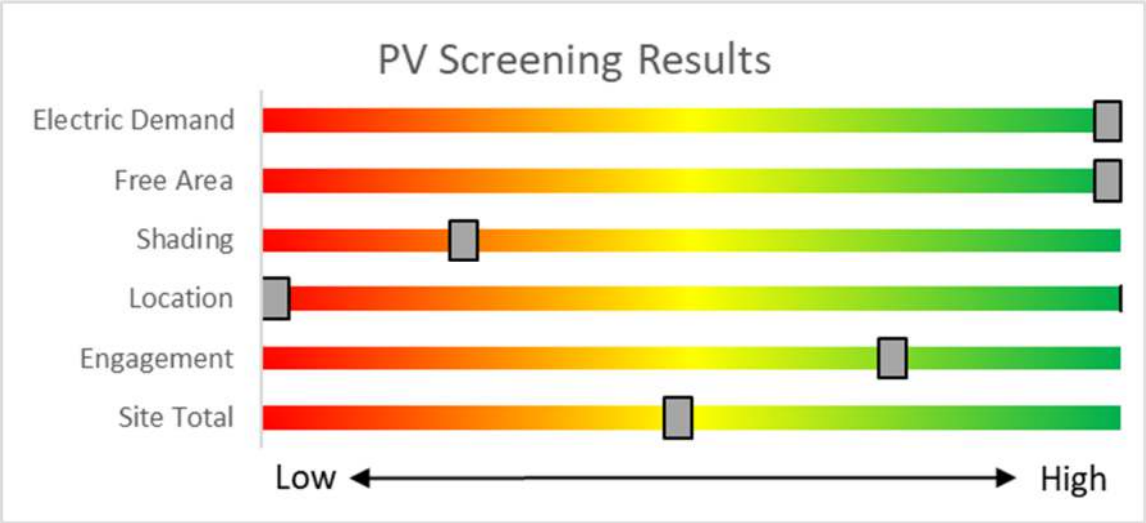
6.1 Solar Photovoltaic

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.

The facility has installed solar PV arrays on approximately 85% of the flat roof spaces and the remaining spaces are occupied by the HVAC equipment.

A preliminary screening based on the facility's electric demand, size and location of the carports parking lot located on State Street, shows that the facility has medium potential for installing additional PV arrays.

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.



Potential	Medium	
System Potential	161	kW DC STC
Electric Generation	121,144	kWh/yr
Displaced Cost	$15,480	/yr
Installed Cost	$544,200	

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
- **NJ Solar Market FAQs**: 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

6.2 Combined Heat and Power

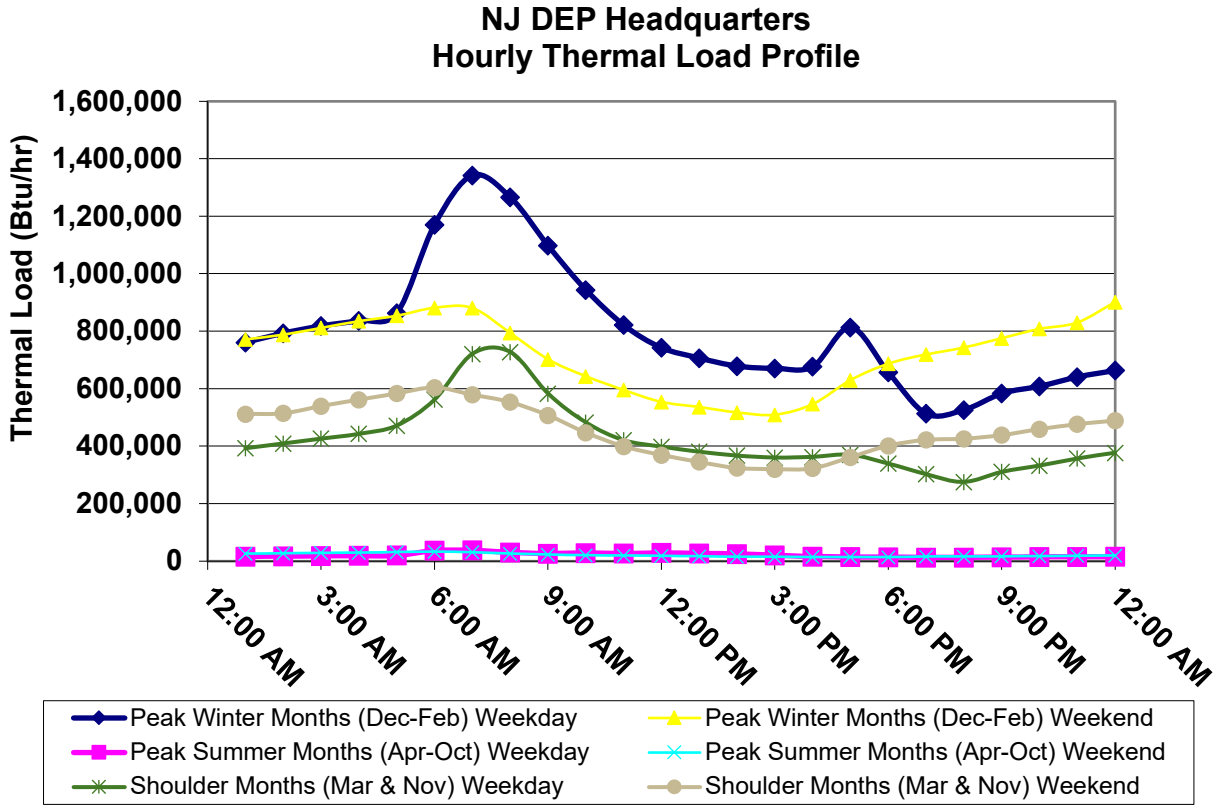
Combined heat and power (CHP) generates electricity at the facility and puts waste heat energy to good use. Common types of CHP systems are reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines.

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. Heat is produced as a byproduct. The heat is typically used to supplement or replace existing boilers to provide space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for space cooling. In some cases, waste heat can be used for industrial processes or swimming pools.

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 significant electrical load and a continuous need for large quantities of waste heat are the best candidates for CHP.

NJ DEP Headquarters – Thermal Load Profile

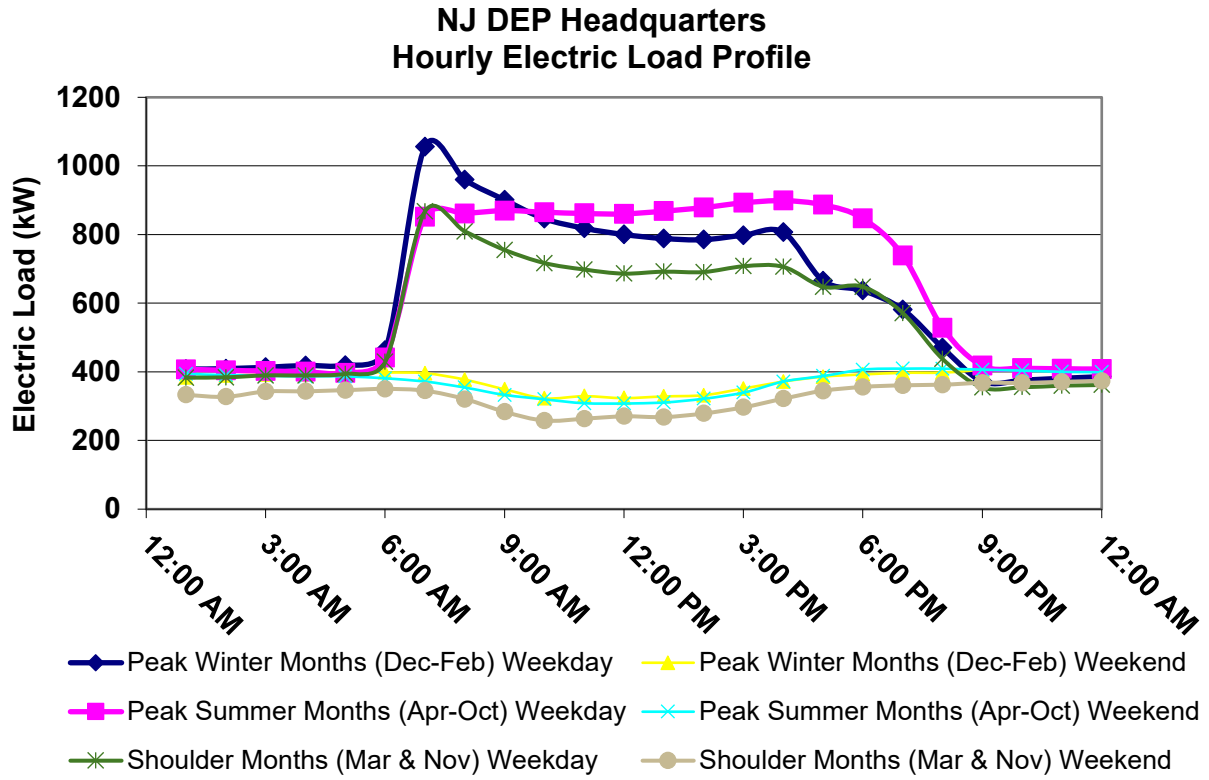
Hourly hot water equivalent therm consumption data provided for year 2021 was used to develop average weekday and weekend load profiles for peak summer, peak winter, and shoulder months with the help of the Excel based Energy Charting and Metrics (ECAM) Tool. The ECAM Tool is an add-on for Microsoft Excel® which was developed to facilitate energy savings analysis from building energy and other data.



Thermal load at this facility is exclusively for space heating. The graph above confirms that the expected thermal load is very low during peak summer period (i.e. Apr-Oct 2021).

NJ DEP Headquarters – Electric Load Profile

Hourly kW consumption data for 2021 was used to develop average weekday and weekend load profiles for peak summer, peak winter, and shoulder months using the ECAM Tool.



Weekday and weekend electric load profiles for summer and non-summer months are similar. As expected, this matches with the typical office building electric load profile.

The facility has a constant year-round baseload of approximately 225kW for electrical energy; however, the facility does not have constant year-round baseload thermal energy requirement. The large variation in thermal load profile affects the CHP system size selection.

Cogen System Screening Methodology

Preliminary CHP system size is selected based on building's thermal load requirement during non-summer month. Goal here is to utilize CHP system at full load capacity during non-summer month, considering there is very low/minimal thermal load during summer months (i.e Apr-Oct 2021).

TRC engineer considered following assumptions during CHP system analysis:

1. That the existing case District Heating System is the baseline.
2. Average natural gas cost for the proposed cogen system was calculated based on the PSE&G Large Volume Gas (LVG) tariff serving a similar client in the same location. The very high per therm cost savings between hot water from Vicinity (baseline heat source) and natural gas (proposed heat source for CHP equipment) is driving the cost effectiveness, and is subject to change based on other factors involved in actual billing such as social benefit charges, balancing charges, commodity charges etc.

3. The current contract thermal energy agreement between the State and Vicinity Energy Trenton, L.P. declares that if the State discontinues services, they will be obligated to pay an amount equal to one times the demand charge for the remainder of the full initial term of the agreement.

   DEP Demand per Contract: 5.0 MMBTU

   Demand Cost = 5.020 X $820.833 = $4,120.58 (or about $900K)

   This penalty should be taken into consideration when planning the project, unless there is a contingency that allows the State to terminate a certain percentage of the overall MMBTU use without incurring this additional cost.
4. The cogen system cost estimate is based on similar sized projects completed by TRC. To be conservative, a 20% contingency is included to calculate total project cost.
5. The building does not presently have natural gas service. Addition of service to the building and distribution within the building will need to be included in any gas alternatives for in depth economic impact.
6. The cogen system performance data was obtained from equipment specification sheets. Manufacturers often use high heating values in their heat rate which takes credit for condensing exhaust gas, which is typically avoided. This approach artificially lowers the amount of gas input by about 10%. We did not compensate this change in our calculation. We considered specification sheet heating values for analysis.

Based on the major criteria and assumptions mentioned above, we considered the following systems in our CHP screening:

- (1) Capstone C65, 65 kW microturbine. Reported cost is $6,400 per kW.
- (1) Aegis TP75, 75 kW reciprocating engine. Reported cost is $6,400 per kW.
- (3) Yanmar CP35D, 35 kW reciprocating engine. Reported cost $7,399 per kW.

Please refer to the summary table below for the Energy and Economic Savings Summary for selected Cogeneration Systems:

Cogeneration System	Project Cost	Total Energy Cost Savings ($/yr)	Non-Discounted Cumulative Positive Cashflow starts in Year	Discounted Cumulative Positive Cashflow starts in Year
(1) 65 kW Capstone Microturbine	$416,000	$54,612	8.0	10.25
(1) 75 kW Aegis TP75 reciprocating engine	$480,000	$55,576	9.0	11.75
(3) 35 kW Yanmar CP35D reciprocating engine	$776,844	$67,653	11.25	15.5

Energy cost saving calculations do not include contract penalties. If penalties outlined in the contract are incurred, an additional 10 to 15 years should be added to the payback range. See Appendix D for additional details.

Absorption Chiller:

The CHP analysis focuses on sizing a generator (engine or turbine) that maximizes the use of waste heat to create an efficient system. TRC selected a 65 kW microturbine from which the site would use all of the electrical output year-round and all of the waste heat during the peak heating period. The system delivers only a small fraction of the sites electrical needs, but it satisfies nearly 90% of the sites heating needs. It should be noted that the site does not need heat year-round, so there are large portions of the year when the CHP system is operating without actually cogenerating hot water and subsequently venting high grade heat to atmosphere. Increasing the size of the of the CHP system to cover more of the site's electrical load, leads to venting even more high-grade heat during the summer and shoulder periods while now also venting heat during the winter.

