INVESTMENT GRADE AUDIT

PREPARED FOR

PUTNAM COUNTY, NEW YORK

OCTOBER 28, 2019 – REVISED AS OF DECEMBER 9, 2019

AMERESCO
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PREPARED FOR

Putnam County, New York

October 28, 2019 – revised as of December 9, 2019

INVESTMENT GRADE AUDIT

PRESENTED BY

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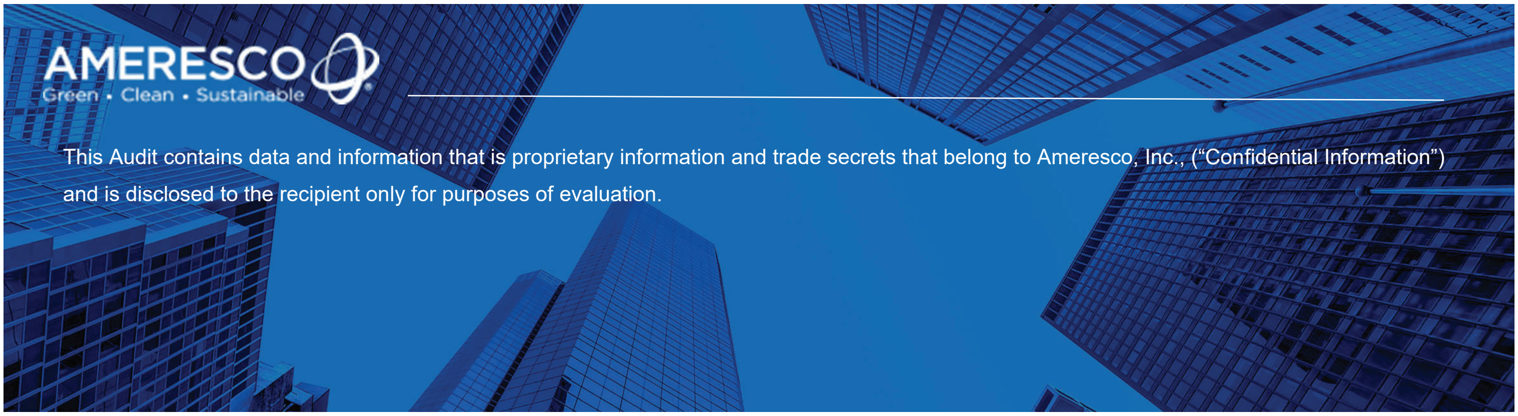

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EXECUTIVE SUMMARY

PROJECT INTENT

Ameresco has completed the Investment Grade Audit (IGA) for Putnam County, New York. In the IGA we set forth a plan which identifies, manages and conserves energy through a variety of Energy Conservation Measures (ECM). By implementing these ECMs with Ameresco each facility within the County will become a more safe, productive and cost-effective environment for the taxpayers and employees. The facilities included in the IGA are:

- **Sheriff's Department/Correctional Facility**
- **David D. Bruen County Office Building**
- **121 Main Street**
- **Emergency Operations Center/TOPS**
- **Donald B. Smith Government Camps – Building 2**
- **Kern Building – Health Dept/DMV/WIC**
- **Putnam Valley Senior Center**
- **Highway Department – Building 1**
- **Highway Department – Building 3**
- **Board of Elections**
- **Putnam Family & Community Services – 1816**
- **Tilly Foster Farm Building #8**
- **New Putnam County Courthouse**
- **1812 Courthouse**
- **Putnam National Golf Club – Clubhouse**
- **`Donald B. Smith Government Camps – Building 1**
- **Donald B. Smith Government Camps – Building 3**
- **William Koehler Senior Center**
- **Putnam Family & Community Services – 1808**
- **Highway Department – Building 2**
- **Highway Department – Building 4**
- **Senator Vincent Leibell Veterans' Home**
- **Burchetta Building (Law Dept)**

PROJECT FINDINGS

The ECMs identified will reduce the energy consumption at these facilities through a combination of the installation of more efficient equipment and modifications to the operation of existing equipment. The recommendations include:

- Lighting System Improvements - Interior
- Lighting System Improvements - Exterior
- Recommission Energy Management Systems
- Web-enabled Programmable Thermostats
- Heat Timer & Thermostatic Radiator Valves
- Fuel Oil to Natural Gas Conversion
- Variable Frequency Drives for HW Pumps
- Premium Efficiency Transformers
- Vending Misers
- Walk-in Refrigeration Controls
- Steam Trap Replacements
- Infiltration Reductions
- Pipe Insulation
- Boiler Replacements
- Window Replacements
- Solar PV Array
- AHU Replacements
- Plug Load Controllers
- Chiller Replacement
- Siding Replacement
- Roof Replacement
- Window Restoration
- Move Register

Table 1 summarizes the project information derived through the IGA. That information is then compared to the project presented in the documents previously submitted to the County.

Table 1: Project Summary

Project Financial Summary	IGA
Design and Specification	$395,422
Energy Efficiency Measure Project Costs	$7,513,013
Total Implementation Costs	**$7,908,435**
Total Project Savings over the Project Term	**$7,939,948**

Table 2 identifies the source of the savings identified during the IGA.

Table 2: Projected Savings, Costs and Simple Pay Back

Ecm #	ECM Name	Total Project Savings	Total Project Costs	SPB
1	Lighting System Improvements - Interior	$ 100,831	$ 1,168,714	11.59
2	Lighting System Improvements - Exterior	$ 25,107	$ 233,085	9.28
3	Recommission Energy Management Systems	$ 61,230	$ 274,503	4.48
4	Web-enabled Programmable Thermostats	$ 37,006	$ 104,869	2.83
5	Heat Timer & Thermostatic Radiator Valves	$ 6,363	$ 71,812	11.29
6	Fuel Oil to Natural Gas Conversion	$ 9,925	$ 420,230	42.34
8	Variable Frequency Drives For HW Pumps	$ 4,307	$ 47,811	11.10
10	Premium Efficiency Transformers	$ 7,820	$ 180,608	23.09
11	Vending Misers	$ 105	$ 945	8.97
12	Walk-in Refrigeration Controls	$ 2,228	$ 31,947	14.34
13	Steam Trap Replacements	$ 2,844	$ 49,555	17.42
14	Infiltration Reductions	$ 10,356	$ 116,002	11.20
15	Pipe Insulation	$ 5,005	$ 55,484	11.09
16	Boiler Replacements	$ 766	$ 76,947	100.43
17	Window Replacements	$ 881	$ 282,290	320.31
18	Solar PV Array	$ 39,520	$ 737,046	18.65
19	AHU Replacements	$ 6,295	$ 891,472	141.61
20	Plug Load Controllers	$ 1,491	$ 18,653	12.51
22	Chiller Replacement	$ 3,878	$ 171,559	44.24
23	Siding Replacement	$ 294	$ 254,840	867.69
24	Roof Replacement	$ 1,539	$ 1,801,208	1,170.25
25	Window Restoration	$ 3,966	$ 264,386	66.67
26	Move Register	$ 721	$ 9,733	13.50
X	Project Contingency	$ -	$ 644,736	-
		$ 332,479	**$ 7,908,435**	**23.79**

Table 3 identifies the ECMs being implemented at each applicable facility.

Table 3: ECM Matrix

Putnam County NY Energy Conservation Measures (ECMs)	Lighting System Improvements - Interior	Lighting System Improvements - Exterior	Recommission Energy Management Systems	Web-enabled Programmable Thermostats	Heat Timer & Thermostatic Radiator Valves	Fuel Oil to Natural Gas Conversion	Variable Frequency Drives For HW Pumps	Premium Efficiency Transformer	Vending Misers	Walk-in Refrigeration Controls	Steam Trap Replacements	Infiltration Reductions	Pipe Insulation	Boiler Replacements	Window Replacements	Solar PV Array	AHU Replacements	Plug Load Controllers	Chiller Replacement	Siding Replacement	Roof Replacement	Window Restoration	Move Register	
Facility	**1**	**2**	**3**	**4**	**5**	**6**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**22**	**23**	**24**	**25**	**26**	
Sheriff's Department/Correctional Facility	X	X	X				X	X	X	X		X						X				X		
New Putnam County Courthouse	X	X	X					X				X	X					X						
David D. Bruen County Office Building	X	X			X	X					X	X	X			X		X				X		
1812 Courthouse	X	X	X			X						X	X					X	X					
121 Main Street	X	X		X								X						X						
Putnam National Golf Club - Clubhouse	X	X		X								X	X		X		X			X	X			
Emergency Operations Center/TOPS	X	X	X				X	X				X	X					X						
Donald B. Smith Government Campus - Building 1																X								
Donald B. Smith Government Campus - Building 2	X	X		X								X				X	X	X			X			
Donald B. Smith Government Campus - Building 3	X	X		X		X						X				X	X	X			X			
Kern Building - Health Dept/DMV/WIC	X	X		X								X				X		X			X	X		
William Koehler Senior Center	X	X		X				X		X		X	X				X						X	
Putnam Valley Senior Center	X	X		X								X	X											
Putnam Family & Community Services - 1808	X	X		X								X					X	X						
Highway Department - Building 1 Admin	X	X		X		X						X	X					X						
Highway Department - Building 2 Sign Shop	X	X		X								X												
Highway Department - Building 3 Dispatch/Garage	X	X		X								X		X										
Highway Department - Building 4 Garage	X	X		X								X												
Board of Elections	X	X		X								X												
Senator Vincent Leibell Veterans' Home	X	X											X											
Putnam Family & Community Services - 1816	X	X		X																				
Burchetta Building (Law Dept) - 48 Gleneida	X	X		X								X	X											
Tilly Foster Farm Building #8	X	X		X																				
Included Sites	22	22	4	16	1	4	2	4	1	2	1	19	10	1	1	5	5	11	1	1	4	3	1	

FINANCIAL TERMS

This IGA presents an extremely beneficial economic scenario to the County as shown in Table 4. Ameresco has maximized the net economic benefit to the County by optimizing the level of guaranteed savings. The financial terms of the proposal advanced by Ameresco are displayed in the table above. Additional information on the financial terms of the project is provided in Section D of the Comprehensive Energy Audit report.

Table 4: Financial Benefits to the County

Financial Terms	
Financing Term (years)	18
Savings Guarantee Period (years)	18
Total Initial Project Costs	$7,908,435
County Capital Buydown	$3,600,000
Utility Incentives	$123,742
Assumed Financed Amount	$4,184,693
Energy Cost Escalation (Annually)	3.0%
Annual Project Savings (Initial)	$331,135

An annual 3% escalation of energy prices from the base year period is included in the IGA calculations. A full eighteen years of guaranteed savings and performance period verification services during the first three (3) years have been provided to the County. Additional information on the specific services included is provided in Section C and Section F of the Investment Grade Audit report.

The project ECMs, in aggregate, are completely self-funding through the project savings over an 18 year project term. The utility rebates shown for the project were estimated from Central Hudson and NYSEG current programs for municipalities – additional information is included in Section D. For the solar PV scope, Ameresco has netted the cost of implementation by the assumed NYSUN program incentive, as required by such program.

Ameresco has the financial resources to successfully fulfill our obligations on this contract, from project inception through construction completion and commissioning.

IMPLEMENTATION

Ameresco has the ability to physically accomplish all of the varied aspects required to implement a performance contract of this project's scope and duration. The capabilities of our local New York office in Newburgh, as well as other regional staff associated with the County's project, are unsurpassed in carrying out the tasks involved, with absolutely no disruption to the County.

Construction will commence once the financing by the County is in place and the Notice to Proceed has been issued.

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SECTION 1: BASELINE

OVERVIEW

Putnam County is located in the Lower Hudson Valley region of New York State. The buildings audited in this project include courthouses, offices, senior centers, community service buildings, garages and others.

Ameresco and Putnam County executed an audit agreement dated January 22, 2019 which included the potential to audit sixty (60) individual buildings. Many of these buildings were later removed by the County. Please refer to Section 2 for details. After refining the initial list with the County Ameresco performed a Preliminary Energy Audit (PEA) for Putnam County on nineteen (19) buildings throughout the County. The total area of building space audited was approximately 415,205 square feet. After review of the facilities with County personnel, the County decided to further develop a total of twenty-three (23) buildings throughout the County during the Investment Grade Audit (IGA) phase. The list consisted of the following buildings.

- Sheriff’s Department/Correctional Facility
- David D. Bruen County Office Building
- 121 Main Street
- Emergency Operations Center/TOPS
- Donald B. Smith Government Camps – Building 2
- Kern Building – Health Dept/DMV/WIC
- Putnam Valley Senior Center
- Highway Department – Building 1
- Highway Department – Building 3
- Board of Elections
- Putnam Family & Community Services – 1816
- Tilly Foster Farm Building #8
- New Putnam County Courthouse
- 1812 Courthouse
- Putnam National Golf Club – Clubhouse
- `Donald B. Smith Government Camps – Building 1
- Donald B. Smith Government Camps – Building 3
- William Koehler Senior Center
- Putnam Family & Community Services – 1808
- Highway Department – Building 2
- Highway Department – Building 4
- Senator Vincent Leibell Veterans’ Home
- Burchetta Building (Law Dept)

The total area of building space audited in the IGA was approximately 440,216 square feet.

As part of the IGA, Ameresco developed a baseline model for each facility included in the project. The baseline developed for each building is based on fiscal year 2018 (FY18) utility data, with a small weather adjustment to the thermal data to match FY18 heating degree days (HDD) to 30-year historic data for Danbury, CT. Utility usage included was 5,683,066 kWh, 171,018 CCF of natural gas, 12,859 gallons of propane, and 44,157 gallons of #2 fuel oil. The total utility cost for this time period was about $906,546. This cost includes estimates of electrical charges and NYSEG natural gas charges based on current rates because actual billed electrical charges and NYSEG natural gas charges for the full time period were unavailable.

The baseline utility cost shown in the proforma located in Section 4 is based on current utility rates and does not include customer charges. Further, many of the tariffs the buildings receive electricity and natural gas under include block rate structures. These structures charge different rates depending on how much is used. Ameresco is only including rates that reflect blocks that will be affected by the ECMs. These rates are shown in Section 7 in the Utility Rate Table. The baseline utility cost shown in the proforma located in Section 4 is the product of the baseline utility energy units multiplied by the utility rates shown in Section 7.

Table 1.1 gives the square footage for each facility analyzed, along with the energy performance of each building, in terms of fossil fuel and electricity usage per square foot. Energy performance is the ratio of yearly energy use by square footage and is a good indicator of how well a building performs. The energy performance of each of the municipal buildings was calculated from the utility information provided by County personnel and directly from the utility companies.

The total mbtu/gsf represents the total energy usage for the entire facility on a square foot basis. The total energy usage for the entire facility on a square foot basis is the addition of both electrical and fossil fuel performance (mbtu/gsf) if applicable. The primary source for space heating is natural gas although #2 fuel oil heating is used at a few locations. Electric cooling is utilized to varying degree in all buildings, either via packaged roof top units, split system condensing units or local space coolers. Buildings with larger percent building cooled operate at a higher annual electrical mbtu/gsf.

Table 1.1: List of Audited Buildings and Weather Adjusted Energy Performance

Facility Name	**Gross Square Feet**	**Electric kWh/g.s.f.**	**Fuel MBTU / g.s.f.**	**Total EUI MBTU / g.s.f.**
Sheriff's Department/Correctional Facility	87,895	16.1	69.6	124.6
New Putnam County Courthouse	50,137	19.9	70.8	138.8
David D. Bruen County Office Building	40,320	5.7	31.9[1]	62.2
1812 Courthouse	13,605	6.8	31.9	23.1
121 Main Street	32,200	4.8	27.1	43.5
Putnam National Golf Club - Clubhouse	26,070	11.1	38.0	75.8
Emergency Operations Center/TOPS	24,922	27.3	51.7	145.0
Donald B. Smith Government Campus - Building 1	6,870	11.0 [2]	55.5 [3]	92.9
Donald B. Smith Government Campus - Building 2	15,900	11.0	55.5	92.9
Donald B. Smith Government Campus - Building 3	20,140	11.0	62.7	100.1
Kern Building - Health Dept/DMV/WIC	19,365	13.5	42.8	88.7
William Koehler Senior Center	17,976	15.3	88.5	140.6
Putnam Valley Senior Center	14,292	9.1	39.6 [4]	70.6
Putnam Family & Community Services - 1808	11,333	12.8	39.2	82.8
Highway Department - Building 1 Admin	5,400	15.2	63.4 [5]	115.3
Highway Department - Building 2 Sign Shop	3,240	6.6 [6]	48.4	70.8
Highway Department - Building 3 Dispatch/Garage	9,600	10.3	75.8	111.1
Highway Department - Building 4 Garage	5,000	6.6	91.5	113.9
Board of Elections	7,260	7.0	77.0	101.0
Senator Vincent Leibell Veterans' Home	6,628	7.6	67.1	92.9
Putnam Family & Community Services - 1816	5,333	9.0	41.6	72.3
Burchetta Building (Law Dept) - 48 Gleneida	4,130	10.0	64.5	98.5
Tilly Foster Farm Building #8	12,600	9.1	85.2	116.4
Totals	**440,216**	**12.9**	**56.2**	**100.3**

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[1] Bruen County Office Building and 1812 Courthouse share a fuel oil tank. Usage per square foot is averaged across both buildings.
[2] Electrical usage for Government Campus Buildings shared between all three buildings.
[3] Same gas-fired boiler serves Government Campus Buildings 1 and 2
[4] Average of FY2018 and FY2019 fuel oil usage at Putnam Valley Senior Center used due to uneven delivery schedule.
[5] Average of FY2018 and FY2019 fuel oil usage at Highway Department used due to uneven delivery schedule.
[6] Highway Department Sign Shop and Garage share electrical usage.

Using information from the energy performance table along with investigating the existing conditions of equipment and systems, Ameresco has identified several key opportunities to reduce utility costs for each facility. Many of those savings opportunities have been captured in the Energy Conservation Measures (ECM) and are detailed in Section 3.

BASELINE INFORMATION

The baseline utility data for this Investment Grade Audit is based on the Fiscal 2018 energy data (*July 2017 through June 2018*). This was the most recent, complete fiscal year information available and the annual heating degree days (HDD) was only slightly lower than the 30-year average weather conditions for Danbury, CT.

Utilities are supplied through a number of different providers. At present, NYSEG provides delivery services while Energy Cooperative of America provides commodity for electricity for all buildings. Natural Gas is delivered by Central Hudson Gas and is supplied by East Coast Power & Gas, LLC for all natural gas buildings except for 121 Main Street and the Kern Building, which receive natural gas delivery and supply from NYSEG. #2 fuel oil is delivered to the Bruen County Office Building, Golf Clubhouse, DBS Government Building 3, Putnam Valley Senior Center, and the Highway Department by Sprague Energy. For annual energy usage at each facility, see Table 1.2.

Table 1.2: Annual Weather Adjusted Energy Use by Facility

Facility Name	**Annual Demand (kW)**	**Peak Electricity (kWh)**	**Off-Peak Electricity (kWh)**	**Total Electricity (kWh)**	**Natural Gas (CCF)**	**Propane (Gallons)**	**#2 Oil (Gallons)**
Sheriff's Department/Correctional Facility	2,966.6	659,437	756,790	1,416,227	59,961	0	0
New Putnam County Courthouse	2,313.0	494,400	504,300	998,700	34,798	0	0
David D. Bruen County Office Building	880.8	230,400	0	230,400	0	0	12,417 [7]
1812 Courthouse	334.8	92,160	0	92,160	0	0	0
121 Main Street	550.4	154,880	0	154,880	8,544	0	0
Putnam National Golf Club - Clubhouse	1,177.2	288,840	0	288,840	0	1,103	6,409
Emergency Operations Center/TOPS	1,515.0	681,500	0	681,500	12,623	0	0
Donald B. Smith Government Campus - Building 1	291.8	75,293 [8]	0	75,293	3,737 [9]	0	0
Donald B. Smith Government Campus - Building 2	675.4	174,259	0	174,259	8,649	0	0
Donald B. Smith Government Campus - Building 3	855.5	220,728	0	220,728	0	0	9,104
Kern Building - Health Dept/DMV/WIC	813.0	260,550	0	260,550	8,127	0	0
William Koehler Senior Center	840.0	148,000	126,250	274,250	15,598	0	0
Putnam Valley Senior Center	416.0	129,600	0	129,600	0	0	4,082 [10]
Putnam Family & Community Services - 1808	528.0	144,680	0	144,680	4,355	0	0

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[7] *Bruen County Office Building and 1812 Courthouse share a fuel oil tank.*
[8] *Electrical usage for Government Campus Buildings on a single meter. Usage is assumed shared between three buildings based on square footage.*
[9] *Same gas-fired boiler serves Government Campus Buildings 1 and 2. Usage is assumed shared between two buildings based on square footage.*
[10] *Average of FY2018 and FY2019 fuel oil usage at Putnam Valley Senior Center used due to uneven delivery schedule.*

Facility Name	**Annual Demand (kW)**	**Peak Electricity (kWh)**	**Off-Peak Electricity (kWh)**	**Total Electricity (kWh)**	**Natural Gas (CCF)**	**Propane (Gallons)**	**#2 Oil (Gallons)**
Highway Department - Building 1 Admin	266.8	81,960	0	81,960	0	0	2,470 [11]
Highway Department - Building 2 Sign Shop	54.1	21,268 [12]	0	21,268	0	0	1,130
Highway Department - Building 3 Dispatch/Garage	329.2	99,320	0	99,320	0	0	5,245
Highway Department - Building 4 Garage	83.5	32,822	0	32,822	0	0	3,299
Board of Elections	214.9	51,148	0	51,148	5,480	0	0
Senator Vincent Leibell Veterans' Home	63.8	50,090	0	50,090	4,360	0	0
Putnam Family & Community Services - 1816	103.2	47,916	0	47,916	2,176	0	0
Burchetta Building (Law Dept) - 48 Gleneida	229.6	41,226	0	41,226	2,610	0	0
Tilly Foster Farm Building #8	236.4	115,249	0	115,249	0	11,756	0
Totals	**15,739**	**4,295,726**	**1,387,340**	**5,683,066**	**171,018**	**12,859**	**44,156**

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[11] *Average of FY2018 and FY2019 fuel oil usage at Highway Department used due to uneven delivery schedule.*
[12] *Highway Department Sign Shop and Garage share electrical usage.*

Each ECM presented in this audit was explicitly “baselined” by a “temperature bin” analysis for temperature variant loads and by a fixed baseline for constant loads. Straightforward electrical saving ECMs such as lighting retrofits and motor replacements were analyzed by a combination of known operating hours, field measurements and engineering calculations. The baseline operating hours for each location or a portion thereof was determined from information from the County and review of metered data acquired during the Investment Grade Audit. Energy cost savings for each ECM was calculated with the energy rates outlined in this section.

ELECTRICITY

The County receives electricity supply from Energy Cooperative of America at a 24 month fixed price of $0.06497 per kWh. NYSEG electricity delivery for these buildings is charged according to two delivery rates: Nonresidential and Nonresidential Time-of-Use. These rates were applied to each energy conservation measure (ECM) as appropriate.

Section 7 of the IGA outlines the exact rate used in determining the cost savings for each building. Each delivery rate plus the supply cost is displayed in Table 1.3.

Table 1.3: Electric Rates (includes Supply and Delivery)

Rate	Non-Res	Time-of-Use
Annual $/kW	$14.75	$9.44
On-Peak $/kWh	$0.07310	$0.07106
Off-Peak $/kWh	$0.07310	$0.07106

Table 1.4: Electric Rates by Building

Facility	Non-Res	Time-of-Use
Sheriff's Department/Correctional Facility		X
New Putnam County Courthouse		X
David D. Bruen County Office Building	X	
1812 Courthouse	X	
121 Main Street	X	
Putnam National Golf Club - Clubhouse	X	
Emergency Operations Center/TOPS	X	
Donald B. Smith Government Campus - Building 1	X	
Donald B. Smith Government Campus - Building 2	X	
Donald B. Smith Government Campus - Building 3	X	
Kern Building - Health Dept/DMV/WIC	X	

Facility	Non-Res	Time-of-Use
William Koehler Senior Center		X
Putnam Valley Senior Center	X	
Putnam Family & Community Services - 1808	X	
Highway Department - Building 1 Admin	X	
Highway Department - Building 2 Sign Shop	X	
Highway Department - Building 3 Dispatch/Garage	X	
Highway Department - Building 4 Garage	X	
Board of Elections	X	
Senator Vincent Leibell Veterans' Home	X	
Putnam Family & Community Services - 1816	X	
Burchetta Building (Law Dept) - 48 Gleneida	X	
Tilly Foster Farm Building #8	X	

NATURAL GAS

With the exceptions of 121 Main Street and the Kern Building, which receive natural gas delivery from NYSEG, natural gas is delivered by Central Hudson Gas and is currently supplied by East Coast Power & Gas, LLC. Central Hudson Gas for these buildings is charged according to three delivery rates: G220, G420, and G521. The County has a contract with East Coast Power & Gas, LLC to supply Natural Gas at an average rate of $0.45622 per CCF. Each rate including supply costs is displayed in in Table 1.5.

Table 1.5: Gas Rates (includes Supply and Delivery)

Natural Gas Charges	Delivery ($/CCF)	Supply ($/CCF)	Total Cost
Central Hudson Gas G220	$0.3590	$0.4562	$0.8152
Central Hudson Gas G420	$0.3171	$0.4562	$0.7733
Central Hudson Gas G521	$0.2526	$0.4562	$0.7088
NYSEG 08702	$0.4156	$0.4562	$0.8718

Table 1.6: Gas Rates by Building

Facility	G220	G420	G521	NYSEG
Sheriff's Department/Correctional Facility			X	
New Putnam County Courthouse		X		
David D. Bruen County Office Building				
1812 Courthouse				

Facility	G220	G420	G521	NYSEG
121 Main Street				X
Putnam National Golf Club - Clubhouse				
Emergency Operations Center/TOPS		X		
Donald B. Smith Government Campus - Building 1	X			
Donald B. Smith Government Campus - Building 2	X			
Donald B. Smith Government Campus - Building 3				
Kern Building - Health Dept/DMV/WIC				X
William Koehler Senior Center		X		
Putnam Valley Senior Center				
Putnam Family & Community Services - 1808		X		
Highway Department - Building 1 Admin				
Highway Department - Building 2 Sign Shop				
Highway Department - Building 3 Dispatch/Garage				
Highway Department - Building 4 Garage				
Board of Elections		X		
Senator Vincent Leibell Veterans' Home	X			
Putnam Family & Community Services - 1816		X		
Burchetta Building (Law Dept) - 48 Gleneida		X		
Tilly Foster Farm Building #8				

FUEL OIL

#2 fuel oil is delivered by Sprague Energy to the buildings indicated in Table 1.7 at an average rate of $2.1738 per gallon.

Table 1.7: Fuel Delivery by Building

Facility	Sprague
Sheriff's Department/Correctional Facility	
New Putnam County Courthouse	
David D. Bruen County Office Building	X
1812 Courthouse	
121 Main Street	
Putnam National Golf Club - Clubhouse	X
Emergency Operations Center/TOPS	

Facility	Sprague
Donald B. Smith Government Campus - Building 1	
Donald B. Smith Government Campus - Building 2	
Donald B. Smith Government Campus - Building 3	X
Kern Building - Health Dept/DMV/WIC	
William Koehler Senior Center	
Putnam Valley Senior Center	X
Putnam Family & Community Services - 1808	
Highway Department - Building 1 Admin	X
Highway Department - Building 2 Sign Shop	X
Highway Department - Building 3 Dispatch/Garage	X
Highway Department - Building 4 Garage	X
Board of Elections	
Senator Vincent Leibell Veterans' Home	
Putnam Family & Community Services - 1816	
Burchetta Building (Law Dept) - 48 Gleneida	
Tilly Foster Farm Building #8	

PROPANE

Propane is delivered by Paraco Gas to the Golf Clubhouse and Tilly Foster Farm at an average rate of $2.2167 per gallon.

END-USE BREAKDOWN

A baseline model was developed for each audited building. Fiscal year 2018 utility data as previously described was used to calibrate the model(s). The energy end-use breakdown for fossil fuel and electricity was calculated from inventoried equipment ratings, local bin weather data, operational characteristics obtained from personnel, and building envelope characteristics. Where equipment data could not be obtained, engineering experience and judgment was used. The major fuel heating end-uses found in the municipal buildings audited includes Space Heating, (which consist of mechanical ventilation, conduction, and infiltration), Domestic Hot Water Usage, and Cooking. Electrical usage includes Lighting, Space Cooling, HVAC Fan/Pumps, Kitchen Equipment (includes cooking appliances, refrigeration, etc.), and Office Equipment (includes computers, copiers, etc.). The remaining energy was placed in the category of "Miscellaneous Loads" and includes other plug loads.

BASELINE UTILITY DATA

See attached.

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SECTION 2: EXISTING CONDITIONS

The following table includes the Facilities List given as Exhibit A in the audit contract between Ameresco and the County, along with whether the building is included in the current project and reasons why buildings are not included. During the energy audit Ameresco explored the potential for all these buildings along with County personnel. Most of the excluded buildings are County-owned properties such as sheds or pavilions that either have no utility usage or are small and have limited usage. The Wastewater Treatment Plant has a large electrical load, but it is a new facility and there are limited improvements that can be made to reduce its process load.

Table 2.1: Facilities List from Contract

Facility Name	Included in Project	Reason Excluded
Putnam County Sheriffs Department/Raynor Weizenecker Correctional Facility	X	
New Putnam County Courthouse	X	
David D. Bruen County Office Building	X	
Putnam National Golf Club - Waste Treatment Plant		Limited energy saving opportunities
121 Main Street	X	
Putnam National Golf Club - clubhouse	X	
Emergency Operations Center/TOPS	X	
Donald B. Smith Government Campus, Buildings #3	X	
Kern Building	X	
William Koehler Senior Center	X	
Donald B. Smith Government Campus, Buildings #2 DSS	X	
6N Stockpile Shed/Office/Dormitory		Being demolished
Putnam Valley Senior Center	X	
Historic 1812 Courthouse	X	
6N Highway Garage		Being demolished
Putnam Family & Community Services -1808	X	
Putnam County Department of Highways & Facilities Building #3 - Dispatch/Garage	X	
Board of Elections	X	
Senator Vincent Leibell Veterans' Home	X	
Tilly Foster Farm Building 8 - Lodge	X	

Facility Name	Included in Project	Reason Excluded
Donald B. Smith Government Campus, Buildings #1 OSR	X	
Putnam County Department of Highways & Facilities Building - Pole bldg		Low/No energy use
Putnam County Department of Highways & Facilities Building #1 - Admin	X	
Putnam Family & Community Services - 1816	X	
Brewster Stockpile DO MAR Shed		Low/No energy use
Putnam County Department of Highways & Facilities Building #4 - Sign Shop/Garage	X	
Putnam County Veterans' Memorial Park - Barn		Low/No energy use
Putnam County Veterans' Memorial Park - 4H/Youth Pole Barn		Low/No energy use
Burchetta Building (Law Dept) - 48 Gleneida	X	
Nelsonville Firehouse/Sheriffs Department		Low/No energy use
Fire Training Center Burn Building		Low/No energy use
Putnam County Department of Highways & Facilities Building #2 - Facilities	X	
Putnam County Department of Highways & Facilities Salt Shed		Low/No energy use
Putnam Lake Stockpile Shed		Low/No energy use
Putnam County Veterans' Memorial Park - Deputy Commissioner's House		Low/No energy use
Putnam National Golf Club - Storage Shed		Low/No energy use
Putnam National Golf Club - office/garage		Low/No energy use
Cornerstone Park		Low/No energy use
Putnam County Veterans' Memorial Park - Restrooms 1		Low/No energy use
Sheriffs Dept Outpost		Low/No energy use
6N Highway Storage attached 1 bay garage		Being demolished
Putnam Lake Stockpile Office/Dormitory/Shanty		Low/No energy use
Putnam Valley Stockpile DO MAR Shed		Low/No energy use
Cold Spring Stockpile		Low/No energy use
Putnam County Veterans' Memorial Park - Park Office		Low/No energy use
Putnam County Veterans' Memorial Park - Garage		Low/No energy use
Putnam County Veterans' Memorial Park - Veterans Museum		Low/No energy use
Putnam County Veterans' Memorial Park - Pumphouse/Workers Cabin		Low/No energy use

Facility Name	Included in Project	Reason Excluded
Putnam County Veterans' Memorial Park- Open pavilion		Low/No energy use
Putnam County Veterans' Memorial Park - Fair Grounds Ticket Office		Low/No energy use
Fire Training Center Office/Classrooms		Low/No energy use
Fire Training Center #2		Low/No energy use
Putnam County Veterans' Memorial Park - Meeting House		Low/No energy use
Putnam County Veterans' Memorial Park - Trainor Barn		Low/No energy use
Putnam County Veterans' Memorial Park - open pavilion		Low/No energy use
Putnam National Golf Club - northern shed		Low/No energy use
Sheriff Garage		Low/No energy use
New Parks Pavilion		Low/No energy use
Transit Facility/Planning Department		Federal building, not eligible for this project
Putnam County Landfill - Capped		Low/No energy use

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SHERIFF'S DEPARTMENT / CORRECTIONAL FACILITY

BUILDING CHARACTERISTICS

The Sheriff's Department and Correctional facility was built in 1994. It is 2 stories tall and has 128 holding cells. Construction of the building is typical CMU block type. The building has onsite laundry and a kitchen. Most of the building houses a jail while a portion houses a sheriff's department with office space. It has several sections of flat EDPM roof and relatively few windows.

Figure 2.1: Putnam Sheriff's Department and Correctional Facility

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

The jail and sheriff's department offices are heated by two Crown hot water boilers located in the boiler room. Heating hot water is pumped from the boiler room to hot water coils inside ten (10) Rooftop Units (RTUs) and two Air Handling Units (AHUs) located in a mechanical space adjacent to the boiler room. These RTUs and AHUs provide heating and ventilation air into the occupied space, as well as cooling, through their DX coils.

ENERGY MANAGEMENT SYSTEMS

The heating and cooling equipment is controlled by Infinity Andover Controls LCX 810, with a Heat Timer on the boilers and Andover Continuum bCX1 series controllers from Schneider Electric. The system is monitored by an on-site desktop with local Andover Continuum CyberStation software.

DOMESTIC HOT WATER SYSTEMS

The domestic hot water heaters and tank were recently replaced with three (3) large storage hot water heaters, located in the boiler room.

LIGHTING SYSTEMS

Cells use T8 secure boxes, secure troffers, CF secure boxes, incandescent surface fixtures, T12 secure troffers, LED surface fixtures. Offices use T8 troffers, secure troffers, secure boxes, incandescent cans, LED secure troffers. Halls use T8 troffers, secure boxes, secure troffers, boxes, secure corner fixture, strips, incandescent surface fixtures, decorative fixtures, exits, CF cans, LED drums, sconces, T12 troffers. Inmate area use T8 secure boxes, secure troffers, troffers, MH secure boxes. Baths use T8 secure troffers, troffers, secure boxes, wraps, old wall mounted fixtures, T12 vanities, boxes, troffers, secure boxes, strips, CF cans. Mechanical areas use incandescent surface fixtures, T8 strips, old surface fixtures, secure troffers, troffers, LED sconces. Storage areas use T8 secure troffers, troffers, strips, secure boxes, wraps, old surface fixtures, MH bay fixtures, incandescent sconces, wall mounted fixtures, surface fixtures, T12 wraps, troffers, CF surface fixtures, LED sconces. Kitchens use T8 secure troffers, troffers, secure boxes, LED wall mounted fixtures. Shops use T8 strips, secure troffers, troffers, . Classrooms use T8 secure troffers. Labs use LED troffers. Warehouses use T8 secure boxes. Perimeters use MH exterior perimeter fixtures. Dining rooms use LED secure troffers.

Perimeters use MH exterior perimeter fixtures, step light, old squares, decorative fixtures, explosion proof fixtures, LED drums. Parking lots use MH exterior area fixtures. Fields use MH exterior area fixtures, exterior perimeter fixtures, MV drums, HPS exterior perimeter fixtures. Driveways use MH exterior area fixtures.

NEW PUTNAM COUNTY COURTHOUSE

BUILDING CHARACTERISTICS

The New Putnam County Courthouse was built in 2007 and is a four-story building housing office and court spaces. It is located adjacent to the Correctional Facility and Bruen County Office Building. It is typical CMU block construction with a brick veneer and tall double-pane windows. It has a flat EDPM roof.

Figure 2.2: The New Putnam County Courthouse

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

The new courthouse is heated by two (2) Smith hot water boilers as well as four (4) gas fired Carrier RTUs. The RTUs provide heat and ventilation air to the occupied space, in addition to cooling through DX coils. Conditioned air is distributed throughout the building via thirty-six (36) Variable Air Volume boxes (VAVs) that match the volume of air delivered to each space to its heating or cooling load. Water is pumped throughout the building by two primary and two 15-HP secondary pumps.

ENERGY MANAGEMENT SYSTEMS

The HVAC systems are controlled by a Honeywell WEB-700 Niagara AX system. This system is monitored by an on-site desktop computer through a standard browser.

DOMESTIC HOT WATER SYSTEMS

Domestic hot water is provided by a Burnham indirect water heater and tank located in the boiler room.

LIGHTING SYSTEMS

Halls use CF cans, decorative fixtures, T8 wraps, strips, indirects, troffers, secure troffers. Offices use T8 indirects, troffers, wraps, CF cans, indirects, decorative fixtures. Court rm use CF cans, decorative fixtures. Baths use T8 troffers, strips, secure troffers, CF drums, cans. Libraries use T8 indirects, troffers, CF cans. Mechanical areas use T8 strips, indirects, troffers. Storage areas use T8 strips, secure troffers, indirects, troffers, . Inmate area use T8 secure troffers. Cells use T8 secure troffers. Shops use T8 strips. Kitchens use T8 troffers, indirects.

Perimeters use LED exterior perimeter fixtures, MH exterior area fixtures, exterior perimeter fixtures, HPS exterior perimeter fixtures, T5 HO sconces. Parking lots use MH exterior decorative fixtures, exterior area fixtures. Fields use MH exterior area fixtures.

DAVID D. BRUEN COUNTY OFFICE BUILDING

BUILDING CHARACTERISTICS

The Bruen County Office Building located between the New Courthouse and 1812 Courthouse is a three-story building housing various County offices. It is traditional brick construction with a stone foundation. The windows are double hung 2-pane type, though several of the window seals have failed.

Figure 2.3: The Bruen County Office Building

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

The county office building is heated by a single oil-fired steam boiler located in the basement boiler room. The steam is generated in the boiler and then flows to space two-pipe radiators located throughout the perimeter of the building. The basement Probation Department is heated by electric baseboard located throughout the offices.

Portions of the building are cooled by DX mini-splits and window ACs.

ENERGY MANAGEMENT SYSTEMS

The boiler is controlled by a Honeywell programmable touchscreen thermostat in boiler room. Heat from the radiators is somewhat controlled by the hand valves on them. Space coolers are controlled locally.

DOMESTIC HOT WATER SYSTEMS

Domestic hot water is provided by an oil-fired Bock storage water heater with 32 gallons of storage and input capacity of 104,000 Btu/hr.

LIGHTING SYSTEMS

Offices use T8 troffers, wraps, LED surface fixtures, troffers, T12 plug-in fixtures. Halls use T8 troffers, wraps, LED surface fixtures, CF old drums, drums. Storage areas use T8 troffers, wraps, T12 strips, LED surface fixtures, incandescent surface fixtures, T12 single pin strips. Baths use T8 wraps, troffers, incandescent vanities, drums, circline drums. Mechanical areas use T8 strips, wraps. Kitchens use T8 troffers.

Parking lots use MH exterior decorative fixtures, exterior area fixtures. Perimeters use HPS exterior perimeter fixtures, exterior area fixtures, MH exterior area fixtures, surface fixtures.

1812 COURTHOUSE

BUILDING CHARACTERISTICS

The Courthouse was built in 1812 or 1814 and is a two-story building that currently serves two functions. The lower level is occupied and used as offices. The upper level features the historic courtroom and chambers but is very rarely used. The back of the building at both levels was occupied by jail cells, but these are currently abandoned and used as file storage. The building is typical brick construction with existing single-pane double hung windows that have interior storm windows inserted.

Figure 2.4: Inside the 1812 Courthouse

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

The historic courthouse is heated by three (3) Weil-McLain oil-fired hot water boilers located in the basement boiler room. Cooling is provided through chilled water from a 80 ton York chiller, with a compressor in the basement mechanical room and air-cooled condenser located on the ground outside.

The hot water and chilled water for the building is pumped to two AHUs, one in the 3rd floor attic, the other in the dirt floor basement. These AHUs have hot water and chilled water coils and provide upper and lower levels. Additionally, eighteen (18) fancoil units (FCUs) provide supplemental heating.

ENERGY MANAGEMENT SYSTEMS

The building's heating and cooling equipment is controlled by Schneider Andover Continuum i2800 series controls. The controls are monitored by an on-site desktop computer in the basement with local software.

DOMESTIC HOT WATER SYSTEMS

Domestic hot water is provided by an AO Smith and a Rheem storage heaters with 50-gallon combined storage volume and 22,000 Btu/hr combined input capacity.

LIGHTING SYSTEMS

Offices use T12 boxes, wraps, incandescent decorative fixtures, T8 wraps, boxes. Halls use CF cans, sconces, exits, incandescent decorative fixtures, circline drums, T12 wraps, LED decorative fixtures. Court rm use incandescent decorative fixtures. Baths use LED drums, circline drums, incandescent vanities. Storage areas use T12 wraps, old surface fixtures, LED surface fixtures, CF cans, incandescent old decorative fixtures. Mechanical areas use T12 wraps, old surface fixtures, LED sconces.

Perimeters use CF cans.

121 MAIN STREET

BUILDING CHARACTERISTICS

The building at 121 Main Street is unique and serves a few different functions. The large lower level houses several rows of file storage along with space for file archiving offices. The middle level once housed offices but has been abandoned for several years. The upper level, which is at street level, house two separate County services storefronts. The building is entirely brick and has single-pane windows.

Figure 2.6: The County Building at 121 Main Street

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

The different sections of the building are heated and cooled by different methods. The lower level storage areas are heated by gas-fired infrared heaters and gas-fired Dayton fan units. The middle and upper levels are heated by electric baseboard around the perimeter. Cooling is provided by small DX split units, as well as window ACs.

ENERGY MANAGEMENT SYSTEMS

The gas-fired equipment is controlled by Honeywell non-programmable thermostats on the lower level. Electric baseboard heaters are controlled by Mears non-programmable thermostats on middle and upper level. The AHU is controlled by a programmable thermostat that has not been programmed with a weekly schedule.

DOMESTIC HOT WATER SYSTEMS

Domestic hot water is provided by an American electric storage heater with 50 gallon storage volume and 15,400 Btu/hr capacity.

LIGHTING SYSTEMS

Offices use T8 troffers, T12 troffers. Storage areas use T12 troffers, T12 single pin strips, T8 troffers, LED troffers, incandescent surface fixtures, CF surface fixtures. Halls use T8 troffers, HPS sconces, T12 single pin strips, T12 wraps, strips, CF sconces. Baths use T8 troffers, wraps, incandescent cans. Mechanical areas use incandescent surface fixtures. Medical areas use T8 troffers. Kitchens use T8 troffers.

Perimeters use HPS exterior perimeter fixtures, exterior road/area fixtures, incandescent sconces. Parking lots use HPS exterior road/area fixtures.

PUTNAM NATIONAL GOLF CLUB - CLUBHOUSE

BUILDING CHARACTERISTICS

The Putnam National Golf Clubhouse is a two-story building on a golf course. Its lower level has locker rooms, a pro shop, a bar and restaurant, and a function room. The upper level can be used for events and has a large ballroom, smaller function room, a kitchen, and offices.

Most of the building is brick construction, with wood siding covering some of it. Both the brick and siding are showing signs of wear in areas. The upper level office windows are residential style, while the windows and door systems on the rest of the building are aluminum frame storefronts with double pane glass.

Figure 2.7: The Putnam National Golf Club - Clubhouse

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

The clubhouse is heated by a single Eastmond oil-fired hot water boiler located in the lower level boiler room, as well as two propane-fired RTUs serving upper level spaces. The RTUs also provide DX cooling to the Patriot Room and upper level offices. Heating hot water is circulated by ten (10) zone pumps, each sending water to a different part of the building.

AHUs located in closets throughout the clubhouse provide DX cooling, with condensing units placed around the outside of the building. I new DX mini-split provides cooling to the upper balcony area of the ballroom.

ENERGY MANAGEMENT SYSTEMS

Non-programmable thermostats in the building's many spaces control zone pumps and AHUs.

DOMESTIC HOT WATER SYSTEMS

Domestic hot water is provided by a 100-gallon oil-fired Bock storage hot water heater with an input capacity of 277 Mbtu/hr.

LIGHTING SYSTEMS

Dining rooms use incandescent decorative fixtures, cans, drums. Offices use incandescent cans, decorative fixtures, LED cans, T8 troffers, CF cans, T12 troffers. Baths use LED cans, vanities, drums, incandescent decorative fixtures, cans, T12 troffers, T8 troffers. Halls use LED cans, T8 troffers, incandescent decorative fixtures, CF cans. Retail spaces use LED cans, incandescent cans. Storage areas use LED cans, CF cans, surface fixtures, incandescent surface fixtures, T8 wraps. Kitchens use T8 4' 28w vapor tights, T12 troffers, LED wall mounted fixtures, circline drums. Shops use T12 single pin strips, wraps, T12 plug-in fixtures. Mechanical areas use T8 strips.

Perimeters use LED cans, exterior area fixtures, decorative fixtures, drums, CF drums, HPS exterior perimeter fixtures. Parking lots use LED exterior area fixtures. Walkways use incandescent decorative fixtures.

EMERGENCY OPERATIONS CENTER / TOPS

BUILDING CHARACTERISTICS

The Emergency Operations Center is a new one-story building. It houses an emergency response center, training and office spaces, an auditorium, and garages for emergency vehicles. It has a flat white EDPM roof and double pane windows.

Figure 2.8: The Emergency Operations Center

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

Two large gas-fired Weil-McLain hot water boilers are located in the boiler room. Hot water is circulated throughout the building through two primary and two 5 HP secondary hot water pumps. Two Carrier air-cooled chillers provide chilled water that is also circulated through a similar primary-secondary pumping system. Four AHUs and two RTUs provide heating, ventilation, and air conditioning to the occupied space.

ENERGY MANAGEMENT SYSTEMS

All HVAC equipment is currently controlled by Andover Continuum Controls installed by EMF.

DOMESTIC HOT WATER SYSTEMS

Domestic hot water is provided by an indirect 76-gallon Weil-McLain storage hot water heater.

LIGHTING SYSTEMS

Offices use T8 troffers, coves, strips, indirects, CF cans, incandescent cans. Halls use CF cans, indirects, decorative fixtures, T8 troffers, incandescent decorative fixtures, LED cans. Auditoriums use T8 troffers, T5 indirects, CF cans. Storage areas use T8 boxes, troffers, CF cans, incandescent cans. Classrooms use T8 troffers, CF cans. Baths use T8 troffers, wraps, CF squares, cans. Mechanical areas use T8 wraps, boxes. Kitchens use T8 troffers.

Parking lots use MH exterior area fixtures. Perimeters use MH goose, CF cans. Walkways use MH goose, exterior area fixtures.

DONALD B. SMITH GOVERNMENT CAMPUS – BUILDING 1

BUILDING CHARACTERISTICS

This building has been undergoing a full renovation at the time of the Investment Grade Audit and no interior work is proposed. As part of this renovation the roof was replaced with a new EDPM membrane.

Figure 2.9: The Donald B. Smith Government Campus – Building 1

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

This building receives heating hot water from the boiler room of Building 2. As part of the ongoing renovation, the three existing RTUs haven been replaced, along with the full ducting system.

DONALD B. SMITH GOVERNMENT CAMPUS – BUILDING 2

BUILDING CHARACTERISTICS

This building has a similar CMU block construction with brick veneer to Building 1 & 3. It is also a single story with a partial basement level. There is an aging flat EDPM roof. It houses several different office areas for the County. The existing window systems are aluminum framed with single windowpanes. Upper sections of the window frames are light-blocking panels instead of glass.

Figure 2.10: The Donald B. Smith Government Campus – Building 2

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

Three new Prestige hot water boilers in the lower level mechanical space provide heating hot water to Buildings 1 & 2. Water is circulated by three primary and two 2 HP secondary pumps. Fintube baseboard and cabinet unit heaters distribute the heat to the perimeter of the occupied spaces. Cooling is provided by four Carrier RTUs which are cooling-only, along with a DX mini-split and window ACs.

ENERGY MANAGEMENT SYSTEMS

RTUs are controlled by programmable thermostats while, non-programmable thermostats control perimeter hot water fintube.

DOMESTIC HOT WATER SYSTEMS

The domestic hot water comes from two 40-gallon electric hot water heaters located in the boiler room and janitor's closet.

LIGHTING SYSTEMS

Offices use T8 troffers, LED troffers. Halls use T8 troffers, strips. Baths use T8 strips, troffers, incandescent surface fixtures, LED troffers. Mechanical areas use T8 vapor tights. Storage areas use T8 strips, T12 single pin strips.

Perimeters use HPS exterior perimeter fixtures, incandescent exterior area fixtures. Parking lots use HPS exterior road/area fixtures.

DONALD B. SMITH GOVERNMENT CAMPUS – BUILDING 3

BUILDING CHARACTERISTICS

This building has a similar CMU block construction with brick veneer to Building 1 & 2. It is also a single story with a flat EDPM roof. It houses several different office areas for the County, as well as some garage space. The existing window systems are aluminum framed with single windowpanes. Large sections of the window frames and glass have been covered with insulating panels.

Figure 2.11: The Donald B. Smith Government Campus – Building 3

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

A single oil-fired Weil-McLain boiler provides heating hot water to the building. It along with above ground oil storage tanks are located within a mechanical garage. Hot water is pumped to a perimeter fintube baseboard and hot water coils in three RTUs. The RTUs provide heating and

DX cooling. AHUs located above the ceiling and associated CUs located outside the building also provide DX cooling.

ENERGY MANAGEMENT SYSTEMS

The RTUs and AHUs are controlled by Carrier non-programmable thermostats while non-programmable thermostats control perimeter hot water fintube.

LIGHTING SYSTEMS

Offices use T8 troffers, wraps, LED troffers, incandescent cans, CF drums. Halls use T8 troffers, wraps, LED troffers, CF drums, circline decorative fixtures, incandescent surface fixtures. Storage areas use LED industrials, troffers, T8 troffers, strips, CF drums. Baths use T8 wraps, LED troffers. Mechanical areas use T8 strips, troffers. Kitchens use T8 troffers.

Perimeters use MH exterior area fixtures, exterior perimeter fixtures.

KERN BUILDING – HEALTH DEPT / DMV / WIC

BUILDING CHARACTERISTICS

The Kern Building is a two-story building that serves multiple functions for the County. The upper level houses the health department offices as well as medical clinic space and WIC services. The lower level houses a Department of Motor Vehicles office. The building exterior is a mix of metal siding and block veneer, and it has both pitched metal roofing and flat membrane roof sections. Windows are aluminum frame and double pane.

Figure 2.12: Kern Building – Health Dept / DMV / WIC

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

The building is heated by seven (7) Trane gas-fired AHUs that also provide DX cooling. Heating and cooling air is distributed by above ceiling ductwork to the spaces below.

ENERGY MANAGEMENT SYSTEMS

Trane programmable thermostats located on the walls of the occupied spaces control the RTUs.

DOMESTIC HOT WATER SYSTEMS

The domestic hot water comes from a 75-gallon electric hot water heater.

LIGHTING SYSTEMS

Offices use T8 troffers, CF cans, LED troffers. Halls use CF cans, T8 troffers, wraps, LED drums, sconces. Baths use T8 troffers, LED drums, incandescent vanities, drums, T12 vanities. Storage areas use T8 troffers, strips, industrials, wraps, T12 single pin strips, industrials, LED strips. Kitchens use T8 troffers, boxes. Mechanical areas use T8 troffers, boxes, CF drums.

Perimeters use HPS exterior perimeter fixtures, exterior area fixtures, LED exterior area fixtures, exterior perimeter fixtures, CF sconces, incandescent cans. Parking lots use HPS exterior area fixtures.

WILLIAM KOEHLER SENIOR CENTER

BUILDING CHARACTERISTICS

The William Koehler Senior Center is a single-story building that was built in 2000. It is split into two sections, with an adult daycare area on one side, and cafeteria, offices, and activity areas on the other. Several sections of pitched roofs cover the building. The cafeteria and dayroom have very high ceilings.

Figure 2.13: The William Koehler Senior Center

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

The building is heated by two Peerless gas-fired hot water boilers and a gas-fired duct furnace located in the basement mechanical space. Heating hot water is circulated to perimeter fintube baseboards, as well as to the hot water coils of two AHUs in the attic. These AHUs provide heating, ventilation, and DX cooling to the entire building. The diffusers over the high ceilings of the day room and cafeteria are located next to the plenum return grilles, leading to short-circuiting of conditioned air before it can get to the occupants below.

ENERGY MANAGEMENT SYSTEMS

Non-programmable thermostats throughout the building control the two (2) AHUs along with five (5) zone pumps.

DOMESTIC HOT WATER SYSTEMS

The domestic hot water comes from two 100-gallon gas-fired hot water heaters with a combined 150 MBH input capacity.

LIGHTING SYSTEMS

Offices use CF cans, decorative fixtures, T8 troffers. Kitchens use T8 troffers, incandescent wall mounted fixtures. Dining rooms use CF cans, decorative fixtures. Baths use T8 troffers. Gyms use CF cans. Storage areas use T8 wraps, troffers, incandescent wall mounted fixtures. Halls use T8 troffers, wraps, MH cans. Mechanical areas use T8 wraps. Classrooms use T8 troffers. Shops use T8 troffers.

Perimeters use incandescent decorative fixtures, cans, CF exterior perimeter fixtures. Parking lots use MH exterior area fixtures. Fields use MH exterior walkway fixtures. Driveways use MH exterior area fixtures.

PUTNAM VALLEY SENIOR CENTER

BUILDING CHARACTERISTICS

The Putnam Valley Senior Center was built in 2005 and is a single-story building with basement garage and mechanical space. The building houses a kitchen, cafeteria, and multiple game rooms, as well as a portion of the building that is an adult day care. The building has a metal sloped roof and vinyl siding.

Figure 2.14: The Putnam Valley Senior Center

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

The building is heated by two Weil-McLain oil-fired hot water boilers and a gas-fired duct furnace located in the basement mechanical space. Heating hot water is circulated to perimeter fintube baseboards, as well as to the hot water coils of AHUs above the ceilings. These eleven (11) AHUs provide heating and DX cooling to the entire building. A propane-fired makeup Airhandling unit (MUA) provides air to the kitchen, to replenish air lost through the kitchen exhaust.

ENERGY MANAGEMENT SYSTEMS

Eight (8) Robert Shaw programmable thermostats and three (3) Basys programmable thermostats control the eleven (11) AHUs. These thermostats have the capability to be programmed to an occupancy schedule, but are currently operationg 24/7.

DOMESTIC HOT WATER SYSTEMS

Domestic hot water is provided by a two 50-gallon Bock oil-fired hot water heater with a combined capacity of 277 MBH input.

LIGHTING SYSTEMS

Offices use T8 troffers, CF cans, incandescent decorative fixtures, LED decorative fixtures. Dining rooms use biax troffers. Halls use biax troffers, CF cans. Kitchens use T8 troffers, incandescent wall mounted fixtures. Storage areas use biax wraps, CF cans, T8 troffers. Baths use T8 troffers, biax wraps. Mechanical areas use T8 strips. Classrooms use T8 troffers. Shops use T8 troffers.

Perimeters use MH cans, exterior walkway fixtures, exterior perimeter fixtures, incandescent decorative fixtures. Driveways use MH exterior area fixtures. Parking lots use MH exterior area fixtures. Walkways use MH decorative fixtures.

PUTNAM FAMILY & COMMUNITY SERVICES - 1808

BUILDING CHARACTERISTICS

Putnam Family & Community Services are located in a single-story building located at 1808 Route 6. The building has a rough brick façade. The building has operable aluminum frame double pane windows and a flat white EDPM roof.

Figure 2.15: The Putnam Family & Community Services building located at 1808 Route 6

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

The building is heated, ventilated, and cooled by five (5) Trane RTUs supplying conditioned air to the space below. These units have DX cooling coils and are gas-fired, and each serves a separate section of the building.

ENERGY MANAGEMENT SYSTEMS

The RTUs are controlled by Trane programmable thermostats. These thermostats have the capability to be programmed to an occupancy schedule, but are currently operationg 24/7.

DOMESTIC HOT WATER SYSTEMS

Domestic hot water is provided by a two 50-gallon American gas-fired hot water heater with a capacity of 15.4 MBH input.

LIGHTING SYSTEMS

Offices use T8 troffers. Halls use CF cans, T8 troffers. Storage areas use T8 troffers. Baths use T8 troffers, CF cans. Kitchens use T8 troffers. Mechanical areas use T8 troffers.

Parking lots use HPS exterior road/area fixtures. Perimeters use MH exterior perimeter fixtures, LED exterior area fixtures.

HIGHWAY DEPARTMENT – BUILDING 1 ADMIN

BUILDING CHARACTERISTICS

The Highway Department Administration Building is a single-story building that houses offices and a conference room. It has metal siding and operable aluminum frame double-pane windows.

Figure 2.16: The Highway Department Administration Building

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

This building is heated by two (2) Weil-McLain oil-fired boilers located in a small boiler room. Hot water is circulated to fintube baseboard throughout the building by six (6) zone pumps, in various stages of disrepair. An AHU above the ceiling of the central restroom was designed to provide ventilation, but its outdoor air damper has been closed. Cooling is provided by fifteen (15) Fujitsu mini-split DX units.

ENERGY MANAGEMENT SYSTEMS

Zone pumps are controlled by Barber Coleman non-programmable thermostats while mini-splits are controlled by local remotes.

DOMESTIC HOT WATER SYSTEMS

Domestic hot water is provided by a Rheem electric hot water heater with a 6.8 kW heating element.

LIGHTING SYSTEMS

Offices use T8 troffers, LED troffers, cans. Halls use T8 wraps, troffers. Baths use T8 old surface fixtures. Mechanical areas use incandescent surface fixtures, LED surface fixtures. Storage areas use incandescent surface fixtures.

Perimeters use MH exterior area fixtures.

HIGHWAY DEPARTMENT – BUILDING 2 SIGN SHOP

BUILDING CHARACTERISTICS

This building is a single-story garage with metal siding and a metal sloped roof. It houses garage work space to support the Putnam County Highway Department. It has roll-up overhead doors and few windows.

Figure 2.17: The Highway Department – Building 2 Sign Shop

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

The sign shop is heated by two (2) York oil-fired furnaces that heat the utility area and the garage. The office and sign shop are cooled by two (2) Friedrich window AC units.

ENERGY MANAGEMENT SYSTEMS

The furnaces are controlled by non-programmable thermostats.

LIGHTING SYSTEMS

Storage areas use T8 strips, T12 single pin strips. Shops use T8 strips, bay fixtures, T12 single pin strips. Offices use T8 troffers, T12 single pin strips. Mechanical areas use T12 strips.

Perimeters use MH bay fixtures, exterior area fixtures, HPS exterior perimeter fixtures, exterior area fixtures, incandescent exterior area fixtures.

HIGHWAY DEPARTMENT – BUILDING 3 DISPATCH/GARAGE

BUILDING CHARACTERISTICS

This building is a single-story garage with metal siding and a metal sloped roof. It houses garage work space to support the Putnam County Highway Department. It has roll-up overhead doors and few windows.

Figure 2.18: The Highway Department – Building 3 Dispatch/Garage

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

The dispatch and garage were originally heated by three Weil-McLain oil-fired hot water boilers, but two of them have failed due to age. Water is pumped from the boilers to Modine Unit Heaters (UH) that warm the space below. Offices are cooled by Friedrich window AC units.

ENERGY MANAGEMENT SYSTEMS

The boilers are controlled by a Tekmar in the boiler room and the UHs are controlled by local thermostats.

LIGHTING SYSTEMS

Storage areas use T12 single pin strips, T8 bay fixtures, strips, T12 plug-in fixtures, vapor tights, old surface fixtures. Offices use T8 wraps, troffers, T12 single pin strips. Mechanical areas use incandescent explosion proof fixtures. Halls use incandescent explosion proof fixtures, LED surface fixtures. Baths use T12 single pin strips.

Fields use MH explosion proof fixtures. Perimeters use HPS exterior perimeter fixtures.

HIGHWAY DEPARTMENT – BUILDING 4 GARAGE

BUILDING CHARACTERISTICS

This building is a single-story garage with metal siding and a metal sloped roof. It houses garage work space to support the Putnam County Highway Department. It has roll-up overhead doors and few windows.

Figure 2.19: The Highway Department – Building 4 Garage

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

The garage is heated by three (3) HCI oil-fired furnaces. Cooling is provided by window AC units.

ENERGY MANAGEMENT SYSTEMS

The furnaces are controlled by non-programmable thermostats.

LIGHTING SYSTEMS

Storage areas use T8 bay fixtures, wraps, MH bay fixtures, T12 wraps, troffers, HPS exterior area fixtures.

Parking lots use MH exterior area fixtures, HPS exterior road/area fixtures. Perimeters use HPS exterior perimeter fixtures, MH exterior area fixtures.

BOARD OF ELECTIONS

BUILDING CHARACTERISTICS

The Board of Elections building serves two separate but related functions. It provides office space for the Board of Elections as well as a storage garage for the County's voting equipment. It has metal siding and a sloped metal roof. The garage area has a roll-up overhead door.

Figure 2.20: The Board of Elections building

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

The building is heated, ventilated, and cooled by four (4) Goodman AHUs. The units have condensing gas-fired heating and DX cooling coils. Associated CUs are located outside the building. Due to the strict temperature conditions that the election equipment must be maintained under, minimal temperature setback of the storage area is allowed.

ENERGY MANAGEMENT SYSTEMS

The four (4) AHUs are controlled by programmable thermostats.

DOMESTIC HOT WATER SYSTEMS

Domestic hot water is provided by an electric hot water heater.

LIGHTING SYSTEMS

Storage areas use T8 strips, CF drums. Offices use T8 troffers, wraps. Classrooms use T8 troffers. Kitchens use T8 troffers. Baths use T8 troffers, wraps. Halls use T8 troffers.

Perimeters use incandescent exterior area fixtures, HPS exterior area fixtures, exterior perimeter fixtures, CF exterior perimeter fixtures. Driveways use MH exterior road/area fixtures. Parking lots use HPS exterior road/area fixtures.

SENATOR VINCENT LEIBELL VETERANS' HOME

BUILDING CHARACTERISTICS

The Veterans' Home is a large two-story residential style building with bedrooms and living space for the County's veterans. It has double-hung windows, siding, and a shingled pitched roof over attic space.

Figure 2.21: The Senator Vincent Leibell Veterans' Home

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

The building is heated by a single Peerless gas-fired hot water boiler. Heating hot water is circulated to the building's fintube baseboard and indirect domestic hot water heater through zone valves.

ENERGY MANAGEMENT SYSTEMS

The zone valves are controlled by non-programmable thermostats.

DOMESTIC HOT WATER SYSTEMS

Domestic hot water is provided by an indirect storage hot water heater.

LIGHTING SYSTEMS

Bedrooms use incandescent cans. Baths use LED vanities, incandescent cans. Halls use incandescent cans, surface fixtures, LED cans. Kitchens use incandescent cans, T12 boxes. Dining rooms use incandescent cans. Offices use incandescent cans. Mechanical areas use LED sconces, incandescent drums. Storage areas use incandescent surface fixtures, drums. Shops use incandescent cans.

Perimeters use incandescent sconces, MH exterior perimeter fixtures, exterior area fixtures, CF decorative fixtures, LED exterior area fixtures.

PUTNAM FAMILY & COMMUNITY SERVICES - 1816

BUILDING CHARACTERISTICS

Putnam Family & Community Services is located at 1816 Route 6. The three-story building is wood construction with vinyl siding. Windows are double-hung and the roof is pitched shingles over attic space.

Figure 2.22: The Putnam Family & Community Services building located at 1816 Route 6

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

The building is served by four (4) York AHUs located in the basement and attic. These AHUs provide gas-fired heating as well as DX cooling, with associated CUs located behind the building.

ENERGY MANAGEMENT SYSTEMS

The AHUs are controlled by four (4) non-programmable thermostats.

LIGHTING SYSTEMS

Offices use T8 troffers. Halls use T8 troffers, CF drums, T12 strips, LED drums. Storage areas use T8 wraps, troffers, incandescent surface fixtures, sconces, CF sconces. Baths use T8 troffers. Classrooms use T8 troffers. Mechanical areas use T12 wraps. Kitchens use T8 troffers.

Perimeters use MH exterior perimeter fixtures, incandescent sconces, drums.

BURCHETTA BUILDING (LAW DEPT) – 48 GLENEIDA

BUILDING CHARACTERISTICS

The Burchetta Building houses office space for the County Law Department and is located adjacent to the Historic 1812 Courthouse. It is a single-story building with plaster exterior. It has a CMU block foundation and an unfinished basement. The existing operable windows are single-pane and quite drafty.

Figure 2.23: The Burchetta Building

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

The building is heated by a single Peerless gas-fired hot water boiler. Hot water is circulated through four (4) zone pumps to the building's baseboard fintube. The building is cooled by a 5 ton DX RTU as well as a small Heat Controller mini-split.

ENERGY MANAGEMENT SYSTEMS

The zone pumps and RTU are controlled by non-programmable thermostats

DOMESTIC HOT WATER SYSTEMS

Domestic hot water is provided by a 19-gallon electric storage hot water heater with a 1.5 kW heating element.

LIGHTING SYSTEMS

Offices use T12 troffers, T8 troffers. Libraries use incandescent cans, T12 troffers, T8 troffers. Halls use T12 troffers, LED troffers, T8 troffers. Baths use CF vanities, incandescent vanities, T8 troffers. Kitchens use T8 troffers.

Perimeters use incandescent exterior area fixtures.

TILLY FOSTER FARM BUILDING #8

BUILDING CHARACTERISTICS

Tilly Foster Farm is a historic landmark in Putnam County. Building #8 on the farm is a barn that has been converted into an upscale restaurant, event space, and cooking school. The two-story building is wood construction with wood siding. The entire building has been renovated and updated to match its new use.

Figure 2.24: Building #8 on the Tilly Foster Farm

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS (HVAC)

The building is heated by a propane-fired Peerless hot water boiler and zone pumps. Hot water is circulated by these pumps through three (3) AHUs as well as through an indirect domestic hot water heater in the boiler room. The building is cooled by the DX cooled AHUs, with accompanying CUs located outside.

ENERGY MANAGEMENT SYSTEMS

The AHUs are controlled by programmable thermostats. Although these thermostats are capable of being programmed, manual control is used to maintain a set temperature.

DOMESTIC HOT WATER SYSTEMS

Domestic hot water is provided by an indirect storage hot water heater.

LIGHTING SYSTEMS

Halls use LED troffers, cans, surface fixtures. Dining rooms use LED decorative fixtures, cans, sconces, incandescent decorative fixtures. Kitchens use LED troffers, wall mounted fixtures, cans. Classrooms use LED troffers. Baths use LED cans, vanities, troffers. Storage areas use LED cans. Mechanical areas use LED drums, troffers. Shops use LED drums.

Perimeters use LED sconces, MH exterior perimeter fixtures.

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SECTION 3: ENERGY CONSERVATION MEASURES

Table 3.1: Recommended Measures Index

ECM No.	Title	Tab
1	Lighting System Improvements - Interior	1
2	Lighting System Improvements - Exterior	2
3	Recommission Energy Management Systems	3
4	Web-enabled Programmable Thermostats	4
5	Heat Timer & Thermostatic Radiator Valves	5
6	Fuel Oil to Natural Gas Conversion	6
8	Variable Frequency Drives for HW Pumps	8
10	Premium Efficiency Transformers	10
11	Vending Misers	11
12	Walk-in Refrigeration Controls	12
13	Steam Trap Replacements	13
14	Infiltration Reductions	14
15	Pipe Insulation	15
16	Boiler Replacements	16
17	Window Replacements	17
18	Solar PV Array	18
19	AHU Replacements	19
20	Plug Load Controllers	20
22	Chiller Replacement	22
23	Siding Replacement	23
24	Roof Replacement	24
25	Window Restoration	25
26	Move Register	26
CNR	ECMs Considered but Not Recommended	CNR

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SAVINGS SUMMARY

Ecm #	ECM Name	Annual kW	Total kWh	Natural Gas (CCF)	Propane (Gallons)	#2 Fuel Oil (Gallons)	Solar Value Stack ($)	Energy Savings	O&M Savings	Total Project Savings	Total Project Costs	SPB
1	Lighting System Improvements - Interior	3,342.8	883,495	(9,316)	(19)	(2,711)	-	$ 94,446	$ 6,384	$ 100,831	$ 1,168,714	11.59
2	Lighting System Improvements - Exterior	-	342,097	-	-	-	-	$ 24,668	$ 439	$ 25,107	$ 233,085	9.28
3	Recommission Energy Management Systems	-	516,168	24,144	-	2,865	-	$ 61,230	$ -	$ 61,230	$ 274,503	4.48
4	Web-enabled Programmable Thermostats	-	114,186	12,957	4,119	5,397	-	$ 39,326	$ (2,320)	$ 37,006	$ 104,869	2.83
5	Heat Timer & Thermostatic Radiator Valves	-	-	-	-	2,927	-	$ 6,363	$ -	$ 6,363	$ 71,812	11.29
6	Fuel Oil to Natural Gas Conversion	-	-	(12,187)	(1,218)	10,378	-	$ 9,925	$ -	$ 9,925	$ 420,230	42.34
8	Variable Frequency Drives For HW Pumps	-	60,285	-	-	-	-	$ 4,307	$ -	$ 4,307	$ 47,811	11.10
10	Premium Efficiency Transformers	126.0	92,218	-	-	-	-	$ 7,820	$ -	$ 7,820	$ 180,608	23.09
11	Vending Misers	-	2,087	(61)	-	-	-	$ 105	$ -	$ 105	$ 945	8.97
12	Walk-in Refrigeration Controls	-	31,353	-	-	-	-	$ 2,228	$ -	$ 2,228	$ 31,947	14.34
13	Steam Trap Replacements	-	-	-	-	1,308	-	$ 2,844	$ -	$ 2,844	$ 49,555	17.42
14	Infiltration Reductions	-	2,476	4,610	-	2,977	-	$ 10,356	$ -	$ 10,356	$ 116,002	11.20
15	Pipe Insulation	-	-	927	-	1,966	-	$ 5,005	$ -	$ 5,005	$ 55,484	11.09
16	Boiler Replacements	-	-	-	-	352	-	$ 766	$ -	$ 766	$ 76,947	100.43
17	Window Replacements	-	252	-	-	397	-	$ 881	$ -	$ 881	$ 282,290	320.31
18	Solar PV Array	257.7	315,658	-	-	-	12,644	$ 39,520	$ (5,789)	$ 33,731	$ 737,046	21.85
19	AHU Replacements	179.3	51,528	-	-	-	-	$ 6,295	$ -	$ 6,295	$ 891,472	141.61
20	Plug Load Controllers	-	20,598	-	-	-	-	$ 1,491	$ -	$ 1,491	$ 18,653	12.51
22	Chiller Replacement	64.7	40,000	-	-	-	-	$ 3,878	$ -	$ 3,878	$ 171,559	44.24
23	Siding Replacement	-	62	-	-	133	-	$ 294	$ -	$ 294	$ 254,840	867.69
24	Roof Replacement	-	474	1,678	-	54	-	$ 1,539	$ -	$ 1,539	$ 1,801,208	1,170.25
25	Window Restoration	-	1,355	1,036	-	1,368	-	$ 3,966	$ -	$ 3,966	$ 264,386	66.67
26	Move Register	-	-	932	-	-	-	$ 721	$ -	$ 721	$ 9,733	13.50
X	Project Contingency	-	-	-	-	-	-	$ -	$ -	$ -	$ 644,736	-
		3,971	**2,474,291**	**24,722**	**2,883**	**27,414**	**12,644**	**$ 327,975**	**$ (1,285)**	**$ 326,690**	**$ 7,908,435**	**24.21**

ECM MATRX

Putnam County NY Energy Conservation Measures (ECMs)	Lighting System Improvements - Interior	Lighting System Improvements - Exterior	Recommission Energy Management Systems	Web-enabled Programmabl Thermostats	Heat Timer & Thermostatic Radiato Valves	Fuel Oil to Natural Gas Conversion	Variable Frequency Drives For HW Pumps	Premium Efficiency Transformer	Vending Misers	Walk-in Refrigeration Controls	Steam Trap Replacements	Infiltration Reductions	Pipe Insulation	Boiler Replacements	Window Replacements	Solar PV Arra	AHU Replacements	Plug Load Controllers	Chiller Replacement	Siding Replacement	Roof Replacement	Window Restoration	Move Register	
Facility	**1**	**2**	**3**	**4**	**5**	**6**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**22**	**23**	**24**	**25**	**26**	
Sheriff's Department/Correctional Facility	X	X	X				X	X	X	X		X						X				X		
New Putnam County Courthouse	X	X	X					X				X	X					X						
David D. Bruen County Office Building	X	X			X	X					X	X	X			X		X				X		
1812 Courthouse	X	X	X			X						X	X					X	X					
121 Main Street	X	X		X								X						X						
Putnam National Golf Club - Clubhouse	X	X		X								X	X		X		X			X	X			
Emergency Operations Center/TOPS	X	X	X				X	X				X	X					X						
Donald B. Smith Government Campus - Building 1																X								
Donald B. Smith Government Campus - Building 2	X	X		X								X				X	X	X			X			
Donald B. Smith Government Campus - Building 3	X	X		X		X						X				X	X	X			X			
Kern Building - Health Dept/DMV/WIC	X	X		X								X				X		X			X	X		
William Koehler Senior Center	X	X		X				X		X		X	X				X						X	
Putnam Valley Senior Center	X	X		X								X	X											
Putnam Family & Community Services - 1808	X	X		X								X					X	X						
Highway Department - Building 1 Admin	X	X		X		X						X	X					X						
Highway Department - Building 2 Sign Shop	X	X		X								X												
Highway Department - Building 3 Dispatch/Garage	X	X		X								X		X										
Highway Department - Building 4 Garage	X	X		X								X												
Board of Elections	X	X		X								X												
Senator Vincent Leibell Veterans' Home	X	X											X											
Putnam Family & Community Services - 1816	X	X		X																				
Burchetta Building (Law Dept) - 48 Gleneida	X	X		X								X	X											
Tilly Foster Farm Building #8	X	X		X																				
Included Sites	22	22	4	16	1	4	2	4	1	2	1	19	10	1	1	5	5	11	1	1	4	3	1	

MAINTENANCE REQUIREMENTS PER ECM

For most of the measures included in this project, O&M is expected to be approximately equal to what the County currently incurs for overall operations and maintenance, therefore O&M can continue to be performed as is. County personnel will receive training on the proper operation and maintenance of the new equipment once equipment commissioning is complete. The County will be expected to perform maintenance on a scheduled basis and repair/replacement of failed components in a timely manner, all in accordance with manufacturer's standards and/or Ameresco O&M manuals for the measures installed under this Performance Contract. If the County is unable to perform these tasks, Ameresco can provide these services for an additional fee and/or the County shall outsource to a qualified service provider. Failure of the County to carry out the aforementioned during the term of the contract, may require Ameresco to adjust the savings guarantee.

The following table describes the general maintenance requirements that will need to be carried out in order to ensure the persistence of savings for the term of the contact. Final operational and maintenance tasks will be developed in detail once these ECMs are commissioned. Ameresco will provide the County with a set of O&M manuals that will details these tasks.

Table 3.2: General Maintenance Requirements

Energy Conservation Measures	Required Maintenance	County Responsibility	Ameresco Responsibility
ECM -1: Lighting System Improvements - Interior	Replace failed lamps and ballasts with the same or similarly rated components.	✓	
ECM-2: Lighting System Improvements - Exterior	Replace failed lamps and ballasts with the same or similarly rated components.	✓	
ECM-3: Recommission Energy Management Systems	Calibrate sensors periodically to maintain accuracy. Replace or repair failed components.	✓	
ECM-4: Web-enabled Programmable Thermostats	Replace or repair failed components.	✓	
ECM-5: Heat Timer & Thermostatic Radiator Valves	Replace or repair failed components.	✓	
ECM-6: Fuel Oil to Natural Gas Conversion	Perform preventative maintenance as detailed in manufactures O&M manual including water treatment.	✓	

Energy Conservation Measures	Required Maintenance	County Responsibility	Ameresco Responsibility
ECM-8: Variable Frequency Drives for HW Pumps	Replace or repair failed components.	✓	
ECM-10: Premium Efficiency Transformers	Replace or repair failed components.	✓	
ECM-11: Vending Misers	Replace or repair failed components.	✓	
ECM-12: Walk-in Refrigeration Controls	Replace or repair failed components.	✓	
ECM-13: Steam Trap Replacements	Replace or repair failed components.	✓	
ECM-14: Infiltration Reductions	Replace or repair failed components.	✓	
ECM-15: Pipe Insulation	Replace or repair failed components.	✓	
ECM-16: Boiler Replacements	Perform preventative maintenance as detailed in manufactures O&M manual including water treatment.	✓	
ECM-17: Window Replacements	Replace or repair failed components.	✓	
ECM-18: Solar PV Array	System operation will be monitored by Ameresco. County will replace or repair failed components.	✓	
ECM-19: AHU Replacements	Replace or repair failed components.	✓	
ECM-20: Plug Load Controllers	Replace or repair failed components.	✓	
ECM-22: Chiller Replacement	Perform preventative maintenance as detailed in manufactures O&M manual including water treatment.	✓	
ECM-23: Siding Replacement	Replace or repair failed components.	✓	
ECM-24: Roof Replacement	Replace or repair failed components.	✓	

Energy Conservation Measures	Required Maintenance	County Responsibility	Ameresco Responsibility
ECM-25: Window Restoration	Replace or repair failed components.	✓	
ECM-26: Move Register	Replace or repair failed components.	✓	

WARRANTY AND MAINTENANCE RESPONSE

WARRANTY

Ameresco will warrant the labor and material for each ECM for a period of one year from the issuance of substantial completion for each ECM. This warranty is for repair of equipment installed by Ameresco only and does not include operation and maintenance unless otherwise included in the table above. After the one-year period, any remaining manufacturer's warranties will be passed on to the County.

