Industrial Assessment Center
U.S. DEPARTMENT OF ENERGY

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Lane Community College

Office Building

U.S. DEPARTMENT OF ENERGY

Oregon State University

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Abbreviations

AFUE Annual Fuel Utilization Efficiency
AHU Air Handling Unit
BTU British Thermal Unit
CFM Cubic Feet (per) Minute
CMU Concrete Masonry Unit
CV Constant Volume
DAT Discharge Air Temperature
DDC Direct Digital Control(s)
DegF Degrees Fahrenheit
DOE Department of Energy
DHW Domestic Hot Water
dP Discharge Pressure
dT Delta T (Temperature difference)
DX Direct Expansion
EEM Energy Efficiency Measure
EFLH Estimated Full Load Hours
ETO Energy Trust of Oregon
EUI Energy Use Index
HC Heating Coil
HP Horsepower
Hr Hour
HVAC Heating Ventilating & Air Conditioning
HW Heating Water
HWP Heating Water Pump
IAC Industrial Assessment Center
kBtu 1,000 Btus
kW Kilowatt
kWh Kilowatt-hours
lbs Pounds
LPD Lighting Power Density
MBH kBtu/hr (1,000 BTU/hr)
MAT Mixed Air Temperature
OAT Outside Air Temperature
RAT Return Air Temperature
RF Return Fan
SAT Supply Air Temperature
sf Square Feet
SF Supply Fan
SOO Sequence of Operations
SP Static Pressure
TMY3 Typical Meteorological Year
TU Terminal Unit
VAV Variable Air Volume
VFD Variable Frequency Drive
W Watts
Yr Year

Disclaimer

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

The intent of this energy analysis is to estimate energy savings associated with the recommended energy efficiency upgrades. This report is not intended to serve as a detailed engineering design document. Any description of proposed improvements that may be diagrammatic in nature are for the purpose of documenting the basis of cost and savings estimates for potential energy efficiency measures only. Detailed design efforts may be required by the participant to implement measures recommended as part of this energy analysis. While the recommendations in this study have been reviewed for technical accuracy and are believed to be reasonably accurate, all findings listed are estimates only. Actual savings and incentives may vary based on final installed measures and costs, actual operating hours, energy rates and usage.

Preface

The Commercial Building Energy Audit (CBEA) program is funded by the DOE and structured within the framework of its predecessor and parent program, the Industrial Assessment Center (IAC). The purpose of the CBEA is to provide customers with free energy assessments of commercial buildings, thereby increasing energy efficiency while simultaneously expanding the workforce of building efficiency professionals through the application of student participation from partnered colleges and universities. The scope of such audits is limited in nature, for the express purpose of identifying no-cost and low-cost energy savings opportunities, and a general view of potential capital improvements. This is accomplished by means of utility usage and billing evaluation, along with observation and analysis of energy using systems. The findings and recommendations within this report represent the conditions observed at the time of this site survey. Conditions and equipment usage are subject to change, and therefore the conclusions expressed within this report may not be evident in the future. The CBEA audit team has endeavored to meet what it believes is the applicable standard of care ordinarily exercised by others in conducting this energy audit. No other warranty, express or implied, is made regarding the information contained in this report.

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Building Efficiency Measure (EEM) Summary

These energy efficiency measures (EEMs) are suggested for the facility. Cost savings are based on average utility rates for electricity and natural gas. Actual rates and cost savings will differ. Non-energy cost benefits are related to cost-savings due to as-avoided maintenance. Simple payback is estimated using current utility rates and estimated project costs, which may vary over time.

Table 1: EEM Summary

Measure Number	Measure Description	Annual Energy and Cost Savings				Measure Cost and Simple Payback	
		Electricity Savings		Gas Fuel Savings	Total Cost Savings	Measure Cost	Simple Payback
		kWh	kW	Therms			Year
EEM 1	Lighting Upgrade	94958	28	-	$ 5,739	$ 21,350	4
EEM 2	Occupancy Sensors	32365	-	-	$ 1,887	$ 2,000	1
EEM 3	Upgrade Controls	324010	-	-	$ 1,949	$ 15,000	8
Totals		451333		0	$ 9,575	$ 38,350	4

Table 2: Additional Recommendations

Capital Improvement	Description	Annual Energy and Cost Savings				Measure Cost and Simple Payback	
		Electricity Savings		Gas Fuel Savings	Total Cost Savings	Measure Cost	Simple Payback
		kWh	kW	Therms			Year
EEM 4	Economzer Control on Upper Level	7310	-	-	$ 426	$ 10,000	23

Building Description

The Office Building was constructed in 1984, and is located in Corvallis, Oregon. The facility is a story structure with offices on both levels. The ground floor houses the Juvenile Department, Dial-A—Bus, County Human Resources, OSU Extension and public meeting rooms. The upper floor houses the Assessment, Finance and Tax, Environmental Health, IT Training Classrooms and additional public meeting rooms.