An absorption chiller can be added to a CHP system to use the waste heat to create chilled water in addition to (or instead of) hot water, increasing waste heat utilization and system efficiency. Unfortunately, the site does not have any systems that use chilled water. For cooling, the site uses a combination of heat pumps and DX compressors tied into a condenser water loop that rejects heat with a cooling tower. The cooling system is currently able to satisfy the site's needs, without short falls. Without equipment that utilizes chilled water and a system to distribute that chilled water an absorption chiller is not advised.

Conclusion:

Based on analysis we conclude that installing one 65 kW Capstone Microturbine may be a cost-effective option for the facility.

Please note that TRC made a preliminary determination as to whether CHP is a technical fit or not based on number of assumptions. Detailed in-depth analysis is required to evaluate cost effectiveness of a Cogen system.

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/

Please refer to the Appendix D "DEP - Additional Scope Analysis" for preliminary analysis.

7 District Energy System Alternatives

7.1 High Level Assessment

Site Detail Recap

New Jersey Department of Environment Protection (NJDEP) Headquarters is a 7-story, 403,000 square foot high rise building built in 1984 and located in Trenton, New Jersey.

PSE&G delivers electricity under rate class Large Power & Lighting Secondary, with electric production provided by Direct Energy, a third-party supplier. Total electricity consumption for year 2021 was 5,107,888 kWh. Facilities average unit cost per kWh for year 2021 was approximately $0.13

The building has solar array comprised of 184 individual roof mounted panels. In 2021, it provided 222,084 kWh of electricity (i.e., approximately 4% of total electricity consumption of the site).

Hot water is supplied by the Vicinity Energy Trenton, L.P owned central plant. Total hot water consumption for year 2021 was equivalent to 23,358 therms. Facilities average unit cost per therm for year 2021 was approximately $3.77.

Heating and cooling are provided by water source heat pumps (WSHPs) and air handling units (AHUs) equipped with semi-hermetic compressors and electric resistance heaters. Hot water supplied from the Vicinity Energy Power Plant provides the WSHPs a supplemental source for heating.

In consideration of operating costs, efficiency, and emissions, this high-level assessment was conducted to review options for re-establishing heating sourced from equipment located within the building.

High Level Options

This high-level assessment was focused on replacing the heating sources with alternatives to the district energy systems (DES). The following options were investigated and are summarized in the table below.

DES Option 1: Heating – Install new natural gas heating plant

DES Option 2: Heating – Install new Air Source Heat Pump Water Heating (ASHP-WH) plant

DES Option 3: Heating – Install (1) 65 kW Capstone Microturbine and natural gas heating plant

DES Option 4: Heating – Install (1) 65 kW Capstone Microturbine and Air Source Heat Pump Water Heating (ASHP-WH) plant

Option	System Type	Possible Approach	Payback Range	Further Consideration?
DES-1	Heating	Install Natural Gas Heating Plant	7.5 – 9.5 yrs.	Yes
DES-2	Heating	Install ASHP-WH Plant	15.5 – 25.5 yrs.	No*
DES-3	Heating	Install CHP (Microturbine) + NG. Heating Plant	6.5 – 8.5 yrs.	Yes
DES-4	Heating	Install CHP (Microturbine) + ASHP Plant	12.5 – 19.5 yrs.	No*

* Measure should only receive further consideration as a carbon-reduction measure, not as an energy cost saving measure.

Energy cost saving calculations do not include contract penalties. If penalties outlined in the contract are incurred, an additional 10 to 15 years should be added to the payback range. See Appendix D for additional details.

Limits to the Analysis

The building has several restrictions that must be considered in any redesign project.

- The building does not presently have natural gas service. Addition of service to the building and distribution within the building will need to be included in any gas alternatives.

Assumptions:

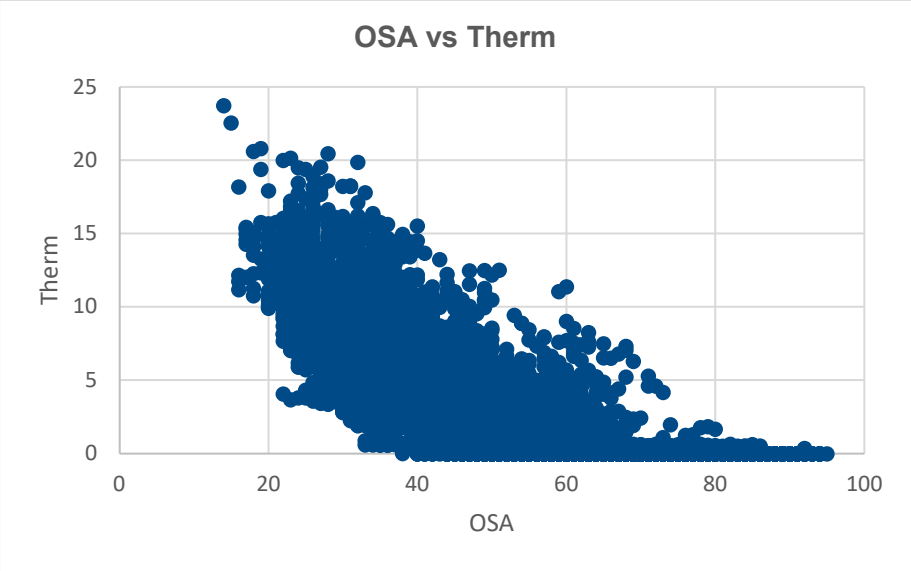
- It is assumed that there is no asbestos in this building, and abatement is not considered in any cost estimates.

7.2 Calculation Methodology

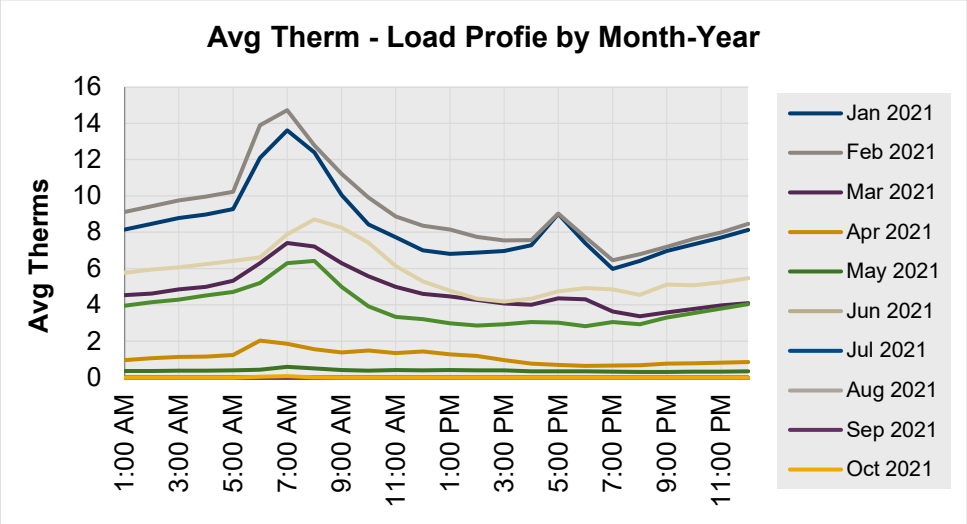
Our process included an evaluation of the logistics of hot water system redesign at a high level as a potential capital project.

Heating Load Estimates

We conducted a heating load assessment for site using submitted hot water hourly therms equivalent consumption data.



The graph above shows that the maximum therms per hour requirement for the facility is about 24 therms. Most of the time, average heating demand is below 16 therms per hour.



The graph above shows that the average daily therm consumption is very low during peak summer period (i.e. Apr-Oct 2021). This profile is consistent with a building that uses natural gas or hot water derived from gas mainly for space heating.

Energy Cost Calculation

Baseline energy cost estimates were generated for different potential heating and cooling scenarios based on 2021 heating and cooling consumption and cost data.

Average natural gas cost for the proposed heating system was calculated at $0.91/therm based on the PSE&G Large Volume Gas (LVG) tariff serving a similar client in the same location.

Project Cost Estimate

Cost estimates are derived from very high level "Assemblies" from 2021 RS Means Mechanical and Electrical Cost Data Manuals for labor and materials. Burdened costs with O&P were used in conjunction with a city multiplier for Trenton, New Jersey.

Where possible, "Assemblies" and their corresponding cost estimates have been adjusted to reflect known building-specific conditions. However, a full building constructability survey, existing condition survey, and block load analysis have not been completed within this scope. Cost estimates should be considered budgetary only, not investment grade, and used only for generalized comparison of options.

7.3 Cooling Systems

Cooling Description:

Cooling is provided to the building by cooling the air at both the AHUs and the perimeter WSHP units.

Main building core spaces are conditioned by 28 air handling units. There are four AHUs per floor, each equipped with R-22 semi-hermetic compressors for cooling. Condenser water is supplied by the cooling tower and is used to cool down the semi hermetic compressors.

Building perimeter cooling is provided by 559 ductless packaged water source heat pumps (WSHPs). WSHPs are equipped with high efficiency compressors that use HFC-410A refrigerant. During cooling mode, refrigerant to water heat exchanger transfers the heat from the cooling tower load plus the heat of compression into the common water loop. This process raises the temperature of the loop. When the loop temperature approaches the upper limit of 90 ˚F, the heat rejector (cooling tower) is staged to

remove heat from the loop. It will maintain a maximum water temperature of 90 ˚F. Individual WSHP units will cycle on and off to satisfy their respective zone temperatures. The data center is cooled by three 30-ton Liebert ACs.

Replacing existing AHU's and/or WSHP units with high efficiency units is not cost-effective. Please refer to the ECM-8 of the Section 4.0 for details. TRC discussed internally and came to conclusion that adding a chiller plant on site and replacing DX coils in each AHU with chilled water coils is also not a cost-effective option. Therefore, we are not reviewing any cooling systems update options under this LGEA additional scope of work.

7.4 Heating System

Heating Description

Heating is provided to the building by heating the air at both the AHUs and the perimeter WSHP units.

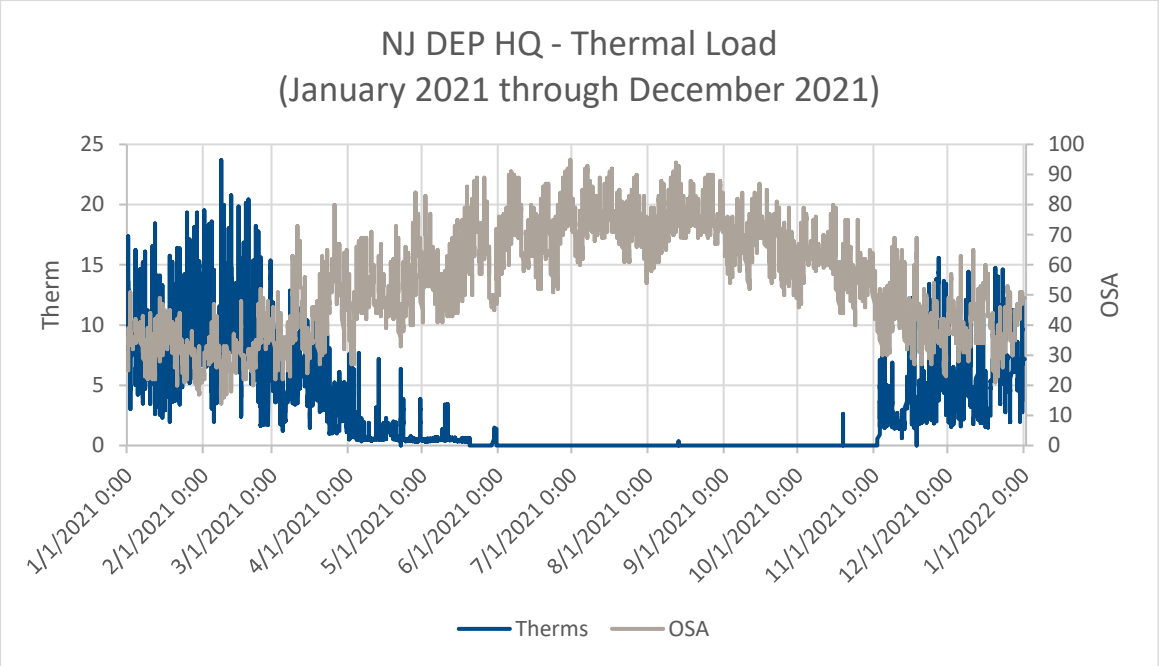
Fifteen of the 28 AHUs have 20 kW resistance coils while thirteen units have 25 kW resistance coils to serve heating demand in core areas.

Building perimeter heating needs are served by 559 WSHP systems. During heating mode, refrigerant to water heat exchanger acts as an evaporator and absorbs heat from the water loop. This lowers the temperature of the loop. When loop temperature approaches the lower limit of about 60 ˚F, the heat adder is staged to add heat to the loop, maintaining a minimum loop water temperature of 60 ˚F. Individual WSHP unit cycle on and off to satisfy their respective zone temperatures. Vicinity Plant hot water is used to add heat to the water loop during winter months when most units are heating.

Most of the building heat load is met by the WSHPs and electric resistance heaters, therefore, use of the District heating hot water (therm equivalents) is less than similar buildings that rely directly or indirectly on fuel-based heating systems to meet the entire load.

Heating Loads

Hourly data from the District thermal system was available for January 2021 through December 2021.



For budgetary estimates, a load of 24 therms/hour (peak load of the study period) was used. It is recommended that a project to replace equipment include a detailed engineering load analysis to determine the load accurately, along with interactive effects from other facility improvements.

Heating Baseline: District Heat

The current District Heating contract includes a fixed thermal demand charge of $4,120 per month in addition to a thermal energy usage. In 2021 the modeled purchased heat of 23,358 therms cost approximately $88,062. Facilities average unit cost per equivalent therm for year 2021 was around $3.77.