MAINTENANCE RESPONSE

To the extent that any Ameresco maintenance services are included in the final project, all operations and services will be coordinated through the Ameresco corporate office located in Framingham, Massachusetts and through local area contractors. This will provide the County with a local, single point of contact. Ameresco's Operations Manager will serve as the single point of contact for the County throughout the entire operations phase of the project.

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ECM 1: INTERIOR LIGHTING SYSTEM IMPROVEMENTS

ECM OVERVIEW

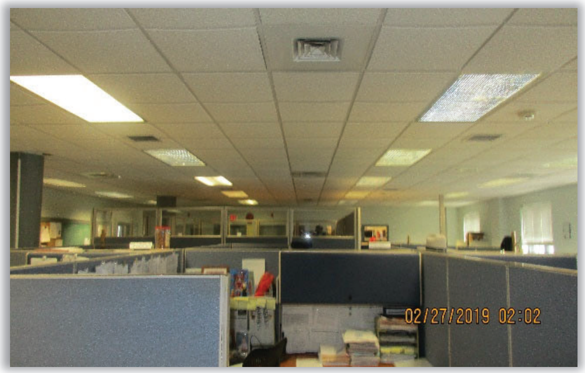


Figure E1.1: This project will improve aesthetics and provide substantial energy savings.

Ameresco will install a long lasting, state-of-the-art lighting system to benefit the building occupants throughout Putnam County. Our in-house lighting team completed a detailed survey of your facilities and proposes upgrading your lighting system with long-life, energy-efficient LED products. Unlike some other lighting scopes that tend to recommend the lowest-possible upfront-cost without considering equipment compatibility or lighting design quality metrics such as uniformity or glare, Ameresco's expert lighting developers strive to develop cost-effective lighting retrofit systems that occupants and facility managers will be happy with for years to come. While we are always willing to work with our customers based on their specific goals and needs to optimize lighting systems, the project described below represents a cost-effective and energy-efficient retrofit program that doesn't sacrifice occupant comfort, long-term maintenance costs, or safety.

EXISTING SYSTEM DETAIL

EXISTING SYSTEM

Ameresco identified 208 unique different lamp/ballast/fixture combinations, the majority of which are linear fluorescent, and provide general lighting in primary areas such as offices, halls, classrooms, baths cells, court rooms, and storage areas.

Approximately 93% of linear fluorescent fixtures use standard-grade T8 lamps on mixture of standard-grade and high efficient-grade electronic ballasts, with only 6% of linear fluorescent fixtures still using T12 lamps on magnetic ballasts. The remaining 1% of linear fluorescent fixures use a mixture of T5 and biax lamps on electronic ballasts.

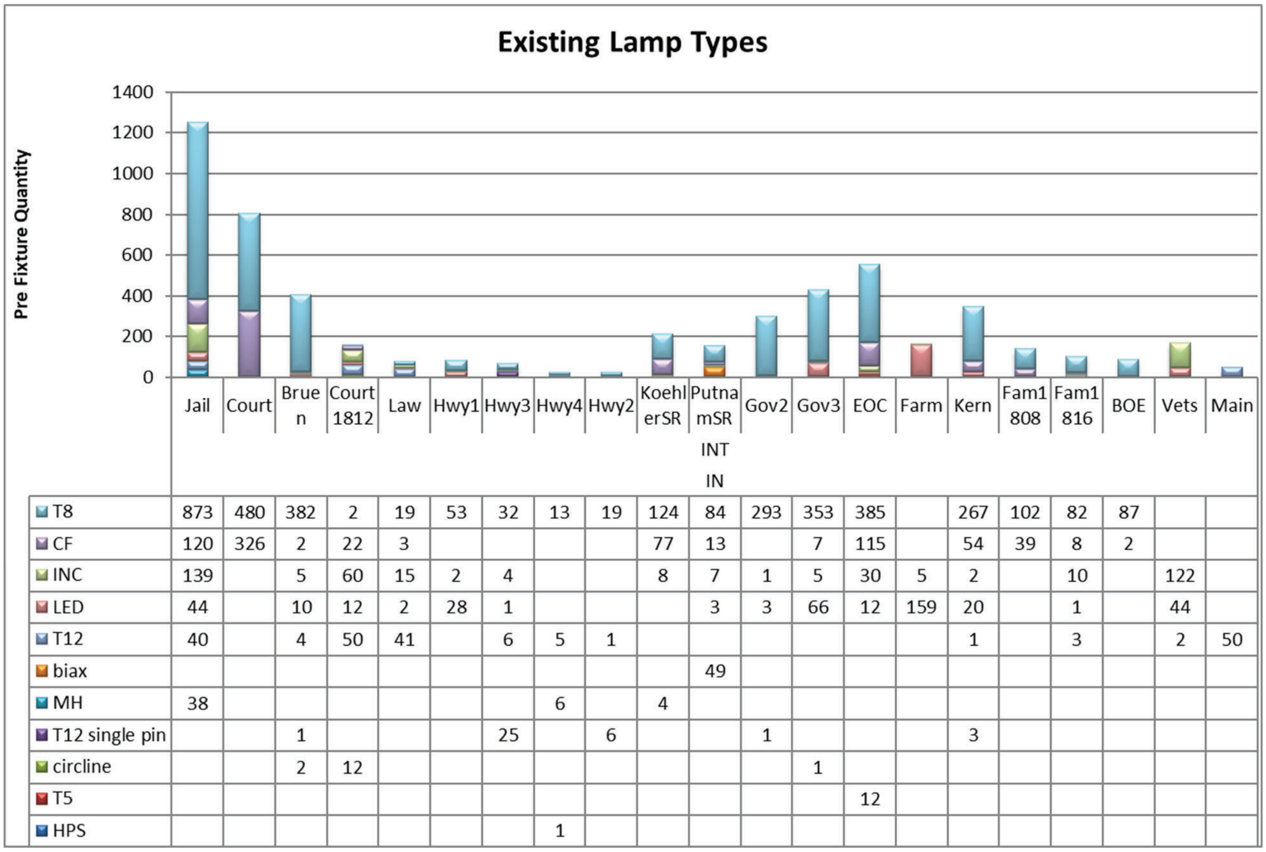
High-intensity discharge (HID) lamps are used in garages, hallways and stairways. Color rendition is fair to poor depending on lamp quality and age, which unfortunately can be a characteristic of HID lamps.

Incandescent lamps are installed in 8% of fixtures, some of which are exit signs which burn 24/7. Compact fluorescents comprise 15% of the existing fixture total.

LED technology is already being used in certain locations such as Jail, Hwy1, Gov3, Farm, and Golf.

The following chart illustrates the types and quantities of existing lamps currently in use.

Chart E1.1: Existing Lamp Types and Quantities Currently in Use

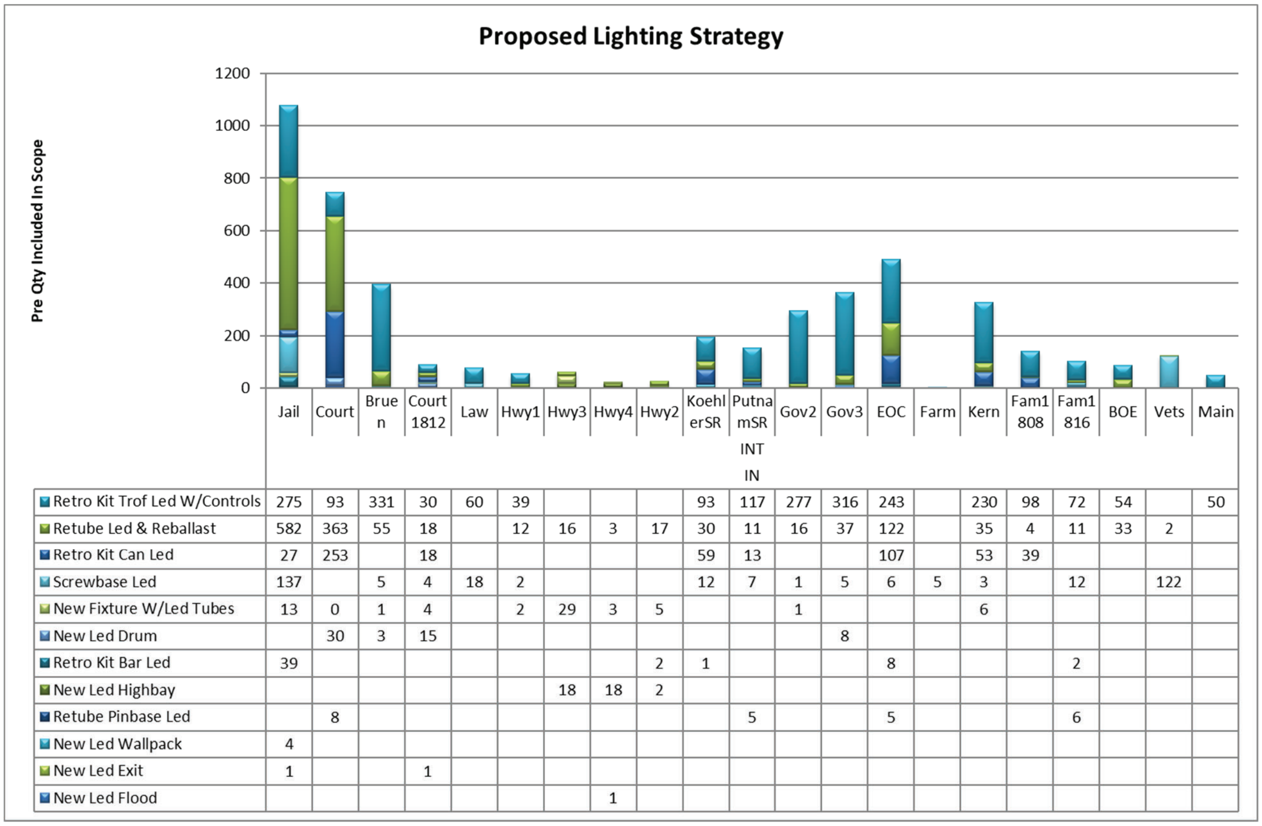


	Jail	Court	Bruen	Court 1812	Law	Hwy1	Hwy3	Hwy4	Hwy2	KoehlerSR	PutnamSR INT IN	Gov2	Gov3	EOC	Farm	Kern	Fam1 808	Fam1 816	BOE	Vets	Main
T8	873	480	382	2	19	53	32	13	19	124	84	293	353	385		267	102	82	87		
CF	120	326	2	22	3					77	13		7	115		54	39	8	2		
INC	139		5	60	15	2	4			8	7	1	5	30	5	2		10		122	
LED	44		10	12	2	28	1				3	3	66	12	159	20		1		44	
T12	40		4	50	41		6	5	1							1		3		2	50
biax											49										
MH	38							6		4											
T12 single pin			1				25		6			1				3					
circline			2	12									1								
T5														12							
HPS								1													

PROPOSED SYSTEM

Ameresco employed a variety of strategies which are presented in descending order beginning with our primary approach. Each subsequent concept represents a smaller portion of the overall scope, and the following chart illustrates the relative quantities involved. For a complete itemized list of work to be performed, please refer to the attached “Lighting System Analysis”.

Chart E1.2: Proposed Lighting Strategies and the Quantities Involved



	Jail	Court	Bruen	Court 1812	Law	Hwy1	Hwy3	Hwy4	Hwy2	KoehlerSR	PutnamSR INT IN	Gov2	Gov3	EOC	Farm	Kern	Fam1808	Fam1816	BOE	Vets	Main
Retro Kit Trof Led W/Controls	275	93	331	30	60	39				93	117	277	316	243		230	98	72	54		50
Retube Led & Reballast	582	363	55	18		12	16	3	17	30	11	16	37	122		35	4	11	33	2	
Retro Kit Can Led	27	253		18						59	13			107		53	39				
Screwbase Led	137		5	4	18	2				12	7	1	5	6	5	3		12		122	
New Fixture W/Led Tubes	13	0	1	4		2	29	3	5			1				6					
New Led Drum		30	3	15									8								
Retro Kit Bar Led	39								2	1				8				2			
New Led Highbay							18	18	2												
Retube Pinbase Led		8									5			5				6			
New Led Wallpack	4																				
New Led Exit	1			1																	
New Led Flood								1													

LED Troffer Kit w/Controls: an LED recessed troffer kit with integrated controls will be installed. Appropriate for “T-grid” ceilings, they provide a dramatic upgrade in performance and aesthetics. Each new fixture will have its own factory installed occupancy/daylight sensor which serves to provide excellent coverage, eliminating “false off” and other undesired behaviors. An intuitive Android app allows fixtures to be grouped, makes commissioning easy, and allows you to modify performance parameters such as high end trim, daylight harvesting, occupancy sensing, background light level, and manual dimming in private spaces. Installation costs are lower because communication wiring to remote

sensors or network hubs are not needed, and there are economies of scale in manufacturing by assembling sensors and fixtures as one unit.

Retube LED & Reballast: linear “Type A” LED tubes will replace existing lamps, and high-efficiency “T8” ballasts will replace existing ballasts. Appropriate for a wide variety of existing fixtures, these tubes provide excellent energy savings and extremely long service life. Modern electronic ballasts are highly reliable, with similar rated life as the tube themselves, therefore maintenance staff will not be burdened with excessive ballast changes. In this “plug & play” approach socket wiring is not altered, thereby avoiding potential safety concerns created with some “direct wire” tubes. Maintaining a ballasted system also ensures any general lighting fixtures that are part of your egress system, which often work in conjunction with fluorescent ballasts, continues to function properly. When service is eventually required, you will be able to easily obtain replacement parts which is not always true for brand new LED fixtures. Using ballasts also allowed us to customize light output by selecting one of three ballast factors (low, medium, or high) according to circumstance.

Retro Kit Can LED: an LED kit specifically designed for recessed down lights will be installed. They extend service intervals and improve fixture efficiency compared to most legacy light sources which leave many of the lumens produced trapped within the can itself.

Screwbase LED: an Edison base LED lamp will be installed. Now available in traditional form factors such as “A” or “PAR” lamps, they are appropriate for standard and decorative fixtures alike. In larger existing fixtures using HID lamps, we often use a larger screwbase LED and simply disconnect the HID ballast.

New Fixture W/LED Tubes: a new “fluorescent” style fixture will be installed, such as a “wrap” or a “strip”. Instead of T8 lamps, we will use “Type A” LED tubes which will operate on the new ballast already contained within the fixture. This allows us to cost-effectively replace fixtures in poor condition with one of similar style and function. When service is eventually required, you will be able to easily obtain replacement parts which is not always true for brand new LED fixtures. This approach integrates seamlessly into projects where “retube/reballast” is already being employed elsewhere for fixtures still in good condition.

New LED Drum: a new LED drum will be installed. Drum fixtures commonly contain multiple existing lamps, and due to their inherent design, are inefficient. New LED drums are highly efficient, and relatively inexpensive compared to other LED fixtures.

Retro Kit Bar LED: an LED bar kit specifically designed for retrofitting existing fluorescent fixtures will be installed. They will allow us to eliminate “U” bent lamp in high security fixtures at the Jail, among other uses.

New LED Highbay: a new LED fixture will be installed. Typically used in locations with high ceilings where uniform illumination is desired, these high-performance fixtures improve light distribution, reduce shadowing and “hot spots”, while savings substantial energy. Additional benefits of LED over legacy sources are improved color rendition, better lumen maintenance, and reduced color shift. Further, LED are instant on and fully compatible with a variety of control methods.

Retube LED Pin Base: small LED tubes will replace a variety of existing compact fluorescent and/or “biax” pin-base lamps and will continue to operate on existing magnetic and/or electronic ballasts. This approach is used for unique and/or decorative fixtures where minimal modification is desired, and extended service life is desired.

New LED Wallpack: Perfect for replacing legacy HID fixtures, LEDs wallpacks provide an energy efficient, low maintenance solution for a variety of building mounted and perimeter applications. The inherent directionality of LED chips makes them perfect where controlled illumination is desired. They are ideal for roof top areas where general wall mounted illumination is appropriate.

New LED Exit: a new LED exit sign with battery backup will be installed. Due to their constant operation, exit signs are one of the best applications of LED technology. Fluorescent exit signs consume about 14 watts per sign and have a rated lamp life of 10,000 hours, so they must be re-lamped every 1 to 1½ years; incandescent exit signs consume about 20 to 40 watts per sign and have a rated life of 2,000 hours and must be re-lamped four to five times per year. LED exit signs consume a few watts per sign and have a rated life of at least 50,000 hours.

New LED Flood: These high-performance fixtures are ideal for garages. LED floodlights are designed to replace HIDs with precision-engineered optics that deliver outstanding optical control, uniformity, and even illumination.

In addition to the strategies listed above, we were cognizant of various lighting and wiring deficiencies which we intended to address as part of this scope. For example, a proper switch will be installed for this storage room in Kern. A few fixtures are being added for mechanical spaces in the Jail where additional light is needed, while 22 fixtures are being added to the basement records area in the Court building.

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTS

Equipment will be identified in product submittals provided to the County for approval prior to procurement. The lighting audit completed for each facility will be submitted as the basis for construction, and includes descriptions of existing & proposed fixtures, operating hours, and energy savings. After approval by the County, they will constitute the construction documents, and upon completion of construction, shall be revised to reflect “As-Built” conditions, and submitted to the County for permanent record.

Despite our best efforts, cataloguing every fixture in every location is quite difficult. Therefore, fixtures or areas not listed are excluded from our scope, and of course you were not charged for them. Typical examples of “missed” areas are: low use closets/crawlspaces, inaccessible and/or areas involved in current or future renovation plans, high-security locations, and specialty fixtures such as medical, stage lighting, or decorative. If your staff acted as primary escort through a site, we assume they took us to every location you desire to be included in the project- therefore areas not visited are not included.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

All installations will be conducted during normal business hours or after normal operating hours if interruption of functions is anticipated. Installations will be coordinated with appointed personnel.

INTEGRATION OF PROPOSED EQUIPMENT WITH EXISTING SYSTEMS

The new lighting system, and all components thereof, will be fully integrated into the existing lighting systems. We assume the entire existing lighting infrastructure (fixtures, wiring, controls, mounting systems) complies with the latest codes, standards, and recommended practices of all relevant agencies, and that prior installations were done following best practices accepted throughout the industry. Required upgrades to meet safety, codes, standards, practices, and/or to prepare the location for the installation as described above, can be performed on a time and material basis.

ENVIRONMENTAL IMPACT

There are no potential adverse environmental impacts associated with this lighting upgrade. During construction, we will remove, package, and recycle all existing lamps that contain mercury, as well as ballasts/capacitors that contain PCBs or DEHP according to applicable regulations. Handling, disposal, abatement, and any other treatment of any other hazardous materials, other than those contained within the light source itself mentioned above (mercury/PCB’s), are excluded from this ECM.

MAINTENANCE

With product lifetimes typically 2-3 times greater than those being replaced, maintenance intervals are extended. Implementation of this measure will result in annual maintenance savings because installation of new equipment will extend service intervals. Our calculation is based on the typical frequency of equipment replacement of the old system versus the new system. No consideration was given to actual labor costs, although we expect everyone will appreciate the reduction in time spent on ladders servicing existing equipment.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

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ECM 2: EXTERIOR LIGHTING SYSTEM IMPROVEMENTS

ECM OVERVIEW

Our in-house lighting team completed a detailed survey of your facilities and proposes upgrading your lighting system with long-life, energy-efficient LED products.

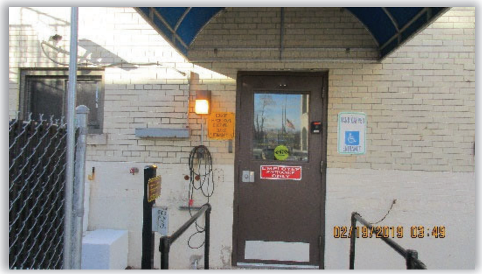


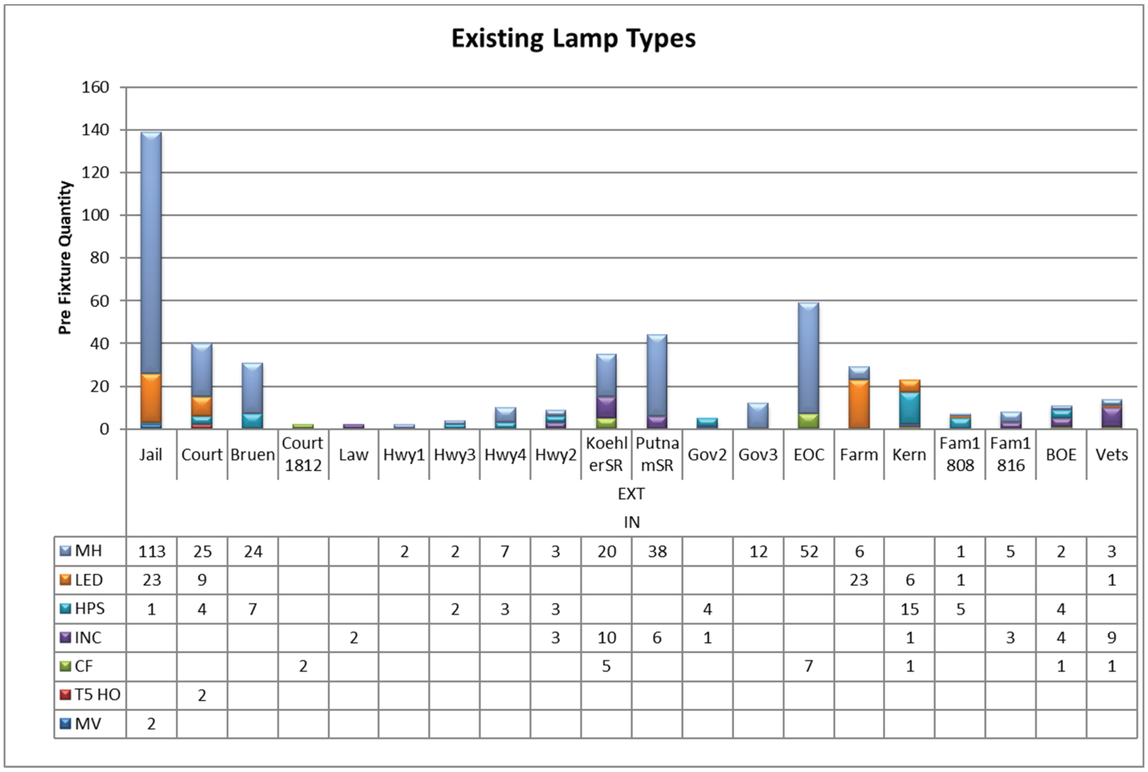
Figure E2.1: This project will improve aesthetics and provide substantial energy savings.

EXISTING SYSTEM DETAIL

Ameresco identified **60** unique lamp/ballast/fixture combinations. Metal Halide (MH) lamps are used in 65% of the fixtures and high-pressure sodium (HPS) lamps are used in 10% of the total exterior fixtures. All of these HID fixtures use standard magnetic ballasts. Incandescent lamps are installed in 8% of fixtures. Compact Fluorescent lamps are installed in 4% of fixtures. LED lamps are used in thre remaining 13% of fixtures.

The following chart illustrates the types and quantities of existing lamps currently in use.

Chart E2.1: Existing Lamp Types and Quantities Currently in Use



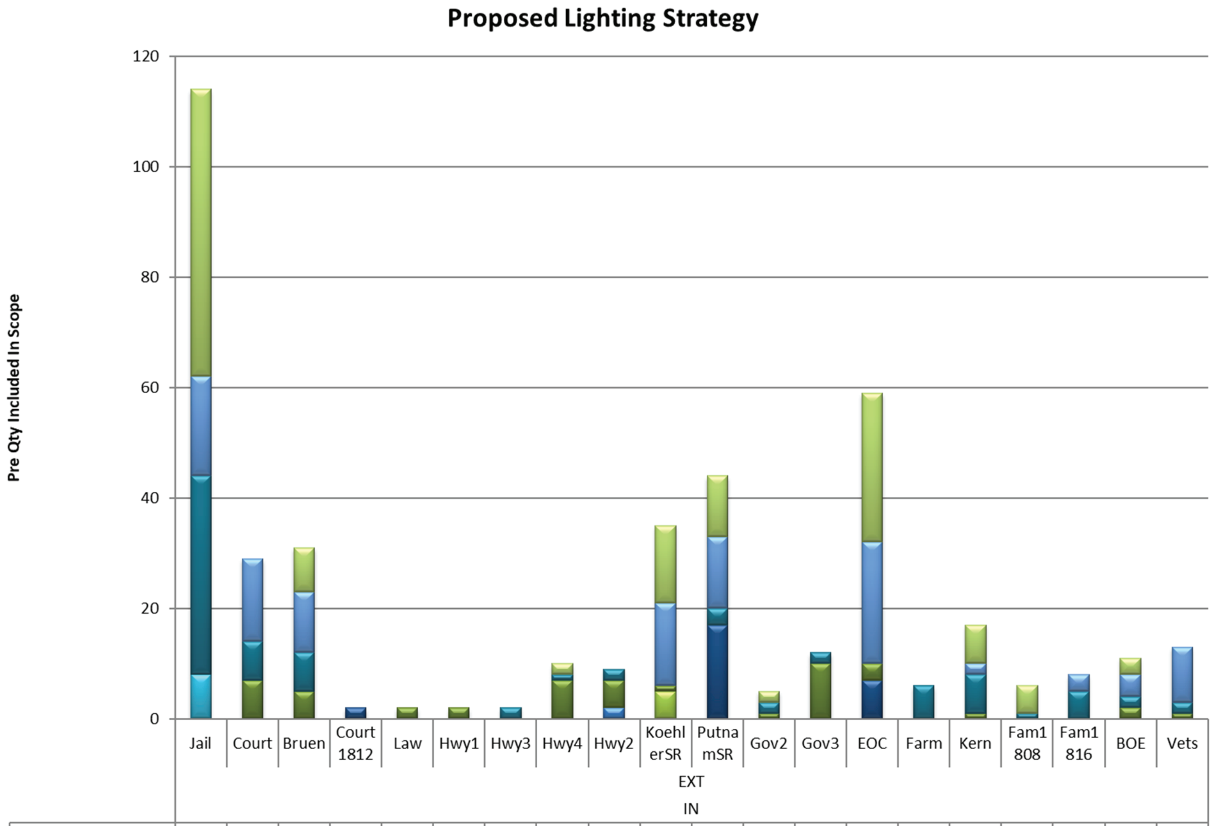
	Jail	Court	Bruen	Court 1812	Law	Hwy1	Hwy3	Hwy4	Hwy2	KoehlerSR	PutnamSR	Gov2	Gov3	EOC	Farm	Kern	Fam1 808	Fam1 816	BOE	Vets
MH	113	25	24			2	2	7	3	20	38		12	52	6		1	5	2	3
LED	23	9													23	6	1			1
HPS	1	4	7				2	3	3			4				15	5		4	
INC					2				3	10	6	1				1		3	4	9
CF				2						5				7		1			1	1
T5 HO		2																		
MV	2																			

PROPOSED SYSTEM

Ameresco proposes to replace existing exterior HID, compact fluorescent, and incandescent fixtures with the latest LED products. With product lifetimes 2-3 times greater than those being replaced, maintenance intervals are extended. LED fixtures produce light efficiently, with minimal wasted light and trespass, and effectively direct that light onto the target areas.

Ameresco employed a variety of strategies which are presented in descending order beginning with our primary approach. Each subsequent concept represents a smaller portion of the overall scope, and the chart illustrates the relative quantities involved. For a complete itemized list of work to be performed, please refer to the attached “Lighting System Analysis”.

Chart E2.2: Proposed Lighting Strategy



	Jail	Court	Bruen	Court 1812	Law	Hwy1	Hwy3	Hwy4	Hwy2	KoehlerSR	PutnamSR	Gov2	Gov3	EOC	Farm	Kern	Fam1808	Fam1816	BOE	Vets
New Led Area	52		8					2		14	11	2		27		7	5		3	
Screwbase Led	18	15	11							15	13			22		2		3	4	10
New Led Wallpack	36	7	7				2	1	2		3	2	2		6	7	1	5	2	2
New Led Flood		7	5		2	2		7	5	1		1	10	3		1			2	1
Retro Kit Can Led				2							17			7						
New Led Surface	8																			
Retube Pinbase Led										5										
New Led Highbay									2											

New LED Area: Offered in a wide variety of distribution patterns appropriate for every area application such as parking lots, driveways, building perimeters and fields, just to name a few, LED area fixtures are engineered for superior distribution & uniformity, providing excellent results across a wide variety of exterior applications.

Screwbase LED: an Edison base LED lamp will be installed. Now available in traditional form factors such as "A" or "PAR" lamps, they are appropriate for standard and decorative fixtures alike. In larger existing fixtures using HID lamps, we often use a larger screwbase LED and simply disconnect the HID ballast.

New LED Wallpack: Perfect for replacing legacy HID fixtures, LEDs wallpacks provide an energy efficient, low maintenance solution for a variety of building mounted and perimeter applications. The inherent directionality of LED chips makes them perfect where controlled illumination is desired. They are ideal for building perimeters where general wall mounted illumination is appropriate.

New LED Flood: These high-performance fixtures are ideal for parking lots, walkways, building perimeters and fields. LED floodlights are designed to replace HIDs with precision-engineered optics that deliver outstanding optical control, uniformity, and even illumination.

Retro Kit Can LED: an LED kit specifically designed for recessed down lights will be installed. They extend service intervals and improve fixture efficiency compared to most legacy light sources which leave many of the lumens produced trapped within the can itself.

New LED Surface: These high-performance LED surface fixtures are ideal for lighting in covered and semi-covered outdoor building perimeters with mounting heights of 8-15'. Lenses provide different photometric distributions suited to a variety of canopy, entry, and covered walkway applications.

Retube LED Pin Base: small LED tubes will replace a variety of existing compact fluorescent and/or "biax" pin-base lamps and will continue to operate on existing magnetic and/or electronic ballasts. This approach is used for unique and/or decorative fixtures where minimal modification is desired, and extended service life is desired.

New LED Highbay: a new LED fixture will be installed. Typically used in locations with high ceilings where uniform illumination is desired, these high-performance fixtures improve light distribution, reduce shadowing and "hot spots", while savings substantial energy. Additional benefits of LED over legacy sources are improved color rendition, better lumen maintenance, and reduced color shift. Further, LED are instant on and fully compatible with a variety of control methods.

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTATION

Equipment will be identified in product submittals provided to the County for approval prior to procurement. The lighting audit completed for each facility will be submitted as the basis for construction, and includes descriptions of existing & proposed fixtures, operating hours, and energy savings. After approval by the County, they will constitute the construction documents, and upon completion of construction, shall be revised to reflect “As-Built” conditions, and submitted to the County for permanent record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

All installations will be conducted during normal business hours. Installations will be coordinated with appointed personnel.

INTEGRATION OF PROPOSED EQUIPMENT WITH EXISTING SYSTEMS

The new lighting system, and all components thereof, will be fully integrated into the existing lighting systems. We assume the entire existing lighting infrastructure (fixtures, wiring, controls, mounting systems) complies with the latest codes, standards, and recommended practices of all relevant agencies, and that prior installations were done following best practices accepted throughout the industry. Required upgrades to meet safety, codes, standards, practices, and/or to prepare the location for the installation as described above, can be performed on a time and material basis.

ENVIRONMENTAL IMPACT

There are no potential adverse environmental impacts associated with this lighting upgrade. During construction, Ameresco will remove, package, and recycle all existing lamps that contain mercury, as well as ballasts/capacitors that contain PCBs or DEHP according to applicable regulations. Handling, disposal, abatement, and any other treatment of any other hazardous materials, other than those contained within the light source itself mentioned above (mercury/PCB’s), are excluded from this ECM.

MAINTENANCE

Implementation of this measure will result in annual maintenance savings because installation of new equipment will extend service intervals. Our calculation is based on the typical frequency of equipment replacement of the old system versus the new system. No consideration was given to actual labor costs, although we expect everyone will appreciate the reduction in time spent on ladders servicing existing equipment.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

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ECM 3: RECOMMISSION ENERGY MANAGEMENT SYSTEMS

Ameresco recommends expanding existing Energy Management Systems (EMS) for the Jail, New Courthouse, Historic Courthouse, and Emergency Operations Center.

The software at each building will be updated to the latest version and schedules and setpoints will be programmed to match current occupancy conditions. The recommended EMS would be accessible from any Internet-enabled personal computer with web browsing software and would provide reduced energy consumption, increase system reliability and improve occupant comfort for the County. The proposed EMS will provide dynamic systems control and utility consumption reporting capabilities for affected building.

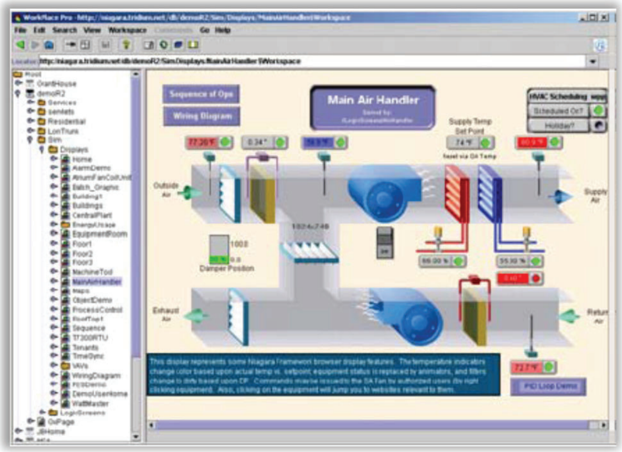


Figure E3.1: Energy Management Systems (EMS) Software

EXISTING SYSTEM DETAIL

SHERIFF'S DEPARTMENT/CORRECTIONAL FACILITY

The Jail is currently controlled by an Infinity Andover Controls LCX 810 controller with Andover bCX1 series field controllers operating on an Andover Continuum front end. All relevant HVAC equipment is currently controlled by this system.

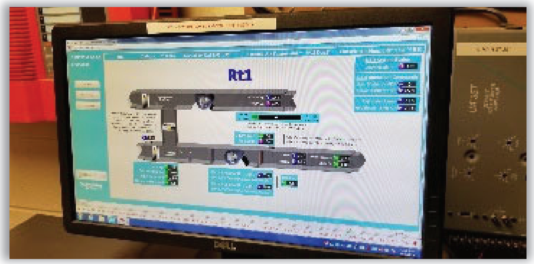


Figure E3.2: Current Controls

Controls are accessed by a desktop located in the basement mechanical space. Due to the nature of the building and condition of the existing system, all spaces are scheduled for 24/7 operation even though some spaces are only occupied during normal business hours. The Jail's RTUs and associated field controllers were recently replaced. The County has recently reported trouble with the existing VAV field controllers, having to replace a number of them. This can lead to loss of occupant comfort as well as unnecessary use of energy from overheating or overcooling.

NEW PUTNAM COUNTY COURTHOUSE

This building has existing Honeywell WEB-700 controls operating on the Niagara AX platform. All relevant HVAC equipment is currently controlled by this system.

Controls are accessed through a web browser on a desktop computer located in the basement mechanical space. Although the building operates on a regular occupancy schedule, the heating system currently operates 24/7. This is likely due to an issue with the morning warmup sequence and fears that the building won't be able to achieve comfortable temperature by the time occupants arrive. Field controllers and actuators are believed to be in good working order.

Figure E3.3: Existing Honeywell WEB-700 Controls

1812 COURTHOUSE

The Historic Courthouse is currently controlled by Schneider Andover i2800 series controllers operating on an Andover Continuum front end. All relevant HVAC equipment is currently controlled by this system.

Controls are accessed through Andover Pinpoint software from a desktop computer located in the basement mechanical space. Although the building operates on a regular occupancy schedule, the heating system currently operates 24/7. This is likely due to an issue with the morning warmup sequence and fears that the building won't be able to achieve comfortable temperature by the time occupants arrive. Field controllers and actuators are believed to be in good working order.

EMERGENCY OPERATIONS CENTER/TOPS

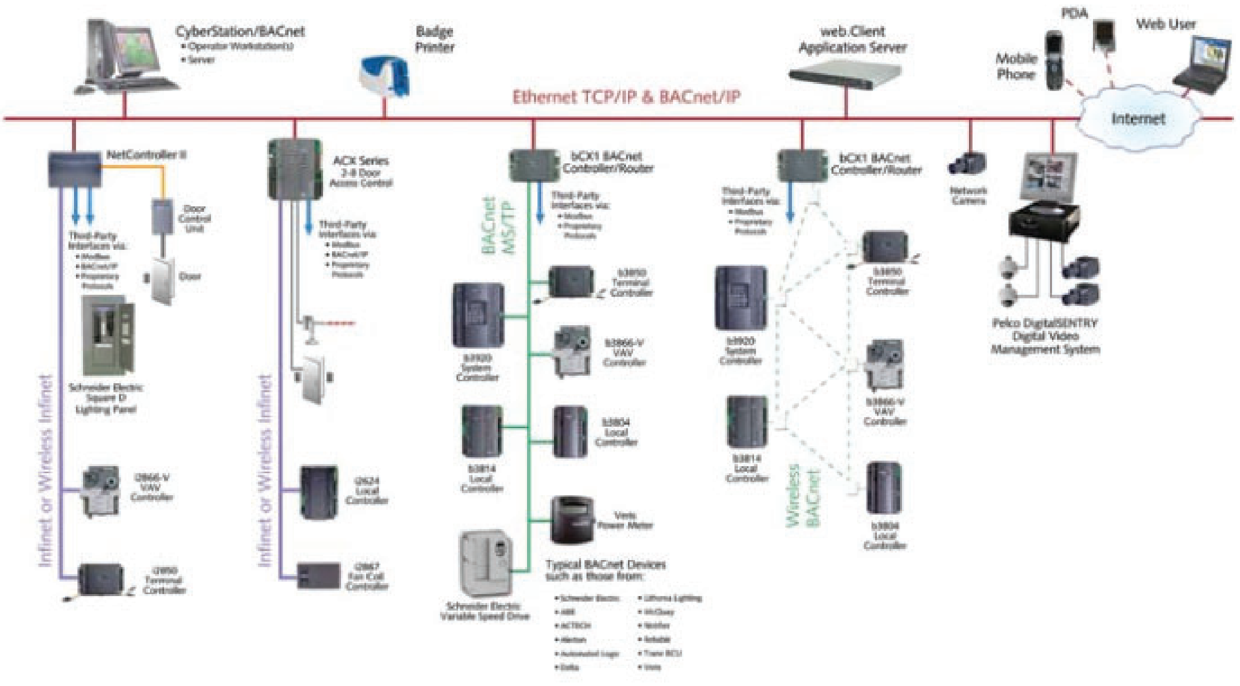
This building is currently controlled by Andover Controls controllers operating on an Andover Continuum front end. All relevant HVAC equipment is currently controlled by this system.

The building is divided into different sections, some of which are occupied during normal business hours and some of which are occupied only during special training or emergency events. Despite this building occupancy the heating system currently operates 24/7 for all sections. Field controllers and actuators are believed to be in good working order.

Figure E3.4: Current Andover Controls

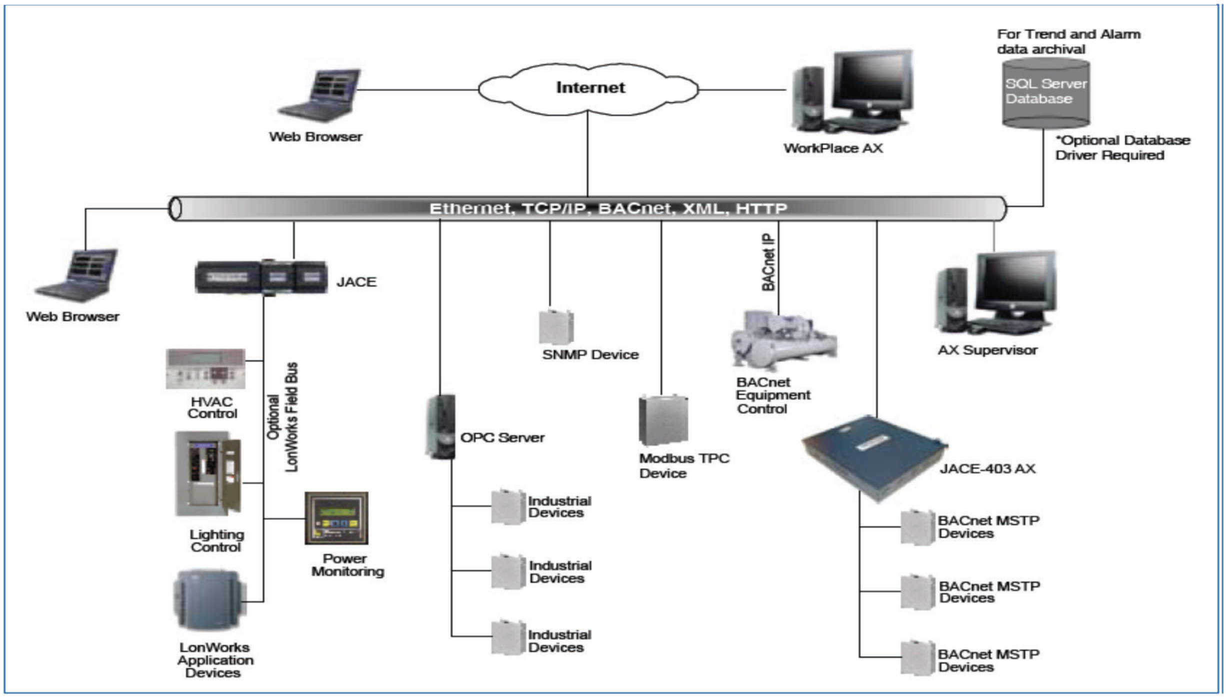
PROPOSED SYSTEM

Andover Continuum System Architecture



For the existing Andover buildings, Ameresco is proposing to update the existing energy management system with the latest version of the Andover Continuum platform. This will allow implementation of updated control strategies such as night setback and morning warmup.

Figure E3.5: Typical Tridium™ configuration



For the New Courthouse, Ameresco is proposing an “open protocol” energy management system with Tridium’s Niagara Framework. The open protocol specification will allow the County to connect products from almost any LonWorks or BACnet vendor to the proposed system, in addition to other systems based on MODBUS or JCI’s N2. Future upgrades and expansions can be competitively bid and will not be limited to the products of any one manufacturer. Ameresco has no commercial alliance with any EMS vendor and considers all applicable products. Ameresco believes the County’s interests would be best served with an open protocol EMS architecture.

SHERIFF’S DEPARTMENT/CORRECTIONAL FACILITY

EMS scope of work at the Jail shall include the following:

- Upgrade of Andover software to latest rev 2.03, featuring:
  - Powerful User Interfaces for controller climate, security, lighting and energy from a single system
  - An interface for all users – Guards, Receptionists, Department Managers, Facility Managers, Building Owners, Technicians
  - Support for open standards – XML, LDAP, ODBC, OLE, SNMP, BACnet
  - Support for wired and wireless Ethernet networks
  - Support for Andover Continuum Infinet and BACnet networks – wired or wireless

    - Powerful interfaces for graphics, schedules, trends, reports, alarms, personnel, programming and more
- New control sequences of operation such as morning warm up
- Reschedule all spaces to match actual occupancies
- Provide and install a new desktop PC running an updated version of Windows 10 to run Continuum desktop interface
- Replace (83) existing field controllers
    - (2) – i2920 controllers
    - (1) – i2810 controller
    - (80) - i2850 VAV controllers
        - (80) – VAV damper actuators

NEW PUTNAM COUNTY COURTHOUSE

Ameresco will furnish and install new system enhancements through the Niagara Framework 4.0 Server Software/Network Controller solution. The new system enhancements will include:

- replace existing AX Network Controller with N4 JACE 8000 Controller
- all current network controller global data will reside in N4 server
- system installation includes re-commissioning of the field control system
- recommissioning includes all 118 system controllers totaling 568 input/output points
- platform support for smart phones & tablets - mobile access to schedules, alarms, and data points
- system Scheduler Switchboard - for easy equipment, area and term schedules
- Astronomical Scheduler using location coordinates - capability for improved temperature control
- weather service advisories located on header bar for scrolling alerts
- email(s) / text(s) providing a simple way to send alarms to the right person at the right time
- enhanced user/password management - providing simplicity to manage system access and privileges

Note:

- Server software only, County to provide virtual machine or physical server
- ISP, LAN and/or WAN connectivity by County
- Work to be performed during normal working hours

1812 COURTHOUSE

EMS scope of work at the historic courthouse shall include the following:

- Upgrade of Andover software to latest rev 2.03, featuring:
    - Powerful User Interfaces for controller climate, security, lighting and energy from a single system
    - An interface for all users – Guards, Receptionists, Department Managers, Facility Managers, Building Owners, Technicians
    - Support for open standards – XML, LDAP, ODBC, OLE, SNMP, BACnet
    - Support for wired and wireless Ethernet networks
    - Support for Andover Continuum Infinet and BACnet networks – wired or wireless
    - Powerful interfaces for graphics, schedules, trends, reports, alarms, personnel, programming and more
- New control sequences of operation such as morning warm up
- Reschedule all spaces to match actual occupancies
- Provide and install a new desktop PC running an updated version of Windows 10 to run Continuum desktop interface

EMERGENCY OPERATIONS CENTER/TOPS

EMS scope of work at the EOC shall include the following:

- Upgrade of Andover software to latest rev 2.03, featuring:
    - Powerful User Interfaces for controller climate, security, lighting and energy from a single system
    - An interface for all users – Guards, Receptionists, Department Managers, Facility Managers, Building Owners, Technicians
    - Support for open standards – XML, LDAP, ODBC, OLE, SNMP, BACnet
    - Support for wired and wireless Ethernet networks
    - Support for Andover Continuum Infinet and BACnet networks – wired or wireless
    - Powerful interfaces for graphics, schedules, trends, reports, alarms, personnel, programming and more
- New control sequences of operation such as morning warm up
- Reschedule all spaces to match actual occupancies
- Provide and install a new desktop PC running an updated version of Windows 10 to run Continuum desktop interface

SEQUENCES OF OPERATION

DDC controls will be integrated and will have the existing programming reviewed by Ameresco's design and commissioning group in order to be optimized for energy savings. The following sequences, at a minimum, will be modified or added to existing DDC controls.

Table E3.1: Sequences to be Modified or Added to Existing DDC Controls

Building	Scheduling	Optimum Start/Stop & Morning Warmup	Supply Air Temp Reset	Boiler & Pump Control	Chiller & Pump Control
Sheriff's Department/Correctional Facility					
Boiler-1	X	X		X	
Boiler-2	X	X		X	
Hot Water Pump-1	X	X		X	
Hot Water Pump-2	X	X		X	
RTU-1	X	X	X		
RTU-2	X	X	X		
RTU-3	X	X	X		
RTU-4	X	X	X		
RTU-5	X	X	X		
RTU-6	X	X	X		
RTU-7	X	X	X		
RTU-8	X	X	X		
RTU-9	X	X	X		
RTU-10	X	X	X		
AHU-2T	X	X	X		
AHU-5T	X	X	X		
AHU-1	X	X	X		
AHU-2	X	X	X		
New Putnam County Courthouse					
Boiler-1	X	X		X	
Boiler-2	X	X		X	
Hot Water Pump-1	X	X		X	
Hot Water Pump-2	X	X		X	
Hot Water Pump-3	X	X		X	
Hot Water Pump-4	X	X		X	
RTU-1	X	X	X		
RTU-2	X	X	X		
RTU-3	X	X	X		
RTU-4	X	X	X		
AHU-1	X	X	X		
AHU-2	X	X	X		
AHU-3	X	X	X		
AHU-4	X	X	X		
VAVs	X	X	X		
1812 Courthouse					
Boiler-1	X	X		X	
Boiler-2	X	X		X	
Boiler-3	X	X		X	
Hot Water Pump-1	X	X		X	

Building	Scheduling	Optimum Start/Stop & Morning Warmup	Supply Air Temp Reset	Boiler & Pump Control	Chiller & Pump Control
Hot Water Pump-2	X	X		X	
Hot Water Pump-3	X	X		X	
Hot Water Pump-4	X	X		X	
Hot Water Pump-5	X	X		X	
Chiller-1	X	X			X
Chilled Water Pump-1	X	X			X
Chilled Water Pump-2	X	X			X
AHU-1	X	X	X		
AHU-2	X	X	X		
Emergency Operations Center/Tops					
Boiler-1	X	X		X	
Boiler-2	X	X		X	
Hot Water Pump-1	X	X		X	
Hot Water Pump-2	X	X		X	
Hot Water Pump-3	X	X		X	
Hot Water Pump-4	X	X		X	
Chiller-1	X	X			X
Chilled Water Pump-1	X	X			X
Chilled Water Pump-2	X	X			X
Chilled Water Pump-3	X	X			X
Chilled Water Pump-4	X	X			X
RTU-1	X	X	X		
RTU-2	X	X	X		
AHU-1	X	X	X		
AHU-2	X	X	X		
AHU-3	X	X	X		
AHU-4	X	X	X		
VAVs	X	X	X		

GENERAL ZONE AND SPECIAL AREA EVENT SCHEDULING

Ameresco proposes to edit and create operating schedules for all controlled spaces and special events. For example, the controls can be used to set templates for events that may occur in the building after hours such as a conference, board meeting, training, other use. For example, the normal schedule will be the default during occupied and unoccupied periods. However, when there is a special event, the system can default to one of the predetermined scenarios. This would allow for events to happen in a conditioned space without disrupting the system or causing the building to be ‘all on’ during an event that is isolated to a certain area of the building. For example, a “conference event” will trigger the schedule for conferences and the conference air handling systems will be engaged for the occupied periods only while the remainder of the building is in unoccupied mode.

OPTIMUM START / STOP

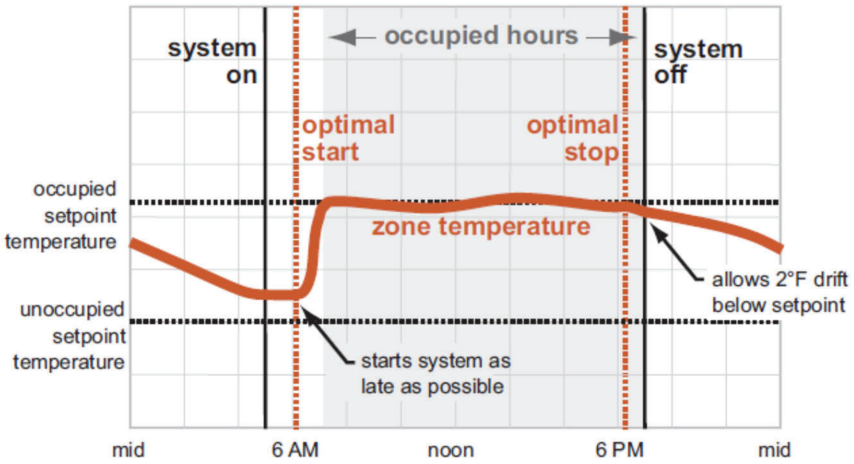


Figure E3.6: System Temperature Schedule

In some buildings, a simple time clock or time of-day schedule is used to start and stop the HVAC system. During hours when the building is expected to be unoccupied, the system is shut off and the temperature is allowed to drift away from the occupied setpoint. The time at which the system starts again in the morning is typically set to ensure that the indoor temperature reaches the desired occupied set point prior to occupancy on either the coldest or warmest morning of the year. As a result, for most days, the system starts much earlier than needed. In turn, this increases the number of operating hours and system energy use. An alternative approach is a strategy called optimal start. This strategy utilizes a building automation system (BAS) to determine the length of time required to bring each zone from current temperature to the occupied setpoint temperature. The system waits as long as possible before starting, so that the temperature in each zone reaches occupied setpoint just in time for occupancy (Figure 2.4). This optimal starting time is determined using the difference between actual zone temperature and occupied set point. It compares this difference with the historical performance of how quickly the zone has been able to warm up or cool down. The optimal start strategy reduces the number of system operating hours and saves energy by avoiding the need to maintain the indoor temperature at occupied set point even though the building is unoccupied. A related strategy is optimal stop. As mentioned earlier, at the end of the occupied period, the system is shut off and the temperature is allowed to drift away from occupied set point. However, the building occupants may not mind if the indoor temperature drifts just a few degrees before they leave for the day. Optimal stop uses the BAS to determine how early heating and cooling can be shut off for each zone, so that the indoor temperature drifts only a few degrees from occupied.

MORNING WARM-UP

Once the building automation system (BAS) has determined that the building should start transitioning from unoccupied to occupied operation, a morning warm-up sequence is activated. Boilers, pumps, and air handling equipment are turned on full to heat the building as quickly as possible. Heating valves and supply air dampers are fully opened, and outdoor air dampers are closed. Heating equipment remains in this mode until space temperature sensors come up to morning warm-up setpoint and normal occupied operation resumes.

SUPPLY-AIR-TEMPERATURE RE-SET

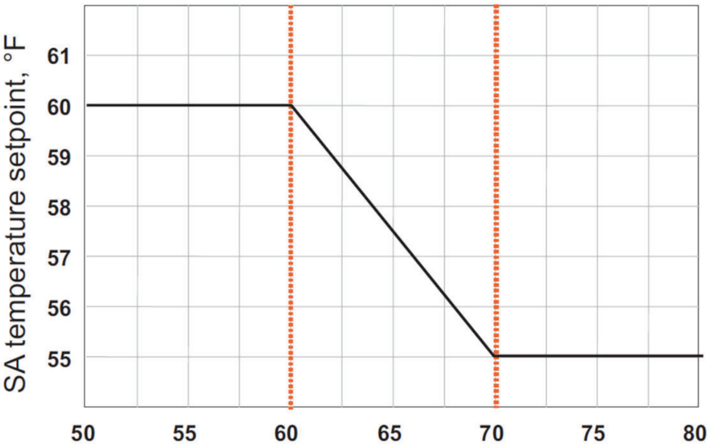


Figure E3.7: Supply-Air-Temperature Setpoint Chart

In a VAV system, it is tempting to raise the supply-air (SA) temperature at part-load conditions to save chiller or compressor and/or reheat energy. Increasing the supply air temperature reduces the chiller's compressor energy because it allows the compressor to operate at a warmer suction temperature. The corresponding higher suction pressure reduces the compressor lift, reducing the power required. In addition, supply-air-temperature reset makes an airside economizer more beneficial. When the outdoor air is cooler than the SA-temperature set point, the compressors are shut off, and the outdoor- and return-air dampers modulate to deliver the desired supply-air temperature. A warmer SA-temperature set point allows the compressors to be shut off sooner and increases the number of hours when the economizer is able to provide all the necessary cooling. For zones with very low cooling loads, when the supply airflow has been reduced to the minimum setting of the VAV terminal, raising the supply-air-temperature also decreases the use of reheat at the zone level. However, because the supply air is warmer, zones that require cooling will need more air to satisfy the cooling load. This may increase supply fan energy. Finally, in non-arid climates, warmer supply air means less dehumidification at the coil and higher humidity levels in the zones. If dehumidification is a concern, caution must be exercised when implementing this strategy. Supply-air-temperature reset should be implemented so that it minimizes overall system energy use. This requires considering the trade-off between compressor, reheat, and fan energy, as well as the impact on space humidity levels. These competing issues are often best balanced by first reducing supply airflow, taking advantage of the significant energy savings from unloading the fan. Once fan airflow has been reduced, raise the supply-air-temperature to minimize reheat energy and enhance the benefit of the airside economizer.

Ameresco recommends supply-air-temperature reset strategy based on the changing outdoor dry-bulb temperature. When the outdoor temperature is warmer than 70°F, no reset takes place and the SA temperature set point remains at the design value of 55°F. When it is this warm outside, the outdoor air provides little or no cooling benefit for economizing. The cooling load in most zones is likely high enough that reheat is not required to prevent overcooling. In addition, the colder (and drier) supply air allows the system to provide sufficiently dry air to the zones, improving part-load dehumidification.

UNOCCUPIED ZONE TEMPERATURE RESET

Ameresco proposes to fully implement unoccupied zone temperature reset. Zone temperature set points will be varied based on occupancy schedules. Unoccupied zone temperature reset is currently implemented by existing control systems. More accurate control will permit maximum unoccupied reset savings. The following table lists the proposed set points. These set points are proposed for all unoccupied periods.

Table E3.2: Proposed Set Points

	Cooling (ºF)	**Heating (ºF)**
Unoccupied	85.0	55.0

OCCUPIED SCHEDULING

Ameresco will initially setup the occupancy schedules in the EMS to reflect the major occupancy schedule of the buildings. The HVAC systems will only be operated when the buildings are supposed to be occupied. Other areas of the buildings like offices, conference rooms, and auditoriums can have longer schedules to reflect occupancy outside of the normal schedules. A temporary override will need to be activated to provide after-hours conditioning of spaces. The following table lists the proposed time schedules. The vacation schedule will also be initially setup in the system to turn off equipment on vacation days. The County will be responsible for updating the vacation and special days schedule to ensure the systems are not operating when the buildings are not occupied. An optimum start sequence will be programmed to ensure the building is at setpoint for the desired start times. Refer to the optimum start discussion below for more details. The Jail has sections that are occupied 24/7 as well as sections that are only occupied during normal business hours.

Table E3.3: Proposed Time Schedules

Building	**Start time (Mon – Fri)**	**Stop time (Mon – Fri)**	**Weekends/ Holidays**	**Period**
Sheriff's Department/Correctional Facility	Jail: 24/7 Office Area: 9:00 AM	Jail: 24/7 Office Area: 5:00 PM	Jail: On Office Area: OFF	Year-round
New Putnam County Courthouse	8:00 AM	5:00 PM	OFF	Year-round
1812 Courthouse	9:00 AM	5:00 PM	OFF	Year-round
Emergency Operations Center/Tops	9:00 AM	5:00 PM	OFF	Year-round

BOILER AND PUMP CONTROL SEQUENCES

Hot water boilers and pumps will be enabled based on both an operating schedule and an outdoor temperature setpoint. During normal operation the boilers and pumps will only be enabled whenever any of the heating related zones are occupied, and the outside air temperature is less than or equal to 60° (adjustable). During unoccupied periods the boilers and pumps will be off unless the outside air temperature is less than or equal to 37.5°, at which time the boilers will maintain a lower hot water loop temperature and the pumps will be operated continuously to prevent frozen coils. If the pumps are driven by VFDs then they will be operated at the minimum design flow rate and all hot water coils will be commanded open.

For steam boilers the occupied period operation will be similar to the hot water sequence above. When the unoccupied outside air temperature is less than or equal to 37.5°the boilers will maintain the steam header setpoint.

CHILLER AND PUMP CONTROL SEQUENCES

Chillers and pumps will be enabled based on both an operating schedule and an outdoor temperature setpoint. During normal operation the chiller and pumps will only be enabled whenever any of the heating related zones are occupied, and the outside air temperature is greater than or equal to 60° (adjustable).

FAULT AND EXCEPTION ALARMING

Ameresco proposes to provide fault or exception alarming for HVAC equipment. Equipment operation status will be proved by sensors operation; a commanded “ON” will result in a proved “ON” or an alarm will be generated. An alarm list will be maintained in a database to provide maintenance information to operators in real time. Operators will save significant time by addressing needs as indicated by the EMS. During non-working hours the EMS will have the capability of paging operators automatically to announce system faults.

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTS

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect “As-Built” conditions and submitted in multiple for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The installation of remotely-accessible energy management systems will improve comfort, reduce energy use and cost, and reduce on-site man-hours by specialized maintenance personnel.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

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ECM 4: WEB-ENABLED PROGRAMMABLE THERMOSTATS

Ameresco recommends installing new web-enabled thermostats to replace the function of existing thermostats at several buildings

The proposed thermostats will be fully programmable and accessible online, allowing County facility staff to set schedules and temperature setpoints remotely. This will drastically save personnel time and ensure thermostats are operating correctly.

Figure E4.1: Proposed Web-enabled Thermostat

Table E4.1: Existing Thermostats by Location

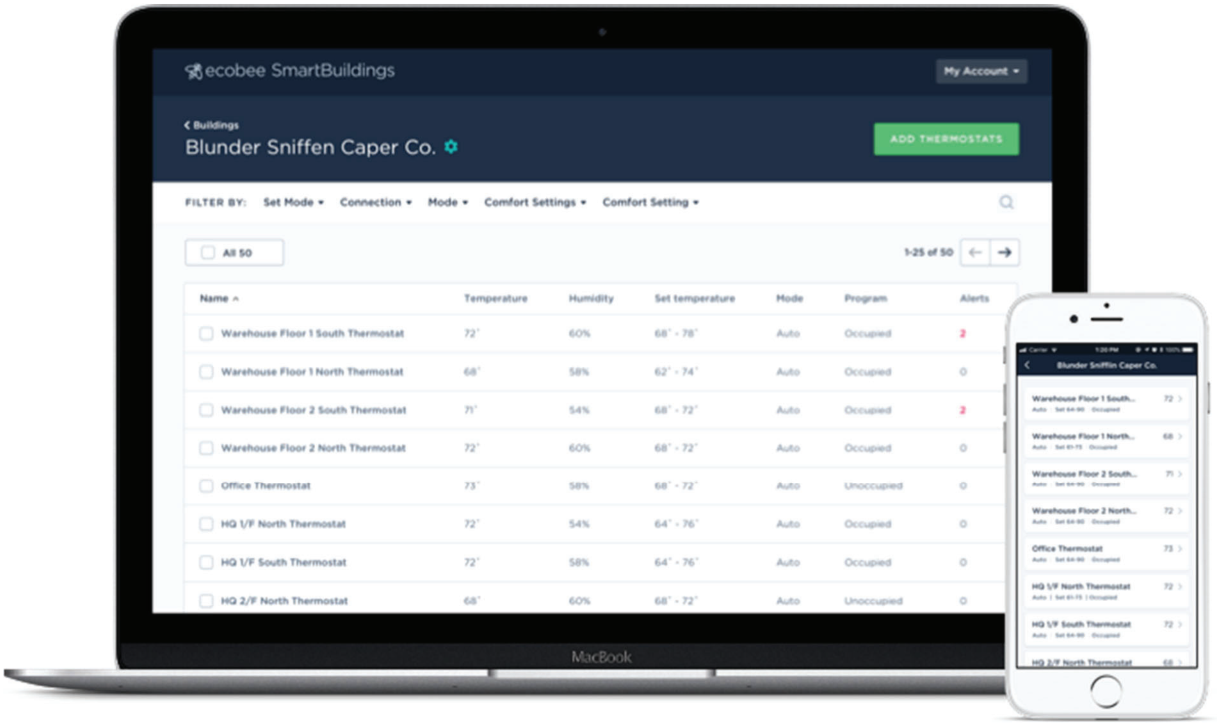
Location	**Existing Thermostats (Equipment)**	**Existing T'stats (Qty)**
121 Main Street	3rd Flr Electric Baseboard	18
Putnam National Golf Club - Clubhouse	2 RTU, 5 AHU, 10 zone pumps	17
Donald B. Smith Government Campus - Building 2	4 RTU, 8 FT Baseboard	12
Donald B. Smith Government Campus - Building 3	3 RTU, 6 FT Baseboard	9
Kern Building - Health Dept/DMV/WIC	7 RTU	7
William Koehler Senior Center	2 AHU, 5 zone pumps	7
Putnam Valley Senior Center	11 Programmable T'stats	11
Putnam Family & Community Services - 1808	5 RTU	5
Highway Department - Building 1 Admin	6 Zone Pumps	6
Highway Department - Building 2 Sign Shop	2 Furnaces	2
Highway Department - Building 3 Dispatch/Garage	4 Unit Heaters	4
Highway Department - Building 4 Garage	3 Furnaces	3
Board of Elections	4 DX Furnaces	4
Putnam Family & Community Services - 1816	4 DX Furnaces	4
Burchetta Building (Law Dept) - 48 Gleneida	4 Zone Pumps	4
Tilly Foster Farm Building #8	3 AHUs	3
Total		**116**

EXISTING SYSTEM DETAIL

EXISTING THERMOSTATS

The existing buildings feature a wide range of heating and cooling equipment controlled by an array of thermostats of varying age, function, and operability. Most thermostats are non-programmable and simply maintain the space at a consistent temperature at all hours, whether the space is occupied or not. The thermostats that are programmable are either not programmed with any schedule or require ongoing maintenance time to reprogram around changes in schedule, daylight savings time, and power outages. Because these thermostats are stand-alone, these changes need to be made in-person and one thermostat at a time. Given the large number of thermostats throughout the County's building stock, that is difficult to manage.

PROPOSED SYSTEM



☐ Name	Temperature	Humidity	Set temperature	Mode	Program	Alerts
☐ Warehouse Floor 1 South Thermostat	72°	60%	68° - 78°	Auto	Occupied	2
☐ Warehouse Floor 1 North Thermostat	68°	58%	62° - 74°	Auto	Occupied	0
☐ Warehouse Floor 2 South Thermostat	71°	54%	68° - 72°	Auto	Occupied	2
☐ Warehouse Floor 2 North Thermostat	72°	60%	68° - 72°	Auto	Occupied	0
☐ Office Thermostat	73°	58%	68° - 72°	Auto	Unoccupied	0
☐ HQ 1/F North Thermostat	72°	54%	64° - 76°	Auto	Occupied	0
☐ HQ 1/F South Thermostat	72°	58%	64° - 76°	Auto	Occupied	0
☐ HQ 2/F North Thermostat	68°	60%	68° - 72°	Auto	Unoccupied	0

Ameresco is proposing a business level platform of thermostats that will be accessed remotely. Multiple users with multiple, customizable levels of access will be able monitor, schedule, or program thermostats throughout the County, in groups or individually. Settings and levels of local access can be determined by the County. Ameresco has allocated negative O&M savings for the annual fee of $20 per thermostat to cover the County's costs within the project cash flow to maintain the remote service for these thermostats. The County will be responsible for maintaining this fee to keep the service active which will be needed to allow remote monitoring.

New web-enabled programmable thermostats will be installed in place of existing thermostats controlling HVAC equipment. Existing wiring will be reused wherever possible. If an existing thermostat is connected to equipment by 2-wire, new 4-wire will be run, per the table below.

Table E4.2: Existing Thermostat Wiring

Building	**Existing 2-Wire Thermostat**	**Existing 4-Wire Thermostat**
121 Main Street	17	1
Putnam National Golf Club - Clubhouse	10	7
Donald B. Smith Government Campus - Building 2	8	4
Donald B. Smith Government Campus - Building 3	6	3
Kern Building - Health Dept/DMV/WIC	0	7
William Koehler Senior Center	2	5
Putnam Valley Senior Center	0	11
Putnam Family & Community Services - 1808	0	5
Highway Department - Building 1 Admin	6	0
Highway Department - Building 2 Sign Shop	2	0
Highway Department - Building 3 Dispatch/Garage	4	0
Highway Department - Building 4 Garage	3	0
Board of Elections	0	4
Putnam Family & Community Services - 1816	0	4
Burchetta Building (Law Dept) - 48 Gleneida	0	4
Tilly Foster Farm Building #8	0	3
Totals	**58**	**58**

SEQUENCES OF OPERATION

The following sequences of operation, at a minimum, will be programmed into every thermostat.

OPTIMUM START/STOP OF HVAC EQUIPMENT

Ameresco proposes to implement optimum start/stop of HVAC Equipment. System energy will be saved if occupied zone temperature is conditioned to its set point as close to the beginning of the occupancy period as possible. For example, if the occupied zone set point is 70ºF and one hour is required to “pull the temperature up” to set point from the unoccupied temperature, the start time of HVAC equipment shall be delayed until one hour before the occupied period. This optimum start time of HVAC equipment is a function of the building characteristics, set points and ambient conditions. The thermostat will create a database of measurements for the facility from which an optimum start time will be automatically determined for each day. Similarly, the stop time of HVAC equipment will be determined from this database.

UNOCCUPIED ZONE TEMPERATURE RESET

Ameresco proposes to fully implement unoccupied zone temperature reset. Zone temperature set points will be varied based on occupancy schedules. More accurate sensing and control will permit maximum unoccupied reset savings. The following table lists the proposed set points. These set points are proposed for all unoccupied periods.

Table E4.3: Proposed Set Points

	Cooling (ºF)	Heating (ºF)
Unoccupied	85.0	55.0

OCCUPIED SCHEDULING

Ameresco will initially setup the occupancy schedules in the Thermostat to reflect the major occupancy schedule of the buildings. The HVAC systems will only be operated when the buildings are supposed to be occupied. Different areas of the buildings like offices, conference rooms, and courtrooms can have different schedules to reflect occupancy outside of the normal schedules. A temporary override will need to be activated to provide after-hours conditioning of spaces. The following table lists the proposed time schedules. The vacation schedule will also be initially setup in the system to turn off equipment on vacation days. The County will be responsible for updating the vacation and special days schedule to ensure the systems are not operating when the buildings are not occupied. An optimum start sequence will be programmed to ensure the building is at setpoint for the desired start times. Refer to the optimum start discussion below for more details. Some buildings have sections that are occupied 24/7 as well as sections that are only occupied during normal business hours.

Table E4.4: Proposed Time Schedules

Building	Start time (Mon – Fri)	Stop time (Mon – Fri)	Weekends/ Holidays	Period
121 Main Street	8:00 AM	5:00 PM	OFF	Year-round
Putnam National Golf Club - Clubhouse	6:00 AM	6:00 PM	ON	Year-round
Donald B. Smith Government Campus - Building 1	9:00 AM	5:00 PM	OFF	Year-round
Donald B. Smith Government Campus - Building 2	9:00 AM	5:00 PM	OFF	Year-round
Donald B. Smith Government Campus - Building 3	9:00 AM	5:00 PM	OFF	Year-round
Kern Building - Health Dept/DMV/WIC	9:00 AM	5:00 PM	OFF	Year-round

Building	Start time (Mon – Fri)	Stop time (Mon – Fri)	Weekends/ Holidays	Period
William Koehler Senior Center	9:30 AM	3:30 PM	OFF	Year-round
Putnam Valley Senior Center	8:00 AM	4:00 PM	OFF	Year-round
Putnam Family & Community Services - 1808	8:30 AM	8:30 PM	OFF	Year-round
Highway Department - Building 1 Admin	9:00 AM	5:00 PM	OFF	Year-round
Highway Department - Building 2 Sign Shop	9:00 AM	5:00 PM	OFF	Year-round
Highway Department - Building 3 Dispatch/Garage	9:00 AM	5:00 PM	OFF	Year-round
Highway Department - Building 4 Garage	9:00 AM	5:00 PM	OFF	Year-round
Board of Elections	8:00 AM	6:00 PM	OFF	Year-round
Putnam Family & Community Services - 1816	8:30 AM	8:30 PM	OFF	Year-round
Burchetta Building (Law Dept) - 48 Gleneida	9:00 AM	5:00 PM	OFF	Year-round
Tilly Foster Farm Building #8	Mon-Wed: Closed Thur-Sun: 5:00 PM	Mon-Wed: Closed Thur-Sun: 11:00 PM	OFF	Year-round

PUMP CONTROL SEQUENCES

Pumps will be enabled based on both an operating schedule and local weather data accessed through wi-fi. During normal operation the pumps will only be enabled whenever any of the heating related zones are occupied. The pumps will cycle to maintain an adjustable occupied temperature setpoint. During unoccupied periods the pumps will be off, except when they cycle on to satisfy a lower adjustable unoccupied temperature setpoint.

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTS

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect “As-Built” conditions and submitted in multiple for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The installation of remotely-accessible energy management systems will improve comfort, reduce energy use and cost, and reduce on-site man-hours by specialized maintenance personnel.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

ECM 5: HEAT TIMER & THERMOSTATIC RADIATOR VALVES

Ameresco proposes to install a new boiler controller and thermostatic radiator valves (TRVs) at the David D Bruen County Office Building to provide individual room temperature control. This measure will reduce the cost of heating these buildings by employing nighttime temperature setback reducing the use of open windows to correct overheating.

EXISTING SYSTEM DETAIL

The County Office Building has a two-pipe steam heating system with a manual valve at each radiator that controls the steam flow through the radiators. Although there are controls present on the steam boilers themselves, many of the rooms have the potential for overheating. This can lead to windows being opened to control the heat and unnecessary energy leaving the building.

The steam boiler is currently controlled by a Honeywell programmable thermostat with a minimal nighttime setback scheduled.

PROPOSED SYSTEM

Ameresco proposes to install temperature-limiting thermostatic radiator valves (TRVs) on existing cast iron radiators at Bruen County Office Building. TRVs will allow individual room temperature control where there is currently none. Their installer-adjustable, tamper-resistant setpoint limits, typically set for 70ºF, will keep room temperatures in an energy-conserving yet comfortable range. TRVs for two-pipe radiators will be installed at each radiator's steam inlet. TRVs for one-pipe radiators will be installed to replace the existing air vents.

Ameresco also proposes to install a dedicated boiler controller, Heat-Timer or equivalent. This will control the firing of the boiler based on outdoor temperature, system temperature, and time of day to ensure the building is receiving the correct amount of heat, which will be reduced during unoccupied hours.

The proposed work excludes the repair of any existing piping or radiators.

Mechanical work for this measure will be conducted as described in the following mechanical scope of work:

THERMOSTATIC RADIATOR VALVES

The scope of work includes all mechanical and demolition work required to replace the existing radiator valves:

- Remove and legally dispose of the existing steam radiator valves
- Install new Macon valve
- Install new Macon thermostatic operator on each new valve
    - Remote sensor thermostat to be located near radiator

Table E5.1: Proposed Thermostat Valves

Valve Configuration	Valve Size	Thermostat	Quantity
N10737	1/2"	ENTL	1
N10637	1/2"	EVO	1
N10737	1/2"	EVO	20
N10737	1/2"	EVO-Z	13
N10857	3/4"	EVO	1
N10757	3/4"	EVO	15
N10757	3/4"	EVO-Z	73
Total			**124**

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTS

Equipment will be identified in submittals provided to the County for approval prior to procurement. Documents will be submitted to the engineering maintenance department, for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect "As-Built" conditions and submitted in multiple to the County for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The TRVs will significantly improve the comfort levels within each occupied space by properly maintaining space temperatures.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

ECM 6: FUEL OIL TO NATURAL GAS CONVERSION

ECM OVERVIEW

Ameresco proposes to convert the primary fuel source for HVAC heating systems from No. 2 fuel oil to natural gas at the David D. Bruen County Office Building and Donald B. Smith Government Campus Building 3 and from No. 2 fuel oil to propane at the Highway Building 1 - Admin. The implementation of this measure will enable the County to utilize higher efficiency burners along with utilizing a cheaper fuel source to heat the buildings. This measure will enable the County to capture substantial energy and utility cost savings within the buildings.

EXISTING SYSTEM DETAIL

BRUEN COUNTY OFFICE BUILDING & 1812 COURTHOUSE

The existing buildings' heating infrastructure consist of #2 oil-fired boiler technology. The boiler at the County Office Building produces low pressure steam that is fed to terminal unit heating coils and Air Handling Units (AHUs). The David D. Bruen County Office Building has boilers producing heating hot water, that is pumped around the building to terminal unit heating coils and AHUs.

Both buildings receive fuel oil from the same 10,000 gallon tank buried next to the historic courthouse. Fuel oil runs from that tank into the courthouse boiler room and also from the tank, through the courthouse basement, under the walkway between the buildings and into the Bruen basement mechanical space.

DONALD B. SMITH GOVERNMENT BUILDING 3

One cast iron hot water boiler generates hot water for the Government Building 3. The existing Weil-McLain cast iron #2 oil-fired boiler is operating at the end of its useful life. It has a gross heating capacity of 2,452,000 Btu/hr. A heating hot water pump distributes the water to the building perimeter radiation. Three (3) 330 gallon fuel oil tanks sit above ground in the boiler room.

There is a natural gas main running from Old Route 6, along the side of Building 3, to the Emergency Operations Center. At some point within the last 10 years, a gas line sized for the full building load was run from this main, buried under the parking lot, to the side of Building 3. This line has been capped and could be used to

Figure E6.1: The existing boiler at the Smith Government Campus Building 3 will be upgraded with a new gas fuel train and burner.

serve the building heating load.

HIGHWAY BUILDING 1 - ADMIN

Cast iron hot water boilers generate hot water for the Highway Department Administration Office. The two (2) existing Weil-McLain cast iron #2 oil-fired boilers are operating at the end of their useful life. They have a combined gross heating capacity of 432,000 Btu/hr. Heating hot water pumps distribute the water to the building perimeter radiation. The boilers receive fuel oil from an oil tank buried directly outside the boiler room.

PROPOSED SYSTEM DETAIL

Ameresco proposes to convert the following buildings to natural gas-fired HVAC heat. The cost benefit of conversion can easily be seen when comparing the relative fuel costs indexed per million BTUs for natural gas and No. 2 fuel oil as shown in the table immediately below: The end-use cost of natural gas is approximately 50% of No. 2 fuel oil. Conversion of the Highway Building to propane, though economically more expensive, is being done to increase equipment efficiency and convenience of maintaining equipment.

Table E6.1: Fuel Cost Comparison

	Cost	Unit	Cost	Unit
Fuel Oil	2.1738	$/Gallon	15.67	$/MMBUT
Natural Gas	0.8152	$/CCF	7.99	$/MBTU
Propane	2.2167	$/Gallon	24.28	$/MMBTU

BRUEN COUNTY OFFICE BUILDING & 1812 COURTHOUSE

The buildings do not have natural gas service currently, but it is known there are natural gas services running near these sites. Our proposed scope of work includes new gas service and meter piped in from the street, and the installation of piping and electrical modifications within the boiler room to facilitate the conversion to natural gas. The existing No. 2 Fuel Oil fired burners will be replaced with appropriately sized gas-fired burners capable of firing on new Natural Gas service. The conversion would involve close coordination with the utility company to add the natural gas service at the buildings. Cost estimates are based on the utility providing gas piping to the new meters, located outside the existing boiler rooms, based on discussions with the utility. Any additional costs that may be assessed by the utility are not included.

Each building will receive its own gas meter and be separately billed. The existing oil tank will be removed and backfilled. The existing fuel oil tank next to the courthouse will be emptied, removed, backfilled, and resodded, pending structural review confirming no risk to the existing courthouse wall by its removal. If the County receives approval from DEC and decides to abandon the tank in place, Ameresco expects a deduct of about $41,000 which would need to be confirmed during construction.