The facility is open to the public Monday – Friday from 8:00 am to 5:00 pm. Staff hours vary generally from 5:30 am – 7:00 pm.

The exterior walls are of wood frame construction, R-19 insulation, with gypsum wall board on the interior surfaces and exterior wood siding. The roof is sloped, constructed of wood truss and attic insulation with asphalt shingle roofing. Windows are fixed, double pane, with vinyl frames. The floors are wood with floor joists and insulation over a 24” vented crawl space. There have been no major renovations since the original construction of the facility.

Windows are double pane, vinyl frame and have a reflective coating to reduce solar gains.

A separate structure on the site is the County Facilities Storage and Shop building. It has similar construction to the office building, with the exception that it has a concrete slab floor.

The energy source for the office is electricity. Natural gas provides heating to the unit heaters in the storage building only.

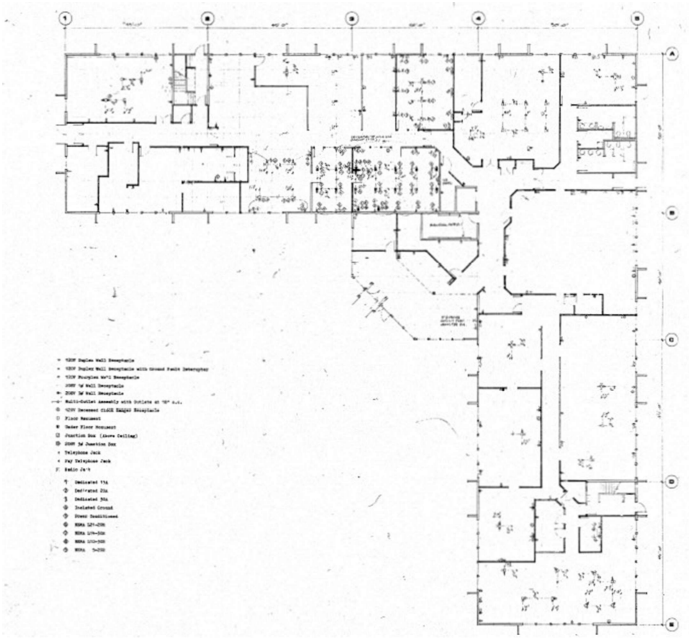


Figure 1 Office Building Lower Level Floor Plan

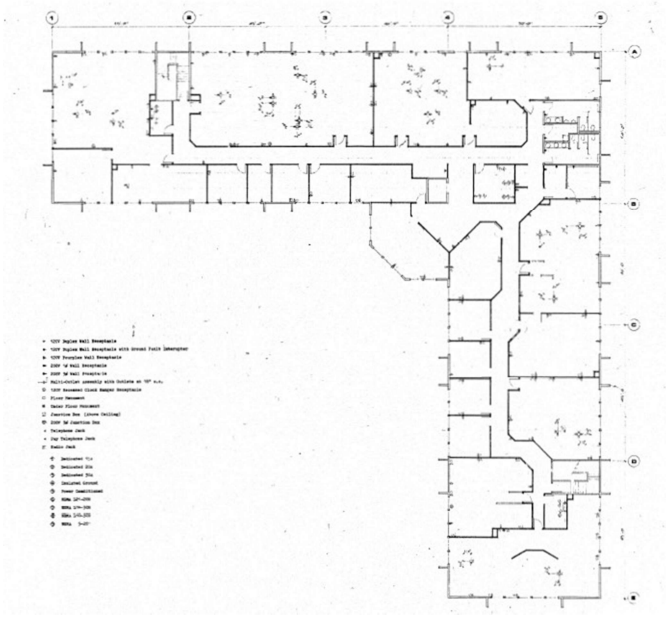


Figure 2 Office Building Upper Level Floor Plan

Best Practices

This audit is per ASHRAE Level 1 requirements. The building's energy cost and efficiency were assessed by analyzing 2021's utility data.

Utility analysis was used to produce reports on the monthly consumption of both electricity and natural gas. The output from these reports was used to benchmark this building against the median EUI for buildings of its size and type in the local vicinity.

The mechanical and lighting schedules were used to generate outlines of energy usage in terms of demand and energy consumption.

A site visit conducted on August 31st provided a walk-through survey of the facility including its construction, operation, and maintenance, and major energy consuming equipment. Feedback from the customer related to facility performance and comfort was used to inform the survey and the resulting recommendations within this report.