DES-1 Heating – Install new Natural Gas Heating Plant

Project Scope – Installation of a new natural gas-fired heating plant to displace purchase of hot water from Vicinity/District Central Plant entirely.

Methodology - Based on submitted hourly equivalent therm consumption data, peak thermal demand for the site is approximately 24 therms.

For budgeting purposes, the proposed natural gas fired boiler plant is sized to fulfill the peak thermal load. Loop return water temperature is well below the 130° required to justify a condensing boiler with operations calculated at high efficiency. Considering combustion efficiency at 96%, the total required input capacity would be in the 3000 MBH range. For redundancy and staging purposes, we modelled a three-boiler configuration. Based on RS Means, a budget for three, 1088 MBH input capacity boilers would be around $375,000. A 20% contingency was added to estimate the total preliminary budget of the proposed heating plant. The cost for the new natural gas heating plant is estimated to be about $450,000.

If the heat purchased in 2021 was purchased as natural gas assuming a 96% efficiency, the heat would have cost about $22,000 at PSE&G rates, which would have saved approximately $66,000 per year as compared to the current District Heating cost. This indicates a simple payback range of 7.5 - 9.5 years.

Energy cost saving calculations do not include contract penalties. If penalties outlined in the contract are incurred, an additional 10 to 15 years should be added to the payback range. See Appendix D for additional details.

DES-2 Heating – Install new Air Source Heat Pump Water Heating (ASHP-WH) plant

Project Scope – Installation of a new Air Source Heat Pump (ASHP-WH) plant to displace purchase of hot water from Vicinity/District Central Plant entirely.

Methodology - Based on submitted hourly equivalent therm consumption data, peak thermal demand for the site is around 24 therms.

For budgeting purposes, the proposed ASHP-WH plant is sized to fulfill peak thermal load of the site. Considering proposed ASHP efficiency, thirteen 187 MBH output capacity ASHP's would be required to fulfill peak heating demand. Based on RS Means, a budget for similar size ASHP plant would be around $1,000,000. A 20% contingency was added to estimate the total preliminary budget of the proposed heating plant. The total cost for the new ASHP heating plant is around $1,200,000.

If the heat purchased in 2021 was purchased as electricity assuming a 2.2 COP for the ASHP plant, the heat would have cost about $33,500, which would have saved approximately $55,000 per year as compared to the District Heating cost. This indicates a simple payback range of 15.5 - 25.5 years.

Energy cost saving calculations do not include contract penalties. If penalties outlined in the contract are incurred, an additional 10 to 15 years should be added to the payback range. See Appendix D for additional details.

Because capital costs are high compared to savings, this measure would likely only be recommended to attain carbon reduction goals. However, another consideration, beyond the scope of this investigation, would be to evaluate the future costs of both electricity and natural gas over the plant life cycle.

DES-3 Heating – Install (1) 65 kW Capstone Microturbine and natural gas heating plant

Project Scope – Installation of (1) 65 kW Capstone Microturbine and a new natural gas-fired heating plant to displace purchase of hot water from Vicinity/District Central Plant entirely.

Methodology - Based on submitted hourly equivalent therm consumption data, peak thermal demand for the site is around 24 therms.

For budgeting purposes, the proposed natural gas fired boiler plant is sized to fulfill the remaining peak thermal load of the site after utilizing waste heat generated by the CHP equipment. Considering combustion efficiency at 96%, the total required input capacity for natural gas heating plant would be in the 2500 MBH range. Based on RS Means, a budget for three, 750 MBH input capacity boilers would be around $350,000. A 20% contingency was added to estimate the total preliminary budget of the proposed heating plant. Total cost for the new natural gas heating plant comes around $420,000. The for installing one 65 kW Capstone Microturbine and a new natural gas-fired heating plant is estimated to be $836,000.

If the heat purchased in 2021 was purchased as natural gas to run both the CHP and an onsite natural gas plant, the annual fuel cost of onsite plant was estimated at $70,500, which would save approximately $17,500 per year from the District Heating cost. However, the CHP equipment would also generate electricity, which would save approximately $95,000 worth of electricity per year. Therefore, the total savings from installing both a 65 kW Capstone Microturbine and a new natural gas-fired heating plant are approximately $112,500. This indicates a simple payback range of 6.5-8.5 years.

Energy cost saving calculations do not include contract penalties. If penalties outlined in the contract are incurred, an additional 10 to 15 years should be added to the payback range. See Appendix D for additional details.

DES-4 Heating – Install (1) 65 kW Capstone Microturbine and Air Source Heat Pump Water Heating (ASHP-WH) plant

Project Scope – Installation of (1) 65 kW Capstone Microturbine and a new Air Source Heat Pump (ASHP-WH) plant to displace purchase of hot water from Vicinity/District Central Plant entirely.

Methodology - Based on submitted hourly equivalent therm consumption data, peak thermal demand for the site is around 24 therms.

For budgeting purposes, the proposed ASHP-WH plant is sized to fulfill the remaining peak thermal load of the site after utilizing waste heat generated by the CHP equipment. Considering proposed ASHP efficiency, ten 187 MBH output capacity ASHP's would be required to fulfill peak heating demand. Based on RS Means, a budget for similar size ASHP plant would be around $800,000. Additional 20% contingency is considered to estimate total preliminary budget of the proposed heating plant. Total cost for the new ASHP heating plant is estimated to be $960,000. Total cost for from installation of one 65 kW Capstone Microturbine and a new Air Source Heat Pump (ASHP-WH) plant is around $1,380,000.

If the heat purchased in 2021 was purchased as natural gas to run both the CHP and an onsite ASHP plant, the annual fuel cost of onsite plant was estimated at $78,500, which would save approximately $9,500 per year from the District Heating cost. However, the CHP equipment would also generate electricity, which would save approximately $95,000 worth of electricity per year. Therefore, the total savings from installing both a 65 kW Capstone Microturbine and a new ASHP heating plant are approximately $105,000. This indicates a simple payback range of 12.5 – 19.5 years.

Because capital cost is high compared to savings, this measure would likely only be recommended to attain carbon reduction goals. However, another consideration, beyond the scope of this investigation, would be to evaluate the future costs of both electricity and natural gas over the plant life cycle.

Energy cost saving calculations do not include contract penalties. If penalties outlined in the contract are incurred, an additional 10 to 15 years should be added to the payback range. See Appendix D for additional details.

8 PROJECT FUNDING AND INCENTIVES

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

8.1 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.

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

9 New Jersey's Clean Energy Programs

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

9.1 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.

9.2 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)[1]	Incentive ($/kW)	% of Total Cost Cap per Project[3]	$ Cap per Project[3]
Powered by non-renewable or renewable fuel source[4]	≤500 kW	$2,000	30-40%[2]	$2 million
Gas Internal Combustion Engine	>500 kW - 1 MW	$1,000		
Gas Combustion Turbine	> 1 MW - 3 MW	$550	30%	$3 million
Microturbine Fuel Cells with Heat Recovery	>3 MW	$350		
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.

9.3 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.

9.4 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.

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.

10 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.

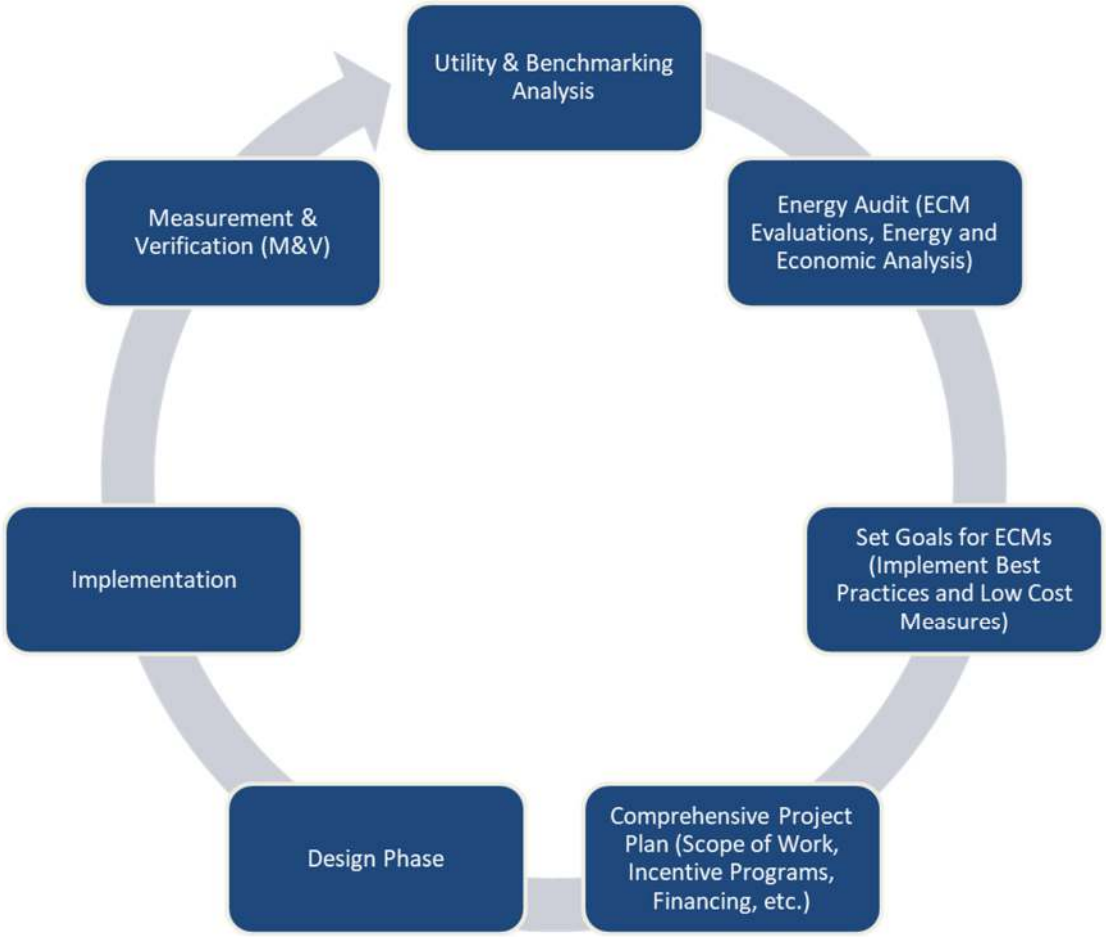


Figure 10 – Project Development Cycle

11 Energy Purchasing and Procurement Strategies

11.1 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[8].

11.2 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[9].

[8] www.state.nj.us/bpu/commercial/shopping.html.

[9] www.state.nj.us/bpu/commercial/shopping.html.

APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	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
Room 5E72	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
Room 5E801	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.8	1,405	0	$168	$982	$230	4.5
Room 5E805	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.4	648	0	$78	$599	$125	6.1
Room 5E806	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.4	648	0	$78	$599	$125	6.1
Room 5E807	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.4	648	0	$78	$599	$125	6.1
Room 5W004	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.2	324	0	$39	$434	$80	9.1
Room 5W200B	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.8	1,513	0	$181	$1,037	$245	4.4
Room 5W501	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
Room 5W601	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
Room 5W805	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.2	324	0	$39	$434	$80	9.1
Room 6E004	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.2	324	0	$39	$434	$80	9.1
Room 6E100	19	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	19	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	1.1	2,054	0	$246	$1,581	$355	5.0
Room 6E101	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	1.2	2,162	0	$259	$1,635	$370	4.9
Room 6E103	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.4	648	0	$78	$599	$125	6.1
Room 6E107	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
Room 6E202	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
Room 6E204	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
Room 6E302	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.2	324	0	$39	$434	$80	9.1
Room 6E304	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
Room 6E311	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.2	432	0	$52	$489	$95	7.6
Room 6E501	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Room 6E501	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	1.0	1,729	0	$207	$1,416	$310	5.3
Room 6E502	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.4	648	0	$78	$599	$125	6.1
Room 6E504	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.2	432	0	$52	$489	$95	7.6
Room 6E601A	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0

	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
Room 6E601A	1	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	1,560	3	Relamp	No	1	LED - Linear Tubes: (1) 3' Lamp	Wall Switch	11	1,560	0.0	28	0	$3	$18	$5	3.9
Room 6E601A	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.1	216	0	$26	$226	$50	6.8
Room 6E602	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Room 6E602	32	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	32	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	1.9	3,459	-1	$415	$2,563	$585	4.8
Room 6E608	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
Room 6W102	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.5	865	0	$104	$708	$155	5.3
Room 6W202	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
Room 6W501	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.4	648	0	$78	$599	$125	6.1
Room 6W601	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.4	648	0	$78	$599	$125	6.1
Room 6W603	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
Room 6W605	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.4	648	0	$78	$599	$125	6.1
Room 6W801	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.1	216	0	$26	$226	$50	6.8
Room 6W85	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.2	324	0	$39	$434	$80	9.1
Room 7E004	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.2	324	0	$39	$434	$80	9.1
Room 7E006	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.2	324	0	$39	$434	$80	9.1
Room 7E202	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
Room 7E404	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
Room 7E4042	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.4	648	0	$78	$599	$125	6.1
Room 7E603	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.4	648	0	$78	$599	$125	6.1
Room 7E604	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.4	648	0	$78	$599	$125	6.1
Room 7E605	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.4	648	0	$78	$599	$125	6.1
Room 7E606	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.5	865	0	$104	$708	$155	5.3
Room 7E703	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
Room 7E705	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
Room 7E803	3	Compact Fluorescent: (1) 23W A19 Screw-In Lamp	Wall Switch	S	23	1,560	3, 4	Relamp	Yes	3	LED Lamps: A19 Lamps	Occupancy Sensor	17	1,076	0.0	58	0	$7	$52	$3	7.0