DONALD B. SMITH GOVERNMENT BUILDING 3

Ameresco proposes to convert the building to natural gas-fired heat. The building does not have natural gas service currently, but it is known there are natural gas services running to Government Building 2 and the EOC nearby. Our proposed scope of work includes new gas service and meter piped in from the street, and the installation of piping and electrical modifications within the boiler room to facilitate the conversion to natural gas. The existing No. 2 Fuel Oil fired burner will be replaced with appropriately sized gas-fired burner capable of firing on new Natural Gas service. The conversion would involve close coordination with the utility company to add the natural gas service at the building. Cost estimates are based reusing the existing buried gas line running from the gas main to the side of the building. New gas piping will be run from a meter installed at this location across the roof and into the mechanical space.

The existing fuel oil tanks above ground in the boiler room will be removed from the building.

HIGHWAY BUILDING 1 ADMIN

Ameresco proposes to replace the existing hot water boilers and zone pumps with new propane-fired units. The new boilers will supply heat to the facility at up to 95% efficiency. They will have a factory tested and assembled ASME stainless steel heat exchanger. The new boilers will provide the County with new more reliable heating and efficient equipment.

Ameresco will remove the two (2) existing boilers located in the building and replace them with two (2) new hot water boilers. The hot water piping will be removed back to the header. The boiler exhaust vent will be demolished, and new venting will be installed in the existing chimney shaft. The new boilers supplied by Ameresco will be Lochinvar Knight KHB condensing fire tube boilers, or equivalent. The existing fuel oil tank will be removed and replaced with a propane tank **by the County**.

Work for this measure will be conducted as described in the following scope of work:

HISTORIC 1812 COURTHOUSE

The scope of work includes all mechanical, electrical and demolition work required to convert existing oil-fired equipment to natural gas-fired:

- New piping, trenching, and backfill work to be performed by Central Hudson
    - New gas line to meter to be provided and installed by Central Hudson
- Replace pavers and patch sidewalk disturbed during trenching
- Reuse three (3) existing 499 MBH input Dual-Fuel burners on existing Weil-McLain 676 boilers.
    - Run new gas line **<u>from new exterior meter</u>** through building to burners – sized 1.5”

    - Provide all testing and balancing for burner and burner accessories
    - Provide startup and commissioning for new burner and accessories
    - Reuse existing power wiring

Figure E6.1: Location of new gas line and meter

OIL TANK DEMOLITION

The scope of work includes all mechanical, electrical and demolition work required to remove existing Fuel Oil Tank:

- Demo existing 10,000 Gallon oil tank direct buried next to building
    - Drain and clean existing tank as required
    - Remove existing tank
    - Remove all associated piping
    - Insulate and seal all exterior penetrations left by removal of piping
    - Refill area after removal of tank
    - Resod over affected area

BRUEN COUNTY OFFICE BUILDING

The scope of work includes all mechanical, electrical and demolition work required to convert existing oil-fired equipment to natural gas-fired:

- New piping and trenching work to be performed by Central Hudson
    - New gas line to meter to be provided and installed by Central Hudson

- Demo and remove one (1) existing 2,913 MBH input burners from existing Smith 28HE-2-10 boiler.
- Provide and install one (1) new Powerflame single nozzle air atomizing burner and accessories
    - Run new gas line from new exterior meter through building to burners – sized 3”
        - Connect to new meter located on exterior at front of building
            - Penetrate and seal building exterior
            - Run new gas piping through basement to boiler room
    - Provide all testing and balancing for burner and burner accessories
    - Provide startup and commissioning for new burner and accessories
    - Reuse existing power wiring
- Demo and remove one (1) existing oil-fired DHW Heater
    - Install one (1) Gas-Fired AO Smith Cyclone HE Power Vent 50-gallon condensing hot water heater
        - Install new stainless steel venting up existing chimney
        - Tie into new gas service in boiler room

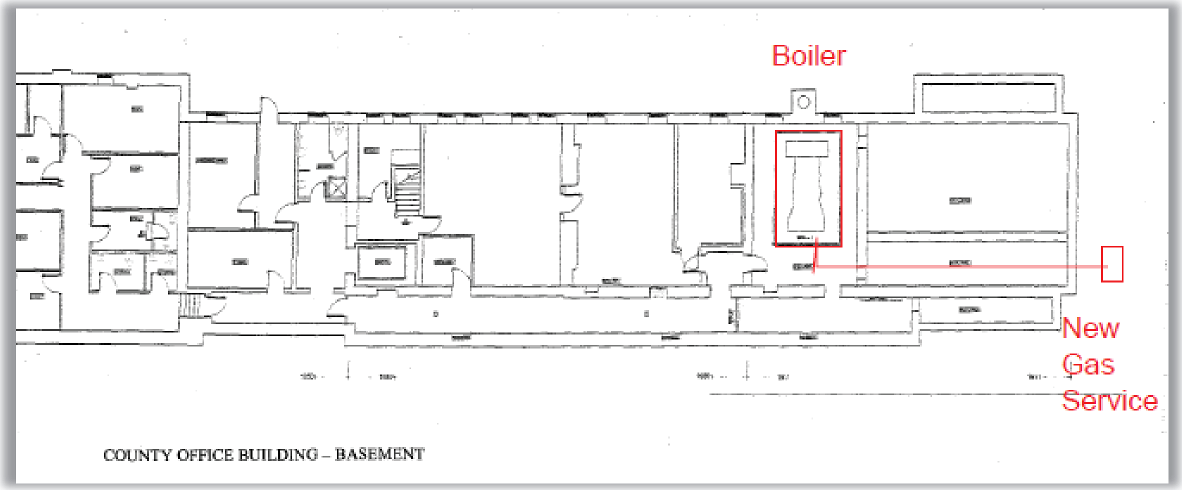


Figure E6.2: New gas servive in boiler room

DONALD B. SMITH GOVERNMENT BUILDING 3

The scope of work includes all mechanical, electrical and demolition work required to convert existing oil-fired equipment to natural gas-fired:

- New gas service to be provided by Utility to side of building reusing existing buried gas line.
- Drain, demo, and remove three (3) 330 Gallon existing oil tanks in boiler room, next to boiler
    - Remove all associated piping
    - Insulate and seal all exterior penetrations left by removal of piping
- Demo and remove one (1) existing 2,982 MBH input burner from existing Weil-McLain 1088 boiler.

  - Provide and install one (1) new Powerflame gas-fired single nozzle air atomizing burner and accessories
  - Run new gas line from new exterior meter over rooftop to burners – sized 3"
    - Reuse existing sidewall penetrations
  - Provide all testing and balancing for burner and burner accessories
  - Provide startup and commissioning for new burner and accessories
  - Reuse existing power wiring
- Provide and install replacement for existing Expansion Tank
- Provide and install replacement for existing inline Hot Water Pump
  - Size based on 260 GPM, 50 Ft Head

HIGHWAY BUILDING 1 - ADMIN

The scope of work includes all mechanical, electrical and demolition work required to replace the two existing oil-fired hot water boilers with two new oil-fired hot water boilers. The work shall be performed at 842 Fair Street (Bldg-1), Carmel, NY

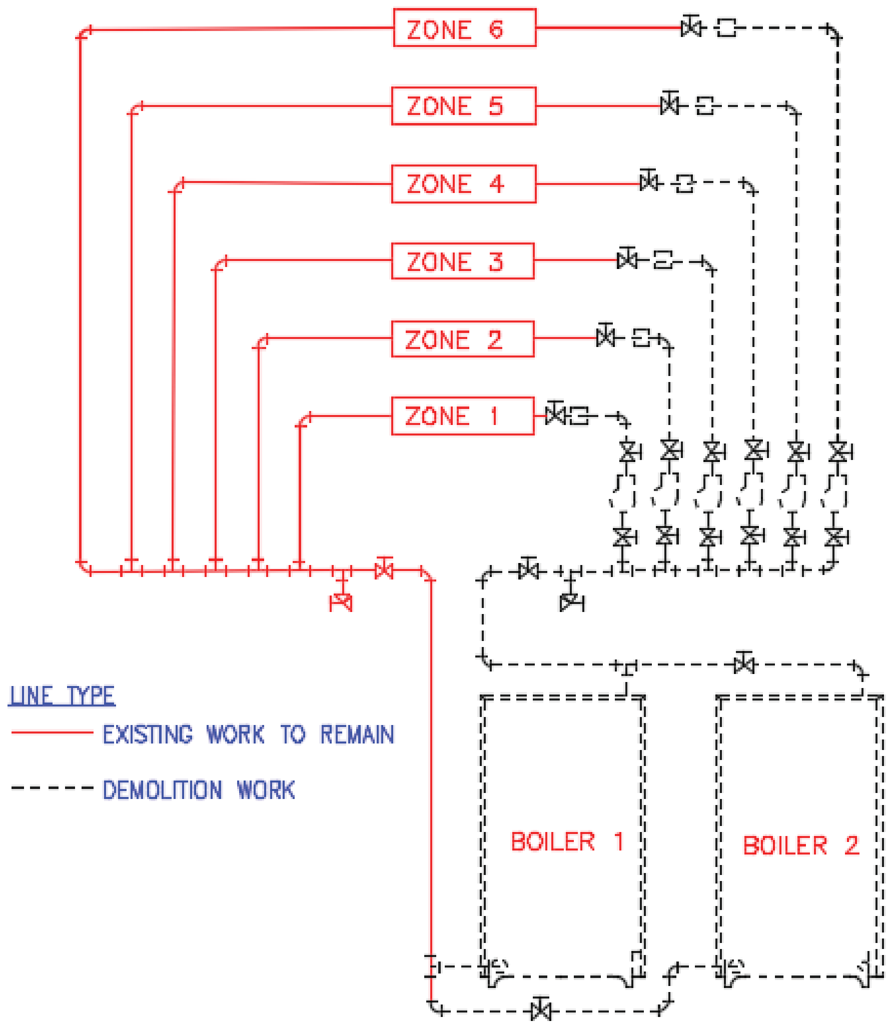
- Demo two (2) existing Weil McLain 248 MBH hot water boilers as indicated below.
  - Demo and remove existing boilers and ancillary equipment through mechanical room interior door.
  - Remove existing hot water supply and return boiler header and boiler branches up to the main hot water supply and return lines.
  - Demo and remove existing power wiring and conduit back to existing breakers
  - Disconnect the oil line from existing hot water boilers.
  - **Fuel oil tanks to be removed by County**
  - Demo existing exhaust flue from the hot water boilers up to about 72" above floor.
  - Demo and remove existing hot water piping back to isolation valves .
  - Remove the existing air separator and expansion tank for replacement.
  - Demo and remove the existing pumps (Pump and motor) – Six (6) hot water pumps. Demo to include wiring and associated relays.
- Install two (2) new propane-fired Lochinvar Knight KBH boilers rated for 285 MBH Input
  - Install two (2) new hot water boilers in the existing location.
  - Provide and install new pumps based on specifications: Pumps shall be Bell and Gossett PL series (or equivalent).

Table E6.2: Proposed Pumps

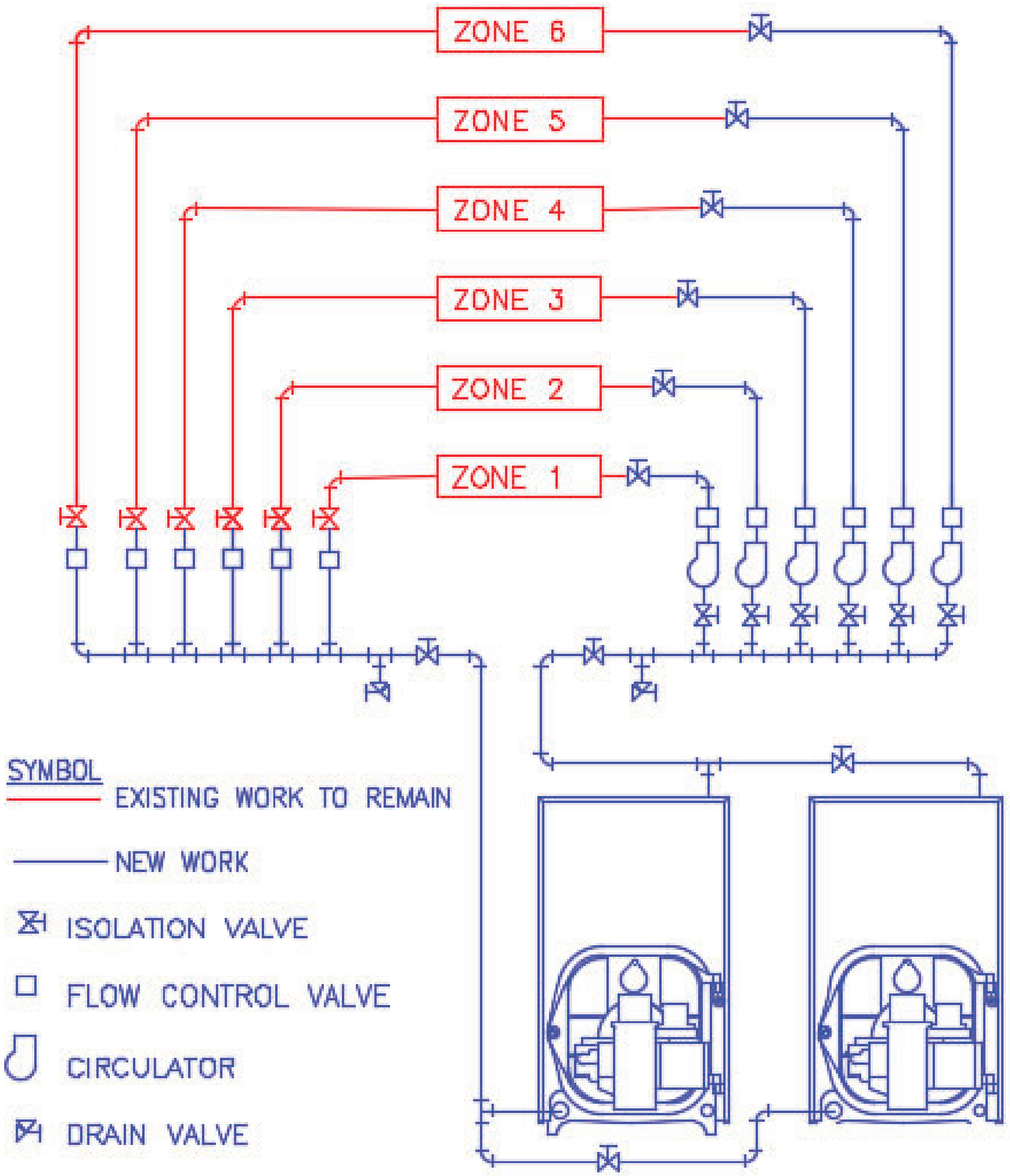
CIRC.	MAKE	MODEL	GPM	HEAD (FT)
1	B&G	PL-36	5	7.5
2	B&G	PL-36	5	7.5
3	B&G	PL-45	16	8
4	B&G	PL-36	5	7.5
5	B&G	PL-36	5	7.5
6	B&G	PL-36	5	7.5

  - Provide all necessary auxiliaries required for turnkey installation

- Provide and install all isolation valves, check valves, balancing valves, pressure gauges, temperature probes, etc. to complete the new piping
- Provide and install a new 115v power service to new boilers per manufacturer's instructions (if necessary).
- Provide and install separate relay for each circulator.
- Provide and install exhaust venting per boiler manufacturer's instructions, vent material must be approved for condensing burners. Extend chimney at least 3 feet above or 2 feet higher than any portion of roof within 10 feet.
- Provide and install new propane piping from interior boiler room wall to new boilers
    - Tank is exterior to building
    - **Propane tank to be installed by County**
    - **Propane piping from tank to interior boiler room wall to be installed by County**
- Insulate and label all new piping.
- Control work will be provided separately by Controls Contractor
- Fill new piping and coordinate start-up with boiler manufacturer's representative
- Provide and install replacement for existing Expansion Tank



HIGHWAY BUILDING 1 - ADMIN – Demolition Work



HIGHWAY BUILDING 1 - ADMIN – New Work

WORK PERFORMED BY CENTRAL HUDSON AT ALL LOCATIONS

The following scope is expected to be performed by Central Hudson, the natural gas utility company for the area:

- Central Hudson would be responsible for
    - install the service
    - dig the trench
    - sand-pad
    - backfill.
- Ameresco would be responsible for
    - sod
    - pavement
    - paver restoration

EXCLUSIONS

Demolition and removal of existing underground fuel oil tank at Bruen County Office Building and 1812 Courthouse is contingent on structural review confirming removal can be done without damaging or requiring alterations to existing foundation of the Courthouse.

Demolition of existing underground fuel tank and installation of propane service at Highway Department Building 1 to be done by County prior to start of Ameresco's work.

Ameresco excludes any potential hazardous remediation required due to existing oil leaks.

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTATION

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect "As-Built" conditions and submitted in multiple for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The proposed scope of work will provide the County with new reliable capital heating equipment and will additionally enable the County to capture substantial energy and utility cost savings within the seven buildings.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

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ECM 8: VARIABLE FREQUENCY DRIVES FOR HW PUMPS

ECM OVERVIEW

Ameresco proposes to install variable frequency drives on the hot water pumps at the Jail and Emergency Operations Center. The VFDs will be integrated to the proposed EMS system. The installation of VFDs and controls on these pumps will allow them to modulate with varying load more efficiently than the existing methods of control, which will reduce electrical energy and improve system efficiency.

Figure E8.1: Hot water pumps

EXISTING SYSTEM DETAIL

Ameresco identified pumps located at the following buildings as good candidates for VFDs. These pumps run continuously to maintain a constant flow of hot water. As the building load fluctuates and less heating is necessary, AHU and perimeter heating valves close, reducing the amount of hot water flow required by the system. This reduction in hot water flow through the heating distribution system is accommodated by a bypass valve in the system, which short-circuits water through the pumps. This reduces the flow through the distribution system, and matches heat output to building heat load, but the pumps continue to run and use the same amount of energy regardless of the building load.

Table E8.1: Existing Pumps by Building

Building	**Motor**	**Size (Horsepower)**
Sheriff's Department/Correctional Facility	HWP-1	20.0
Sheriff's Department/Correctional Facility	HWP-2	20.0
Emergency Operations Center/TOPS	HWP-1	5.0
Emergency Operations Center/TOPS	HWP-2	5.0
Total		**50**

PROPOSED SYSTEM

Ameresco proposes to install the above variable frequency drives on pumps. The new VFD's will be integrated with the proposed EMS systems. As part of the VFD measure, premium efficient, inverter rated motors will also be installed at the Sheriff's Department/Correctional Facility.

The VFD's will also provide the motors with soft-start capability, which will help to decrease spikes in power draw and decrease mechanical stress to equipment.

The existing bypass valve will be locked in position to allow maximum hot water flow through the distribution system and will be used as a backup to the VFDs should they fail. On a reduction in building heat load and required water flow. The pump motors will slow down to produce the correct amount of flow. Electric energy savings will be realized because of the reduced power consumption of the motors controlled by the VFDs. The savings analyses are based on a calculated speed reduction estimated for each motor.

EXCLUSIONS

Work for this measure excludes any repair work to existing electrical equipment. Existing pump couplings to be reused.

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTS

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect "As-Built" conditions and submitted in multiple for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The new VFD's will provide improved temperature control and significantly reduce electrical energy. VFD's will also enable soft start capability, which will reduce power draw spikes and decrease mechanical damage to equipment.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

ECM 10: PREMIUM EFFICIENCY TRANSFORMERS

ECM OVERVIEW

Ameresco proposes to replace a total of seventeen (17) existing step-down transformers with new energy-efficient transformers throughout the County. All of the transformers are dry-type indoor transformers that step-down 480 volt power to 208Y/120 volt power. Ameresco proposes to replace these transformers with new premium efficiency units that will reduce the electric losses and lower the cooling load of some of the equipment rooms.

Figure E10.1: New energy-efficient transformer

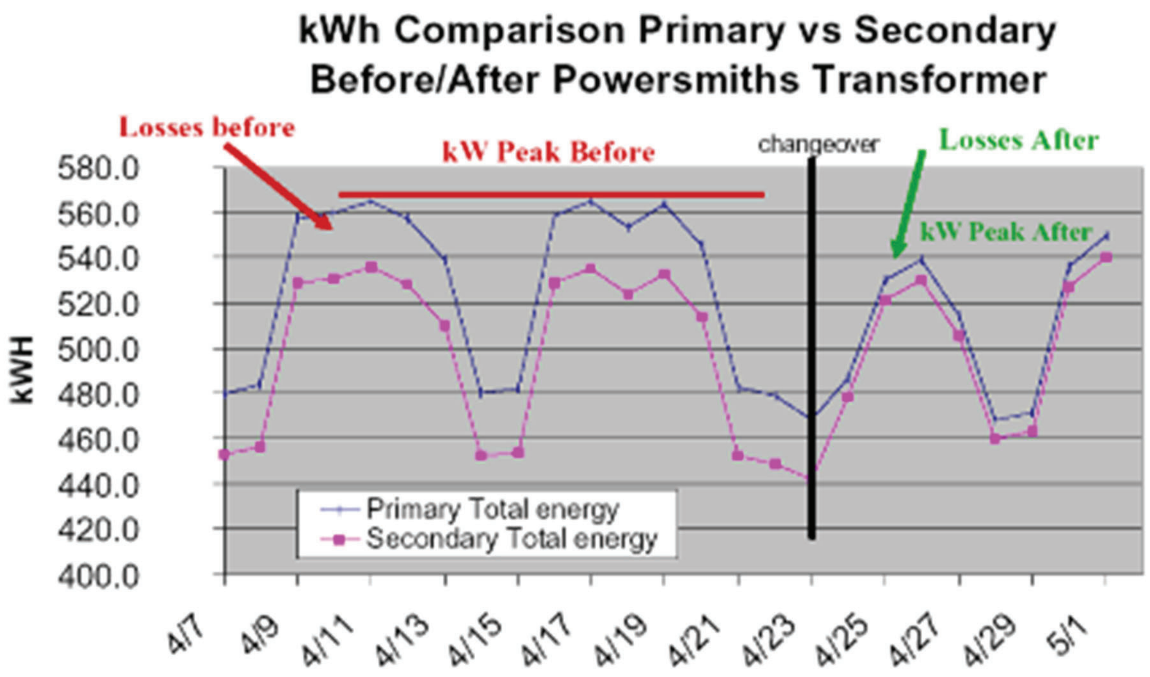
EXISTING SYSTEM DETAIL

Most transformers in use today in the County are estimated to be loaded at about 5% - 30% of their total capacity which is typical of other buildings. These loadings are based on spot measurements taken during the audit. These transformers are designed to be able to transform the electricity up to design ratings and are most efficient at or around the design rating. Operating at low levels for normal transformers is inefficient. The standard low voltage step-down transformer is widely considered a commodity and as such the only perceived differentiator is price – lowest purchase cost typically wins. Commercial transformer specifications rarely require a minimum efficiency. As one would expect, building a less efficient transformer is cheaper than building a more efficient one, so a typical low-first-cost transformer will have a low up-front cost but high operating cost, with the lifetime cost of the operating losses exceeding the purchase cost many times over.

The standard transformer is built to deliver its nameplate kVA rating under linear load only and is UL listed on this basis. As it has the lower purchase price on the market, it represents most transformer purchases across the country. Along with the high operating cost goes substantial lost capacity and distortion of the voltage to connected equipment. Most of the transformers are oversized.

PROPOSED SYSTEM

The Powersmiths E-SAVER OPAL-R transformers proposed for this measure are designed to increase efficiency of the electricity transformation. Understanding that efficiency and power quality are complimentary goals, Powersmiths designed its transformers with both in mind. Furthermore, they have been independently validated at Oak Ridge National Lab, a US DOE test facility, to run at 98% efficiency under single-phase nonlinear load profile, a dramatic improvement over traditional transformers. The chart below shows the efficiency and percent loaded an example transformer would have pre- and post-retrofit.



Seventeen (17) existing step-down transformers were found throughout the County that qualify for replacement. All the transformers identified are dry-type indoor transformers that step-down 480-volt power to 208/120-volt power. Tie-ins to the existing primary and secondary power feeds will be required. Some may require work to meet code which has been included in the cost just in case. Ameresco recommends installing Powersmiths' E-SAVER OPAL-R Series transformers under this ECM. Implementation of this ECM will result in electrical energy and demand savings. The following table lists all transformers recommended for replacement.

Table E10.1: Transformers to be Replaced by Building

Building	**Unit Size kVA**	**New Size kVA**	**Occupied % Load**	**Unoccupied % Load**
Sheriff's Department/Correctional Facility	30.0	30.0	15.0%	10.0%
Sheriff's Department/Correctional Facility	45.0	45.0	15.0%	10.0%
Sheriff's Department/Correctional Facility	112.5	112.5	15.0%	10.0%
New Putnam County Courthouse	45.0	45.0	15.0%	10.0%
New Putnam County Courthouse	112.5	112.5	15.0%	10.0%
New Putnam County Courthouse	112.5	112.5	15.0%	10.0%
New Putnam County Courthouse	45.0	45.0	15.0%	10.0%
New Putnam County Courthouse	45.0	45.0	15.0%	10.0%
New Putnam County Courthouse	45.0	45.0	15.0%	10.0%
New Putnam County Courthouse	45.0	45.0	15.0%	10.0%
New Putnam County Courthouse	45.0	45.0	15.0%	10.0%
Emergency Operations Center/TOPS	112.5	112.5	15.0%	10.0%
Emergency Operations Center/TOPS	30.0	30.0	15.0%	10.0%
Emergency Operations Center/TOPS	112.5	112.5	15.0%	10.0%
Emergency Operations Center/TOPS	45.0	45.0	15.0%	10.0%
William Koehler Senior Center	112.5	112.5	15.0%	10.0%
William Koehler Senior Center	30.0	30.0	15.0%	10.0%

Ameresco assumes the installation of this ECM will occur during normal business hours. Ameresco will coordinate with the County to schedule shutdowns of the affected areas. Installation of the measure will require isolation of each of the affected transformers and the associated distribution panels that are fed by the transformer while the transformer is removed and the new transformer installed. The existing wiring is expected to be reused. Repair of any damaged wiring discovered after removal of the transformers is not included. Ameresco will relocate some transformers to be code complaint.

During the replacement power will be cut to the loads served by the transformers. Some electrical equipment may require a manual reset or testing after power is resumed. Ameresco has not included any allowance for any such resets or testing. Ameresco assumes existing breakers and/or switches will re-energize after the shutdown. No allowance is included for replacements.

Typical installation sequence of the transformers would be as follows:

- Lockout/tagout panel feeding step-down transformer
- Disconnect primary and secondary feeds into transformer
- Remove and dispose of existing transformer, recycling where possible
- Install new transformer on same pad or floor footprint
- Reconnect primary and secondary feeds into transformer

EXCLUSIONS

Work excludes hazardous testing and removal, repair to existing wiring, breakers, disconnects, fuses, etc., corrections of any existing code violations, and resetting of fire alarm systems, computer systems, and clock systems after shutdown. Work assumed to take place during normal work hours.

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTS

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect “As-Built” conditions and submitted in multiple for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The new transformers will operate in the same manner as the units they replace. There will be no difference in the power supplied from the transformers. The only difference will be the amount of power lost through the transformation process.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

ECM 11: VENDING MISERS

ECM OVERVIEW

Ameresco proposes to install occupancy-sensing plug load controllers to reduce the unnecessary operation of the County’s vending machines during unoccupied periods. Each vending machine controller will save energy used by the refrigerated vending machine during unoccupied hours without compromising product quality. The controller will use a sensor to detect when the space is unoccupied and turn off the vending machine. Existing non-refrigerated snack machines will also be controlled.

EXISTING SYSTEM DETAIL

Vending machines were found throughout the County’s buildings. The vending machines are typically stocked with soda, juice and sports drinks and are cooled and illuminated year-round regardless of occupancy. Snack vending machines were also found in the same areas.

Ameresco identified the following vending machines for VendingMiser® controller installation, however, the County wishes to only include the units at the Sheriff's Department/Correctional Facility since the other units are expected to be removed shortly.

Table E11.1: Existing Vending Machines for VendingMiser® Controller Installation

Building	**Snack Qty.**	**Drink Qty.**	**Notes**
Sheriff's Department/Correctional Facility	1	1	
David D. Bruen County Office Building	0	1	Not Included
Kern Building - Health Dept/DMV/WIC	0	1	Not Included
Putnam Family & Community Services - 1808	1	1	Not Included
Totals	**2**	**4**	

PROPOSED SYSTEM

Ameresco proposes to install a VendingMiser™ controller, or equal, on the soft drink and snack vending machine to save energy during unoccupied periods. This device controls the vending machine operation without compromising its product quality. The controller is external to the vending machine, therefore not requiring vendor maintenance. Major soft drink producers have approved the controller for use on vending machines offering their products.

The controller employs infrared sensing technology to interrupt power to a vending machine when the surrounding area is unoccupied. Regardless of occupancy, the controller automatically enables the vending machine to ensure that its product remains cold. The controller is designed so that it will not de-energize the vending machine during a cooling compressor cycle.

As reported by the American Council for an Energy Efficient Economy (ACEEE), the 2.23 million vending machines operating in the U.S. consume nearly $600 million in energy and demand costs. Since County buildings are not constantly occupied, the refrigerated vending machines consume more energy than needed.

According to the manufacturer's representative, if switched off, this product's resumes normal operation once its power is restored.

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTATION

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect "As-Built" conditions and submitted in multiple for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The new vending machine controls will enhance facility operations by reducing electricity usage during unoccupied periods. Customers will notice no reduction in drink quality as a result of this measure.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

ECM 12: WALK-IN REFRIGERATION CONTROLS

ECM OVERVIEW

Ameresco proposes to install controllers on the walk-in refrigerators in Putnam County to reduce the unnecessary operation of the door heaters, compressors, and evaporator fans. Each controller will save energy used by the refrigerator without compromising product quality.

Figure E12.1: Existing Evaporator Fans

EXISTING SYSTEM DETAIL

Existing evaporator fan motors inside the walk-in coolers run continuously, 8,760 hours per year. The motors run even when walk-in temperature is satisfied and no refrigerant is being circulated through the evaporator coil. This results in high energy use from motors but also increased compressor energy use since the extra heat rejected by the motors needs to be removed by the refrigeration system.

Existing evaporator fans are all operated with shaded pole motors. These motors use significantly higher energy than modern electrically commutated motors and give off excess heat as well.

Anti-sweat door heaters run continuously, even when the door has not been opened recently or when the walk-in is above the dew point temperature.

Ameresco identified the following walk-in refrigerators for controller installation, though only the units at the Jail and Senior Center are included in the scope of work per the County. Kern units are excluded because of vaccines being housed in the unit. Golf units are excluded because the units are slated to be replaced.

Table E12.1: Existing Walk-in Refrigerators by Building

Building	**Cooler Qty.**	**Freezer Qty.**	**Notes**
Sheriff's Department/Correctional Facility	1	1	
Putnam National Golf Club - Clubhouse	1	1	Not Included
Kern Building - Health Dept/DMV/WIC	0	1	Not Included
William Koehler Senior Center	2	3	
Totals	**4**	**6**	

PROPOSED SYSTEM

Ameresco proposes to install a National Resource Management Cooltrol® controller on the walk-in refrigerators to save energy during. This device controls the refrigerator without compromising its product quality. The new controllers will control the temperature, evaporator fans, and door heaters. Evaporator fans will only run in conjunction with the compressor during a rise in walk-in temperature above setpoint, rather than continuously. Evaporator fan motors will be replaced with electrically commutated motors (ECM). Defrost cycles will be based on coil temperature and refrigeration run time instead of timed cycling. The Cooltrol® system logs and provides historical usage patterns, which extends the life of the equipment by exposing potential problematic refrigeration areas. The door heaters will run based on dew point temperature of the walk-in, rather than continuously.

Figure E12.2: National Resource Management Cooltrol® controller

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTATION

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect “As-Built” conditions and submitted in multiple for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The new refrigerator controls will enhance facility operations by reducing electricity usage during unoccupied periods. Building faculty will notice no reduction in food quality as a result of this measure.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

ECM 13: STEAM TRAP REPLACEMENTS

ECM OVERVIEW

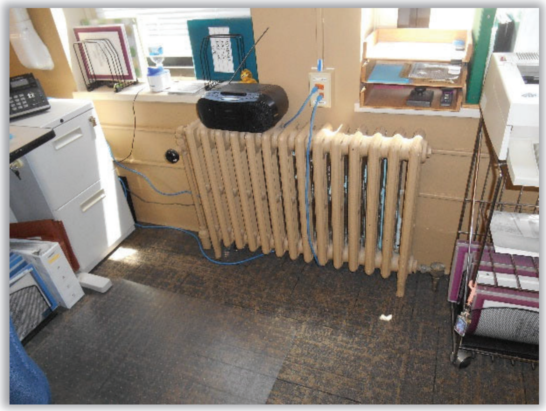


Figure E13.1: Existing System

Ameresco has completed a survey of the County's steam traps and proposes to replace existing F&T steam trap internals and install new drop in inserts for existing thermostatic traps throughout the Bruen County Office Building. The proposed replacement and/or repair of steam traps will improve the overall steam use and heating system efficiencies. Steam distribution is accomplished at low pressure with thermal energy wasted due to failing traps. Properly functioning steam traps pass air and drain condensate formed in the steam distribution system and prevent live steam from exiting. This measure will address approximately **143** existing steam traps, and the improvement will result in energy and maintenance cost savings.

EXISTING SYSTEM DETAIL

DAVID D BRUEN COUNTY OFFICE BUILDING

The steam heating system at the County Office Building consists of low-pressure steam and condensate distribution piping, steam control valves, terminal equipment (steam coils, converters, radiators, heaters, etc.) and steam traps. Failed open steam traps permit steam to enter the condensate plumbing. This wasted steam is then vented through the condensate receivers. Steam traps that fail in the closed position restrict the flow of condensate to the return piping.

Leaking steam traps typically go unnoticed because they have little effect on the terminal heating units. A typical problem report is for a failed closed, or cold, steam trap. This results in a high failure rate for the steam traps in the open position, resulting in substantial steam losses.

Properly functioning steam traps pass air and drain condensate formed in the steam distribution systems and prevents live steam from exiting. The condensate is trapped and removed via various types of steam traps, each with a specific function and range of applications. Steam traps of differing design perform the task of removing condensate from various components such as drip legs, heating coils, and converters. These traps require periodic maintenance to assure proper operation.

Please refer to the following table for a list of steam traps to be replaced. The inventory is based on the latest steam trap survey conducted by Ameresco to confirm quantities and trap conditions.

Table E13.1: Steam Traps to be Replaced

Steam Trap Type	**Bruen**
Thermostatic 1/2”	136
3/4” F&T	7
Total	**143**

PROPOSED SYSTEM

Ameresco proposes to replace the steam traps at Bruen County Office Building to improve the overall steam use and heating system efficiencies. The scope of work will consist of replacing all the existing traps with new or retrofitting the trap internal components. With this method, all failed, leaking or plugged traps are assured to be replaced. The malfunctioning F&T traps will be replaced with properly sized equivalent traps, while the malfunctioning thermostatic traps will be fitted with new components. Steam trap housings will be reused wherever possible with only the critical parts being retrofitted with new elements. Thermostatic traps will be replaced with new drop-in elements. If repairs to the existing thermostatic traps are not feasible, at Ameresco’s discretion, the trap will be replaced with a new trap.

Ameresco did not observe any major issues that would merit a significant allowance for piping repair. Major repairs to the existing steam and condensate piping are excluded from the scope.

Excluded from the scope of work is any asbestos abatement and repair of existing steam/condensate piping, although no signs of asbestos were discovered during the trap audit.

This energy conservation measure will substantially improve the overall efficiency of the steam heating systems, as well as improve the comfort level of occupants.

Work for this measure will be conducted as described in the following mechanical scope of work:

STEAM TRAP REPAIR

The scope of work includes all mechanical and demolition work required to replace or repair the existing steam traps:

- Provide unit price for replacing and/or repairing the existing steam traps displayed in the following table.
- Float and Thermostatic (FT), and Thermostatic (TT) type steam traps will be replaced with new equivalent Tunstall model traps.

Table E13.2: Existing Steam Traps

Application	**Type**	**Pipe Size**	**Tunstall Repair Kit Part # or New Trap #**	**Work**	**Quantity**
Drip	FT	3/4"	TUN-215	Replace	7
Drip	TT	1/2"	TFHF-1409 w/CVR	Repair	3
Drip	TT	1/2"	TFSA-2203 w/CVR	Repair	9
RAD	TT	1/2"	TFSA-2203 w/CVR	Repair	37
Convector	TT	1/2"	TFSA-2203 w/CVR	Repair	85
Convector	TT	1/2"	TFSA-2231 w/CVR	Repair	1
Convector	TT	1/2"	TFHF-1409 w/CVR	Repair	1
Total					**143**

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTS

Equipment will be identified in submittals provided to County for approval prior to procurement. Documents will be submitted to the engineering maintenance department, for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect “As-Built” conditions and submitted in multiple to County for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The new steam traps will provide the County with new equipment, reduce fuel consumption for the heating plants and perform a much-needed maintenance of the County steam traps.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

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ECM 14: INFILTRATION REDUCTIONS

ECM OVERVIEW

Ameresco proposes to reduce outdoor air infiltration into most of the Putnam County buildings. Some of the exterior doors at these buildings had no weather-stripping with gaps between the door jambs. The new weather-stripping and other measures will greatly reduce heat loss as well as increase occupant comfort due to fewer drafts.

Figure E14.1: Clear daylight around the door shows a direct pathway for unwanted air leakage (Donald B. Smith Gov't Campus).

EXISTING SYSTEM DETAIL

The infiltration of outdoor air can be a significant load on a building's central heating and cooling systems. There are many sources of infiltration in a building's exterior envelope that can be considerably reduced with proper weather-stripping and air sealing methods. A few of the major sources of infiltration are exterior doors, windows, roofs and roof/wall interfaces.

Ameresco evaluated the exterior of each building and found some areas that needed proper weather-stripping and other air sealing.

- **Caulking** – there are weaknesses in the sealant at the perimeter of the window systems at select buildings. These gaps, cracks and holes allow air to find its way into the wall and door/ window frame cavities or directly from outside to inside resulting in unwanted energy losses. A clear air leakage bypass around the window system diminishes the performance of the window unit itself.

- **Door Weather Stripping** – deteriorated weather stripping materials, ineffective weather stripping installation and daylight showing at the perimeter of door systems create direct pathways for unwanted infiltration/ exfiltration.

- **Double Hung Window Weatherization** – air leakage at the bottom of the lower sash of the double hung windows in 121 Main Street and William Koehler Senior Center is wasting energy and contributing to occupant comfort problems surrounding the windows. The wood double hung window systems at 1812 Courthouse have been restored aesthetically, but air-tightness at the perimeter of the upper and lower sash was never improved, which is leading to unwanted air leakage and energy loss.

- **Overhang Air Sealing** – overhangs are roofs, floor systems or areas above entryways that extend beyond the plane of the exterior wall system. These areas of construction are often misunderstood by builders and the cavity that extends beyond the plane of the exterior wall system is often incorrectly "connected" to the interior heated spaces of the building. Overhangs that are not properly sealed at the plane of the surface that should separate the conditioned space from the outdoors lead to excessive air leakage and heat loss at these vulnerable areas in the building envelope.

- **Overhead Door Replacement** – one of the overhead doors at 6N Highway Garage is severely damaged and past its useful life; the damage to the door is amplifying the infiltration and heat loss problems through the old door system.

- **Overhead Door Weather Stripping/ Roll-Up Door Weather Stripping** – remove existing weather stripping and replace with new commercial grade weather stripping to create a full air seal around the door. With low grade, none, or deteriorating materials in place at roll-up doors at select buildings these doors are a major air leakage source.

- **Roof-Wall Intersection Air Sealing** – the roof-wall intersection is regularly an area that allows unwanted air leakage through the building shell. Exterior flashing and finish details at this area are not constructed to stop air leakage (exterior flashings are for water control, not air control); unsealed exterior flashing details combine with interior gaps in the framing between the roof and wall assembly to allow infiltration/ exfiltration. The roof-wall intersection is a significant weakness in the building envelope at many buildings throughout the County.

- **Wall Air Sealing** – a wall assembly that does not have an effective air barrier in place allows unnecessary air leakage losses. Select areas of poorly insulated and sealed wall assemblies at Emergency Operations Center create bypasses for air leakage and heat loss that force the heating and cooling systems to work harder than necessary. At William Koehler Senior Center the gable end vents are open to the attic space; however, the insulation is located at the underside of the roof. This system intentionally directs outside air below the level of the insulation barrier and into the conditioned spaces of the building. Further investigation is necessary at the Investment Grade Audit stage to determine if the HVAC system is using these louvers as outside air or combustion air; coordination between the insulation and HVAC teams will be necessary to design the best solution. The current system is counter-productive to an energy-efficient facility.

- **Window Weatherization** – the glazing gasket has shrunk at the corners of the fixed window systems at the Golf Club Clubhouse. The shrinking at the corners always unwanted infiltration and can contribute to future glazing failures.

PROPOSED SYSTEM DETAIL

Ameresco proposes to reduce the infiltration of outside air and the leaking of conditioned air by implementing proper weather-stripping and air-sealing of building envelopes. The new weather-stripping will reduce the amount of infiltration at the facilities. The scope of work is indicated in Table E14.1. on the following pages.

*Note: See the column titled **Total Quantities** in the table on the following pages for the total number of units or footage, etc. that is proposed across all sites. For example, the total linear feet of interior seal caulking for all sites is 1,803.*

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Table E14.1: Work Task Descriptions and Quantities to be Addressed Under This Measure

Task	Putnam County Sheriff' s Dept/ Correctional Facility	New Putnam County Courthouse	David D. Bruen County Office Building	1812 Courthouse	121 Main Street	Putnam National Golf Club - Clubhouse	Emergency Operations Center/TOPS	Donald B. Smith Govt Campus, Building 2	Donald B. Smith Govt Campus, Building 3	Kern Building (Public Health)	William Koehler Senior Center	Putnam Valley Senior Center	Putnam Family & Community	Putnam County Dept of Highways & Facilities	Board of Elections	Law Department	Total Quantities
Caulking - Interior Seal (LF)	0	0	0	0	0	23	331	0	0	299	190	648	312	0	0	0	**1,803**
Door Weather Stripping - Double Door - Sides, Sweep, Center (UT)	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	**3**
Door Weather Stripping - Double Door - Sides, Top, Sweep (UT)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	**1**
Door Weather Stripping - Double Door - Sides, Top, Sweep, Center (UT)	1	1	0	0	0	4	0	0	0	0	0	0	0	0	0	0	**6**
Door Weather Stripping - Double Door - Sweep (UT)	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	**4**
Door Weather Stripping - Double Door - Sweep, Center (UT)	2	2	0	2	0	0	2	0	0	2	0	0	2	1	0	0	**13**
Door Weather Stripping - Replace Threshold (UT)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Door Weather Stripping - Single Door - Sides, Top, Sweep (UT)	3	4	5	1	4	9	4	0	0	8	2	2	0	6	2	0	**50**

Table E14.1: Work Task Descriptions and Quantities to be Addressed Under This Measure

Task	Putnam County Sheriff’ s Dept/ Correctional Facility	New Putnam County Courthouse	David D. Bruen County Office Building	1812 Courthouse	121 Main Street	Putnam National Golf Club - Clubhouse	Emergency Operations Center/TOPS	Donald B. Smith Govt Campus, Building 2	Donald B. Smith Govt Campus, Building 3	Kern Building (Public Health)	William Koehler Senior Center	Putnam Valley Senior Center	Putnam Family & Community	Putnam County Dept of Highways & Facilities	Board of Elections	Law Department	Total Quantities
Door Weather Stripping - Single Door - Sweep (UT)	0	0	0	0	3	0	0	0	0	0	6	2	0	1	0	4	**16**
Garage Door Weather Stripping - Overhead Door Weather Strip - Sides	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	**6**
Garage Door Weather Stripping - Overhead Door Weather Strip - Sides, Top, Bottom	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	**13**
Garage Door Weather Stripping - Roll-Up Door Weather Strip - Sides, Top, Bottom	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Overhang Air Sealing - Block, Seal (SF)	0	0	0	0	0	0	104	0	0	0	0	0	0	0	0	0	**104**
Roof-Wall Intersection Air Sealing - Block, Seal (LF)	0	0	0	0	0	0	0	0	0	192	0	0	239	102	80	0	**613**
Roof-Wall Intersection Air Sealing - Block, Seal Paint (LF)	0	0	0	0	275	0	34	0	0	0	0	0	0	0	0	0	**309**

Table E14.1: Work Task Descriptions and Quantities to be Addressed Under This Measure

Task	Putnam County Sheriff’ s Dept/ Correctional Facility	New Putnam County Courthouse	David D. Bruen County Office Building	1812 Courthouse	121 Main Street	Putnam National Golf Club - Clubhouse	Emergency Operations Center/TOPS	Donald B. Smith Govt Campus, Building 2	Donald B. Smith Govt Campus, Building 3	Kern Building (Public Health)	William Koehler Senior Center	Putnam Valley Senior Center	Putnam Family & Community	Putnam County Dept of Highways & Facilities	Board of Elections	Law Department	Total Quantities
Roof-Wall Intersection Air Sealing - Seal (LF)	0	0	0	0	0	0	454	512	0	0	0	0	287	0	0	0	**1253**
Roof-Wall Intersection Air Sealing - Seal Paint (LF)	0	0	0	0	0	0	62	0	0	0	0	0	0	0	0	0	**62**
Wall Air Sealing - Block, Seal (SF)	0	0	0	0	0	0	380	0	0	0	0	0	0	0	0	0	**380**
Wall Air Sealing - Block, Seal (UT)	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	**3**
Window Weatherization - Double Hung Window Weatherization (UT)	0	0	0	34	0	0	0	0	0	0	0	0	0	0	0	0	**34**
Window Weatherization - Hopper Weatherization (UT)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	**11**

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ASSUMPTIONS & EXCLUSIONS

- Prevailing Wage – all pricing in this Report is based on prevailing wage. There is no 2nd shift premium included in the labor pricing for this Report.
- Electrical Hazards – testing and/ or repair of hazardous electrical components (knob and tube wiring, open junction boxes, etc.) that are encountered are excluded from the scope of work and pricing.
- Hazardous Materials – testing, remediation and/ or removal of any potentially hazardous material that is encountered is excluded from the scope of work and pricing. No hazardous material was encountered during audit of representative areas above the drop ceiling.
- Debris & Storage Removal – this report does not include recommendations or pricing calculations to remove, relocate, or dispose of debris or storage in spaces included in this scope of work. Ameresco can discuss removal alternatives with the County if self-removal is not a viable option for some or all the areas to be treated.
    - For example: Board of Election – personal belongings in offices.
- Building-specific Assumptions & Exclusions:
    - 121 Main Street – all Double Hung Windows are included in the weather stripping scope of work; it is assumed that the window AC units are removed and re-installed seasonally by the County.
    - New Putnam County Courthouse – the curtainwall area above the main entry area is excluded from the scope of work.
        - The work at the curtainwall is significantly more challenging to access than the work at the other windows throughout the building and would drive installation costs up significantly. As a result, the caulking in this area is excluded to avoid a poor payback measure.
    - Putnam Family & Community Services (1816) – there are no cost-effective building envelope improvement opportunities at this building so there are no building envelope recommendations.
    - Senator Vincent Liebells Veterans Home – there are no cost-effective building envelope improvement opportunities at this building so there are no building envelope recommendations.
    - William Kohler Senior Center – it is assumed that the gable end vents – planned to be blocked – are not used as part of the HVAC system for outside air or combustion air; confirmation of this assumption will be required during the design phase, prior to installation.
        - At William Koehler Senior Center the gable end vents are open to the attic space; however the insulation is located at the underside of the roof. This system incorrectly directs outside air below the level of the insulation barrier and into the conditioned spaces of the building.
        - The Assumption & Exclusion note is included to call out the need to eliminate the scope if the gable end vents are being used for make-up air to the mechanical equipment.

- See pictures below.

FINDINGS & RECOMMENDATIONS

Wall Air Sealing – the gable end vents are open to the attic space; however the insulation is located at the underside of the roof. This system intentionally directs outside air below the level of the insulation barrier and into the conditioned spaces of the building, which is counterproductive (Koehler Senior Center).

Wall Air Sealing – the gable end vents are open to the attic space; however the insulation is located at the underside of the roof. This system intentionally directs outside air below the level of the insulation barrier and into the conditioned spaces of the building, which is counterproductive (Koehler Senior Center).

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTATION

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect "As-Built" conditions and submitted in multiple for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The new weather-stripping and air sealing will enhance facility operations by reducing infiltration that causes drafts during the winter. Employees and visitors will notice a more comfortable environment. In addition, the new weather-stripping will have no adverse effect on door operation or office environment.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

BUILDING ENVELOPE REPORT

Please see **Appendix C** for the building envelope report.

ECM 15: PIPE INSULATION

ECM OVERVIEW

Ameresco proposes to insulate steam, hot water, and condensate piping and tanks where insulation is absent or insufficient at Putnam County facilities. The specific scope is outlined in the following sections. Replacing insufficient insulation and insulating bare pipes will improve the overall efficiency of each system and alleviate over heating due to heat loss from exposed piping. Cost savings from the reduction of fossil fuel usage will result from the implementation of this measure.

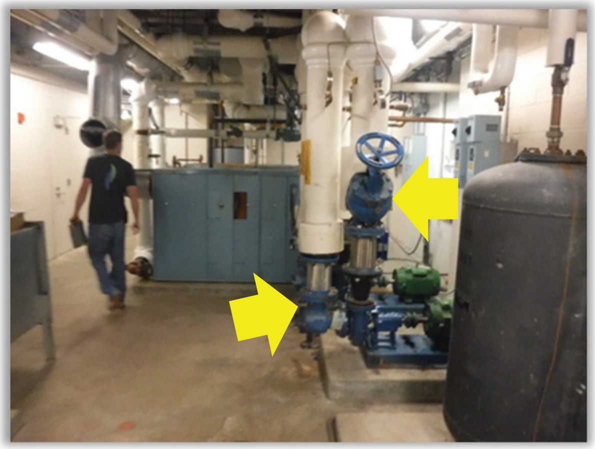

Figure E15.1: Valve & Fitting Insulation – the suction diffuser, strainer and flex fittings are not insulated which is leading to unnecessary distribution losses (New Putnam County Courthouse).

EXISTING SYSTEM DETAIL

Uninsulated or under-insulated system components can be a significant load on a building's central heating and cooling systems. There are several sources of unintended heat gain/loss in a building that can be considerably reduced with proper insulation on pipes, valves, fittings, and tanks.

Ameresco evaluated each building and found some areas that needed proper insulation.

- Pipe Insulation – un-insulated pipes in the heating and domestic hot water systems are leading to unnecessary distribution losses and wasted energy.
- Valve & Fitting Insulation – valves and fittings are difficult components of a mechanical system to insulate and as a result are frequently left un-insulated. These un-insulated or poorly insulated components have the same temperature fluids passing through them as the pipes that are more likely to be insulated; un-insulated components of the distribution system lead to unnecessary distribution losses and wasted energy.
- Tank Insulation – tanks are difficult components of a mechanical system to insulate and as a result are frequently left un-insulated. Un-insulated or poorly insulated tanks or equipment have the same temperature fluids passing through them as the pipes that are more likely to be insulated; un-insulated components of the distribution system lead to unnecessary distribution losses and wasted energy.

PROPOSED SYSTEM DETAIL

Ameresco proposes to install a combined total of **956** linear feet of insulation at the buildings. The proposed insulation will be a fibrous glass type with a factory applied fire retardant vapor barrier jacket. The insulation will have a K-factor of at least 0.27 at 75°F mean temperature. Typical manufacturers include Owens-Corning, Certain Teed, Manville or Knauf.

This scope was developed during the Investment Grade Audit and is indicated in the following table.

Table E15.1: Insulation Scope

Buildings	Location	Pipe Size (Inches)	Fluid Type	Fluid Temp (F)	Length (ft)
1812 Courthouse	MTHW In-Line Pump	2	Water	185.0	25.0
1812 Courthouse	MTHW Straight Pipe	2	Water	185.0	3.0
1812 Courthouse	MTHW Strainer	2	Water	185.0	15.0
1812 Courthouse	MTHW Suction Diffuser	2	Water	185.0	8.8
1812 Courthouse	MTHW Air Separator Tank	12 20/21	Water	185.0	13.0
David D. Bruen County Office Building	LPS Strainer	3/4	Steam	205.0	5.0
David D. Bruen County Office Building	LPS 90 Degree Elbow	1	Steam	205.0	3.6
David D. Bruen County Office Building	LPS 90 Degree Elbow	1	Steam	205.0	5.4
David D. Bruen County Office Building	LPS 45 Degree Elbow	1 1/4	Steam	205.0	1.0
David D. Bruen County Office Building	LPS 90 Degree Elbow	1 1/4	Steam	205.0	9.0
David D. Bruen County Office Building	LPS 90 Degree Elbow	1 1/2	Steam	205.0	5.4
David D. Bruen County Office Building	LPS 90 Degree Elbow	1 1/2	Steam	205.0	10.8
David D. Bruen County Office Building	LPS Straight Pipe	1 1/2	Steam	205.0	9.0
David D. Bruen County Office Building	LPS Straight Pipe	1 1/2	Steam	205.0	11.0
David D. Bruen County Office Building	LPS T Intersection	1 1/2	Steam	205.0	3.6
David D. Bruen County Office Building	LPS 45 Degree Elbow	2	Steam	205.0	2.0
David D. Bruen County Office Building	LPS 90 Degree Elbow	2	Steam	205.0	5.4
David D. Bruen County Office Building	LPS Straight Pipe	2	Steam	205.0	16.0
David D. Bruen County Office	LPS 45 Degree	2 1/2	Steam	205.0	1.0

Buildings	Location	Pipe Size (Inches)	Fluid Type	Fluid Temp (F)	Length (ft)
Building	Elbow				
David D. Bruen County Office Building	LPS 90 Degree Elbow	2 1/2	Steam	205.0	5.4
David D. Bruen County Office Building	LPS Flange	2 1/2	Steam	205.0	1.8
David D. Bruen County Office Building	LPS Straight Pipe	2 1/2	Steam	205.0	16.0
David D. Bruen County Office Building	LPS T Intersection	2 1/2	Steam	205.0	2.4
David D. Bruen County Office Building	LPS 90 Degree Elbow	3	Steam	205.0	5.4
David D. Bruen County Office Building	LPS Flange	3	Steam	205.0	1.8
David D. Bruen County Office Building	LPS Straight Pipe	3	Steam	205.0	15.0
David D. Bruen County Office Building	LPS T Intersection	3	Steam	205.0	2.4
David D. Bruen County Office Building	LPS 90 Degree Elbow	4	Steam	205.0	1.8
David D. Bruen County Office Building	LPS Bonnet	4	Steam	205.0	3.6
David D. Bruen County Office Building	LPS Bonnet	4	Steam	205.0	1.8
David D. Bruen County Office Building	LPS Straight Pipe	4	Steam	205.0	7.0
David D. Bruen County Office Building	LPS Straight Pipe	4	Steam	205.0	9.0
David D. Bruen County Office Building	LPS Straight Pipe	4	Steam	205.0	11.0
David D. Bruen County Office Building	LPS T Intersection	4	Steam	205.0	2.4
David D. Bruen County Office Building	LPS 90 Degree Elbow	5	Steam	205.0	1.8
David D. Bruen County Office Building	LPS Bonnet	5	Steam	205.0	3.6
David D. Bruen County Office Building	LPS Bonnet	5	Steam	205.0	1.8
David D. Bruen County Office Building	LPS Straight Pipe	5	Steam	205.0	7.0
David D. Bruen County Office Building	LPS Straight Pipe	5	Steam	205.0	9.0
David D. Bruen County Office Building	LPS T Intersection	5	Steam	205.0	2.4
David D. Bruen County Office Building	Cond 90 Degree Elbow	3/4	Water	165.0	7.2
David D. Bruen County Office Building	Cond 90 Degree Elbow	3/4	Water	165.0	23.4
David D. Bruen County Office Building	Cond 90 Degree Elbow	1	Water	165.0	1.8

Buildings	Location	Pipe Size (Inches)	Fluid Type	Fluid Temp (F)	Length (ft)
David D. Bruen County Office Building	Cond T Intersection	1	Water	165.0	4.8
David D. Bruen County Office Building	Cond 45 Degree Elbow	2	Water	165.0	2.0
David D. Bruen County Office Building	Cond 90 Degree Elbow	2	Water	165.0	10.8
David D. Bruen County Office Building	Cond 90 Degree Elbow	2	Water	165.0	9.0
David D. Bruen County Office Building	Cond Straight Pipe	2	Water	165.0	10.0
David D. Bruen County Office Building	Cond Straight Pipe	2	Water	165.0	49.0
David D. Bruen County Office Building	Cond Strainer	2	Water	165.0	5.0
David D. Bruen County Office Building	Cond 90 Degree Elbow	2 1/2	Water	165.0	7.2
David D. Bruen County Office Building	Cond Flange	2 1/2	Water	165.0	1.8
David D. Bruen County Office Building	Cond Straight Pipe	2 1/2	Water	165.0	23.0
David D. Bruen County Office Building	Cond Gate Valve	3	Water	165.0	4.1
David D. Bruen County Office Building	Cond Straight Pipe	3	Water	165.0	2.0
David D. Bruen County Office Building	Cond T Intersection	3	Water	165.0	1.2
David D. Bruen County Office Building	Cond Condensate Tank	8	Water	165.0	8.0
Emergency Operations Center/TOPS	MTHW In-Line Pump	2	Water	185.0	10.0
Emergency Operations Center/TOPS	MTHW Centrifugal Pump	4	Water	185.0	10.0
Emergency Operations Center/TOPS	MTHW Strainer	4	Water	185.0	10.0
Emergency Operations Center/TOPS	MTHW Suction Diffuser	4	Water	185.0	8.8
Law Department	MTHW 90 Degree Elbow	3/4	Water	185.0	7.2
Law Department	MTHW 90 Degree Elbow	3/4	Water	185.0	34.2
Law Department	MTHW Ball Valve	3/4	Water	185.0	32.8
Law Department	MTHW Flo-Check	1	Water	185.0	16.4
Law Department	MTHW In-Line Pump	1	Water	185.0	40.0
Law Department	MTHW 90 Degree Elbow	1 1/2	Water	185.0	1.8
Law Department	MTHW 90 Degree Elbow	1 1/2	Water	185.0	3.6

Buildings	Location	Pipe Size (Inches)	Fluid Type	Fluid Temp (F)	Length (ft)
Law Department	MTHW Straight Pipe	1 1/2	Water	185.0	7.0
Law Department	MTHW Straight Pipe	1 1/2	Water	185.0	3.0
Law Department	MTHW T Intersection	1 1/2	Water	185.0	7.2
Law Department	MTHW T Intersection	1 1/2	Water	185.0	6.0
New Putnam County Courthouse	MTHW 90 Degree Elbow	4	Water	185.0	1.8
New Putnam County Courthouse	MTHW End Cap	4	Water	185.0	1.5
New Putnam County Courthouse	MTHW Straight Pipe	4	Water	185.0	3.0
New Putnam County Courthouse	MTHW Flex Fitting	5	Water	185.0	6.0
Putnam County Dept of Highways & Facilities	MTHW 90 Degree Elbow	1 1/2	Water	185.0	3.6
Putnam County Dept of Highways & Facilities	MTHW Straight Pipe	1 1/2	Water	185.0	7.0
Putnam County Dept of Highways & Facilities	MTHW 90 Degree Elbow	2	Water	185.0	3.6
Putnam County Dept of Highways & Facilities	MTHW Straight Pipe	2	Water	185.0	12.0
Putnam National Golf Club - Clubhouse	MTHW In-Line Pump	1 1/2	Water	185.0	50.0
Putnam National Golf Club - Clubhouse	MTHW Bonnet	3	Water	185.0	1.8
Putnam National Golf Club - Clubhouse	MTHW Flange	3	Water	185.0	1.8
Putnam National Golf Club - Clubhouse	MTHW In-Line Pump	3	Water	185.0	5.0
Putnam National Golf Club - Clubhouse	MTHW Air Seperator Tank	6 7/25	Water	185.0	6.3
Putnam Valley Senior Center	MTHW 90 Degree Elbow	2 1/2	Water	185.0	3.6
Putnam Valley Senior Center	MTHW Straight Pipe	2 1/2	Water	185.0	3.0
Putnam Valley Senior Center	MTHW Flex Fitting	3	Water	185.0	3.0
Putnam Valley Senior Center	MTHW Strainer	3	Water	185.0	10.0
Putnam Valley Senior Center	MTHW Suction Diffuser	3	Water	185.0	8.8
Putnam Valley Senior Center	MTHW Straight Pipe	4	Water	185.0	9.0
Putnam Valley Senior Center	MTHW Strainer	4	Water	185.0	10.0
Putnam Valley Senior Center	MTHW T Intersection	4	Water	185.0	2.4
Putnam Valley Senior Center	DHW Straight Pipe	3/4	Water	125.0	6.0

Buildings	Location	Pipe Size (Inches)	Fluid Type	Fluid Temp (F)	Length (ft)
Putnam Valley Senior Center	DHW Straight Pipe	1	Water	125.0	2.0
Veterans Home	MTHW 90 Degree Elbow	3/4	Water	185.0	16.2
Veterans Home	MTHW 90 Degree Elbow	1	Water	185.0	36.0
Veterans Home	MTHW 90 Degree Elbow	1 1/4	Water	185.0	7.2
Veterans Home	MTHW Straight Pipe	1 1/4	Water	185.0	9.0
Veterans Home	MTHW 45 Degree Elbow	1 1/2	Water	185.0	4.0
Veterans Home	MTHW 90 Degree Elbow	1 1/2	Water	185.0	9.0
Veterans Home	MTHW Straight Pipe	1 1/2	Water	185.0	4.0
Veterans Home	MTHW Straight Pipe	1 1/2	Water	185.0	18.0
Veterans Home	MTHW T Intersection	1 1/2	Water	185.0	18.0
Veterans Home	DHW 45 Degree Elbow	1 1/2	Water	125.0	3.0
Veterans Home	DHW 90 Degree Elbow	1 1/2	Water	125.0	5.4
Veterans Home	DHW T Intersection	1 1/2	Water	125.0	2.4
William Koehler Senior Center	MTHW 90 Degree Elbow	1 1/2	Water	185.0	3.6
William Koehler Senior Center	MTHW In-Line Pump	1 1/2	Water	185.0	5.0
William Koehler Senior Center	MTHW Strainer	1 1/2	Water	185.0	5.0
William Koehler Senior Center	MTHW 90 Degree Elbow	2	Water	185.0	5.4
William Koehler Senior Center	MTHW In-Line Pump	2	Water	185.0	5.0
William Koehler Senior Center	MTHW Strainer	2	Water	185.0	5.0
Total					**956**

ASSUMPTIONS & EXCLUSIONS

- Prevailing Wage – all pricing in this Report is based on prevailing wage. There is no 2nd shift premium included in the labor pricing for this Report.
- Asbestos in the Work Area – it is assumed that no comprehensive asbestos remediation project is planned; as a result, it is assumed that all the areas of asbestos insulation that were found during on-site inspections will remain in place. Under these assumptions, work areas that are directly adjacent to likely asbestos-containing

material cannot be included in the scope of work because installing the retrofit insulation would disrupt potentially hazardous material. Any work areas that are directly adjacent to likely asbestos-containing material or would potentially disrupt asbestos-containing material are excluded from the scope of work.

- Hazardous Materials – testing, remediation and/ or removal of any potentially hazardous material that is encountered is excluded from the scope of work and pricing.

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTATION

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect “As-Built” conditions and submitted in multiple for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The new insulation will significantly reduce distribution losses and improve system efficiency.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

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ECM 16: BOILER REPLACEMENTS

ECM OVERVIEW

The existing cast iron sectional boilers installed at the Putnam County Highway Department Building 3 Dispatch Garage are operating past their useful life. Ameresco proposes to install high efficiency boilers to replace the existing units. The boilers will supply heat to the facility using higher efficiency burner technology, and improved efficiency.

Figure E16.1: Existing boilers at the Highway Department Building 3 Dispatch

EXISTING SYSTEM DETAIL

Cast iron sectional hot water boilers generate hot water for the Highway Department Dispatch Garage. The existing Weil-McLain cast iron #2 oil-fired boilers are operating at the end of their useful life. Of the original three boilers, one has failed and has been abandoned in place and one has failed and has been removed entirely, leaving only a single working boiler to heat the building. When all three were operable they had a combined gross heating capacity of 1,188,000 Btu/hr. Heating hot water pumps distribute the water to the building unit heaters.

PROPOSED SYSTEM DETAIL

Ameresco proposes to replace the existing hot water boilers and zone pumps with new units. The boilers will supply heat to the facility at up to 85% efficiency. They will have a factory tested and assembled cast iron sectional heat exchanger and insulated steel jacket with aluminized steel flue collector hood. The new boilers will provide the County with new more reliable heating equipment.

Ameresco will remove the two (2) existing boilers located in the building and replace them with two (2) new hot water boilers. The hot water piping will be removed back to the header. The boiler exhaust vent will be demolished, and new venting will be installed in the existing chimney shaft. The new boilers supplied by Ameresco will be Weil McLain Commercial Series Oil Boilers, or equivalent.

Work for this measure is to be conducted as described in the following scope of work:

BOILERS REPLACEMENT

The scope of work includes all mechanical, electrical and demolition work required to replace the three existing oil-fired hot water boilers with two new oil-fired hot water boilers.

- Demo two (2) existing Weil McLain 480 hot water boilers as indicated below.
  - Demo and remove existing boilers and ancillary equipment through mechanical room interior door.
  - Demo and remove existing power wiring and conduit back to existing breakers
  - Disconnect the oil line from existing hot water boilers. Relocate the oil lines as necessary for the two (2) new hot water boilers.
  - Demo and remove existing hot water piping back to isolation valves.
  - Demo and remove the existing boiler pumps (Pump and motor) – Two (2) hot water pumps. Demo to include wiring and associated relays.
    - Air separator and expansion tanks to remain and be reused
- Install two (2) new oil-fired Weil McLain Commercial 580 boilers rated for 515 MBH Output each, **(2) boilers will be purchased by Ameresco.**
  - Install two (2) new hot water boilers in the existing location.
  - Provide and install new pumps based on specifications: Pumps shall be Bell and Gossett PL series (or equivalent).

Table E16.1: New Pumps

CIRC.	MAKE	MODEL	GPM	HEAD (FT)
1	B&G	PL-75	50	10
2	B&G	PL-75	50	10

  - Provide all necessary auxiliaries required for turnkey installation
  - Provide and install all isolation valves, check valves, balancing valves, pressure gauges, temperature probes, etc. to complete the new piping
  - Provide and install a new 115v power service to new boilers per manufacturer’s instructions (if necessary).
  - Provide and install separate relay for each circulator.
  - Properly cap (or remove) unused exhaust manifold.
  - Provide and install new oil piping from existing tank to new boilers
    - Tank is exterior to building
    - Existing tank will be reused as is
  - Insulate and label all new piping.
  - Control work will be provided separately by Controls Contractor
  - Fill new piping and coordinate start-up with boiler manufacturer’s representative
  - Recharge existing Expansion Tank

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTATION

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect "As-Built" conditions and submitted in multiple for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The new boilers will enhance facility operations by replacing older, less efficient equipment.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

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ECM 17: WINDOW REPLACEMENTS

ECM OVERVIEW

Ameresco proposes to replace old windows with new heavy-duty, commercial grade, architectural, thermally efficient double-pane windows at the Golf Clubhouse to provide a draft-free working environment that will save energy and lower operating and maintenance costs.

Figure E17.1: Existing aluminum windows and doors at the Golf Clubhouse

EXISTING SYSTEM DETAIL

The windows at the below sites are predominantly double-pane commercial aluminum windows. All are in fair to poor condition, are drafty, are not thermally efficient and are a source of discomfort in many areas. The estimated U-values of the windows to be replaced are shown in Table E17.1 below.

The Windows at the Golf Clubhouse are a mixture of double hung or casement windows at the upper floor offices and aluminum double-pane commercial storefront window systems that include doors. The aluminum framing of these windows has failed in parts and water entering the wall through these windows has damaged the basement windows of the pro shop, along with the wood siding.

Table E17.1: Estimated U-Values of Windows Scheduled for Replacement

BUILDING	WINDOW AREA (SF)	WINDOW U-VALUE (BTUH/°F-SF)
Putnam County National Golf Course	1,418	0.64

PROPOSED SYSTEM DETAIL

Table E17.2: Schedule of Windows & Doors to be Replaced at Golf Clubhouse

Item	Type	Qty
A	Casement Picture Window	1
B	Assembly Window	5
C	Assembly Window	5
D	Assembly Window	2
E	Assembly Window	1
F	Casement Picture Window	1
G	Assembly Window	1
H	Direct Glaze Rectangle Window	3
I	Direct Glaze Rectangle Window & Door Assembly	1
J	Direct Glaze Rectangle Window & Door Assembly	1
K	Direct Glaze Rectangle Window	2
L	Outswing French Door & Direct Glaze Rectangle Window Assembly	1
M	Bay Assembly Windows	1
N	Direct Glaze Rectangle Windows	6
O	Direct Glaze Rectangle Windows	6
P	Glass Door Storefront Assembly	1

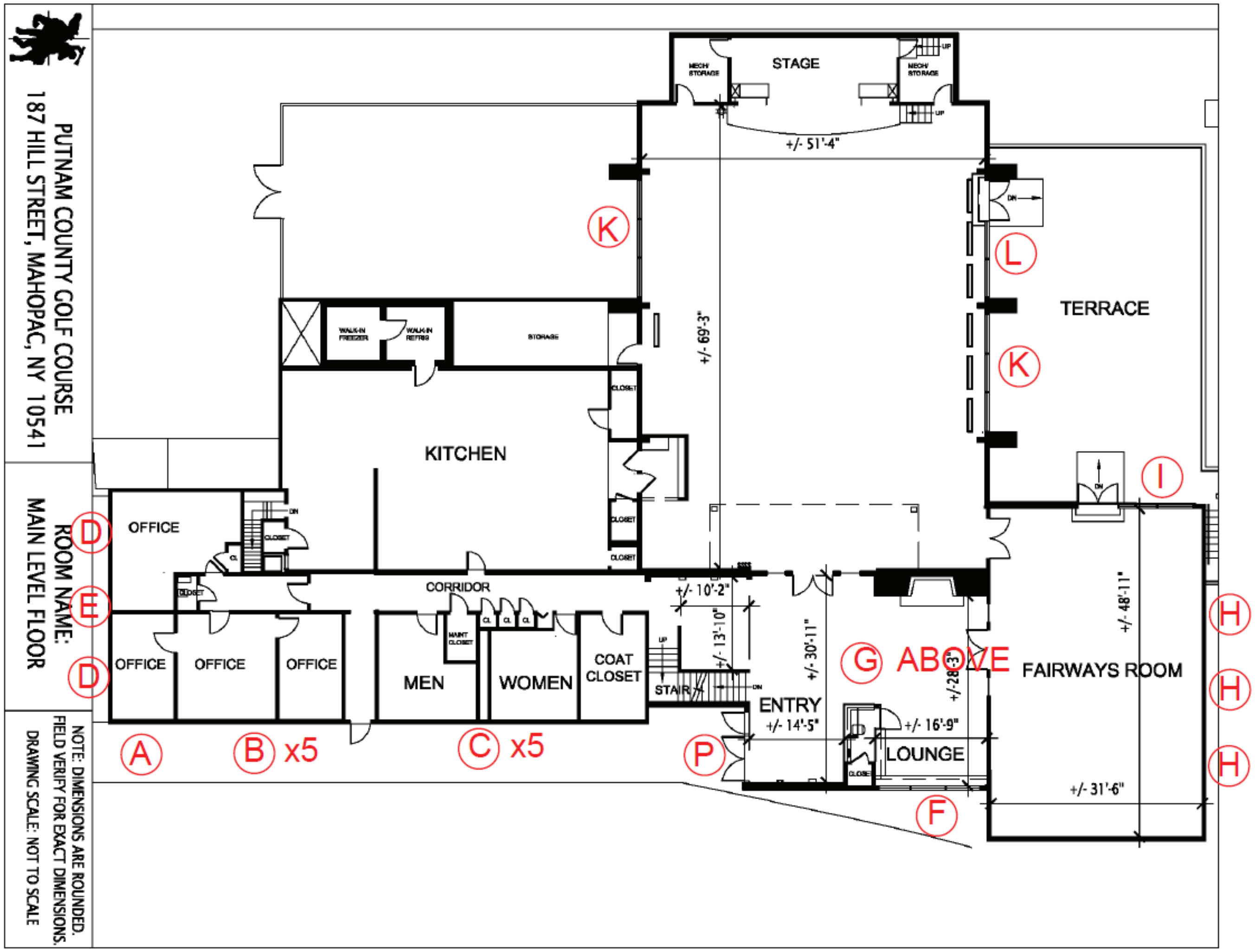

Figure E17.2: Proposed Window and Door Replacements on the Main Level Floor at the Putnam County Golf Course

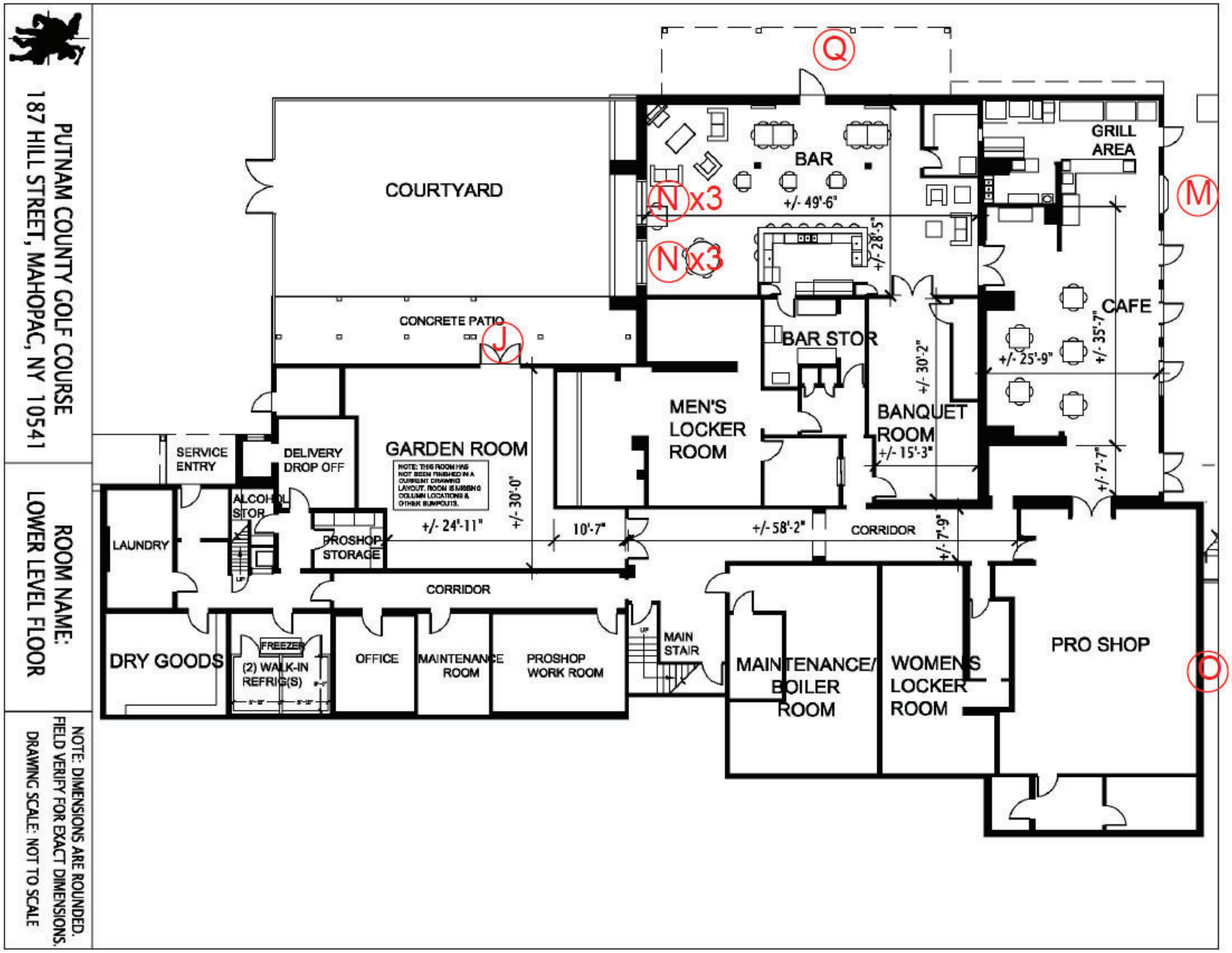

Figure E17.3: Proposed Window and Door Replacements on the Lower Level Floor at the Putnam County Golf Course

New windows will be custom designed architectural, heavy-duty and commercial grade. The new windows will utilize insulated glass with a “low-E” coating that will improve thermal efficiency and performance. These new windows will also have a “thermal break” to virtually eliminate thermal conduction loss through their frames. The overall thermal transmission value (“U-value”) of the proposed windows is 0.31 BTU/hr-sf-ºF or better.

Frame and sash construction will consist of thermally broken aluminum alloy materials. All extrusions will have a poured in place urethane thermal break. All sash members will consist of hollow aluminum extrusions for added strength. All fasteners will be made of a non-corroding metal.

By reducing outside air infiltration and solar radiation the new windows will significantly improve comfort levels within each occupied space. The disparity of temperatures within individual rooms will be reduced, eliminating the excessive heat in the interior portions of the room and the noticeably cooler temperatures along the windowed walls.

As part of this work Ameresco also proposes to replace the three (3) upper level front entrance doors. Side lower level glass doors from the bar/café area to the patio are not included in this scope due to their relatively new age and good condition and the fact that they may be replaced during a future remodel of the bar/patio area.