The data was then used to identify no-cost and low-cost measures for improving energy efficiency. Because calculations at this level are minimal, savings and costs are approximate.

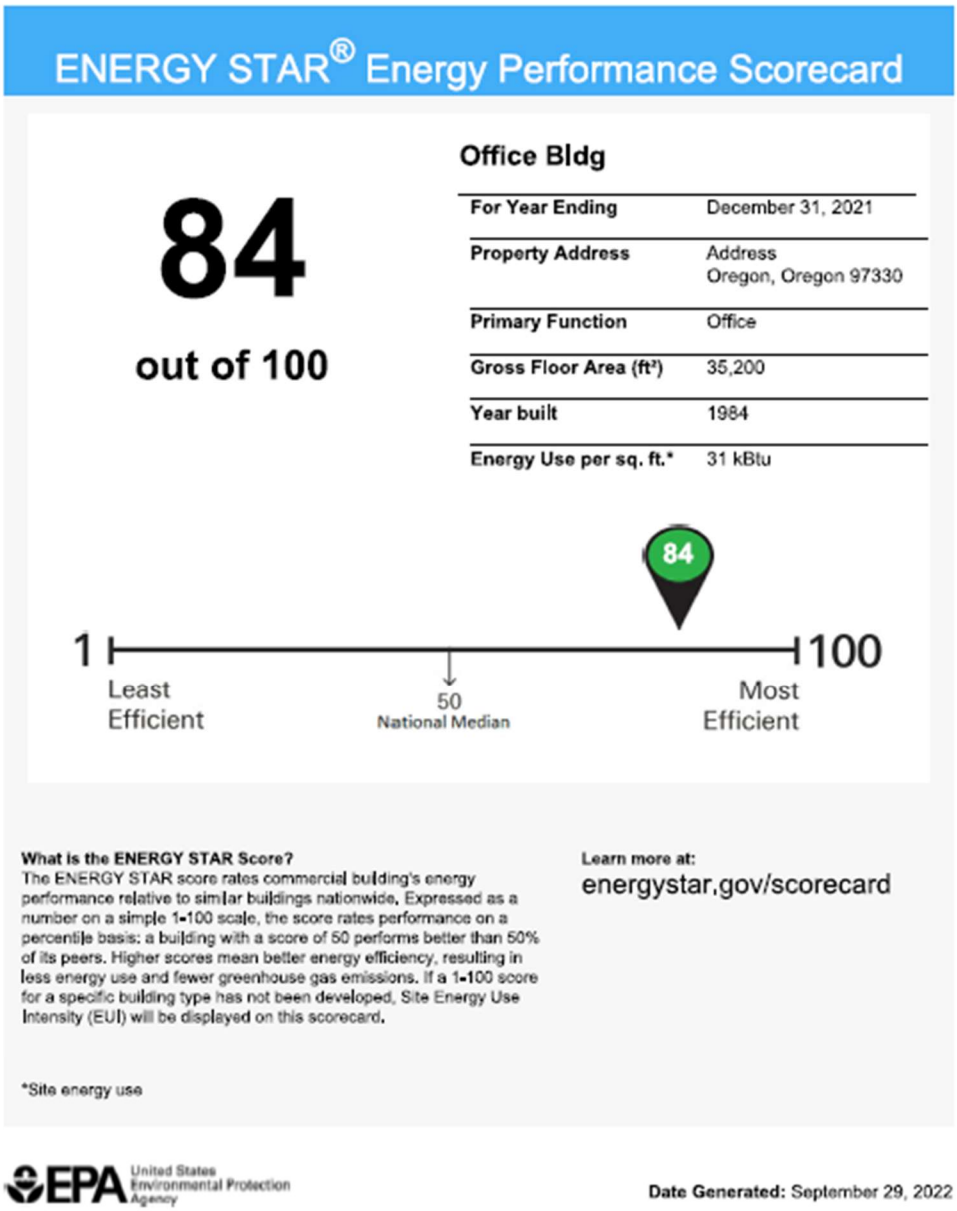
Energy Cost Analysis

Table 3: 2021 Utility Data

2021 Electrical Data						
Month	kWh	kWh Charge	Charge / kWh	kW	kW Charge	Fees
Jan	35,040	$ 2,035	$0.06	126	$881.31	$506.37
Feb	32,640	$ 1,886	$0.06	124	$866.59	$476.30
Mar	32,640	$ 1,886	$0.06	119	$833.64	$474.96
Apr	26,640	$ 1,553	$0.06	111	$787.96	$393.10
May	21,120	$ 1,240	$0.06	62	$508.17	$306.78
Jun	22,320	$ 1,308	$0.06	66	$531.01	$539.30
Jul	25,680	$ 1,500	$0.06	84	$633.79	$373.42
Aug	5,993	$ 352	$0.06	36	$268.41	$92.70
Sep	24,240	$ 1,418	$0.06	74	$576.69	$351.61
Oct	22,080	$ 1,297	$0.06	72	$565.27	$322.33
Nov	30,720	$ 1,795	$0.06	128	$885.58	$452.49
Dec	41,040	$ 2,389	$0.06	125	$864.60	$589.65
TOTALS	320,153	$ 18,661		1,127	$8,203.02	$4,879.01