	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
Room 7E803	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Room 7E803	19	LED Lamps: (1) 10W A21 Screw-In Lamp	Wall Switch	S	10	1,560	4	None	Yes	19	LED Lamps: (1) 10W A21 Screw-In Lamp	Occupancy Sensor	10	1,076	0.1	101	0	$12	$540	$70	38.8
Room 7E803	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.9	1,621	0	$194	$1,092	$260	4.3
Room 7E809	2	Halogen Incandescent: (1) 75W A19 Screw-In Lamp	Wall Switch	S	75	3,380	3, 4	Relamp	Yes	2	LED Lamps: A19 Lamps	Occupancy Sensor	12	2,332	0.1	496	0	$59	$150	$22	2.2
Room 7E810 - Commissioner Office	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	1,560		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	1,560	0.0	0	0	$0	$0	$0	0.0
Room 7E810 - Commissioner Office	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.4	757	0	$91	$653	$140	5.7
Room 7E811	2	Compact Fluorescent: (1) 23W A21 Screw-In Lamp	Wall Switch	S	23	1,560	3, 4	Relamp	Yes	2	LED Lamps: A21 Lamps	Occupancy Sensor	17	1,076	0.0	39	0	$5	$186	$22	35.4
Room 7E814	7	LED Lamps: (1) 10W A21 Screw-In Lamp	Wall Switch	S	10	1,560	4	None	Yes	7	LED Lamps: (1) 10W A21 Screw-In Lamp	Occupancy Sensor	10	1,076	0.0	37	0	$4	$270	$35	52.6
Room 7E814	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.1	216	0	$26	$226	$50	6.8
Room 7E816	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.2	324	0	$39	$434	$80	9.1
Room 7E818	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.2	324	0	$39	$434	$80	9.1
Room 7W1001	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	1.0	1,729	0	$207	$1,416	$310	5.3
Room 7W1003	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.4	648	0	$78	$599	$125	6.1
Room 7W1007	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.4	648	0	$78	$599	$125	6.1
Room 7W102	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.4	648	0	$78	$599	$125	6.1
Room 7W104	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
Room 7W202	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.4	648	0	$78	$599	$125	6.1
Room 7W501	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
Room 7W503	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
Room 7W701	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.1	216	0	$26	$226	$50	6.8
Room 7W805	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,560	0.0	85	0	$10	$55	$15	3.9
Room 7W901	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
Room 7W903	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	0.3	540	0	$65	$544	$110	6.7
1st Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
1st Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3

	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
1st Floor switch Gear	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	520		None	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	520	0.0	0	0	$0	$0	$0	0.0
2nd Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
2nd Floor Janitorial	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	780		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	780	0.0	0	0	$0	$0	$0	0.0
2nd Floor Elevator Lobby 2WEL1	14	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,860	3, 5	Relamp	Yes	14	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	1,973	0.3	969	0	$116	$706	$520	1.6
2rd Floor Elevator Lobby 3WEL1	14	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,860	3, 5	Relamp	Yes	14	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	1,973	0.3	969	0	$116	$706	$520	1.6
3rd Floor Janitorial	1	Compact Fluorescent: (1) 23W A19 Screw-In Lamp	Wall Switch	S	23	780	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	17	780	0.0	5	0	$1	$17	$1	26.3
3rd Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
4th Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
4th Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
5th Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
5th Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
6th Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
6th Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
7th Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
7th Floor Janitorial (	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
Buss Bar Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,560	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,076	0.2	288	0	$35	$416	$75	9.9
Cafeteria	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Cafeteria	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,380	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,332	0.6	2,342	0	$281	$818	$185	2.3
Central Supply Room	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	1.2	2,270	0	$272	$1,690	$385	4.8
Corridor	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1
Closet	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1
Corridor	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1
Corridor	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1
Corridor	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1
Corridor	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1

	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
1st Floor switch Gear	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	520		None	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	520	0.0	0	0	$0	$0	$0	0.0
2nd Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
2nd Floor Janitorial	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	780		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	780	0.0	0	0	$0	$0	$0	0.0
2nd Floor Elevator Lobby 2WEL1	14	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,860	3, 5	Relamp	Yes	14	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	1,973	0.3	969	0	$116	$706	$520	1.6
2rd Floor Elevator Lobby 3WEL1	14	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,860	3, 5	Relamp	Yes	14	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	1,973	0.3	969	0	$116	$706	$520	1.6
3rd Floor Janitorial	1	Compact Fluorescent: (1) 23W A19 Screw-In Lamp	Wall Switch	S	23	780	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	17	780	0.0	5	0	$1	$17	$1	26.3
3rd Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
4th Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
4th Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
5th Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
5th Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
6th Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
6th Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
7th Floor Janitorial	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
7th Floor Janitorial (	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	520	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	520	0.1	31	0	$4	$17	$1	4.3
Buss Bar Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,560	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,076	0.2	288	0	$35	$416	$75	9.9
Cafeteria	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Cafeteria	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,380	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,332	0.6	2,342	0	$281	$818	$185	2.3
Central Supply Room	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	1.2	2,270	0	$272	$1,690	$385	4.8
Closet	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1
Closet	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1
Closet	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1
Closet	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1
Closet	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1
Closet	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1

	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
Corridor	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1
Corridor	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	520	0.1	34	0	$4	$69	$10	14.5
Corridor	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1
Corridor	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1
Corridor	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	520	0.1	34	0	$4	$69	$10	14.5
Corridor	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1
Corridor	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1
Corridor	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	520	0.1	34	0	$4	$69	$10	14.5
Closet	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1
Closet	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	520	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.0	18	0	$2	$51	$5	21.1
Closet 4W805	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	520	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	520	0.0	28	0	$3	$55	$15	11.7
Conference Room 1E105	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,300	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	897	0.4	540	0	$65	$599	$125	7.3
Conference Room 1W - 1005	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	38	1,040		None	No	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	38	1,040	0.0	0	0	$0	$0	$0	0.0
Conference Room 1W - 1005	3	LED - Fixtures: Downlight Recessed	Occupancy Sensor	S	13	1,040		None	No	3	LED - Fixtures: Downlight Recessed	Occupancy Sensor	13	1,040	0.0	0	0	$0	$0	$0	0.0
Conference Room 2E002	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,300	3, 4	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	897	0.5	721	0	$86	$708	$155	6.4
Conference Room 2E204	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,300	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	897	0.4	540	0	$65	$599	$125	7.3
Conference Room 2E801	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,300	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	897	0.4	540	0	$65	$599	$125	7.3
Conference Room 2E803	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,300	3, 4	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	897	0.5	721	0	$86	$708	$155	6.4
Conference Room 2E805	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,300	3, 4	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	897	0.5	721	0	$86	$708	$155	6.4
Conference Room 2W101	7	LED - Fixtures: Downlight Recessed	Wall Switch	S	13	1,300	4	None	Yes	7	LED - Fixtures: Downlight Recessed	Occupancy Sensor	13	897	0.0	40	0	$5	$270	$35	48.6
Conference Room 3E001	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,300	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	897	0.2	270	0	$32	$434	$80	10.9
Conference Room 3E001	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,300	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	897	0.2	270	0	$32	$434	$80	10.9
Conference Room 3E806	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,300	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	897	0.4	540	0	$65	$599	$125	7.3
Conference Room 3W101	7	LED - Fixtures: Downlight Recessed	Wall Switch	S	13	1,300	4	None	Yes	7	LED - Fixtures: Downlight Recessed	Occupancy Sensor	13	897	0.0	40	0	$5	$270	$35	48.6
Conference Room 4E001	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,300	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	897	0.2	270	0	$32	$434	$80	10.9

	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
Conference Room 4E002	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,300	3, 4	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	897	0.5	721	0	$86	$708	$155	6.4
Conference Room 4E005	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,300	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	897	0.1	180	0	$22	$226	$50	8.1
Conference Room 4E802	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,300	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	897	0.4	540	0	$65	$599	$125	7.3
Conference Room 4E802B	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,300	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	897	0.4	540	0	$65	$599	$125	7.3
Conference Room 4W101	7	LED - Fixtures: Downlight Recessed	Wall Switch	S	13	1,300	4	None	Yes	7	LED - Fixtures: Downlight Recessed	Occupancy Sensor	13	897	0.0	40	0	$5	$270	$35	48.6
Conference Room 5E002	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,300	3, 4	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	897	0.5	721	0	$86	$708	$155	6.4
Conference Room 5W101	7	LED - Fixtures: Downlight Recessed	Wall Switch	S	13	1,300	4	None	Yes	7	LED - Fixtures: Downlight Recessed	Occupancy Sensor	13	897	0.0	40	0	$5	$270	$35	48.6
Conference Room 5W903	5	LED - Fixtures: Downlight Recessed	Wall Switch	S	13	1,300	4	None	Yes	5	LED - Fixtures: Downlight Recessed	Occupancy Sensor	13	897	0.0	29	0	$3	$270	$35	68.0
Conference Room 5W905	5	LED - Fixtures: Downlight Recessed	Wall Switch	S	13	1,300	4	None	Yes	5	LED - Fixtures: Downlight Recessed	Occupancy Sensor	13	897	0.0	29	0	$3	$270	$35	68.0
Conference Room 6E002	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,300	3, 4	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	897	0.5	721	0	$86	$708	$155	6.4
Conference Room 6W002	7	LED - Fixtures: Downlight Recessed	Wall Switch	S	13	1,300	4	None	Yes	7	LED - Fixtures: Downlight Recessed	Occupancy Sensor	13	897	0.0	40	0	$5	$270	$35	48.6
Conference Room 7W002	7	LED - Fixtures: Downlight Recessed	Wall Switch	S	13	1,300	4	None	Yes	7	LED - Fixtures: Downlight Recessed	Occupancy Sensor	13	897	0.0	40	0	$5	$270	$35	48.6
Conference Room 7W1005	6	LED - Fixtures: Downlight Recessed	Wall Switch	S	13	1,300	4	None	Yes	6	LED - Fixtures: Downlight Recessed	Occupancy Sensor	13	897	0.0	35	0	$4	$270	$35	56.7
Conference Room 7W601	10	LED - Fixtures: Downlight Recessed	Wall Switch	S	13	1,300	4	None	Yes	10	LED - Fixtures: Downlight Recessed	Occupancy Sensor	13	897	0.0	58	0	$7	$270	$35	34.0
Corridor 1E600	2	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	4,380	3, 5	Relamp	Yes	2	LED - Linear Tubes: (1) 3' Lamp	High/Low Control	11	3,022	0.0	190	0	$23	$262	$80	8.0
Corridor 1E600	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,380	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,380	0.0	238	0	$29	$55	$15	1.4
Corridor 1st Floor East 1E100	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 1st Floor East 1E100	6	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	4,380	3, 5	Relamp	Yes	6	LED - Linear Tubes: (1) 3' Lamp	High/Low Control	11	3,022	0.1	571	0	$68	$335	$240	1.4
Corridor 1st Floor East 1E100	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,380	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,380	0.0	238	0	$29	$55	$15	1.4
Corridor 1st Floor West	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 1st Floor West	1	LED - Fixtures: Downlight Recessed	Wall Switch	S	13	4,380		None	No	1	LED - Fixtures: Downlight Recessed	Wall Switch	13	4,380	0.0	0	0	$0	$0	$0	0.0
Corridor 1st Floor West	14	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	4,380	3, 5	Relamp	Yes	14	LED - Linear Tubes: (1) 3' Lamp	High/Low Control	11	3,022	0.3	1,333	0	$160	$931	$560	2.3
Corridor 1st Floor West	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,380	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.0	159	0	$19	$37	$10	1.4
Corridor 2E605B	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 2E605B	2	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,860	3, 5	Relamp	Yes	2	LED - Linear Tubes: (1) 2' Lamp	High/Low Control	9	1,973	0.0	102	0	$12	$258	$76	14.9

	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
Corridor 2E605B	2	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	2,860	3, 5	Relamp	Yes	2	LED - Linear Tubes: (1) 3' Lamp	High/Low Control	11	1,973	0.0	124	0	$15	$262	$80	12.2
Corridor 2E605B	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 5	Relamp	Yes	17	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	1,973	1.0	3,369	-1	$404	$1,606	$850	1.9
Corridor 2E605B	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,860	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,860	0.1	176	0	$21	$73	$20	2.5
Corridor 2W100	7	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	7	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 2W100	2	LED Lamps: (1) 32W A23 Screw-In Lamp	Wall Switch	S	32	2,860	5	None	Yes	2	LED Lamps: (1) 32W A23 Screw-In Lamp	High/Low Control	32	1,973	0.0	62	0	$7	$225	$70	20.7
Corridor 2W100	3	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,860	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 2' Lamp	High/Low Control	9	1,973	0.0	152	0	$18	$274	$114	8.8
Corridor 2W100	3	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	2,860	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 3' Lamp	High/Low Control	11	1,973	0.1	186	0	$22	$280	$120	7.1
Corridor 3W100	5	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	5	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 3W100	3	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,860	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 2' Lamp	High/Low Control	9	1,973	0.0	152	0	$18	$274	$114	8.8
Corridor 3W100	1	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	2,860	3	Relamp	No	1	LED - Linear Tubes: (1) 3' Lamp	Wall Switch	11	2,860	0.0	52	0	$6	$18	$5	2.1
Corridor 3W100	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 5	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	1,973	0.5	1,585	0	$190	$888	$400	2.6
Corridor 4W100	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 4W100	2	LED Lamps: (1) 32W A23 Screw-In Lamp	Wall Switch	S	32	2,860	5	None	Yes	2	LED Lamps: (1) 32W A23 Screw-In Lamp	High/Low Control	32	1,973	0.0	62	0	$7	$225	$70	20.7
Corridor 4W100	5	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,860	3, 5	Relamp	Yes	5	LED - Linear Tubes: (1) 2' Lamp	High/Low Control	9	1,973	0.1	254	0	$30	$306	$190	3.8
Corridor 4W100	3	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	2,860	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 3' Lamp	High/Low Control	11	1,973	0.1	186	0	$22	$280	$120	7.1
Corridor 4W100	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 5	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	1,973	0.2	793	0	$95	$444	$200	2.6
Corridor 5W100	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 5W100	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 5W100	6	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,860	3, 5	Relamp	Yes	6	LED - Linear Tubes: (1) 2' Lamp	High/Low Control	9	1,973	0.1	305	0	$37	$323	$228	2.6
Corridor 5W100	2	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	2,860	3, 5	Relamp	Yes	2	LED - Linear Tubes: (1) 3' Lamp	High/Low Control	11	1,973	0.0	124	0	$15	$262	$80	12.2
Corridor 5W100	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 5	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	1,973	0.5	1,783	0	$214	$943	$450	2.3
Corridor 6W001	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 6W001	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 6W001	2	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,860	3, 5	Relamp	Yes	2	LED - Linear Tubes: (1) 2' Lamp	High/Low Control	9	1,973	0.0	102	0	$12	$258	$76	14.9
Corridor 6W001	7	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	2,860	3, 5	Relamp	Yes	7	LED - Linear Tubes: (1) 3' Lamp	High/Low Control	11	1,973	0.1	435	0	$52	$578	$280	5.7