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTATION

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect “As-Built” conditions and submitted in multiple for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The new windows will significantly improve the comfort levels within each occupied space by reducing the outside air infiltration. The comfort levels will also be enhanced by reducing the disparity of temperatures within any individual room thus eliminating the current condition of excessive heating to the interior portions of the room and the noticeably cooler temperatures along the windowed walls. Few, if any, changes in the thermostat setting will be required during a normal workday.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

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ECM 18: SOLAR PV

Figure E18.1: Example of a typical ballast mounted solar PV array

Ameresco performed a review of all buildings and recommends the installation of 369.2 kWdc of roof mounted solar PV at five locations. Combined, these systems will generate approximately 464,029 kWh annually for onsite use and assist the County in offsetting electrical energy purchased. Ameresco proposes to mount the PV systems on the facility roofs with a ballast mounting system which will eliminate the need for roof penetration. All systems will be oriented in a Southern direction to ensure maximum performance. The systems will be behind the meter, and Ameresco expects each building to fully use all output from each solar array.

PROPOSED SYSTEM DETAIL

The proposed rooftop systems are designed with a ballast-mounted racking system that has fewer roof penetrations. A third-party structural consultant, with P.E. licensure in the State of NY, will analyze the roofs to identify reserve roof capacity for the proposed roofs. In design of the proposed systems, shading analysis was conducted on the mechanical structures on the roofs as well as surrounding trees and buildings to maximize the output of the systems. Current walkways on the roofs now will be preserved, and panels will be installed around them. The proposed systems use a PanelClaw Solar Racking System or equal with a tilt angle of 5 degrees. This racking systems will meet the specific wind load requirements, while also providing one of the lowest overall pounds per square foot of added weight to the roof, minimizing concerns related to reserve roof capacity. System azimuth angle is facing southern orientation to maximize total installed capacity of the roof area. This approach was selected to maximize production output and inverter efficiency, given the array design.

The following table summarizes the proposed installation at each facility.

Table E18.1: Solar Output Directory

Building	Total KW DC	1st Year annual Production kWh
David D. Bruen County Office Building	45.6	57,985
Donald B. Smith Government Campus – Building 1	45.3	57,420
Donald B. Smith Government Campus – Building 2	99.3	124,350
Donald B. Smith Government Campus – Building 3	131.4	165,724
Kern Building – Health Dept/DMV/WIC	47.6	58,550
Totals	**369.2**	**464,029**

The following table summarizes an example of the specific warranties for the individual components we would propose (or equal) to use for this project. In Ameresco's experience, all active warranties are transferrable should the ownership of the system change.

Table E18.2: All Proposed Warranties

Equipment	**Manufacturer**	**Warranty Provisions**
Modules	Jinko Solar	• During the first ten years, Jinko provides repair or replacement to their panels. • By the end of year 25, the actual power output will be no less than 80.0% of the labeled power output
Inverter	Solar Edge	• The power inverters come with a standard 12-year warranty • Power optimizers carry a 25-year warranty
Racking	PanelClaw	• Warranty for products' durability for a period of twenty-five (25) years after the date the Project is Substantially Completed.

GENERAL SCOPE OF SERVICES

The general scope of work includes the following:

- Contractor shall provide all labor, tools, equipment, transportation, hoisting, rigging etc. for all work herein specified and or required to complete the project
- Evaluate the roof area or other installation site to see if it is capable of handling the desired system size, modifications to existing structural systems are not included.
- Specify sunlight and weather resistant materials for all outdoor equipment
- Design the system in compliance with all applicable building and electrical codes
- Ensure the design meets local utility interconnection requirements

- Properly seal any roof penetrations with roofing industry approved sealing methods
- Install equipment according to manufacturer’s specifications, using installation requirements and Procedures from the manufacturers' specifications
- Properly ground the system parts to reduce the threat of shock hazards and induced surges
- Check for proper PV system operation by following the checkout procedures on the PV System Installation Checklist

EXCLUSIONS

This energy conservation measure does not include:

- Roof upgrades to have solar installed. The exact age and condition of the proposed rooftops was not known at the time of this report.
- Structural modifications – Ameresco has included the cost to evaluate the existing structures by a structural engineer. Any required modifications would be an additional cost.
- Ameresco will complete the utility interconnection application on the County’s behalf for the PV systems. While not anticipated, the utility may require upgrades to its distribution system in order to allow connection of the PV systems. This is a scope that cannot be determined until after the Utility completes its review of the application. Therefore, Ameresco has not included any additional costs associated with potential utility required upgrades.

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTS

Equipment will be identified in submittals provided to the appointed personnel for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect “As-Built” conditions, and submitted in multiple to the University for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

Installing solar PV roof mounted systems well help generate electricity for each building it is installed on. This means the County will require less electricity from the Utility.

DAVID D. BRUEN COUNTY OFFICE BUILDING

The Bruen Building currently does not have any solar installed on the roof of the building. Ameresco proposes to install the following system.

Figure E18.2: Site diagram/illustration that includes location/design of array, and proposed capacity (45.6 kWdc)

DONALD B. SMITH GOVERNMENT CAMPUS – BUILDING 1

The Government Building 1 currently does not have any solar installed on the roof of the building. Ameresco proposes to install the system seen below.

Figure E18.4: Site diagram/illustration that includes location/design of array, and proposed capacity (45.3 kWdc)

DONALD B. SMITH GOVERNMENT CAMPUS – BUILDING 2

The Government Building 2 currently does not have any solar installed on the roof of the building. Ameresco proposes to install the system seen below.

Figure E18.5: Site diagram/illustration that includes location/design of array, and proposed capacity (99.3 kWdc)

DONALD B. SMITH GOVERNMENT CAMPUS – BUILDING 3

The Government Building 3 currently does not have any solar installed on the roof of the building. Ameresco proposes to install the system seen below.

Figure E18.6: Site diagram/illustration that includes location/design of array, and proposed capacity (131.4 kWdc)

KERN BUILDING – HEALTH DEPT/DMV/WIC

The Kern Building currently does not have any solar installed on the roof of the building. Ameresco proposes to install the system seen below.

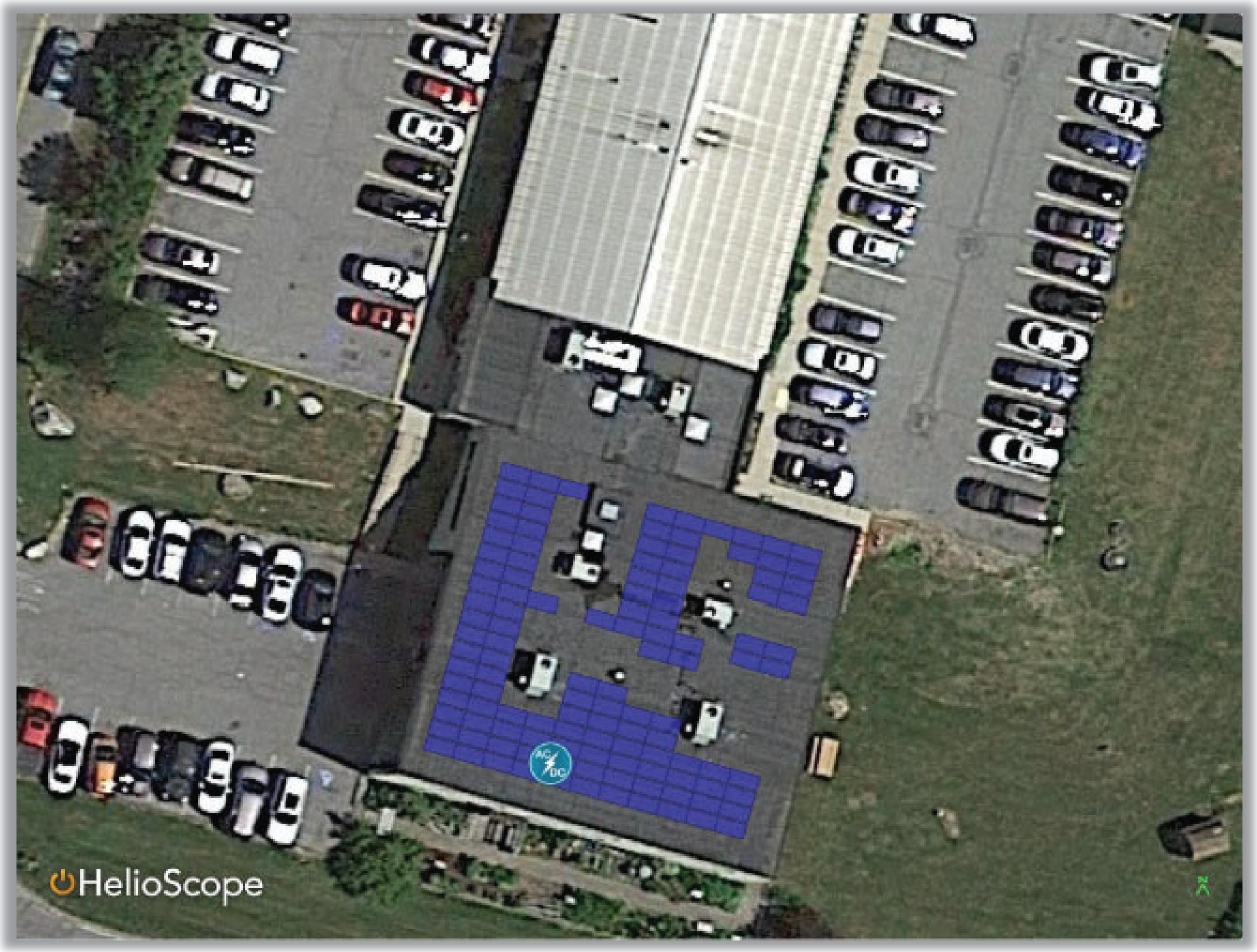

Figure E18.7: Site diagram/illustration that includes location/design of array, and proposed capacity (47.6 kWdc)

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

ECM 19: AHU REPLACEMENTS

ECM OVERVIEW

Ameresco proposes to replace the air handling unit (AHU) serving the Pro Shop in the lower level of the Golf Clubhouse and associated outdoor condensing unit (CU) located on the ground behind the Clubhouse and two (2) AHUs serving the Golf Clubhouse ballroom as well as the five (5) Rooftop Units (RTU) serving the Putnam Family & Community Services located at 1808 Route 6, four (4) RTUs serving Donald B. Smith Government Campus Building 2, and three (3) RTUs serving Government Building 3. The old units will be removed, and the new equipment will be installed in the same locations. The existing supply ductwork will be reused. Ameresco also proposes replacing the two (2) DX refrigerant coils and CUs serving the Koehler Senior Center.

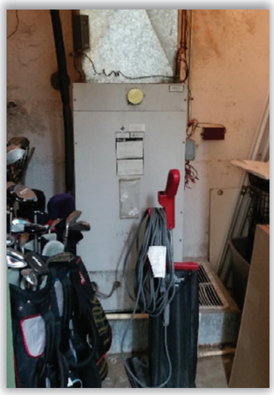

Figure E19.1: AHU serving Pro Shop of Golf Clubhouse

New equipment capacities will be matched to the capacity of the old, while providing comfort air conditioning at a lower operating cost. In addition, maintenance costs on these new units is expected to be greatly reduced.

EXISTING SYSTEM DETAIL

The existing cooling equipment is old and quite past its useful life. The existing controls on these units are dedicated local electronic programmable thermostats. As the units continue to age, they will face increased reliability issues and require increased maintenance.

The existing cooling equipment serving the Ballroom at the Golf Course Clubhouse is old and quite past its useful life. The indoor units located in closets on either side of the stage are noisy and interfere with future plans to level the stage area. The location of the outdoor condensing units alongside a cart path and handicap access leads to ongoing damage to the units.

Figure E19.2: CU providing DX cooling to AHU

Table E19.1: Existing Equipment by Building

Building	**Equipment**	**Size (Tons)**
Putnam National Golf Clubhouse	AHU-1 & CU-1	15.0
Putnam National Golf Clubhouse	AHU-2 & CU-2	15.0
Putnam National Golf Clubhouse	AHU-5 & CU-5	3.5
Koehler Senior Center	DX Coil-1 & CU-1	20.0
Koehler Senior Center	DX Coil-2 & CU-2	7.5
Donald B Smith Government Campus Building 2	RTU-1	12.5
Donald B Smith Government Campus Building 2	RTU-2	12.5
Donald B Smith Government Campus Building 2	RTU-3	12.5
Donald B Smith Government Campus Building 2	RTU-4	12.5
Donald B Smith Government Campus Building 3	RTU-1	15.0
Donald B Smith Government Campus Building 3	RTU-2	15.0
Donald B Smith Government Campus Building 3	RTU-3	15.0
Putnam Family & Community Services – 1808	RTU-1	7.5
Putnam Family & Community Services – 1808	RTU-2	10.0
Putnam Family & Community Services – 1808	RTU-3	10.0
Putnam Family & Community Services – 1808	RTU-4	7.5
Putnam Family & Community Services – 1808	RTU-5	7.5
Total		**211**

PROPOSED SYSTEM DETAIL

Ameresco proposes replacing the outdated units indicated in the following scope table with newer units to improve reliability and maintenance concerns. Additionally, they will be more efficient, consuming less electricity, and have fewer thermal losses within the units and better integrity regarding air leakage and thermal insulation. Our replacement strategy is detailed in the following tables. In each case our scope of work includes removal and disposal of the existing units, installation of new units, and re-connection of all service piping and air ducts.

The Ballroom AHUs and CUs will be removed and replaced with similarly sized packaged DX AHUs located at the exterior of the building. Concrete footings and steel supports will be installed to elevate the units to the level of the rear upper floor ballroom. Supply and return ductwork will be run from the new AHUs into the building, connecting to existing grilles and diffusers. This will free up space in the closets to be used for storage and move all mechanical equipment away from the stage.

The Koehler Senior Center condensing units and DX cooling coils will be removed and replaced with in-kind equipment, reusing the rest of the AHUs.

Table E19.2: Air Handling Unit Replacement Specifications

Building	UNIT ID	AREA SERVED	COOLING	Heating	AIRFLOW CFM	Cooling Capacity Tons
Golf	AHU-1	Ballroom	DX	None	6,000	15.0
Golf	AHU-2	Ballroom	DX	None	6,000	15.0
Golf	AHU-5	Pro Shop	DX	Hot Water Coil	3,000	7.5
Koehler	DX Coil-1	Senior Center	DX	NA	8,000	20.0
Koehler	DX Coil-2	Senior Center	DX	NA	3,000	7.5
Gov2	RTU-1	Offices	DX	None	5,000	12.5
Gov2	RTU-2	Offices	DX	None	5,000	12.5
Gov2	RTU-3	Offices	DX	None	5,000	12.5
Gov2	RTU-4	Offices	DX	None	5,000	12.5
Gov3	RTU-1	Offices	DX	None	6,000	15
Gov3	RTU-2	Offices	DX	None	6,000	15
Gov3	RTU-3	Offices	DX	None	6,000	15
Fam1808	RTU-1	Offices	DX	Gas	3,000	7.5
Fam1808	RTU-2	Offices	DX	Gas	4,000	10.0
Fam1808	RTU-3	Offices	DX	Gas	4,000	10.0
Fam1808	RTU-4	Offices	DX	Gas	3,000	7.5
Fam1808	RTU-5	Offices	DX	Gas	3,000	7.5
Totals					**84,400**	**211**

GENERAL SCOPE OF SERVICES

GOLF - INSTALL BALLROOM AIR HANDLING UNITS

The scope of work includes all mechanical, electrical and demolition work required to replace (2) Worthington split systems with two (2) new exterior Air handling Units. The (2) two existing units will be replaced with (2) two new cooling only split system units.

- **Demo and remove** (2) two existing Worthington DX systems (evaporators and condensing units) and all related accessories (electric wiring, damper actuators, dampers etc.)
    - Properly dispose of existing units per EPA regulations
    - Disconnect from existing electric service.
    - Disconnect from existing supply duct work.
    - Demolish existing pads supporting condensing units.
    - Properly recover and dispose of all R22 refrigerants.
- **Provide: Rigging & crane service** for demo and removal of old equipment
- **Install** (2) Trane (or equivalent) 15 Ton, packaged units.

    - Provide: Rigging & crane service for setting of new equipment, electrical reconnect and startup of equipment.
        - New Units to be installed on the exterior of building, off the back of the Ballroom stage area.
    - New exterior ductwork to be installed and connected to existing sidewall diffusers at front of stage wall
        - Ductwork to have exterior grade insulation.
    - Connect power wiring to new equipment. Install new wiring as required.
    - Provide and install new breakers if necessary.
    - Provide Start-up, commissioning, operations manual and specification sheets on all units.
- Create catwalk around two new AHUs for maintenance access
    - Catwalk to be at least 24” wide from inner rail to outer side and allow access to two sides of units.
    - Structure to be supported by two 8” footing extending 4’ below soil line.
    - Steel to be carbon steel welded, primed, and painted.

GOLF - REPLACE BASEMENT SPLIT SYSTEM UNITS

The scope of work includes all mechanical, electrical and demolition work required to replace (1) split system. The AHU serving the Pro Shop each have a hot water coil as well as a DX cooling coil.

- **Demo and remove** (1) existing DX system (evaporator and condensing unit) and all related accessories (electric wiring, damper actuators, dampers etc.)
    - Properly dispose of existing units per EPA regulations
    - Disconnect from existing electric service.
    - Disconnect from existing supply duct work.
    - Demolish existing pad supporting condensing unit.
    - Properly recover and dispose of all R22 refrigerants.
- **Provide: Rigging & crane service** for demo and removal of old equipment
- **Install** (1) Carrier (or equivalent) split system unit to meet the design criteria below.
- Provide: Rigging & crane service for setting of new equipment, electrical reconnect and startup of equipment.
- Provide new footing/pad as required for (1) new condensing unit.
- Connect power wiring to new equipment. Install new wiring as required.
- Provide and install new breakers if necessary.
- Condensing unit will be installed outdoors on ground level and evaporator will be installed in existing mechanical closet. Provide and install new, supply, ductwork from the new evaporator unit to the existing main, the supply ductwork will be rated for medium pressure with a velocity range of 2,500 – 3,500 FPM and with a static pressure of 0.25 inches per 100’ feet.
    - Provide Start-up, commissioning, operations manual and specification sheets on all units.

GOV2 - REPLACE (4) PACKAGED ROOF TOP UNITS

The scope of work includes all mechanical, electrical and demolition work required to replace (4) Carrier Weathermaker 50DP014510 AA Roof Top Units (RTU) with equal. The (4) existing RTUs will be replaced with (4) new air-cooled packaged systems.

- **Demo and remove** (4) four existing Carrier RTUs systems and all related accessories (electric wiring, damper actuators, dampers etc.)
  - Properly dispose of existing units per EPA regulations
  - Disconnect from existing electric service.
  - Disconnect from existing supply/return duct work.
  - Properly recover and dispose of all refrigerants.
- **Provide: Rigging & crane service** for demo and removal of all old equipment
- **Install** (4) Trane (or equivalent) 12.5 Ton packaged units.
  - Provide: Rigging & crane service for setting of new equipment, electrical reconnect and startup of equipment.
  - New roof curb adaptors are required and will be provided with equipment.
  - Connect power wiring to new equipment. Install new wiring as required.
  - Provide and install new breakers if necessary.
  - Adjust existing supply and return ductwork to new equipment if necessary.
  - Provide Start-up, commissioning, operations manual and specification sheets on all units.

GOV3 - REPLACE (3) PACKAGED ROOF TOP UNITS

The scope of work includes all mechanical, electrical and demolition work required to replace (3) Carrier Weathermaker 48DP016 Roof Top Units (RTU) with equal. The (3) existing RTUs will be replaced with (3) new air-cooled gas-fired packaged systems.

- **Demo and remove** (3) three existing Carrier RTUs systems and all related accessories (electric wiring, damper actuators, dampers etc.)
  - Properly dispose of existing units per EPA regulations
  - Disconnect from existing electric service.
  - Disconnect from existing supply/return duct work.
  - Properly recover and dispose of all refrigerants.
- **Provide: Rigging & crane service** for demo and removal of all old equipment
- **Install** (3) Trane (or equivalent) 15 Ton packaged units.
  - Provide: Rigging & crane service for setting of new equipment, electrical reconnect and startup of equipment.
  - Run new gas piping across roof and connect to each RTU
  - New roof curb adaptors are required and will be provided with equipment.
  - Connect power wiring to new equipment. Install new wiring as required.
  - Provide and install new breakers if necessary.
  - Adjust existing supply and return ductwork to new equipment if necessary.
  - Provide Start-up, commissioning, operations manual and specification sheets on all units.

FAM1808 - REPLACE (5) PACKAGED ROOF TOP UNITS

The scope of work includes all mechanical, electrical and demolition work required to replace (5) Trane Roof Top Units (RTU) with equal. The (5) existing RTUs will be replaced with (5) new air cooled/gas fired packaged systems. Details for the unit are shown in the table below.

- **Demo and remove** (5) five existing Trane RTUs systems and all related accessories (electric wiring, damper actuators, dampers etc.)
    - Properly dispose of existing units per EPA regulations
    - Disconnect from existing gas & electric service.
    - Disconnect from existing supply/return duct work.
    - Properly recover and dispose of all refrigerants.
- **Provide: Rigging & crane service** for demo and removal of all old equipment
- **Install** (5) Trane (or equivalent) packaged units per schedule below.
  (*Table below is for information related to construction installation only)*

SINGLE PACKAGED AIR CONDITIONER GAS/ELECTRIC SCHEDULE (ROOFTOP)

							COOLING CAPACITY							HEATING CAPACITY						
MARK	LOCATION	AREA AND/OR BLDG SERVED	PKGD RTU	TOTAL SUPPLY AIR FLOW	MIN. OUTSIDE AIR FLOW	EXT STATIC PRESSURE	MIN TOTAL CAPACITY	MIN SENS CAPACITY	MIN SEER	EAT Db	EAT Wb	OSA DESIGN TEMP	GAS MIN. INPUT	NET OUTPUT	EAT Db	LAT Db	UNIT POWER CONNECTION MCA	PHASE	VOLT	Manuf./Model (B.O.D): Trane
				CFM	CFM	IN	MBH	MBH		°F	°F	°F	MBH	MBH	°F	°F				
RTU-1	ROOF	OFFICES	RTU	3,000	600	0.4	92	86.6	14.5	80	67	95	120	96	70	99.9	42	[3]	208	YHC092F3RLA
RTU-2	ROOF	OFFICES	RTU	4,000	800	.43	114	94	14.7	80	67	95	150	120	70	99.9	48	[3]	208	YHC120F3RLA
RTU-3	ROOF	OFFICES	RTU	4,000	800	0.4	114	94	14.7	80	67	95	150	120	70	99.9	48	[3]	208	YHC120F3RLA
RTU-4	ROOF	OFFICES	RTU	3,000	600	0.45	92	86.6	14.5	80	67	95	120	96	70	99.9	42	[3]	208	YHC092F3RLA
RTU-5	ROOF	OFFICES	RTU	3,000	600	0.41	92	86.6	14.5	80	67	95	120	96	70	99.9	42	[3]	208	YHC092F3RLA

    - Provide: Rigging & crane service for setting of new equipment, electrical reconnect and startup of equipment.
    - New roof curb adaptors are required and will be provided with equipment.
    - Connect power wiring to new equipment. Install new wiring as required.
    - Connect to existing gas lines
    - Provide and install new breakers if necessary.
    - Adjust existing supply and return ductwork to new equipment if necessary.
    - Provide Start-up, commissioning, operations manual and specification sheets on all units.

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTATION

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect “As-Built” conditions and submitted in multiple for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The new air conditioning systems will enhance facility operations by reducing electricity usage, reducing ongoing maintenance costs and improving comfort levels in the space.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

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ECM 20: PLUG LOAD CONTROLLERS

ECM OVERVIEW

Ameresco proposes to install plug load control units to control the operation of printers, copiers, and coffee machines. By adding plug-in controls on the electrical receptacles that supply these items, they will operate more efficiently by using a schedule to turn the power completely off when it is unnecessary. This will reduce energy consumption by turning off equipment during unoccupied hours.

Figure E20.1: Pictured above is a BertBrain 110 plug load controller.

EXISTING SYSTEM DETAIL

Ameresco identified a variety of different uncontrolled plug loads during the walkthrough audit. Once these plug loads are turned on, they will remain operating until they are turned off by the occupants. Since they are manually controlled, some of these plug loads are left running by the occupants at the closure of a given day, and these units that are left running continure to operate during unoccupied periods, thereby wasting electrical energy. These plug loads include printers, copiers, and coffee machines.

The following table lists the quantities of plug loads identified at each building during the walkthrough audit.

Table E20.1: Existing Plug Load Quantities

Building	Quantity of Medium Printers	Quantity of Large Copiers (110V)	Quantity of Large Coffee Machines	Total Controlled Plug Loads
Sheriff's Department/Correctional Facility	5	2	2	9
New Putnam County Courthouse	15	6	3	24
David D. Bruen County Office Building	4	2	1	7
Historic 1812 Courthouse	4	2	1	7
121 Main Street	2	0	1	3
Emergency Operations Center/TOPS	5	2	2	9
Donald B. Smith Government Campus - Building 2	4	2	2	8
Donald B. Smith Government Campus - Building 3	8	2	2	12
Kern Building - Health Dept/DMV/WIC	5	2	2	9
Putnam Family & Community Services - 1808	5	0	1	6
Highway Department - Building 1 Admin	5	1	1	7
Totals	**62**	**21**	**18**	**101**

PROPOSED SYSTEM DETAIL

Ameresco proposes to install Bert 110 receptacle controllers to control the plug based devices at the County's buildings. Through scheduling, the Berts will enable power supply to the printers, copiers, and coffee machines only during occupied periods and will disable power supply during unoccupied times.

Each device will be plugged into a BertBrain, which will be plugged directly into the wall receptacle. Each Bert can store 7-day on/off schedules with multiple on/off commands each day. This allows for setting schedules that mirror the actual operating hours of each facility and easily modifying schedules throughout the year.

Figure E20.2: Existing coffee machines at Bruen Office Building

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTATION

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect "As-Built" conditions and submitted in multiple for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The plug-in controls will enhance facility operations by reducing electricity usage during unoccupied periods. Users will notice no difficulties in operation after the installation.

ENVIRONMENTAL IMPACT

There are no potential adverse environmental impacts associated with the plug load energy conservation measure.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

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ECM 22: CHILLER REPLACEMENTS

ECM OVERVIEW

The existing chiller at the Historic 1812 Courthouse is operating past its useful life. Ameresco proposes to install a new high efficiency chiller to replace the existing unit. The chiller will supply chilled water to the facility using the existing distribution system but with improved efficiency.

Figure E22.1: Existing chiller at the Historic 1812 Courthouse

EXISTING SYSTEM DETAIL

An existing 80 ton split air-cooled chiller currently cools the Historic 1812 Courthouse. A compressor in the basement is connected by refrigerant piping to an exterior groundmount condensing unit located just outside the mechanical space. Chilled water is circulated through a distribution system by two in-line chilled water pumps. Water is circulated to cooling coils in Air Handling Units (AHU) which provide conditioned air to the occupied spaces. The chiller has reached the end of its useful life and is need of replacement.

PROPOSED SYSTEM DETAIL

Ameresco proposes to replace the existing split chiller with a packaged air-cooled chiller. Instead of an interior compressor and evaporator and exterior condenser, the entire chiller will be located outside in a single packaged unit. New chilled water pipes will run into the building and connect to the existing chilled water pumps and distribution system. Chilled water will run through the existing pipes inside the building to AHU cooling coils.

The new chiller will be an 80 ton scroll packaged chiller with an EER of at least 14.60.

Work for this measure is to be conducted as described in the following mechanical scope of work.

CHILLER REPLACEMENT

The scope of work includes all mechanical, electrical and demolition work required to replace the (1) existing chiller and condensing unit.

- Demo and remove the (1) existing York YCRZ33JOO/17PA (80 Tons) chiller and exterior condensing unit
  - Reclaim refrigerant and drain oil from existing chiller
  - Disconnect all piping and electrical on existing chiller
  - Remove all existing refrigerant piping between chiller and condensing unit
  - Provide crane and rigging services to demo existing chiller and remove from jobsite
- Install (1) new Trane RTHD (80 Tons) screw chiller, or equivalent
  - Provide crane and rigging services to bring new chiller to jobsite and set on existing exterior concrete pad
  - Run new chilled water piping into building and connect to existing chilled water system.
  - Assist factory startup technician
  - Install privacy fence around new chiller

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTATION

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect “As-Built” conditions and submitted in multiple for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The new chiller will enhance facility operations by replacing older, less efficient equipment.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

ECM 23: SIDING REPLACEMENT

ECM OVERVIEW

Ameresco proposes to replace the siding at the Putnam National Golf Club Clubhouse. The existing wood siding, as well as the brick portions of the building's exterior is in poor condition and in need of replacement. The total exterior wall area to be covered is approximately **12,900** square feet.

Figure E23.1: Existing wood and brick exterior of Golf Clubhouse.

EXISTING SYSTEM DETAIL

At the Clubhouse, parts of the exterior wall are clad in wood siding and parts are left as exposed brickwork. Much of the existing siding and brickwork is in poor condition, showing signs of water damage. Sections of bricks are loose and crumbling.

Figure E23.2: Damage to existing brick exterior.

PROPOSED SYSTEM

Ameresco proposes removing all of the existing wood siding and furring to reveal the base plywood underneath. The existing plywood will be evaluated and replaced as necessary. New furring strips and siding will be installed over all exterior walls of the building. New siding will be pre-painted Hardie board. Corners and trim will be PVC. This system will offer much better resistance to the elements than the existing.

Work includes a new soffit at the upper floor rear of the building as well as reframing the existing Yankee gutters

The proposed scope of work is as follows.

SPECIFICATIONS TO REPLACE SIDING AND INSTALL HARDIE BOARD AND PVC TRIM

Scope of work:

- Supply and install new Hardie siding and PVC trim to the entire exterior of club house building
- Supply and install pre-painted Hardie horizontal siding 6-1/4” inch by 12’ feet with a 5” inch exposure per manufacturers specifications
- Fir out all masonry/brick exterior surfaces to enable installation of Hard siding and PVC trim
- Supply and install 5/4”x6” PVC (Azek or equal) one piece corner posts with 5/4”x6” water table at base of building along entire perimeter
- Supply and install 5/4”x4” PVC window and door trim
- Supply and install new vinyl soffit at rear second floor of building
- Supply and install new PVC fascia boards, remove and re-frame back of building with existing Yankee gutters

Note: Scope of work excludes repair of rotted fascia boards, electrical/HVAC connections and/or disconnections, structural enhancements, lead/asbestos and PCB abatement. No hazardous material was detected during audit, but condition of building under existing siding is unknown.

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTATION

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect “As-Built” conditions and submitted in multiple for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The new roof will enhance facility operations by eliminating any leaks that have accumulated over the years and maintenance costs will be reduced.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

ECM 24: ROOF REPLACEMENTS

ECM OVERVIEW

Ameresco proposes to replace the various roofs at the Golf Clubhouse and repair the existing flat roofs at the Donald B. Smith Buildings 2 & 3 and Kern Building. This measure will replace both the flat roof and pitched roof sections of the Golf Clubhouse. The total roof area to be replaced/repaired is approximately **59,504** square feet. While the energy savings are not sufficient to warrant the measure by itself, combining it with the savings from other measures allows for the inclusion of the new roofs in the project.

Figure E24.1: Existing roof at the Golf Clubhouse

EXISTING SYSTEM DETAIL

Table E24.1: Existing Roof Details

Building	**Flat section (SF)**	**Pitched Shingle Section (SF)**
Donald B. Smith Government Building 2	14,541	0
Donald B. Smith Government Building 3	22,900	0
Golf Clubhouse	6,650	7,150
Kern Building - Health Dept/DMV/WIC	8,263	0
Totals	**52,354**	**7,150**

DONALD B. SMITH GOVERNMENT BUILDINGS 2 & 3

These roofs are old and are showing signs of age. The roofs are constructed of single ply membrane over approximately 2" of polyisocyanurate insulation which varies in depth depending on location and distance from roof drains. A recent IR roof scan and core sampling revealed small areas of the insulation that have failed as well as rusting of the steel roof structure.

Figure E24.2: Existing roof at the Smith Building 3

GOLF CLUBHOUSE

Most of the roof area was last replaced many years ago and is showing signs of age. The flat roof at the Golf Clubhouse is constructed of EPDM over polyisocyanurate insulation which varies in depth depending on location and distance from roof drains. Pitched portions of the roof are asphalt shingles with batt insulation in the joists. Site visits conducted by Ameresco identified numerous areas where the roof has begun to deteriorate as it approaches the end of its useful life.

Figure E24.3: Pooling on existing flat section of roof at Golf Clubhouse

KERN BUILDING – HEALTH DEPT/DMV/WIC

This roof is old and should be replaced in order to facilitate solar panels being installed. The roofs are constructed of single ply membrane over approximately 2” of polyisocyanurate insulation which varies in depth depending on location and distance from roof drains. No work on the sloped metal portion of the roofs is proposed.

Figure E24.3: Existing flat roof at the Kern Building

PROPOSED SYSTEM

DONALD B. SMITH GOVERNMENT BUILDINGS 2 & 3

Ameresco proposes to repair and re-cover approximately **37,441** square feet of the existing roof over Building 2 & 3 of the Donald B. Smith Government Campus with a single-ply EPDM membrane. The proposed roofing system should be more durable and help to prevent further damage during snow removal and reduce maintenance costs and risks of catastrophic roof leaks.

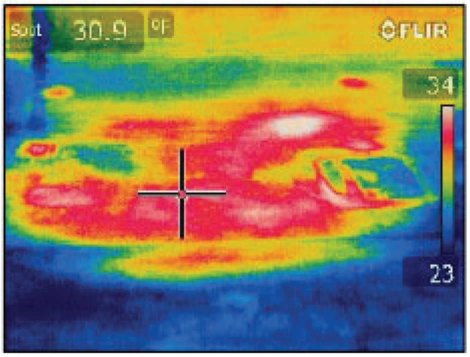

Figure E24.4: Scan of small area of wet insulation on roof of Smith Building #3

The repaired roof will have the same insulating value since the existing insulation will be reused.

The proposed scope of work for the roof is as follows.

- Removal and disposal of existing insulation where it has failed.
    - A recent IR scan performed by the County reveals existing roof insulation to be in relatively good condition.

  - Building 3 has a small area of wet insulation, approximately 5’ x 5’, and another smaller area of wet insulation near a section of the roof where past repair work was done.
  - Building 2 presented no areas of wet insulation.

- Furnish and install 2” polyiso insulation to replace removed patches
  - Ameresco carried a direct cost of about $75,000 to replace wet insulation and make potential deck repairs. Any cost beyond this amount would be extra.
- Install ¼ cover board
- Fully adhered 60 mil white EPDM membrane.
- Perform all necessary flashing details.
- Terminate new EPDM flashings with aluminum termination bars and sealant.
- Install new pitch pockets as required and fill them up with pourable sealer.
- Perform all flashing details at roof drains.
- Provide the owner with 20 year NDL warranty, which covers all labor and material for the duration of the warranty.

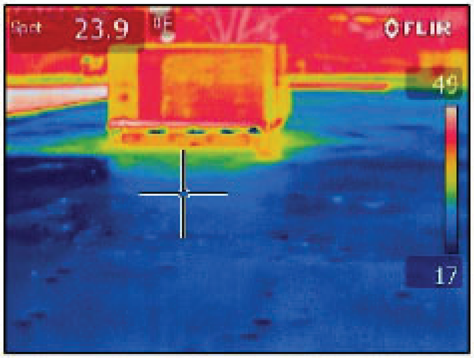

Figure E24.5: Scan of dry insulation on roof of Smith Building #2

Exclusions

- The Donald B. Smith Government Buildings scope is for repair and “go-over” membrane work only and excludes added insulation work to bring roof to code for new work.
- This scope excludes any structural work or repairs to the existing steel decking.

KERN BUILDING – HEALTH DEPT/DMV/WIC

Ameresco proposes to repair and re-cover approximately **8,263** square feet of the existing flat roof over the Kern Building with a single-ply EPDM membrane. The proposed roofing system should be more durable and help to prevent further damage during snow removal and reduce maintenance costs and risks of catastrophic roof leaks.

The repaired roof will have the same insulating value since the existing insulation will be reused.

The proposed scope of work for the roof is as follows.

- Removal and disposal of existing insulation where it has failed.
    - An IR roof scan will have to be performed prior to start of work to determine how much of the existing roof insulation has failed. Based on the general condition of the roof this percentage is expected to be low.
- Furnish and install 2" polyiso insulation to replace removed patches
    - Ameresco carried a direct cost of about $16,500 to replace wet insulation and make potential deck repairs. Any cost beyond this amount would be extra.
- Install ¼ cover board
- Fully adhered 60 mil white EPDM membrane.
- Perform all necessary flashing details.
- Terminate new EPDM flashings with aluminum termination bars and sealant.
- Install new pitch pockets as required and fill them up with pourable sealer.
- Perform all flashing details at roof drains.
- Provide the owner with 20 year NDL warranty, which covers all labor and material for the duration of the warranty.

Exclusions

- The Kern Building scope is for repair and "go-over" membrane work only and excludes added insulation work to bring roof to code for new work.
- Only the southern flat membrane portion of the roof is included in this project. Any work on the sloped metal portion of the roof is excluded.
- This scope excludes any structural work or repairs to the existing steel decking.

GOLF CLUBHOUSE

Ameresco proposes to replace approximately **13,800** square feet of the existing flat roof and pitched roof over the Golf Clubhouse with a single-ply EPDM built-up roof system and new shingles, respectively. The flat roofs will be taken down for a full teardown and build-up with new thicker insulation to meet current building code. The proposed roofing system should be more durable and help to prevent further damage during snow removal and reduce maintenance costs and risks of catastrophic roof leaks. The drainage plan will be improved through tapered insulation. The pitched roof will have new shingles installed over the existing wood deck and the insulation below will be left in place.

The new roof will have a higher insulating value than the existing roof and reduce building heat loss.

The proposed scope of work for the flat portions of the roof is as follows.

- Removal and disposal of existing roofing system down to the deck.
- Furnish and install 6'' NRG insulation with approved fasteners w/3'' plates.
- Install ¼ cover board
- Fully adhered 60 mil white EPDM membrane.
- Perform all necessary flashing details.
- Terminate new EPDM flashings with aluminum termination bars and sealant.
- Install new pitch pockets as required and fill them up with pourable sealer.
- Perform all flashing details at roof drains.
- Provide the owner with 20 year NDL warranty, which covers all labor and material for the duration of the warranty.

The proposed scope of work for the sloped portions of the roof is as follows.

- Removal and disposal of existing roofing shingles down to the deck.
- Furnish and install ice and water shield at the perimeter edge of the building.
- Install new felt underlayment.
- Furnish and install all necessary metal flashings, and drip edges.
- Install 50 year roof shingles, as manufactured by GAF.
- Perform all necessary flashing details.
- Provide the owner with manufacturers shingle warranty.

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTATION

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect “As-Built” conditions and submitted in multiple for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The new roof will enhance facility operations by eliminating any leaks that have accumulated over the years and maintenance costs will be reduced.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

ECM 25: WINDOW RESTORATION

ECM OVERVIEW

Ameresco proposes restoring the following operable windows at the Sheriff's Department/Correctional Facility, Bruen County Office Building, and Kern Building. The restored windows will create a well-insulated, low-draft envelope, providing staff with a more comfortable working environment. This will save energy and lower operating and maintenance costs.

Figure E25.1 Existing double hung windows are difficult to operate and some have failed seals, causing visible clouding.

ECM DETAIL

EXISTING SYSTEM

The existing windows at the Sheriff's Department/Correctional Facility, Bruen County Office Building and Kern Building are in various states of failed operation. The existing weather stripping, hinges, and locking mechanism on these operable sections are all worn and failing from high use. This can cause the windows to remain at least partially open and very drafty, increasing building energy use and decreasing occupant comfort.

Window Replacement – Glass Only – there is a significant problem with failed/ frosted glazing units throughout the County buildings. The most severe problems are at the County Office Building, Kern Building and the administrative area of the Correctional Facility. The failed glazing units are problematic for aesthetic reasons as well as reduced performance related to air infiltration and heat transfer of the window systems.

Window Restoration – the aluminum window frames at the County Office Building are in good condition, but the operational components (balances) have failed creating terrible operation and excessive infiltration problems. This condition creates an excellent opportunity for thorough restoration work (combined with replacing glass units) which represents a fraction of the cost of window replacement and can achieve the same low air infiltration rates as new windows. The windows at the County Office Building are an excellent opportunity for cost-effective energy savings work to achieve a major day-to-day facility improvement for staff and visitors. These same weaknesses with glazing and sash operation at the slider windows at the Kern Building; repair of these existing windows can result in an effective long-term solution.

PROPOSED SYSTEM

Rather than replacing the entire window, Ameresco proposes restoring the following windows to ensure proper opening and closing occurs. This will reduce unwanted drafts and decrease building energy use.

- **Window Replacement – Glass Only**
  - Replace Glass Only – remove existing failed glass unit from sash frame; clean and prep frame and glass; install new glass unit in sash frame.
- **Window Restoration**
  - Double Hung Window Restoration (David Bruen County Offices) – remove lower sash; remove existing balances (lower sash only); secure top sash in closed position; replace locking hardware; install new Ultra-Lift balance systems; reinstall bottom sash.
  - Slider Window Restoration (Kern Building) – remove operable panel; seal fixed panel in the shut position with sealant; install weather stripping at meeting rail and jamb; install new rollers; re-install operable panel.

Table E25.1: Proposed Windows to be Restored

Task	Putnam County Sheriff' s Dept/ Correctional Facility	David D. Bruen County Office Building	Kern Building (Public Health)	Total Quantities
Window Replacement - Replace Glass Only (Units)	14	151	22	187
Window Restoration - Double Hung Window Restoration (Units)	0	232	0	232
Window Restoration - Slider Restoration (Units)	0	0	44	44

EXCLUSIONS

Work performed for this measure excludes the following.

1. Moving of furniture and interior window curtains
   a. David D Bruen County Office Building – furniture/ personal belongings in offices.
   b. Kern Building (Public Health) – furniture/ personal belongings in offices.
   c. Putnam County Sheriff's Dept/ Correctional Facility – furniture/ personal belongings in offices.

2. Automatic or electrical hardware
3. Misc. interior glass & glazing not specified above (NO MIRRORS, display case glass, glass block etc.)
4. Louvers, skylights, and Dumpsters
5. Painting, scraping or repairing of any existing framing or adjacent conditions
6. Work on any Alternate not listed above
7. True muntins in doors, entrances, or windows unless specifically called out in specs or noted in words on drawings
8. Wiring, prep work, or adjustments to, any electrical or pneumatic hardware device of any kind
9. Repair of any sills, headers, rot, and mortar work. No such conditions were encountered during the audit.

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTATION

Equipment will be identified in submittals provided to the County for approval prior to procurement. Documents will be submitted to the engineering maintenance department, for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect "As-Built" conditions, and submitted in multiple to the County for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The repaired windows will improve the comfort levels within each occupied space by reducing the outside air infiltration and reducing solar heat gain. The repaired windows will improve occupant comfort by eliminating draft condition.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

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ECM 26: MOVE REGISTER

Ameresco recommends altering the return air grille locations at the Day Room and Cafeteria of the Koehler Senior Center. A lower grille will enhance mixing of conditioned air with room air and improve occupant comfort while increasing system efficiency.

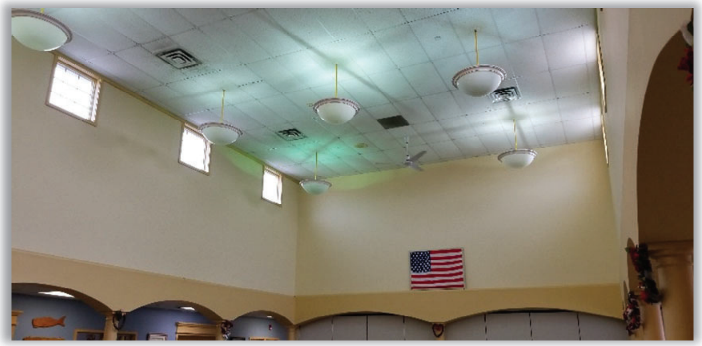


Figure E26.1: The existing supply diffusers and return grilles at the Koehler Senior Center are located close to each other and high above occupants.

EXISTING SYSTEM DETAIL

Both the Day Room and Cafeteria of the Koehler Senior Center have high ceilings of over 20'. Ducted supply air and plenum return air flows above these high ceiling and exchanges with the room air below through supply air diffusers and return air grilles. Because there is an open plenum return above the ceiling, the return grille is a simple opening between the space above and below the ceiling tiles.

Because the supply and returns are located so high above the occupants below, and because they're located adjacent to each other, conditioned air from the air handlers flows along the underside of the ceiling tiles and returns directly through the grilles back to the air handlers, without mixing well with room air and providing good heating or cooling to those occupants. This increases the amount that the air handlers have to run in order to try to maintain a comfortable temperature at the occupant level.

PROPOSED SYSTEM

Ameresco is proposing to move the return grilles to a lower location in order to more fully mix the conditioned air coming from the air handlers with room air before it returns to the air handlers. The existing ceiling grilles will be removed and replaced with ceiling tiles to match existing.

Figure E26.2: Lower sidewall grilles will better mix the air vertically.

New sidewall grilles will be installed in the walls between the Day Room and Cafeteria and the mechanical room that houses the existing AHUs. Because the existing system is plenum return, no new ductwork will be required. The new grilles will be installed well below the high ceiling, ensuring that supply air has to travel vertically and mix with room air. This will result in better efficiency of the system as well an increase in occupant comfort.

Work for this measure will be conducted as described in the following mechanical scope of work.

INSTALL SIDEWALL REGISTERS

The scope of work includes all mechanical and demolition work required to convert the Cafeteria and Dayroom spaces from high ceiling return air to sidewall return air systems.

- Demo and remove two (2) 2x2 ceiling return registers in each space, four (4) total
    - Ceiling approximately 25'
    - Existing ceiling grid 4x2 acoustic tiles
    - Plenum return above ceiling
- Install new 4x2 acoustic ceiling tiles to match existing, four (4) total
- Provide and install two (2) new sidewall return registers from each space to mechanical space, four (4) total
    - Registers 24"x24"
    - To be located as low as possible within the 2nd floor mechanical space, to better mix space air

EQUIPMENT, DESIGN AND CONSTRUCTION DOCUMENTS

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect "As-Built" conditions and submitted in multiple for record.

IMPACT ON FACILITY OPERATIONS AND PERFORMANCE

The installation of sidewall return grilles will improve comfort and system efficiency.

ENERGY SAVINGS CALCULATIONS

Please see **Appendix A** for the energy savings calculations for this ECM.

MANUFACTURER SPECIFICATION SHEETS

Please see **Appendix B** for the manufacturer specification sheets.

CNR: CONSIDERED BUT NOT RECOMMENDED

DONALD B. SMITH GOVERNMENT BUILDING 1

Ameresco originally performed an energy audit of this building during the proposal phase, but it is currently undergoing a major interior renovation. Therefore, Ameresco is only proposing a limited scope, affecting the exterior of the building. Measures originally considered but no longer recommended for this building include:

- Lighting System Improvements – Interior
- Web-enabled Programmable Thermostats
- Infiltration Reductions
- Pipe Insulation
- Plug Load Controllers
- Window Film
- Window Replacements

ECM 17: WINDOW REPLACEMENTS

Ameresco proposes to replace old windows with new heavy-duty, commercial grade, architectural, thermally efficient double-pane windows at the Donald B. Smith Government Campus Buildings and Historic 1812 Courthouse to provide a draft-free working environment that will save energy and lower operating and maintenance costs.

Figure CNR17.1: The Smith Government Building's single pane windows will be replaced with new heavy-duty, commercial grade, architectural, thermal windows.

EXISTING SYSTEM DETAIL

The windows at the below sites are predominantly double-pane commercial aluminum windows. All are in fair to poor condition, are drafty, are not thermally efficient and are a source of discomfort in many areas. The estimated U-values of the windows to be replaced are shown in Table 17.1 below.

The Windows at the Donald B. Smith Government Campus are older single-pane commercial aluminum windows. Several windows at these buildings have had the upper window sections covered with light-blocking panels. A number of the windows are commercial storefront window systems that include doors.

The Windows at the 1812 Courthouse are historic, wooden, double hung windows. They are single pane glass, but most window frames in the building have had compression fit interior storm windows added, greatly increasing the level of thermal insulation the windows provide.

PROPOSED SYSTEM DETAIL

New windows will be custom designed architectural, heavy-duty and commercial grade. The new windows will utilize insulated glass with a “low-E” coating that will improve thermal efficiency and performance. These new windows will also have a “thermal break” to virtually eliminate thermal conduction loss through their frames. The overall thermal transmission value (“U-value”) of the proposed windows is 0.31 BTU/hr-sf-ºF or better.

Frame and sash construction will consist of thermally broken aluminum alloy materials. All extrusions will have a poured in place urethane thermal break. All sash members will consist of hollow aluminum extrusions for added strength. All fasteners will be made of a non-corroding metal.

By reducing outside air infiltration and solar radiation the new windows will significantly improve comfort levels within each occupied space. The disparity of temperatures within individual rooms will be reduced, eliminating the excessive heat in the interior portions of the room and the noticeably cooler temperatures along the windowed walls.

Table CNR17.1: Estimated U-Values of Windows Scheduled for Replacement

BUILDING	WINDOW AREA (SF)	WINDOW U-VALUE (BTUH/°F-SF)
1812 Courthouse	1,138	0.84
Donald B. Smith Government Campus – Building 1	1,603	1.27
Donald B. Smith Government Campus – Building 2	2,520	1.27
Donald B. Smith Government Campus – Building 3	4,388	1.27
Total	**9,649**	

Due to the high cost and resulting payback of this measure. These windows are not recommended for replacement at this time.

ECM 11: VENDING MISERS

Ameresco proposes to install occupancy-sensing plug load controllers to reduce the unnecessary operation of the County’s vending machines during unoccupied periods. Each vending machine controller will save energy used by the refrigerated vending machine during unoccupied hours without compromising product quality. The controller will use a sensor to detect when the space is unoccupied and turn off the vending machine. Existing non-refrigerated snack machines will also be controlled.

EXISTING SYSTEM DETAIL

Vending machines were found throughout the County's buildings. The vending machines are typically stocked with soda, juice and sports drinks and are cooled and illuminated year-round regardless of occupancy. Snack vending machines were also found in the same areas.

Ameresco identified the following vending machines for VendingMiser® controller installation, however, the County wishes to only include the units at the Jail since the other units are expected to be removed shortly.

Table CNR11.1: Vending Machines by Building

Building	**Snack Qty.**	**Drink Qty.**
David D. Bruen County Office Building	0	1
Kern Building - Health Dept/DMV/WIC	0	1
Putnam Family & Community Services - 1808	1	1
Totals	**1**	**3**

Ameresco originally proposed this measure for the Bruen County Office Building, Kern Building, and Family Services building at 1808 Route 6. At this time vending machines at these buildings are either unserviced or uncertain going forward. For this reason, this measure is not recommended at these buildings at this time.

ECM 12: WALK-IN REFRIGERATION CONTROLS

Ameresco proposes to install controllers on the walk-in refrigerators in Putnam County to reduce the unnecessary operation of the door heaters, compressors, and evaporator fans. Each controller will save energy used by the refrigerator without compromising product quality.

EXISTING SYSTEM DETAIL

Existing evaporator fan motors inside the walk-in coolers run continuously, 8,760 hours per year. The motors run even when walk-in temperature is satisfied and no refrigerant is being circulated through the evaporator coil. This results in high energy use from motors but also increased compressor energy use since the extra heat rejected by the motors needs to be removed by the refrigeration system.

Existing evaporator fans are all operated with shaded pole motors. These motors use significantly higher energy than modern electrically commutated motors and give off excess heat as well.

Anti-sweat door heaters run continuously, even when the door has not been opened recently or when the walk-in is above the dew point temperature.

Ameresco identified the following walk-in refrigerators for controller installation, though only the units at the Jail and Senior Center are included in the scope of work per the County. Kern units are excluded because of vaccines being housed in the unit. Golf units are excluded because the units are slated to be replaced.

Table CNR12.1: Walk-in Refrigerators by Building

Building	**Cooler Qty.**	**Freezer Qty.**
Putnam National Golf Club - Clubhouse	1	1
Kern Building - Health Dept/DMV/WIC	0	1
Totals	**1**	**2**

Ameresco originally proposed this measure for the Golf Clubhouse and Kern Building. The existing walk-in coolers at the Golf Clubhouse are potentially being replaced in the near future, and the walk-in cooler at the Kern Building is used to store vaccines, which the County is very concerned with limiting any temperature fluctuations. For these reasons, this measure is not recommended at these buildings at this time.

ECM 14: INFILTRATION REDUCTIONS

Ameresco proposes to reduce outdoor air infiltration into most of the Putnam County buildings. Some of the exterior doors at these buildings had no weather-stripping with gaps between the door jambs. The new weather-stripping and other measures will greatly reduce heat loss as well as increase occupant comfort due to fewer drafts.

EXISTING SYSTEM DETAIL

The infiltration of outdoor air can be a significant load on a building's central heating and cooling systems. There are many sources of infiltration in a building's exterior envelope that can be considerably reduced with proper weather-stripping and air sealing methods. A few of the major sources of infiltration are exterior doors, windows, roofs and roof/wall interfaces.

Ameresco evaluated the exterior of each building and found some areas that needed proper weather-stripping and other air sealing.

Roof-Wall Intersection Air Sealing – the roof-wall intersection is regularly an area that allows unwanted air leakage through the building shell. Exterior flashing and finish details at this area are not constructed to stop air leakage (exterior flashings are for water control, not air control); unsealed exterior flashing details combine with interior gaps in the framing between the roof and wall assembly to allow infiltration/ exfiltration. The roof-wall intersection is a significant weakness in the building envelope at many buildings throughout the County.

Table CNR14.1: Work Task Descriptions and Quantities to be Addressed Under This Measure

Task	**Donald B. Smith Govt Campus, Building 1**
Roof-Wall Intersection Air Sealing - Seal (LF)	388

Ameresco originally proposed this measure for the Donald B. Smith Government Building 1. However, Building 1 is currently undergoing a major renovation, including work that would affect the scope of this measure. For this reason, this measure is not recommended at this building at this time.

ECM 15: PIPE INSULATION

Ameresco proposes to insulate steam, hot water, and condensate piping and tanks where insulation is absent or insufficient at Putnam County facilities. The specific scope is outlined in the following sections. Replacing insufficient insulation and insulating bare pipes will improve the overall efficiency of each system and alleviate over heating due to heat loss from exposed piping.

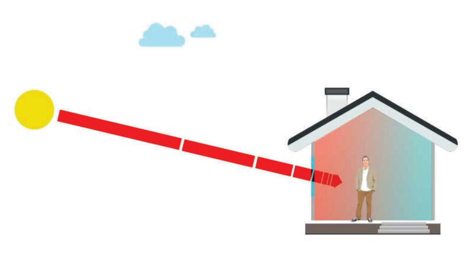
Ameresco originally proposed this measure for the Donald B. Smith Government Buildings 1, 2 and 3. However, due to the poor payback of the particular insulation opportunities at these buildings, it is not recommended at this time.

Table CNR15.1: Existing Piping by Building

Buildings	**Location**	**Pipe Size (Inches)**	**Fluid Type**	**Fluid Temp (F)**	**Length (ft)**
Donald B. Smith Govt Campus, Building 1	DHW 90 Degree Elbow	1	Water	125.0	7.2
Donald B. Smith Govt Campus, Building 1	DHW Straight Pipe	1	Water	125.0	24.0
Donald B. Smith Govt Campus, Building 2	MTHW 45 Degree Elbow	3/4	Water	185.0	7.0
Donald B. Smith Govt Campus, Building 2	MTHW 90 Degree Elbow	3/4	Water	185.0	7.2
Donald B. Smith Govt Campus, Building 2	MTHW Straight Pipe	3/4	Water	185.0	33.0
Donald B. Smith Govt Campus, Building 2	MTHW 45 Degree Elbow	1 1/2	Water	185.0	1.0
Donald B. Smith Govt Campus, Building 2	MTHW 90 Degree Elbow	1 1/2	Water	185.0	1.8
Donald B. Smith Govt Campus, Building 2	MTHW Straight Pipe	1 1/2	Water	185.0	24.0
Donald B. Smith Govt Campus, Building 2	MTHW 45 Degree Elbow	2	Water	185.0	1.0

Buildings	Location	Pipe Size (Inches)	Fluid Type	Fluid Temp (F)	Length (ft)
Donald B. Smith Govt Campus, Building 2	MTHW 90 Degree Elbow	2	Water	185.0	5.4
Donald B. Smith Govt Campus, Building 2	MTHW In-Line Pump	2	Water	185.0	10.0
Donald B. Smith Govt Campus, Building 2	MTHW Straight Pipe	2	Water	185.0	27.0
Donald B. Smith Govt Campus, Building 2	MTHW 90 Degree Elbow	3	Water	185.0	10.8
Donald B. Smith Govt Campus, Building 2	MTHW End Cap	3	Water	185.0	3.0
Donald B. Smith Govt Campus, Building 2	MTHW Straight Pipe	3	Water	185.0	36.0
Donald B. Smith Govt Campus, Building 2	MTHW Straight Pipe	3	Water	185.0	33.0
Donald B. Smith Govt Campus, Building 2	MTHW Strainer	3	Water	185.0	5.0
Donald B. Smith Govt Campus, Building 3	MTHW 90 Degree Elbow	2	Water	185.0	10.8
Donald B. Smith Govt Campus, Building 3	MTHW In-Line Pump	2	Water	185.0	5.0
Donald B. Smith Govt Campus, Building 3	MTHW Straight Pipe	2	Water	185.0	27.0
Donald B. Smith Govt Campus, Building 3	MTHW 90 Degree Elbow	3	Water	185.0	5.4
Donald B. Smith Govt Campus, Building 3	MTHW Butterfly Valve	3	Water	185.0	8.2
Donald B. Smith Govt Campus, Building 3	MTHW Straight Pipe	3	Water	185.0	36.0
Donald B. Smith Govt Campus, Building 3	MTHW 45 Degree Elbow	4	Water	185.0	1.0
Donald B. Smith Govt Campus, Building 3	MTHW 90 Degree Elbow	4	Water	185.0	12.6
Donald B. Smith Govt Campus, Building 3	MTHW Gate Valve	4	Water	185.0	8.2
Donald B. Smith Govt Campus, Building 3	MTHW Straight Pipe	4	Water	185.0	21.0
Donald B. Smith Govt Campus, Building 3	MTHW 90 Degree Elbow	5	Water	185.0	3.6
Donald B. Smith Govt Campus, Building 3	MTHW Straight Pipe	5	Water	185.0	3.0

ECM 21: WINDOW FILM



ECM OVERVIEW

Ameresco completed the site visit audits at the Putnam County (County) facilities and identified an opportunity for installation of window film at the Sheriff's Department/Correctional Facility (Jail) where the County could save energy.

Ameresco proposes to install window film on the Jail. Window film will significantly reduce solar heat gain to the building in the cooling season and reduce the cooling load. In the winter, the film provides a thermal factor by preventing interior radiant heat from easily passing through the window glazing. Window film provides the largest energy impact on single pane glazing but is still effective on double pane units.

EXISTING SYSTEM DETAIL

During Ameresco's audit of the County, most of the Jail windows were discovered to have no Low-E or solar heat gain reducing windows or film installed. Without this protection, the sun shines through all of the building's glass surface area heating up the spaces and occupants inside. During the summer months, this puts a much larger load on the building's HVAC equipment to keep the building cooled. It not only needs to cool the space and overcome any internal gains from the buildings occupants and equipment, but additionally needs to overcome the solar gain from the sun.

During the winter the window film can also play a role to increase building efficiency. Window film also blocks heat effectively and can be used to help the Jail retain the heat added by HVAC equipment from leaving the building through conduction as well as radiation. Ameresco found the Jail to contain windows lacking window film or Low-E windows.

PROPOSED SYSTEM DETAIL

Ameresco proposes to install solar heat gain reducing window film on the non-secure area windows of the Jail. Window film is a thin laminate film that can be installed on the interior or exterior of glass surfaces such as windows. It is made from polyethylene terephthalate (PET), a thermoplastic polymer resin of the polyester family, due to its clarity, tensile strength, dimensional stability, and ability to accept a variety of surface-applied or embedded

Figure CNR21.1: An example of commercial size windows that have had window film installed.

treatments. It has a variety of different uses, including solar gain reducing window film, which is what Ameresco is proposing for the County to install.

Solar radiation penetrates through windows causing unwanted heat gain in a building, along with glare and uncomfortable hot spots. Applying a solar film to the windows can mitigate these issues and reduce the cooling load of a building.

There are a variety of different films that can be applied to most windows. They vary in reflectivity and visible light transmittance. Typically, the darker the film, the more solar heat gain reduction and the better the savings. Alternatively, some films are quite clear, and they can be applied without altering the look of the windows. Most films are installed on the inside of the window, so to not affect the warranty of the window and avoid weathering issues, but some films can be applied on the outside to reduce solar gain, provide increased security, or to alter the aesthetic look of a building. Ameresco is recommending installing Vista by Llumar® Low-E series ambiance VE35 SR CDF window film with Dow Corning® 795 Silicone Building sealant around the edges. The Llumar window film rejects up to 72% of solar energy and retains heat in cooler months, reducing year-round energy costs. It blocks over 99% of ultraviolet rays helping to protect furnishings by reducing premature fading. It is optically clear with advanced color stable technology. The building sealant is a one-part, neutral-cure, architectural-grade sealant that easily extrudes in any weather and cures quickly at room temperature. The sealant is a versatile – high performing structural glazing and weather sealant. It has excellent weatherability – virtually unaffected by sunlight, rain, snow, ozone and temperature extremes of -40ºF to 300ºF.

Table CNR21.1: Window Film Inventory

Building	**Window Square Footage (SF)**
Sheriff’s Department/Correctional Facility	2,651

The poor payback of this measure, along with security concerns about a peelable window application being used in a correctional facility lead Ameresco to not recommend this measure at this time.

ECM 20: DHW HEATERS REPLACEMENTS

ECM OVERVIEW

Ameresco proposes to replace the existing domestic hot water (DHW) heater tanks located in the Donald B. Smith Government Campus Building 2, Kern Building, and Putnam Family and Community Services – 1808. All three (3) of these sites currently have electric DHW tanks, while also receiving city natural gas service providing building heating. The proximity of the existing natural gas services connected to the facilities boiler rooms or packaged gas-fired forced hot-air rooftop units in the case of Family Services, enables a new tap off for gas-fired DHW heaters for minimal extra first cost. Based on the current utility tariffs, DHW can be generated at a lower operating cost than the old electric tanks. In addition, new capital equipment will be installed in the County, thus reducing operations and maintenance costs compared with the older equipment.

Figure CNR20.1: Existing self-contained electric domestic hot water heater tank, located in the attic storage area of the Kern Building.

EXISTING SYSTEM DETAIL

During the time of the site audit, Ameresco auditors observed electric DHW tanks in the Donald B. Smith Government Campus Building 2, Kern Building, and Putnam Family and Community Services – 1808. While these units are in good operating condition based on appearance, the average self-contained DHW tank has an expected 7-10-year lifespan before the heating element fails or the tank leaks. Also, electricity is often not the most cost-effective way of generating service heat, including for the generation of DHW.

PROPOSED SYSTEM DETAIL

Ameresco proposes to replace the existing electric DHW tanks located in the Smith Government Building 2 basement level boiler room, the Kern Building attic space, and Family Services hallway custodian's closet, with natural gas-fired units of equivalent thermal output and storage capacity.

Figure CNR20.2: Proposed Natural Gas-fire Unit

<u>Scope of Work</u> **(at each of three (3) identified sites)**

- All material to be provided as part of a turnkey proposal for the scope of work.
- Isolate and drain as needed the domestic hot water systems
- Demo and remove (1) existing electric heating hot water storage tank.
  - Asbestos removal if required will be performed outside this scope

- Extend/install existing site natural gas service to supply fuel to new DHW tank.
- Remove portions of existing electrical service to old tank which are no longer needed for generating DHW.
    - 120-volt, 1PH, 60Hz line to remain for new tank controls and circulating pump(s) etc.
- Install new A.O. Smith 90% average thermal efficiency, natural gas-fired DHW tank in the same location as old unit.
- Connect new gas service and electric service to new tank.
- Cut and cap any piping that is not to be used any longer.
- Connect water tank to existing building DHW piping.
- Fill, start up, and test new unit to ensure proper and safe operation in accordance with all applicable codes and standards.
- Provide one-year parts and labor warranty on all components.

Because of the high cost and poor payback of this measure, it is not recommended at this time.

ECM 18: SOLAR PV

Ameresco performed a review of all buildings and recommends the installation of 152.2 kWdc of roof mounted solar PV at 121 Main Street. This system will generate approximately 193,700 kWh annually for onsite use and assist the County in offsetting electrical energy purchased. Ameresco proposes to mount the PV systems on the facility roof with a ballast mounting system which will eliminate the need for roof penetration. All systems will be oriented in a Southern direction to ensure maximum performance. The system will be behind the meter, and Ameresco expects the building to fully use all output from the solar array.

PROPOSED SYSTEM DETAIL

The proposed rooftop systems are designed with a ballast-mounted racking system that has fewer roof penetrations. A third-party structural consultant, with P.E. licensure in the State of NY, will analyze the roofs to identify reserve roof capacity for the proposed roofs. In design of the proposed systems, shading analysis was conducted on the mechanical structures on the roofs as well as surrounding trees and buildings to maximize the output of the systems. Current walkways on the roofs now will be preserved, and panels will be installed around them. The proposed systems use a PanelClaw Solar Racking System or equal with a tilt angle of 5 degrees. This racking systems will meet the specific wind load requirements, while also providing one of the lowest overall pounds per square foot of added weight to the roof, minimizing concerns related to reserve roof capacity. System azimuth angle is facing southern orientation to maximize total installed capacity of the roof area. This approach was selected to maximize production output and inverter efficiency, given the array design.

The following table summarizes the proposed installation at the facility.

Table CNR18.1: Solar Output Directory

Building	**Total KW DC**	**1st Year annual Production kWh**
121 Main Street	152.9	193,700
Totals	**152.9**	**193,700**

Because of the uncertain use of the building long-term, installation of a solar PV array on its roof is not recommended at this time.

121 MAIN STREET

121 Main Street currently does not have any solar installed on the roof of the building. Ameresco proposes to install the system seen below.

Figure CNR18.1 Site diagram/illustration that includes location/design of array, and proposed capacity (152.9 kWdc)

ECM 24: ROOF REPLACEMENTS

ECM OVERVIEW

Ameresco proposes to replace the various roofs at the 1812 Courthouse. The total roof area to be replaced is approximately **5,067** square feet. While the energy savings are not sufficient to warrant the measure by itself, combining it with the savings from other measures allows for the inclusion of the new roofs in the project.

EXISTING SYSTEM DETAIL

Table CNR24.1: Existing Roof Details

Building	**Flat Section (SF)**	**Pitched Shingle Section (SF)**
1812 Courthouse	5,067	0
Totals	**5,067**	**0**

These roofs are old and are showing signs of age. The roofs are constructed of EDPM over polyisocyanurate insulation which varies in depth depending on location and distance from roof drains.

PROPOSED SYSTEM

1812 COURTHOUSE

Ameresco proposes to replace approximately **5,067** square feet of the existing roof with a single-ply EDPM built-up roof system. The roofs will be taken down for a full teardown and build-up with new thicker insulation to meet current building code. The proposed roofing system should be more durable and help to prevent further damage during snow removal and reduce maintenance costs and risks of catastrophic roof leaks. The drainage plan will be improved through tapered insulation.

The new roof will have a higher insulating value than the existing roof and reduce building heat loss.

The proposed scope of work for the flat portions of the roof is as follows.

- Removal and disposal of existing roofing system down to the deck.
- Furnish and install 6’’ NRG insulation with approved fasteners w/3’’ plates.
- Install ¼ cover board
- Fully adhered 60 mil white EPDM membrane.
- Perform all necessary flashing details.
- Terminate new EPDM flashings with aluminum termination bars and sealant.

- Install new pitch pockets as required and fill them up with pourable sealer.
- Perform all flashing details at roof drains.
- Provide the owner with 20 year NDL warranty, which covers all labor and material for the duration of the warranty.

The County has indicated to Ameresco that they do not want replacement of the 1812 Courthouse roof to be addressed under this project, and so it is not recommended at this time.

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SECTION 4: FINANCIAL RESULTS / RECOMMENDATIONS

The specifics of the project being presented to Putnam County are as follows:

Table 4.1: Project Financial Specifics

Initial Project Costs	
Design and Specifications	$395,422
Implementation Costs	$7,513,013
Total Initial Project Costs	$7,908,435
Estimated Rebates and Incentives over Term	$123,742
Net Project Costs	$7,784,693
County Cost Contribution	$3,600,000
Net Project Costs to be Financed	$4,184,693

The estimated rebates over the term are based on current prescriptive programs offered by the local Utilities.

NY-Sun & NYSERDA Incentive programs for the Solar PV projects have been netted out of the Total Initial Project Costs as per NY-Sun program requirements. The current NY-Sun incentive is based on MegaWatt Block structures. Each Block is set to a prescribed incentive rate and capacity of solar. As applications to the program are submitted the capacity limit of each block fills up and when the capacity limit is reached the incentive structure moves to the next block, which has a new capacity cap and generally lower incentive level. The incentive program is tiered with the incentive structure reducing for each Block. At the time of this document's publication the current MW Block for Non-Residential is level 8, which is about at 56% of the set capacity (opened 6/17/18 with three additional blocks). Ameresco has based the current incentive structure on these blocks. In the event this project does not move forward in a timely manner the incentive program may move to a subsequent block or end all together. Significant delays in this project's execution could impact the estimated incentive levels. As required by the NYSUN program, Ameresco has netted the anticipated incentives out of the implementation cost – the values presented for the Solar PV ECM are therefore net of anticipated incentives.

Assumptions for the pro-forma analyses include the following:

- Financing Term = 18-years, with quarterly payments due in arrears starting 18 months after securing financing

- Project Term = 18-years
- Energy Rate Escalations = 3.00%
- Cost Escalation = 3.00%
- Interest rate = 2.95%

We have included an estimated project proforma analysis immediately following this section, based on an 18-year contract term. This proforma incorporates Ameresco's energy costs savings, annual lease payments and results in substantial estimated positive cash flows to the County over the life of the proposed project.

Maintenance savings is included only for the lighting measures. Lighting material savings is calculated based on the reduction of material and reduced O&M expense due to the upgrade.

Ameresco has allocated negative O&M savings for the annual fee of $20 per thermostat to cover the County's costs within the project cash flow to maintain the remote service for these thermostats. The County will be responsible for maintaining this fee to keep the service active which will be needed to allow remote monitoring.

Please refer to the following pro-forma analyses for further information regarding the financial aspects of this project.

TAX-EXEMPT PROJECT FINANCING

For certain types of clients - particularly state, municipal and not-for-profit clients – it makes sense to leverage their tax-exempt borrowing capability to fund the energy efficiency project. Typically, this is done via a Tax-Exempt Lease Purchase (TELP) agreement. Major benefits to the County from using TELP financing include:

- There is no requirement for bond issuance or voter referendum;
- The financing can be put together quickly and at very low administrative and legal expense to the County;
- The lease agreement will contain necessary 'non-appropriations' language that is critical to the County.

PROPOSED FINANCING STRUCTURE

Method Used to Determine Payments. Ameresco has a firm, fixed contract value for the defined scope of work, including specified equipment and services. Ameresco assumes all of the financial risks associated with the development, design and implementation of the project. Payments have been determined by amortizing the contract value using the frequency of payments, the proposed term of the agreement, and an estimated interest rate for tax-exempt borrowing.

Frequency of Payments. We have structured our proposal based on a 18 year financing term, using quarterly **level** payments due in arrears starting 18 months after securing the financing.

Term of the Proposed Agreement. Ameresco proposes a contract term of 18 years after the Final Installation Date of the Equipment. The contract term must extend for at least the greater of the financing term or the simple payback period.

ENERGY SAVINGS GUARANTEE

Description of Ameresco's Guarantee. As an integral part of its contract with the County, Ameresco will guarantee a minimum level of energy cost savings to County over the full term of the contract. Our guarantee ensures the County that the cash inflows from the project will exceed the County's cash requirements for the project, the lease payments and any on-going payments for the provision of operations and maintenance services.

Value of Our Guarantee: For this project, Ameresco will guarantee that 100% of all project costs will be recovered from energy savings over the term of the agreement. Annual Guaranteed Savings are based on current energy costs and annual hours of operations, as provided by County and as gathered through site investigations. Specified unit costs for energy will be used to establish a per unit floor price in our contract. Ameresco's proposed energy cost savings and the resulting level of Annual Guaranteed Savings have been determined using a 3% escalation in energy prices over the contract term with a -0.5% escalation in solar production savings.

Procedures for Administering our Guarantee. Reporting is an essential part of any guarantee because it substantiates the project's performance in achieving expected energy cost savings. Ameresco utilizes internally created spreadsheets, which will be customized based on input from the County, so that we present the necessary data to the County in the format it wishes to receive it.

County's A/E firm: Ameresco has assumed ECG will complete the design and submittal packages for a fee of 5.00%.

30% upon County signing contract with ESCO

30% upon submittal of plans & specifications to the County

30% upon approval of plans & specifications by the County

10% upon substantial completion

Ameresco expects to enter into an agreement with the above identified firm for these services and pay them directly, but alternatively the County can contract with the firm directly and Ameresco will reimburse the County for the cost. Ameresco has not included any allowance for third-party construction management. If the County choses to hire a third-party construction manager for the project, the cost will need to be either outside the performance contract or the energy services agreement amended to incorporate the additional cost.

Table 4.2: Project Pro-Forma

Putnam County NY - Pro-Forma

Initial Project Costs:		
Design and Specifications	$	395,422
Implementation costs	$	7,513,013
Total Initial Project Costs	**$**	**7,908,435**
County Capital Buydow n	$	3,600,000
Estimated Rebates and Incentives	$	123,742
Net Project Costs After Rebates	**$**	**4,184,693**

Financial Assumptions		
Term of Project {yrs}		18.0 yrs
Term of Financing {yrs}		18.0 yrs
Estimated Financing Rate		2.95%
Payments per year (frequency)		4
Discount Rate		2.95%
Net Present Value of cash flow	$	1,450,220
Average Energy escalation rate {annual}		3.00%
Average Cost escalation rate {annual}		0.00%
Project Simple Payback		**12.28**

Pro-forma									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Year	**Annual Energy Costs Without Improvements**	**Annual Energy Costs With Improvements**	**Annual Energy Cost Savings (1 - 2)**	**O&M Savings**	**Total Project Savings (3 + 4)**	**Payments for Financing Equipment**	**Payments for Ongoing Services**	**Net Annual Benefits (5 - 6 - 7)**	**Cumulative Cash Flow**
1	$ 890,780	$ 554,546	$ 336,234	$ 4,639	$ 340,873	$ 314,393	$ 26,148	$ 332	$ 332
2	$ 917,503	$ 571,384	$ 346,120	$ 4,778	$ 350,898	$ 314,393	$ 26,933	$ 9,572	$ 9,904
3	$ 945,028	$ 588,732	$ 356,297	$ 4,921	$ 361,218	$ 314,393	$ 27,741	$ 19,085	$ 28,989
4	$ 973,379	$ 606,605	$ 366,774	$ 5,069	$ 371,843	$ 314,393	$ 6,515	$ 50,935	$ 79,924
5	$ 1,002,581	$ 625,020	$ 377,560	$ 5,221	$ 382,781	$ 314,393	$ 6,711	$ 61,678	$ 141,601
6	$ 1,032,658	$ 643,993	$ 388,665	$ 5,378	$ 394,042	$ 314,393	$ 6,912	$ 72,738	$ 214,339
7	$ 1,063,638	$ 663,541	$ 400,097	$ 5,539	$ 405,636	$ 314,393	$ 7,119	$ 84,124	$ 298,463
8	$ 1,095,547	$ 683,681	$ 411,866	$ 5,705	$ 417,571	$ 314,393	$ 7,333	$ 95,846	$ 394,309
9	$ 1,128,413	$ 704,430	$ 423,983	$ 5,876	$ 429,859	$ 314,393	$ 7,553	$ 107,914	$ 502,222
10	$ 1,162,266	$ 725,808	$ 436,457	$ 6,053	$ 442,510	$ 314,393	$ 7,780	$ 120,338	$ 622,560
11	$ 1,197,134	$ 747,834	$ 449,300	$ 6,234	$ 455,534	$ 314,393	$ 8,013	$ 133,128	$ 755,688
12	$ 1,233,048	$ 770,527	$ 462,521	$ 6,421	$ 468,942	$ 314,393	$ 8,253	$ 146,296	$ 901,985
13	$ 1,270,039	$ 793,906	$ 476,133	$ 6,614	$ 482,747	$ 314,393	$ 8,501	$ 159,853	$ 1,061,838
14	$ 1,308,140	$ 817,994	$ 490,146	$ 6,812	$ 496,959	$ 314,393	$ 8,756	$ 173,810	$ 1,235,648
15	$ 1,347,385	$ 842,811	$ 504,573	$ 7,017	$ 511,590	$ 314,393	$ 9,019	$ 188,179	$ 1,423,827
16	$ 1,387,806	$ 868,380	$ 519,427	$ 7,227	$ 526,654	$ 314,393	$ 9,289	$ 202,972	$ 1,626,798
17	$ 1,429,440	$ 894,722	$ 534,718	$ 7,444	$ 542,162	$ 314,393	$ 9,568	$ 218,202	$ 1,845,000
18	$ 1,472,323	$ 921,862	$ 550,461	$ 7,667	$ 558,129	$ 314,393	$ 9,855	$ 233,881	$ 2,078,881
Totals	**$ 20,857,109**	**$ 13,025,777**	**$ 7,831,332**	**$ 108,616**	**$ 7,939,948**	**$ 5,659,067**	**$ 202,000**	**$ 2,078,881**	**$ 2,078,881**
		Annual Energy Costs Savings	**37**						
		Annual Energy Savings (mmbtu)	**34.9%**						

Notes:

1 This Proforma Cash Flow reflects an estimated financing rate of 2.95%. The actual rate will increase or decrease based on market conditions and customer credit rating at the time of lease funding.