2021 Natural Gas Data					
Month	Therms	Cost	Cost / Therm	Other Charges	Total
Jan	549	$432.10	$0.787	$48.99	$481.09
Feb	864	$487.36	$0.787	$58.01	$545.37
Mar	656	$514.01	$0.787	$18.56	$532.57
Apr	494	$390.11	$0.787	$41.53	$964.21
May	398	$300.51	$0.787	$35.66	$336.17
Jun	150	$148.82	$0.787	$25.73	$174.55
Jul	110	$88.08	$0.787	$25.24	$113.32
Aug	6	$4.49	$0.787	$16.28	$20.77
Sep	1	$0.88	$0.787	$16.04	$16.92
Oct	0	$0.00	$0.787	$15.99	$15.99
Nov	1	$0.88	$0.787	$16.04	$16.92
Dec	327	$282.41	$0.787	$34.48	$316.89
TOTALS	3,556.0	$2,649.65		$352.55	$3,534.77

The facility has an EUI (Energy Utilization Index) of 31 kBtu/sf. The Energy Star Performance Scorecard rates the facility at 84 out of 100 which is above the national median.



ENERGY STAR® Energy Performance Scorecard

84

out of 100

Office Bldg

For Year Ending	December 31, 2021
Property Address	Address Oregon, Oregon 97330
Primary Function	Office
Gross Floor Area (ft²)	35,200
Year built	1984
Energy Use per sq. ft.*	31 kBtu

84

1 — 100

Least Efficient

50 National Median

Most Efficient

What is the ENERGY STAR Score?
The ENERGY STAR score rates commercial building's energy performance relative to similar buildings nationwide. Expressed as a number on a simple 1-100 scale, the score rates performance on a percentile basis: a building with a score of 50 performs better than 50% of its peers. Higher scores mean better energy efficiency, resulting in less energy use and fewer greenhouse gas emissions. If a 1-100 score for a specific building type has not been developed, Site Energy Use Intensity (EUI) will be displayed on this scorecard.

Learn more at:
energystar.gov/scorecard

*Site energy use

EPA United States Environmental Protection Agency

Date Generated: September 29, 2022

Figure 4 Energy Performance Scorecard

Major Energy Consuming Equipment

Mechanical

Heating, Ventilation and Air Conditioning

General Office Spaces

The main HVAC system for the office building consists of split system heat pumps. The air handling units are located in various mechanical rooms throughout the facility. The first floor air handling units are installed within mechanical closets. The upper level air handling units are installed in the attic space above the second floor. The outdoor heat pumps are mounted on the ground and located around the perimeter of the facility. Ventilation air is ducted to the first floor units through the crawlspace. The ventilation to the upper level is ducted from exterior wall louvers. Most of the units have been replaced in the last 3 years and have been maintained in good condition.

The facility is controlled by programmable thermostats There is no central control. Each system has its own thermostat. There is no air side economizer control or demand control ventilation on the systems.

Restrooms are exhausted by independent local exhaust fans.

Server Room

There is a Server Room on the first floor that is conditioned by a split system air conditioning unit. This system is scheduled to be replaced by dedicated computer room equipment with temperature and humidity control.

Storage and Shop Facility

The storage and shop building is heated and ventilated with natural gas fired units heaters. The units are controlled by local thermostats set to maintain heating setpoints of 68 degF. There is no cooling in the storage/shop building.

Domestic Hot Water

Domestic hot water use in the facility is limited to break room sinks and restroom lavatories. There are no showers or laundry services at the site. The domestic hot water system consists of electric tank type units. There are no recirculating pumps on the systems.

Lighting

The general lighting in the offices consists of 2 ft x 4ft ceiling recessed luminaires with 2-lamp 4ft T8 fluorescent bulbs. In the front entrance lobby there are recessed can lights with incandescent bulbs and track lighting for wall displays that have LED bulbs.

The lighting in the offices is manually controlled by wall switches. The entrance lobby is controlled by occupancy sensor.

The lighting in the storage/shop consists of a combination of 8 ft and 12 ft suspended fixtures with T12 bulbs. These are also manually controlled.