	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
Corridor 6W001	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 5	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	1,973	0.4	1,189	0	$143	$554	$300	1.8
Corridor 7W001E	5	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	5	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 7W001E	6	LED - Fixtures: Display Case Lighting	Wall Switch	S	11	2,860	5	None	Yes	6	LED - Fixtures: Display Case Lighting	High/Low Control	11	1,973	0.0	64	0	$8	$225	$210	1.9
Corridor 7W001E	3	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,860	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 2' Lamp	High/Low Control	9	1,973	0.0	152	0	$18	$274	$114	8.8
Corridor 7W001E	3	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	2,860	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 3' Lamp	High/Low Control	11	1,973	0.1	186	0	$22	$280	$120	7.1
Corridor 7W001E	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 5	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	1,973	0.2	793	0	$95	$444	$200	2.6
Corridor 7W001W	5	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	5	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 7W001W	3	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	2,860	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 3' Lamp	High/Low Control	11	1,973	0.1	186	0	$22	$280	$120	7.1
Corridor 7W001W	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,860	0.0	156	0	$19	$55	$15	2.1
Corridor 7W500	2	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	2,860	3, 5	Relamp	Yes	2	LED - Linear Tubes: (1) 3' Lamp	High/Low Control	11	1,973	0.0	124	0	$15	$262	$80	12.2
Corridor Basement	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor Basement	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,380	3, 5	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,022	0.4	1,821	0	$218	$779	$405	1.7
Corridor Mail Room	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor Mail Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,380	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,022	0.1	405	0	$49	$298	$90	4.3
Data Center	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Data Center	53	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	53	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	3.2	5,728	-1	$687	$3,983	$935	4.4
Dishwasher Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,380	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,332	0.1	312	0	$37	$189	$40	4.0
Duty Office 1W -1002	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	38	2,332		None	No	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	38	2,332	0.0	0	0	$0	$0	$0	0.0
Electrical Room E1E309	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Electrical Room E1W303	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Electrical Room E1W801	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Electrical Room E2W007	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Electrical Room E2W007	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Electrical Room E2W801	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Electrical Room E3E309	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4

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Electrical Room E3W801	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Electrical Room E4E309	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Electrical Room E4W305	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Electrical Room E4W801	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Electrical Room E5E309	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Electrical Room E5W305	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Electrical Room E5W801	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Electrical Room E6E309	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Electrical Room E6W302	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Electrical Room E6W601	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Electrical Room E6W701	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Electrical Room E7E309	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Electrical Room E7W302	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	7.4
Elevator Lobby 1WEL1	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Elevator Lobby 1WEL1	8	LED Lamps: (1) 54W A23 Screw-In Lamp	Wall Switch	S	54	3,510	5	None	Yes	8	LED Lamps: (1) 54W A23 Screw-In Lamp	High/Low Control	54	2,422	0.1	517	0	$62	$450	$280	2.7
Elevator Lobby 1WEL1	1	LED - Fixtures: High-Bay	Wall Switch	S	23	3,510		None	No	1	LED - Fixtures: High-Bay	Wall Switch	23	3,510	0.0	0	0	$0	$0	$0	0.0
Elevator Lobby 4WEL1	14	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,860	3, 5	Relamp	Yes	14	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	1,973	0.3	969	0	$116	$706	$520	1.6
Elevator Lobby 5WEL1	14	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,860	3, 5	Relamp	Yes	14	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	1,973	0.3	969	0	$116	$706	$520	1.6
Elevator Lobby 5WEL1	14	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,860	3, 5	Relamp	Yes	14	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	1,973	0.3	969	0	$116	$706	$520	1.6
Elevator Lobby 7WLE1	14	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,860	3, 5	Relamp	Yes	14	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	1,973	0.3	969	0	$116	$706	$520	1.6
Elevator Pole	1	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell		260	4,380		None	No	1	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell	260	4,380	0.0	0	0	$0	$0	$0	0.0
Emergency Center 1W - 1001	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Emergency Center 1W - 1001	15	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	38	2,332		None	No	15	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	38	2,332	0.0	0	0	$0	$0	$0	0.0
Exterior Back	1	LED - Fixtures: Downlight Surface Mount	Timeclock		85	4,380		None	No	1	LED - Fixtures: Downlight Surface Mount	Timeclock	85	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Front Recessed	2	LED - Fixtures: Downlight Surface Mount	Timeclock		150	4,380		None	No	2	LED - Fixtures: Downlight Surface Mount	Timeclock	150	4,380	0.0	0	0	$0	$0	$0	0.0

	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
Exterior Parking Lot	3	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell		50	4,380		None	No	3	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell	50	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Pole	8	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell		260	4,380		None	No	8	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell	260	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Pole	2	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell		54	4,380		None	No	2	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell	54	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Pole Main Parking Lot	18	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell		200	4,380		None	No	18	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell	200	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Wall Pack	2	LED - Fixtures: Wall Pack	Photocell		150	4,380		None	No	2	LED - Fixtures: Wall Pack	Photocell	150	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Wall Pack	2	LED - Fixtures: Wall Pack	Photocell		29	4,380		None	No	2	LED - Fixtures: Wall Pack	Photocell	29	4,380	0.0	0	0	$0	$0	$0	0.0
Fire Pump Room	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Fire Pump Room	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,040	3, 4	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	718	0.3	336	0	$40	$526	$105	10.4
Freight Elevator	3	LED - Fixtures: Linear Strip	None		44	3,380	4	None	Yes	3	LED - Fixtures: Linear Strip	Occupancy Sensor	44	2,332	0.0	152	0	$18	$270	$35	12.9
Freight Elevator Lobby 2WEL2	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,973	0.1	264	0	$32	$298	$90	6.6
Freight Elevator Lobby 3WEL2	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,973	0.1	264	0	$32	$298	$90	6.6
Freight Elevator Lobby 4WEL2	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,973	0.1	264	0	$32	$298	$90	6.6
Freight Elevator Lobby 5WEL2	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,973	0.1	264	0	$32	$298	$90	6.6
Freight Elevator Lobby 6WEL2	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,973	0.1	264	0	$32	$298	$90	6.6
Freight Elevator Lobby 7WEL2	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,973	0.1	264	0	$32	$298	$90	6.6
IT Office	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
IT Office	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	1.0	1,729	0	$207	$1,416	$310	5.3
IT Room - 1W - 1002	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	38	1,560		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	38	1,560	0.0	0	0	$0	$0	$0	0.0
Janitorial Basement	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	780	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.0	28	0	$3	$37	$10	7.8
Kitchen	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,380	3, 4	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,332	0.4	1,561	0	$187	$635	$135	2.7
Kitchen 7E808 - Commissioner	2	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	32	1,040	4	None	Yes	2	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	32	718	0.0	23	0	$3	$116	$20	35.3
Kitchenette	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,040	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	718	0.1	96	0	$12	$189	$40	12.9
Loading Dock	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Loading Dock	3	LED Lamps: (1) 54W A23 Screw-In Lamp	Wall Switch	S	54	3,380	4	None	Yes	3	LED Lamps: (1) 54W A23 Screw-In Lamp	Occupancy Sensor	54	2,332	0.0	187	0	$22	$270	$35	10.5
Loading Dock	4	Metal Halide: (1) 250W Lamp	Wall Switch	S	295	3,380	1, 4	Fixture Replacement	Yes	4	LED - Fixtures: High-Bay	Occupancy Sensor	75	2,332	0.9	3,618	-1	$434	$2,290	$235	4.7

	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
Mail Room	39	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,560	3, 4	Relamp	Yes	39	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,076	2.3	4,215	-1	$505	$2,946	$690	4.5
Main Electrical Room	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Main Electrical Room	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,300	3, 4	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	897	0.4	540	0	$65	$599	$125	7.3
Main Lobby 1W001	2	Compact Fluorescent: (2) 42W G25 Screw-In Lamps	Wall Switch	S	84	3,510	3, 5	Relamp	Yes	2	LED Lamps: G25 Lamps	High/Low Control	59	2,422	0.1	334	0	$40	$326	$78	6.2
Main Lobby 1W001	2	LED Lamps: (1) 24W A23 Screw-In Lamp	Wall Switch	S	24	3,510	5	None	Yes	2	LED Lamps: (1) 24W A23 Screw-In Lamp	High/Low Control	24	2,422	0.0	57	0	$7	$225	$70	22.5
Main Lobby 1W001	15	LED - Fixtures: High-Bay	Wall Switch	S	80	3,510	5	None	Yes	15	LED - Fixtures: High-Bay	High/Low Control	80	2,422	0.4	1,436	0	$172	$675	$525	0.9
Maintenance Shop Basement	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,560	3, 4	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,076	0.4	648	0	$78	$599	$125	6.1
Mechanical Room 1-1	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 1-2	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 1-3	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 1-4	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 2-2	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 2-3	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 2-4	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 3-1	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 3-2	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 3-3	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 3-4	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 3-4	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 4-2	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 4-3	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 4-4	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 5-1	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 5-2	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 5-3	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5

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
Mechanical Room 5-4	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 6-1	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 6-2	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 6-3	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 6-4	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 7-1	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 7-2	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 7-3	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mechanical Room 7-4	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,040	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,040	0.0	60	0	$7	$55	$15	5.5
Mens Restroom 1E101	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,950	3, 4	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,346	0.1	236	0	$28	$361	$60	10.7
Mens Restroom 1W300	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,950	3, 4	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,346	0.1	236	0	$28	$361	$60	10.7
Mens Restroom 2W301	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,950	3, 4	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,346	0.1	236	0	$28	$361	$60	10.7
Mens Restroom 4W300	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,950	3, 4	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,346	0.1	236	0	$28	$361	$60	10.7
Mens Restroom 6W300	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,950	3, 4	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,346	0.1	236	0	$28	$361	$60	10.7
Mens Restroom 7E301	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,950	3, 4	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,346	0.1	236	0	$28	$361	$60	10.7
Mens Restroom 7W301	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,950	3, 4	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,346	0.1	236	0	$28	$361	$60	10.7
Mens Restroom Basement	2	Compact Fluorescent: (1) 14W A15 Screw-In Lamp	Wall Switch	S	14	1,950	3, 4	Relamp	Yes	2	LED Lamps: A15 Lamps	Occupancy Sensor	10	1,346	0.0	30	0	$4	$164	$22	39.0
Mens Restroom Basement	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,950	3, 4	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,346	0.1	236	0	$28	$361	$60	10.7
Mens Restroom Basement	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,950	0.0	71	0	$8	$37	$10	3.1
Mens Restroom 2E300	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.2	450	0	$54	$453	$85	6.8
Mens Restroom 3E301	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.2	450	0	$54	$453	$85	6.8
Mens Restroom 3W300	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.2	450	0	$54	$453	$85	6.8
Mens Restroom 3W805	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,950	0.0	71	0	$8	$37	$10	3.1
Mens Restroom 3W903	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.2	450	0	$54	$453	$85	6.8
Mens Restroom 3W905	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.2	450	0	$54	$453	$85	6.8

	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
Mens Restroom 4E301	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.2	450	0	$54	$453	$85	6.8
Mens Restroom 5E301	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.2	450	0	$54	$453	$85	6.8
Mens Restroom 5W301	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.2	450	0	$54	$453	$85	6.8
Mens Restroom 6E301	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,950	3, 4	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,346	0.1	236	0	$28	$361	$60	10.7
Office - Open Plan 2E100	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 2E100	43	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	43	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	2.6	8,520	-2	$1,021	$3,165	$750	2.4
Office - Open Plan 2E200	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 2E200	83	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	83	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	4.9	16,447	-3	$1,971	$6,166	$1,455	2.4
Office - Open Plan 2W100	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 2W100	63	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	63	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	3.7	12,484	-3	$1,496	$4,801	$1,120	2.5
Office - Open Plan 2W800	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 2W800	7	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,860	3, 4	Relamp	Yes	7	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,973	0.1	355	0	$43	$114	$21	2.2
Office - Open Plan 2W800	138	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	138	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	8.2	27,345	-6	$3,278	$10,259	$2,420	2.4
Office - Open Plan 3E200	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 3E200	98	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	98	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	5.8	19,419	-4	$2,328	$7,258	$1,715	2.4
Office - Open Plan 3E601	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 3E601	78	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	78	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	4.6	15,456	-3	$1,853	$5,892	$1,380	2.4
Office - Open Plan 3E700	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 3E700	2	LED - Fixtures: Downlight Recessed	Wall Switch	S	13	2,860	4	None	Yes	2	LED - Fixtures: Downlight Recessed	Occupancy Sensor	13	1,973	0.0	25	0	$3	$116	$20	31.6
Office - Open Plan 3E700	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,860	3	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	2,860	0.0	42	0	$5	$16	$3	2.6
Office - Open Plan 3E700	1	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	2,860	3	Relamp	No	1	LED - Linear Tubes: (1) 3' Lamp	Wall Switch	11	2,860	0.0	52	0	$6	$18	$5	2.1
Office - Open Plan 3E700	26	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	26	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	1.5	5,152	-1	$618	$1,964	$460	2.4
Office - Open Plan 3E802	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 3E802	35	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	35	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	2.1	6,935	-1	$831	$2,727	$630	2.5
Office - Open Plan 3W400	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0