2 Savings are based on current utility rate structures and usage information provided for purposes of this project.

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Table 4.3: Cost and Savings by Measure

Putnam County NY

Project Savings Summary

Ecm #	ECM Name	Annual kW	Total kWh	Natural Gas (CCF)	Propane (Gallons)	#2 Fuel Oil (Gallons)	Solar Value Stack ($)	Energy Savings	O&M Savings	Total Project Savings	Total Project Costs	SPB
1	Lighting System Improvements - Interior	3,342.8	883,495	(9,316)	(19)	(2,711)	-	$ 94,446	$ 6,384	$ 100,831	$ 1,168,714	11.59
2	Lighting System Improvements - Exterior	-	342,097	-	-	-	-	$ 24,668	$ 439	$ 25,107	$ 233,085	9.28
3	Recommission Energy Management Systems	-	516,168	24,144	-	2,865	-	$ 61,230	$ -	$ 61,230	$ 274,503	4.48
4	Web-enabled Programmable Thermostats	-	114,186	12,957	4,119	5,397	-	$ 39,326	$ (2,320)	$ 37,006	$ 104,869	2.83
5	Heat Timer & Thermostatic Radiator Valves	-	-	-	-	2,927	-	$ 6,363	$ -	$ 6,363	$ 71,812	11.29
6	Fuel Oil to Natural Gas Conversion	-	-	(12,187)	(1,218)	10,378	-	$ 9,925	$ -	$ 9,925	$ 420,230	42.34
8	Variable Frequency Drives For HW Pumps	-	60,285	-	-	-	-	$ 4,307	$ -	$ 4,307	$ 47,811	11.10
10	Premium Efficiency Transformers	126.0	92,218	-	-	-	-	$ 7,820	$ -	$ 7,820	$ 180,608	23.09
11	Vending Misers	-	2,087	(61)	-	-	-	$ 105	$ -	$ 105	$ 945	8.97
12	Walk-in Refrigeration Controls	-	31,353	-	-	-	-	$ 2,228	$ -	$ 2,228	$ 31,947	14.34
13	Steam Trap Replacements	-	-	-	-	1,308	-	$ 2,844	$ -	$ 2,844	$ 49,555	17.42
14	Infiltration Reductions	-	2,476	4,610	-	2,977	-	$ 10,356	$ -	$ 10,356	$ 116,002	11.20
15	Pipe Insulation	-	-	927	-	1,966	-	$ 5,005	$ -	$ 5,005	$ 55,484	11.09
16	Boiler Replacements	-	-	-	-	352	-	$ 766	$ -	$ 766	$ 76,947	100.43
17	Window Replacements	-	252	-	-	397	-	$ 881	$ -	$ 881	$ 282,290	320.31
18	Solar PV Array	257.7	315,658	-	-	-	12,644	$ 39,520	$ (5,789)	$ 33,731	$ 737,046	21.85
19	AHU Replacements	179.3	51,528	-	-	-	-	$ 6,295	$ -	$ 6,295	$ 891,472	141.61
20	Plug Load Controllers	-	20,598	-	-	-	-	$ 1,491	$ -	$ 1,491	$ 18,653	12.51
22	Chiller Replacement	64.7	40,000	-	-	-	-	$ 3,878	$ -	$ 3,878	$ 171,559	44.24
23	Siding Replacement	-	62	-	-	133	-	$ 294	$ -	$ 294	$ 254,840	867.69
24	Roof Replacement	-	474	1,678	-	54	-	$ 1,539	$ -	$ 1,539	$ 1,801,208	1,170.25
25	Window Restoration	-	1,355	1,036	-	1,368	-	$ 3,966	$ -	$ 3,966	$ 264,386	66.67
26	Move Register	-	-	932	-	-	-	$ 721	$ -	$ 721	$ 9,733	13.50
X	Project Contingency	-	-	-	-	-	-	$ -	$ -	$ -	$ 644,736	-
		3,971	**2,474,291**	**24,722**	**2,883**	**27,414**	**12,644**	**$ 327,975**	**$ (1,285)**	**$ 326,690**	**$ 7,908,435**	**24.21**

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SECTION 5: PRELIMINARY IMPLEMENTATION SCHEDULE

The following schedule represents the estimated project schedule from IGA submission to final construction completion. This preliminary schedule is subject to revision based on actual contract execution date and changes in project timing. Naturally, all scheduling will be coordinated with County personnel to ensure that no work will interfere with normal County operations.

This preliminary schedule represents a roll-up of major project activities from execution of the Agreement, through completion of improvements and the County's acceptance, to commencement of performance period services. As construction of this project requires significant involvement of County personnel for review and approval of project specifications, design work, and selection of subcontractors, the schedule is intended to be representative of the expected construction period but in no way is a guarantee that any specific activities or the aggregate project will be completed in accordance with the specified periods.

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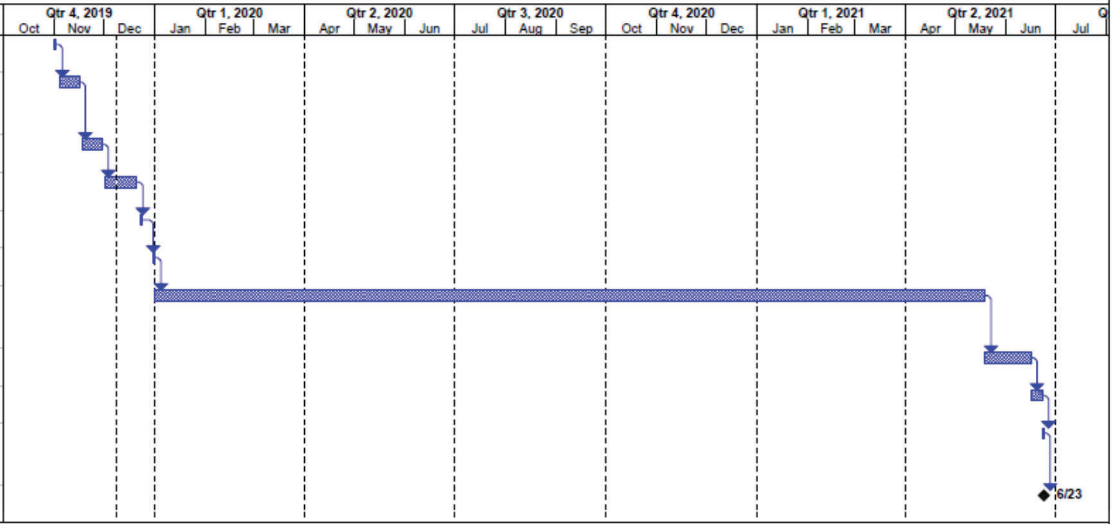
Investment Grade Audit
Putnam County

PRELIMINARY PROJECT SCHEDULE

ID	Task Name	Duration	Start	Finish	Duration
1	Submission of Final IGA Document	1 day	Fri 11/1/19	Fri 11/1/19	1 day
2	County Review & Response to Submission and Contract	2 wks	Mon 11/4/19	Fri 11/15/19	2 wks
3	Complete Audit Revisions & Finalize Contract	2 wks	Mon 11/18/19	Fri 11/29/19	2 wks
4	County Acceptance of Audit and Contract	3 wks	Mon 12/2/19	Fri 12/20/19	3 wks
5	Execute Energy Performance Contract	1 day	Mon 12/23/19	Mon 12/23/19	1 day
6	Project Kick-off Meeting	1 day	Tue 12/31/19	Tue 12/31/19	1 day
7	Construction Phase (design, equipment procurement, install, test, start-up)	18 mons	Wed 1/1/20	Tue 5/18/21	18 mons
8	Post M&V and Post Commissioning	4 wks	Wed 5/19/21	Tue 6/15/21	4 wks
9	Training of County Personnel	1 wk	Wed 6/16/21	Tue 6/22/21	1 wk
10	Project Commissioning and Commencement of Normal Operations	1 day	Wed 6/23/21	Wed 6/23/21	1 day
11	Commence Ongoing Services	0 days	Wed 6/23/21	Wed 6/23/21	0 days



Schedule for Construction & Completion
Section 5

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SECTION 6: PRELIMINARY COMMISSIONING PLAN

The commissioning of this project will utilize industry accepted standards to insure all ECMs' are completed and operating as designed and intended. Ameresco will utilize previously developed documents and strategies to insure the ECMs are installed according to the project specifications, that the installing contractor has provided all the necessary deliverables noted in the specifications, the equipment performs as expected, the facility staff have been properly trained, Operations & Maintenance documents have been provided, and the Measurement &Verification portion of the contract can successfully oversee the operation and maintenance of the equipment thus insuring the project meets the energy and operational expectations of Ameresco and the County.

Commissioning is the systematic process of ensuring all mechanical equipment related to the project performs interactively according to the owner's requirements and the design narrative. Commissioning includes Design Review, Submittal Review, Pre-functional Testing, and Functional Testing. Commissioning additionally ensures that the owner has received all of the deliverables as specified and that the building staff, through supervised training, is prepared to take over the operations and maintenance of the systems and equipment.

The purpose of the commissioning plan is to provide direction for the commissioning process during construction. The plan will identify what equipment and systems will be commissioned. It will also identify parties involved in the commissioning process, their roles, and required deliverables. The commissioning plan will also identify the goals of commissioning and/or the project, if they have not been clearly defined elsewhere.

This preliminary plan will detail the following:

- A breakdown of each ECM and the level of pre-functional and functional testing including areas of responsibility and deliverables. This breakdown will be provided in an easy to read table.
- Acceptance and turn over procedures including the integration of commissioning activities.
- A brief description of commissioning documents.
- A training agenda and sample training goals for each ECM

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ECM PERFORMANCE TESTING MATRIX

Pre-functional and functional reports shall be modified during the design and construction phases based on actual system design and installation. Results of Pre-functional Testing, as necessary, and Functional Testing will be included in the O & M Manuals.

ECM	Equipment/systems to be performance tested	Observations, Tests and Inspections during Construction (Pre-Functional)	Pre-functional Responsibility	Observations, Tests and Inspections Prior to Acceptance (Functional)	Functional Responsibility	Testing Documentation
ECM 1: Lighting System Improvements - Interior	Lighting fixtures	Verify operation of all fixtures as completed Inspect equipment and compare to approved submittals	Electrical Contractor Ameresco	Verify operation of all newly installed fixtures and/or lamps.	Electrical Contractor Ameresco	Commissioning Data Sheets will be completed for a statistically significant sample.
ECM 2: Lighting System Improvements - Exterior	Lighting fixtures	Verify operation of all fixtures as completed Inspect equipment and compare to approved submittals	Electrical Contractor Ameresco	Verify operation of all newly installed fixtures and/or lamps.	Electrical Contractor Ameresco	Commissioning Data Sheets will be completed for a statistically significant sample.
ECM 3: Recommission Energy Management Systems	Schedules, setpoints, sequences, lockouts, alarms, interlocks, control strategies, trending	Provide start up sheets for all controllers. Inspect construction progress for conformance to project specifications.	Controls Contractor Ameresco	Ameresco will Functionally test (Ft) the new controls by utilizing the approved sequence of operations to create project specific test sheets. The Ft's will document each step of the sequence and the outcome in order to show conformance to the design intent. Controls testing will be combined with individual equipment testing as it relates to operation and control. Sample sheets to show the depth and detail of testing have been included in appendix A.	Controls Contractor and Ameresco	FPT Reports will be completed for each system.
ECM 4: Web-enabled Programmable Thermostats	Schedules, setpoints, sequences, lockouts, alarms, interlocks, control strategies, trending	Provide start up sheets for all programmable thermostats. Inspect construction progress for conformance to project specifications.	Controls Contractor Ameresco	Ameresco will Functionally test (Ft) the new controls by utilizing the approved sequence of operations to create project specific test sheets. The Ft's will document each step of the sequence and the outcome in order to show conformance to the design intent. Controls testing will be combined with individual equipment testing as it relates to operation and control. Sample sheets to show the depth and detail of testing have been included in appendix A.	Controls Contractor and Ameresco	FPT Reports will be completed for each system.
ECM 5: Heat Timer & Thermostatic Radiator Valves	Schedules, setpoints, sequences, lockouts, alarms, interlocks, control strategies, trending	Provide start up sheets for controller and valves. Inspect construction progress for conformance to project specifications.	Controls Contractor Ameresco	Ameresco will Functionally test (Ft) the new controls by utilizing the approved sequence of operations to create project specific test sheets. The Ft's will document each step of the sequence and the outcome in order to show conformance to the design intent. Controls testing will be combined with individual equipment testing as it relates to operation and control. Sample sheets to show the depth and detail of testing have been included in appendix A.	Controls Contractor and Ameresco	FPT Reports will be completed for each system.
ECM 6: Fuel Oil to Natural Gas Conversion	Boilers, Burners and Controls.	Start-up reports from installing contractors. Boiler tuning sheets Pre-functional check sheets	Mechanical Contractor Ameresco	Functional testing will be conducted and include the operation of the boilers and burners as well as tie ins to controls. See sample FT's in the Appendix.	Mechanical Contractor Ameresco	FPT Reports will be provided for each boiler.
ECM 8: Variable Frequency Drives for HW Pumps	New drives	Provide start up sheets for all controllers and programmable thermostats. Inspect construction progress for conformance to project specifications.	Controls Contractor Ameresco	Ameresco will Functionally test (Ft) the new drives by utilizing the approved sequence of operations to create project specific test sheets. The Ft's will document each step of the sequence and the outcome in order to show conformance to the design intent.	Controls Contractor Ameresco	FPT Reports will be completed for each system.
ECM 10: Transformers	New transformers	Inspect construction progress for conformance to project specifications.	Electrical Contractor Ameresco	Visual inspection to ensure that all transformers are installed and functioning properly.	Electrical Contractor Ameresco	FPT Reports will be completed for each system.
ECM 11: Vending Machine Controls	Control units	Inspect construction progress for conformance to project specifications.	Ameresco	Visual inspection of controls to ensure that they are installed and functioning properly	Installation Contractor Ameresco	FPT Reports will be completed for each system.
ECM 12: Walk-In Refrigerator Controls	Walk-in cooler evaporator, condenser and controls	Start-up reports from installing contractors. Manufacturer start up reports Pre-functional check sheets	Electrical Contractor Ameresco	Functional testing will be conducted and include the operation of the walk-in cooler.	Electrical Contractor Ameresco	FPT Reports will be provided for each system.

ECM	Equipment/systems to be performance tested	Observations, Tests and Inspections during Construction (Pre-Functional)	Pre-functional Responsibility	Observations, Tests and Inspections Prior to Acceptance (Functional)	Functional Responsibility	Testing Documentation
ECM 13: Steam Trap Replacements	Steam Traps, Repair Kits	Inspect construction progress for conformance to project specifications.	Installation Contractor Ameresco	Visual inspection to ensure that all steam traps and repair kits are installed and functioning properly.	Installation Contractor Ameresco	FPT Reports will be completed for each system.
ECM 14: Infiltration Reductions	New weather-stripping, foam sealant and insulation	Inspect construction progress for conformance to project specifications.	Ameresco	Visual inspection to ensure that all weather stripping and air sealing material is installed and functioning properly.	Installation Contractor Ameresco	FPT Reports will be completed for each system.
ECM 15: Pipe Insulation	New insulation	Inspect construction progress for conformance to project specifications.	Ameresco	Visual inspection to ensure that all insulation material is installed and functioning properly.	Installation Contractor Ameresco	FPT Reports will be completed for each system.
ECM 16: Boiler Replacements	Boilers, Burners and Controls.	Start-up reports from installing contractors. Boiler tuning sheets Pre-functional check sheets	Mechanical Contractor Ameresco	Functional testing will be conducted and include the operation of the boilers and burners as well as tie ins to controls. See sample FT's in the Appendix.	Mechanical Contractor Ameresco	FPT Reports will be provided for each boiler.
ECM 17: Window Replacements	Windows	Inspect construction progress for conformance to project specifications.	Ameresco	Visual inspection to ensure that all windows material is installed and functioning properly.	Installation Contractor Ameresco	FPT Reports will be completed for each system.
ECM 18: PV Solar Array	Panels, Inverters, and Control units	Verify operation of all components as completed Inspect equipment and compare to approved submittals	Ameresco	Verify operation of all newly installed panels, inverters, and control units.	Installation Contractor Ameresco	FPT Reports will be completed for each system.
ECM 19: AHU Replacements	Air Handling Units	Start-up reports from installing contractors. Pre-functional check sheets	Mechanical Contractor Ameresco	Functional testing will be conducted and include the operation of the existing equipment as well as tie ins to controls. See sample FT's in the Appendix.	Mechanical Contractor Ameresco	FPT Reports will be provided for each system.
ECM 20: Plug Load Controllers	Controllers	Provide start up sheets for all controllers. Inspect construction progress for conformance to project specifications.	Installation Contractor Ameresco	Ameresco will Functionally test (Ft) the new controls by utilizing the approved sequence of operations to create project specific test sheets. The Ft's will document each step of the sequence and the outcome in order to show conformance to the design intent. Controls testing will be combined with individual equipment testing as it relates to operation and control. Sample sheets to show the depth and detail of testing have been included in appendix A.	Installation Contractor Ameresco	FPT Reports will be completed for each system.
ECM 22: Chiller Replacements	Chiller and Controls.	Start-up reports from installing contractors. Chiller tuning sheets Pre-functional check sheets	Mechanical Contractor Ameresco	Functional testing will be conducted and include the operation of the chiller and cooling tower as well as tie ins to controls. See sample FT's in the Appendix.	Mechanical Contractor Ameresco	FPT Reports will be provided for each chiller.
ECM 23: Siding Replacement	New Siding, Trim	Inspect construction progress for conformance to project specifications.	Ameresco	Visual inspection to ensure that all siding material is installed and functioning properly.	Installation Contractor Ameresco	FPT Reports will be completed for each system.
ECM 24: Roof Replacement	Roof Membrane, Insulation	Inspect construction progress for conformance to project specifications.	Ameresco	Visual inspection to ensure that all insulation and roofing material is installed and functioning properly.	Installation Contractor Ameresco	FPT Reports will be completed for each system.
ECM 25: Window Restoration	Existing Windows	Inspect construction progress for conformance to project specifications.	Ameresco	Visual inspection to ensure that restored window material is installed and functioning properly.	Installation Contractor Ameresco	FPT Reports will be completed for each system.
ECM 26: Move Register	Ceiling Tiles, Sidewall Grilles	Inspect construction progress for conformance to project specifications.	Ameresco	Visual inspection to ensure that grilles are installed and functioning properly.	Installation Contractor Ameresco	FPT Reports will be completed for each system.

ACCEPTANCE PROCEDURES AND DOCUMENTATION

Upon completion of the pre-functional testing, completion of the functional performance testing, and completion of the training as described below, Ameresco shall issue Certificates of Substantial Completion for each ECM that is providing a performance and financial benefit to the County. The Certificates will have accompanying punch lists; all punch list items that could directly affect the potential to generate energy cost savings must be completed prior to functional performance testing. It is important to note that the warranty periods for equipment/systems that are in operation will begin upon execution of the Certificates of Substantial Completion, which is after completion of functional performance testing.

Upon successful completion of all functional performance tests and all construction period M&V testing, as prescribed in Section 7, the ECMs are deemed to have the potential to achieve the estimated energy cost and maintenance savings. Ameresco will also provide applicable training required to allow the County to assume operational control and maintenance responsibilities for the ECMs, such training to be as described in the section on training, below. Ameresco will then formally request from the County an inspection of the work completed. A Certificate of Substantial Completion will accompany the formal inspection request. The Certificate of Substantial Completion formally acknowledges that the work has been completed, or a portion thereof, and is being accepted. Some ECMs may not be able to be completed at that time due to circumstances beyond the control of Ameresco. In these instances, a percentage complete will be assigned to the ECM and a punch list of outstanding items will be included. These items typically will not have an impact on the savings or the potential to achieve savings since the functional performance test will have been completed prior to requesting the final inspection. All outstanding punch list items will be completed as soon as possible.

Commissioning will include two levels of testing for equipment and systems, Pre-functional Testing and Functional Performance Testing; Pre-functional testing checks the readiness of equipment to work within the system and includes contractor or manufacturer start up sheets. Functional testing tests the operation of the system, specifically the sequence of operations.

PRE-FUNCTIONAL TESTING

The PFT is a validation of individual equipment for readiness to work in conjunction with the associated system. The contractors must successfully complete the pre-functional test for each component of a given system prior to formal functional performance testing of equipment and subsystems of the given system. Pre-functional Tests will augment and are combined with the manufacturer’s start-up checklist. Completion of the Pre-functional Tests will allow the contractor to ensure that the overall installation reflects the requirements of the plans, specifications and manufacturer’s installation manuals.

FUNCTIONAL PERFORMANCE TESTING

The FPT is the equipment or system performance evaluation under operating conditions for compliance with the project documents (installation drawings, one line diagrams, Sequences of Operation, and specifications including changes during construction). It verifies equipment or system component performances, e.g., temperature, humidity, pressure, flow, start/stop etc.

Functional testing is the dynamic testing of systems (rather than just components) under full operation. Systems are tested under various modes, such as during high/low heating loads, high/low steam loads, component failures, etc. The systems are run through all of the control system's sequences of operation and components are verified to be responding as the sequences state. Ameresco develops the FPT procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is performed with assistance, typically from the controls contractor.

The Energy Management or Control system will be used to verify and document the functional performance of the commissioned systems. Since the EMS is critical to the FPT process, the EMS PFT (performed by the contractor point-to-point checkout and controller start up reports) must be complete and accepted before any FPT can begin. Much of the BMS FPT is accomplished during the testing process for the equipment and systems. For example, while testing the hot water heating pumps, the BMS is tested at the same time for many of its individual features such as set point control and scheduling.

INSPECTION REPORTS

Inspection reports are brief reports completed by an inspecting Ameresco employee that document the extent of construction, verify conformance to approved submittals and construction documents, and identifies any deficiencies. The intent of the reports are to insure equipment is properly supplied to the construction site and installed properly, this will aid in a quick and successful Functional test and final sign off of ECM's.

OPERATIONS AND MAINTENANCE MANUALS

O & M Manuals will be provided upon completion of all functional performance tests and upon completion of the as-built documentation. O&M's will be provided for each ECM and be related to that specific ECM. The manuals will be provided as hard copy binders as well as electronic copies on a CD. A sample O&M outline follows:

SECTION I – SYSTEM DESCRIPTION

- A brief description of the system, its major components and function.
- Control strategies and sequences describing start-up, modes of operation, and shutdown.
- Energy conservation strategies important to the selection of the equipment.

SECTION II – EQUIPMENT DATA SHEETS

- Corrected shop drawings, including performance curves, efficiency ratings, features and options
- Approved submittal
- Copies of approved certifications and factory test reports (where applicable)
- Wiring and control schematics detailing the operation and control of each component for troubleshooting

SECTION III – MAINTENANCE

- Manufacturer’s Operation and Maintenance instructions
- Manufacturer’s Spare Parts Lists
- Manufacturer recommended spare parts inventory list
- Manufacturer’s recommended maintenance frequency
- Name, address, and telephone number of the manufacturer’s local representative for each type of equipment for replacement parts and service

SECTION IV– TEST REPORTS

- Pre-functional Reports (Equipment start-up reports and commissioning data sheets)
- Functional Reports (System start-up reports and functional performance tests)
- Copies of welder certifications (where applicable)
- Non-destructive testing reports (where applicable)
- Hydrostatic/pneumatic pipe testing reports (where applicable)
- Water treatment analysis and report (where applicable)
- Testing and Balancing reports (where applicable)
- Other reports as applicable

SECTION V – WARRANTIES/GUARANTEES

- A typewritten warranty, on company letterhead, for each system installed. The warranty shall state the system and components covered, the duration of the warranty period, and emergency contact phone numbers for service and repair.
- Warranties/guarantees from subcontractors or equipment suppliers.

TRAINING PLAN

Training and orientation on the systems installed will vary depending on the complexity of the specific equipment installed for each ECM. At a minimum each ECM O&M manual will be reviewed with the staff to review the installed measure, scope of work, effect on energy consumption, and warrantee information. Additionally, a site inspection to review a typical installation will be conducted. Ameresco will be present at all training sessions to ensure training is provided as required and is thorough, a brief training report will be issued for each session that will include a sign in sheet and instructor contact information. Training is anticipated to be provided at the following levels depending on ECM complexity:

1. For systems and/or equipment that are essentially direct replacements of existing equipment, and where no additional specific skills will be required to perform operations and maintenance functions, training will be limited to a general overview of the equipment installed and a review of the O&M manuals. Training will be directed to operating personnel. Training should be provided at the completion of construction of each of the ECMs and will generally last less than a day.
2. For systems/equipment that are new to the site and require more in-depth understanding as to their function and operation, training will include classroom time that will provide an overview of the implemented technology and design intent as well as O&M review. Training will be geared towards operations staff as well as direct supervisors. Following the classroom training, a site tour will be conducted to view the installation and operation of the equipment, a "hands on" session of training will be provided at this time. Training will be scheduled to coincide with the completion of construction and should be anticipated to last as long as a full day for each ECM.
3. For systems and/or equipment that are new to the site and more complex in nature, training will be directed to the operations staff, immediate supervisors, and site supervisors as necessary. In general, training will consist of classroom training followed by hands-on instruction in the field. Training will be provided through a complement of Ameresco personnel, design engineers, installation contractors, and manufacturer's representatives. Specifics on the training program, including schedule and training materials, will be further refined during the design process, but the training, in general, will consist of the following:
    a. Explanation of the design concept
        i. Design intent
        ii. Energy efficiency considerations
        iii. Seasonal modes of operation
        iv. Emergency conditions and operation
        v. Comfort conditions and indoor air quality

b. Systems operation
    i. Operation of individual components, instruction from authorized factory technicians, if required
    ii. Physical location of critical shut-off valves, fire, smoke, and balancing dampers, relief valves, safeties, and control panels
    iii. System operational procedures for all modes in manual and automatic modes

c. Operation of the control systems
    i. Sequences of Operation
    ii. Use of Graphical User Interfaces
    iii. Alarms and problem indicators
    iv. Diagnostics and corrective actions

d. Service and Maintenance
    i. Use of the O&M manuals
    ii. Instruction and logging procedures for maintenance
    iii. Instruction from authorized factory technicians, where applicable
    iv. Troubleshooting and investigation of malfunctions
    v. Recommended procedures for collecting, interpreting, and storing specific performance data

4. For systems Training will be provided during construction, commissioning, and acceptance phases as dictated by the complexity of the ECM. It is also anticipated that additional training will be provided after 6 and 12 months from acceptance of the ECMs to ensure that the equipment is being operated and maintained in accordance with manufacturer’s recommendations and within contract requirements so that the potential to generate cost savings is not jeopardized. All training activities will be coordinated carefully with County facilities personnel.

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TRAINING GOAL MATRIX

This is a general outline of training for each ECM. Specific times and topics will be adjusted as final equipment selections are made.

ECM	Equipment/ Systems	Classroom Training	Hands on Instruction	Personnel Groups Trained
ECM 1: Lighting System Improvements - Interior	Lighting Fixtures	1 hour to go over lighting, lighting controls and operation of controls	Site review to identify typical locations for lighting retrofits and controls.	Facility Engineers Facility Technicians O&M Personnel
ECM 2: Lighting System Improvements - Exterior	Lighting Fixtures	1 hour to go over lighting, lighting controls and operation of controls	Site review to identify typical locations for lighting retrofits and controls.	Facility Engineers Facility Technicians O&M Personnel
ECM 3: Recommission Energy Management Systems	Existing Energy Management Systems	2 hours of classroom training to review the steps to change schedules, set-points, generate trend logs, reset alarms, interpret alarms, and review the control sequences. Classroom training will be broken up into several training sessions	Site review to identify controlled equipment, sensor types and locations.	Facility Engineers Facility Technicians Supervisors O&M Personnel
ECM 4: Web-enabled Programmable Thermostats	New Thermostats	2 hours of classroom training to review the steps to change schedules, set-points, generate trend logs, reset alarms, interpret alarms, and review the control sequences. Classroom training will be broken up into several training sessions	Site review to identify controlled equipment, sensor types and locations.	Facility Engineers Facility Technicians Supervisors O&M Personnel
ECM 5: Heat Timer & Thermostatic Radiator Valves	New Heat Timer & TRV	2 hours of classroom training to review the steps to change schedules, set-points, generate trend logs, reset alarms, interpret alarms, and review the control sequences. Classroom training will be broken up into several training sessions	Site review to identify controlled equipment, sensor types and locations.	Facility Engineers Facility Technicians Supervisors O&M Personnel
ECM 6: Fuel Oil to Natural Gas Conversion	New Boilers and Burners	1 hour of training to evaluate the new heating equipment and review of the control sequences.	Review of the boiler components, demonstrate the control sequences, show how to change the setpoint and troubleshoot alarms.	Facility Engineers Facility Technicians O&M Personnel
ECM 8: Variable Frequency Drives	VFDs	2 hours of training to evaluate the new VFD equipment and review of the control sequences.	Onsite overview of equipment, how to adjust controls and settings.	Facility Technicians O&M Personnel
ECM 10: Premium Efficiency Transformers	Transformers	Review of O&M	None	Facility Technicians O&M Personnel
ECM 11: Vending Misers	Control Units	None	Review of controls to discuss unit operation and sensor operation.	Facility Technicians O&M Personnel
ECM 12: Walk-In Refrigerator Controls	New Walk-In Cooler	1 hour of training to evaluate the new cooling equipment and review of the control sequences.	Review of the cooling components, demonstrate the control sequences, show how to change the setpoint and troubleshoot alarms.	Facility Engineers Facility Technicians O&M Personnel Kitchen Personnel
ECM 13: Steam Trap Replacements	Steam Traps	1 hour of training to evaluate the new heating equipment and review of the replacement process.	Review of the trap components, demonstrate the replacement process.	Facility Engineers Facility Technicians O&M Personnel

ECM	Equipment/ Systems	Classroom Training	Hands on Instruction	Personnel Groups Trained
ECM 14: Infiltration Reductions	Weather-stripping	None	Review of sample installations to discuss reinstalling weather-stripping during maintenance operations	Facility Engineers Facility Technicians O&M Personnel
ECM 15: Pipe Insulation	Pipe Insulation	None	Review of sample installations to discuss reinstalling weather-stripping during maintenance operations	Facility Engineers Facility Technicians O&M Personnel
ECM 16: Boiler Replacements	New Boilers and Burners	1 hour of training to evaluate the new heating equipment and review of the control sequences.	Review of the boiler components, demonstrate the control sequences, show how to change the setpoint and troubleshoot alarms.	Facility Engineers Facility Technicians O&M Personnel
ECM 17: Window Replacements	Windows	Review of O&M	Site review to identify implementation locations, training to discuss reinstalling insulation during maintenance operations and discuss energy savings potentials.	Facility Technicians O&M Personnel
ECM 18: Solar PV Array	Panels, Inverters, and Control Units	None	Review of equipment to discuss unit operation.	Facility Technicians O&M Personnel
ECM 19: AHU Replacements	New Air Handling Units	1 hour of training to evaluate the new heating equipment and review of the control sequences.	Review of the AHU components, demonstrate the control sequences, show how to change the setpoint and troubleshoot alarms.	Facility Engineers Facility Technicians O&M Personnel
ECM 20: Plug Load Controllers	Control Units	1 hour of classroom training to review the steps to change schedules and review the control sequences. Classroom training will be broken up into several training sessions	Review of controls to discuss unit operation.	Facility Technicians O&M Personnel
ECM 22: Chiller Replacement	New Chiller and Cooling Tower	1 hour of training to evaluate the new equipment and review of the control sequences.	Review of the chiller components, demonstrate the control sequences, show how to change the setpoint and troubleshoot alarms.	Facility Engineers Facility Technicians O&M Personnel
ECM 23: Siding Replacement	New Siding	Review of O&M	Site review to identify implementation locations, training to discuss reinstalling equipment during maintenance operations and discuss energy savings potentials.	Facility Technicians O&M Personnel
ECM 24: Roof Replacement	New Roof	Review of O&M	Site review to identify implementation locations, training to discuss reinstalling equipment during maintenance operations and discuss energy savings potentials.	Facility Technicians O&M Personnel
ECM 25: Window Restoration	Windows	Review of O&M	Site review to identify implementation locations, training to discuss reinstalling equipment during maintenance operations and discuss energy savings potentials.	Facility Technicians O&M Personnel
ECM 26: Move Register	Return Air Grille	None	Site review to identify implementation locations, training to discuss reinstalling equipment during maintenance operations and discuss energy savings potentials.	Facility Technicians O&M Personnel

SECTION 6 APPENDIX: SAMPLE TESTING DOCUMENTATION FORMS

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ECM1: Lighting Measurement & Verification Worksheet

AMERESCO
Green • Clean • Sustainable

Project Name: **Project #:**

Use this worksheet to document the measured post-retrofit light fixture watts, for each circuit of light fixtures, to the nearest whole watt.

Use a separate worksheet for each type of light fixtures. Calculate the overall average watt/fixture at the bottom of each sheet..

Complete Signatures and Metering Device Information at bottom of worksheet.

	New/Retrofitted Light Fixtures (Post-Measurement)								
Item	Building	Location	Qty	Lamp/Ballast Type	Amps	Voltage	PF	Total Watts	Watt Per Fixture
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
								Average Watts/Fixture	

Owner Representative (Print Name): **Signature:** **Date:**

Ameresco Project Manager (Print Name): **Signature:** **Date:**

Contractor Performing M&V (Print Name): **Signature:** **Date:**

Model & Serial Number of Watt Meter: **Date of Calibration:** **NIST Standard:**

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FUNCTIONAL PERFORMANCE TEST (FPT) REPORT

ENERGY MANAGEMENT SYSTEM

Project:______________________________ Date: __________________________________

System:______________________________ Location:_______________________________

Functional Performance Test: Performance Partner shall verify the operation of the automatic controls to comply with the contract documents. As a minimum, the following functions shall be tested:

COMPLIANCE CHECKLIST:

1. Verify that the wiring is correct to each point. **Compliance?** ____________

   (Attach a comprehensive list of points with this completed form)

2. Verify that the software address is correct. **Compliance?** ____________

   (Attach a list of all software addresses and a brief description of the address (i.e., OADB = Outside Air Dry Bulb temperature in degrees Fahrenheit) with this completed form)

3. If the device is/has an actuator, verify free movement through its full range.
   Compliance? ____________

4. Verify stroke/range calibration for all controlled valves, dampers, actuators, fans, pumps, etc.

   Simulate maximum and minimum transmitter signal values and verify minimum and maximum controller output values and verify the stroke and capacity range for each control device. *(Provide completed calibration forms for all sensors and controllers.)* **Compliance?** ____________

5. Verify that the software with the correct setpoints has been downloaded for each control loop.
   Compliance? ____________

6. ECM Specific:

- Verify the three EMCS front-end computers are installed and operationally identical. **Compliance?** ____________

- Verify all inoperable control devices, which were existing, have been replaced with new functional units as per scope. **Compliance?** ____________

- Verify existing Honeywell, Trane, and Automated Logic points have been migrated to the new Johnson EMCS. **Compliance?** ______
- EMCS logic:

  Scheduled start / stop. **Compliance?** ____________

  Optimum start. **Compliance?** ____________ *(Attach control algorithm used to determine optimum start time based on historical weather data and space response time)*

  Enthalpy controlled economizer. **Compliance?** ____________

  Supply air temperature reset. **Compliance?** ____________

  Outside air lockout. **Compliance?** ____________

  Nighttime space temperature setup / setback. **Compliance?** ____________ *(space heating setback to 55℉, cooling set up to 85℉)*

  Attach a log, generated for one month at one-hour intervals by the EMCS, with recorded values for date, time, outside air temperature (dry bulb and wet bulb), AHU fan status (supply and return), discharge air temperature, return air temperature (dry bulb and wet bulb), mixed air temperature (dry bulb and wet bulb), supply temperature (dry bulb and wet bulb), supply temperature setpoint and outside air damper position for all AHUs.

7. Certification and Witness

Performance Partner ____

Client ____

Ameresco ____

Sensor Calibration Sheet

Date:

Sensor ID:

Manufacturer:

Model Number:

Serial Number:

Input Low: Output Low:

Input High: Output High:

Input Units: Output Units:

Input Mode:

AS FOUND

Input %	Actual Input in Deg. F	M/A Output	Computer Read	Controller Voltage Read

AS LEFT

Input %	Actual Input in Deg. F	M/A Output	Computer Read	Controller Voltage Read

Test Equipment Used

Manufacturer	Model Number	Serial Number	Cert Date	NIST Number

COMMENTS:

FUNCTIONAL PERFORMANCE TEST (FPT) REPORT

VFD – FAN APPLICATION

Project:________________________________ Date:____________________________________

Air Handling Unit No.:____________________

System:________________________________ Location:________________________________

Functional Performance Test: Performance Partner shall verify the operation of the variable frequency drive for control of a variable air volume system for compliance with the contract documents. As a minimum, the following items shall be tested and /or recorded:

1. **General Information**

VFD manufacturer and model no. ____

Supply Fan (SF) HP:__________ CFM: ____________ RPM: ___________ SP: ___________

Return Fan (RF) HP:__________ CFM: ____________ RPM: ___________ SP: ___________

2. **Static Pressure Sensor/Transmitter**

Verify location of the static pressure sensor in % of the distance from fan to terminal unit. (Normally, the sensor should be located 2/3 to 3/4 downstream of the fan to the terminal unit of the most restrictive branch)

Distance __________________%

3. **Pressure Reading Reliability**

Duct diameter or equivalent diameter _____________________

Nearest duct fitting upstream ______________________

Nearest duct fitting downstream _______________________

(Ideally, the most reliable readings occur when the sensor is at least 10 duct diameters downstream and 5 duct diameters upstream from takeoffs or fittings)

Does the location comply? _______________

4. Functional Performance Test

a. Terminal Units Full Cooling (Boxes at Max)
Adjust all space temperature setpoints at least 10ºF below design setpoints. All zones should be in full cooling and terminal units should be open to the maximum position.

- Measure or read the duct static pressure and record in column A of Table 1.
- Read the frequency output of the VFDs and record in Table 1.

b. Terminal Units Intermediate Position (Boxes Partially Opened)
Readjust thermostats to a few degrees below normal setpoints, to simulate an approaching thermostat satisfaction and take readings.

- Measure or read the duct static pressure and record in column B of Table 1.
- Read the frequency output of the VFDs and record in Table 1.

c. Terminal Units Satisfied (Boxes at Min)
Readjust thermostats to actual room temperatures to simulate a satisfied condition. Boxes should close to the minimum position.

- Measure or read the duct static pressure and record in column C of Table 1.
- Read the frequency output of the VFDs and record in Table 1.

d. Verify Static Pressure Sensor/Transmitter
Using a magnehelic gauge, record actual static pressure at the location of the sensor and record static pressure indicated by the BMS

Actual Static Pressure _______________
BMS Static Pressure _______________
Is the variance less than 5%? _____________ If no, investigate problem.

5. Test Data

Design Static Pressure (in.) _______________
Design Frequency (Hz): SF ___________ RF ___________
Design RPM: SF ___________ RF ___________

SP Setpoint during test (in.) _______________

Table 1.

Test Data	A Boxes at Max position		B Boxes Partially Open		C Boxes at Min position	
	SF	RF	SF	RF	SF	RF
VFD Frequency or RPM						
Static Pressure during Test						

6. **Analysis**

   a. Compare the full open frequency or RPM to the design values for the supply fan. Divide the design value by the reading in Column A. If the percentage is less than 95%, all boxes may not have driven to the full open position. Investigate possible problems.

   Is the variance less than 5%? ______________

   b. Is the static pressure recorded in Columns B & C within 10% of the setpoint?
   Is the variance less than 5%? _______________

   c. The SP during the full open condition should be significantly less than the partially loaded conditions and close to the value calculated in Attachment A (within 0.15 inches). If not, investigate possible problems.

   Compliance? _____________

7. **General Issues**

   a. Verify that power quality requirements from the specifications have been completed.

   b. Record results and include in the Operation and Maintenance Manuals.

   c. Certification and Witness

Performance Partner ____

Client ____

Ameresco ____

FUNCTIONAL PERFORMANCE TEST (FPT) REPORT

VFD – PUMP APPLICATION

Project:______________________________ Date:___________________________________

Pump No.:___________________________

System:_____________________________ Location:________________________________

Functional Performance Test: Performance Partner shall verify the operation of the variable frequency drive for control of a variable pumping system for compliance with the contract documents. As a minimum, the following items shall be tested and/or recorded:

1. **General Information**

   VFD manufacturer and model no. ____

   Pump HP: _________ GPM: ___________ Head (ft): __________

2. **Differential Sensor/Transmitter**

   Verify location of the differential pressure sensor.

   (Ideally, the sensor should be located at or near the last branch takeoff)

   Location _________________

3. **Functional Performance Test**

   a. Intermediate Flow – Valves Partially Opened
      It is expected to find the system in this condition.

      – Read the speed, DP at the sensor, and gpm in the loop, if available, and record in condition 3, in Table 1.

   b. Design Flow – Valves Full Open

   (maximum cooling or heating)

- Set the space temperature setpoints 10ºF below the current space temperature for cooling valves and 10ºF above the space temperature for heating so that all valves modulate to the full open position.
- Read the speed, DP at the sensor, and gpm in the loop, if available, and record in condition 2, in Table 1.

c. Minimum Flow – Valves Shut
(minimum cooling or heating)

- Set the space temperature setpoints equal to the current space temperature so that all conditions are satisfied, driving all valves to the minimum or closed position.
- Read the speed, DP at the sensor, and gpm in the loop, if available, and record in condition 4, in Table 1.

4. Test Data

Design Differential Pressure (psig)_______________

Design Frequency (Hz): ___________

Design RPM: ___________

DP Setpoint during test (psig) _______________

(The operating setpoint shall be determined using the procedure listed in attachment A)

Table 1.

Condition	Pump No.	Speed (Hz or RPM)		DP at Sensor (psig)		Total Flow (GPM)
		Unit	Avg	Unit	Avg	
1. At design flow by TAB report	Pump - 1					
	Pump - 2					
	Pump - 3					
2. At design flow (during commissioning)	Pump - 1					
	Pump - 2					
	Pump - 3					
3. At intermediate	Pump - 1					

flow (during commissioning)	Pump - 2					
	Pump - 3					
4. At minimum flow (during commissioning)	Pump - 1					
	Pump - 2					
	Pump - 3					

5. **Analysis**

   a. During operation of each pump combination, the average DP readings for all conditions should remain within 10% of each other. If not, investigate problems.

   Is the variance less than 5%? _______________

   b. At no flow, Condition 4, is the flow and DP zero or equal to the minimum by-pass flows?

   Compliance? ___________

   c. Is the system balanced to the lowest DP? **Compliance?** ___________

6. **General Issues**

   a. Verify that power quality requirements from the specifications have been completed.
   Compliance? __________

   B. VERIFY THAT THERE ARE NO 3-WAY VALVES IN THE PIPING SYSTEM THAT MAY NEGATE THE SAVINGS FROM THE VFD BY ALLOWING FLOW TO BYPASS THE COILS.
   COMPLETE? __________

   c. Verify that the VFD control has been integrated into the BMS as specified.
   Complete? __________

7. **Record results and include in the Operation and Maintenance Manuals.**

8. **Certification and Witness**

   Performance Partner ____

   Client ____

   Ameresco ____

COMMISSIONING DATA SHEET

AIR HANDLING UNIT

PROJECT NAME:___________________________________ DATE: __________________

LOCATION:____

UNIT NO.:____ COMPLETED BY: __________________

Service/Location: ____________________________

Manufacturer: ____________________________

Model Number: ____________________________

Serial Number: ____________________________

*** Complete/Attach Data Sheet for the Supply Fan**

*** Complete/Attach Data Sheet for the Return Fan**

DATA	DESIGN	ACTUAL
Total Airflow Rate (cfm)		
Total System Static Pressure (in. of water)		
Discharge Static Pressure		
Filter Differential Static Pressure		
Coil(s) Differential Static Pressure		
Outside Air DB/WB		
Return Air DB/WB		
Mixed Air DB/WB		
Supply Air DB/WB		
Coil(s) Face Velocity (fpm)		
Ent/Lvg Chilled Water Temperature, if applicable		
Ent/Lvg Hot Water Temperature, if applicable		
Inlet Steam Pressure, if applicable		

CHECK	COMPLETE
Condensate Removal (Cond. piping is not obstructed)	
Lubrication	
Damper Operation	
Filters Installed	

FUNCTIONAL PERFORMANCE TEST (FPT) REPORT

VFD – VAV FAN APPLICATION

Project:________________________________ Date: _____________________________________

Air Handling Unit No.:____________________

System:_______________________________ Location:__________________________________

Functional Performance Test: Performance Partner shall verify the operation of the variable frequency drive for control of a variable air volume system for compliance with the contract documents. As a minimum, the following items shall be tested and /or recorded:

1. General Information

VFD manufacturer and model no. ____

Supply Fan (SF) HP: _________ CFM: ____________ RPM: ___________ SP: ___________

Return Fan (RF) HP: _________ CFM: ____________ RPM: ___________ SP: ___________

2. Static Pressure Sensor/Transmitter

a. Verify location of the static pressure sensor in % of the distance from fan to terminal unit. (Normally, the sensor should be located 2/3 to 3/4 downstream of the fan to the terminal unit of the most restrictive branch)

Distance __________________%

b. Pressure Reading Reliability

- Duct diameter or equivalent diameter _____________________
- Nearest duct fitting upstream _______________________
- Nearest duct fitting downstream ________________________
- (Ideally, the most reliable readings occur when the sensor is at least 10 duct diameters downstream and 5 duct diameters upstream from takeoffs or fittings)
- **Does the location comply?** _______________

3. Functional Performance Test

a. Terminal Units Full Cooling (Boxes at Max)
Adjust all space temperature setpoints at least 10ºF below design setpoints. All zones should be in full cooling and terminal units should be open to the maximum position.

- Measure or read the duct static pressure and record in column A of Table 1.
- Read the frequency output of the VFDs and record in Table 1.

b. Terminal Units Intermediate Position (Boxes Partially Opened)
Readjust thermostats to a few degrees below normal setpoints, to simulate an approaching thermostat satisfaction and take readings.

- Measure or read the duct static pressure and record in column B of Table 1.
- Read the frequency output of the VFDs and record in Table 1.

c. Terminal Units Satisfied (Boxes at Min)
Readjust thermostats to actual room temperatures to simulate a satisfied condition. Boxes should close to the minimum position.

- Measure or read the duct static pressure and record in column C of Table 1.
- Read the frequency output of the VFDs and record in Table 1.

d. Verify Static Pressure Sensor/Transmitter
Using a magnehelic gauge, record actual static pressure at the location of the sensor and record static pressure indicated by the BMS

Actual Static Pressure _______________

BMS Static Pressure _______________

Is the variance less than 5%? _____________ If no, investigate problem.

4. **Test Data**

Design Static Pressure (in.)_______________

Design Frequency (Hz): SF ___________ RF ___________

Design RPM: SF ___________ RF ___________

SP Setpoint during test (in.) _______________

Table 1.

Test Data	**A** Boxes at Max position		**B** Boxes Partially Open		**C** Boxes at Min position	
	SF	RF	SF	RF	SF	RF
VFD Frequency or RPM						
Static Pressure during Test						

5. **Analysis**

   a. Compare the full open frequency or RPM to the design values for the supply fan. Divide the design value by the reading in Column A. If the percentage is less than 95%, all boxes may not have driven to the full open position. Investigate possible problems.

   Is the variance less than 5%? ______________

   b. Is the static pressure recorded in Columns B & C within 10% of the setpoint?
   Is the variance less than 5%? _______________

   c. The SP during the full open condition should be significantly less than the partially loaded conditions and close to the value calculated in Attachment A (within 0.15 inches). If not, investigate possible problems.

   Compliance? _____________

6. **General Issues**

   Verify that power quality requirements from the specifications have been completed.

7. **Record results and include in the Operation and Maintenance Manuals.**

8. **Certification and Witness**

   Performance Partner ____

   Client ____

   Ameresco ____

ATTACHMENT A

To ensure that the energy savings are maximized, the system must be operated at the lowest static pressure (SP) possible. The objective is to find the lowest SP at the sensor that will allow full design flow at the terminal unit most difficult to satisfy (the duct run with the greatest pressure losses). The system minimum SP determined should be the setpoint for the VFD.

The procedure for finding the system minimum static pressure is as follows:

1. Manually or automatically set the temperature setpoints for all zones to 55 F, which should cause all units to open to the maximum position.
2. The airflow at each terminal unit should be measured and compared to the design flow.
3. The terminal unit receiving the lowest fraction of the design flow should be identified.
   (It should be the unit with the longest duct run, most fittings, etc.)

4. The SP at the controlling sensor should be noted.
5. A calculation should be made to determine the static pressure at the sensor that will allow the critical terminal unit to achieve its design flow.
   SP (setpoint) = SP (at the sensor from Step 4) X (1 / (fraction of flow from Step 3)^2)

It should be noted that if all terminal units were calling for full cooling simultaneously, the fan may not be able to achieve the SP setpoint calculated in Step 5 due to diversity allowances made by the design engineer.

SECTION 7: MEASUREMENT & VERIFICATION PLAN

SITE SPECIFIC PLAN

Ameresco has based its verification pricing on a short-term plan with certain instantaneous measurements performed at commissioning to ensure audit savings projections are met, and on-going monitoring for the first 3 years of the Guarantee Term to assist the County in operating at peak efficiency for the first 3 years of the Guarantee Term. After that time, no inspections, periodic monitoring services, or reconciliation reports will be provided, unless services are otherwise extended by the County, and the Annual Savings shall be deemed verified for the remainder of the Guarantee Term.

The above approach to verification minimizes the effect of inevitable changes at the facility, while still ensuring the County savings will be realized. Other verification approaches require adjustments for changes outside of the ESCO’s control and can result in conflicts about the true magnitude of the adjustment. Our recommended approach preserves the ability to recognize savings while minimizing the long-term potential for conflicts.

Annual Savings shall equal the sum of all savings calculated pursuant to this plan, inclusive of the savings from each ECM calculated as per the below algorithms plus the O&M savings.

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ECM 1: LIGHTING SYSTEM IMPROVEMENTS - INTERIOR

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = LightingSavings - Heat + Cool$$

$$LightingSavings = DemandSavings + EnergySavings$$

$$DemandSavings = BaselineDemand - PostDemand$$

$$EnergySavings = BaselineEnergy - PostEnergy$$

$$BaselineDemand = \sum_{buildings} \sum_{fixtures} \left(kW_{Base} \times Mths \times {}^{\$}/_{kW} \right)$$

$$PostDemand = \sum_{buildings} \sum_{fixtures} \left(kW_{retro} \times Mths \times {}^{\$}/_{kW} \right)$$

$$BaselineEnergy = \sum_{buildings} \sum_{fixtures} \left(kW_{Base} \times Hrs_{Base} \times {}^{\$}/_{kWh} \right)$$

$$PostEnergy = \sum_{buildings} \sum_{fixtures} \left(kW_{Re\,tro} \times Hrs_{Base} \times {}^{\$}/_{kWh} \right)$$

$$Heat = \sum_{buildings} \sum_{fixtures} \left(\frac{(kW_{Base} - kW_{Re\,tro}) \times Hrs_{Base} \times \frac{Mths_{heat}}{12months} \times 3{,}413 \frac{btu}{kW\square} \times Util}{Boiler_{Eff} \times 1{,}000{,}000\, {}^{btu}/_{mmbtu}} \times {}^{\$}/_{mmbtu} \right)$$

$$Cool = \sum_{buildings} \sum_{fixtures} \left(\frac{(kW_{Base} - kW_{Re\,tro}) \times Hrs_{Base} \times \frac{Mths_{cool}}{12months} \times Util \times \mathrm{Cool\%}}{Cool_{Eff}} \times {}^{\$}/_{kWh} \right)$$

Where

kW_{Base} - Base fixture kW, as per lighting audit calculation included in the energy audit

kW_{Retro} - Retrofit fixture kW, as per lighting audit calculation included in the energy audit, subject to metering described below

Mths - Number of months of operation, as per lighting audit calculation included in the energy audit

Hrs_{Base} - Baseline fixture operating hours, as per lighting audit calculation included in the energy audit

$Boiler_{Eff}$ - Average heating system efficiency, as per lighting audit calculation included in the energy audit

$Cool_{Eff}$ - Average cooling system performance (COP), as per lighting audit calculation included in the energy audit

Util - Factor representing the amount of energy transmitted to the space, as per lighting audit calculation included in the energy audit

Cool% - Factor representing the amount space with cooling, as per calculation in the energy audit

$Mths_{heat}$ - Number of months the heating penalty will occur, as per lighting audit calculation included in the energy audit

$Mths_{cool}$ - Number of months the cooling benefit will occur, as per lighting audit calculation included in the energy audit

$/kW - Unit cost of electric demand, as per Unit Prices section

$/kWh - Unit cost of electric energy, as per Unit Prices section

$/mmbtu - Unit cost of fossil fuel, as per Unit Prices section

Ameresco will measure the post-installation fixture input power for a statistically significant sample size of the retrofit fixtures, and if the total sample values are within 10% of the energy audit values no change will be made. If the total sample values are not within 10%, Ameresco will either take corrective action for them to be within this limit, or will utilize the measured values.

Ameresco will use a calibrated hand held RMS meter (Fluke or equivalent) to measure power readings (kW, V, Amps, PF) from the lighting systems. These measurements can include individual fixtures or single lighting circuits with multiple fixtures of the same type and will continue until the sample size for each lighting group has been achieved. Fixtures to be metered must have at least 100 hours of operation following retrofit. Measurements shall be made only after the fixtures have reached steady state operating temperature and space temperatures are within normal occupied ranges.

The wattage measurements for each sample group will be averaged together. These averages will then be summed for all sample groups in order to determine the total measured wattage for the entire lighting sample. The difference between the total measured sample wattage and the total proposed wattage for the same sample will be subject to the 10% hurdle. If the difference is not within the 10% hurdle, the proposed wattage in the energy audit for the entire lighting project will be multiplied by the measured percentage difference and substituted into the energy audit calculation. The resulting savings will become the actual savings for this ECM. Interactive savings are stipulated and will not be part of the comparison.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

ECM 2: LIGHTING SYSTEM IMPROVEMENTS - EXTERIOR

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = BaselineEnergy - PostEnergy$$

$$BaselineEnergy = \sum_{buildings} \sum_{fixtures} \left(kW_{Base} \times Hrs_{Base} \times {}^{\$}/_{kWh} \right)$$

$$PostEnergy = \sum_{buildings} \sum_{fixtures} \left(kW_{Re\,tro} \times Hrs_{Base} \times {}^{\$}/_{kWh} \right)$$

Where

kW_{Base} - Base fixture kW, as per lighting audit calculation included in the energy audit

kW_{Retro} - Retrofit fixture kW, as per lighting audit calculation included in the energy audit, subject to metering described below

Hrs_{Base} - Baseline fixture operating hours, as per lighting audit calculation included in the energy audit

$\$/kWh_{offpeak}$ - Unit cost of electric energy, as per Unit Prices section

METERING PLAN

Ameresco will measure the post-installation fixture input power for a statistically significant sample size of the retrofit fixtures, and if the total sample values are within 10% of the energy audit values no change will be made. If the total sample values are not within 10%, Ameresco will either take corrective action for them to be within this limit, or will utilize the measured values.

Ameresco will use a calibrated hand held RMS meter (Fluke or equivalent) to measure power readings (kW, V, Amps, PF) from the lighting systems. These measurements can include individual fixtures or single lighting circuits with multiple fixtures of the same type and will continue until the sample size for each lighting group has been achieved. Fixtures to be metered must have at least 100 hours of operation following retrofit. Measurements shall be made only after the fixtures have reached steady state operating temperature and space temperatures are within normal occupied ranges.

The wattage measurements for each sample group will be averaged together. These averages will then be summed for all sample groups in order to determine the total measured wattage for the entire lighting sample. The difference between the total measured sample wattage and the total proposed wattage for the same sample will be subject to the 10% hurdle. If the difference is not within the 10% hurdle, the proposed wattage in the energy audit for the entire lighting project will be multiplied by the measured percentage difference and substituted into the energy audit calculation. The resulting savings will become the actual savings for this ECM. Interactive savings are stipulated and will not be part of the comparison.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

ECM 3: INTEGRATED AND NEW ENERGY MANAGEMENT SYSTEMS

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = Motors + Heating + Cooling$$

$$Motors = ElecBase - ElecPost$$

$$ElecBase = \sum_{buildings} \left(kW_{Base} \times Hrs_{Base} \times {}^{\$}/_{kWh} \right)$$

$$ElecPost = \sum_{buildings} \left(kW_{Base} \times Hrs_{Re\,tro} \times {}^{\$}/_{kWh} \right)$$

$$Heating = HeatBase - HeatPost$$

$$HeatBase =$$

$$\sum_{buildings} \left[\sum_{Bin}^{Heating} \left(\frac{Load_{OccBase} \times Hrs_{OccBase} + Load_{UnoccBase} \times Hrs_{UnoccBase}}{Eff \times 1{,}000\, {}^{mbtu}/_{mmbtu}} \right) \times {}^{\$}/_{mmbtu} \right]$$

$$HeatPost =$$

$$\sum_{buildings} \left[\sum_{Bin}^{Heating} \left(\frac{Load_{Occ\,Re\,tro} \times Hrs_{Occ\,Re\,tro} + Load_{Unocc\,Re\,tro} \times Hrs_{Unocc\,Re\,tro}}{Eff \times 1{,}000\, {}^{mbtu}/_{mmbtu}} \right) \times {}^{\$}/_{mmbtu} \right]$$

$$Cooling = CoolBase - CoolPost$$

$$CoolBase =$$

$$\sum_{buildings} \left[\sum_{Bin}^{Cooling} \left(\frac{Load_{OccBase} \times Hrs_{OccBase} + Load_{UnoccBase} \times Hrs_{UnoccBase}}{COP \times 3.413\, {}^{mbtu}/_{kWh}} \right) \times {}^{\$}/_{kWh} \right]$$

$$CoolPost =$$

$$\sum_{buildings}\left[\sum_{Bin}^{Cooling}\left(\frac{Load_{Occ\,Re\,tro}\times Hrs_{Occ\,Re\,tro}+Load_{Unocc\,Re\,tro}\times Hrs_{Unocc\,Re\,tro}}{COP\times 3.413\,{}^{mbtu}/_{kWh}}\right)\times {}^{\$}/_{kWh}\right]$$

Where

kW_{Base} - Total fan and pump motor kW under EMS control, as per calculation in the energy audit

Hrs_{Base} - Base motor operating hours, as per calculation in the energy audit

Hrs_{Retro} - Retrofit motor operating hours, as per calculation in the energy audit

$Load_{OccBase}$ - Building load per bin, including infiltration load, (mbtu/hr) under current conditions during occupied hours, as per calculation in the energy audit

$Load_{UnoccBase}$ - Building load per bin, including infiltration load, (mbtu/hr) under current conditions during unoccupied hours, as per calculation in the energy audit

$Load_{OccRetro}$ - Building load per bin, including infiltration load, (mbtu/hr) with reduced setpoint temperature and improved control, as per calculation in the energy audit

$Load_{UnoccRetro}$ - Building load per bin, including infiltration load, (mbtu/hr) with night setback and improved control, as per calculation in the energy audit

$Hrs_{OccBase}$ - Baseline heating and cooling bin hours during occupied period k, as per calculation in the energy audit

$Hrs_{UnoccBase}$ - Baseline heating and cooling bin hours during unoccupied period, as per calculation in the energy audit

$Hrs_{OccRetro}$ - Retrofit heating and cooling bin hours during occupied period, as per calculation in the energy audit

$Hrs_{UnoccRetro}$ - Retrofit heating and cooling bin hours during unoccupied period, as per calculation in the energy audit

Eff - Heating system efficiency, as per calculation in the energy audit

COP - Cooling system coefficient of performance, as per calculation included in the energy audit

$/kWh - Unit cost of offpeak electric energy, as per Unit Prices section

$/mmbtu - Unit cost of fossil fuel, as per Unit Prices section

METERING PLAN

Upon completion of the installation, Ameresco will commission the energy management system and test its functionality to ensure the ability of savings as specified in the energy audit to occur. Monitoring of equipment operating hours and space temperatures will be completed in detail to verify the performance of the new EMS over at least 4 weather bins at time of commissioning, up to a maximum of 4 weeks. Performance of the new EMS shall be considered verified once all time schedules are shown to turn on and off controlled equipment per the programmed times and temperature setpoints, both occupied and unoccupied are substantially achieved. Additionally, the commissioning report for the EMS, completed during construction, will be attached to the first measurement and verification report to confirm the EMS is commissioned per the designed intent. Trends will be setup to track operating hours and temperatures per the final commissioning plan developed during the design and construction phase.

Ameresco will inspect the energy management system both quarterly and annually, as part of its site inspection. A review of available trend data will be performed, and a visual inspection of major control areas will be completed. Observations identified during the site inspection shall be incorporated into the annual reconciliation report.

ANNUAL INSPECTION PROCEDURES (GENERAL)

- Confirm that the system/equipment is functional and operating as intended.
- Verify that the system is being properly maintained. Review current O&M practices to ensure compliance with the contract requirements.
- Review current or past problems with the system, especially those that may affect energy savings.
- Identify any building renovations or changes in the facility operation during the past year that would affect the project performance and/or savings.

QUARTERLY INSPECTION PROCEDURES (EMS)

- Review trend logs and compare with the standards established in the ESA.
- Review the notification history for set-points and occupancy schedules that have been modified since the last inspection.
- Recommend set-point and schedule adjustments – particularly those that do not comply with the contract standards.
- Review the basic system operation with new personnel and recommend training, if necessary.
- Review alarm history and discuss possible reasons and corrections.

OCCUPIED SCHEDULING

Ameresco will initially setup the occupancy schedules in the EMS to reflect the occupancy of the buildings as specified in the energy audit. The HVAC systems will only be operated when the buildings are supposed to be occupied. Other areas of the buildings like meeting rooms can have slightly longer schedules to reflect occupancy outside of the normal occupancy. The County will be responsible for updating special days or holiday schedule to ensure the systems are placed into “unoccupied” mode when the buildings are not occupied.

Table 7.1: Occupancy Schedule by Building

Building	Start time (Mon – Fri)	Stop time (Mon – Fri)	Weekends/ Holidays	Period
Sheriff’s Department/Correctional Facility	Jail: 24/7 Office Area: 9:00 AM	Jail: 24/7 Office Area: 5:00 PM	Jail: On Office Area: OFF	Year-round
New Putnam County Courthouse	8:00 AM	5:00 PM	OFF	Year-round
1812 Courthouse	9:00 AM	5:00 PM	OFF	Year-round
Emergency Operations Center/Tops	9:00 AM	5:00 PM	OFF	Year-round

UNOCCUPIED ZONE TEMPERATURE RESET

The following setpoints will initially be setup in the EMS.

Table 7.2: Initial Setpoints

	Cooling	Heating
Occupied	74.0	70.0
Unoccupied	80.0	55.0

ECM 4: WEB-ENABLED PROGRAMMABLE THERMOSTATS

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = Motors + Heating + Cooling$$

$$Motors = ElecBase - ElecPost$$

$$ElecBase = \sum_{buildings} \left(kW_{Base} \times Hrs_{Base} \times {}^{\$}/_{kWh} \right)$$

$$ElecPost = \sum_{buildings} \left(kW_{Base} \times Hrs_{Re\,tro} \times {}^{\$}/_{kWh} \right)$$

$$Heating = HeatBase - HeatPost$$

$$HeatBase = $$

$$\sum_{buildings} \left[\sum_{Bin}^{Heating} \left(\frac{Load_{OccBase} \times Hrs_{OccBase} + Load_{UnoccBase} \times Hrs_{UnoccBase}}{Eff \times 1{,}000\, {}^{mbtu}/_{mmbtu}} \right) \times {}^{\$}/_{mmbtu} \right]$$

$$HeatPost = $$

$$\sum_{buildings} \left[\sum_{Bin}^{Heating} \left(\frac{Load_{Occ\,Re\,tro} \times Hrs_{Occ\,Re\,tro} + Load_{Unocc\,Re\,tro} \times Hrs_{Unocc\,Re\,tro}}{Eff \times 1{,}000\, {}^{mbtu}/_{mmbtu}} \right) \times {}^{\$}/_{mmbtu} \right]$$

$$Cooling = CoolBase - CoolPost$$

$$CoolBase = $$

$$\sum_{buildings} \left[\sum_{Bin}^{Cooling} \left(\frac{Load_{OccBase} \times Hrs_{OccBase} + Load_{UnoccBase} \times Hrs_{UnoccBase}}{COP \times 3.413\, {}^{mbtu}/_{kWh}} \right) \times {}^{\$}/_{kWh} \right]$$

$$CoolPost = $$

$$\sum_{buildings} \left[\sum_{Bin}^{Cooling} \left(\frac{Load_{Occ\,Re\,tro} \times Hrs_{Occ\,Re\,tro} + Load_{Unocc\,Re\,tro} \times Hrs_{Unocc\,Re\,tro}}{COP \times 3.413\, {}^{mbtu}/_{kWh}} \right) \times {}^{\$}/_{kWh} \right]$$

Where

kW_{Base} - Total fan and pump motor kW under EMS control, as per calculation in the energy audit
Hrs_{Base} - Base motor operating hours, as per calculation in the energy audit
Hrs_{Retro} - Retrofit motor operating hours, as per calculation in the energy audit
$Load_{OccBase}$ - Building load per bin, including infiltration load, (mbtu/hr) under current conditions during occupied hours, as per calculation in the energy audit
$Load_{UnoccBase}$ - Building load per bin, including infiltration load, (mbtu/hr) under current conditions during unoccupied hours, as per calculation in the energy audit
$Load_{OccRetro}$ - Building load per bin, including infiltration load, (mbtu/hr) with reduced setpoint temperature and improved control, as per calculation in the energy audit
$Load_{UnoccRetro}$ - Building load per bin, including infiltration load, (mbtu/hr) with night setback and improved control, as per calculation in the energy audit
$Hrs_{OccBase}$ - Baseline heating and cooling bin hours during occupied period, as per calculation in the energy audit
$Hrs_{UnoccBase}$ - Baseline heating and cooling bin hours during unoccupied period, as per calculation in the energy audit
$Hrs_{OccRetro}$ - Retrofit heating and cooling bin hours during occupied period, as per calculation in the energy audit
$Hrs_{UnoccRetro}$ - Retrofit heating and cooling bin hours during unoccupied period, as per calculation in the energy audit
Eff - Heating system efficiency, as per calculation in the energy audit
COP - Cooling system coefficient of performance, as per calculation included in the energy audit
$/kWh - Unit cost of electric energy, as per Unit Prices section
$/mmbtu - Unit cost of fossil fuel, as per Unit Prices section

METERING PLAN

Upon completion of the installation, Ameresco will commission the programmable thermostats and boiler controls and test their functionality to ensure the ability of savings as specified in the energy audit to occur. No measurements will be taken.

Ameresco will inspect the web enabled thermostats both quarterly and annually, as part of its site inspection. A review of available trend data will be performed, and a visual inspection of major control areas will be completed. Observations identified during the site inspection shall be incorporated into the annual reconciliation report.

ANNUAL INSPECTION PROCEDURES (GENERAL)

- Confirm that the system/equipment is functional and operating as intended.

- Verify that the system is being properly maintained. Review current O&M practices to ensure compliance with the contract requirements.
- Review current or past problems with the system, especially those that may affect energy savings.
- Identify any building renovations or changes in the facility operation during the past year that would affect the project performance and/or savings.

QUARTERLY INSPECTION PROCEDURES (EMS)

- Review trend logs and compare with the standards established in the ESA.
- Review the notification history for set-points and occupancy schedules that have been modified since the last inspection.
- Recommend set-point and schedule adjustments – particularly those that do not comply with the contract standards.
- Review the basic system operation with new personnel and recommend training, if necessary.
- Review alarm history and discuss possible reasons and corrections.

OCCUPIED SCHEDULING

Ameresco will initially setup the occupancy schedules in the programmable thermostats to reflect the current occupancy of the buildings. The HVAC systems will only be operated when the buildings are supposed to be occupied.

Table 7.3: Occupancy Schedule by Building

Building	**Start time (Mon – Fri)**	**Stop time (Mon – Fri)**	**Weekends/ Holidays**	**Period**
121 Main Street	8:00 AM	5:00 PM	OFF	Year-round
Putnam National Golf Club - Clubhouse	6:00 AM	6:00 PM	ON	Year-round
Donald B. Smith Government Campus - Building 1	9:00 AM	5:00 PM	OFF	Year-round
Donald B. Smith Government Campus - Building 2	9:00 AM	5:00 PM	OFF	Year-round
Donald B. Smith Government Campus - Building 3	9:00 AM	5:00 PM	OFF	Year-round
Kern Building - Health Dept/DMV/WIC	9:00 AM	5:00 PM	OFF	Year-round
William Koehler Senior Center	9:30 AM	3:30 PM	OFF	Year-round
Putnam Valley Senior Center	8:00 AM	4:00 PM	OFF	Year-round
Putnam Family & Community Services - 1808	8:30 AM	8:30 PM	OFF	Year-round
Highway Department - Building 1 Admin	9:00 AM	5:00 PM	OFF	Year-round
Highway Department - Building 2 Sign Shop	9:00 AM	5:00 PM	OFF	Year-round
Highway Department - Building 3 Dispatch/Garage	9:00 AM	5:00 PM	OFF	Year-round
Highway Department - Building 4 Garage	9:00 AM	5:00 PM	OFF	Year-round
Board of Elections	8:00 AM	6:00 PM	OFF	Year-round
Putnam Family & Community Services - 1816	8:30 AM	8:30 PM	OFF	Year-round
Burchetta Building (Law Dept) - 48 Gleneida	9:00 AM	5:00 PM	OFF	Year-round
Tilly Foster Farm Building #8	Mon-Wed: Closed Thur-Sun: 5:00 PM	Mon-Wed: Closed Thur-Sun: 11:00 PM	OFF	Year-round

UNOCCUPIED ZONE TEMPERATURE RESET

The following setpoints will initially be setup in the programmable thermostats.

Table 7.4: Initial Setpoints

	Cooling (ºF)	*Heating (ºF)*
Occupied	74.0	70.0
Unoccupied	80.0	55.0

ECM 5: HEAT TIMER & THERMOSTATIC RADIATOR VALVES

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = HeatBase - HeatPost$$

$$HeatBase =$$

$$\sum_{buildings}\left[\sum_{Bin}^{Heating}\left(\frac{Load_{OccBase}\times Hrs_{OccBase}+Load_{UnoccBase}\times Hrs_{UnoccBase}}{Eff\times 1{,}000\,{}^{mbtu}/_{mmbtu}}\right)\times {}^{\$}/_{mmbtu}\right]$$

$$HeatPost =$$

$$\sum_{buildings}\left[\sum_{Bin}^{Heating}\left(\frac{Load_{Occ\,Re\,tro}\times Hrs_{Occ\,Re\,tro}+Load_{Unocc\,Re\,tro}\times Hrs_{Unocc\,Re\,tro}}{Eff\times 1{,}000\,{}^{mbtu}/_{mmbtu}}\right)\right.$$

$$\left.\times {}^{\$}/_{mmbtu}\right]$$

Where

Load$_{\text{OccBase}}$ - Building load per bin, including infiltration load, (mbtu/hr) under current conditions during occupied hours, as per calculation in the energy audit

Load$_{\text{UnoccBase}}$ - Building load per bin, including infiltration load, (mbtu/hr) under current conditions during unoccupied hours, as per calculation in the energy audit

Load$_{\text{OccRetro}}$ - Building load per bin, including infiltration load, (mbtu/hr) with reduced setpoint temperature and improved control, as per calculation in the energy audit

Load$_{\text{UnoccRetro}}$ - Building load per bin, including infiltration load, (mbtu/hr) with night setback and improved control, as per calculation in the energy audit

Hrs$_{\text{OccBase}}$ - Baseline heating and cooling bin hours during occupied period broken out into peak and offpeak, as per calculation in the energy audit

Hrs$_{\text{UnoccBase}}$ - Baseline heating and cooling bin hours during unoccupied period broken out into peak and offpeak, as per calculation in the energy audit

Hrs$_{\text{OccRetro}}$ - Retrofit heating and cooling bin hours during occupied period broken out into peak and offpeak, as per calculation in the energy audit

Hrs$_{\text{UnoccRetro}}$ - Retrofit heating and cooling bin hours during unoccupied period broken out into peak and offpeak, as per calculation in the energy audit

Eff - Heating system efficiency, as per calculation in the energy audit

$/mmbtu - Unit cost of fossil fuel, as per Unit Prices section

METERING PLAN

Upon completion of the installation, Ameresco will commission the TRVs and boiler controls and test their functionality to ensure the ability of savings as specified in the energy audit to occur. No measurements will be taken.

ECM 6: FUEL OIL TO NATURAL GAS CONVERSION

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = Baseline - PostInstallation$$

$$Baseline = \frac{Usage_{Current} \times Eff_{Retro}}{Eff_{Base}} \times {}^{\$}/_{mmbtu_{Base}}$$

$$PostInstallation = Usage_{Current} \times {}^{\$}/_{mmbtu_{Post}}$$

Where

Eff_{Base}	- Base heating system efficiency, as per calculation in the energy audit
Eff_{Retro}	- Retrofit heating system efficiency, as per calculation in the energy audit, subject to metering plan below
$Usage_{Current}$	- Actual metered fuel usage in mmbtu for new boilers, minimum of the proposed usage in the energy audit. Actual metered fuel usage for the affected boilers only shall be provided by the County or utility and must be from utility grade meters.
$\$/mmbtu_{Base}$	- Baseline unit cost of fossil fuel, as per Unit Prices section below
$\$/mmbtu_{Post}$	- Proposed unit cost of fossil fuel, as per Unit Prices section below

METERING PLAN

As part of the commissioning process, the combustion efficiency of the newly installed boilers will be measured and compared to the expected values for the new boilers per the energy audit calculation.If the measurement is within 3% of the energy audit combustion efficiency values no change will be made. If the measurement value is not within 3%, Ameresco will either take corrective action for them to be within this limit, or will utilize the measured values. For condensing boilers these measurements will be taken over a range of return water temperatures during a period of not more than a week. For non-condensing boilers these measurements will be taken one time during a burner cycle, after steady state firing has been reached.

Ameresco will use a calibrated portable flue gas analyzer (Testo or equivalent) to measure combustion efficiency for each new boiler. Boilers will only be tested once they have reached steady state firing, which shall be defined as having continuously fired on high fire for at least 15 minutes and the return water temperature remains constant, plus or minus 2.5ºF, for 15 minutes. For steam boilers, the return water requirement is replaced with 15 minutes of continuous steam production as indicated by continuously rising or constant steam pressure greater than 1psi. Once steady state is reached, the operational boiler’s combustion efficiency will be measured with at least two additional measurements taken at least 5 minutes apart with the boiler remaining in continuous high fire operation. Only one boiler shall be operated at a time in order to assist steady state operation. This process shall be repeated for each new boiler.

For non-condensing boilers, the above measurement procedure shall only need to be performed once. For condensing boilers, the above measurement procedure shall be repeated so as to perform measurements at multiple steady state return water temperatures between 100ºF and 140ºF. At least 3 return water states shall be measured with at least 5ºF between states.