Detailed Energy Efficiency Measures

EEM 1 Lighting Upgrade

EXISTING CONDITIONS

The lighting in the general office areas consist of 2' x 4' luminaires with 2-4 ft T8 lamps. In the Shop building the lighting consists of suspended fixtures that are a combination of T8 and T12 lamps.

PROPOSED MEASURE DESCRIPTION

Replace existing T8 and T12 lamps with LED.

SAVINGS METHODOLOGY

Spreadsheet calculations are used to determine energy, demand and cost savings.

Existing Conditions

Fixture Type	lamps per Fixtrure	Wall/lamp	Watt/fixture	Qty	Total Watt	
4' T8	2	32	64	389	24896	
8' T8	2	59	118	14	1652	
4' T12	2	60	120	1	120	
8' T12	2	75	150	23	3450	
				427	30118	Watt Existing

Recommended Change

4' LED	2	15	30	389	11670	
8' LED	2	44	88	14	1232	
4' LED	2	15	30	1	30	
8' LED	2	44	88	23	2024	Watt Proposed

Hours "ON"	3380	hrs
Existing Energy =	101799	kWh
Existing Energy Cost = $	5,934	
Proposed Energy =	6841	kWh
Proposed Energy Cost = $	399	
Existing Demand =	30	
Existing Demand Cost = $	219	
Proposed Demand =	2.0	
Proposed Demand Cost =	15	

Calculations

Energy (kWh) = Lighting Fixture Watt X No. of Fixture x "ON Hrs

Demand (kW) = Lighting total Watt/1000

Estimated Cost/Fixture =	$20/tube
Installation	$30/Fixture
Total Count	427
Total Cost = $	21,350

EEM #1 Estimated Savings			
Annual Energy Usage & Savings Estimate	Baseline Electric Usage (kWh)		101799
	Proposed Electric Usage (kWh)		6841
	Electric Savings (kWh)		94958
	Electric Cost Savings ($)	$	5,535
	Demand Savings (kW)		28
	Electric Demand Savings ($)	$	204
	Baseline Natural Gas Usage (Therms)	-	
	Proposed Natural Gas Usage (Therms)	-	
	Natural Gas Savings (Therms)	-	
	Natural Gas Savings ($)	-	
	Annual Energy Cost Savings	$	5,739
Measure Cost & Simple Payback	Project Cost	$	21,350
	Simple Payback (Cost/Savings)		3.7

EEM 2 Occupancy Sensors

EXISTING CONDITIONS

Office lighting is controlled by wall switches.

PROPOSED MEASURE DESCRIPTION

Replace existing wall switches with occupancy sensors.

SAVINGS METHODOLOGY

Spreadsheet calculations are used to determine energy and cost savings.

Offices do not have Occupancy Sensors

Fixture Type	Description	Watt/Fixture	Quantity	Total Watt Fixture Type
General Offices	4' T8	64	389	24896

"ON" Time Existing= 3380 hrs

Proposed reduces "ON" Time from 10 hrs/day 5 days per week to 8 hrs/day

"ON" Time proposed = 2080 hrs

Calculations

Energy (kWh) = Lighting Fixture Watt X No. of Fixture x "ON Hrs

EEM #2 Estimated Savings			
Annual Energy Usage & Savings Estimate	Baseline Electric Usage (kWh)		84148
	Proposed Electric Usage (kWh)		51784
	Electric Savings (kWh)		32365
	Electric Cost Savings ($)	$	1,887
	Baseline Natural Gas Usage (Therms)		
	Proposed Natural Gas Usage (Therms)	-	
	Natural Gas Savings (Therms)	-	
	Natural Gas Savings ($)	$	-
	Annual Energy Cost Savings	$	1,887
Measure Cost & Simple Payback	Project Cost	$	2,000
	Simple Payback (Cost/Savings)		1.1

EEM 3 Update Controls

EXISTING CONDITIONS

The split system heat pumps are controlled by stand-alone programmable thermostats.

PROPOSED MEASURE DESCRIPTION

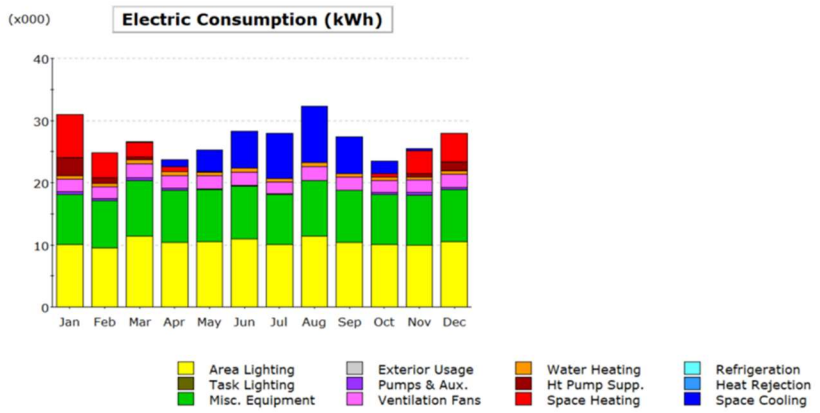
Replace existing thermostats with digital control system and sensors providing for control access to the facility.