	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
Office - Open Plan 3W400	7	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,860	3, 4	Relamp	Yes	7	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,973	0.1	355	0	$43	$114	$21	2.2
Office - Open Plan 3W400	1	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	2,860	3	Relamp	No	1	LED - Linear Tubes: (1) 3' Lamp	Wall Switch	11	2,860	0.0	52	0	$6	$18	$5	2.1
Office - Open Plan 3W400	138	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	138	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	8.2	27,345	-6	$3,278	$10,259	$2,420	2.4
Office - Open Plan 4E100	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 4E100	37	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	37	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	2.2	7,332	-2	$879	$2,837	$660	2.5
Office - Open Plan 4E200	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 4E200	87	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	87	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	5.2	17,239	-4	$2,066	$6,385	$1,515	2.4
Office - Open Plan 4E601	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 4E601	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,860	3	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	2,860	0.0	42	0	$5	$16	$3	2.6
Office - Open Plan 4E601	74	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	74	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	4.4	14,663	-3	$1,758	$5,403	$1,285	2.3
Office - Open Plan 4E700	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 4E700	3	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	2,860	3, 4	Relamp	Yes	3	LED - Linear Tubes: (1) 3' Lamp	Occupancy Sensor	11	1,973	0.1	186	0	$22	$55	$15	1.8
Office - Open Plan 4E700	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	1.4	4,756	-1	$570	$1,855	$430	2.5
Office - Open Plan 4W100	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 4W100	66	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	66	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	3.9	13,078	-3	$1,568	$4,965	$1,165	2.4
Office - Open Plan 5E100	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 5E100	42	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	42	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	2.5	8,322	-2	$998	$3,110	$735	2.4
Office - Open Plan 5E200	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 5E200	96	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	96	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	5.7	19,022	-4	$2,280	$7,148	$1,685	2.4
Office - Open Plan 5E601	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 5E601	66	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	66	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	3.9	13,078	-3	$1,568	$4,965	$1,165	2.4
Office - Open Plan 5E601B	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 5E601B	25	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	25	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	1.5	4,954	-1	$594	$1,909	$445	2.5
Office - Open Plan 5E700	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 5E700	2	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,860	3, 4	Relamp	Yes	2	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,973	0.0	102	0	$12	$149	$26	10.1

	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
Office - Open Plan 5E700	1	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	2,860	3	Relamp	No	1	LED - Linear Tubes: (1) 3' Lamp	Wall Switch	11	2,860	0.0	52	0	$6	$18	$5	2.1
Office - Open Plan 5E700	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	1.4	4,756	-1	$570	$1,855	$430	2.5
Office - Open Plan 5W100	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 5W100	66	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	66	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	3.9	13,078	-3	$1,568	$4,965	$1,165	2.4
Office - Open Plan 5W200	7	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	7	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 5W200	5	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,860	3, 4	Relamp	Yes	5	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,973	0.1	254	0	$30	$81	$15	2.2
Office - Open Plan 5W200	1	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	2,860	3	Relamp	No	1	LED - Linear Tubes: (1) 3' Lamp	Wall Switch	11	2,860	0.0	52	0	$6	$18	$5	2.1
Office - Open Plan 5W200	135	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	135	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	8.0	26,750	-6	$3,207	$9,824	$2,340	2.3
Office - Open Plan 5W200C	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 5W200C	48	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	48	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	2.9	9,511	-2	$1,140	$3,709	$860	2.5
Office - Open Plan 5W800	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 5W800	96	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	96	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	5.7	19,022	-4	$2,280	$7,148	$1,685	2.4
Office - Open Plan 6E200	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 6E200	67	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	67	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	4.0	13,276	-3	$1,591	$5,020	$1,180	2.4
Office - Open Plan 6E601	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 6E601	48	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	48	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	2.9	9,511	-2	$1,140	$3,709	$860	2.5
Office - Open Plan 6E700	1	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	2,860	3	Relamp	No	1	LED - Linear Tubes: (1) 3' Lamp	Wall Switch	11	2,860	0.0	52	0	$6	$18	$5	2.1
Office - Open Plan 6E700	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	1.4	4,756	-1	$570	$1,855	$430	2.5
Office - Open Plan 6W100	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 6W100	53	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	53	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	3.2	10,502	-2	$1,259	$3,983	$935	2.4
Office - Open Plan 6W400	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Open Plan 6W400	6	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,860	3, 4	Relamp	Yes	6	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,973	0.1	305	0	$37	$98	$18	2.2
Office - Open Plan 6W400	1	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	2,860	3	Relamp	No	1	LED - Linear Tubes: (1) 3' Lamp	Wall Switch	11	2,860	0.0	52	0	$6	$18	$5	2.1
Office - Open Plan 6W400	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.1	264	0	$32	$189	$40	4.7
Office - Open Plan 6W400	102	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	3, 4	Relamp	Yes	102	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	6.1	20,211	-4	$2,423	$7,477	$1,775	2.4

	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
Office - Open Plan 6W400B	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0

		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
Sub- Basement	Pneumatic Control System	1	Air Compressor	15.0	91.0%	No			W	1,200		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
Sub- Basement	Pneumatic Control System	1	Air Compressor	10.0	91.7%	No			W	1,200		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Penthouse Pump Room	Condenser Water Pumps (P1P2)	2	Condenser Water Pump	150.0	96.2%	Yes			W	1,600		No	96.2%	No		0.0	0	0	$0	$0	$0	0.0
Penthouse Pump Room	Tower Water Pump (P3)	1	Chilled Water Pump	60.0	95.0%	Yes			W	1,600		No	95.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room 1-3	Condenser Water Pumps	2	Condenser Water Pump	5.0	85.5%	No			W	1,600		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Penthouse Pump Room	Tower Water Pumps	1	Chilled Water Pump	15.0	91.0%	No			W	1,600		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Cooling Tower Fans	3	Cooling Tower Fan	15.0	92.4%	Yes			W	1,600		No	92.4%	No		0.0	0	0	$0	$0	$0	0.0
Fire Pump Room	Fire Pump Room - Exhaust Fan	1	Exhaust Fan	0.5	70.0%	No			W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Main Electrical Room	Main Electrical Room - Exhaust Fan	1	Exhaust Fan	0.3	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Maintenance Shop	Maintenance Shop - Exhaust Fan	1	Exhaust Fan	0.3	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Penthouse	Penthouse - Exhaust Fan	1	Exhaust Fan	0.3	65.0%	No			W	8,760		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Penthouse Passenger Elevator Room	Penthouse Passenger Elevator Room - Exhaust Fan	1	Exhaust Fan	0.3	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Restrooms - Exhaust Fan	1	Exhaust Fan	5.0	86.5%	No			W	8,760	6	No	89.5%	Yes	1	1.6	9,795	0	$1,251	$4,076	$900	2.5
Roof	Restrooms - Exhaust Fan EF-4	1	Exhaust Fan	5.0	86.5%	No			W	8,760	6	No	89.5%	Yes	1	1.6	9,795	0	$1,251	$4,076	$900	2.5
Roof	Restrooms - Exhaust Fan EF-2	1	Exhaust Fan	5.0	86.5%	No			W	8,760	6	No	89.5%	Yes	1	1.6	9,795	0	$1,251	$4,076	$900	2.5
Stairs	Smoke Evacuation - Exhaust Fan	3	Exhaust Fan	0.3	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Sub- Basement	Sub- Basement - Exhaust Fan	1	Exhaust Fan	0.2	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Main Lobby	Main Lobby - Cabinet Heaters	4	Supply Fan	0.3	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Sub- Basement	Loading Dock - Hot Water Pumps	2	Heating Hot Water Pump	2.0	84.0%	No			W	1,280	7	No	86.5%	Yes	2	0.4	1,794	0	$229	$6,522	$200	27.6
Penthouse	Freight Elevator Motor	1	Other	30.0	84.0%	No			W	500		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0

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
Penthouse Passenger Elevator Room	Passenger Elevator Motor	6	Other	40.0	84.0%	No			W	750		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Sub- Basement	Sub- Basement - Ventilation Fans	2	Ventilation Fan	0.3	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Fire Pump Room	Water Booster Pumps	2	Water Supply Pump	10.0	83.0%	Yes			W	960		No	83.0%	No		0.0	0	0	$0	$0	$0	0.0
DEP Headquarters	Water Source Heat Pump Fans	449	Supply Fan	0.1	65.0%	No			W	2,500		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
DEP Headquarters	Water Source Heat Pump Fans	108	Supply Fan	0.2	65.0%	No			W	2,500		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
DEP Headquarters	Water Source Heat Pump Fans	2	Supply Fan	1.0	82.0%	No			W	2,500		No	82.0%	No		0.0	0	0	$0	$0	$0	0.0
DEP Headquarters	AHUs - Supply Fan Motors	19	Supply Fan	15.0	93.0%	Yes			W	2,500		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
DEP Headquarters	AHUs - Supply Fan Motors	9	Supply Fan	15.0	91.7%	Yes			W	2,500		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
DEP Headquarters	AHUs - Exhaust Fan Motors	28	Exhaust Fan	7.5	89.5%	No			W	2,500	6	No	91.0%	Yes	28	63.8	168,968	0	$21,586	$132,671	$28,000	4.8
Data Center	Data Center Liebert Units	6	Supply Fan	3.0	86.7%	No			W	8,760		No	86.7%	No		0.0	0	0	$0	$0	$0	0.0
Data Center	Data Center Liebert Backup Unit	3	Supply Fan	3.0	86.7%	No			W	1,000		No	86.7%	No		0.0	0	0	$0	$0	$0	0.0
Sub- Basement	AHU - Sub Basement	1	Supply Fan	1.0	2.0%	No			W	1,373		No	2.0%	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
1st Floor	First Floor	45	Water Source HP	0.67	11.40	11.60	4.4 COP	ClimateMaster	TRC09BENX	W		No							0.0	0	0	$0	$0	$0	0.0
1st Floor	First Floor	16	Water Source HP	0.88	14.30	11.70	4.7 COP	ClimateMaster	TRC12BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
1st Floor	First Floor	14	Water Source HP	1.08	17.70	11.60	4.8 COP	ClimateMaster	TRC15BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
1st Floor	First Floor	2	Water Source HP	3.58	62.00	12.00	4.7 COP	ClimateMaster	TS048CGC	W		No							0.0	0	0	$0	$0	$0	0.0
2nd Floor	Second Floor	35	Water Source HP	0.67	11.40	11.60	4.4 COP	ClimateMaster	TRC09BENX	W		No							0.0	0	0	$0	$0	$0	0.0
2nd Floor	Second Floor	11	Water Source HP	0.88	14.30	11.70	4.7 COP	ClimateMaster	TRC12BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
2nd Floor	Second Floor	16	Water Source HP	1.08	17.70	11.60	4.8 COP	ClimateMaster	TRC15BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
2nd Floor	Second Floor	16	Water Source HP	1.23	19.60	11.40	4.3 COP	ClimateMaster	TRC18BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
2nd Floor	Second Floor	2	Water Source HP	5.00	75.00	14.00	4.9 COP	ClimateMaster	TS060CGC	W		No							0.0	0	0	$0	$0	$0	0.0
3rd Floor	Third Floor	32	Water Source HP	0.67	11.40	11.60	4.4 COP	ClimateMaster	TRC09BENX	W		No							0.0	0	0	$0	$0	$0	0.0
3rd Floor	Third Floor	12	Water Source HP	0.88	14.30	11.70	4.7 COP	ClimateMaster	TRC12BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
3rd Floor	Third Floor	16	Water Source HP	1.08	17.70	11.60	4.8 COP	ClimateMaster	TRC15BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
3rd Floor	Third Floor	20	Water Source HP	1.23	19.60	11.40	4.3 COP	ClimateMaster	TRC18BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
4th Floor	Fourth Floor	32	Water Source HP	0.67	11.40	11.60	4.4 COP	ClimateMaster	TRC09BENX	W		No							0.0	0	0	$0	$0	$0	0.0
4th Floor	Fourth Floor	12	Water Source HP	0.88	14.30	11.70	4.7 COP	ClimateMaster	TRC12BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
4th Floor	Fourth Floor	16	Water Source HP	1.08	17.70	11.60	4.8 COP	ClimateMaster	TRC15BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
4th Floor	Fourth Floor	20	Water Source HP	1.23	19.60	11.40	4.3 COP	ClimateMaster	TRC18BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
5th Floor	Fifth Floor	32	Water Source HP	0.67	11.40	11.60	4.4 COP	ClimateMaster	TRC09BENX	W		No							0.0	0	0	$0	$0	$0	0.0
5th Floor	Fifth Floor	12	Water Source HP	0.88	14.30	11.70	4.7 COP	ClimateMaster	TRC12BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
5th Floor	Fifth Floor	16	Water Source HP	1.08	17.70	11.60	4.8 COP	ClimateMaster	TRC15BEXX	W		No							0.0	0	0	$0	$0	$0	0.0