The measurements for all new boilers associated with a single boiler plant will be averaged together to represent the measured combustion efficiency for each new boiler plant. The difference between the energy audit boiler calculation efficiency and the measured combustion efficiency will be subject to the 5% hurdle.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

ECM 8: VARIABLE FREQUENCY DRIVES

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = Baseline - PostInstallation$$

$$Baseline = \sum_{motor} \left(kW \times Hours \times {}^{\$}/_{kWh} \right)$$

$$Postinstallation = \sum_{motor} \left(Usage \times {}^{\$}/_{kWh} \right)$$

Where

kW - Base motor kW, as per calculation in the energy audit

Hours - Run hours of each applicable motor, as per calculation in the energy audit

Usage - Energy usage of each motor with VFD control, as per calculation in the energy audit

$/kWh - Unit cost of electric energy, as per Unit Prices section

METERING PLAN

No measurements will be taken for this ECM.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

ECM 10: PREMIUM EFFICIENCY TRANSFORMERS

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = Baseline - PostInstallation$$

$$Baseline = \sum_{transformer} \left(Usage_{Base} \times {}^{\$}/_{kWh} + kW_{Base} \times Mths \times {}^{\$}/_{kW} \right)$$

$$PostInstallation = \sum_{transformer} \left(Usage_{Re\,tro} \times {}^{\$}/_{kWh} + kW_{Re\,tro} \times Mths \times {}^{\$}/_{kW} \right)$$

Where

kW_{Base} - Baseline transformer kW, as per calculation in the energy audit
kW_{Retro} - Retrofit transformer kW, as per calculation in the energy audit, subject to metering described below
Mths - Number of months of operation, as per calculation in the energy audit
$Usage_{Base}$ - Baseline energy usage for transformers, as per calculation in the energy audit, subject to metering described below
$Usage_{Post}$ - Retrofit energy usage for transformers, as per calculation in the energy audit, subject to metering described below
$/kW - Unit cost of electrical demand, as per Unit Prices section
$/kWh - Unit cost of electric energy, as per Unit Prices section

METERING PLAN

Ameresco will measure the input and output power for a statistically significant sample size of transformers after replacement, and if the total sample values are within 10% of the energy audit values no change will be made. If the total sample values are not within 10%, Ameresco will either take corrective action for them to be within this limit, or will utilize the measured values.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

ECM 11: VENDING MISERS

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = EnergySavings - Heat + Cool$$

$$EnergySavings = \sum_{machine} \left(kW \times (Hrs_{Base} - Hrs_{Re\,tro}) \times {}^{\$}/_{kWh} \right)$$

$$Heat = \sum_{machine} \left(\frac{kW \times (Hrs_{Base} - Hrs_{Re\,tro}) \times \frac{Mths_{heat}}{12months} \times 3{,}413 \frac{btu}{kW\square} \times Util}{Boiler_{Eff} \times 1{,}000{,}000 \, {}^{btu}/_{mmbtu}} \times {}^{\$}/_{mmbtu} \right)$$

$$Cool = \sum_{machine} \left(\frac{kW \times (Hrs_{Base} - Hrs_{Re\,tro}) \times \frac{Mths_{cool}}{12months} \times Util \times \text{Cool\%}}{Cool_{Eff}} \times {}^{\$}/_{kWh} \right)$$

Where

kW - Vending machine kW, as per calculation in the energy audit

Hrs_{Base} - Total base operating hours, as per calculation in the energy audit

Hrs_{Retro} - Total retro operating hours, as per calculation in the energy audit

$Mths_{heat}$ - Number of months the heating penalty will occur, as per calculation in the energy audit

$Mths_{cool}$ - Number of months the cooling benefit will occur, as per calculation in the energy audit

$Boiler_{Eff}$ - Average heating system efficiency, as per calculation in the energy audit

$Cool_{Eff}$ - Average cooling system performance (COP), as per calculation in the energy audit

Util - Factor representing the amount of energy transmitted to the space, as per calculation in the energy audit

Cool% - Factor representing the amount space with cooling, as per calculation in the energy audit

\$/mmbtu - Unit cost of fossil fuel, as per Unit Prices section below

\$/kWh - Unit cost of electric energy, as per Unit Prices section

METERING PLAN

No measurements will be taken for this ECM.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

ECM 12: WALK-IN REFRIGERATOR CONTROLS

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = Baseline - PostInstallation$$

$$Baseline = \sum_{unit} \left(Electric_{Base} \times {}^{\$}/_{kWh} \right)$$

$$Postinstallation = \sum_{unit} \left(Electric_{Post} \times {}^{\$}/_{kWh} \right)$$

Where

$Electric_{Base}$ - Electric usage based on existing system, as per calculation in energy audit

$Electric_{Post}$ - Electric usage based on proposed system, as per calculation in energy audit

\$/kWh - Unit cost of electric energy, as per Unit Prices section

METERING PLAN

No measurements will be taken for this ECM.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

ECM 13: STEAM TRAP REPLACEMENTS

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = Baseline - PostInstallation$$

$$Baseline = Loss_{Base} \times {}^{\$}/_{mmbtu}$$

$$PostInstallation = Loss_{Post} \times {}^{\$}/_{mmbtu}$$

Where

$Loss_{Base}$ - Base energy lost due to steam traps (mmbtu), as per calculation in energy audit
$Loss_{Post}$ - Retrofit energy lost due to steam traps (mmbtu), as per calculation in energy audit
$/mmbtu - Unit cost of fossil fuel, as per Unit Prices section below

METERING PLAN

No measurements will be taken for this ECM.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

ECM 14: INFILTRATION REDUCTION

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = Baseline - PostInstallation$$

$$Baseline =$$

$$\sum_{Building} \left(\sum_{Bin}^{Heating} \left(\frac{Load_{BaseOcc} \times Hrs_{Occ} + Load_{BaseUnocc} \times Hrs_{Unocc}}{Eff \times 1{,}000\, {}^{mbtu}/_{mmbtu}} \right) \times {}^{\$}/_{mmbtu} + \sum_{Bin}^{Cooling} \left(\frac{Load_{BaseOcc} \times Hrs_{Occ} + Load_{BaseUnocc} \times Hrs_{Unocc}}{COP \times 3.413 \frac{mbtu}{kWh}} \right) \times {}^{\$}/_{kWh} \right)$$

$$PostInstallation =$$

$$\sum_{Building} \left(\sum_{Bin}^{Heating} \left(\frac{Load_{Re\,troOcc} \times Hrs_{Occ} + Load_{Re\,troUnocc} \times Hrs_{Unocc}}{Eff \times 1{,}000\, {}^{mbtu}/_{mmbtu}} \right) \times {}^{\$}/_{mmbtu} + \sum_{Bin}^{Cooling} \left(\frac{Load_{Re\,troOcc} \times Hrs_{Occ} + Load_{Re\,troUnocc} \times Hrs_{Unocc}}{COP \times 3.413 \frac{mbtu}{kWh}} \right) \times {}^{\$}/_{kWh} \right)$$

$$Load_{\frac{Base}{Re\,tro}\frac{Occ}{Unocc}} = \left(Infil_{\frac{Base}{Re\,tro}\frac{Occ}{Unocc}} \right)$$

Where

Infil - The infiltration load per bin (mbtu/hr) for either the base case or the retrofit case during either the occupied or unoccupied period, as per the calculation in the energy audit

Hrs_{Occ} - Bin hours for occupied period, as per calculation in the energy audit

Hrs_{Unocc} - Bin hours for unoccupied period, as per calculation in the energy audit

Eff - Heating system efficiency, as per calculation in the energy audit

COP - Cooling system coefficient of performance, as per calculation included in the energy audit

$/mmbtu - Unit cost of fossil fuel, as per Unit Prices section below

$/kWh - Unit cost of electric energy, as per Unit Prices section

METERING PLAN

No measurements will be taken for this ECM.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

ECM 15: PIPE INSULATION

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = Baseline_{Heat} - PostInstallation_{Heat}$$

$$Baseline_{Heat} = \sum_{Pipes} \left(\frac{LossRate_{Base} \times Hrs}{Eff \times 1000 \, {}^{mbtu}/_{mmbtu}} \right) \times {}^{\$}/_{mmbtu}$$

$$PostInstallation_{Heat} = \sum_{Pipes} \left(\frac{LossRate_{Retro} \times Hrs}{Eff \times 1000 \, {}^{mbtu}/_{mmbtu}} \right) \times {}^{\$}/_{mmbtu}$$

Where

$LossRate_{Base}$ - Existing pipe heat loss rate (mbtu/hr), as per calculation in energy audit
$LossRate_{Retro}$ - Proposed pipe heat loss rate (mbtu/hr), as per calculation in energy audit
Hrs - Total pipe run hours, as per calculation in energy audit
Eff - Base heating plant efficiency, as per calculation in energy audit
COP - Cooling system coefficient of performance, as per calculation included in energy audit
$/mmbtu - Unit cost of fossil fuel, as per Unit Prices section below
$/kWh - Unit cost of electric energy, as per Unit Prices section

METERING PLAN

No measurements will be taken for this ECM.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

ECM 16: BOILER REPLACEMENTS

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = Baseline - PostInstallation$$

$$Baseline = \frac{Usage_{Current} \times Eff_{Retro}}{Eff_{Base}} \times {}^{\$}/_{mmbtu_{Base}}$$

$$PostInstallation = Usage_{Current} \times {}^{\$}/_{mmbtu_{Post}}$$

Where

Eff_{Base}	- Base heating system efficiency, as per calculation in the energy audit
Eff_{Retro}	- Retrofit heating system efficiency, as per calculation in the energy audit, subject to metering plan below
$Usage_{Current}$	- Actual metered fuel usage in mmbtu for new boilers, minimum of the proposed usage in the energy audit. Actual metered fuel usage for the affected boilers only shall be provided by the County or utility and must be from utility grade meters.
$\$/mmbtu_{Base}$	- Baseline unit cost of fossil fuel, as per Unit Prices section below
$\$/mmbtu_{Post}$	- Proposed unit cost of fossil fuel, as per Unit Prices section below

METERING PLAN

As part of the commissioning process, the combustion efficiency of the newly installed boilers will be measured and compared to the expected values for the new boilers per the energy audit calculation. If the measurement is within 3% of the energy audit combustion efficiency values no change will be made. If the measurement value is not within 3%, Ameresco will either take corrective action for them to be within this limit, or will utilize the measured values. For condensing boilers these measurements will be taken over a range of return water temperatures during a period of not more than a week. For non-condensing boilers these measurements will be taken one time during a burner cycle, after steady state firing has been reached.

Ameresco will use a calibrated portable flue gas analyzer (Testo or equivalent) to measure combustion efficiency for each new boiler. Boilers will only be tested once they have reached steady state firing, which shall be defined as having continuously fired on high fire for at least 15 minutes and the return water temperature remains constant, plus or minus 2.5ºF, for 15 minutes. For steam boilers, the return water requirement is replaced with 15 minutes of continuous steam production as indicated by continuously rising or constant steam pressure greater than 1psi. Once steady state is reached, the operational boiler's combustion efficiency will be measured with at least two additional measurements taken at least 5 minutes apart with the boiler remaining in continuous high fire operation. Only one boiler shall be operated at a time in order to assist steady state operation. This process shall be repeated for each new boiler.

For non-condensing boilers, the above measurement procedure shall only need to be performed once. For condensing boilers, the above measurement procedure shall be repeated so as to perform measurements at multiple steady state return water temperatures between 100ºF and 140ºF. At least 3 return water states shall be measured with at least 5ºF between states.

The measurements for all new boilers associated with a single boiler plant will be averaged together to represent the measured combustion efficiency for each new boiler plant. The difference between the energy audit boiler calculation efficiency and the measured combustion efficiency will be subject to the 3% hurdle.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

ECM 17: WINDOW REPLACEMENTS

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = Baseline - PostInstallation$$

$$Baseline =$$

$$\sum_{Building}\left(\sum_{Bin}^{Heating}\left(\frac{Load_{BaseOcc}\times Hrs_{Occ}+Load_{BaseUnocc}\times Hrs_{Unocc}}{Eff\times 1{,}000\,{}^{mbtu}/_{mmbtu}}\right)\times {}^{\$}/_{mmbtu} + \sum_{Bin}^{Cooling}\left(\frac{Load_{BaseOcc}\times Hrs_{Occ}+Load_{BaseUnocc}\times Hrs_{Unocc}}{COP\times 3.413\,{}^{mbtu}/_{kWh}}\right)\times {}^{\$}/_{kWh}\right)$$

$$PostInstallation =$$

$$\sum_{Building}\left(\sum_{Bin}^{Heating}\left(\frac{Load_{Re\,troOcc}\times Hrs_{Occ}+Load_{Re\,troUnocc}\times Hrs_{Unocc}}{Eff\times 1{,}000\,{}^{mbtu}/_{mmbtu}}\right)\times {}^{\$}/_{mmbtu} + \sum_{Bin}^{Cooling}\left(\frac{Load_{Re\,troOcc}\times Hrs_{Occ}+Load_{Re\,troUnocc}\times Hrs_{Unocc}}{COP\times 3.413\,{}^{mbtu}/_{kWh}}\right)\times {}^{\$}/_{kWh}\right)$$

$$Load_{\frac{Base}{Re\,tro}\frac{Occ}{Unocc}} = \left(Trans_{\frac{Base}{Re\,tro}\frac{Occ}{Unocc}} + Infil_{\frac{Base}{Re\,tro}\frac{Occ}{Unocc}}\right)$$

Where

Trans - The transmission load per bin (mbtu/hr) for either the base case or the retrofit case during either the occupied or unoccupied period, as per the calculation in the energy audit

Infil - The infiltration load per bin (mbtu/hr) for either the base case or the retrofit case during either the occupied or unoccupied period, as per the calculation in energy audit

Hrs_{Occ} - Bin hours for occupied period, as per calculation in energy audit

Hrs_{Unocc} - Bin hours for unoccupied period, as per calculation in energy audit

Eff - Heating system efficiency, as per calculation in energy audit

COP - Cooling system coefficient of performance, as per calculation included in energy audit

$/mmbtu - Unit cost of fossil fuel, as per Unit Prices section below

$/kWh - Unit cost of peak electric energy, as per Unit Prices section

METERING PLAN

No measurements will be taken for this ECM.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

ECM 18: SOLAR PV ARRAY

SAVINGS ALGORITHM

$$Savings = Consumed + Exported + Demand$$

$$Consumed = \sum_{Month} \left(PV_{Output} \times \%Used \times (1 + Solar_{Esc})^{(Year-1)} \times {}^{\$}/_{kWh} \right)$$

$$Exported = \sum_{Month} \left(PV_{Output} \times (1 - \%Used) \times (1 + Solar_{Esc})^{(Year-1)} \times {}^{\$}/_{kWh_{VS}} \right)$$

$$Demand = \sum_{Month} \left(kW \times {}^{\$}/_{kW} \right)$$

Where

PV_{Output} - Electrical energy output by the PV array, as per calculation in the energy audit
%Used - Monthly expected energy consumed onsite, as per calculation in the energy audit
$Solar_{Esc}$ - Solar degradation rate, as per Unit Prices section
Year - Applicable savings year, i.e. Year 1
kW - Monthly demand reduction due to the array, as per calculation in the energy audit
\$/kW - Unit cost of electric demand, as per Unit Prices section
\$/kWh - Unit cost of electric energy, as per Unit Prices section
$\$/kWh_{VS}$ - Unit cost of Value Stack electric energy, as per Unit Prices section

METERING PLAN

Every year of the M&V term Ameresco will compare the peak output of the system on a clear day to the expected peak output from the modelling software for the same time of year, given similar angle of the sun and insolation, in order to confirm the system is fully operational.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report. Additionally, Ameresco will provide an annual summary of the monthly production for each system including any operational data provided by the monitoring system.

ECM 19: AHU REPLACEMENTS

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = Baseline - PostInstallation$$

$$Baseline =$$

$$Usage_{Base} \times {}^{\$}/_{kWh} + kW_{Base} \times Mths \times {}^{\$}/_{kW}$$

$$PostInstallation =$$

$$Usage_{Re\,tro} \times {}^{\$}/_{kWh} + kW_{Re\,tro} \times Mths \times {}^{\$}/_{kW}$$

Where

kW_{Base} - Baseline AHU kW, as per calculation in the energy audit
kW_{Retro} - Retrofit AHU kW, as per calculation in the energy audit
Mths - Number of months of operation, as per in the energy audit
$Usage_{Base}$ - Baseline energy usage for AHUs, as per calculation in the energy audit
$Usage_{Post}$ - Retrofit energy usage for AHUs, as per calculation in the energy audit
$/kW - Unit cost of electrical demand, as per Unit Prices section
$/kWh - Unit cost of electric energy, as per Unit Prices section

METERING PLAN

No measurements will be taken for this ECM.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

ECM 20: PLUG LOAD CONTROLLERS

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = EnergySavings$$

$$EnergySavings = \sum_{machine} \left(kW \times (Hrs_{Base} - Hrs_{Re\,tro}) \times {}^{\$}/_{kWh} \right)$$

Where

kW	- Connected kW, as per calculation in the energy audit
Hrs_{Base}	- Total base operating hours, as per calculation in the energy audit
Hrs_{Retro}	- Total retro operating hours, as per calculation in the energy audit
$/kWh	- Unit cost of electric energy, as per Unit Prices section

METERING PLAN

No measurements will be taken for this ECM.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

ECM 22: CHILLER REPLACEMENTS

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = Baseline - PostInstallation$$

$$Baseline =$$

$$Usage_{Base} \times {}^{\$}\!/_{kWh} + kW_{Base} \times Mths \times {}^{\$}\!/_{kW}$$

$$PostInstallation =$$

$$Usage_{Re\,tro} \times {}^{\$}\!/_{kWh} + kW_{Re\,tro} \times Mths \times {}^{\$}\!/_{kW}$$

Where

kW_{Base} - Baseline chiller kW, as per calculation in the energy audit
kW_{Retro} - Retrofit chiller kW, as per calculation in the energy audit,
Mths - Number of months of operation, as per in the energy audit
$Usage_{Base}$ - Baseline energy usage for chillers, as per calculation in the energy audit
$Usage_{Post}$ - Retrofit energy usage for chillers, as per calculation in the energy audit
$/kW - Unit cost of electrical demand, as per Unit Prices section
$/kWh - Unit cost of electric energy, as per Unit Prices section

METERING PLAN

No measurements will be taken for this ECM.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

ECM 23: SIDING REPLACEMENT

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = Baseline - PostInstallation$$

$$Baseline =$$

$$\sum_{Building}\left(\sum_{Bin}^{Heating}\left(\frac{Load_{BaseOcc} \times Hrs_{Occ} + Load_{BaseUnocc} \times Hrs_{Unocc}}{Eff \times 1{,}000\,{}^{mbtu}/_{mmbtu}}\right) \times {}^{\$}/_{mmbtu} + \sum_{Bin}^{Cooling}\left(\frac{Load_{BaseOcc} \times Hrs_{Occ} + Load_{BaseUnocc} \times Hrs_{Unocc}}{COP \times 3.413\,{}^{mbtu}/_{kWh}}\right) \times {}^{\$}/_{kWh}\right)$$

$$PostInstallation =$$

$$\sum_{Building}\left(\sum_{Bin}^{Heating}\left(\frac{Load_{RetroOcc} \times Hrs_{Occ} + Load_{RetroUnocc} \times Hrs_{Unocc}}{Eff \times 1{,}000\,{}^{mbtu}/_{mmbtu}}\right) \times {}^{\$}/_{mmbtu} + \sum_{Bin}^{Cooling}\left(\frac{Load_{RetroOcc} \times Hrs_{Occ} + Load_{RetroUnocc} \times Hrs_{Unocc}}{COP \times 3.413\,{}^{mbtu}/_{kWh}}\right) \times {}^{\$}/_{kWh}\right)$$

$$Load_{\frac{Base}{Retro}\frac{Occ}{Unocc}} = \left(Trans_{\frac{Base}{Retro}\frac{Occ}{Unocc}} + Infil_{\frac{Base}{Retro}\frac{Occ}{Unocc}}\right)$$

Where

Trans - The transmission load per bin (mbtu/hr) for either the base case or the retrofit case during either the occupied or unoccupied period, as per the calculation in the energy audit

Infil - The infiltration load per bin (mbtu/hr) for either the base case or the retrofit case during either the occupied or unoccupied period, as per the calculation in energy audit

Hrs_{Occ} - Bin hours for occupied period, as per calculation in energy audit

Hrs_{Unocc} - Bin hours for unoccupied period, as per calculation in energy audit

Eff - Heating system efficiency, as per calculation in energy audit

COP - Cooling system coefficient of performance, as per calculation included in energy audit

$/mmbtu - Unit cost of fossil fuel, as per Unit Prices section below

$/kWh - Unit cost of peak electric energy, as per Unit Prices section

METERING PLAN

No measurements will be taken for this ECM.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

ECM 24: ROOF REPLACEMENT

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = Baseline - PostInstallation$$

$$Baseline =$$

$$\sum_{Building}\left(\sum_{Bin}^{Heating}\left(\frac{Load_{BaseOcc}\times Hrs_{Occ}+Load_{BaseUnocc}\times Hrs_{Unocc}}{Eff\times 1{,}000\,{}^{mbtu}/_{mmbtu}}\right)\times {}^{\$}/_{mmbtu} + \sum_{Bin}^{Cooling}\left(\frac{Load_{BaseOcc}\times Hrs_{Occ}+Load_{BaseUnocc}\times Hrs_{Unocc}}{COP\times 3.413\,{}^{mbtu}/_{kWh}}\right)\times {}^{\$}/_{kWh}\right)$$

$$PostInstallation =$$

$$\sum_{Building}\left(\sum_{Bin}^{Heating}\left(\frac{Load_{Re\,troOcc}\times Hrs_{Occ}+Load_{Re\,troUnocc}\times Hrs_{Unocc}}{Eff\times 1{,}000\,{}^{mbtu}/_{mmbtu}}\right)\times {}^{\$}/_{mmbtu} + \sum_{Bin}^{Cooling}\left(\frac{Load_{Re\,troOcc}\times Hrs_{Occ}+Load_{Re\,troUnocc}\times Hrs_{Unocc}}{COP\times 3.413\,{}^{mbtu}/_{kWh}}\right)\times {}^{\$}/_{kWh}\right)$$

$$Load_{\frac{Base}{Re\,tro}\frac{Occ}{Unocc}} = \left(Trans_{\frac{Base}{Re\,tro}\frac{Occ}{Unocc}}\right)$$

Where

Trans	- The transmission load per bin (mbtu/hr) for either the base case or the retrofit case during either the occupied or unoccupied period, as per the calculation in the energy audit
Hrs_{Occ}	- Bin hours for occupied period, as per calculation in energy audit
Hrs_{Unocc}	- Bin hours for unoccupied period, as per calculation in energy audit
Eff	- Heating system efficiency, as per calculation in energy audit
COP	- Cooling system coefficient of performance, as per calculation included in energy audit
$/mmbtu	- Unit cost of fossil fuel, as per Unit Prices section below
$/kWh	- Unit cost of peak electric energy, as per Unit Prices section

METERING PLAN

No measurements will be taken for this ECM.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

ECM 25: WINDOW RESTORATION

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = Baseline - PostInstallation$$

$$Baseline =$$

$$\sum_{Building}\left(\sum_{Bin}^{Heating}\left(\frac{Load_{BaseOcc}\times Hrs_{Occ}+Load_{BaseUnocc}\times Hrs_{Unocc}}{Eff\times 1{,}000\,{}^{mbtu}/_{mmbtu}}\right)\times{}^{\$}/_{mmbtu} + \sum_{Bin}^{Cooling}\left(\frac{Load_{BaseOcc}\times Hrs_{Occ}+Load_{BaseUnocc}\times Hrs_{Unocc}}{COP\times 3.413\,{}^{mbtu}/_{kWh}}\right)\times{}^{\$}/_{kWh}\right)$$

$$PostInstallation =$$

$$\sum_{Building}\left(\sum_{Bin}^{Heating}\left(\frac{Load_{Re\,troOcc}\times Hrs_{Occ}+Load_{Re\,troUnocc}\times Hrs_{Unocc}}{Eff\times 1{,}000\,{}^{mbtu}/_{mmbtu}}\right)\times{}^{\$}/_{mmbtu} + \sum_{Bin}^{Cooling}\left(\frac{Load_{Re\,troOcc}\times Hrs_{Occ}+Load_{Re\,troUnocc}\times Hrs_{Unocc}}{COP\times 3.413\,{}^{mbtu}/_{kWh}}\right)\times{}^{\$}/_{kWh}\right)$$

$$Load_{\frac{Base}{Re\,tro}_{\frac{Occ}{Unocc}}} = \left(Trans_{\frac{Base}{Re\,tro}_{\frac{Occ}{Unocc}}} + Infil_{\frac{Base}{Re\,tro}_{\frac{Occ}{Unocc}}}\right)$$

Where

Trans - The transmission load per bin (mbtu/hr) for either the base case or the retrofit case during either the occupied or unoccupied period, as per the calculation in the energy audit

Infil - The infiltration load per bin (mbtu/hr) for either the base case or the retrofit case during either the occupied or unoccupied period, as per the calculation in energy audit

Hrs_{Occ} - Bin hours for occupied period, as per calculation in energy audit

Hrs_{Unocc} - Bin hours for unoccupied period, as per calculation in energy audit

Eff - Heating system efficiency, as per calculation in energy audit

COP - Cooling system coefficient of performance, as per calculation included in energy audit

$/mmbtu - Unit cost of fossil fuel, as per Unit Prices section below

$/kWh - Unit cost of peak electric energy, as per Unit Prices section

METERING PLAN

No measurements will be taken for this ECM.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

ECM 26: MOVE REGISTER

ENERGY SAVINGS CALCULATION METHODOLOGY

SAVINGS ALGORITHM

$$Savings = Baseline - PostInstallation$$

$$Baseline = Loss_{Base} \times {}^{\$}/_{mmbtu}$$

$$PostInstallation = Loss_{Post} \times {}^{\$}/_{mmbtu}$$

Where

$Loss_{Base}$ - Base energy loss (mmbtu), as per calculation in energy audit
$Loss_{Post}$ - Retrofit energy loss (mmbtu), as per calculation in energy audit
$/mmbtu - Unit cost of fossil fuel, as per Unit Prices section below

METERING PLAN

No measurements will be taken for this ECM.

As part of the monitoring services under this Agreement Ameresco will perform a yearly site inspection of this ECM. The observations during this inspection will be made part of the Annual Reconciliation Report.

OPERATIONS AND MAINTENANCE SAVINGS

$$AnnualSavings = {\$MAINT}/{year} \times (1 + Esc)^{(CurrentYear - 2019)}$$

The maintenance savings breakdown per measure is as follows:

Table 7.5: Maintenance Savings per Measure

ECM	**$MAINT/year**
ECM 1: Lighting System Improvements - Interior	$6,384
ECM 2: Lighting System Improvements - Exterior	$439
ECM 4: Web-enabled Programmable Thermostats	-$2,320
Totals	**$4,504**

ECM 1 & 2 O&M savings are based on reduced material replacements costs due to replacing old lamps and ballasts with new.

ECM 4 O&M costs are related to EcoBee service fees to maintain the internet connection to the thermostats.

The variable “Esc” equals 3.0% for the term of the project and is described in the Unit Prices section.

UNIT PRICES SECTION

The following base unit prices are based on unit prices for the County, as provided for purposes of this project. These unit prices were utilized in calculating the financial savings associated with modified energy use.

ELECTRIC COSTS

$$\$/_{kW} = Base_{kW} \times (1 + Esc)^{(CurrentYear - 2019)}$$

$$\$/_{kWh} = Base_{kWh} \times (1 + Esc)^{(CurrentYear - 2019)}$$

$$\$/_{kWh_{VS}} = Base_{kWh_{VS}} \times (1 + Esc)^{(CurrentYear - 2019)}$$

The base for each location is listed in the following table.

FOSSIL FUEL COSTS

$$\$/_{mmbtu_{gas}} = \frac{Base_{gas}}{100\, ^{mbtu}/_{Therm}} \times (1 + Esc)^{(CurrentYear - 2019)}$$

$$\$/_{mmbtu_{2oil}} = \frac{Base_{oil}}{138.7\, ^{mbtu}/_{Gal}} \times (1 + Esc)^{(CurrentYear - 2019)}$$

$$\$/_{mmbtu_{2oil}} = \frac{Base_{propane}}{91.3\, ^{mbtu}/_{Gal}} \times (1 + Esc)^{(CurrentYear - 2019)}$$

The base for each location is listed in the following table.

UTILITY ESCALATION

$$Esc = {}^{3.0\%}/_{yr}$$

$$SolarEsc = {}^{-0.5\%}/_{yr}$$

For the purposes of the calculations set forth in this verification plan, the Parties stipulate that all Base Year utility rates and avoided maintenance cost savings shall be cumulatively escalated at three percent (3.0%) for each successive twelve (12) month period commencing with the first twelve (12) month period following the date of the energy audit. This escalation rate will be fixed for the full term of the project and applied annually to all energy unit prices.

For ECM 18, the solar production is estimated to degrade by 0.5% per year. This degradation will be accounted for in addition to the utility rate escalation.

UTILITY RATES TABLE

The following table presents the utility rates applicable to this project.

Table 7.6: Utility Rates Table

Facility	Electric Demand $/kW	Electric $/kWh	Value Stack $/kWh$_{VS}$	Natural Gas $/Therm	Propane $/Gallon	#2 Oil $/Gallon
Sheriff's Department/Correctional Facility	$9.444	$0.07106		$0.7088	$2.216669	$2.1738
New Putnam County Courthouse	$9.444	$0.07106		$0.7733	$2.216669	$2.1738
David D. Bruen County Office Building	$14.750	$0.07310	$0.07678	$0.8152	$2.216669	$2.1738
1812 Courthouse	$14.750	$0.07310		$0.8152	$2.216669	$2.1738
121 Main Street	$14.750	$0.07310		$0.8718	$2.216669	$2.1738
Putnam National Golf Club – Clubhouse	$14.750	$0.07310		$0.8152	$2.216669	$2.1738
Emergency Operations Center/TOPS	$14.750	$0.07310	$0.07617	$0.7733	$2.216669	$2.1738
Donald B. Smith Government Campus – Building 1	$14.750	$0.07310	$0.08599	$0.8152	$2.216669	$2.1738
Donald B. Smith Government Campus – Building 2	$14.750	$0.07310	$0.08555	$0.8152	$2.216669	$2.1738
Donald B. Smith Government Campus – Building 3	$14.750	$0.07310	$0.08591	$0.8152	$2.216669	$2.1738
Kern Building – Health Dept/DMV/WIC	$14.750	$0.07310	$0.07921	$0.8718	$2.216669	$2.1738
William Koehler Senior Center	$9.444	$0.07106		$0.7733	$2.216669	$2.1738
Putnam Valley Senior Center	$14.750	$0.07310		$0.8152	$2.216669	$2.1738
Putnam Family & Community Services – 1808	$14.750	$0.07310		$0.7733	$2.216669	$2.1738
Highway Department – Building 1 Admin	$14.750	$0.07310		$0.8152	$2.216669	$2.1738
Highway Department – Building 2 Sign Shop	$14.750	$0.07310		$0.8152	$2.216669	$2.1738
Highway Department – Building 3 Dispatch/Garage	$14.750	$0.07310		$0.8152	$2.216669	$2.1738
Highway Department – Building 4 Garage	$14.750	$0.07310		$0.8152	$2.216669	$2.1738
Transit Facility/Planning Department	$14.750	$0.07310		$0.8152	$2.216669	$2.1738
Board of Elections	$14.750	$0.07310		$0.7733	$2.216669	$2.1738
Senator Vincent Leibell Veterans' Home	$14.750	$0.07310		$0.8152	$2.216669	$2.1738
Putnam Family & Community Services – 1816	$14.750	$0.07310		$0.7733	$2.216669	$2.1738
Burchetta Building (Law Dept) – 48 Gleneida	$14.750	$0.07310		$0.7733	$2.216669	$2.1738
Tilly Foster Farm Building #8	$14.750	$0.07310		$0.8152	$2.216669	$2.1738

(1) The above Utility Rate Table is used to define the initial "Base" value for purposes of the above calculations.

UTILITY RATES FOR THERMAL SAVINGS

The following table presents the fuels to be used for each ECM having thermal savings.

Table 7.7: Fuels for Each ECM with Thermal Savings

ECM	Jail	Court	Bruen	Court1812	Main	Golf	EOC	Gov2	Gov3	Kern	KoehlerSr	PutnamSr	Fam1808	Hwy1	Hwy2	Hwy3	Hwy4	BOE	Vets	Fam1816	Law	Farm
ECM 1: Lighting Interior	G	G	O	O	G	O	O	G	O	G	G	O	G	O	O	O	O	G	G	G	G	P
ECM 3: Recommission EMS	G	G		O			O															
ECM 4: Web Thermostats						O		G	O	G	G	O	G	O	O	O	O	G		G	G	P
ECM 5: Heat Timer & TRVs			O																			
ECM 6: Oil to Gas			G/O	G/O					G/O					O/P								
ECM 13: Steam Traps			O																			
ECM 14: Infiltration	G	G	O	O	G	O	O	G	O	G	G	O	G	O	O	O	O	G			G	
ECM 15: Pipe Insulation		G	O	O		O	O				G	O		O					G		G	
ECM 16: Boilers																O						
ECM 17: Windows						O																
ECM 23: Siding						O																
ECM 24: Roofs						O		G	G	G												
ECM 25: Window Repair	G		O							G												
ECM 26: Move Register											G											

Gas = G, Oil = O, Propane = P

- **Locations listed with two fuels indicate a switch from oil as the baseline fuel to natural gas or propane as the proposed fuel. The applicable base and post rates for the identified fuels will be used in the respective calculation.**

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APPENDIX A: ENERGY SAVINGS CALCULATIONS

Energy savings calculations are provided for the following ECMs.

ECM No.	Title
1	Lighting System Improvements - Interior
2	Lighting System Improvements - Exterior
3	Recommission Energy Management Systems
4	Web-enabled Programmable Thermostats
5	Heat Timer & Thermostatic Radiator Valves
6	Fuel Oil to Natural Gas Conversion
8	Variable Frequency Drives for HW Pumps
10	Premium Efficiency Transformers
11	Vending Misers
12	Walk-in Refrigeration Controls
13	Steam Trap Replacements
14	Infiltration Reductions
15	Pipe Insulation
16	Boiler Replacements
17	Window Replacements
18	Solar PV Array
19	AHU Replacements
20	Plug Load Controllers
22	Chiller Replacement
23	Siding Replacement
24	Roof Replacement
25	Window Restoration
26	Move Register

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Energy Savings Calculations for

ECM 1: Lighting System Improvements - Interior

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Putnam County, NY
Energy and Demand Savings Summary
Measure ID: 1
Measure Name: **Lighting System Improvements - Interior**
Measure Location:
Engineers:

Site Name:		**Jail**	**Court**	**Bruen**	**Court1812**	**Main**	**Golf**	**EOC**	**Gov2**	**Gov3**	**Kern**	**KoehlerSr**	**PutnamSr**	**Fam1808**	**Hwy1**	**Hwy2**	**Hwy3**	**Hwy4**	**BOE**	**Vets**	**Fam1816**	**Law**	**Farm**	**Summary**
Item	Units	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	
Electricity																								
Energy On-Peak	kWh	273,571	77,397	72,491	8,191	41,395	46,069	40,135	40,961	43,505	48,689	27,729	26,264	30,243	7,006	3,433	9,717	6,073	14,520	26,290	16,891	22,001	925	883,495
Energy Off-Peak	kWh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy Total	kWh	273,571	77,397	72,491	8,191	41,395	46,069	40,135	40,961	43,505	48,689	27,729	26,264	30,243	7,006	3,433	9,717	6,073	14,520	26,290	16,891	22,001	925	883,495
Demand On-Peak, Monthly	kW	54.3	24.4	27.4	3.8	19.7	15.6	17.0	12.2	16.4	16.7	9.8	12.6	9.6	2.6	1.6	4.8	2.5	5.5	7.9	5.5	8.3	0.2	278.6
Demand On-Peak, Annual	kW	652.2	293.1	329.1	45.1	236.2	186.9	203.9	146.3	196.5	200.9	117.4	151.7	115.3	31.6	19.0	57.8	30.3	65.9	95.3	65.7	100.0	2.7	3,342.8
Demand Off-Peak, Monthly	kW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Demand Off-Peak, Annual	kW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fossil Fuel																								0
Natural Gas (NG)	CCF	-4,155	-1,177	0	0	-512	0	0	-480	0	-683	-388	0	-424	0	0	0	0	-176	-571	-291	-458	0	-9,316
Liquid Propane Gas (LPG)	Gallons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-19	-19
Steam	Mlbs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Oil, #2	Gallons	0	0	-732	-88	0	-511	-400	0	-437	0	0	-277	0	-77	-37	-95	-57	0	0	0	0	0	-2,711
Fuel Oil, #4	Gallons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Oil, #6	Gallons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solar Value Stack	$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water																								0
Water Savings	kGallons																							0
Sewer																								0
Sewer Savings	kGallons																							0

Putnam County, NY
Interactive Lighting Savings Calculation

AMERESCO

		Lighting Savings		Heating Penalty								Cooling Benefit			
A		B	C	D	E	F	G					H	I	J	K
Facility	Lighting FAC ID	Annual kW	Annual kWh	Heat Gain to Space	Heating Months	Heating System Efficiency	Heating Penalty MMBtu	Heating Source	Gas Savings	Propane Savings	#2 Oil Savings	Total Space Cooled	Cooling Months	Cooling System COP	Cooling Benefit MMBtu
Sheriff's Department/Correctional Facility	1	54.3	261,190	50.0%	8.0	70.1%	(423.8)	Gas	(4,155)	0	0	100.0%	4.0	3.52	42.3
New Putnam County Courthouse	2	24.4	73,894	50.0%	8.0	70.0%	(120.1)	Gas	(1,177)	0	0	100.0%	4.0	3.52	12.0
David D. Bruen County Office Building	3	27.4	70,486	50.0%	8.0	79.0%	(101.5)	2Oil	0	0	(732)	60.0%	4.0	3.52	6.8
1812 Courthouse	4	3.8	8,009	50.0%	8.0	75.0%	(12.1)	2Oil	0	0	(88)	40.0%	4.0	2.93	0.6
121 Main Street	5	19.7	41,278	50.0%	8.0	90.0%	(52.2)	Gas	(512)	0	0	5.0%	4.0	2.93	0.4
Putnam National Golf Club - Clubhouse	6	15.6	43,589	50.0%	8.0	70.0%	(70.8)	2Oil	0	0	(511)	100.0%	4.0	2.93	8.5
Emergency Operations Center/TOPS	7	17.0	38,318	50.0%	8.0	78.5%	(55.5)	2Oil	0	0	(400)	100.0%	4.0	3.52	6.2
Donald B. Smith Government Campus - Building 2	9	12.2	38,756	50.0%	8.0	90.0%	(49.0)	Gas	(480)	0	0	100.0%	4.0	2.93	7.5
Donald B. Smith Government Campus - Building 3	10	16.4	41,163	50.0%	8.0	77.2%	(60.6)	2Oil	0	0	(437)	100.0%	4.0	2.93	8.0
Kern Building - Health Dept/DMV/WIC	11	16.7	46,068	50.0%	8.0	75.2%	(69.7)	Gas	(683)	0	0	100.0%	4.0	2.93	8.9
William Koehler Senior Center	12	9.8	26,474	50.0%	8.0	76.0%	(39.6)	Gas	(388)	0	0	100.0%	4.0	3.52	4.3
Putnam Valley Senior Center	13	12.6	25,362	50.0%	8.0	75.0%	(38.5)	2Oil	0	0	(277)	75.0%	4.0	3.52	3.1
Putnam Family & Community Services - 1808	15	9.6	28,615	50.0%	8.0	75.3%	(43.2)	Gas	(424)	0	0	100.0%	4.0	2.93	5.6
Highway Department - Building 1 Admin	16	2.6	6,629	50.0%	8.0	71.0%	(10.6)	2Oil	0	0	(77)	100.0%	4.0	2.93	1.3
Highway Department - Building 2 Sign Shop	17	1.6	3,338	50.0%	8.0	75.0%	(5.1)	2Oil	0	0	(37)	50.0%	4.0	2.93	0.3
Highway Department - Building 3 Dispatch/Garage	18	4.8	9,194	50.0%	8.0	79.0%	(13.2)	2Oil	0	0	(95)	100.0%	4.0	2.93	1.8
Highway Department - Building 4 Garage	19	2.5	5,905	50.0%	8.0	85.1%	(7.9)	2Oil	0	0	(57)	50.0%	4.0	2.93	0.6
Board of Elections	21	5.5	13,739	50.0%	8.0	87.0%	(18.0)	Gas	(176)	0	0	100.0%	4.0	2.93	2.7
Senator Vincent Leibell Veterans' Home	22	7.9	26,290	80.0%	8.0	82.1%	(58.3)	Gas	(571)	0	0	0.0%	4.0	2.93	0.0
Putnam Family & Community Services - 1816	23	5.5	15,482	80.0%	8.0	95.0%	(29.7)	Gas	(291)	0	0	100.0%	4.0	2.93	4.8
Burchetta Building (Law Dept) - 48 Gleneida	24	8.3	21,043	80.0%	8.0	82.1%	(46.7)	Gas	(458)	0	0	50.0%	4.0	2.93	3.3
Tilly Foster Farm Building #8	25	0.2	854	80.0%	8.0	90.2%	(1.7)	Propane	0	(19)	0	100.0%	4.0	3.22	0.2
Totals		**278.6**	**845,678**				**(1,327.9)**		**(9,316)**	**(19)**	**(2,711)**				**129.1**

Notes:	
A	Applicable building included in comprehensive energy audit
B	Lighting demand savings {kW} associated with lighting retrofit measures
C	Lighting energy savings {kWh} associated with lighting retrofit measures
D	Estimated percentage of lighting energy transmitted to conditioned space
E	Estimated length of heating season
F	Estimated heating system efficiency, interacted with other measures
G	Resulting heating penalty due to lighting upgrades = [col C] x [col D] x 3,413 x ([col E] / 12) / [col F] / 1,000,000
H	Estimated percentage of space cooled
I	Estimated Length of cooling season
J	Estimated cooling system efficiency, interacted with other measures
K	Resulting cooling benefit due to lighting upgrades = [col C] x [col D] x 3,413 x ([col I] / 12) / [col J] / 1,000,000

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
1.0	Jail	Lobby Entrance	1	2L4' T8 32w U/EL	trof acr	8	8	24 WATT LED/KIT	trof kit LED with controls	8,760	0.5	0.1	0.4	4,205	505	3,700
2.0	Jail	Lobby Entrance	1	2x32W CF HARDWIRED/EL	can rec hor 8"	2	2	17 WATT LED/KIT	can kit LED Syl RT/HO 6"	8,760	0.1	0.0	0.1	1,191	298	894
3.0	Jail	Locker In Main Entry	1	4L4' T8 32w/EL	trof acrylic secure	1	1	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,458	0.1	0.1	0.1	387	194	194
4.0	Jail	Bath Men Main Entry	1	4L4' T8 32w/EL	trof acrylic secure	1	1	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,458	0.1	0.1	0.1	387	194	194
5.0	Jail	Bath Men Main Entry	1	4L4' T8 32w/EL	trof acrylic secure	1	1	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,458	0.1	0.1	0.1	387	194	194
6.0	Jail	Hall Vestibule Main Entry	1	2x32W CF HARDWIRED/EL	can rec hor 8"	2	2	17 WATT LED/KIT	can kit LED Syl RT/HO 6"	8,760	0.1	0.0	0.1	1,191	298	894
7.0	Jail	Stair To Basement		9 WATT LED	sconce	3		NO RETRO	no change already efficient	8,760	0.0	0.0		237	237	
8.0	Jail	Locker Men	b	4L4' T8 32w/EL	trof acrylic secure	6	6	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,458	0.6	0.3	0.3	2,324	1,162	1,162
9.0	Jail	Locker Men	b	2L4' T8 U 1.5"/EL	trof acrylic secure	3	3	20 WATT LED/KIT	rt 2L2' LED bar kit	3,458	0.2	0.1	0.1	602	207	394
10.0	Jail	Bath Men	b	4L4' T8 32w/EL	trof acrylic secure	2	2	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,458	0.2	0.1	0.1	775	387	387
11.0	Jail	Bath Men	b	13W CF HARDWIRED	can rec vert 6"	3	3	8 WATT LED/KIT	can kit LED Syl RT/5-6"	3,458	0.0	0.0	0.0	156	83	73
12.0	Jail	Locker Women	b	4L4' T8 32w/EL	trof acrylic secure	4	4	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,458	0.4	0.2	0.2	1,549	775	775
13.0	Jail	Bath Women	b	4L4' T8 32w/EL	trof acrylic secure	2	2	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,458	0.2	0.1	0.1	775	387	387
14.0	Jail	Bath Women	b	13W CF HARDWIRED	can rec vert 6"	3	3	8 WATT LED/KIT	can kit LED Syl RT/5-6"	3,458	0.0	0.0	0.0	156	83	73
15.0	Jail	Foyer Women Locker	b	2L4' T8 U 1.5"/EL	trof acrylic secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	8,760	0.1	0.0	0.0	508	175	333
16.0	Jail	Hall Basement	b	4L4' T8 32w/EL	trof acrylic secure	8	8	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.9	0.4	0.4	7,849	3,924	3,924
17.0	Jail	Hall Basement	b	2L4' T8 U 1.5"/EL	trof acrylic secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	8,760	0.1	0.0	0.0	508	175	333
18.0	Jail	Office Bed Room	b	4L4' T8 32w/EL	trof acrylic secure	4	4	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,621	0.4	0.2	0.2	1,174	587	587
19.0	Jail	Classroom Training Room	b	4L4' T8 32w/EL	trof acrylic secure	11	11	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,223	1.2	0.6	0.6	2,739	1,369	1,369
20.0	Jail	Bath Men-Training Room	b	2L4' T8 U 1.5"/EL	trof acrylic secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	3,458	0.1	0.0	0.0	201	69	131
21.0	Jail	Bath Women-Training Room	b	2L4' T8 U 1.5"/EL	trof acrylic secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	3,458	0.1	0.0	0.0	201	69	131
22.0	Jail	Storage In Training Room	b	2L4' T8 U 1.5"/EL	trof acrylic secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	1,638	0.1	0.0	0.0	95	33	62
23.0	Jail	Office In Training Room	b	4L4' T8 32w/EL	trof acrylic secure	2	2	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,621	0.2	0.1	0.1	587	294	294
24.0	Jail	Office Union Room (In Traini	b	4L4' T8 32w/EL	trof acrylic secure	1	1	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,621	0.1	0.1	0.1	294	147	147
25.0	Jail	Office Main Control	1	2L4' T8 U 1.5"/EL	trof acrylic secure	3	3	20 WATT LED/KIT	rt 2L2' LED bar kit	2,621	0.2	0.1	0.1	456	157	299
26.0	Jail	Office Main Control	1	4L4' T8 32w/EL	trof acrylic secure	2	2	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,621	0.2	0.1	0.1	587	294	294
27.0	Jail	Hall G1 To G9	1	4L4' T8 32w/EL	trof acrylic secure	10	10	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	1.1	0.6	0.6	9,811	4,906	4,906
28.0	Jail	Storage Key Box G3	1	2L4' T8 U 1.5"/EL	trof acrylic secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	1,638	0.1	0.0	0.0	95	33	62
29.0	Jail	Storage Next To Key Box G3	1	2L4' T8 U 1.5"/EL	box secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	1,638	0.1	0.0	0.0	95	33	62
30.0	Jail	Storage Near To Key Box G3	1	2L4' T8 U 1.5"/EL	box secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	1,638	0.1	0.0	0.0	95	33	62
31.0	Jail	Conference G4 Visitation Ro	1	4L4' T8 32w/EL	trof acrylic secure	15	15	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,767	1.6	0.8	0.8	4,649	2,324	2,324
32.0	Jail	Storage In G4 (4)	1	4L4' T8 32w/EL	trof acrylic secure	4	4	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,638	0.4	0.2	0.2	734	367	367
33.0	Jail	Conference Meeting Room In	1	2L4' T8 32w/EL	trof acr 1' wide secure	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,767	0.1	0.0	0.0	166	77	89
34.0	Jail	Office Open Sd8 Booking	1	4L4' T8 32w/EL	trof acrylic secure	17	17	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	4,150	1.8	0.9	0.9	7,902	3,951	3,951
35.0	Jail	Bath Unisex-Private	1	2L4' T8 U 1.5"/EL	box secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	3,458	0.1	0.0	0.0	201	69	131
36.0	Jail	Cell Holding In Sd8	1	2L4' T8 32w/EL	box secure	4	4	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	5,460	0.2	0.1	0.1	1,310	612	699
37.0	Jail	Cell Holding In Sd8 (2)	1	2L4' T8 32w/EL	box secure	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	5,460	0.1	0.1	0.1	655	306	349
38.0	Jail	Storage Search Room-Men	1	2L4' T8 U 1.5"/EL	box secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	1,638	0.1	0.0	0.0	95	33	62
39.0	Jail	Shower In Search Room	1	13W CF HARDWIRED	can rec vert 6"	1	1	8 WATT LED/KIT	can kit LED Syl RT/5-6"	3,458	0.0	0.0	0.0	52	28	24
40.0	Jail	Foyer In Search Room	1	4L4' T8 32w/EL	box secure	1	1	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.1	0.1	0.1	981	491	491
41.0	Jail	Storage File Room/Coffee	1	4L4' T8 32w/EL 2 BALLASTS	trof acrylic secure	2	2	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED dbl switched	1,638	0.2	0.1	0.1	393	183	210
42.0	Jail	Storage Inside File	1	4L4' T8 32w/EL	trof acrylic secure	1	1	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,638	0.1	0.1	0.1	183	92	92
43.0	Jail	Garage Police Cars	1	175w METAL HALIDE	lowbay	6	6	36 WATT LED SI	screw in LED KT-LED36HID-EX39-840-D/h2	1,638	1.1	0.2	0.9	2,015	354	1,661
44.0	Jail	Hall Gate 7 (E-4)	1	4L4' T8 32w/EL	trof acrylic secure	4	4	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.4	0.2	0.2	3,924	1,962	1,962
45.0	Jail	Office Transportation	1	4L4' T8 32w/EL	trof acrylic secure	2	2	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,621	0.2	0.1	0.1	587	294	294
46.0	Jail	Storage Warehouse-Shelves	1	4L4' T8 32w/EL	trof acrylic secure	3	3	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,638	0.3	0.2	0.2	550	275	275
47.0	Jail	Laundry	1	4L4' T8 32w/EL	trof acrylic secure	6	6	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,340	0.6	0.3	0.3	1,572	786	786
48.0	Jail	Storage Property Room (In L	1	4L4' T8 32w/EL	trof acrylic secure	2	2	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,638	0.2	0.1	0.1	367	183	183
49.0	Jail	Hall G-6	1	2L4' T8 32w/EL	box acr 1' wide secure	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.1	0.0	0.0	526	245	280
50.0	Jail	Hall G-6	1	2L4' T8 32w/EL	trof acrylic secure	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.2	0.1	0.1	1,577	736	841
51.0	Jail	Storage Sd-11 Slop Sink	1	100w INCANDESCENT	keyless	1	1	10 WATT LED SI	screw in LED Alamp	1,638	0.1	0.0	0.1	164	16	147
52.0	Jail	Hall Gate 5 (Near E5)	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	8,760	0.2	0.0	0.2	1,962	168	1,794
53.0	Jail	Kitchen Main	1	4L4' T8 32w/EL	trof acrylic secure	13	13	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	5,187	1.4	0.7	0.7	7,552	3,776	3,776
54.0	Jail	Kitchen Main	1	2L4' T8 32w/EL	box acr 1' wide secure	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	5,187	0.1	0.0	0.0	311	145	166
55.0	Jail	Kitchen Hood	1	9 WATT LED	jar	6		NO RETRO	no change already efficient	5,187	0.1	0.1		280	280	
56.0	Jail	Dining Room Lunch Room(N	1	9 WATT LED	trof acrylic secure	3		NO RETRO	no change already efficient	5,096	0.0	0.0		138	138	
57.0	Jail	Bath Kitchen	1	2L2' T8 17w/EL	old vanity	1	1	18 WATT LED/NEW	New vanity	3,458	0.0	0.0	0.0	128	62	66
58.0	Jail	Storage Food (In Kitchen)	1	2L2' T8 17w/EL	trof acrylic secure	1	1	2L2' LED 7w/ELEE LO/RLRB	rtrb 2' LED	1,638	0.0	0.0	0.0	61	28	33
59.0	Jail	Stair 5 (To Basement)	1	2L4' T8 32w/EL	box acr 1' wide	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.1	0.1	0.1	1,051	491	561
60.0	Jail	Hall G-9 To G11	1	4L4' T8 32w/EL	trof acrylic secure	4	4	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.4	0.2	0.2	3,924	1,962	1,962

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
61.0	Jail	Storage Search Room By G9	1	2L4' T8 U 1.5"/EL	box secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	1,638	0.1	0.0	0.0	95	33	62
62.0	Jail	Inmate Area G-10 Whu Cell	1	2L4' T8 32w/EL	box acr 1' wide secure	13	13	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	6,188	0.8	0.4	0.4	4,827	2,252	2,574
63.0	Jail	Inmate Area G-10 Whu Cell	1	4L4' T8 32w/EL	box secure	9	9	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	6,188	1.0	0.5	0.5	6,238	3,119	3,119
64.0	Jail	Cell Whu-Upper & Lower	1	2L4' T8 32w/EL	box acr 1' wide secure	44	44	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	5,460	2.6	1.2	1.4	14,414	6,727	7,688
65.0	Jail	Mechanical Pipe Chase	1	100w INCANDESCENT	keyless	22	22	10 WATT LED SI	screw in LED Alamp	2,949	2.0	0.2	1.8	6,488	649	5,839
66.0	Jail	Shower Whu	1	2L4' T8 32w/EL	box acr 1' wide secure	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,458	0.1	0.0	0.0	207	97	111
67.0	Jail	Bath Sd-14	1	2L4' T8 U 1.5"/EL	box secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	3,458	0.1	0.0	0.0	201	69	131
68.0	Jail	Storage Sd-15 Slop	1	2L4' T8 U 1.5"/EL	box secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	1,638	0.1	0.0	0.0	95	33	62
69.0	Jail	Inmate Area Open Area	1	250w METAL HALIDE	box secure	12		NO RETRO	no change	6,188	3.5	3.5		21,906	21,906	
70.0	Jail	Stair F-7 (#1)	1	2L4' T8 32w/EL	box acr 1' wide secure	6	6	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.4	0.2	0.2	3,154	1,472	1,682
71.0	Jail	Bldg Mt F-10 (Near Main Con	roof	250w METAL HALIDE	wallpack	4	4	47 WATT LED/NEW	new LED wallpack	4,380	1.2	0.2	1.0	5,168	823	4,345
72.0	Jail	Office Sd-13 Main Control -S	1	2L4' T8 32w/EL	box acr 1' wide secure	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,621	0.2	0.1	0.1	472	220	252
73.0	Jail	Office Sd-13 Main Control -S	1	2L4' T8 32w/EL	trof parabolic	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,621	0.1	0.1	0.1	315	147	168
74.0	Jail	Office Sd-13 Main Control -S	1	2L3' T8 25w/EL	trof parabolic	2	2	2L3' LED 8.5w/ELEE LO/RLRB	rtrb 3' LED	2,621	0.1	0.0	0.0	246	110	136
75.0	Jail	Storage Sd-13 Mezzanine	mezz	2L4' T8 32w/EL	strip	7	7	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,092	0.4	0.2	0.2	459	214	245
76.0	Jail	Mechanical Sd-13 Elevator M		2L4' T8 32w/EL	strip	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,949	0.1	0.1	0.1	354	165	189
77.0	Jail	Office Belowsd-13		4L4' T8 32w/EL	box secure	1	1	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,621	0.1	0.1	0.1	294	147	147
78.0	Jail	Bath Belowsd-13		2L4' T8 U 1.5"/EL	box secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	3,458	0.1	0.0	0.0	201	69	131
79.0	Jail	Mechanical Electrical		100w INCANDESCENT	keyless	1	1	10 WATT LED SI	screw in LED Alamp	2,949	0.1	0.0	0.1	295	29	265
80.0	Jail	Warehouse Worker Day Area		2L4' T8 32w/EL	box acr 1' wide secure	5	5	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,717	0.3	0.1	0.2	815	380	435
81.0	Jail	Foyer Near G-12		4L4' T8 32w/EL	box secure	2	2	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.2	0.1	0.1	1,962	981	981
82.0	Jail	Stair Sd202- #2		2L4' T8 32w/EL	box acr 1' wide secure	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.1	0.0	0.0	526	245	280
83.0	Jail	Stair Sd202- #2		2L4' T8 32w/EL	box acr 1' wide secure	6	6	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.4	0.2	0.2	3,154	1,472	1,682
84.0	Jail	Inmate Area Ehu Upper Oper		2L4' T8 32w/EL	box acr 1' wide secure	16	16	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	6,188	1.0	0.4	0.5	5,940	2,772	3,168
85.0	Jail	Inmate Area Ehu Lower Oper		4L4' T8 32w/EL	trof acrylic secure	5	5	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	6,188	0.6	0.3	0.3	3,465	1,733	1,733
86.0	Jail	Inmate Area Ehu Lower Oper		2L4' T8 32w/EL	box acr 1' wide secure	17	17	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	6,188	1.0	0.5	0.5	6,312	2,945	3,366
87.0	Jail	Cell Ehu (Total Cells)		2L4' T8 32w/EL	box acr 1' wide secure	56	56	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	5,460	3.4	1.6	1.8	18,346	8,561	9,784
88.0	Jail	Cell Night Lights For Ehu&W		5W CF HARDWIRED	box acr 1' wide secure	100		NO RETRO	no change already efficient	5,460	0.7	0.7		3,822	3,822	
89.0	Jail	Mechanical Pipe Chase		100w INCANDESCENT	keyless	28	28	10 WATT LED SI	screw in LED Alamp	2,949	2.5	0.3	2.3	8,257	826	7,431
90.0	Jail	Shower Ehu Lower Open Are		2L4' T8 32w/EL	box acr 1' wide secure	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,458	0.1	0.1	0.1	415	194	221
91.0	Jail	Shower Ehu Upper Open Are		2L4' T8 32w/EL	box acr 1' wide secure	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,458	0.1	0.1	0.1	415	194	221
92.0	Jail	Bath Sd 21 Lower Ehu		2L4' T8 U 1.5"/EL	trof acrylic secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	3,458	0.1	0.0	0.0	201	69	131
93.0	Jail	Bath Sd 21 Lower Ehu		2L4' T8 U 1.5"/EL	trof acrylic secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	3,458	0.1	0.0	0.0	201	69	131
94.0	Jail	Storage Sd 23 Slop Lower Eh		2L4' T8 U 1.5"/EL	trof acrylic secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	1,638	0.1	0.0	0.0	95	33	62
95.0	Jail	Bath Sd 20 Upper Ehu		2L4' T8 U 1.5"/EL	trof acrylic secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	3,458	0.1	0.0	0.0	201	69	131
96.0	Jail	Bath Sd 20 Upper Ehu		2L4' T8 U 1.5"/EL	trof acrylic secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	3,458	0.1	0.0	0.0	201	69	131
97.0	Jail	Storage Sd 18 Slop Upper Eh		2L4' T8 U 1.5"/EL	trof acrylic secure	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	1,638	0.1	0.0	0.0	95	33	62
98.0	Jail	Inmate Area Sd 17		4L4' T8 32w/EL	trof acrylic secure	4	4	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	6,188	0.4	0.2	0.2	2,772	1,386	1,386
99.0	Jail	Inmate Area Ehu Open Area		250w METAL HALIDE	box secure	16		NO RETRO	no change	6,188	4.7	4.7		29,207	29,207	
100.0	Jail	Stair F-12		2L4' T8 32w/EL	box acr 1' wide secure	8	8	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.5	0.2	0.3	4,205	1,962	2,243
101.0	Jail	Hall Elevator Lights		1L4' T8 32w/EL	strip	4		NO RETRO	no change	8,760	0.1	0.1		1,051	1,051	
102.0	Jail	Hall Outside Elevator	LL	2L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls	8,760	0.2	0.0	0.2	1,577	252	1,325
103.0	Jail	Mechanical Elevator Machine	LL	2L4' T8 32w/EL	old strip	3	3	2L4' LED 13w/ELEE LO/NEW white goods	new wrap	2,949	0.2	0.1	0.1	531	248	283
104.0	Jail	Mechanical Telephone	LL	2L4' T8 32w/EL	old strip	2	2	2L4' LED 13w/ELEE LO/NEW white goods	new wrap	2,949	0.1	0.1	0.1	354	165	189
105.0	Jail	Storage Next To Telephone	LL	2L4' T8 32w/EL	old strip	2	2	2L4' LED 13w/ELEE LO/NEW white goods	new wrap	1,638	0.1	0.1	0.1	197	92	105
106.0	Jail	Hall G13 - G16	LL	2L4' T8 32w/EL	trof acr	9	9	32 WATT LED/KIT	trof kit 2x4 LED with controls	8,760	0.5	0.1	0.5	4,730	757	3,974
107.0	Jail	Office Sergeant	LL	4L4' T8 32w/EL 2 BALLASTS	trof acrylic secure	2	2	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED dbl switched	2,621	0.2	0.1	0.1	629	294	335
108.0	Jail	Office Briefing Room	LL	4L4' T8 32w/EL 2 BALLASTS	trof acrylic secure	4	4	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED dbl switched	2,621	0.4	0.2	0.2	1,258	587	671
109.0	Jail	Office Classification Room	LL	2L4' T8 32w/EL	trof acr	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,621	0.1	0.0	0.0	157	73	84
110.0	Jail	Hall Shu	LL	2L4' T8 32w/EL	trof acr	8	8	32 WATT LED/KIT	trof kit 2x4 LED with controls	8,760	0.5	0.1	0.4	4,205	673	3,532
111.0	Jail	Storage Janitor	LL	100w INCANDESCENT	jar	1	1	10 WATT LED SI	screw in LED Alamp	1,092	0.1	0.0	0.1	109	11	98
112.0	Jail	Inmate Area Sd 48 (Inside Re	LL	2L4' T8 32w/EL	trof acr	8	8	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	6,188	0.5	0.2	0.3	2,970	1,386	1,584
113.0	Jail	Hall Sd-47 , J Block	LL	2L4' T8 32w/EL	corner secure	8	8	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.5	0.2	0.3	4,205	1,962	2,243
114.0	Jail	Shower G 27 (In Sd 47)	LL	2L4' T8 32w/EL	box acr 1' wide secure	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,458	0.1	0.0	0.0	207	97	111
115.0	Jail	Hall Exit Sign By E-12	LL	2x20 INCANDESCENTS	exit sign	1	1	3 WATT LED/NEW EXIT BATTERY	new LED exit bat	8,760	0.0	0.0	0.0	350	26	324
116.0	Jail	Hall G-025 To 028	LL	9 WATT LED	drum wall mt.	4		NO RETRO	no change already efficient	8,760	0.0	0.0		315	315	
117.0	Jail	Cell #25,26,27,28	LL	1L4' T12 34w U EE/EEMAG	trof acrylic secure	4	4	1L4' LED "U" 13w/ELEE LO/RLRB	rtrb 4' U LED	5,460	0.2	0.1	0.1	874	306	568
118.0	Jail	Cell Night Light#25,26,27,28	LL	25w INCANDESCENT	keyless	4	4	10 WATT LED SI	screw in LED Alamp	5,460	0.1	0.0	0.1	546	218	328
119.0	Jail	Mechanical Plumber Chase	LL	100w INCANDESCENT	keyless	3	3	10 WATT LED SI	screw in LED Alamp	2,949	0.3	0.0	0.2	885	88	796
120.0	Jail	Cell Sd-49 Cell Block	LL	4L4' T8 32w/EL	trof acrylic secure	10	10	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	5,460	1.1	0.6	0.6	6,115	3,058	3,058

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
121.0	Jail	Bath Sd-49	LL	2L4' T8 32w/EL	box acr 1' wide secure	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,458	0.1	0.0	0.0	207	97	111
122.0	Jail	Cell 24 (4)	LL	1L4' T12 34w U EE/EEMAG	trof acrylic secure	8	8	1L4' LED "U" 13w/ELEE LO/RLRB	rtrb 4' U LED	5,460	0.3	0.1	0.2	1,747	612	1,136
123.0	Jail	Cell 24 Night Light(Inside Fix	LL	20w INCANDESCENT	keyless	8	8	6 WATT LED SI	screw in LED Alamp	5,460	0.2	0.0	0.1	874	262	612
124.0	Jail	Laundry Sd 50 Dryer Area	LL	2L4' T8 32w/EL	trof acr	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,340	0.1	0.0	0.0	140	66	75
125.0	Jail	Bath Sd 29	LL	2L4' T8 32w/EL	trof acr	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,458	0.1	0.0	0.0	207	97	111
126.0	Jail	Storage Sd 28 Clothes Stock	LL	2L4' T8 32w/EL	trof acr	4	4	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,638	0.2	0.1	0.1	393	183	210
127.0	Jail	Shop Sd 33 Maintenance	LL	2L4' T8 32w/EL	strip	17	17	2L4' LED 13w/ELEE/RLRB	rtrb 4' LED	2,470	1.0	0.5	0.5	2,519	1,344	1,176
128.0	Jail	Shop Sd 33 Maintenance	LL	NO EXISTING FIXTURE	no fixture exists			2L4' LED 13w/ELEE/NEW white goods	new strip new wiring	2,470		0.0	0.0		79	-79
129.0	Jail	Mechanical Electrical Panel I	LL	2L4' T8 32w/EL	strip	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,949	0.1	0.1	0.1	354	165	189
130.0	Jail	Office In Sd 33	LL	2L4' T8 32w/EL	box acr 1' wide secure	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,621	0.2	0.1	0.1	472	220	252
131.0	Jail	Mechanical Boiler	LL	2L4' T8 32w/EL	strip	9	9	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,949	0.5	0.2	0.3	1,592	743	849
132.0	Jail	Mechanical Boiler	LL	NO EXISTING FIXTURE	no fixture exists			2L4' LED 13w/ELEE LO/NEW white goods	new strip new wiring	2,949		0.0	0.0		83	-83
133.0	Jail	Hall G13 To G15	LL	2L4' T8 32w/EL	trof acr	15	15	32 WATT LED/KIT	trof kit 2x4 LED with controls	8,760	0.9	0.1	0.8	7,884	1,261	6,623
134.0	Jail	Office Medical Admin	LL	2L4' T8 32w/EL	trof acr	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,621	0.1	0.0	0.0	157	73	84
135.0	Jail	Office Open Medical Unit	LL	4L4' T8 32w/EL 2 BALLASTS	box secure	8	8	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED dbl switched	4,150	0.9	0.4	0.5	3,984	1,859	2,125
136.0	Jail	Storage Medical Unit	LL	4L4' T8 32w/EL	box secure	1	1	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,638	0.1	0.1	0.1	183	92	92
137.0	Jail	Storage Quarter Master-Unifo	LL	4L4' T8 32w/EL	trof acrylic secure	7	7	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,638	0.7	0.4	0.4	1,284	642	642
138.0	Jail	Storage Jan Across F1	LL	9 WATT LED	sconce	1		NO RETRO	no change already efficient	1,092	0.0	0.0		10	10	
139.0	Jail	Hall Exit Out F1	LL	4L4' T8 32w/EL	trof acrylic secure	2	2	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.2	0.1	0.1	1,962	981	981
140.0	Jail	Office Sd 35 Social Worker	LL	4L4' T8 32w/EL	trof acrylic secure	6	6	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,621	0.6	0.3	0.3	1,761	881	881
141.0	Jail	Office Sd 36 Program Room	LL	4L4' T8 32w/EL	trof acrylic secure	6	6	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,621	0.6	0.3	0.3	1,761	881	881
142.0	Jail	Office Sd 37 Program 2	LL	4L4' T8 32w/EL	trof acrylic secure	5	5	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,621	0.5	0.3	0.3	1,468	734	734
143.0	Jail	Classroom Sd 38	LL	4L4' T8 32w/EL	trof acrylic secure	9	9	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,223	1.0	0.5	0.5	2,241	1,120	1,120
144.0	Jail	Inmate Area Recreation Sd 3	LL	4L4' T8 32w/EL	trof acrylic secure	3	3	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	6,188	0.3	0.2	0.2	2,079	1,040	1,040
145.0	Jail	Hall Exit Out F2	LL	4L4' T8 32w/EL	trof acrylic secure	2	2	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.2	0.1	0.1	1,962	981	981
146.0	Jail	Bath Across Sd 37	LL	2L2' T12 20w STD/STD	vanity	1	1	18 WATT LED/NEW	New vanity	3,458	0.1	0.0	0.0	194	62	131
147.0	Jail	Storage Medical File - Acros	LL	4L4' T8 32w/EL	trof acrylic secure	3	3	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,638	0.3	0.2	0.2	550	275	275
148.0	Jail	Inmate Area Nhu Unit 2	LL	4L4' T8 32w/EL	trof acrylic secure	8	8	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	6,188	0.9	0.4	0.4	5,544	2,772	2,772
149.0	Jail	Bath Nhu Unit 2	LL	2L4' T12 40w STD/STD	box acr 1' wide secure	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,458	0.1	0.0	0.1	325	97	228
150.0	Jail	Cell 001	LL	2L4' T12 U 3" EE/EEMAG	trof acrylic secure	2	2	20 WATT LED/KIT	rt 2L2' LED bar kit	5,460	0.1	0.0	0.1	764	218	546
151.0	Jail	Cell 001 Night Light	LL	20w INCANDESCENT	keyless	1	1	6 WATT LED SI	screw in LED Alamp	5,460	0.0	0.0	0.0	109	33	76
152.0	Jail	Cell 002	LL	2L4' T12 U 3" EE/EEMAG	trof acrylic secure	2	2	20 WATT LED/KIT	rt 2L2' LED bar kit	5,460	0.1	0.0	0.1	764	218	546
153.0	Jail	Cell 002 Night Light	LL	20w INCANDESCENT	keyless	1	1	6 WATT LED SI	screw in LED Alamp	5,460	0.0	0.0	0.0	109	33	76
154.0	Jail	Cell 003	LL	2L4' T12 U 3" EE/EEMAG	trof acrylic secure	2	2	20 WATT LED/KIT	rt 2L2' LED bar kit	5,460	0.1	0.0	0.1	764	218	546
155.0	Jail	Cell 003 Night Light	LL	20w INCANDESCENT	keyless	1	1	6 WATT LED SI	screw in LED Alamp	5,460	0.0	0.0	0.0	109	33	76
156.0	Jail	Cell 004	LL	2L4' T12 U 3" EE/EEMAG	trof acrylic secure	3	3	20 WATT LED/KIT	rt 2L2' LED bar kit	5,460	0.2	0.1	0.2	1,147	328	819
157.0	Jail	Cell 004 Night Light	LL	20w INCANDESCENT	keyless	1	1	6 WATT LED SI	screw in LED Alamp	5,460	0.0	0.0	0.0	109	33	76
158.0	Jail	Hall Nhu	LL	2L4' T8 32w/EL	box acr 1' wide secure	30	30	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	1.8	0.8	1.0	15,768	7,358	8,410
159.0	Jail	Hall Nhu	LL	20w INCANDESCENT	keyless	30	30	6 WATT LED SI	screw in LED Alamp	8,760	0.6	0.2	0.4	5,256	1,577	3,679
160.0	Jail	Shower For Cells	LL	2L4' T12 40w STD/STD	box acr 1' wide	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,458	0.1	0.0	0.1	325	97	228
161.0	Jail	Shower For Cells	LL	2L4' T12 40w STD/STD	box acr 1' wide	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,458	0.1	0.0	0.1	325	97	228
162.0	Jail	Shower For Cells	LL	2L4' T12 40w STD/STD	box acr 1' wide	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,458	0.1	0.0	0.1	325	97	228
163.0	Jail	Shower For Cells	LL	2L4' T12 40w STD/STD	box acr 1' wide	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,458	0.1	0.0	0.1	325	97	228
164.0	Jail	Mechanical Pipe Chase	LL	9 WATT LED	sconce	3		NO RETRO	no change already efficient	2,949	0.0	0.0		80	80	
165.0	Jail	Cell Nhu (8)	LL	9 WATT LED	keyless	8		NO RETRO	no change already efficient	5,460	0.1	0.1		393	393	
166.0	Jail	Cell Nhu Night Light (8)	LL	20w INCANDESCENT	keyless	8	8	6 WATT LED SI	screw in LED Alamp	5,460	0.2	0.0	0.1	874	262	612
167.0	Jail	Cell Nhu (8)	LL	60w INCANDESCENT	keyless	8	8	10 WATT LED SI	screw in LED Alamp	5,460	0.5	0.1	0.4	2,621	437	2,184
168.0	Jail	Cell Nhu Night Light (8)	LL	20w INCANDESCENT	keyless	8	8	6 WATT LED SI	screw in LED Alamp	5,460	0.2	0.0	0.1	874	262	612
169.0	Jail	Mechanical Pipe Chase Nhu	LL	100w INCANDESCENT	keyless	3	3	10 WATT LED SI	screw in LED Alamp	2,949	0.3	0.0	0.2	885	88	796
170.0	Jail	Hall Sheriff- Vestibule	1	2L4' T12 34w U EE/EEMAG	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	8,760	0.1	0.0	0.1	613	63	550
171.0	Jail	Lobby Sheriff	1	2L4' T8 32w U/EL	trof acr	5	5	24 WATT LED/KIT	trof kit LED with controls	8,760	0.3	0.0	0.3	2,628	315	2,313
172.0	Jail	Bath 212B Women	2	2L2' T8 17w/EL	wrap narrow	1	1	2L2' LED 7w/ELEE LO/RLRB	rtrb 2' LED	3,458	0.0	0.0	0.0	128	59	69
173.0	Jail	Bath 212A Men	2	2L2' T8 17w/EL	wrap narrow	1	1	2L2' LED 7w/ELEE LO/RLRB	rtrb 2' LED	3,458	0.0	0.0	0.0	128	59	69
174.0	Jail	Storage Next To 212B Wome	2	2L4' T12 34w U EE/EEMAG	trof acr	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	1,092	0.1	0.0	0.1	76	22	55
175.0	Jail	Hall Jail Admin	2	2L4' T8 32w/EL	trof acr	5	5	32 WATT LED/KIT	trof kit 2x4 LED with controls	8,760	0.3	0.0	0.3	2,628	420	2,208
176.0	Jail	Storage Evidence	2	2L4' T8 32w/EL	trof acr	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,092	0.2	0.1	0.1	197	92	105
177.0	Jail	Storage Evidence	2	2L4' T8 32w/EL	trof acr	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,092	0.1	0.1	0.1	131	61	70
178.0	Jail	Office Open Secretary- Jail A	2	4L4' T8 32w/EL	trof acrylic secure	1	1	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	4,150	0.1	0.1	0.1	465	232	232
179.0	Jail	Office	2	44 WATT LED	trof acrylic secure	1		NO RETRO	no change already efficient	2,621	0.0	0.0		115	115	
180.0	Jail	Office Lieutenant	2	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.4	0.0	0.4	1,174	81	1,094

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
181.0	Jail	Office Captain	2	4L4' T8 32w/EL	trof acrylic secure	4	4	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,621	0.4	0.2	0.2	1,174	587	587
182.0	Jail	Office Captain	2	75w INCANDESCENT	can rec vert 6"	6	6	8 WATT LED/KIT	can kit LED Syl RT/5-6"	2,621	0.4	0.0	0.4	1,179	126	1,054
183.0	Jail	Office Open Communication	2	4L4' T8 32w/EL	trof acrylic secure	8	8	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	4,150	0.9	0.4	0.4	3,718	1,859	1,859
184.0	Jail	Mechanical Server	2	4L4' T8 32w/EL	trof acrylic secure	4	4	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,949	0.4	0.2	0.2	1,321	661	661
185.0	Jail	Kitchen Admin	2	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	5,187	0.1	0.0	0.1	622	80	543
186.0	Jail	Bath Men-Admin (2)	2	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,458	0.1	0.0	0.1	415	53	362
187.0	Jail	Bath Men-Admin	2	2L4' T12 40w STD/STD	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,458	0.1	0.0	0.1	325	27	298
188.0	Jail	Bath 217 Private	2	2L2' T12 20w STD/STD	vanity	1	1	18 WATT LED/NEW	New vanity	3,458	0.1	0.0	0.0	194	62	131
189.0	Jail	Storage Slop Sink	2	100w INCANDESCENT	sconce	1	1	10 WATT LED SI	screw in LED Alamp	1,638	0.1	0.0	0.1	164	16	147
190.0	Jail	Office Open Civil Bureau	2	2L4' T8 32w/EL	trof acr	15	15	32 WATT LED/KIT	trof kit 2x4 LED with controls	4,150	0.9	0.1	0.7	3,735	598	3,137
191.0	Jail	Office Open Civil Bureau Cor	2	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	4,150	0.1	0.0	0.0	249	40	209
192.0	Jail	Office Captain (Civil Bureau)	2	2L4' T8 32w/EL	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.3	0.1	0.3	944	121	823
193.0	Jail	Office Finance	2	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.0	157	20	137
194.0	Jail	Office Sergeant	2	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	629	81	549
195.0	Jail	Conference	2	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,767	0.2	0.0	0.2	664	85	579
196.0	Jail	Hall Finance To Lobby	2	2L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls	8,760	0.2	0.0	0.2	1,577	252	1,325
197.0	Jail	Hall Sheriff	2	2L4' T8 32w/EL	trof acr	8	8	32 WATT LED/KIT	trof kit 2x4 LED with controls	8,760	0.5	0.1	0.4	4,205	673	3,532
198.0	Jail	Hall Sheriff	2	2L4' T12 34w U EE/EEMAG	trof acr	2	2	24 WATT LED/KIT	trof kit LED with controls	8,760	0.1	0.0	0.1	1,226	126	1,100
199.0	Jail	Locker 220 Women (2)	2	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,458	0.1	0.0	0.1	415	53	362
200.0	Jail	Locker 220 Women	2	2L4' T12 34w U EE/EEMAG	trof acr	2	2	24 WATT LED/KIT	trof kit LED with controls	3,458	0.1	0.0	0.1	484	40	444
201.0	Jail	Locker 220 Women	2	2L2' T12 20w STD/STD	vanity	1	1	18 WATT LED/NEW	New vanity	3,458	0.1	0.0	0.0	194	62	131
202.0	Jail	Bath 221 Women	2	2L4' T12 40w STD/STD	strip	1	1	1L4' LED 13w/ELEE/NEW white goods	new LED strip	3,458	0.1	0.0	0.1	325	55	270
203.0	Jail	Bath 221 Women	2	2L2' T12 20w STD/STD	vanity	1	1	18 WATT LED/NEW	New vanity	3,458	0.1	0.0	0.0	194	62	131
204.0	Jail	Office Open 225 Operation (2	2	2L4' T8 32w/EL	trof acr	8	8	32 WATT LED/KIT	trof kit 2x4 LED with controls	4,150	0.5	0.1	0.4	1,992	319	1,673
205.0	Jail	Office 225 Operation	2	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	315	40	274
206.0	Jail	Office Open Secretary- Sheri	2	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	4,150	0.2	0.0	0.2	996	159	837
207.0	Jail	Office Sheriff (2)	2	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	629	81	549
208.0	Jail	Office Open Chief Staff	2	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	4,150	0.4	0.0	0.4	1,859	159	1,700
209.0	Jail	Office Sheriff	2	2L4' T8 U 1.5"/EL	trof acr	8	8	24 WATT LED/KIT	trof kit LED with controls & switch	2,621	0.4	0.1	0.3	1,216	121	1,095
210.0	Jail	Bath Sheriff	2	2L4' T8 U 1.5"/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	3,458	0.1	0.0	0.0	201	20	181
211.0	Jail	Closet Phone	2	23W CF SCREWIN	keyless	1	1	10 WATT LED SI	screw in LED Alamp	1,092	0.0	0.0	0.0	27	11	16
212.0	Jail	Office Sgt Meyer	2	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.0	157	20	137
213.0	Jail	Office Sgt Meyer	2	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	315	40	274
214.0	Jail	Storage Sgt Meyer	2	2L4' T8 32w/EL	wrap	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,638	0.1	0.0	0.0	98	46	52
215.0	Jail	Storage Computer (Next To 2	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,638	0.1	0.0	0.1	183	13	171
216.0	Jail	Storage Computer (Next To 2	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,638	0.1	0.0	0.1	183	13	171
217.0	Jail	Office Next To Computer Sto	2	4L4' T8 32w/EL 2 BALLASTS	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.6	0.1	0.6	1,887	121	1,766
218.0	Jail	Lab In Office	2	44 WATT LED	trof acr	1		NO RETRO	no change already efficient	2,767	0.0	0.0		122	122	
219.0	Jail	Lab In Office	2	34 WATT LED	trof acr 2x2	4		NO RETRO	no change already efficient	2,767	0.1	0.1		376	376	
220.0	Jail	Lab In Office	2	44 WATT LED	trof acr	10		NO RETRO	no change already efficient	2,767	0.4	0.4		1,217	1,217	
221.0	Jail	Closet In Lab	2	2L4' T8 32w U/EL	trof acr	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	1,092	0.1	0.0	0.0	66	22	44
222.0	Jail	Storage Vault 1	2	2L4' T8 32w/EL	wrap	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,638	0.1	0.0	0.0	98	46	52
223.0	Jail	Storage Vault 3 (3Rd Floor)	3	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,638	0.4	0.0	0.4	734	50	684
224.0	Jail	Storage Records (Next To Va	3	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,638	0.2	0.0	0.2	367	25	342
225.0	Jail	Office Pbp (3Rd Floor)	3	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	587	40	547
226.0	Jail	Office Open Union Room (3R	3	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	4,150	0.4	0.0	0.4	1,859	159	1,700
227.0	Jail	Mechanical Electrical	3	2L4' T8 U 1.5"/EL	trof acr	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	2,949	0.1	0.0	0.0	171	59	112
228.0	Jail	Storage Next To Electrical	3	4L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,638	0.3	0.0	0.3	550	38	513
229.0	Jail	Hall 3Rd Floor	3	4L4' T8 32w/EL	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls	8,760	0.7	0.1	0.6	5,887	505	5,382
230.0	Jail	Locker Men-Admin	3	4L4' T8 32w/EL	trof acr	5	5	32 WATT LED/KIT	trof kit 2x4 LED with controls	8,760	0.6	0.1	0.5	4,906	336	4,569
231.0	Jail	Bath Locker Men Admin	3	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	8,760	0.2	0.0	0.2	1,962	135	1,828
232.0	Jail	Bath Locker Men Admin	3	13W CF HARDWIRED	can rec vert 6"	2	2	8 WATT LED/KIT	can kit LED Syl RT/5-6"	3,458	0.0	0.0	0.0	104	55	48
233.0	Jail	Locker Women-Admin	3	4L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,458	0.3	0.0	0.3	1,162	80	1,082
234.0	Jail	Bath Locker Women Admin	3	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,458	0.2	0.0	0.2	775	53	721
235.0	Jail	Bath Locker Women Admin	3	13W CF HARDWIRED	can rec vert 6"	2	2	8 WATT LED/KIT	can kit LED Syl RT/5-6"	3,458	0.0	0.0	0.0	104	55	48
236.0	Jail	Stair 6 Patrol		2L4' T8 32w/EL	box acr 1' wide side mt	6	6	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.4	0.2	0.2	3,154	1,472	1,682
237.0	Jail	Office Open Bci (Bureau Crim	2	4L4' T8 32w/EL	trof minicube	24	24	32 WATT LED/KIT	trof kit 2x4 LED with controls	4,150	2.6	0.2	2.3	11,155	956	10,199
238.0	Jail	Office Jackson	2	4L4' T8 32w/EL 2 BALLASTS	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	629	40	589
239.0	Jail	Office Alfano	2	4L4' T8 32w/EL 2 BALLASTS	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	629	40	589
240.0	Jail	Kitchen	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	5,187	0.1	0.0	0.1	581	40	541