SAVINGS METHODOLOGY

DOE Energy Modeling eQUEST software was used to estimate baseline energy use and compare this with upgrading controls energy use. It is assumed that the controls will optimize the run time of the HVAC equipment. The baseline energy model was calibrated to 2021 total energy use (kWh) to within 5%. This is considered acceptable for this level of analysis.

Calculations				Proposed:
				DDC Control
Elec Cost =	$	0.06		Assumes controls will provide
Baseline Energy Use =		324010	kWh	closer scheduling of equipment
Proposed Energy Use =		290570	kWh	
Energy Savings =		33440	kWh	New Contols $ 15,000
Energy Cost Savings =	$	1,949		

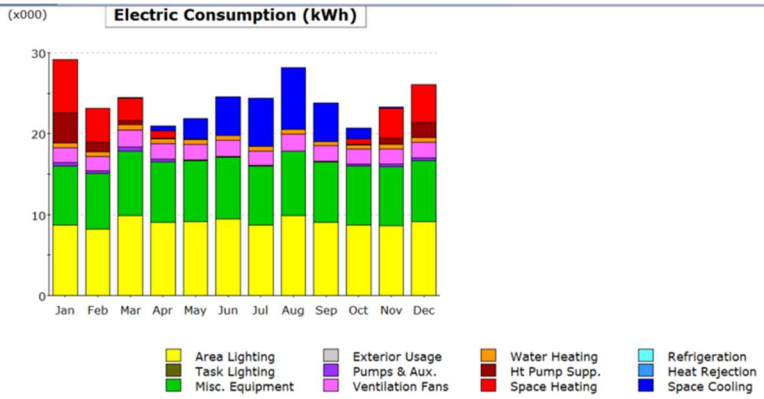
EEM #3 Estimated Savings			
	Electric Savings (kWh)		324010
	Electric Cost Savings ($)	$	1,949
	Baseline Natural Gas Usage (Therms)		0
	Proposed Natural Gas Usage (Therms)		0
	Natural Gas Savings (Therms)		0
	Natural Gas Savings ($)	$	-
	Annual Energy Cost Savings	$	1,949
Measure Cost & Simple Payback	Project Cost	$	15,000
	Simple Payback (Cost/Savings)		7.7



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.00	0.04	0.11	1.12	3.47	5.96	7.24	9.11	5.91	1.94	0.30	0.02	35.22
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	6.99	4.07	2.35	0.78	0.07	-	-	-	-	0.55	3.62	4.65	23.08
HP Supp.	2.83	0.84	0.38	0.03	-	-	-	-	-	0.03	0.56	1.42	6.08
Hot Water	0.59	0.57	0.69	0.62	0.60	0.59	0.52	0.58	0.53	0.52	0.54	0.59	6.94
Vent. Fans	2.00	1.90	2.31	2.11	2.11	2.21	2.00	2.31	2.11	2.00	2.00	2.11	25.16
Pumps & Aux.	0.42	0.38	0.46	0.34	0.16	0.07	0.03	0.02	0.06	0.25	0.39	0.35	2.93
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	8.12	7.57	8.89	8.28	8.37	8.53	8.12	8.89	8.28	8.12	8.02	8.37	99.56
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	10.01	9.47	11.39	10.45	10.47	10.91	10.01	11.39	10.45	10.01	9.99	10.47	125.03
Total	30.97	24.85	26.57	23.71	25.24	28.27	27.92	32.30	27.33	23.43	25.43	27.98	324.01

EEM #3 Energy Model – Baseline Energy Use



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.00	0.03	0.05	0.59	2.51	4.77	5.97	7.56	4.80	1.41	0.19	0.01	27.89
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	6.65	4.15	2.76	0.95	0.09	-	-	-	-	0.67	3.68	4.68	23.62
HP Supp.	3.63	1.21	0.55	0.05	-	-	-	-	-	0.04	0.78	1.85	8.12
Hot Water	0.59	0.57	0.69	0.62	0.60	0.59	0.52	0.58	0.53	0.52	0.54	0.59	6.95
Vent. Fans	1.82	1.73	2.10	1.91	1.91	2.01	1.82	2.10	1.91	1.82	1.82	1.91	22.88
Pumps & Aux.	0.43	0.38	0.45	0.34	0.16	0.07	0.03	0.02	0.06	0.24	0.39	0.35	2.93
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	7.33	6.82	7.98	7.45	7.55	7.67	7.33	7.98	7.45	7.33	7.23	7.55	89.65
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	8.70	8.23	9.88	9.07	9.09	9.46	8.70	9.88	9.07	8.70	8.67	9.09	108.53
Total	29.16	23.13	24.45	20.98	21.90	24.57	24.37	28.11	23.83	20.73	23.30	26.04	290.57