		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 (kBtu/hr)	Cooling Mode Efficiency (SEER/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
5th Floor	Fifth Floor	20	Water Source HP	1.23	19.60	11.40	4.3 COP	ClimateMaster	TRC18BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
6th Floor	Sixth Floor	40	Water Source HP	0.67	11.40	11.60	4.4 COP	ClimateMaster	TRC09BENX	W		No							0.0	0	0	$0	$0	$0	0.0
6th Floor	Sixth Floor	11	Water Source HP	0.88	14.30	11.70	4.7 COP	ClimateMaster	TRC12BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
6th Floor	Sixth Floor	14	Water Source HP	1.08	17.70	11.60	4.8 COP	ClimateMaster	TRC15BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
6th Floor	Sixth Floor	16	Water Source HP	1.23	19.60	11.40	4.3 COP	ClimateMaster	TRC18BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
7th Floor	Seventh Floor	40	Water Source HP	0.67	11.40	11.60	4.4 COP	ClimateMaster	TRC09BENX	W		No							0.0	0	0	$0	$0	$0	0.0
7th Floor	Seventh Floor	11	Water Source HP	0.88	14.30	11.70	4.7 COP	ClimateMaster	TRC12BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
7th Floor	Seventh Floor	14	Water Source HP	1.08	17.70	11.60	4.8 COP	ClimateMaster	TRC15BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
7th Floor	Seventh Floor	16	Water Source HP	1.23	19.60	11.40	4.3 COP	ClimateMaster	TRC18BEXX	W		No							0.0	0	0	$0	$0	$0	0.0
Penthouse	Penthouse	1	Electric Resistance Heat		17.07		1 COP			W		No							0.0	0	0	$0	$0	$0	0.0
Penthouse Passenger Elevator Room	Penthouse Passenger Elevator Room	1	Electric Resistance Heat		17.07		1 COP			W		No							0.0	0	0	$0	$0	$0	0.0
Penthouse Pump Room	Penthouse Pump Room	1	Electric Resistance Heat		17.07		1 COP			W		No							0.0	0	0	$0	$0	$0	0.0
Penthouse Storage	Penthouse Storage	1	Electric Resistance Heat		17.07		1 COP			W		No							0.0	0	0	$0	$0	$0	0.0
Stairs	Stairs	9	Electric Resistance Heat		6.83		1 COP			W		No							0.0	0	0	$0	$0	$0	0.0
Penthouse Passenger Elevator Room	Penthouse Passenger Elevator Room	2	Split-System Air-Source HP	3.00	38.00	17.90	7.7 HSPF	Daikin	RXS36LVJU	W		No							0.0	0	0	$0	$0	$0	0.0
Penthouse Freight Elevator Room	Penthouse Freight Elevator Room	1	Split-System Air-Source HP	3.00	38.00	17.90	7.7 HSPF	Daikin	RXS36LVJU	W		No							0.0	0	0	$0	$0	$0	0.0
Guard Parking Lot Gate	Guard Parking Lot Gate	1	Window AC	0.42		10.70				W		No							0.0	0	0	$0	$0	$0	0.0
DEP Headqaurters	Air Handling Units	15	Package Unit	16.67		10.10				B	8	Yes	15	Package Unit	16.67		14.00		41.4	49,646	0	$6,342	$270,417	$22,250	39.1
DEP Headqaurters	Air Handling Units	13	Package Unit	16.67		10.10				B	8	Yes	13	Package Unit	16.67		14.00		35.9	43,027	0	$5,497	$234,361	$19,283	39.1
Data Center	Data Center	2	Split-System	30.00		10.10		Liebert	SD105AUA	W		No							0.0	0	0	$0	$0	$0	0.0

		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 (kBtu/hr)	Cooling Mode Efficiency (SEER/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
Data Center	Data Center	1	Split-System	30.00		9.70		Liebert		B	8	Yes	1	Split-System	30.00		12.50		4.2	1,663	0	$212	$43,159	$2,550	191.2
DEP Headqaurters	Air Handling Units	15	Electric Resistance Heat		68.26		1 COP			B		No							0.0	0	0	$0	$0	$0	0.0
DEP Headqaurters	Air Handling Units	13	Electric Resistance Heat		85.33		1 COP			B		No							0.0	0	0	$0	$0	$0	0.0
Main Lobby	Main Lobby - Cabinet Heaters	4	Electric Resistance Heat		17.06		1 COP			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
Vicinity Power Plant	Hot Water Boiler (Proxy Boiler)	1	Non-Condensing Hot Water Boiler	2,336	Proxy boiler for Analysis		W		No						0.0	0	0	$0	$0	$0	0.0

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
Floors 1-7	Floors 1-7	9	180	0.75	0.0	14,900	0	$1,904	$1,039	$360	0.4

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
Closets	Restrooms	11	Storage Tank Water Heater (≤ 50 Gal)	A O Smith	DEL-30-110	W		No						0.0	0	0	$0	$0	$0	0.0
Closets	Restrooms	2	Storage Tank Water Heater (≤ 50 Gal)	A O Smith	ELDS30-C	W		No						0.0	0	0	$0	$0	$0	0.0
Basement	Restrooms - Basement	1	Storage Tank Water Heater (≤ 50 Gal)	A O Smith	DRE52-100	W		No						0.0	0	0	$0	$0	$0	0.0
Storage Room	Kitchen	1	Storage Tank Water Heater (> 50 Gal)	A O Smith	ECT80-210	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommedation 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
Restrooms	10	20	Faucet Aerator (Lavatory)	2.20	0.50	0.0	5,561	0	$710	$143	$72	0.1

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	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
Dishwasher Room	2	Refrigerator Chest	Continental		No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	6	Refrigerator Chest	Continental		No		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Traulsen	ALT132DUT	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	2	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Traulsen	G12010	No		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	1	Stand-Up Refrigerator, Glass Door (31 - 50 cu. ft.)	TRUE	GDM-47	No		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	1	Stand-Up Refrigerator, Glass Door (>50 cu. ft.)	Beverage Air	MT66	No		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	1	Stand-Up Refrigerator, Glass Door (31 - 50 cu. ft.)	Beverage Air	MT38-B	No		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Traulsen	AH132D-X008	No		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Traulsen	G10010	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Traulsen	G10010	No		No	0.0	0	0	$0	$0	$0	0.0

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	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
Dishwasher Room	1	Self-Contained Unit (≥175 lbs/day), Batch	Manitovoc	QD0212A	Yes		No	0.0	0	0	$0	$0	$0	0.0

Plug Load Inventory

	Existing Conditions					
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
DEP Headquarters	44	Coffee Machine	800	No		
DEP Headquarters	1	Dishwasher (Undercounter)	175	No		
DEP Headquarters	63	Microwave	1,000	No		
DEP Headquarters	24	Paper Shredder	125	No		
DEP Headquarters	100	Printer (Medium/Small)	144	No		
DEP Headquarters	70	Printer/Copier (Large)	600	No		
DEP Headquarters	4	Projector	244	No		
DEP Headquarters	61	Refrigerator (Mini)	212	No		
DEP Headquarters	12	Refrigerator (Residential)	440	No		
DEP Headquarters	27	Television	144	No		
DEP Headquarters	25	Water Cooler	392	No		
DEP Headquarters	15	Miscellenous Plug Load	1,000	No		
DEP Headquarters	1,200	Desktop Computers	270	No		
DEP Headquarters	1	Level 2 EV Charging Station	2,500	No		
DEP Headquarters	2	Level 3 EV Charging Station	50,000	No		

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	ECM #	Install Controls?	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
Cafeteria	1	Glass Fronted Refrigerated	11	Yes	0.1	1,209	0	$154	$230	$50	1.2
Cafeteria	3	Non-Refrigerated	N/A	No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	3	Refrigerated	11	Yes	0.6	4,836	0	$618	$690	$150	0.9

Miscellaneous Fuel Inventory

	Existing Conditions					
Location	Quantity	Equipment Description	Input Capacity per Unit (MBh)	ENERGY STAR Qualified?	Manufacturer	Model
DEP Headquarters	1	Data Center	77.9	No	0.0	0.0

Custom (High Level) Measure Analysis

Installation of an Energy Management System

Building Square Footage: 362,700
Percent of Conditioned Area Impacted: 100%
Fuel Utility Rate: $37.701 MMBtu
Blended Electric Utility Rate: $0.128 kWh

Existing Conditions						Proposed Conditions					Energy Impact & Financial Analysis										
Description	Area(s)/System(s) Served	Remaining Useful Life	Total HVAC Motor Usage kWh	Total HVAC Electric Usage kWh	Total HVAC Fuel Usage MMBtu	Description	% Savings HVAC Motor Usage kWh	% Savings HVAC Electric Usage kWh	% Savings HVAC Fuel Usage MMBtu	Estimated Cost per Sqft	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	Simple Payback w/ Incentives in Years
Limited/No HVAC Controls	HVAC Equipment & Systems	15	1,700,106	1,458,178	2,336	Installation of an Energy Management System	10%	10%	5%	$8.50	0.00	315,828	117	$44,751	$3,082,950	$0	$0	$0	$3,082,950	68.89	68.89

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)	DEP Building	8,000	Electric	9.0	30	Heat Pump Water Heater	2.5	30	$1,756.63	0.00	6,753	0	$863	$1,757	$0	$0	$0	$1,757	2.04	2.04

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.

LEARN MORE AT energystar.gov

ENERGY STAR® Statement of Energy Performance

N/A

ENERGY STAR® Score[1]

DEP Headquarters Building

Primary Property Type: Office
Gross Floor Area (ft²): 403,000
Built: 1984

For Year Ending: December 31, 2021
Date Generated: August 03, 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

Property Address	Property Owner	Primary Contact
DEP Headquarters Building 401 E. State Street Trenton, New Jersey 08625	State of New Jersey 428 East State Street Trenton, NJ 08625 (609) 940-4129	New Jersey Board of Public Utilities State Energy Services 44 South Clinton Ave Trenton, NJ 08625 6096339666 BPU.EnergyServices@bpu.nj.gov

Property ID: 1177872

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
48.8 kBtu/ft²

Source EUI
124.1 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	16,577,144 (84%)
Electric - Solar (kBtu)	758,811 (4%)
District Hot Water (kBtu)	2,344,240 (12%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	45.8
National Median Source EUI (kBtu/ft²)	116.4
% Diff from National Median Source EUI	7%

Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	1,695

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
Blended Rate	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.
Btu	*British thermal unit*: a unit of energy equal to the amount of heat required to increase the temperature of one pound of water by one-degree Fahrenheit.
CHP	*Combined heat and power*. Also referred to as cogeneration.
COP	*Coefficient of performance*: a measure of efficiency in terms of useful energy delivered divided by total energy input.
Demand Response	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.
DCV	*Demand control ventilation*: a control strategy to limit the amount of outside air introduced to the conditioned space based on actual occupancy need.
US DOE	*United States Department of Energy*
EC Motor	*Electronically commutated motor*
ECM	*Energy conservation measure*
EER	*Energy efficiency ratio*: a measure of efficiency in terms of cooling energy provided divided by electric input.
EUI	*Energy Use Intensity:* measures energy consumption per square foot and is a standard metric for comparing buildings' energy performance.
Energy Efficiency	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.
ENERGY STAR	ENERGY STAR is the government-backed symbol for energy efficiency. The ENERGY STAR program is managed by the EPA.
EPA	*United States Environmental Protection Agency*
Generation	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
GHG	*Greenhouse gas* 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.
gpf	*Gallons per flush*

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

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

NJ DEP Headquarters
Energy and Economic Savings Summary for Different Cogeneration Systems + Remaining Required Hot water from Vicinity

System Description	Electrical Energy from Cogeneration System (kWh/yr)	Electrical Energy Purchased from Grid (kWh/yr)	Fuel Consumption of Cogeneration System (therms/yr)	Hot water/Fuel required from District Energy (therms/yr)	Annual Electrical Cost ($/yr)	Annual Fuel Cost ($/yr)	Annual Energy Cost ($/yr)
Base Case without Cogeneration System	0	4,885,004	0	23,358	$624,076	$88,063	$712,138
(1) 60 kW Capstone Microturbines	524,256	4,330,711	65,298	11,905	$529,204	$128,322	$657,526
(1) 75 kW Aegis TP75 reciprocating engine	607,473	4,247,496	78,939	9,994	$519,035	$137,527	$656,563
(3) 35 kW Yanmar CP35D reciprocating engine	848,797	4,006,171	101,635	8,082	$489,546	$154,939	$644,485

Cogeneration System	Project Cost	Electrical Energy Savings (kWh/yr)	Fuel Energy Savings (therms/yr)	Thermal Load Provided by Cogeneration System (%)	Annual Ele Provided by Cogeneration System (%)	Electrical Cost Savings ($/yr)	Fuel Cost Savings ($/yr)	Total Energy Cost Savings ($/yr)	Non-Discounted IRR	Discounted IRR	Non-Discounted Cumulative Positive Cashflow starts in Year	Discounted Cumulative Positive Cashflow starts in Year
(1) 60 kW Capstone Microturbines	$416,000	524,256	-53,845	88%	10%	$94,872	-$40,259	$54,612	15%	8%	8.0	10.25
(1) 75 kW Aegis TP75 reciprocating engine	$480,000	607,473	-65,575	91%	12%	$105,040	-$49,465	$55,576	13%	6%	9.0	11.75
(3) 35 kW Yanmar CP35D reciprocating engine	$776,844	848,797	-86,359	94%	17%	$134,530	-$66,877	$67,653	9%	3%	11.3	15.5

Cogeneration System	Project Cost	Total Energy Cost Savings ($/yr)	Non-Discounted Cumulative Positive Cashflow starts in Year	Discounted Cumulative Positive Cashflow starts in Year	
(1) 65 kW Capstone Microturbines	$416,000	$54,612	8.0	10.25	Best Option
(1) 75 kW Aegis TP75 reciprocating engine	$480,000	$55,576	9.0	11.75	
(3) 35 kW Yanmar CP35D reciprocating engine	$776,844	$67,653	11.25	15.5	