Line	Building Name	Location	Fl	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
241.0	Jail	Bath Men (In Kitchen)	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,458	0.1	0.0	0.1	387	27	361
242.0	Jail	Office Women (In Kitchen)	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	20	273
243.0	Jail	Office Garner	2	4L4' T8 32w/EL 2 BALLASTS	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	629	40	589
244.0	Jail	Office Sec (Garner)	2	4L4' T8 32w/EL 2 BALLASTS	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	629	40	589
245.0	Jail	Office Exam Room	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	20	273
246.0	Jail	Conference Interview Room	2	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,767	0.2	0.0	0.2	620	43	577
247.0	Jail	Office Sandy	2	4L4' T8 32w/EL 2 BALLASTS	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	629	40	589
248.0	Jail	Office Jackie	2	4L4' T8 32w/EL 2 BALLASTS	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	629	40	589
249.0	Jail	Conference Interview Room	2	4L4' T8 32w/EL 2 BALLASTS	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,767	0.2	0.0	0.2	664	43	622
250.0	Jail	Stair #7		2L4' T8 32w/EL	box acr 1' wide side mt	9	9	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.5	0.3	0.3	4,730	2,208	2,523
252.0	Jail	Office Open Patrol	1	4L4' T8 32w/EL	trof acr	18	18	32 WATT LED/KIT	trof kit 2x4 LED with controls	4,150	1.9	0.2	1.8	8,366	717	7,649
253.0	Jail	Office Across Stair 6	1	4L4' T8 32w/EL 2 BALLASTS	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	629	40	589
254.0	Jail	Office Inside Office Across St	1	4L4' T8 32w/EL 2 BALLASTS	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	8,760	0.2	0.0	0.2	2,102	135	1,968
255.0	Jail	Office Lee	1	4L4' T8 32w/EL 2 BALLASTS	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	629	40	589
256.0	Jail	Storage Lee	1	2L2' T12 20w STD/STD	wrap narrow	1	1	2L2' LED 7w/ELEE LO/RLRB	rtrb 2' LED	1,092	0.1	0.0	0.0	61	19	43
257.0	Jail	Office Manus	1	4L4' T8 32w/EL 2 BALLASTS	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	629	40	589
258.0	Jail	Closet Manus	1	2L2' T12 20w STD/STD	wrap narrow	1	1	2L2' LED 7w/ELEE LO/RLRB	rtrb 2' LED	1,092	0.1	0.0	0.0	61	19	43
259.0	Jail	Kitchen Corner Area	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	5,187	0.2	0.0	0.2	1,162	80	1,082
260.0	Jail	Bath Men Near Kitchen	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	3,458	0.1	0.0	0.0	207	20	188
261.0	Jail	Bath Women Near Kitchen	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	3,458	0.1	0.0	0.0	207	20	188
262.0	Jail	Office Tompkins (Captain)	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	587	40	547
263.0	Jail	Storage Tompkins (Clothes)	1	2L4' T8 32w/EL	wrap narrow	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,638	0.1	0.0	0.0	98	46	52
264.0	Jail	Office Tompkins Sec	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	587	40	547
265.0	Jail	Office Kennedy (Sergeant)	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	20	273
266.0	Jail	Storage Uniform Room-Patro	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,638	0.1	0.0	0.1	183	13	171
267.0	Jail	Bath Next To Uniform Room	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	3,458	0.1	0.0	0.0	207	20	188
268.0	Jail	Storage Janitor Next To Unifo	1	2L4' T8 32w U/EL	trof acr	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	1,092	0.1	0.0	0.0	66	22	44
269.0	Jail	Hall Vestibule-Patrol	1	2x26W CF HARDWIRED/EL	can rec hor 6"	4	4	13 WATT LED/KIT	can kit LED Syl RT/5-6"	8,760	0.2	0.1	0.2	1,892	456	1,437
270.0	Jail	Office #78 Sgt Chanek	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	20	273
271.0	Jail	Office #88	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	20	273
272.0	Jail	Office #136	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	587	40	547
273.0	Jail	Office Sgt Lombardo	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	587	40	547
274.0	Jail	Lobby Civil Division Window	1	50w INCANDESCENT	decorative	2	2	8 WATT LED/KIT	can kit LED Syl RT/5-6"	8,760	0.1	0.0	0.1	876	140	736
305.0	Court	Lobby 4Th Floor	4	32W CF SCREWIN	can rec hor 6"	23	23	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,796	0.8	0.3	0.5	2,968	1,135	1,833
306.0	Court	Lobby 4Th Floor	4	4x42W CF HARDWIRED/EL	decorative	1		NO RETRO	no change	3,796	0.2	0.2		714	714	
307.0	Court	Lobby 4Th Floor Lobby Cove	4	1L3' T8 25w/EL	strip	3	3	1L3' LED 8.5w/ELEE LO/RLRB	rtrb 3' LED	3,796	0.1	0.0	0.0	273	120	154
308.0	Court	Bath Men By Lobby	4	2L4' T8 32w/EL	trof para 1' wide	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,717	0.2	0.1	0.1	489	228	261
309.0	Court	Bath Men By Lobby	4	2L3' T8 25w/EL	trof para 1' wide	2	2	2L3' LED 8.5w/ELEE LO/RLRB	rtrb 3' LED	2,717	0.1	0.0	0.0	255	114	141
310.0	Court	Bath Men By Lobby	4	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,717	0.0	0.0	0.0	92	35	57
311.0	Court	Bath Women By Lobby	4	2L4' T8 32w/EL	trof para 1' wide	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,717	0.2	0.1	0.1	489	228	261
312.0	Court	Bath Women By Lobby	4	2L3' T8 25w/EL	trof para 1' wide	2	2	2L3' LED 8.5w/ELEE LO/RLRB	rtrb 3' LED	2,717	0.1	0.0	0.0	255	114	141
313.0	Court	Bath Women By Lobby	4	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,717	0.0	0.0	0.0	92	35	57
314.0	Court	Conference 403	4	3L4' T8 32w/EL	troffer basket	3	3	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.2	0.1	0.1	525	251	274
315.0	Court	Conference 404	4	3L4' T8 32w/EL	troffer basket	3	3	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.2	0.1	0.1	525	251	274
316.0	Court	Stair 1-Roof Access	4	2L4' T8 32w/EL	wrap wall mt.	20	20	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,796	1.2	0.6	0.6	4,555	2,126	2,429
317.0	Court	Mechanical Roof	4	2L4' T8 32w/EL	strip	6	6	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,872	0.3	0.2	0.2	674	314	359
318.0	Court	Mechanical P04-Elevator Ma	4	2L4' T8 32w/EL	strip	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,872	0.2	0.1	0.1	337	157	180
320.0	Court	Bath Men By Lobby	3	2L4' T8 32w/EL	trof para 1' wide	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,717	0.2	0.1	0.1	489	228	261
321.0	Court	Bath Men By Lobby	3	2L3' T8 25w/EL	trof para 1' wide	2	2	2L3' LED 8.5w/ELEE LO/RLRB	rtrb 3' LED	2,717	0.1	0.0	0.0	255	114	141
322.0	Court	Bath Men By Lobby	3	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,717	0.0	0.0	0.0	92	35	57
323.0	Court	Bath Women By Lobby	3	2L4' T8 32w/EL	trof para 1' wide	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,717	0.2	0.1	0.1	489	228	261
324.0	Court	Bath Women By Lobby	3	2L3' T8 25w/EL	trof para 1' wide	2	2	2L3' LED 8.5w/ELEE LO/RLRB	rtrb 3' LED	2,717	0.1	0.0	0.0	255	114	141
325.0	Court	Bath Women By Lobby	3	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,717	0.0	0.0	0.0	92	35	57
326.0	Court	Lobby 3Rd Floor	3	32W CF SCREWIN	can rec hor 6"	22	22	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,796	0.7	0.3	0.5	2,839	1,086	1,754
327.0	Court	Lobby 3Rd Floor Lobby Cove	3	1L3' T8 25w/EL	strip	3	3	1L3' LED 8.5w/ELEE LO/RLRB	rtrb 3' LED	3,796	0.1	0.0	0.0	273	120	154
328.0	Court	Lobby 3Rd Floor	3	4x42W CF HARDWIRED/EL	decorative	1		NO RETRO	no change	3,796	0.2	0.2		714	714	
329.0	Court	Bath Men By Lobby	2	2L4' T8 32w/EL	trof para 1' wide	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,717	0.2	0.1	0.1	489	228	261
330.0	Court	Bath Men By Lobby	2	2L3' T8 25w/EL	trof para 1' wide	2	2	2L3' LED 8.5w/ELEE LO/RLRB	rtrb 3' LED	2,717	0.1	0.0	0.0	255	114	141
331.0	Court	Bath Men By Lobby	2	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,717	0.0	0.0	0.0	92	35	57
332.0	Court	Bath Women By Lobby	2	2L4' T8 32w/EL	trof para 1' wide	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,717	0.2	0.1	0.1	489	228	261

Line	Building Name	Location	Fl	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
333.0	Court	Bath Women By Lobby	2	2L3' T8 25w/EL	trof para 1' wide	2	2	2L3' LED 8.5w/ELEE LO/RLRB	rtrb 3' LED	2,717	0.1	0.0	0.0	255	114	141
334.0	Court	Bath Women By Lobby	2	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,717	0.0	0.0	0.0	92	35	57
335.0	Court	Lobby 2Nd Floor	2	4x42W CF HARDWIRED/EL	decorative	1		NO RETRO	no change	3,796	0.2	0.2		714	714	
336.0	Court	Lobby 2Nd Floor Cove	2	2L3' T8 25w/EL	strip	3	3	2L3' LED 8.5w/ELEE LO/RLRB	rtrb 3' LED	3,796	0.1	0.1	0.1	535	239	296
337.0	Court	Conference 204	2	3L4' T8 32w/EL	troffer basket	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,223	0.1	0.0	0.0	196	93	102
338.0	Court	Lounge Waiting Area-Middle	2	32W CF SCREWIN	drum decorative	2	2	1L6" LED 11w 4PINBASE/EL/RETUBE ONLY	retube LED 4pinG24q horizontal	2,470	0.1	0.0	0.0	168	69	99
339.0	Court	Shop Maintenance	b	2L4' T8 32w/EL	strip	4	4	2L4' LED 13w/ELEE/RLRB	rtrb 4' LED	2,223	0.2	0.1	0.1	534	285	249
340.0	Court	Inmate Area Holding Area	b	3L4' T8 32w/EL	trof acrylic secure	24		NO RETRO	no change per customer	2,600	2.1	2.1		5,491	5,491	
341.0	Court	Inmate Area Holding Area	b	3L4' T8 32w/EL	trof acrylic secure	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,210	0.1	0.0	0.0	194	93	102
342.0	Court	Bath Holding Area	b	3L4' T8 32w/EL	trof acrylic secure	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,431	0.1	0.0	0.0	214	102	112
343.0	Court	Garage B07 Prison Transpor	b	3L4' T8 32w/EL	trof acr 1' wide secure	9	9	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	936	0.7	0.3	0.4	741	354	388
344.0	Court	Lobby Basement Entry	b	2L4' T8 32w/EL	strip	4	4	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,796	0.2	0.1	0.1	911	425	486
345.0	Court	Storage B05	b	2L2' T8 17w/EL	strip	1	1	2L2' LED 7w/ELEE LO/RLRB	rtrb 2' LED	884	0.0	0.0	0.0	33	15	18
346.0	Court	Mechanical Boiler	b	2L4' T8 32w/EL	strip	13	13	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,872	0.7	0.3	0.4	1,460	681	779
347.0	Court	Hall Basement	b	2L4' T8 32w/EL	strip	10	10	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,796	0.6	0.3	0.3	2,278	1,063	1,215
348.0	Court	Storage Records-V. Large -	b	2L4' T8 32w/EL	strip	13	13	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	936	0.7	0.3	0.4	730	341	389
349.0	Court	Storage Records-V. Large -	b	NO EXISTING FIXTURE	no fixture exists			2L4' LED 13w/ELEE LO/NEW white goods	new strip new wiring	936		0.6	-0.6		577	-577
350.0	Court	Office 1 Media	b	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.1	371	75	295
351.0	Court	Lobby 1St Floor	1	4x42W CF HARDWIRED/EL	decorative	2		NO RETRO	no change	3,796	0.4	0.4		1,427	1,427	
352.0	Court	Lobby 1St Floor	1	32W CF SCREWIN	can rec hor 6"	24	24	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,796	0.8	0.3	0.5	3,098	1,184	1,913
353.0	Court	Bath Men By Lobby	1	2L4' T8 32w/EL	trof para 1' wide	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,717	0.2	0.1	0.1	489	228	261
354.0	Court	Bath Men By Lobby	1	2L3' T8 25w/EL	trof para 1' wide	2	2	2L3' LED 8.5w/ELEE LO/RLRB	rtrb 3' LED	2,717	0.1	0.0	0.0	255	114	141
355.0	Court	Bath Men By Lobby	1	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,717	0.0	0.0	0.0	92	35	57
356.0	Court	Bath Women By Lobby	1	2L4' T8 32w/EL	trof para 1' wide	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,717	0.2	0.1	0.1	489	228	261
357.0	Court	Bath Women By Lobby	1	2L3' T8 25w/EL	trof para 1' wide	2	2	2L3' LED 8.5w/ELEE LO/RLRB	rtrb 3' LED	2,717	0.1	0.0	0.0	255	114	141
358.0	Court	Bath Women By Lobby	1	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,717	0.0	0.0	0.0	92	35	57
359.0	Court	Office Open 101 Jury Assem	1	3L4' T8 32w/EL	indirect/direct	5	5	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,717	0.4	0.2	0.2	1,195	571	625
360.0	Court	Office 101 Security	1	3L4' T8 32w/EL	trof parabolic	2	2	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	500	0.2	0.1	0.1	88	42	46
361.0	Court	Office 101D	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	350	53	298
362.0	Court	Office Copy Corner	1	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	175	26	149
363.0	Court	Lounge Jury Assembly 101	1	3L4' T8 32w/EL	indirect/direct	10	10	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,470	0.8	0.4	0.4	2,174	1,037	1,136
364.0	Court	Lounge Jury Assembly 101	1	32W CF SCREWIN	indirect/direct	6	6	1L6" LED 11w 4PINBASE/EL/RETUBE ONLY	retube LED 4pinG24q horizontal	2,470	0.2	0.1	0.1	504	207	296
365.0	Court	Bath Women-Jury Assembly	1	2L4' T8 32w/EL	trof para 1' wide	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,431	0.1	0.0	0.1	292	136	156
366.0	Court	Bath Women-Jury Assembly	1	2L3' T8 25w/EL	trof para 1' wide	1	1	2L3' LED 8.5w/ELEE LO/RLRB	rtrb 3' LED	2,431	0.0	0.0	0.0	114	51	63
367.0	Court	Bath Women-Jury Assembly	1	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,431	0.0	0.0	0.0	83	32	51
368.0	Court	Lounge Jury	1	3L4' T8 32w/EL	indirect/direct	6	6	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,470	0.5	0.2	0.3	1,304	622	682
369.0	Court	Lounge Jury	1	3L2' T8 17w/EL	troffer basket	4	4	3L2' LED 7w/ELEE LO/RLRB	rtrb 2' LED	2,470	0.2	0.1	0.1	524	252	272
370.0	Court	Bath Men-Jury Assembly 101	1	2L4' T8 32w/EL	trof para 1' wide	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,431	0.1	0.0	0.1	292	136	156
371.0	Court	Bath Men-Jury Assembly 101	1	2L3' T8 25w/EL	trof para 1' wide	1	1	2L3' LED 8.5w/ELEE LO/RLRB	rtrb 3' LED	2,431	0.0	0.0	0.0	114	51	63
372.0	Court	Bath Men-Jury Assembly 101	1	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,431	0.0	0.0	0.0	83	32	51
373.0	Court	Hall Across Men	1	1L4' T8 32w/EL	strip	1	1	1L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,796	0.0	0.0	0.0	114	53	61
374.0	Court	Hall Outside 106	1	32W CF SCREWIN	can rec hor 6"	4	4	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,796	0.1	0.1	0.1	516	197	319
375.0	Court	Stair 3		2L4' T8 32w/EL	wrap wall mt.	16	16	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,796	1.0	0.4	0.5	3,644	1,701	1,944
376.0	Court	Stair 2		2L4' T8 32w/EL	wrap wall mt.	16	16	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,796	1.0	0.4	0.5	3,644	1,701	1,944
377.0	Court	Hall Basement Hall By Stair 2	b	2L4' T8 32w/EL	strip	4	4	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,796	0.2	0.1	0.1	911	425	486
378.0	Court	Locker B13	b	2L4' T8 32w/EL	strip	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,717	0.1	0.1	0.1	326	152	174
379.0	Court	Mechanical Telephone	b	2L4' T8 32w/EL	strip	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,872	0.1	0.0	0.0	112	52	60
380.0	Court	Locker Men	b	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.1	0.0	0.1	239	36	203
381.0	Court	Bath In Men'S Locker	b	2x32W CF HARDWIRED/EL	drum	2	2	14 WATT LED/NEW	new LED drum 12"	2,717	0.1	0.0	0.1	370	76	293
382.0	Court	Office Security	b	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	8,760	0.2	0.0	0.1	1,542	231	1,310
383.0	Court	Locker Women	b	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.1	0.0	0.1	239	36	203
384.0	Court	Bath In Women'S Locker	b	2x32W CF HARDWIRED/EL	drum	2	2	14 WATT LED/NEW	new LED drum 12"	2,717	0.1	0.0	0.1	370	76	293
385.0	Court	Office Open 405 Judge Chan	4	3L4' T8 32w/EL	trof parabolic	5	5	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.4	0.1	0.3	1,195	179	1,016
386.0	Court	Office Open 405 Judge Chan	4	32W CF SCREWIN	can rec hor 6"	4	4	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,717	0.1	0.0	0.1	370	141	228
387.0	Court	Office 405E Copy	4	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	175	26	149
388.0	Court	Storage 405F Storage	4	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	884	0.1	0.0	0.1	78	16	62
389.0	Court	Conference 405C	4	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	350	53	298
390.0	Court	Office 405B	4	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	350	53	298
391.0	Court	Office 405A Judge	4	3L4' T8 32w/EL	trof parabolic	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	556	83	473
392.0	Court	Foyer 405A Judge	4	3L4' T8 32w/EL	troffer indirect	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,227	0.1	0.0	0.0	284	136	148

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
393.0	Court	Storage Audio/Video By 405	4	3L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	884	0.1	0.0	0.1	78	16	62
394.0	Court	Court Rm Large	4	4x42W CF HARDWIRED/EL	decorative	6		NO RETRO	no change	2,574	0.9	0.9		2,903	2,903	
395.0	Court	Court Rm Large	4	32W CF SCREWIN	can rec hor 6"	22	22	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,574	0.6	0.2	0.4	1,925	736	1,189
396.0	Court	Conference 410A Visitor	4	42W CF HARDWIRED	can rec hor 6"	1	1	17 WATT LED/KIT	can kit LED Syl RT/HO 6"	1,989	0.0	0.0	0.0	88	34	54
397.0	Court	Cell 413B Holding	4	3L4' T8 32w/EL	trof acr 1' wide secure	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.1	0.0	0.0	771	368	403
398.0	Court	Cell 413A Holding	4	3L4' T8 32w/EL	trof acr 1' wide secure	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.1	0.0	0.0	771	368	403
399.0	Court	Foyer Cells	4	3L4' T8 32w/EL	trof acr 1' wide secure	2	2	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.2	0.1	0.1	1,542	736	806
400.0	Court	Office 407	4	3L4' T8 32w/EL	trof para 1' wide	3	3	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.2	0.1	0.1	525	251	274
401.0	Court	Bath 407	4	2x32W CF HARDWIRED/EL	drum	2	2	14 WATT LED/NEW	new LED drum 12"	2,431	0.1	0.0	0.1	331	68	263
402.0	Court	Bath Women Next To 407	4	2x32W CF HARDWIRED/EL	drum	1	1	14 WATT LED/NEW	new LED drum 12"	2,431	0.1	0.0	0.0	165	34	131
403.0	Court	Foyer 408	4	3L4' T8 32w/EL	indirect/direct	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,227	0.1	0.0	0.0	284	136	148
404.0	Court	Bath 408	4	2x32W CF HARDWIRED/EL	drum	1	1	14 WATT LED/NEW	new LED drum 12"	2,431	0.1	0.0	0.0	165	34	131
405.0	Court	Conference 408	4	3L4' T8 32w/EL	indirect/direct	6	6	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.4	0.2	0.2	1,050	501	549
406.0	Court	Library 412	4	3L4' T8 32w/EL	indirect/direct	5	5	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,210	0.4	0.2	0.2	972	464	508
407.0	Court	Kitchen 410	4	3L4' T8 32w/EL	indirect/direct	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,223	0.1	0.0	0.0	196	93	102
408.0	Court	Mechanical 409 It Room	4	3L4' T8 32w/EL	indirect/direct	6	6	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,872	0.5	0.2	0.2	988	472	517
409.0	Court	Hall Outside	4	3L4' T8 32w/EL	indirect/direct	12	12	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,796	1.1	0.5	0.6	4,009	1,913	2,095
410.0	Court	Bath Men Next 411	4	2x32W CF HARDWIRED/EL	drum	1	1	14 WATT LED/NEW	new LED drum 12"	2,431	0.1	0.0	0.0	165	34	131
411.0	Court	Mechanical Electrical By Elev	4	2L4' T8 32w/EL	strip	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,872	0.1	0.0	0.0	112	52	60
412.0	Court	Conference 402	4	3L4' T8 32w/EL	indirect/direct	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.1	0.0	0.0	175	84	91
413.0	Court	Foyer 402	4	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,227	0.0	0.0	0.0	110	42	68
414.0	Court	Office 305 Judge Chamber	3	3L4' T8 32w/EL	trof parabolic	5	5	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.4	0.1	0.3	927	139	788
415.0	Court	Office 304 Judge Chamber	3	3L4' T8 32w/EL	indirect/direct	3	3	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,106	0.2	0.1	0.1	556	265	291
416.0	Court	Office 304 Judge Chamber	3	3L2' T8 17w/EL	trof parabolic	1	1	24 WATT LED/KIT	trof kit LED with controls & switch	2,106	0.0	0.0	0.0	112	21	91
417.0	Court	Bath 304	3	2x32W CF HARDWIRED/EL	drum	2	2	14 WATT LED/NEW	new LED drum 12"	2,717	0.1	0.0	0.1	370	76	293
418.0	Court	Office 304D	3	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	350	53	298
419.0	Court	Hall 304 To 304A	3	32W CF SCREWIN	can rec hor 6"	5	5	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,796	0.2	0.1	0.1	645	247	399
420.0	Court	Hall 307	3	32W CF SCREWIN	can rec hor 6"	10	10	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,796	0.3	0.1	0.2	1,291	493	797
421.0	Court	Office 308	3	3L4' T8 32w/EL	indirect/direct	3	3	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.2	0.1	0.1	525	251	274
422.0	Court	Bath 308	3	2x32W CF HARDWIRED/EL	drum	1	1	14 WATT LED/NEW	new LED drum 12"	2,717	0.1	0.0	0.1	185	38	147
423.0	Court	Bath Next 308	3	2x32W CF HARDWIRED/EL	drum	1	1	14 WATT LED/NEW	new LED drum 12"	2,717	0.1	0.0	0.1	185	38	147
424.0	Court	Court Rm 301 Large	3	4x42W CF HARDWIRED/EL	decorative	6		NO RETRO	no change	2,574	0.9	0.9		2,903	2,903	
425.0	Court	Court Rm 301 Large	3	32W CF SCREWIN	can rec hor 6"	22	22	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,574	0.6	0.2	0.4	1,925	736	1,189
426.0	Court	Cell 313A Holding	3	3L4' T8 32w/EL	trof acr 1' wide secure	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.1	0.0	0.0	771	368	403
427.0	Court	Cell 313B Holding	3	3L4' T8 32w/EL	trof acr 1' wide secure	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.1	0.0	0.0	771	368	403
428.0	Court	Cell 313C Holding	3	3L4' T8 32w/EL	trof acr 1' wide secure	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.1	0.0	0.0	771	368	403
429.0	Court	Foyer Cells	3	3L4' T8 32w/EL	trof acr 1' wide secure	3	3	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,796	0.3	0.1	0.1	1,002	478	524
430.0	Court	Foyer 309 Jury	3	3L2' T8 17w/EL	troffer basket	1	1	3L2' LED 7w/ELEE LO/RLRB	rtrb 2' LED	3,227	0.0	0.0	0.0	171	82	89
431.0	Court	Bath 309	3	2x32W CF HARDWIRED/EL	drum	1	1	14 WATT LED/NEW	new LED drum 12"	2,431	0.1	0.0	0.0	165	34	131
432.0	Court	Conference 309	3	3L4' T8 32w/EL	indirect/direct	6	6	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.4	0.2	0.2	1,050	501	549
433.0	Court	Mechanical Electrical	3	2L4' T8 32w/EL	strip	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,872	0.1	0.0	0.0	112	52	60
434.0	Court	Court Rm 306 Large	3	4x42W CF HARDWIRED/EL	decorative	6		NO RETRO	no change	2,574	0.9	0.9		2,903	2,903	
435.0	Court	Court Rm 306 Large	3	32W CF SCREWIN	can rec hor 6"	22	22	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,574	0.6	0.2	0.4	1,925	736	1,189
436.0	Court	Conference Visitor	3	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,223	0.0	0.0	0.0	76	29	47
437.0	Court	Foyer 310 Jury	3	3L2' T8 17w/EL	troffer basket	1	1	3L2' LED 7w/ELEE LO/RLRB	rtrb 2' LED	3,227	0.0	0.0	0.0	171	82	89
438.0	Court	Conference 310 Jury	3	3L4' T8 32w/EL	indirect/direct	6	6	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.4	0.2	0.2	1,050	501	549
439.0	Court	Bath 310 Jury	3	2x32W CF HARDWIRED/EL	drum	1	1	14 WATT LED/NEW	new LED drum 12"	2,431	0.1	0.0	0.0	165	34	131
440.0	Court	Bath Women	3	2x32W CF HARDWIRED/EL	drum	1	1	14 WATT LED/NEW	new LED drum 12"	2,431	0.1	0.0	0.0	165	34	131
441.0	Court	Office 312	3	3L4' T8 32w/EL	indirect/direct	3	3	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.2	0.1	0.1	525	251	274
442.0	Court	Hall 305/307 Judge Chamber	3	32W CF SCREWIN	can rec hor 6"	5	5	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,227	0.1	0.1	0.1	549	210	339
443.0	Court	Office 305D	3	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	350	53	298
444.0	Court	Office 305A Judge Chamber	3	3L4' T8 32w/EL	indirect/direct	3	3	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,106	0.2	0.1	0.1	556	265	291
445.0	Court	Office 305A Judge Chamber	3	3L2' T8 17w/EL	troffer basket	1	1	3L2' LED 7w/ELEE LO/RLRB	rtrb 2' LED	2,106	0.0	0.0	0.0	112	54	58
446.0	Court	Bath 305A Judge Chamber	3	2x32W CF HARDWIRED/EL	drum	2	2	14 WATT LED/NEW	new LED drum 12"	2,717	0.1	0.0	0.1	370	76	293
447.0	Court	Office Open 305 Judge Chan	3	3L4' T8 32w/EL	trof parabolic	5	5	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.4	0.1	0.3	1,195	179	1,016
448.0	Court	Office 219	2	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	350	53	298
449.0	Court	Kitchen 220	2	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,989	0.1	0.0	0.1	350	53	298
450.0	Court	Office Open 221 Files	2	3L4' T8 32w/EL	trof parabolic	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,431	0.3	0.1	0.2	856	128	727
451.0	Court	Office Open 207 Family Cour	2	3L4' T8 32w/EL	trof parabolic	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.3	0.1	0.2	717	108	610
452.0	Court	Office Open 207 Reception	2	32W CF SCREWIN	can rec hor 6"	2	2	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,717	0.1	0.0	0.0	185	71	114

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
453.0	Court	Hall 219 To 221	2	3L4' T8 32w/EL	trof parabolic	5	5	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,796	0.4	0.1	0.4	1,670	251	1,420
454.0	Court	Storage 223 Files	2	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	884	0.1	0.0	0.1	78	16	62
455.0	Court	Office 223 Copy	2	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	185	28	158
456.0	Court	Lounge Family Court Waiting	2	3L4' T8 32w/EL	trof parabolic	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,470	0.3	0.1	0.2	652	98	554
457.0	Court	Lounge Family Court Waiting	2	32W CF SCREWIN	can rec hor 6"	4	4	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,470	0.1	0.0	0.1	336	128	207
458.0	Court	Lounge 206 Nursery	2	3L4' T8 32w/EL	wrap wall mt.	6	6	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,210	0.4	0.2	0.2	1,167	557	610
459.0	Court	Foyer 209 Hearing Room	2	32W CF SCREWIN	can rec hor 6"	2	2	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,796	0.1	0.0	0.0	258	99	159
460.0	Court	Storage 208 Files	2	3L4' T8 32w/EL	indirect/direct	2	2	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	884	0.1	0.1	0.1	156	74	81
461.0	Court	Conference 211 Probation	2	3L4' T8 32w/EL	indirect/direct	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,223	0.1	0.0	0.0	196	93	102
462.0	Court	Conference 215 Meeting	2	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	350	53	298
463.0	Court	Court Rm 209 Hearing Room	2	4x42W CF HARDWIRED/EL	decorative	6		NO RETRO	no change	2,574	0.9	0.9		2,903	2,903	
464.0	Court	Office 217	2	3L4' T8 32w/EL	indirect/direct	3	3	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.2	0.1	0.1	525	251	274
465.0	Court	Office 217A	2	3L4' T8 32w/EL	indirect/direct	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.1	0.0	0.0	175	84	91
466.0	Court	Bath Next 217	2	2x32W CF HARDWIRED/EL	drum	2	2	14 WATT LED/NEW	new LED drum 12"	2,431	0.1	0.0	0.1	331	68	263
467.0	Court	Office 215	2	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	350	53	298
468.0	Court	Mechanical Audio/Video By 2	2	3L2' T8 17w/EL	troffer basket	1	1	3L2' LED 7w/ELEE LO/RLRB	rtrb 2' LED	1,768	0.0	0.0	0.0	94	45	49
469.0	Court	Office 214	2	3L4' T8 32w/EL	indirect/direct	2	2	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.1	0.1	0.1	350	167	183
470.0	Court	Mechanical Electrical	2	2L4' T8 32w/EL	strip	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,872	0.1	0.0	0.0	112	52	60
471.0	Court	Court Rm 201 Large	2	4x42W CF HARDWIRED/EL	decorative	6		NO RETRO	no change	2,574	0.9	0.9		2,903	2,903	
472.0	Court	Court Rm 201 Large	2	32W CF SCREWIN	can rec hor 6"	22	22	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,574	0.6	0.2	0.4	1,925	736	1,189
473.0	Court	Foyer 213 Jury 1	2	3L4' T8 32w/EL	indirect/direct	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,227	0.1	0.0	0.0	284	136	148
474.0	Court	Conference 213	2	3L4' T8 32w/EL	indirect/direct	6	6	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.4	0.2	0.2	1,050	501	549
475.0	Court	Bath 213	2	2x32W CF HARDWIRED/EL	drum	1	1	14 WATT LED/NEW	new LED drum 12"	2,431	0.1	0.0	0.0	165	34	131
476.0	Court	Bath Men Next 213	2	2x32W CF HARDWIRED/EL	drum	1	1	14 WATT LED/NEW	new LED drum 12"	2,431	0.1	0.0	0.0	165	34	131
477.0	Court	Conference 212	2	3L4' T8 32w/EL	indirect/direct	3	3	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.2	0.1	0.1	525	251	274
478.0	Court	Bath 212	2	2x32W CF HARDWIRED/EL	drum	1	1	14 WATT LED/NEW	new LED drum 12"	2,431	0.1	0.0	0.0	165	34	131
479.0	Court	Hall 212 To 217	2	32W CF SCREWIN	can rec hor 6"	12	12	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,227	0.3	0.1	0.2	1,317	503	813
480.0	Court	Hall 203 Judge Chamber	2	42W CF HARDWIRED	can rec hor 6"	5	5	17 WATT LED/KIT	can kit LED Syl RT/HO 6"	3,796	0.2	0.1	0.1	835	323	512
481.0	Court	Office 203E	2	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	350	53	298
482.0	Court	Office 203A Judge Chamber	2	3L4' T8 32w/EL	indirect/direct	3	3	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.2	0.1	0.1	525	251	274
483.0	Court	Office 203A Judge Chamber	2	3L2' T8 17w/EL	troffer basket	1	1	3L2' LED 7w/ELEE LO/RLRB	rtrb 2' LED	1,989	0.0	0.0	0.0	105	51	55
484.0	Court	Bath 203A Judge Chamber	2	2x32W CF HARDWIRED/EL	drum	2	2	14 WATT LED/NEW	new LED drum 12"	2,431	0.1	0.0	0.1	331	68	263
485.0	Court	Office Open 203	2	3L4' T8 32w/EL	trof parabolic	5	5	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.4	0.1	0.3	1,195	179	1,016
486.0	Court	Conference 202	2	3L4' T8 32w/EL	indirect/direct	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.1	0.0	0.0	175	84	91
487.0	Court	Foyer 202	2	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,227	0.0	0.0	0.0	110	42	68
488.0	Court	Conference 302	3	3L4' T8 32w/EL	indirect/direct	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.1	0.0	0.0	175	84	91
489.0	Court	Conference 303	3	3L4' T8 32w/EL	indirect/direct	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.1	0.0	0.0	175	84	91
490.0	Court	Foyer 302/303	3	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,796	0.0	0.0	0.0	129	49	80
491.0	Court	Conference 307	3	3L4' T8 32w/EL	indirect/direct	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.1	0.0	0.0	175	84	91
492.0	Court	Conference 308	3	3L4' T8 32w/EL	indirect/direct	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.1	0.0	0.0	175	84	91
493.0	Court	Foyer 307/308	3	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,796	0.0	0.0	0.0	129	49	80
494.0	Court	Office Open 104 Drug Court	1	3L4' T8 32w/EL	indirect/direct	4	4	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,431	0.3	0.1	0.2	856	408	447
495.0	Court	Bath 105 Drug Court Coordin	1	2x32W CF HARDWIRED/EL	drum	1	1	14 WATT LED/NEW	new LED drum 12"	2,717	0.1	0.0	0.1	185	38	147
496.0	Court	Library 103	1	4L4' T8 32w/EL-8'	trof acr 1' wide	6	6	4L4' LED 13w/ELEE/RLRB	rtrb 4' LED	2,470	0.6	0.4	0.3	1,660	948	711
497.0	Court	Library 103	1	2L4' T8 32w/EL	trof acr 1' wide	6	6	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,470	0.3	0.2	0.2	889	415	474
498.0	Court	Library 103	1	32W CF SCREWIN	can rec hor 6"	10	10	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,470	0.3	0.1	0.2	840	321	519
499.0	Court	Library 103	1	3L4' T8 32w/EL	indirect/direct	7	7	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,470	0.6	0.3	0.3	1,522	726	795
500.0	Court	Library 103 Reception	1	32W CF SCREWIN	can rec hor 6"	6	6	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,470	0.2	0.1	0.1	504	193	311
501.0	Court	Office 103A	1	3L4' T8 32w/EL	indirect/direct	2	2	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,106	0.2	0.1	0.1	371	177	194
502.0	Court	Office 103C	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.1	371	56	315
503.0	Court	Office 102 Clerk-Waiting	1	3L4' T8 32w/EL	indirect/direct	2	2	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,106	0.2	0.1	0.1	371	177	194
504.0	Court	Office Open 102	1	3L4' T8 32w/EL	trof parabolic	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.3	0.1	0.3	956	143	813
505.0	Court	Office Open 102	1	32W CF SCREWIN	can rec hor 6"	2	2	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,717	0.1	0.0	0.0	185	71	114
506.0	Court	Office 102B	1	3L4' T8 32w/EL	indirect/direct	2	2	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,106	0.2	0.1	0.1	371	177	194
507.0	Court	Office 102C	1	3L4' T8 32w/EL	indirect/direct	2	2	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.1	0.1	0.1	350	167	183
508.0	Court	Storage 102D	1	3L2' T8 17w/EL	troffer basket	1	1	3L2' LED 7w/ELEE LO/RLRB	rtrb 2' LED	884	0.0	0.0	0.0	47	23	24
509.0	Court	Office 102A	1	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	175	26	149
510.0	Court	Office 114	1	3L4' T8 32w/EL	indirect/direct	3	3	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.2	0.1	0.1	525	251	274
511.0	Court	Bath Men	1	2x32W CF HARDWIRED/EL	drum	2	2	14 WATT LED/NEW	new LED drum 12"	2,431	0.1	0.0	0.1	331	68	263
512.0	Court	Storage 113 Slop	1	3L4' T8 32w/EL	strip	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,040	0.1	0.0	0.0	92	44	48

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
513.0	Court	Office 112	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	350	53	298
514.0	Court	Mechanical Network	1	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,768	0.1	0.0	0.1	156	23	132
515.0	Court	Office 111	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	350	53	298
516.0	Court	Mechanical Electrical	1	3L4' T8 32w/EL	strip	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,768	0.1	0.0	0.0	156	74	81
517.0	Court	Office 109	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	350	53	298
518.0	Court	Office 109B	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	350	53	298
519.0	Court	Office 109A	1	3L4' T8 32w/EL	indirect/direct	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,989	0.1	0.0	0.0	175	84	91
520.0	Court	Lounge 110	1	3L4' T8 32w/EL	trof parabolic	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,210	0.2	0.0	0.2	583	88	496
521.0	Court	Bath Women	1	2x32W CF HARDWIRED/EL	drum	2	2	14 WATT LED/NEW	new LED drum 12"	2,431	0.1	0.0	0.1	331	68	263
522.0	Court	Office 108	1	3L4' T8 32w/EL	trof parabolic	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.2	0.0	0.2	525	79	446
523.0	Court	Hall 108 To 114	1	32W CF SCREWIN	can rec hor 6"	9	9	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,796	0.3	0.1	0.2	1,162	444	717
532.0	Bruen	Office County Executive	3	4L4' T8 32w/EL	trof acr	5	5	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.5	0.1	0.4	1,179	139	1,040
533.0	Bruen	Office Secretary	3	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
534.0	Bruen	Office Deputy County Execut	3	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
535.0	Bruen	Bath Unisex	3	3x40w INCANDESCENTS	vanity	1	1	6.5 WATT LED/NEW	screw in LED globe	2,470	0.1	0.0	0.1	296	48	248
536.0	Bruen	Office Copy	3	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	236	28	208
537.0	Bruen	Office Open Next Copy	3	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.1	0.0	0.1	326	72	254
538.0	Bruen	Lounge Next To Unisex	3	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,470	0.2	0.0	0.2	553	65	488
539.0	Bruen	Conference	3	4L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,223	0.3	0.1	0.3	747	88	659
540.0	Bruen	Office Nick	3	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	236	28	208
541.0	Bruen	Office 312	3	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	236	28	208
542.0	Bruen	Office Open 309	3	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.2	0.0	0.2	609	72	537
543.0	Bruen	Office 310	3	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	236	28	208
544.0	Bruen	Office 310A	3	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
545.0	Bruen	Office 308	3	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	236	28	208
546.0	Bruen	Lounge X308	3	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,470	0.1	0.0	0.1	277	33	244
547.0	Bruen	Office 313	3	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
548.0	Bruen	Office 314A	3	4L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.3	0.0	0.3	708	83	624
549.0	Bruen	Storage 314	3	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,170	0.4	0.1	0.3	524	84	440
550.0	Bruen	Office 315	3	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
551.0	Bruen	Bath Men	3	2L4' T8 32w/EL	wrap narrow	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,470	0.1	0.1	0.1	296	138	158
552.0	Bruen	Conference	3	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,223	0.4	0.1	0.4	996	117	879
553.0	Bruen	Storage	3	100w INCANDESCENT	keyless pullchain	1	1	10 WATT LED SI	screw in LED Alamp	780	0.1	0.0	0.1	78	8	70
554.0	Bruen	Bath Women	3	2L4' T8 32w/EL	wrap narrow	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,470	0.1	0.1	0.1	296	138	158
555.0	Bruen	Office 317	3	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
556.0	Bruen	Office 319	3	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
557.0	Bruen	Office X319	3	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
558.0	Bruen	Conference 318-320	3	4L4' T8 32w/EL	trof acr	15	15	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,223	1.6	0.3	1.3	3,735	440	3,294
559.0	Bruen	Office Open 321 Legislative	3	4L4' T8 32w/EL	trof acr	9	9	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	1.0	0.2	0.8	2,739	323	2,416
560.0	Bruen	Office Chairman	3	4L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.3	0.0	0.3	708	83	624
561.0	Bruen	Office Copy-File	3	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.4	0.1	0.3	943	111	832
562.0	Bruen	Storage Storage To Exit	3	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,170	0.1	0.0	0.0	70	21	49
563.0	Bruen	Office Next To Storage	3	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.4	0.1	0.3	943	111	832
564.0	Bruen	Office Dianne T .	3	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
565.0	Bruen	Office Next Dianne	3	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
566.0	Bruen	Hall 3Rd Floor	3	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.1	343	76	268
567.0	Bruen	Hall 3Rd Floor	3	2L4' T8 32w U/EL	trof acr	8	8	24 WATT LED/KIT	trof kit LED with controls	2,860	0.5	0.1	0.4	1,373	227	1,146
568.0	Bruen	Office Open 206	2	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.4	0.1	0.4	1,217	143	1,074
569.0	Bruen	Office 205	2	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.4	0.1	0.3	943	111	832
570.0	Bruen	Office 207	2	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	253	56	197
571.0	Bruen	Bath Men	2	2L4' T8 32w/EL	wrap narrow	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,470	0.1	0.1	0.1	296	138	158
572.0	Bruen	Office 208	2	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.2	0.0	0.2	446	53	393
573.0	Bruen	Office 209	2	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.2	0.0	0.2	446	53	393
574.0	Bruen	Bath Women	2	2L4' T8 32w/EL	wrap narrow	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,470	0.1	0.1	0.1	296	138	158
575.0	Bruen	Office 210	2	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
576.0	Bruen	Office 211	2	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
577.0	Bruen	Office 211	2	2L4' T8 32w/EL	wrap narrow	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,106	0.1	0.0	0.0	126	59	67
578.0	Bruen	Office 212	2	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.2	0.0	0.2	446	53	393
579.0	Bruen	Office 213 Copy	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	236	28	208
580.0	Bruen	Office 213	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	236	28	208

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
581.0	Bruen	Office 213 District Atty	2	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
582.0	Bruen	Office 213 Corner	2	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.4	0.1	0.3	943	111	832
583.0	Bruen	Conference Corner	2	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,223	0.4	0.1	0.4	996	117	879
584.0	Bruen	Kitchen 214	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,989	0.1	0.0	0.1	223	26	197
585.0	Bruen	Foyer 214	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.1	320	38	283
586.0	Bruen	Office 214 Left	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	236	28	208
587.0	Bruen	Office 214 Middle	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	223	26	197
588.0	Bruen	Office 214 Right	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	223	26	197
589.0	Bruen	Office 214 Copy	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	236	28	208
590.0	Bruen	Office 200	2	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.2	0.0	0.2	446	53	393
591.0	Bruen	Office 200	2	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.0	126	28	99
592.0	Bruen	Office 210	2	4L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.3	0.0	0.3	708	83	624
593.0	Bruen	Office Sheila	2	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.2	0.0	0.2	446	53	393
594.0	Bruen	Bath Toilet	2	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,210	0.1	0.0	0.0	133	29	103
595.0	Bruen	Foyer Shelves	2	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.0	172	38	134
596.0	Bruen	Hall Cooler	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.1	320	38	283
597.0	Bruen	Hall Cooler	2	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.0	172	38	134
598.0	Bruen	Office Payroll 1	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	223	26	197
599.0	Bruen	Office Payroll 2	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	236	28	208
600.0	Bruen	Stair Near 200	2	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	2,860	0.1	0.0	0.0	172	28	143
601.0	Bruen	Bath By Long Hall	2	2L4' T8 32w/EL	wrap	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,470	0.1	0.0	0.0	148	69	79
602.0	Bruen	Office Open 202	2	4L4' T8 32w/EL	trof acr	7	7	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.7	0.1	0.6	2,130	251	1,879
603.0	Bruen	Office 202 Catherine	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	223	26	197
604.0	Bruen	Office 202 Left	2	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	223	26	197
605.0	Bruen	Office Open 203	2	4L4' T8 32w/EL	trof acr	5	5	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,431	0.5	0.1	0.4	1,361	160	1,201
606.0	Bruen	Office Open 203	2	2L4' T8 32w U/EL	trof acr	3	3	24 WATT LED/KIT	trof kit LED with controls	2,431	0.2	0.0	0.1	438	72	365
607.0	Bruen	Storage 203	2	4L4' T8 32w/EL	trof acr	1	1	2L4' LED 13w/ELEE HI/RLRB	rtrb 4' LED socket bar kit	663	0.1	0.0	0.1	74	29	46
608.0	Bruen	Hall 2Nd Floor Long Hall	2	2L4' T8 32w U/EL	trof acr	6	6	24 WATT LED/KIT	trof kit LED with controls	2,860	0.4	0.1	0.3	1,030	170	860
609.0	Bruen	Hall 200 To 201	2	2L4' T8 32w U/EL	trof acr	2	2	24 WATT LED/KIT	trof kit LED with controls	2,860	0.1	0.0	0.1	343	57	287
610.0	Bruen	Hall 2Nd Floor District Atty	2	2L4' T8 32w U/EL	trof acr	8	8	24 WATT LED/KIT	trof kit LED with controls	2,860	0.5	0.1	0.4	1,373	227	1,146
611.0	Bruen	Hall 2Nd Floor District Atty	2	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.2	0.0	0.2	641	76	565
612.0	Bruen	Stair Middle	1	2L4' T8 32w U/EL	trof acr	4	4	24 WATT LED/KIT	trof kit LED with controls	2,860	0.2	0.1	0.2	686	113	573
613.0	Bruen	Stair Middle	1	20W CF SCREWIN	drum	1		NO RETRO	no change	2,860	0.0	0.0		63	63	
614.0	Bruen	Office 105 Alexis	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
615.0	Bruen	Office Next Alexis	1	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.0	126	28	99
616.0	Bruen	Office Next Alexis	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls & switch	2,106	0.1	0.0	0.0	126	21	106
617.0	Bruen	Office Alessandro 105	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
618.0	Bruen	Hall 105	1	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.2	0.1	0.2	686	151	535
619.0	Bruen	Hall 105	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	2,860	0.1	0.0	0.0	172	28	143
620.0	Bruen	Office Open 104	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.2	0.0	0.2	609	72	537
621.0	Bruen	Office Open 104	1	2L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.2	0.1	0.1	489	108	381
622.0	Bruen	Kitchen 104	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,223	0.1	0.0	0.1	249	29	220
623.0	Bruen	Office Director	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
624.0	Bruen	Office Next Director	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	236	28	208
625.0	Bruen	Office Open Open	1	3L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.1	0.0	0.1	239	36	203
626.0	Bruen	Office Open Open	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	2,717	0.1	0.0	0.0	163	27	136
627.0	Bruen	Office Ofc-Files 104	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	236	28	208
628.0	Bruen	Office Open 102	1	4L4' T8 32w/EL	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.6	0.1	0.5	1,826	215	1,611
629.0	Bruen	Office 102	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls & switch	2,106	0.1	0.0	0.0	126	21	106
630.0	Bruen	Office 102 Copy	1	2L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.1	379	83	296
631.0	Bruen	Office 101	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	223	26	197
632.0	Bruen	Storage By Lobby	1	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,170	0.1	0.0	0.0	70	21	49
633.0	Bruen	Hall 102-105	1	2L4' T8 32w U/EL	trof acr	5	5	24 WATT LED/KIT	trof kit LED with controls	2,860	0.3	0.1	0.2	858	142	716
634.0	Bruen	Bath Men	1	2L4' T8 32w/EL	wrap	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,470	0.1	0.1	0.1	296	138	158
635.0	Bruen	Lobby Main	1	2L4' T8 32w U/EL	trof acr	9	9	24 WATT LED/KIT	trof kit LED with controls	2,860	0.5	0.1	0.4	1,544	255	1,290
636.0	Bruen	Hall Vending /Storage By Lob	1	2L4' T8 32w U/EL	trof acr	2	2	24 WATT LED/KIT	trof kit LED with controls	2,860	0.1	0.0	0.1	343	57	287
637.0	Bruen	Storage Behind Guard	1	100w INCANDESCENT	keyless pullchain	1	1	10 WATT LED SI	screw in LED Alamp	780	0.1	0.0	0.1	78	8	70
638.0	Bruen	Office Open 100 Reception	1	4L4' T8 32w/EL	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.6	0.1	0.5	1,826	215	1,611
639.0	Bruen	Office Open 100 Reception 2	1	4L4' T8 32w/EL	trof acr	8	8	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.9	0.1	0.7	2,434	287	2,148
640.0	Bruen	Office Open 100 Reception 2	1	34 WATT LED	trof acr	1		NO RETRO	no change already efficient	2,717	0.0	0.0		92	92	

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
641.0	Bruen	Office Open 100 Record Area	1	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.4	0.1	0.4	1,217	143	1,074
642.0	Bruen	Office Open 100 Record Area	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	2,717	0.1	0.0	0.0	163	27	136
643.0	Bruen	Office Open 100 County Cler	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.2	0.0	0.2	609	72	537
644.0	Bruen	Office Open 100 County Cler	1	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.1	0.0	0.0	163	36	127
645.0	Bruen	Office Open 100 Reception/S	1	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.4	0.1	0.4	1,217	143	1,074
646.0	Bruen	Hall 100	1	2L4' T8 32w U/EL	trof acr	2	2	24 WATT LED/KIT	trof kit LED with controls	2,860	0.1	0.0	0.1	343	57	287
647.0	Bruen	Stair 100 To 200	1	23W CF SCREWIN	old drum	1	1	14 WATT LED/NEW	new LED drum 12"	2,860	0.0	0.0	0.0	72	40	31
648.0	Bruen	Foyer Exit By 100	1	2L4' T8 32w/EL	wrap	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,860	0.1	0.0	0.0	172	80	92
649.0	Bruen	Hall Long	1	2L4' T8 32w U/EL	trof acr	5	5	24 WATT LED/KIT	trof kit LED with controls	2,860	0.3	0.1	0.2	858	142	716
650.0	Bruen	Bath Near Long Hall	1	2L4' T8 32w/EL	wrap	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,470	0.1	0.0	0.0	148	69	79
651.0	Bruen	Storage	b	18 WATT LED	keyless	2		NO RETRO	no change already efficient	780	0.0	0.0		28	28	
652.0	Bruen	Hall Long-Basement	b	18 WATT LED	keyless	5		NO RETRO	no change already efficient	2,860	0.1	0.1		257	257	
653.0	Bruen	Hall By Elevator	b	2L4' T8 32w/EL	wrap	4	4	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,860	0.2	0.1	0.1	686	320	366
654.0	Bruen	Office B1 Maintenance	b	18 WATT LED	keyless pullchain	2		NO RETRO	no change already efficient	2,106	0.0	0.0		76	76	
655.0	Bruen	Office B1 Maintenance	b	1L4' T12 40w STD/STD	strip plug-in	1	1	2L4' LED 13w/ELEE LO/NEW white goods	new LED strip hardwire needed	2,106	0.1	0.0	0.0	120	59	61
656.0	Bruen	Bath By Elevator	b	22w CIRCLELINE HARDWIRE	drum	2	2	14 WATT LED/NEW	new LED drum 12"	2,470	0.0	0.0	0.0	119	69	49
657.0	Bruen	Bath By Elevator	b	2L4' T8 32w/EL	wrap	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,470	0.1	0.0	0.0	148	69	79
658.0	Bruen	Storage Under Stair	b	2L4' T8 32w/EL	wrap	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	780	0.1	0.0	0.0	47	22	25
659.0	Bruen	Storage Under Stair	b	2L4' T8 32w/EL	wrap	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	780	0.1	0.0	0.0	47	22	25
660.0	Bruen	Storage B2	b	2L4' T8 32w/EL	trof acr	7	7	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	780	0.4	0.2	0.2	328	153	175
661.0	Bruen	Storage B2	b	2L4' T8 32w/EL	wrap	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	780	0.1	0.0	0.0	47	22	25
662.0	Bruen	Storage B2 Back	b	2L4' T8 32w/EL	wrap	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	780	0.1	0.1	0.1	94	44	50
663.0	Bruen	Storage B2 Middle	b	2L4' T8 32w/EL	trof acr	4	4	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	780	0.2	0.1	0.1	187	87	100
664.0	Bruen	Storage B2 Middle	b	2L8' T12 75w STD/STD	strip	1	1	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED (8' strip kit)	780	0.2	0.1	0.1	135	44	91
665.0	Bruen	Storage B2 Back	b	2L4' T12 40w STD/STD	strip	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	780	0.2	0.1	0.1	147	44	103
666.0	Bruen	Storage B2 Back	b	4L4' T12 40w STD/STD-8'	strip reflector	1	1	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	780	0.2	0.1	0.1	147	44	103
667.0	Bruen	Mechanical Boiler	b	2L4' T8 32w/EL	strip	7	7	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,872	0.4	0.2	0.2	786	367	419
668.0	Bruen	Mechanical Electrical Panel R	b	2L4' T8 32w/EL	wrap	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,872	0.1	0.1	0.1	225	105	120
669.0	Bruen	Storage By Elevator For Prob	b	4L4' T8 32w/EL	trof acr	6	6	2L4' LED 13w/ELEE HI/RLRB	rtrb 4' LED socket bar kit	780	0.7	0.3	0.4	524	201	323
670.0	Bruen	Office Open Probation	b	4L4' T8 32w/EL	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,717	0.6	0.1	0.5	1,826	215	1,611
671.0	Bruen	Office John-Probation	b	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	239	53	186
672.0	Bruen	Office Liz-Probation	b	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	253	56	197
673.0	Bruen	Office John M-Probation	b	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	253	56	197
674.0	Bruen	Office Adam-Probation	b	4L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.3	0.0	0.2	668	79	590
675.0	Bruen	Lounge Probation	b	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,470	0.2	0.0	0.2	553	65	488
676.0	Bruen	Office Sharlene-Probation	b	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.2	0.0	0.2	446	53	393
677.0	Bruen	Office Randy-Probation	b	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
678.0	Bruen	Office Rick-Probation	b	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
679.0	Bruen	Office Dianne-Probation	b	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
680.0	Bruen	Office Joanne-Intake-Probati	b	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	223	26	197
681.0	Bruen	Office April-Intake-Probation	b	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.2	0.0	0.2	446	53	393
682.0	Bruen	Office Elaine-Probation	b	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
683.0	Bruen	Office Gene-Probation	b	4L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.3	0.0	0.3	708	83	624
684.0	Bruen	Office Angel-Probation	b	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.2	0.0	0.2	446	53	393
685.0	Bruen	Kitchen Probation	b	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,223	0.1	0.0	0.1	249	29	220
686.0	Bruen	Bath In Kitchen-Probation	b	60w INCANDESCENT	vanity	1	1	10 WATT LED SI	screw in LED Alamp	2,470	0.1	0.0	0.0	148	25	124
687.0	Bruen	Bath In Kitchen-Probation	b	60w INCANDESCENT	drum	1	1	10 WATT LED SI	screw in LED Alamp	2,470	0.1	0.0	0.0	148	25	124
688.0	Bruen	Office	b	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
689.0	Bruen	Office	b	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
690.0	Bruen	Office Kelly-Probation	b	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	223	26	197
691.0	Bruen	Bath Unisex=Probation	b	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,210	0.1	0.0	0.1	248	29	218
692.0	Bruen	Bath Staff-Probation	b	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,210	0.1	0.0	0.1	248	29	218
693.0	Bruen	Hall Probation	b	4L4' T8 32w/EL	trof acr	9	9	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	1.0	0.2	0.8	2,883	340	2,543
694.0	Bruen	Office Eileen-Probation	b	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.2	0.0	0.2	446	53	393
695.0	Bruen	Office Amy-Probation	b	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.2	0.0	0.2	446	53	393
696.0	Bruen	Lobby Waiting-Probation	b	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.2	0.0	0.2	641	76	565
704.0	Court1812	Office 1	1	2L4' T12 34w U EE/EEMAG	box para	4	4	21 WATT LED/KIT	trof kit LED door	1,404	0.3	0.1	0.2	393	118	275
705.0	Court1812	Office 2	1	2L4' T12 34w U EE/EEMAG	box para	3	3	21 WATT LED/KIT	trof kit LED door	1,404	0.2	0.1	0.1	295	88	206
706.0	Court1812	Office 2	1	2L4' T8 32w U/EL	box para	1	1	21 WATT LED/KIT	trof kit LED door	1,404	0.1	0.0	0.0	84	29	55
707.0	Court1812	Office 3	1	2L4' T12 34w U EE/EEMAG	box para	4	4	21 WATT LED/KIT	trof kit LED door	1,404	0.3	0.1	0.2	393	118	275

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
708.0	Court1812	Office Open 4	1	2L4' T12 34w U EE/EEMAG	box para	14	14	21 WATT LED/KIT	trof kit LED door	1,976	0.9	0.3	0.7	1,936	581	1,356
709.0	Court1812	Hall 1 To 4	1	10 WATT LED	decorative	4		NO RETRO	no change already efficient	2,860	0.0	0.0		114	114	
710.0	Court1812	Stair To Court (2)	1	200w INC HALOGEN	decorative	2		NO RETRO	no change decorative	2,860	0.4	0.4		1,144	1,144	
711.0	Court1812	Court Rm (2)	2	200w INC HALOGEN	decorative	16		NO RETRO	no change decorative	1,404	2.6	2.6		4,493	4,493	
712.0	Court1812	Court Rm	2	200w INC HALOGEN	decorative	8		NO RETRO	no change	1,404	1.3	1.3		2,246	2,246	
713.0	Court1812	Court Rm (8)	2	200w INC HALOGEN	decorative	8		NO RETRO	no change	1,404	1.3	1.3		2,246	2,246	
714.0	Court1812	Bath Men	1	20 WATT LED	drum wall mt.	5		NO RETRO	no change already efficient	2,470	0.1	0.1		247	247	
715.0	Court1812	Bath Women	1	32w CIRCLELINE HARDWIRE	drum	5	5	14 WATT LED/NEW	new LED drum 12"	2,470	0.2	0.1	0.1	420	173	247
716.0	Court1812	Hall Main Entrance	1	2x13W CF HARDWIRED	can rec hor 8"	17	17	17 WATT LED/KIT	can kit LED Syl RT/HO 6"	2,860	0.5	0.3	0.2	1,459	827	632
718.0	Court1812	Storage Phone Corner	1	2x13W CF HARDWIRED	can rec hor 8"	1	1	17 WATT LED/KIT	can kit LED Syl RT/HO 6"	780	0.0	0.0	0.0	23	13	10
719.0	Court1812	Hall By Reception	1	20W CF SCREWIN	sconce	3	3	14 WATT LED/NEW	new LED drum 12"	2,860	0.1	0.0	0.0	189	120	69
720.0	Court1812	Lounge Break Room	1	2L4' T8 32w/EL	wrap	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,976	0.1	0.0	0.0	119	55	63
721.0	Court1812	Lounge Break Room	1	2L4' T12 40w STD/STD	wrap	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,976	0.2	0.1	0.1	371	111	261
722.0	Court1812	Hall Files Hall	1	2L4' T12 40w STD/STD	wrap	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,860	0.3	0.1	0.2	807	240	566
723.0	Court1812	Stair To 2Nd Floor	1	22w & 32w CIRCLELINE HAR	drum	5	5	14 WATT LED/NEW	new LED drum 12"	2,860	0.3	0.1	0.2	829	200	629
724.0	Court1812	Hall 2Nd Floor (2)	2	200w INC HALOGEN	decorative	6		NO RETRO	no change	2,860	1.2	1.2		3,432	3,432	
725.0	Court1812	Conference 2Nd Floor (2)	2	200w INC HALOGEN	decorative	4		NO RETRO	no change	1,482	0.8	0.8		1,186	1,186	
726.0	Court1812	Conference 2Nd Floor	2	200w INC HALOGEN	decorative	4		NO RETRO	no change	1,482	0.8	0.8		1,186	1,186	
727.0	Court1812	Bath In Conf	2	2x60w INCANDESCENTS	vanity	1	1	10 WATT LED SI	screw in LED Alamp	2,470	0.1	0.0	0.1	296	49	247
728.0	Court1812	Bath In Conf	2	2x60w INCANDESCENTS	vanity	1	1	10 WATT LED SI	screw in LED Alamp	2,470	0.1	0.0	0.1	296	49	247
729.0	Court1812	Storage Slop Sink	2	2x60w INCANDESCENTS	old sconce	1	1	10 WATT LED SI	screw in LED Alamp	780	0.1	0.0	0.1	94	16	78
730.0	Court1812	Office 5 (2)	2	200w INC HALOGEN	decorative	4		NO RETRO	no change	1,404	0.7	0.7		1,123	1,123	
731.0	Court1812	Office 5	2	200w INC HALOGEN	decorative	4		NO RETRO	no change	1,404	0.7	0.7		1,123	1,123	
732.0	Court1812	Bath 5	2	2x60w INCANDESCENTS	vanity	1	1	10 WATT LED SI	screw in LED Alamp	2,470	0.1	0.0	0.1	296	49	247
733.0	Court1812	Office 6	2	2L4' T12 34w U EE/EEMAG	box para	2	2	21 WATT LED/KIT	trof kit LED door	1,404	0.1	0.0	0.1	197	59	138
734.0	Court1812	Office 7	2	2L4' T12 34w U EE/EEMAG	box para	2	2	21 WATT LED/KIT	trof kit LED door	1,404	0.1	0.0	0.1	197	59	138
735.0	Court1812	Storage Old Cell Area	2	2L4' T12 40w STD/STD	wrap	4	4	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	780	0.4	0.1	0.3	293	87	206
736.0	Court1812	Stair To Basement	2	22w & 32w CIRCLELINE HAR	drum	2	2	14 WATT LED/NEW	new LED drum 12"	2,860	0.1	0.0	0.1	332	80	252
737.0	Court1812	Mechanical Boiler Room	b	2L4' T12 40w STD/STD	wrap	4	4	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,340	0.3	0.1	0.2	880	262	618
738.0	Court1812	Mechanical Electrical Panel	b	2L4' T12 40w STD/STD	wrap	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,340	0.1	0.0	0.1	220	66	154
739.0	Court1812	Storage B04	b	2L4' T12 40w STD/STD	old wrap	2	2	2L4' LED 13w/ELEE LO/NEW white goods	new wrap	780	0.2	0.1	0.1	147	44	103
740.0	Court1812	Mechanical Chiller	b	2L4' T12 40w STD/STD	old wrap	2	2	2L4' LED 13w/ELEE LO/NEW white goods	new wrap	2,340	0.2	0.1	0.1	440	131	309
741.0	Court1812	Mechanical Chiller	b	14 WATT LED	sconce	1		NO RETRO	no change already efficient	2,340	0.0	0.0		33	33	
742.0	Court1812	Storage Under Stair	b	9 WATT LED	keyless	2		NO RETRO	no change already efficient	780	0.0	0.0		14	14	
743.0	Court1812	Mechanical Elevator Motor	b	2L4' T12 40w STD/STD	wrap	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,340	0.1	0.0	0.1	220	66	154
744.0	Court1812	Hall Basement	b	2L4' T12 40w STD/STD	wrap	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,860	0.2	0.1	0.1	538	160	378
745.0	Court1812	Hall Basement Hall Exit Sign	b	2x5W CF HARDWIRED	exit sign	1	1	3 WATT LED/NEW EXIT BATTERY	new LED exit bat	8,760	0.0	0.0	0.0	123	26	96
746.0	Law	Lobby Waiting Area	1	4L4' T12 34w EE/EEMAG	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.8	0.1	0.7	2,402	227	2,176
747.0	Law	Office Diaz	1	4L4' T12 40w STD/STD	trof acr	5	5	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.8	0.1	0.8	1,980	139	1,841
748.0	Law	Office Sue	1	4L4' T12 40w STD/STD	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.7	0.1	0.6	1,584	111	1,473
749.0	Law	Office Dawn	1	4L4' T12 40w STD/STD	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.3	0.0	0.3	792	56	736
750.0	Law	Office Conrad	1	4L4' T12 40w STD/STD	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.3	0.0	0.3	792	56	736
751.0	Law	Hall Dawn To Conrad	1	34 WATT LED	trof acr 2x2	2		NO RETRO	no change already efficient	2,860	0.1	0.1		194	194	
752.0	Law	Hall Copy Area	1	4L4' T12 40w STD/STD	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.4	0.0	0.3	1,075	76	1,000
753.0	Law	Kitchen	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	2,223	0.1	0.0	0.0	133	22	111
754.0	Law	Bath Women	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	2,223	0.1	0.0	0.0	133	22	111
755.0	Law	Office Next To Women	1	4L4' T12 40w STD/STD	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	396	28	368
756.0	Law	Office Next To Women	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	236	28	208
757.0	Law	Office Next To Jennifer N.	1	4L4' T12 40w STD/STD	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.3	0.0	0.3	792	56	736
758.0	Law	Office Jennifer N.	1	4L4' T12 40w STD/STD	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.3	0.0	0.3	792	56	736
759.0	Law	Office Next To Jennifer N.	1	4L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.3	0.0	0.3	708	83	624
760.0	Law	Office Marissa	1	4L4' T12 34w EE/EEMAG	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.5	0.1	0.4	1,179	111	1,068
761.0	Law	Office Andrew	1	4L4' T12 40w STD/STD	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.7	0.1	0.6	1,584	111	1,473
762.0	Law	Office County Atty	1	2L4' T8 32w U/EL	trof acr	4	4	24 WATT LED/KIT	trof kit LED with controls & switch	2,106	0.2	0.0	0.2	505	83	422
763.0	Law	Bath County Atty	1	60w INCANDESCENT	vanity	1	1	10 WATT LED SI	screw in LED Alamp	2,223	0.1	0.0	0.0	133	22	111
764.0	Law	Bath Men	1	42W CF SCREWIN	vanity	3	3	10 WATT LED SI	screw in LED Alamp	2,223	0.1	0.0	0.1	320	67	253
765.0	Law	Library Library/Conference	1	2L4' T8 32w U/EL	trof acr	3	3	24 WATT LED/KIT	trof kit LED with controls	2,223	0.2	0.0	0.1	400	66	334
766.0	Law	Library Library/Conference	1	2L4' T12 34w U EE/EEMAG	trof acr	3	3	24 WATT LED/KIT	trof kit LED with controls	2,223	0.2	0.0	0.2	467	66	401
767.0	Law	Library Library/Conference	1	100w INCANDESCENT	can rec vert 6" dim	14	14	10 WATT LED SI	screw in LED Alamp	2,223	1.3	0.1	1.2	3,112	311	2,801
768.0	Law	Office Dina	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
769.0	Law	Office Reception	1	4L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.3	0.0	0.3	708	83	624
770.0	Law	Hall Long	1	4L4' T12 40w STD/STD	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.8	0.1	0.7	2,151	151	2,000
771.0	Law	Hall Long	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.1	320	38	283
773.0	Hwy1	Office 100	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
774.0	Hwy1	Office 101	1	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.4	0.1	0.3	943	111	832
775.0	Hwy1	Office 102 (2)	1	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	253	56	197
776.0	Hwy1	Office 103	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
777.0	Hwy1	Office 104	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	472	56	416
778.0	Hwy1	Office 107	1	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.1	0.2	505	111	394
779.0	Hwy1	Mechanical Boiler	1	90w INCANDESCENT	keyless	1	1	10 WATT LED SI	screw in LED Alamp	520	0.1	0.0	0.1	47	5	42
780.0	Hwy1	Mechanical Boiler	1	9 WATT LED	keyless	1		NO RETRO	no change already efficient	520	0.0	0.0		5	5	
781.0	Hwy1	Office Open Cubical/Drat	1	34 WATT LED	trof acr	15		NO RETRO	no change already efficient	2,470	0.5	0.5		1,260	1,260	
782.0	Hwy1	Office 114	1	34 WATT LED	trof acr	2		NO RETRO	no change already efficient	1,989	0.1	0.1		135	135	
783.0	Hwy1	Office 108	1	34 WATT LED	trof acr	2		NO RETRO	no change already efficient	2,106	0.1	0.1		143	143	
784.0	Hwy1	Office 115	1	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	239	53	186
785.0	Hwy1	Lounge (2)	1	2L4' T8 32w/EL	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,470	0.3	0.1	0.2	889	196	694
786.0	Hwy1	Conference 111	1	14 WATT LED	can rec vert 6"	8		NO RETRO	no change already efficient	2,223	0.1	0.1		249	249	
787.0	Hwy1	Office 116 (2)	1	2L4' T8 32w/EL	trof acr	8	8	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.4	0.1	0.3	1,011	222	788
788.0	Hwy1	Office 112	1	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	253	56	197
789.0	Hwy1	Office 113	1	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.1	0.2	505	111	394
790.0	Hwy1	Bath Men	1	4L4' T8 32w/EL-8'	old wrap	1	1	4L4' LED 13w/ELEE LO/NEW white goods	new wrap	1,989	0.1	0.0	0.0	223	111	111
791.0	Hwy1	Bath Women	1	4L4' T8 32w/EL-8'	old wrap	1	1	4L4' LED 13w/ELEE LO/NEW white goods	new wrap	1,989	0.1	0.0	0.0	223	111	111
792.0	Hwy1	Storage Slop Sink	1	60w INCANDESCENT	keyless	1	1	10 WATT LED SI	screw in LED Alamp	1,040	0.1	0.0	0.1	62	10	52
793.0	Hwy1	Hall	1	2L4' T8 32w/EL-8'	wrap narrow	12	12	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,860	0.7	0.3	0.4	2,059	961	1,098
794.0	Hwy1	Foyer Entry	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.1	320	38	283
795.0	Hwy3	Office Dispatch	1	4L8' T12 75w STD/STD	strip	1	1	4L4' LED 13w/ELEE/NEW white goods	new strip	2,106	0.3	0.1	0.3	729	135	594
796.0	Hwy3	Office Mechanic	1	2L4' T8 32w/EL	trof acr	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,106	0.1	0.1	0.1	253	118	135
797.0	Hwy3	Garage Central	1	6L4' T8 32w/EL	high bay	12	12	86 WATT LED/NEW	new LED hibay	1,638	1.9	0.9	1.0	3,420	1,690	1,730
798.0	Hwy3	Garage Central	1	4L4' T8 32w/EL-8'	strip	1	1	4L4' LED 13w/ELEE/RLRB	rtrb 4' LED	1,638	0.1	0.1	0.0	183	105	79
799.0	Hwy3	Garage Central	1	2L8' T12 75w STD/STD	strip	15	15	4L4' LED 13w/ELEE/NEW white goods	new strip	1,638	2.3	0.9	1.5	4,251	1,572	2,678
800.0	Hwy3	Garage Mezzanine	1	2L8' T12 75w STD/STD	strip	3	3	4L4' LED 13w/ELEE/NEW white goods	new strip	1,638	0.5	0.2	0.3	850	314	536
801.0	Hwy3	Lounge Garage	1	2L4' T8 32w/EL	wrap	8	8	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,210	0.4	0.2	0.2	1,061	495	566
802.0	Hwy3	Bath Men	1	2L8' T12 75w STD/STD	strip	2	2	4L4' LED 13w/ELEE/NEW white goods	new strip	1,768	0.3	0.1	0.2	612	226	385
803.0	Hwy3	Mechanical Boiler	1	100w INCANDESCENT	explosion	3		NO RETRO	no change	2,210	0.3	0.3		663	663	
804.0	Hwy3	Garage Right	1	6L4' T8 32w/EL	high bay	6	6	86 WATT LED/NEW	new LED hibay	1,638	0.9	0.5	0.5	1,710	845	865
805.0	Hwy3	Garage Right	1	2L8' T12 75w STD/STD	strip wall mt.	1	1	4L4' LED 13w/ELEE/NEW white goods	new strip	1,638	0.2	0.1	0.1	283	105	179
806.0	Hwy3	Garage Right	1	2L8' T12 75w STD/STD	strip	3	3	4L4' LED 13w/ELEE/NEW white goods	new strip	1,638	0.5	0.2	0.3	850	314	536
807.0	Hwy3	Office Right	1	2L4' T8 32w/EL	wrap	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,106	0.2	0.1	0.1	379	177	202
808.0	Hwy3	Garage Right	1	4L4' T12 40w STD/STD	old wrap	1	1	4L4' LED 13w/ELEE/NEW white goods	new wrap	1,638	0.2	0.1	0.1	308	105	203
809.0	Hwy3	Garage Main	1	2L4' T12 40w STD/STD	wrap plugin	3	3	2L4' LED 13w/ELEE/NEW white goods	new LED strip hardwire needed	1,638	0.3	0.1	0.2	462	157	305
810.0	Hwy3	Garage Main	1	2L4' T12 40w STD/STD	vapor tight	2	2	2L4' LED 13w/ELEE/RLRB	rtrb 4' LED	1,638	0.2	0.1	0.1	308	105	203
811.0	Hwy3	Foyer Main	1	100w INCANDESCENT	explosion	1		NO RETRO	no change	2,340	0.1	0.1		234	234	
812.0	Hwy3	Foyer Main	1	9 WATT LED	keyless	1		NO RETRO	no change already efficient	2,340	0.0	0.0		21	21	
813.0	Hwy4	Garage Parks	1	6L4' T8 32w/EL	high bay	7	7	86 WATT LED/NEW	new LED hibay	2,106	1.1	0.5	0.6	2,565	1,268	1,297
814.0	Hwy4	Garage Small Engine	1	250w METAL HALIDE	lowbay	6	6	86 WATT LED/NEW	new LED hibay	2,106	1.6	0.5	1.1	3,728	1,087	2,641
815.0	Hwy4	Garage Small Engine (2)	1	2L4' T12 40w STD/STD	trof parabolic	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,106	0.2	0.1	0.1	396	118	278
816.0	Hwy4	Garage Small Engine Lounge	1	2L4' T12 40w STD/STD	wrap	3	3	2L4' LED 13w/ELEE/NEW white goods	new wrap	2,106	0.3	0.1	0.2	594	202	392
817.0	Hwy4	Garage Small Engine Lounge	1	2L4' T8 32w/EL	wrap	1	1	2L4' LED 13w/ELEE/RLRB	rtrb 4' LED	2,106	0.1	0.0	0.0	126	67	59
818.0	Hwy4	Garage Small Engine Mezza	1	150w HI PRESSURE SODIUM	flood	1	1	42 WATT LED/NEW	new LED flood	2,106	0.2	0.0	0.1	400	88	312
819.0	Hwy4	Garage Highway	1	6L4' T8 32w/EL	high bay	5	5	86 WATT LED/NEW	new LED hibay	2,106	0.8	0.4	0.4	1,832	906	927
820.0	Hwy2	Garage Storage	1	4L4' T8 32w/EL-8'	strip reflector	9	9	4L4' LED 13w/ELEE/RLRB	rtrb 4' LED	1,638	0.9	0.5	0.4	1,651	943	708
821.0	Hwy2	Garage Storage	1	2L8' T12 75w STD/STD	strip	2	2	4L4' LED 13w/ELEE/RLRB	rtrb 4' LED (8' strip rfl kit)	1,638	0.3	0.1	0.2	567	210	357
822.0	Hwy2	Lounge Plans	1	2L8' T12 75w STD/STD	strip	1	1	4L4' LED 13w/ELEE/NEW white goods	new strip	2,470	0.2	0.1	0.1	427	158	269
823.0	Hwy2	Storage Next To Utility	1	3L4' T8 32w/EL	strip	4	4	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,040	0.4	0.2	0.2	366	175	191
824.0	Hwy2	Mechanical Utility	1	2L4' T12 40w STD/STD	strip	1	1	1L4' LED 13w/ELEE/NEW white goods	new LED strip	1,872	0.1	0.0	0.1	176	30	146
825.0	Hwy2	Shop Sign	1	6L4' T8 32w/EL	lowbay	2	2	86 WATT LED/NEW	new LED hibay	2,470	0.3	0.2	0.2	860	425	435
826.0	Hwy2	Shop Sign	1	4L4' T8 32w/EL-8'	strip	2	2	4L4' LED 13w/ELEE/RLRB	rtrb 4' LED	2,470	0.2	0.1	0.1	553	316	237
827.0	Hwy2	Shop Sign	1	2L8' T12 75w STD/STD	strip	3	3	4L4' LED 13w/ELEE/NEW white goods	new strip	2,470	0.5	0.2	0.3	1,282	474	808
828.0	Hwy2	Office Sign Shop	1	2L4' T8 32w U/EL	trof acr	2	2	20 WATT LED/KIT	rt 2L2' LED bar kit	2,340	0.1	0.0	0.1	281	94	187
841.0	KoehlerSR	Dining Room Main	1	4x42W CF HARDWIRED/EL	decorative	10		NO RETRO	no change	2,340	1.9	1.9		4,399	4,399	