EEM #3 Energy Model – Proposed Energy Use

Capital Improvements

EEM 4 Provide Economizer on Upper Level Units

EXISTING CONDITIONS

The split system heat pumps on the upper level do not have functioning economizer control.

PROPOSED MEASURE DESCRIPTION

Provide economizer control on the upper level heat pumps.

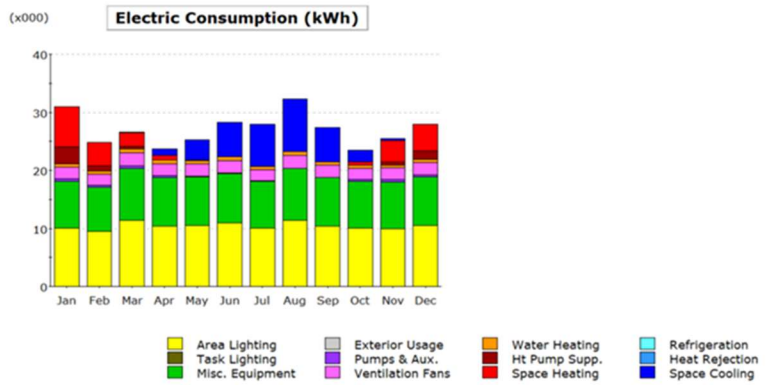
SAVINGS METHODOLOGY

DOE Energy Modeling eQUEST software was used to estimate baseline energy use and compare this with adding economizers to the upper level split system heat pumps. The baseline energy model was calibrated to 2021 total energy use (kWh) to within 5%. This is considered acceptable for this level of analysis.

Calculations

Elec Cost =	$	0.06	
Baseline Energy Use =		324010	kWh
Proposed Energy Use =		316700	kWh
Energy Savings =		7310	kWh
Energy Cost Savings =	$	426.1	

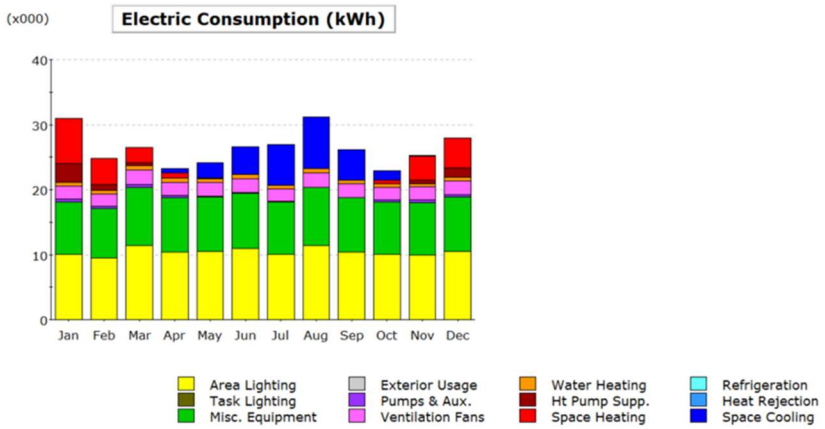
EEM #4 Estimated Savings			
	Electric Savings (kWh)		7310
	Electric Cost Savings ($)	$	426
	Baseline Natural Gas Usage (Therms)		0
	Proposed Natural Gas Usage (Therms)		0
	Natural Gas Savings (Therms)		0
	Natural Gas Savings ($)	$	-
	Annual Energy Cost Savings	$	426
Measure Cost & Simple Payback	Project Cost	$	10,000
	Simple Payback (Cost/Savings)		23.5