Energy Savings
Summary
With Capstone C65 microturbine

Annual electricity produced by cogeneration system	524,256	kWh/yr	(assumes 5% downtime)
Annual electricity obtained from grid	4,330,711	kWh/yr	(all electricity obtained from grid during cogen system downtime)
Annual electricity obtained from solar	222,084		
Annual Electricity Provided by Cogeneration System	10%		
Annual fuel consumed by cogeneration system	65,298	therms/yr	(assumes 5% downtime)
Annual hot water obtained from District Energy (Vicinity)	11,905	therms/yr	(all thermal load obtained from boilers during cogen system downtime)
Thermal Load Provided by Cogeneration System	88%		
Annual Electric Cost	$529,204	/yr	
Annual Fuel Cost	$128,322	/yr	
Annual Energy Cost	$657,526	/yr	
Without Cogeneration System			
Annual electricity obtained from grid	4,854,969	kWh/yr	
Annual hot water obtained from District Energy (Vicinity)	25,649	therms/yr	
Annual Electric Cost	$624,076	/yr	
Annual Fuel Cost	$88,063	/yr	
Annual Energy Cost	$712,138	/yr	
Annual Cost Savings using cogeneration system	$54,612	/yr	

Energy Savings Summary With Aegis TP75 Reciprocating Engine

Annual electricity produced by cogeneration system	607,473	kWh/yr	(assumes 5% downtime)
Annual electricity obtained from grid	4,247,496	kWh/yr	(all electricity obtained from grid during cogen system downtime)
Annual electricity obtained from solar	222,084		
Annual Electricity Provided by Cogeneration System	12%		
Annual fuel consumed by cogeneration system	78,939	therms/yr	(assumes 5% downtime)
Annual hot water obtained from District Energy (Vicinity)	9,994	therms/yr	(all thermal load obtained from boilers during cogen system downtime)
Thermal Load Provided by Cogeneration System	91%		
Annual Electric Cost	$519,035	/yr	
Annual Fuel Cost	$137,527	/yr	
Annual Energy Cost	$656,563	/yr	
Without Cogeneration System			
Annual electricity obtained from grid	4,854,969	kWh/yr	
Annual hot water obtained from District Energy (Vicinity)	25,649	therms/yr	
Annual Electric Cost	$624,076	/yr	
Annual Fuel Cost	$88,063	/yr	
Annual Energy Cost	$712,138	/yr	
Annual Cost Savings using cogeneration system	$55,576	/yr	

Energy Savings Summary
With Yanmar CP35D Reciprocating Engine

Annual electricity produced by cogeneration system	848,797	kWh/yr	(assumes 5% downtime)
Annual electricity obtained from grid	4,006,171	kWh/yr	(all electricity obtained from grid during cogen system downtime)
Annual electricity obtained from solar	222,084		
Annual Electricity Provided by Cogeneration System	17%		
Annual fuel consumed by cogeneration system	101,635	therms/yr	(assumes 5% downtime)
Annual hot water obtained from District Energy (Vicinity)	8,082	therms/yr	(all thermal load obtained from boilers during cogen system downtime)
Thermal Load Provided by Cogeneration System	94%		
Annual Electric Cost	$489,546	/yr	
Annual Fuel Cost	$154,939	/yr	
Annual Energy Cost	$644,485	/yr	
Without Cogeneration System			
Annual electricity obtained from grid	4,854,969	kWh/yr	
Annual hot water obtained from District Energy (Vicinity)	25,649	therms/yr	
Annual Electric Cost	$624,076	/yr	
Annual Fuel Cost	$88,063	/yr	
Annual Energy Cost	$712,138	/yr	
Annual Cost Savings using cogeneration system	$67,653	/yr	

District Energy System Alternatives - Summary

Option	Scope	Project Cost	Total Energy Cost Savings ($/yr)	Non-Discounted Cumulative Positive Cashflow starts in Year	Discounted Cumulative Positive Cashflow starts in Year	No contract penalties (Non-Discounted)
1 - NG. Boiler Plant	Install new natural gas heating plant instead of purchasing hot water from Vicinity	$ 1,350,000	$ 66,189	20.4	25.8	7.5
2 - ASHP Plant	Install air source heat pump plant instead of purchasing hot water from Vicinity.	$ 2,100,000	$ 54,601	38.5	63.3	15.5
3.a - CHP (Microturbine) + NG. Boiler Plant	(1) 65 kW Capstone Microturbines and natural gas heating plant instead of purchasing hot water from Vicinity	$ 1,736,000	$ 112,502	15.4	20.2	6.5
3.b CHP (Microturbine) + ASHP Plant	(1) 65 kW Capstone Microturbines and onsite ASHP plant instead of purchasing hot water from Vicinity	$ 2,276,000	$ 104,369	21.8	34.0	12.5

Note - The project cost includes $900,000 for a buyout of the take-or-pay contract. The column depicting "No Contract Penalties" removes the contract penalties from the analysis.

Option 1 - Installation of onsite boiler plant instead of purchasing hot water from Vicinity

	Project Cost	Total Energy Cost Savings ($/yr)	Non-Discounted Cumulative Positive Cashflow starts in Year	Discounted Cumulative Positive Cashflow starts in Year
Onsite NG. Boiler Plant	$ 1,350,000	$ 66,189	20.4	25.8

Calculation:

Existing Hot Water Usage		23,358 therms
Proposed Condensing Hot Water Boiler Efficiency		0.968
Proposed Boiler Plant Fuel Consumption		24,130 therms
Avg Natural Gas Cost	**$**	**0.91**
Fuel Cost for Boiler Plant	$	21,873
Savings for moving from Vinicity to NG Bolier Plant	$	66,189

Note:
1. Average natural gas cost was calculated based on the PSE&G Large Volume Gas (LVG) tariff serving a similar client in the same location. Please note that $/therm cost is only an estimate and subject to change based on other factors involved in actual billing such as Social Benefit Charges, Balancing Charges, Commodity charges etc.
2. As we do not know the current status of the heating contract between the State and District Energy, the $/therm value does not include the take-or-pay hot water contract penalties

Boiler Plant Sizing

Max Therm/hr from Houlrly Data	23.72	therms
Max Btu/hr from Houlrly Data	2,372,000	Btu/Hr
Number of boilers required	3	
Output capacity of boiler	790,667	Btu/Hr

Looks like three Benchmark Platinum 1000 MBH input capacity condensing boilers are sufficent to serve required space heating load.

Boiler Plant Preliminary Budget	$	375,000
(Additional 20% for Contengency)	$	75,000
Approx Total Preliminary Budget	$	450,000
Vicinity Penalities	$	900,000

Option 2 - Installation of onsite Air Source - Heat Pump Water Heater (AS-HPWH) System instead of purchasing hot water from Vicinity

	Project Cost	Total Energy Cost Savings ($/yr)	Non-Discounted Cumulative Positive Cashflow starts in Year	Discounted Cumulative Positive Cashflow starts in Year
Onsite ASHP Plant	$ 2,100,000	$ 54,601	38.5	63.3

Existing Hot Water Usage	23,358	therms
Proposed Air Source - Heat Pump Water Heater Efficiency	2.20	COP
Proposed AS-HPWH Plant Electricity Consumption	273,833.53	kWh
Avg Electricity Cost	**$ 0.12**	
Electricity Cost for AS-HPWH Plant	$ 33,461.89	
Savings for moving from Vinicity to AS-HPWH System Plant	$ 54,600.73	

Note:

1. Average natural gas cost was calculated based on the PSE&G Large Volume Gas (LVG) tariff serving a similar client in the same location. Please note that $/therm cost is only an estimate and subject to change based on other factors involved in actual billing such as Social Benefit Charges, Balancing Charges, Commodity charges etc.

2. As we do not know the current status of the heating contract between the State and District Energy, the $/therm value does not include the take-or-pay hot water contract penalties

AS-HPWH Plant Sizing

Max Thems/hr from Hourly Data	23.72	therms
Max Btu/hr from Houlrly Data	2,372,000	Btu/Hr
Number of AS-HPWH required	13	
Heating capacity per ASHP system	187,000	Btu/Hr

ASHP-WH Plant Preliminary Budget	$	1,000,000
(Additional 20% for Contengency)	$	200,000
Approx Total Preliminary Budget	$	1,200,000
Vicinity Penalities	$	900,000

NJ DEP Headquarters

Energy and Economic Savings Summary for Cogeneration System with onsite plant for supplemental hot water needs (Boiler Plant or ASHP Plant)

System Description	Electrical Energy from Cogeneration System (kWh/yr)	Electrical Energy Purchased from Grid (kWh/yr)	Fuel Consumption of Cogeneration System (therms/yr)	Hot water/Fuel required from Onsite Plant (therms/yr)	Annual Electrical Cost ($/yr)	Annual Fuel Cost of Onsite Plant ($/yr)	Annual Energy Cost ($/yr)
Base Case without Cogeneration System	0	4,885,004	0	23,358	$624,076	$88,063	$712,138
(1) 65 kW Capstone Microturbines + Boiler Plant	524,256	4,330,711	65,298	11,905	$529,204	$70,432	$599,636
(1) 65 kW Capstone Microturbines + AS-HPWH Plant	524,256	4,330,711	65,298	11,905	$529,204	$78,566	$607,769

Cogeneration System	Project Cost	Electrical Energy Savings (kWh/yr)	Fuel Energy Savings (therms/yr)	Thermal Load Provided by Cogeneration System (%)	Annual Ele Provided by Cogeneration System (%)	Electrical Cost Savings ($/yr)	Fuel Cost Savings ($/yr)	Total Energy Cost Savings ($/yr)	Non-Discounted IRR	Discounted IRR	Non-Discounted Cumulative Positive Cashflow starts in Year	Discounted Cumulative Positive Cashflow starts in Year
(1) 65 kW Capstone Microturbines + Boiler Plant	$1,736,000	524,256	-53,845	88%	10%	$94,872	$17,631	$112,502	17%	10%	15.4	20.2
(1) 65 kW Capstone Microturbines + AS-HPWH Plant	$2,276,000	524,256	-53,845	88%	10%	$94,872	$9,497	$104,369	13%	6%	21.8	34.0

Cogeneration System	Project Cost	Total Energy Cost Savings ($/yr)	Non-Discounted Cumulative Positive Cashflow starts in Year	Discounted Cumulative Positive Cashflow starts in Year	
(1) 65 kW Capstone Microturbines + Boiler Plant	$1,736,000	$112,502	15.4	20.2	Best Option
(1) 65 kW Capstone Microturbines + AS-HPWH Plant	$2,276,000	$104,369	21.8	34.0	

AS-HPWH Plant Sizing

ourly Data after Capstone MT	19.22	therms
Max Btu/hr from Houlrly Data after Capstone MT	1,922,000	Btu/Hr
Number of AS-HPWH required	10	
Required Heating capacity of ASHP system	187,000	Btu/Hr

ASHP-WH Plant Preliminary Budget

	$	800,000
(Additional 20% for Contengency)	$	160,000
Approx Total Preliminary Budget	$	960,000
Vicinity Penalities	$	900,000

Energy Savings Summary
With Capstone C65 Microturbine & NG Boiler Plant

Annual electricity produced by cogeneration system	524,256	kWh/yr	(assumes 5% downtime)
Annual electricity obtained from grid	4,330,711	kWh/yr	(all electricity obtained from grid during cogen system downtime)
Annual electricity obtained from solar	222,084		
Annual Electricity Provided by Cogeneration System	10%		
Annual fuel consumed by cogeneration system	65,298	therms/yr	(assumes 5% downtime)
Annual hot water obtained from onsite boilers	11,905	therms/yr	(all thermal load obtained from boilers during cogen system downtime)
Thermal Load Provided by Cogeneration System	88%		
Annual Electric Cost	$529,204	/yr	
Annual Fuel Cost	$70,432	/yr	
Annual Energy Cost	$599,636	/yr	
Without Cogeneration System			
Annual electricity obtained from grid	4,854,969	kWh/yr	
Annual hot water obtained from District Energy (Vicinity)	25,649	therms/yr	
Annual Electric Cost	$624,076	/yr	
Annual Fuel Cost	$88,063	/yr	
Annual Energy Cost	$712,138	/yr	
Annual Cost Savings using cogeneration system & Boilers	$112,502	/yr	

Energy Savings
Summary
Capstone C65 Microturbine and ASHP Plant

Annual electricity produced by cogeneration system	524,256	kWh/yr	(assumes 5% downtime)
Annual electricity obtained from grid	4,330,711	kWh/yr	(all electricity obtained from grid during cogen system downtime)
Annual electricity obtained from solar	222,084		
Annual Electricity Provided by Cogeneration System	10%		
Annual fuel consumed by cogeneration system	65,298	therms/yr	(assumes 5% downtime)
Annual hot water obtained from onsite AS - HPWH	11,905	therms/yr	(all thermal load obtained from boilers during cogen system downtime)
Annual electricity provided to AS-HPWH	158,553.50	kWh/yr	
Thermal Load Provided by Cogeneration System	88%		
Annual Electric Cost	$529,204	/yr	
Annual Electric Cost for AS-HPWH	$78,566	/yr	
Annual Energy Cost	$607,769	/yr	
Without Cogeneration System			
Annual electricity obtained from grid	4,854,969	kWh/yr	
Annual hot water obtained from District Energy (Vicinity)	25,649	therms/yr	
Annual Electric Cost	$624,076	/yr	
Annual Fuel Cost	$88,063	/yr	
Annual Energy Cost	$712,138	/yr	
Annual Cost Savings using cogeneration system & Boilers	$104,369	/yr	