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.00	0.04	0.11	1.12	3.47	5.96	7.24	9.11	5.91	1.94	0.30	0.02	35.22
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	6.99	4.07	2.35	0.78	0.07	-	-	-	-	0.55	3.62	4.65	23.08
HP Supp.	2.83	0.84	0.38	0.03	-	-	-	-	-	0.03	0.56	1.42	6.08
Hot Water	0.59	0.57	0.69	0.62	0.60	0.59	0.52	0.58	0.53	0.52	0.54	0.59	6.94
Vent. Fans	2.00	1.90	2.31	2.11	2.11	2.21	2.00	2.31	2.11	2.00	2.00	2.11	25.16
Pumps & Aux.	0.42	0.38	0.46	0.34	0.16	0.07	0.03	0.02	0.06	0.25	0.39	0.35	2.93
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	8.12	7.57	8.89	8.28	8.37	8.53	8.12	8.89	8.28	8.12	8.02	8.37	99.56
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	10.01	9.47	11.39	10.45	10.47	10.91	10.01	11.39	10.45	10.01	9.99	10.47	125.03
Total	30.97	24.85	26.57	23.71	25.24	28.27	27.92	32.30	27.33	23.43	25.43	27.98	324.01

EEM #4 Energy Model – Baseline Energy Use



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.00	0.02	0.05	0.61	2.37	4.28	6.21	8.04	4.67	1.45	0.18	0.01	27.89
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	6.99	4.07	2.35	0.78	0.07	-	-	-	-	0.55	3.62	4.65	23.08
HP Supp.	2.83	0.84	0.38	0.03	-	-	-	-	-	0.03	0.56	1.42	6.08
Hot Water	0.59	0.57	0.69	0.62	0.60	0.59	0.52	0.58	0.53	0.52	0.54	0.59	6.94
Vent. Fans	2.00	1.90	2.31	2.11	2.11	2.21	2.00	2.31	2.11	2.00	2.00	2.11	25.16
Pumps & Aux.	0.42	0.38	0.46	0.34	0.16	0.07	0.03	0.02	0.06	0.25	0.39	0.35	2.94
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	8.12	7.57	8.89	8.28	8.37	8.53	8.12	8.89	8.28	8.12	8.02	8.37	99.56
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	10.01	9.47	11.39	10.45	10.47	10.91	10.01	11.39	10.45	10.01	9.99	10.47	125.03
Total	30.97	24.82	26.52	23.21	24.15	26.59	26.90	31.22	26.09	22.94	25.31	27.97	316.70

EEM #4 Energy Model – Proposed Energy Use

Appendix

Appendix 1 Photos

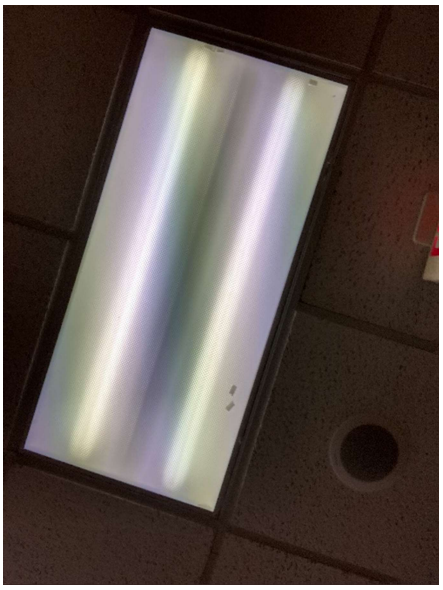


Figure A: Typical Office Lighting

Figure B: Typical Split System Heat Pump Indoor Unit (Lower Level Mechanical Room)

Figure C: Typical Split System Heat Pump Indoor Unit (Upper Level Attic Installation)

Figure D: Typical Split System Heat Pump Outdoor Units

Figure E Electric Storage Tank Domestic Water Heater

Appendix 2 eQUEST Energy Model Geometry

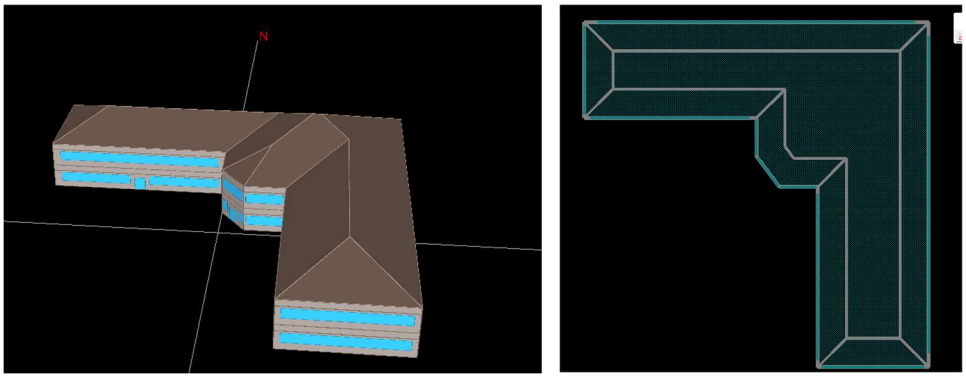


Figure F 3-D and 2-D Dimensional Geometry