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
842.0	KoehlerSR	Dining Room Main Lower Ce	1	2x13W CF HARDWIRED	can rec hor 6"	16	16	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,340	0.5	0.2	0.3	1,123	487	636
843.0	KoehlerSR	Kitchen	1	3L4' T8 32w/EL	trof acr	23	23	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	1.9	0.4	1.5	4,999	750	4,249
844.0	KoehlerSR	Kitchen Hood	1	60w INCANDESCENT	jar	4	4	6 WATT LED SI	screw in LED Alamp	2,470	0.2	0.0	0.2	593	59	534
845.0	KoehlerSR	Office Kitchen	1	2x26W CF HARDWIRED/EL	can rec hor 6"	2	2	13 WATT LED/KIT	can kit LED Syl RT/5-6"	1,872	0.1	0.0	0.1	202	49	154
846.0	KoehlerSR	Bath Kitchen	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	1,989	0.1	0.0	0.0	119	20	100
847.0	KoehlerSR	Storage Food	1	3L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,170	0.2	0.0	0.1	206	42	164
848.0	KoehlerSR	Storage Food	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	1,170	0.1	0.0	0.0	70	16	54
849.0	KoehlerSR	Storage W-In	1	60w INCANDESCENT	jar	2	2	10 WATT LED SI	screw in LED Alamp	1,170	0.1	0.0	0.1	140	23	117
850.0	KoehlerSR	Storage W-In	1	60w INCANDESCENT	jar	1	1	10 WATT LED SI	screw in LED Alamp	1,170	0.1	0.0	0.0	70	12	59
851.0	KoehlerSR	Storage W-In	1	60w INCANDESCENT	jar	1	1	10 WATT LED SI	screw in LED Alamp	1,170	0.1	0.0	0.0	70	12	59
852.0	KoehlerSR	Lounge Adult Day Care	1	4x42W CF HARDWIRED/EL	decorative	8		NO RETRO	no change	2,470	1.4	1.4		3,715	3,715	
853.0	KoehlerSR	Lounge Adult Day Care	1	2x26W CF HARDWIRED/EL	can rec hor 6"	20	20	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,470	1.0	0.2	0.8	2,668	642	2,025
854.0	KoehlerSR	Laundry	1	3L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,574	0.2	0.0	0.1	453	68	385
855.0	KoehlerSR	Shower Area In Laundry	1	2L4' T8 32w U/EL	trof acr	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	1,989	0.1	0.0	0.0	119	22	97
856.0	KoehlerSR	Bath Men	1	3L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,989	0.3	0.1	0.2	700	105	595
857.0	KoehlerSR	Bath Women	1	3L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,989	0.3	0.1	0.2	700	105	595
858.0	KoehlerSR	Office 3 Kim	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.1	0.0	0.1	311	47	264
859.0	KoehlerSR	Office 2	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.1	0.0	0.1	311	47	264
860.0	KoehlerSR	Office 1	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.1	0.0	0.1	311	47	264
861.0	KoehlerSR	Hall 1 To Laundry	1	3L4' T8 32w/EL	trof acr	5	5	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,431	0.4	0.1	0.3	1,070	160	909
862.0	KoehlerSR	Office Reception	1	2L4' T8 32w U/EL	trof acr	2	2	24 WATT LED/KIT	trof kit LED with controls & switch	1,872	0.1	0.0	0.1	225	37	188
863.0	KoehlerSR	Storage Coat Room	1	3L4' T8 32w/EL	trof acr	1	1	2L4' LED 13w/ELEE HI/RLRB	rtrb 4' LED socket bar kit	884	0.1	0.0	0.0	78	21	57
864.0	KoehlerSR	Lobby	1	250w METAL HALIDE	can rec vert 12"	4	4	54 WATT LED SI	screw in LED KT-LED54HID-EX39-840-D/2	2,860	1.2	0.2	1.0	3,375	618	2,757
865.0	KoehlerSR	Storage Coat Room	1	3L4' T8 32w/EL	trof acr	1	1	2L4' LED 13w/ELEE HI/RLRB	rtrb 4' LED socket bar kit	884	0.1	0.0	0.0	78	21	57
866.0	KoehlerSR	Hall Vestibule	1	3L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.1	252	38	214
867.0	KoehlerSR	Bath Women	1	2L4' T8 32w U/EL	trof acr	4	4	24 WATT LED/KIT	trof kit LED with controls	1,989	0.2	0.0	0.2	477	79	399
868.0	KoehlerSR	Bath Women	1	3L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,989	0.1	0.0	0.1	350	53	298
869.0	KoehlerSR	Bath Men	1	2L4' T8 32w U/EL	trof acr	3	3	24 WATT LED/KIT	trof kit LED with controls	1,989	0.2	0.0	0.1	358	59	299
870.0	KoehlerSR	Bath Men	1	3L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,989	0.1	0.0	0.1	350	53	298
871.0	KoehlerSR	Storage Slop	1	2L4' T8 32w/EL	wrap	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,170	0.1	0.0	0.0	70	33	37
872.0	KoehlerSR	Office Irene	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.1	0.0	0.1	311	47	264
873.0	KoehlerSR	Office Mary	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.1	0.0	0.1	311	47	264
874.0	KoehlerSR	Classroom Computer Lab	1	3L4' T8 32w/EL	trof parabolic	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.3	0.1	0.2	700	105	595
875.0	KoehlerSR	Lounge Pool Room	1	3L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,210	0.3	0.1	0.2	778	117	661
876.0	KoehlerSR	Classroom Craft	1	3L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.3	0.1	0.2	700	105	595
877.0	KoehlerSR	Conference	1	3L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.1	0.0	0.1	156	23	132
878.0	KoehlerSR	Bath Unisex In Conference	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	1,989	0.1	0.0	0.0	119	20	100
879.0	KoehlerSR	Bath Unisex In Conference	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	1,989	0.1	0.0	0.0	119	20	100
880.0	KoehlerSR	Hall Conf To Lobby	1	3L4' T8 32w/EL	trof acr	7	7	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,431	0.5	0.1	0.4	1,497	225	1,273
881.0	KoehlerSR	Exercise	1	2x26W CF HARDWIRED/EL	can rec hor 6"	21	21	13 WATT LED/KIT	can kit LED Syl RT/5-6"	1,976	1.1	0.3	0.8	2,241	539	1,701
882.0	KoehlerSR	Lounge Tv Room	1	3L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,210	0.2	0.0	0.2	583	88	496
883.0	KoehlerSR	Stair To Basement		3L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.2	0.0	0.1	503	76	428
884.0	KoehlerSR	Stair To Basement		2L4' T8 32w/EL	wrap	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,860	0.1	0.0	0.0	172	80	92
885.0	KoehlerSR	Storage Large	b	2L4' T8 32w/EL	wrap	11	11	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	8,760	0.7	0.3	0.4	5,782	2,698	3,084
886.0	KoehlerSR	Mechanical Electrical Panel	b	2L4' T8 32w/EL	wrap	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,170	0.1	0.1	0.1	140	66	75
887.0	KoehlerSR	Mechanical Water Tank	b	2L4' T8 32w/EL	wrap	8	8	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,170	0.4	0.2	0.2	562	262	300
888.0	KoehlerSR	Mechanical Boiler	b	2L4' T8 32w/EL	wrap	5	5	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,170	0.3	0.1	0.1	351	164	187
897.0	PutnamSR	Office Outreach	1	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,547	0.4	0.1	0.3	693	111	582
898.0	PutnamSR	Lounge Activity	1	4L4' T8 32w/EL	trof acr	8	8	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,976	0.9	0.1	0.7	1,770	209	1,562
899.0	PutnamSR	Storage Activity	1	1L2' F55 BIAX/EL	wrap	1	1	1L4' LED 16.5w BIAX/EL/RETUBE ONLY	retube LED biax	780	0.1	0.0	0.0	44	16	27
900.0	PutnamSR	Hall Vest	1	2L2' F55 BIAX/EL	trof acr 2x2	1	1	24 WATT LED/KIT	trof kit LED with controls	2,340	0.1	0.0	0.1	262	23	239
901.0	PutnamSR	Lounge	1	3L4' T8 32w/EL	trof parabolic	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,976	0.3	0.1	0.2	522	78	443
902.0	PutnamSR	Office Mgr. Office	1	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,638	0.4	0.1	0.3	734	117	616
903.0	PutnamSR	Classroom Computer	1	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,326	0.1	0.0	0.0	80	24	56
904.0	PutnamSR	Storage Computer	1	1L2' F55 BIAX/EL	wrap	1	1	1L4' LED 16.5w BIAX/EL/RETUBE ONLY	retube LED biax	780	0.1	0.0	0.0	44	16	27
905.0	PutnamSR	Classroom Arts	1	4L4' T8 32w/EL	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,482	0.6	0.1	0.5	996	159	837
906.0	PutnamSR	Lounge Game Room	1	4L4' T8 32w/EL	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.6	0.1	0.5	1,188	140	1,048
907.0	PutnamSR	Lounge Game Room-Pool Ta	1	75w INCANDESCENT	pendant decorative	3	3	10 WATT LED SI	screw in LED Alamp	1,768	0.2	0.0	0.2	398	53	345
908.0	PutnamSR	Dining Room Main	1	3L2' F55 BIAX/EL	trof acr 2x2	24	24	24 WATT LED/KIT	trof kit LED with controls & switch	1,547	3.4	0.3	3.1	6,238	499	5,739
909.0	PutnamSR	Storage Dining	1	2L4' T8 32w/EL	trof acr	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	780	0.1	0.0	0.0	47	22	25

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
910.0	PutnamSR	Storage Coat Room	1	2x26W CF HARDWIRED/EL	can rec hor 6"	4	4	13 WATT LED/KIT	can kit LED Syl RT/5-6"	663	0.2	0.0	0.1	143	34	109
911.0	PutnamSR	Office Open Reception	1	2x26W CF HARDWIRED/EL	can rec hor 6"	6	6	13 WATT LED/KIT	can kit LED Syl RT/5-6"	1,729	0.3	0.1	0.2	560	135	425
912.0	PutnamSR	Office Open Reception	1	10 WATT LED	pendant decorative	3		NO RETRO	no change already efficient	1,729	0.0	0.0		52	52	
913.0	PutnamSR	Hall Main Entry Vestibule	1	2L2' F55 BIAX/EL	trof acr 2x2	2	2	24 WATT LED/KIT	trof kit LED with controls	2,340	0.2	0.0	0.2	524	46	478
914.0	PutnamSR	Hall Main	1	2L2' F55 BIAX/EL	trof acr 2x2	16	16	24 WATT LED/KIT	trof kit LED with controls	2,340	1.8	0.2	1.6	4,193	371	3,823
915.0	PutnamSR	Hall Main	1	2x26W CF HARDWIRED/EL	can rec hor 6"	3	3	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,340	0.2	0.0	0.1	379	91	288
916.0	PutnamSR	Office Site Mgr.	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,547	0.2	0.0	0.2	347	55	291
917.0	PutnamSR	Kitchen	1	4L4' T8 32w/EL	trof acr	10	10	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,976	1.1	0.2	0.9	2,213	261	1,952
918.0	PutnamSR	Kitchen Hood	1	100w INCANDESCENT	jar	4	4	10 WATT LED SI	screw in LED Alamp	1,976	0.4	0.0	0.3	790	79	711
919.0	PutnamSR	Office Senator Serino (Med)	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,547	0.2	0.0	0.2	347	55	291
920.0	PutnamSR	Office Alzheimer'S	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,547	0.2	0.0	0.2	347	55	291
921.0	PutnamSR	Bath Men	1	3L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,768	0.1	0.0	0.1	311	47	264
922.0	PutnamSR	Bath Women	1	3L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,768	0.1	0.0	0.1	311	47	264
923.0	PutnamSR	Storage Slop	1	1L2' F55 BIAX/EL	wrap	1	1	1L4' LED 16.5w BIAX/EL/RETUBE ONLY	retube LED biax	780	0.1	0.0	0.0	44	16	27
924.0	PutnamSR	Office Interview Room	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,638	0.1	0.0	0.1	183	29	154
925.0	PutnamSR	Lounge Adult Day Care	1	4L4' T8 32w/EL	trof acr	15	15	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,976	1.6	0.3	1.3	3,320	391	2,928
926.0	PutnamSR	Office Nurse	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,547	0.2	0.0	0.2	347	55	291
927.0	PutnamSR	Hall Vestibule By Nurse	1	2L2' F55 BIAX/EL	trof acr 2x2	1	1	24 WATT LED/KIT	trof kit LED with controls	2,340	0.1	0.0	0.1	262	23	239
928.0	PutnamSR	Bath Men - In Adult Care	1	3L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,768	0.1	0.0	0.1	156	23	132
929.0	PutnamSR	Bath Women - Adult Care	1	3L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,768	0.1	0.0	0.1	156	23	132
930.0	PutnamSR	Storage Near Women	1	2L4' T8 32w/EL	trof acr	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	663	0.1	0.0	0.0	40	19	21
931.0	PutnamSR	Laundry	1	3L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,547	0.1	0.0	0.1	136	28	108
932.0	PutnamSR	Shower	1	3L4' T8 32w/EL	trof acr	1	1	2L4' LED 13w/ELEE HI/RLRB	rtrb 4' LED socket bar kit	1,768	0.1	0.0	0.0	156	43	113
933.0	PutnamSR	Storage In Adult Care	1	1L2' F55 BIAX/EL	wrap	1	1	1L4' LED 16.5w BIAX/EL/RETUBE ONLY	retube LED biax	780	0.1	0.0	0.0	44	16	27
934.0	PutnamSR	Bath Unisex- Behind Nurse	1	1L2' F55 BIAX/EL	wrap	1	1	1L4' LED 16.5w BIAX/EL/RETUBE ONLY	retube LED biax	1,768	0.0	0.0	0.0	99	37	62
935.0	PutnamSR	Storage Next	1	2L4' T8 32w/EL	trof acr	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	780	0.1	0.0	0.0	47	22	25
936.0	PutnamSR	Mechanical	b	4L4' T8 32w/EL-8'	strip	7	7	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	936	0.7	0.4	0.4	734	367	367
945.0	gov2	Hall Vestibule	1	2L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.2	0.1	0.1	515	113	402
946.0	gov2	Lounge Waiting	1	2L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,470	0.2	0.1	0.1	445	98	347
947.0	gov2	Office Reception	1	2L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.2	0.0	0.1	438	96	342
948.0	gov2	Hall Vestibule	1	1L4' T8 32w/EL	strip	1	1	1L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,860	0.0	0.0	0.0	86	40	46
949.0	gov2	Office Data	1	2L4' T8 32w/EL	trof acr	13	13	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.7	0.2	0.5	1,899	418	1,481
950.0	gov2	Office Next To Lounge	1	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.1	0.0	0.1	292	64	228
951.0	gov2	Lounge	1	2L4' T8 32w/EL	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,470	0.3	0.1	0.2	889	196	694
952.0	gov2	Foyer By Lounge	1	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.0	172	38	134
953.0	gov2	Office Open Temp Assistants	1	2L4' T8 32w/EL	trof acr	14	14	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,063	0.8	0.2	0.6	2,573	566	2,007
954.0	gov2	Office Temp Assistants 1	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.1	0.0	0.1	273	32	240
955.0	gov2	Office Temp Assistants 2	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.1	0.0	0.1	273	32	240
956.0	gov2	Office Temp Assistants	1	2L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.2	0.0	0.1	438	96	342
957.0	gov2	Office Temp Assistants	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.2	0.0	0.2	545	64	481
958.0	gov2	Storage Temp Assistants	1	1L4' T8 32w/EL	strip	1	1	1L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	780	0.0	0.0	0.0	23	11	12
959.0	gov2	Storage Temp Assistants-Ph	1	4L4' T8 32w/EL-8'	strip	1	1	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	780	0.1	0.1	0.1	87	44	44
960.0	gov2	Bath Public	1	1L4' T8 32w/EL	strip	1	1	1L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,767	0.0	0.0	0.0	83	39	44
961.0	gov2	Foyer By Restroom	1	2L4' T8 32w/EL-8'	strip	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,860	0.1	0.0	0.0	172	80	92
962.0	gov2	Office Copy	1	2L4' T8 32w/EL	trof acr rfl	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.1	0.0	0.0	146	32	114
963.0	gov2	Bath Women	1	2L4' T8 32w/EL-8'	strip	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,767	0.1	0.0	0.0	166	77	89
964.0	gov2	Bath Public By Women	1	100w INCANDESCENT	keyless	1	1	10 WATT LED SI	screw in LED Alamp	2,767	0.1	0.0	0.1	277	28	249
965.0	gov2	Foyer Women	1	2L4' T8 32w/EL-8'	strip	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,860	0.1	0.0	0.0	172	80	92
966.0	gov2	Storage Supply	1	2L8' T12 75w STD/STD	strip	1	1	4L4' LED 13w/ELEE/NEW white goods	new strip	1,170	0.2	0.1	0.1	202	75	128
967.0	gov2	Office Open Long Term Care	1	2L4' T8 32w/EL	trof acr	27	27	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,063	1.5	0.5	1.1	4,962	1,092	3,870
968.0	gov2	Office Open Long Term Care	1	2L4' T8 32w U/EL	trof acr	2	2	24 WATT LED/KIT	trof kit LED with controls	3,063	0.1	0.0	0.1	368	61	307
969.0	gov2	Office Long Term Care	1	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.1	0.0	0.0	146	32	114
970.0	gov2	Office Long Term Care	1	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.1	0.0	0.0	146	32	114
971.0	gov2	Office Long Term Care	1	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.1	0.0	0.1	292	64	228
972.0	gov2	Office Long Term Care	1	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.1	0.0	0.0	146	32	114
973.0	gov2	Office Long Term Care	1	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.1	0.0	0.0	146	32	114
974.0	gov2	Office Open Medicaid	1	2L4' T8 32w/EL	trof acr	25	25	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,063	1.4	0.4	1.0	4,595	1,011	3,584
975.0	gov2	Office Open Medicaid	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	3,063	0.1	0.0	0.0	184	30	153
976.0	gov2	Office Medicaid 1	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.1	0.0	0.1	273	32	240
977.0	gov2	Office Open Medicaid 2	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,063	0.1	0.0	0.1	343	55	288

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
978.0	gov2	Office Open Medicaid 3	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,063	0.1	0.0	0.1	343	55	288
979.0	gov2	Office Open Chronic Care	1	2L4' T8 32w/EL	trof acr	8	8	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,063	0.5	0.1	0.3	1,470	323	1,147
980.0	gov2	Office Open Chronic Care	1	2L4' T8 32w U/EL	trof acr	2	2	24 WATT LED/KIT	trof kit LED with controls	3,063	0.1	0.0	0.1	368	61	307
981.0	gov2	Office Open Child Protective	1	2L4' T8 32w/EL	trof acr	10	10	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,063	0.6	0.2	0.4	1,838	404	1,433
982.0	gov2	Office Child Protective Servic	1	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.1	0.0	0.1	292	64	228
983.0	gov2	Office Open Admin (2)	1	2L4' T8 32w/EL	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,063	0.3	0.1	0.2	1,103	243	860
984.0	gov2	Office Admin - Back (2)	1	2L4' T8 32w/EL	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.3	0.1	0.2	876	193	683
985.0	gov2	Office Open Fiscal	1	2L4' T8 32w/EL	trof acr	20	20	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,063	1.1	0.3	0.8	3,676	809	2,867
986.0	gov2	Office Fiscal-Copy	1	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.1	0.0	0.0	146	32	114
987.0	gov2	Office Fiscal	1	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.2	0.1	0.2	584	129	456
988.0	gov2	Office Director Of Services	1	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.1	0.0	0.1	292	64	228
989.0	gov2	Office Director Of Services	1	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.1	0.0	0.1	292	64	228
990.0	gov2	Office Director Of Services-B	1	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.2	0.1	0.2	584	129	456
991.0	gov2	Bath Next To Fiscal	1	34 WATT LED	trof acr 2x2	1		NO RETRO	no change already efficient	2,476	0.0	0.0		84	84	
992.0	gov2	Office Deputy Commissioner	1	3L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.2	0.0	0.1	428	64	364
993.0	gov2	Office Deputy Commissioner-	1	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.2	0.1	0.2	584	129	456
994.0	gov2	Office Deputy Commissioner-	1	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.1	0.0	0.1	292	64	228
995.0	gov2	Office Sport Collection Unit-F	1	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.2	0.1	0.2	584	129	456
996.0	gov2	Office Sport Collection Unit-F	1	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.2	0.1	0.2	584	129	456
997.0	gov2	Office Sport Collection Unit-B	1	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.1	0.0	0.1	292	64	228
998.0	gov2	Office Sport Collection Unit-R	1	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.2	0.1	0.2	584	129	456
999.0	gov2	Office Sport Collection Unit-R	1	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.1	0.0	0.1	292	64	228
1,000.0	gov2	Hall	1	2L4' T8 32w U/EL	trof acr	20	20	24 WATT LED/KIT	trof kit LED with controls	2,860	1.2	0.3	0.9	3,432	566	2,866
1,001.0	gov2	Stair To Basement		1L4' T8 32w/EL	strip	1	1	1L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,860	0.0	0.0	0.0	86	40	46
1,002.0	gov2	Foyer Legal Services	b	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.0	172	38	134
1,003.0	gov2	Office Open Protective Servic	b	2L4' T8 32w/EL	trof acr	14	14	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,063	0.8	0.2	0.6	2,573	566	2,007
1,004.0	gov2	Office Open Protective Servic	b	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,063	0.1	0.0	0.1	368	81	287
1,005.0	gov2	Office Protective Services (2)	b	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.2	0.1	0.2	584	129	456
1,006.0	gov2	Office Open Legal Services	b	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,063	0.2	0.1	0.2	735	162	573
1,007.0	gov2	Office Legal Services (2)	b	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.2	0.1	0.2	584	129	456
1,008.0	gov2	Office Legal Services (2)	b	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,434	0.2	0.1	0.2	584	129	456
1,009.0	gov2	Conference Legal Services	b	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,569	0.1	0.0	0.1	308	68	240
1,010.0	gov2	Foyer By Legal & Protective	b	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.0	172	38	134
1,011.0	gov2	Bath Men	b	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,767	0.1	0.0	0.0	166	37	129
1,012.0	gov2	Bath Women	b	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,767	0.1	0.0	0.0	166	37	129
1,013.0	gov2	Mechanical Boiler Room	b	4L4' T8 32w/EL	vapor tight	5	5	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	884	0.5	0.2	0.2	495	248	248
1,014.0	gov2	Conference Large	b	2L4' T8 32w/EL	trof acr	11	11	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,569	0.6	0.2	0.4	1,696	373	1,323
1,015.0	gov2	Conference Large	b	34 WATT LED	trof acr 2x2	2		NO RETRO	no change already efficient	2,569	0.1	0.1		175	175	
1,016.0	gov2	Hall Basement	b	1L4' T8 32w/EL	strip	3	3	1L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,860	0.1	0.0	0.0	257	120	137
1,020.0	gov3	Office Veterans	1	2L4' T8 32w/EL	trof acr rfl	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.3	0.1	0.2	674	148	526
1,021.0	gov3	Office Open Early Interventio	1	2L4' T8 32w/EL	trof acr rfl	20	20	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	1.1	0.3	0.8	2,964	652	2,312
1,022.0	gov3	Conference Early Interventior	1	2L4' T8 32w/EL	trof acr rfl	33	33	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,976	1.9	0.6	1.3	3,912	861	3,052
1,023.0	gov3	Office Early Intervention	1	2L4' T8 32w/EL	trof acr rfl	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.1	0.0	0.1	225	49	175
1,024.0	gov3	Office Early Intervention Adm	1	2L4' T8 32w/EL	trof acr rfl	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.2	0.1	0.2	449	99	350
1,025.0	gov3	Storage Early Intervention Ac	1	2x13W CF HARDWIRED	drum	1	1	14 WATT LED/NEW	new LED drum 12"	780	0.0	0.0	0.0	23	11	12
1,026.0	gov3	Storage Early Intervention Ac	1	2x13W CF HARDWIRED	drum	3	3	14 WATT LED/NEW	new LED drum 12"	780	0.1	0.0	0.0	70	33	37
1,027.0	gov3	Office Open Vets	1	2L4' T8 32w/EL	trof acr rfl	10	10	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	0.6	0.2	0.4	1,482	326	1,156
1,028.0	gov3	Office Vets	1	2L4' T8 32w/EL	trof acr rfl	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.3	0.1	0.2	674	148	526
1,029.0	gov3	Storage Vets	1	2L4' T8 32w/EL	trof acr rfl	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	780	0.2	0.1	0.1	140	66	75
1,030.0	gov3	Storage Slop Sink	1	1L4' T8 32w/EL	strip	1	1	1L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	780	0.0	0.0	0.0	23	11	12
1,031.0	gov3	Office Impaired Driver	1	2L4' T8 32w/EL	trof acr rfl	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.2	0.1	0.2	449	99	350
1,032.0	gov3	Office People With Disabilitie	1	4L4' T8 32w/EL	wrap wide	4	4	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,872	0.4	0.2	0.2	839	419	419
1,033.0	gov3	Bath Unisex	1	2L4' T8 32w/EL	wrap	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,470	0.1	0.1	0.1	296	138	158
1,034.0	gov3	Office Across Unisex	1	4L4' T8 32w/EL	wrap wide	4	4	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,872	0.4	0.2	0.2	839	419	419
1,035.0	gov3	Office Children'S Mental Hea	1	2L4' T8 32w/EL	trof acr rfl	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.2	0.1	0.2	449	99	350
1,036.0	gov3	Office Dept Of Labor-Employ	1	2L4' T8 32w/EL	trof acr rfl	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.3	0.1	0.2	674	148	526
1,037.0	gov3	Office Career Center	1	2L4' T8 32w/EL	trof acr rfl	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.2	0.1	0.2	449	99	350
1,038.0	gov3	Office Employment Counselo	1	2L4' T8 32w/EL	trof acr rfl	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.1	0.0	0.1	225	49	175
1,039.0	gov3	Lobby Work Force	1	2L4' T8 32w/EL	trof acr rfl	10	10	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.6	0.2	0.4	1,716	378	1,338
1,040.0	gov3	Hall Work Force -Vestibule	1	2x13W CF HARDWIRED	drum	1	1	14 WATT LED/NEW	new LED drum 12"	2,860	0.0	0.0	0.0	86	40	46

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
1,041.0	gov3	Office Open Career Researc	1	2L4' T8 32w/EL	trof acr rfl	12	12	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	0.7	0.2	0.5	1,778	391	1,387
1,042.0	gov3	Office Open Career Researc	1	2L4' T8 32w/EL	trof acr rfl	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	0.2	0.1	0.1	445	98	347
1,043.0	gov3	Office Career Research	1	2L4' T8 32w/EL	trof acr rfl	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.1	0.0	0.0	112	25	88
1,044.0	gov3	Office Open Social Services	1	2L4' T8 32w/EL	trof acr rfl	5	5	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	0.3	0.1	0.2	741	163	578
1,045.0	gov3	Office Open Social Services	1	2L4' T8 32w/EL	trof acr rfl	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	0.2	0.1	0.2	593	130	462
1,046.0	gov3	Office Social Services	1	2L4' T8 32w/EL	trof acr rfl	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.1	0.0	0.1	225	49	175
1,047.0	gov3	Office Social Services	1	2L4' T8 32w/EL	trof acr rfl	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.1	0.0	0.1	225	49	175
1,048.0	gov3	Office Open Social Services	1	2x13W CF HARDWIRED	drum	1	1	14 WATT LED/NEW	new LED drum 12"	2,470	0.0	0.0	0.0	74	35	40
1,049.0	gov3	Foyer Youth Bureau	1	2L4' T8 32w/EL	trof acr rfl	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.1	343	76	268
1,050.0	gov3	Office Youth Bureau (2)	1	2L4' T8 32w/EL	trof acr rfl	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.2	0.1	0.2	449	99	350
1,051.0	gov3	Office Youth Bureau	1	2L4' T8 32w/EL	trof acr rfl	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.1	0.0	0.1	225	49	175
1,052.0	gov3	Office Youth Bureau-17	1	2L4' T8 32w/EL	trof acr rfl	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.1	0.0	0.1	225	49	175
1,053.0	gov3	Storage Near Youth Bureau	1	2L4' T8 32w/EL	trof acr rfl	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	780	0.1	0.0	0.0	47	22	25
1,054.0	gov3	Office Youth Bureau-14 (2)	1	2L4' T8 32w/EL	trof acr rfl	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.2	0.1	0.2	449	99	350
1,055.0	gov3	Conference 15-Youth Bureau	1	2L4' T8 32w/EL	trof acr rfl	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,976	0.1	0.0	0.0	119	26	92
1,056.0	gov3	Conference 15-Youth Bureau	1	2L4' T8 32w/EL	trof acr rfl	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,976	0.3	0.1	0.2	711	156	555
1,057.0	gov3	Foyer Youth Bureau By 15	1	2L4' T8 32w/EL	trof acr rfl	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.2	0.1	0.1	515	113	402
1,058.0	gov3	Office 12-Youth Bureau	1	4L4' T8 32w/EL	wrap wide	4	4	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,872	0.4	0.2	0.2	839	419	419
1,059.0	gov3	Bath 13 Men	1	2L4' T8 32w/EL	wrap	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,470	0.1	0.0	0.0	148	69	79
1,060.0	gov3	Office 11-Youth Bureau	1	4L4' T8 32w/EL	wrap wide	4	4	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,872	0.4	0.2	0.2	839	419	419
1,061.0	gov3	Bath Women	1	2L4' T8 32w/EL	wrap	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,470	0.2	0.1	0.1	445	207	237
1,062.0	gov3	Kitchen By Women (2)	1	2L4' T8 32w/EL	trof acr rfl	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,976	0.1	0.0	0.1	237	52	185
1,063.0	gov3	Office 8 Drc Mediation (2)	1	2L4' T8 32w/EL	trof acr rfl	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.2	0.1	0.2	449	99	350
1,064.0	gov3	Office 9 Drc Mediation	1	2L4' T8 32w/EL	trof acr rfl	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.1	0.0	0.1	225	49	175
1,065.0	gov3	Conference 10 Drc Mediation	1	2L4' T8 32w/EL	trof acr rfl	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,976	0.2	0.1	0.2	474	104	370
1,066.0	gov3	Conference 11 Drc Mediation	1	2L4' T8 32w/EL	trof acr rfl	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,976	0.1	0.0	0.1	237	52	185
1,067.0	gov3	Office Dispute Resolution (2)	1	2L4' T8 32w/EL	trof acr rfl	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.2	0.1	0.1	424	93	331
1,068.0	gov3	Office Dispute Resolution	1	2L4' T8 32w/EL	trof acr rfl	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.1	0.0	0.1	225	49	175
1,069.0	gov3	Office Open Personel (2)	1	2L4' T8 32w/EL	trof acr rfl	10	10	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	0.6	0.2	0.4	1,482	326	1,156
1,070.0	gov3	Office Open Personel	1	2L4' T8 32w/EL	trof acr rfl	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	0.2	0.1	0.2	593	130	462
1,071.0	gov3	Office Personel	1	2L4' T8 32w/EL	trof acr rfl	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.1	0.0	0.0	112	25	88
1,072.0	gov3	Office Personel	1	2L4' T8 32w U/EL	trof acr rfl	1	1	24 WATT LED/KIT	trof kit LED with controls & switch	1,872	0.1	0.0	0.0	112	19	94
1,073.0	gov3	Office Personel	1	4L4' T8 32w/EL-8'	trof acr rfl	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.2	0.0	0.2	419	49	370
1,074.0	gov3	Office Personel	1	2L4' T8 32w/EL	trof acr rfl	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.1	0.0	0.1	225	49	175
1,075.0	gov3	Office Personel-Paul Eldridge	1	4L4' T8 32w/EL-8'	trof acr rfl	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.4	0.1	0.3	839	99	740
1,076.0	gov3	Office Open Personel	1	2L4' T8 32w/EL	trof acr rfl	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	0.1	0.0	0.1	296	65	231
1,077.0	gov3	Foyer Personal-Exit	1	2L4' T8 32w/EL	trof acr rfl	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.0	172	38	134
1,078.0	gov3	Office Stop Dwi	1	2L4' T8 32w/EL	trof acr rfl	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.1	0.0	0.0	112	25	88
1,079.0	gov3	Foyer Personal Entry	1	4L4' T8 32w/EL	wrap wide	2	2	2L4' LED 13w/ELEE HI/RLRB	rtrb 4' LED	2,860	0.2	0.1	0.1	641	246	395
1,080.0	gov3	Mechanical Boiler Room	1	4L4' T8 32w/EL	trof acr	1	1	2L4' LED 13w/ELEE HI/RLRB	rtrb 4' LED socket bar kit	1,170	0.1	0.0	0.1	131	28	103
1,081.0	gov3	Mechanical Boiler Room	1	4L4' T8 32w/EL-8'	strip	1	1	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,170	0.1	0.1	0.1	131	66	66
1,082.0	gov3	Office 1 Child Care	1	2L4' T8 32w/EL	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.3	0.1	0.2	674	148	526
1,083.0	gov3	Conference 2	1	4L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,976	0.3	0.1	0.3	664	78	586
1,084.0	gov3	Conference 2	1	75w INCANDESCENT	can rec vert 6"	4	4	10 WATT LED SI	screw in LED Alamp	1,976	0.3	0.0	0.2	593	79	514
1,085.0	gov3	Office 4	1	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.1	0.0	0.0	112	25	88
1,086.0	gov3	Hall Vestibule-Personal	1	2x13W CF HARDWIRED	drum	1	1	14 WATT LED/NEW	new LED drum 12"	2,860	0.0	0.0	0.0	86	40	46
1,087.0	gov3	Foyer Office For Aging	1	34 WATT LED	trof acr 2x2	4		NO RETRO	no change already efficient	2,860	0.1	0.1		389	389	
1,088.0	gov3	Office Office For Aging-Rece	1	44 WATT LED	trof acr	1		NO RETRO	no change already efficient	1,768	0.0	0.0		78	78	
1,089.0	gov3	Office Open Office For Aging	1	44 WATT LED	trof acr	21		NO RETRO	no change already efficient	2,470	0.9	0.9		2,282	2,282	
1,090.0	gov3	Office Office For Aging (2)	1	44 WATT LED	trof acr	2		NO RETRO	no change already efficient	1,768	0.1	0.1		156	156	
1,091.0	gov3	Office Office For Aging	1	34 WATT LED	trof acr 2x2	1		NO RETRO	no change already efficient	1,768	0.0	0.0		60	60	
1,092.0	gov3	Office Office For Aging	1	34 WATT LED	trof acr 2x2	3		NO RETRO	no change already efficient	1,768	0.1	0.1		180	180	
1,093.0	gov3	Office Office For Aging	1	34 WATT LED	trof acr	1		NO RETRO	no change already efficient	1,768	0.0	0.0		60	60	
1,094.0	gov3	Lounge Office For Aging	1	44 WATT LED	trof acr	3		NO RETRO	no change already efficient	1,976	0.1	0.1		261	261	
1,095.0	gov3	Hall Office For Aging	1	34 WATT LED	trof acr 2x2	8		NO RETRO	no change already efficient	2,860	0.3	0.3		778	778	
1,096.0	gov3	Bath Office For Aging	1	34 WATT LED	trof acr 2x2	2		NO RETRO	no change already efficient	2,210	0.1	0.1		150	150	
1,097.0	gov3	Office Open It Support (2)	1	2L4' T8 32w/EL	trof acr	10	10	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	0.6	0.2	0.4	1,482	326	1,156
1,098.0	gov3	Office Open It Admin	1	2L4' T8 32w/EL	trof acr	7	7	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	0.4	0.1	0.3	1,037	228	809
1,099.0	gov3	Office It Admin	1	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.4	0.1	0.3	839	99	740
1,100.0	gov3	Office It Printer Room	1	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.4	0.1	0.3	839	99	740

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
1,101.0	gov3	Foyer It Printer Room	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.2	0.0	0.2	641	76	565
1,102.0	gov3	Office Open Consumer Affair	1	3L4' T8 32w/EL	trof acr	16	16	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	1.3	0.3	1.1	3,478	522	2,956
1,103.0	gov3	Lounge Consumer Affairs (2)	1	2L4' T8 32w/EL	trof acr	8	8	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,976	0.5	0.1	0.3	948	209	740
1,104.0	gov3	Office Consumer Affairs	1	3L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.3	0.1	0.3	659	99	560
1,105.0	gov3	Office Consumer Affairs Dire	1	3L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.3	0.1	0.3	659	99	560
1,106.0	gov3	Foyer Consumer Affairs	1	22w CIRCLELINE HARDWIRE	decorative	1	1	14 WATT LED/NEW	new LED drum 12"	2,860	0.0	0.0	0.0	69	40	29
1,107.0	gov3	Bath Consumer Affairs	1	34 WATT LED	trof acr 2x2	1		NO RETRO	no change already efficient	2,210	0.0	0.0		75	75	
1,108.0	gov3	Office Weights & Measures	1	2L4' T8 32w/EL	wrap	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,872	0.1	0.1	0.1	225	105	120
1,109.0	gov3	Office Consumer Affairs	1	3L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.3	0.1	0.3	659	99	560
1,110.0	gov3	Office Consumer Affairs	1	3L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.3	0.1	0.3	659	99	560
1,111.0	gov3	Hall Campus 3	1	2L4' T8 32w/EL	trof acr	26	26	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	1.6	0.5	1.1	4,462	982	3,480
1,112.0	gov3	Hall Campus 3	1	2L4' T8 32w/EL	wrap wide	4	4	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,860	0.2	0.1	0.1	686	320	366
1,113.0	gov3	Hall Campus 3	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.1	320	38	283
1,114.0	gov3	Hall Campus 3	1	60w INCANDESCENT	keyless	1	1	10 WATT LED SI	screw in LED Alamp	2,860	0.1	0.0	0.1	172	29	143
1,115.0	gov3	Bath Outside Garage	1	34 WATT LED	trof acr 2x2	1		NO RETRO	no change already efficient	2,470	0.0	0.0		84	84	
1,116.0	gov3	Foyer Outside Garage	1	34 WATT LED	trof acr 2x2	3		NO RETRO	no change already efficient	2,860	0.1	0.1		292	292	
1,117.0	gov3	Storage Across Bath	1	34 WATT LED	trof acr 2x2	1		NO RETRO	no change already efficient	780	0.0	0.0		27	27	
1,118.0	gov3	Garage Campus 3	1	28 WATT LED	industrial	12		NO RETRO	no change already efficient	780	0.3	0.3		262	262	
1,119.0	gov3	Garage Campus 3	1	34 WATT LED	trof acr 2x2	2		NO RETRO	no change already efficient	780	0.1	0.1		53	53	
1,126.0	EOC	Garage	1	3L4' T8 32w/ELEE 2 BALLAS	box acrylic	10	10	3L4' LED 13w/ELEE/RLRB	rtrb 4' LED	936	0.7	0.4	0.3	758	449	309
1,127.0	EOC	Garage Stair Area	1	2L4' T8 32w U/EL	trof parabolic	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	936	0.1	0.0	0.0	56	10	46
1,128.0	EOC	Mechanical Electrical Room #	1	2L4' T8 32w U/EL	box acrylic	5	5	20 WATT LED/KIT	rt 2L2' LED bar kit	936	0.3	0.1	0.2	281	94	187
1,129.0	EOC	Mechanical	1	2L4' T8 32w/EL	wrap narrow	7	7	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	936	0.4	0.2	0.2	393	183	210
1,130.0	EOC	Storage Janitor Closet #2	1	2L4' T8 32w U/EL	trof parabolic	1	1	24 WATT LED/KIT	trof kit LED with controls	936	0.1	0.0	0.0	56	13	44
1,131.0	EOC	Office Media Center	1	3L4' T8 32w/ELEE 2 BALLAS	trof parabolic	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.3	0.1	0.2	682	111	571
1,132.0	EOC	Office Open Training Area	1	3L4' T8 32w/EL	trof parabolic	10	10	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	0.8	0.2	0.7	2,174	326	1,848
1,133.0	EOC	Office Open Training Area	1	3x100w INCANDESCENTS	track head	2	2	14 WATT LED SI	screw in LED par38 hl	2,470	0.6	0.1	0.5	1,482	207	1,275
1,134.0	EOC	Classroom Training #1	1	3L4' T8 32w/ELEE 2 BALLAS	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,976	0.2	0.0	0.1	320	52	268
1,135.0	EOC	Classroom Training #2	1	3L4' T8 32w/ELEE 2 BALLAS	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,976	0.2	0.0	0.1	320	52	268
1,136.0	EOC	Classroom Training #3	1	3L4' T8 32w/ELEE 2 BALLAS	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,976	0.2	0.0	0.1	320	52	268
1,137.0	EOC	Classroom Training #4	1	3L4' T8 32w/ELEE 2 BALLAS	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,976	0.2	0.0	0.1	320	52	268
1,138.0	EOC	Classroom Training #5	1	3L4' T8 32w/ELEE 2 BALLAS	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,976	0.2	0.0	0.1	320	52	268
1,139.0	EOC	Classroom Training #6	1	3L4' T8 32w/ELEE 2 BALLAS	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,976	0.2	0.0	0.1	320	52	268
1,140.0	EOC	Office Instructor-Training	1	3L4' T8 32w/EL	trof parabolic	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.2	556	83	473
1,141.0	EOC	Storage Book Storage	1	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	936	0.1	0.0	0.1	112	34	79
1,142.0	EOC	Storage Book Storage	1	3x100w INCANDESCENTS	track head	4	4	14 WATT LED SI	screw in LED par38 hl	936	1.1	0.2	0.9	1,123	157	966
1,143.0	EOC	Storage Storage 2	1	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	936	0.1	0.0	0.0	56	17	39
1,144.0	EOC	Storage Coat Room	1	2L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	936	0.1	0.0	0.1	112	34	79
1,145.0	EOC	Lounge Pantry	1	2L4' T8 32w/EL	trof parabolic	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,210	0.2	0.1	0.1	530	117	414
1,146.0	EOC	Classroom 2	1	3L4' T8 32w/ELEE 2 BALLAS	trof parabolic	9	9	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.6	0.1	0.5	1,289	210	1,079
1,147.0	EOC	Classroom 2	1	32W CF SCREWIN	can rec hor 6"	4	4	13 WATT LED/KIT	can kit LED Syl RT/5-6"	1,768	0.1	0.0	0.1	240	92	149
1,148.0	EOC	Storage Ems-Class 2	1	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	936	0.1	0.0	0.0	56	17	39
1,149.0	EOC	Classroom 1	1	3L4' T8 32w/EL	trof parabolic	9	9	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.7	0.1	0.5	1,400	210	1,190
1,150.0	EOC	Classroom 1	1	32W CF SCREWIN	can rec hor 6"	4	4	13 WATT LED/KIT	can kit LED Syl RT/5-6"	1,768	0.1	0.0	0.1	240	92	149
1,151.0	EOC	Bath Men	1	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,326	0.2	0.1	0.1	318	95	223
1,152.0	EOC	Bath Men	1	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	1,326	0.0	0.0	0.0	45	17	28
1,153.0	EOC	Bath Women	1	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,326	0.2	0.1	0.1	318	95	223
1,154.0	EOC	Bath Women	1	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	1,326	0.0	0.0	0.0	45	17	28
1,155.0	EOC	Hall Classrooms To Boiler	1	2L4' T8 32w U/EL	trof parabolic	9	9	24 WATT LED/KIT	trof kit LED with controls	2,600	0.5	0.1	0.4	1,404	232	1,172
1,156.0	EOC	Hall Classrooms To Boiler	1	32W CF SCREWIN	can rec hor 6"	12	12	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,600	0.4	0.2	0.3	1,061	406	655
1,157.0	EOC	Hall Classrooms To Boiler	1	2x13W CF HARDWIRED	direct/indirect	3		NO RETRO	no change	2,600	0.1	0.1		234	234	
1,158.0	EOC	Auditorium	1	2L4' T8 32w U/EL	trof parabolic	22	22	24 WATT LED/KIT	trof kit LED with controls	1,638	1.2	0.3	0.9	2,162	357	1,805
1,159.0	EOC	Auditorium	1	4L4' T5/EL-8'	indirect/direct	12		NO RETRO	no change	1,638	1.4	1.4		2,477	2,477	
1,160.0	EOC	Auditorium	1	32W CF SCREWIN	can rec hor 6"	10	10	13 WATT LED/KIT	can kit LED Syl RT/5-6"	1,638	0.3	0.1	0.2	557	213	344
1,161.0	EOC	Storage Auditorium Projectio	1	2L4' T8 32w U/EL	trof parabolic	2	2	24 WATT LED/KIT	trof kit LED with controls	936	0.1	0.0	0.1	112	25	87
1,162.0	EOC	Storage Auditorium Projectio	1	32W CF SCREWIN	can rec hor 6"	2	2	13 WATT LED/KIT	can kit LED Syl RT/5-6"	936	0.1	0.0	0.0	64	24	39
1,163.0	EOC	Auditorium #3 (In Auditorium)	1	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	1,638	0.0	0.0	0.0	56	21	34
1,164.0	EOC	Lobby Main	1	72 WATT LED	can rec hor 6"	12		NO RETRO	no change already efficient	2,600	0.9	0.9		2,246	2,246	
1,165.0	EOC	Lobby Main	1	32W CF SCREWIN	can rec hor 6"	8	8	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,600	0.3	0.1	0.2	707	270	437
1,166.0	EOC	Lobby Main	1	2x26W CF HARDWIRED/EL	can rec hor 8"	2	2	17 WATT LED/KIT	can kit LED Syl RT/HO 6"	2,600	0.1	0.0	0.1	281	88	192

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
1,167.0	EOC	Foyer Main Lobby Vestibule	1	2x26W CF HARDWIRED/EL	can rec hor 8"	4	4	17 WATT LED/KIT	can kit LED Syl RT/HO 6"	2,600	0.2	0.1	0.1	562	177	385
1,168.0	EOC	Lobby Main	1	50w INCANDESCENT	pendant decorative	24		NO RETRO	no change	2,600	1.2	1.2		3,120	3,120	
1,169.0	EOC	Kitchen Admin	1	2L4' T8 32w U/EL	trof parabolic	4	4	24 WATT LED/KIT	trof kit LED with controls	1,989	0.2	0.0	0.2	477	79	399
1,170.0	EOC	Kitchen Admin	1	2L4' T8 32w U/EL	trof acr	2	2	24 WATT LED/KIT	trof kit LED with controls	1,989	0.1	0.0	0.1	239	39	199
1,171.0	EOC	Office Open Eoc Ready Roor	1	2L4' T8 32w U/EL	trof parabolic	9	9	24 WATT LED/KIT	trof kit LED with controls	2,470	0.5	0.1	0.4	1,334	220	1,114
1,172.0	EOC	Office Open Eoc Ready Roor	1	32W CF SCREWIN	can rec hor 6"	2	2	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,470	0.1	0.0	0.0	168	64	104
1,173.0	EOC	Storage Closet 4	1	32W CF SCREWIN	can rec hor 6"	2	2	13 WATT LED/KIT	can kit LED Syl RT/5-6"	1,040	0.1	0.0	0.0	71	27	44
1,174.0	EOC	Office Open Eoc	1	2L4' T8 32w U/EL	trof parabolic	16	16	24 WATT LED/KIT	trof kit LED with controls	2,470	0.9	0.2	0.7	2,371	391	1,980
1,175.0	EOC	Office Open Eoc	1	32W CF SCREWIN	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,470	0.0	0.0	0.0	84	32	52
1,176.0	EOC	Office Open Eoc Cove	1	1L2' T8 17w/EL	strip	28	28	1L2' LED 7w/ELEE LO/RLRB	rtrb 2' LED	2,470	0.5	0.2	0.2	1,176	588	588
1,177.0	EOC	Office Radio Operation	1	2L4' T8 32w U/EL	trof parabolic	3	3	24 WATT LED/KIT	trof kit LED with controls & switch	2,106	0.2	0.0	0.1	379	63	317
1,178.0	EOC	Office Radio Operation	1	32W CF SCREWIN	can rec hor 6"	4	4	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,106	0.1	0.0	0.1	286	110	177
1,179.0	EOC	Office Next To Radio Operati	1	2L4' T8 32w U/EL	trof parabolic	2	2	24 WATT LED/KIT	trof kit LED with controls & switch	2,106	0.1	0.0	0.1	253	42	211
1,180.0	EOC	Office Next To Radio Operati	1	32W CF SCREWIN	can rec hor 6"	4	4	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,106	0.1	0.0	0.1	286	110	177
1,181.0	EOC	Storage #1	1	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	936	0.1	0.0	0.0	56	17	39
1,182.0	EOC	Office Dose Assessment	1	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.1	0.2	505	111	394
1,183.0	EOC	Office Dose Assessment	1	32W CF SCREWIN	can rec hor 6"	2	2	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,106	0.1	0.0	0.0	143	55	88
1,184.0	EOC	Bath Men/Locker	1	2L4' T8 32w U/EL	trof acr	2	2	24 WATT LED/KIT	trof kit LED with controls	1,326	0.1	0.0	0.1	159	36	123
1,185.0	EOC	Bath Men/Locker	1	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,326	0.1	0.0	0.1	159	48	112
1,186.0	EOC	Bath Men/Locker	1	2L3' T8 25w/EL	wrap	2	2	2L3' LED 8.5w/ELEE LO/RLRB	rtrb 3' LED	1,326	0.1	0.0	0.0	125	56	69
1,187.0	EOC	Bath Men/Locker	1	32W CF SCREWIN	square recessed	1	1	1L6" LED 11w 4PINBASE/EL/RETUBE ONLY	retube LED 4pinG24q horizontal	1,326	0.0	0.0	0.0	45	19	27
1,188.0	EOC	Storage Janitor	1	2L4' T8 32w U/EL	trof acr	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	1,040	0.1	0.0	0.0	62	12	51
1,189.0	EOC	Bath Women/Locker	1	2L4' T8 32w U/EL	trof acr	2	2	24 WATT LED/KIT	trof kit LED with controls	1,326	0.1	0.0	0.1	159	36	123
1,190.0	EOC	Bath Women/Locker	1	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,326	0.1	0.0	0.1	159	48	112
1,191.0	EOC	Bath Women/Locker	1	2L3' T8 25w/EL	wrap	2	2	2L3' LED 8.5w/ELEE LO/RLRB	rtrb 3' LED	1,326	0.1	0.0	0.0	125	56	69
1,192.0	EOC	Bath Women/Locker	1	32W CF SCREWIN	square recessed	1	1	1L6" LED 11w 4PINBASE/EL/RETUBE ONLY	retube LED 4pinG24q horizontal	1,326	0.0	0.0	0.0	45	19	27
1,193.0	EOC	Closet #1	1	2L4' T8 32w U/EL	trof acr	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	1,040	0.1	0.0	0.0	62	12	51
1,194.0	EOC	Conference Command & Cor	1	2L4' T8 32w U/EL	trof parabolic	6	6	24 WATT LED/KIT	trof kit LED with controls & switch	1,989	0.3	0.1	0.2	716	118	598
1,195.0	EOC	Conference Command & Cor	1	32W CF SCREWIN	can rec hor 6"	6	6	13 WATT LED/KIT	can kit LED Syl RT/5-6"	1,989	0.2	0.1	0.1	406	155	251
1,196.0	EOC	Office Races / React	1	2L4' T8 32w/EL	trof parabolic	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.2	0.1	0.1	477	105	372
1,197.0	EOC	Office Races / React	1	32W CF SCREWIN	can rec hor 6"	2	2	13 WATT LED/KIT	can kit LED Syl RT/5-6"	1,989	0.1	0.0	0.0	135	52	84
1,198.0	EOC	Office Open Communication	1	2L4' T8 32w U/EL	trof parabolic	20	20	24 WATT LED/KIT	trof kit LED with controls	2,470	1.1	0.3	0.9	2,964	489	2,475
1,199.0	EOC	Office Open Communication	1	32W CF SCREWIN	can rec hor 6"	8	8	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,470	0.3	0.1	0.2	672	257	415
1,200.0	EOC	Office Open Communication	1	4L3' T8 25w/EL	indirect/direct	12		NO RETRO	no change	500	1.1	1.1		528	528	
1,201.0	EOC	Office Open Communication	1	1L2' T8 17w/EL	cove	54	54	1L2' LED 7w/ELEE LO/RLRB	rtrb 2' LED	2,470	0.9	0.4	0.4	2,267	1,134	1,134
1,202.0	EOC	Office Copy Room-Communi	1	2L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	239	53	186
1,203.0	EOC	Storage Eoc Equipment	1	3L4' T8 32w/EL	box acrylic	6	6	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	884	0.4	0.2	0.2	467	223	244
1,204.0	EOC	Mechanical It Room	1	2L4' T8 32w/EL	box acrylic	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	884	0.1	0.0	0.1	106	50	57
1,205.0	EOC	Storage Rad	1	2L4' T8 32w/EL	box acrylic	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	936	0.1	0.1	0.1	112	52	60
1,206.0	EOC	Mechanical Electrical Rm #1	1	3L4' T8 32w/EL	box acrylic	1	1	3L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	884	0.1	0.0	0.0	78	37	41
1,207.0	EOC	Mechanical Mech Room #1	1	2L4' T8 32w/EL	wrap wall mt.	8	8	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	936	0.4	0.2	0.2	449	210	240
1,208.0	EOC	Foyer Mech Room #1	1	2L4' T8 32w U/EL	trof parabolic	2	2	24 WATT LED/KIT	trof kit LED with controls	2,600	0.1	0.0	0.1	312	51	261
1,209.0	EOC	Hall Operation Center	1	2L4' T8 32w U/EL	trof parabolic	17	17	24 WATT LED/KIT	trof kit LED with controls	2,600	1.0	0.2	0.8	2,652	438	2,214
1,210.0	EOC	Hall Operation Center	1	32W CF SCREWIN	can rec hor 6"	19	19	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,600	0.6	0.2	0.4	1,680	642	1,037
1,211.0	EOC	Hall Operation Center	1	13W CF HARDWIRED	decorative	3	3	1L6" LED 5w 2PINBASE/MAG/RETUBE ONLY	retube LED 2pinGX23 horizontal	2,600	0.0	0.0	0.0	117	47	70
1,212.0	EOC	Conference Administration	1	3L4' T8 32w/EL	trof parabolic	8	8	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.6	0.1	0.5	1,400	210	1,190
1,213.0	EOC	Office Open Reception	1	2L4' T8 32w U/EL	trof parabolic	6	6	24 WATT LED/KIT	trof kit LED with controls	2,470	0.3	0.1	0.3	889	147	742
1,214.0	EOC	Office Open Reception	1	32W CF SCREWIN	can rec hor 6"	4	4	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,470	0.1	0.0	0.1	336	128	207
1,215.0	EOC	Closet #2	1	32W CF SCREWIN	can rec hor 6"	2	2	13 WATT LED/KIT	can kit LED Syl RT/5-6"	1,040	0.1	0.0	0.0	71	27	44
1,216.0	EOC	Office Admin- Linda	1	2L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	239	53	186
1,217.0	EOC	Office 106	1	2L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	239	53	186
1,218.0	EOC	Office 105	1	2L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	239	53	186
1,219.0	EOC	Office 104	1	2L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	239	53	186
1,220.0	EOC	Office 103	1	2L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	239	53	186
1,221.0	EOC	Office 102	1	2L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	239	53	186
1,222.0	EOC	Office 101	1	2L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	239	53	186
1,223.0	EOC	Office 100	1	2L4' T8 32w/EL	trof parabolic	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.2	0.1	0.1	477	105	372
1,224.0	EOC	Hall Administration	1	2L4' T8 32w U/EL	trof parabolic	12	12	24 WATT LED/KIT	trof kit LED with controls	2,600	0.7	0.2	0.6	1,872	309	1,563
1,225.0	EOC	Hall Administration	1	32W CF SCREWIN	can rec hor 6"	2	2	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,600	0.1	0.0	0.0	177	68	109
1,233.0	Farm	Kitchen Main	1	34 WATT LED	trof acr 2x2	14		NO RETRO	no change already efficient	5,580	0.5	0.5		2,656	2,656	

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
1,234.0	Farm	Kitchen Main	1	44 WATT LED	trof acr	4		NO RETRO	no change already efficient	5,580	0.2	0.2		982	982	
1,235.0	Farm	Kitchen Main	1	LED	trof acr 1' wide	4		NO RETRO	no change already efficient	5,580						
1,236.0	Farm	Storage Kitchen	1	14 WATT LED	can rec vert 5"	3		NO RETRO	no change already efficient	1,443	0.0	0.0		61	61	
1,237.0	Farm	Kitchen Hood	1	9 WATT LED	jar	6		NO RETRO	no change already efficient	5,580	0.1	0.1		301	301	
1,238.0	Farm	Kitchen Coffee Area	1	14 WATT LED	can rec vert 5"	2		NO RETRO	no change already efficient	5,580	0.0	0.0		156	156	
1,239.0	Farm	Hall Near Coffee Area	1	14 WATT LED	can rec vert 5"	4		NO RETRO	no change already efficient	5,676	0.1	0.1		318	318	
1,240.0	Farm	Hall Near Coffee Area	1	14 WATT LED	can rec vert 5"	3		NO RETRO	no change already efficient	5,676	0.0	0.0		238	238	
1,241.0	Farm	Hall Near Coffee Area	1	14 WATT LED	can rec vert 5"	3		NO RETRO	no change already efficient	5,676	0.0	0.0		238	238	
1,242.0	Farm	Dining Room	1	3x40w INCANDESCENTS	pendant decorative	1	1	6 WATT LED SI	screw in LED Alamp	3,848	0.1	0.0	0.1	462	69	392
1,243.0	Farm	Dining Room	1	2x25 INCANDESCENTS	decorative	4	4	10 WATT LED SI	screw in LED Alamp	3,848	0.2	0.1	0.1	770	308	462
1,244.0	Farm	Dining Room	1	14 WATT LED	can rec vert 6"	9		NO RETRO	no change already efficient	3,848	0.1	0.1		485	485	
1,245.0	Farm	Dining Room Bar Area	1	54 WATT LED	decorative	4		NO RETRO	no change already efficient	3,848	0.2	0.2		831	831	
1,246.0	Farm	Dining Room Bar Sitting Area	1	9 WATT LED	decorative	8		NO RETRO	no change already efficient	3,848	0.1	0.1		277	277	
1,247.0	Farm	Dining Room Bar	1	14 WATT LED	can rec vert 6"	4		NO RETRO	no change already efficient	3,848	0.1	0.1		215	215	
1,248.0	Farm	Dining Room	1	9 WATT LED	sconce	6		NO RETRO	no change already efficient	3,848	0.1	0.1		208	208	
1,249.0	Farm	Bath Men	1	14 WATT LED	can rec vert 6"	4		NO RETRO	no change already efficient	2,309	0.0	0.0		129	129	
1,250.0	Farm	Bath Men	1	36 WATT LED	vanity	1		NO RETRO	no change already efficient	2,309	0.0	0.0		83	83	
1,251.0	Farm	Bath Woman	1	14 WATT LED	can rec vert 6"	5		NO RETRO	no change already efficient	2,309	0.1	0.1		162	162	
1,252.0	Farm	Bath Women	1	36 WATT LED	vanity	1		NO RETRO	no change already efficient	2,309	0.0	0.0		83	83	
1,253.0	Farm	Storage By Side Of Bar	1	LED	can rec vert 6"	2		NO RETRO	no change already efficient	1,443						
1,254.0	Farm	Dining Room Mezzanine	1	54 WATT LED	decorative	2		NO RETRO	no change already efficient	3,848	0.1	0.1		416	416	
1,255.0	Farm	Stair To Basement		9 WATT LED	keyless	1		NO RETRO	no change already efficient	5,676	0.0	0.0		51	51	
1,256.0	Farm	Stair To Basement		34 WATT LED	trof acr 2x2	2		NO RETRO	no change already efficient	5,676	0.1	0.1		386	386	
1,257.0	Farm	Hall Panel Area	1	14 WATT LED	can rec vert 7"	6		NO RETRO	no change already efficient	5,676	0.1	0.1		477	477	
1,258.0	Farm	Hall Basement	1	34 WATT LED	trof acr 2x2	24		NO RETRO	no change already efficient	5,676	0.8	0.8		4,632	4,632	
1,259.0	Farm	Hall Vestibule	1	34 WATT LED	trof acr 2x2	2		NO RETRO	no change already efficient	5,676	0.1	0.1		386	386	
1,260.0	Farm	Classroom	1	34 WATT LED	trof acr 2x2	21		NO RETRO	no change already efficient	4,329	0.7	0.7		3,091	3,091	
1,261.0	Farm	Classroom	1	14 WATT LED	trof acr	2		NO RETRO	no change already efficient	4,329	0.0	0.0		121	121	
1,262.0	Farm	Locker	1	44 WATT LED	trof acr	1		NO RETRO	no change already efficient	2,309	0.0	0.0		102	102	
1,263.0	Farm	Laundry	1	15 WATT LED	drum wall mt.	2		NO RETRO	no change already efficient	2,886	0.0	0.0		87	87	
1,264.0	Farm	Mechanical Panel	1	34 WATT LED	trof acr 2x2	1		NO RETRO	no change already efficient	1,924	0.0	0.0		65	65	
1,265.0	Farm	Mechanical Panel	1	15 WATT LED	drum wall mt.	3		NO RETRO	no change already efficient	1,924	0.0	0.0		87	87	
1,266.0	Farm	Stair		34 WATT LED	trof acr 2x2	1		NO RETRO	no change already efficient	5,676	0.0	0.0		193	193	
1,267.0	Farm	Stair		9 WATT LED	can rec vert 5"	4		NO RETRO	no change already efficient	5,676	0.0	0.0		204	204	
1,271.0	Kern	Office Open Wic	1	4L4' T8 32w/EL	trof parabolic	11	11	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,866	1.2	0.2	1.0	3,531	416	3,115
1,272.0	Kern	Office Open Wic	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	2,866	0.1	0.0	0.0	172	28	144
1,273.0	Kern	Office Open Wic	1	3L4' T8 32w/EL	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,866	0.5	0.1	0.4	1,513	227	1,286
1,274.0	Kern	Office Wic	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.2	0.0	0.2	419	49	370
1,275.0	Kern	Office Wic Back	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.1	0.0	0.1	210	25	185
1,276.0	Kern	Office Wic Back	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.1	0.0	0.1	210	25	185
1,277.0	Kern	Bath Wic	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	2,476	0.1	0.0	0.0	149	25	124
1,278.0	Kern	Kitchen Wic	1	2L4' T8 32w/EL	box acr 1' wide	5	5	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,564	0.3	0.1	0.1	769	359	410
1,279.0	Kern	Kitchen Wic	1	4L4' T8 32w/EL	trof acr	5	5	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,866	0.5	0.1	0.4	1,605	189	1,416
1,280.0	Kern	Mechanical Dhw Rm	1	20W CF SCREWIN	drum	1	1	10 WATT LED SI	screw in LED Alamp	936	0.0	0.0	0.0	21	9	11
1,281.0	Kern	Garage Wic	1	2L4' T8 32w/EL	wrap wall mt.	2	2	2L4' LED 13w/ELEE/RLRB	rtrb 4' LED	988	0.1	0.1	0.1	119	63	55
1,282.0	Kern	Office Open Health Dept	1	42 WATT LED	trof parabolic	4		NO RETRO	no change already efficient	2,866	0.2	0.2		481	481	
1,283.0	Kern	Office Open Health Dept	1	3L4' T8 32w/EL	trof parabolic	13	13	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,866	1.1	0.2	0.9	3,279	492	2,787
1,284.0	Kern	Bath Men	1	12 WATT LED	drum	2		NO RETRO	no change already efficient	2,767	0.0	0.0		66	66	
1,285.0	Kern	Bath Women	1	12 WATT LED	drum	3		NO RETRO	no change already efficient	2,767	0.0	0.0		100	100	
1,286.0	Kern	Foyer Women	1	12 WATT LED	drum	3		NO RETRO	no change already efficient	3,276	0.0	0.0		118	118	
1,287.0	Kern	Lounge Health Dept	1	3L4' T8 32w/EL	trof parabolic	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,564	0.3	0.1	0.2	903	135	767
1,288.0	Kern	Office Open Coop Extension	1	3L4' T8 32w/EL	trof parabolic	21	21	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,866	1.8	0.4	1.4	5,296	794	4,502
1,289.0	Kern	Office Open Coop Extension	1	2L4' T8 U 1.5"/EL	trof parabolic	2	2	24 WATT LED/KIT	trof kit LED with controls	2,866	0.1	0.0	0.1	332	57	276
1,290.0	Kern	Office Open Coop Extension	1	2x32W CF HARDWIRED/EL	can rec hor 6"	12	12	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,866	0.8	0.1	0.6	2,339	447	1,892
1,291.0	Kern	Office Coop (1) Plan	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.1	0.0	0.1	311	47	264
1,292.0	Kern	Office Coop (2) Plan	1	3L4' T8 32w/EL	trof parabolic	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.4	0.1	0.4	934	140	793
1,293.0	Kern	Bath	1	1L18" T12 STD/STD	vanity	1	1	18 WATT LED/NEW	New vanity	2,767	0.0	0.0	0.0	47	50	-3
1,294.0	Kern	Bath	1	4x60w INCANDESCENTS	vanity	1	1	6.5 WATT LED/NEW	screw in LED globe	2,767	0.2	0.0	0.2	664	72	592
1,295.0	Kern	Bath	1	60w INCANDESCENT	drum	1	1	10 WATT LED SI	screw in LED Alamp	2,767	0.1	0.0	0.0	166	28	138
1,296.0	Kern	Office Copy	1	3L4' T8 32w/EL	trof parabolic	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.2	0.0	0.2	467	70	397

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
1,297.0	Kern	Office Copy	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls & switch	1,872	0.1	0.0	0.0	112	19	94
1,298.0	Kern	Storage Coop Supply	1	2L8' T8/EL	industrial	2	2	4L4' LED 13w/ELEE/NEW white goods	new strip	840	0.2	0.1	0.1	183	108	76
1,299.0	Kern	Storage Coop Supply	1	2L8' T12 75w STD/STD	industrial	1	1	4L4' LED 13w/ELEE/NEW white goods	new strip	840	0.1	0.1	0.1	145	54	92
1,300.0	Kern	Storage Coop-Mezzanine	1	2L8' T12 75w STD/STD	strip	2	2	4L4' LED 13w/ELEE/NEW white goods	new strip	988	0.3	0.1	0.2	342	126	215
1,301.0	Kern	Mechanical Phone Rm	1	2L4' T8 32w/EL	box acr 1' wide	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	884	0.1	0.0	0.0	53	25	28
1,302.0	Kern	Office Commissioner Of Heal	1	2L4' T8 U 1.5"/EL	trof parabolic	5	5	24 WATT LED/KIT	trof kit LED with controls & switch	1,768	0.2	0.1	0.2	513	88	425
1,303.0	Kern	Hall Vestibule (Next To Comr	1	2x13W CF HARDWIRED	can rec hor 8"	1	1	17 WATT LED/KIT	can kit LED Syl RT/HO 6"	3,276	0.0	0.0	0.0	98	56	43
1,304.0	Kern	Lobby Entry- Health Dept	1	2x13W CF HARDWIRED	can rec hor 8"	3	3	17 WATT LED/KIT	can kit LED Syl RT/HO 6"	3,276	0.1	0.1	0.0	295	167	128
1,305.0	Kern	Lobby Entry- Health Dept	1	2L4' T8 U 1.5"/EL	trof parabolic	3	3	24 WATT LED/KIT	trof kit LED with controls	3,276	0.2	0.0	0.1	570	97	473
1,306.0	Kern	Lobby Entry- Health Dept	1	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,276	0.1	0.0	0.1	288	43	245
1,307.0	Kern	Lobby Entry- Health Dept	1	14 WATT LED	sconce	3		NO RETRO	no change already efficient	3,276	0.0	0.0		138	138	
1,308.0	Kern	Office Water Dept	1	3L4' T8 32w/EL	trof parabolic	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.2	0.0	0.2	467	70	397
1,309.0	Kern	Office Reception-Health Dept	1	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.1	0.0	0.1	165	25	140
1,310.0	Kern	Bath Unisex	1	2L4' T8 32w/EL	trof acr 1' wide	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,767	0.2	0.1	0.1	498	232	266
1,311.0	Kern	Bath Women	1	2L4' T8 32w/EL	trof acr 1' wide	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,767	0.2	0.1	0.1	498	232	266
1,312.0	Kern	Mechanical Phone Equipmen	1	2L4' T8 32w/EL	trof acr 1' wide	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	936	0.1	0.1	0.1	112	52	60
1,313.0	Kern	Office Aly	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls & switch	1,872	0.1	0.0	0.0	112	19	94
1,314.0	Kern	Office Next To Aly	1	2L4' T8 U 1.5"/EL	trof acr	4	4	24 WATT LED/KIT	trof kit LED with controls & switch	1,768	0.2	0.0	0.2	410	70	340
1,315.0	Kern	Kitchen	1	2L4' T8 U 1.5"/EL	trof acr	4	4	24 WATT LED/KIT	trof kit LED with controls	2,866	0.2	0.1	0.2	665	113	551
1,316.0	Kern	Office Immunization	1	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.1	0.0	0.1	156	23	132
1,317.0	Kern	Office Treatment Rm #1	1	4L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.3	0.0	0.3	629	74	555
1,318.0	Kern	Storage Nurse File Rm	1	4L4' T8 32w/EL	trof parabolic	2	2	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	840	0.2	0.1	0.1	188	94	94
1,319.0	Kern	Office Tb	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.1	0.0	0.1	311	47	264
1,320.0	Kern	Office Maternal Child Health	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.1	0.0	0.1	311	47	264
1,321.0	Kern	Office Next To Maternal Child	1	3L4' T8 32w/EL	trof parabolic	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.2	0.0	0.2	467	70	397
1,322.0	Kern	Office Next	1	2L4' T8 U 1.5"/EL	trof parabolic	2	2	24 WATT LED/KIT	trof kit LED with controls & switch	1,872	0.1	0.0	0.1	217	37	180
1,323.0	Kern	Office Open	1	3L4' T8 32w/EL	trof parabolic	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,866	0.5	0.1	0.4	1,513	227	1,286
1,324.0	Kern	Office Next To Conf	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.2	0.0	0.1	329	49	280
1,325.0	Kern	Conference Next To Conf	1	3L4' T8 32w/EL	trof parabolic	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,976	0.3	0.1	0.3	696	104	591
1,326.0	Kern	Conference	1	2L4' T8 U 1.5"/EL	trof parabolic	4	4	24 WATT LED/KIT	trof kit LED with controls & switch	1,976	0.2	0.1	0.2	458	78	380
1,327.0	Kern	Office Erin	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.1	0.0	0.1	311	47	264
1,328.0	Kern	Office Corner Office	1	2L4' T8 U 1.5"/EL	trof parabolic	6	6	24 WATT LED/KIT	trof kit LED with controls & switch	1,768	0.3	0.1	0.2	615	105	510
1,329.0	Kern	Office Admin Fiscal	1	3L4' T8 32w/EL	trof parabolic	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.5	0.1	0.4	988	148	840
1,330.0	Kern	Office Copy Area	1	2L4' T8 U 1.5"/EL	trof parabolic	6	6	24 WATT LED/KIT	trof kit LED with controls & switch	1,872	0.3	0.1	0.2	651	111	540
1,331.0	Kern	Conference Clinic	1	2L4' T8 U 1.5"/EL	trof parabolic	4	4	24 WATT LED/KIT	trof kit LED with controls & switch	1,768	0.2	0.0	0.2	410	70	340
1,332.0	Kern	Office Treatment Rm #2	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.2	0.0	0.2	419	49	370
1,333.0	Kern	Office Empty	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,872	0.2	0.0	0.1	329	49	280
1,334.0	Kern	Office Open Environmental. H	1	3L4' T8 32w/EL	trof parabolic	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,564	0.3	0.1	0.2	903	135	767
1,335.0	Kern	Office Open Environmental. H	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,866	0.2	0.0	0.2	642	76	566
1,336.0	Kern	Office Environmental Enginee	1	2L4' T8 U 1.5"/EL	trof acr	6	6	24 WATT LED/KIT	trof kit LED with controls & switch	1,768	0.3	0.1	0.2	615	105	510
1,337.0	Kern	Hall Health-Right	1	2x13W CF HARDWIRED	can rec hor 8"	6	6	17 WATT LED/KIT	can kit LED Syl RT/HO 6"	3,276	0.2	0.1	0.1	590	334	256
1,338.0	Kern	Hall Health-Left	1	2x13W CF HARDWIRED	can rec hor 8"	13	13	17 WATT LED/KIT	can kit LED Syl RT/HO 6"	3,276	0.4	0.2	0.2	1,278	724	554
1,339.0	Kern	Hall Health-Left	1	2L4' T8 U 1.5"/EL	trof parabolic	3	3	24 WATT LED/KIT	trof kit LED with controls	3,276	0.2	0.0	0.1	570	97	473
1,340.0	Kern	Lobby Health Main Entrance	1	2x13W CF HARDWIRED	can rec hor 8"	4	4	17 WATT LED/KIT	can kit LED Syl RT/HO 6"	3,276	0.1	0.1	0.1	393	223	170
1,341.0	Kern	Lobby Health Main Entrance	1	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,276	0.1	0.0	0.0	197	43	153
1,342.0	Kern	Hall Vestibule-Health	1	2x13W CF HARDWIRED	can rec hor 8"	1	1	17 WATT LED/KIT	can kit LED Syl RT/HO 6"	3,276	0.0	0.0	0.0	98	56	43
1,343.0	Kern	Stair Down To Dmv	1	1L4' T8 32w/EL	wrap narrow	2	2	1L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,276	0.1	0.0	0.0	197	92	105
1,344.0	Kern	Bath Dmv Unisex	1	3L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,767	0.1	0.0	0.1	243	37	207
1,345.0	Kern	Lobby Outside Dmv Office	1	2x13W CF HARDWIRED	can rec hor 8"	5	5	17 WATT LED/KIT	can kit LED Syl RT/HO 6"	3,276	0.2	0.1	0.1	491	278	213
1,346.0	Kern	Storage Next To Unisex Rest	1	3L4' T8 32w/EL	trof acr	4	4	2L4' LED 13w/ELEE HI/RLRB	rtrb 4' LED socket bar kit & switch rewiring	988	0.4	0.2	0.2	348	170	178
1,347.0	Kern	Storage Plate Storage	1	2L4' T8 32w/EL	strip	5	5	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	988	0.3	0.1	0.2	296	138	158
1,348.0	Kern	Storage Plate Storage	1	44 WATT LED	strip	3		NO RETRO	no change already efficient	988	0.1	0.1		130	130	
1,349.0	Kern	Lounge Lunch Room	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,564	0.2	0.0	0.2	574	68	507
1,350.0	Kern	Lounge Lunch Room	1	44 WATT LED	trof acr	2		NO RETRO	no change already efficient	2,564	0.1	0.1		226	226	
1,351.0	Kern	Hall Back Of Open Area	1	2x13W CF HARDWIRED	can rec hor 8"	8	8	17 WATT LED/KIT	can kit LED Syl RT/HO 6"	3,276	0.2	0.1	0.1	786	446	341
1,352.0	Kern	Hall Back Of Open Area	1	2L4' T8 U 1.5"/EL	trof parabolic	1	1	24 WATT LED/KIT	trof kit LED with controls	3,276	0.1	0.0	0.0	190	32	158
1,353.0	Kern	Bath Women-Staff	1	2L4' T8 32w/EL	trof para 1' wide	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,767	0.2	0.1	0.1	498	232	266
1,354.0	Kern	Bath Men	1	2L4' T8 32w/EL	trof para 1' wide	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,767	0.2	0.1	0.1	498	232	266
1,355.0	Kern	Office	1	3L4' T8 32w/EL	trof parabolic	5	5	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.4	0.1	0.3	778	117	661
1,356.0	Kern	Office Open Dmv Main Hall	1	2L4' T8 U 1.5"/EL	trof parabolic	4	4	24 WATT LED/KIT	trof kit LED with controls	2,564	0.2	0.0	0.2	595	102	493

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
1,357.0	Kern	Office Open Dmv Main Hall	1	3L4' T8 32w/EL	trof parabolic	38	38	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,564	2.8	0.6	2.3	8,574	1,286	7,288
1,358.0	Kern	Office Fax Room	1	3L4' T8 32w/EL	trof parabolic	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,768	0.3	0.1	0.2	622	93	529
1,370.0	Fam1808	Hall Entry Vestibule	1	2x13W CF HARDWIRED	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,692	0.0	0.0	0.0	111	48	63
1,371.0	Fam1808	Lobby	1	4L4' T8 32w/EL 2 BALLASTS	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,692	0.5	0.1	0.4	1,772	195	1,577
1,372.0	Fam1808	Lobby Waiting Area	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,692	0.1	0.0	0.1	414	49	365
1,373.0	Fam1808	Office Open Main	1	4L4' T8 32w/EL 2 BALLASTS	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,310	0.1	0.0	0.1	397	59	338
1,374.0	Fam1808	Storage Main	1	4L4' T8 32w/EL	trof acr	7	7	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,264	0.7	0.1	0.6	991	159	832
1,375.0	Fam1808	Office Manager	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,376.0	Fam1808	Office 18	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	587	69	518
1,377.0	Fam1808	Office 18	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	587	69	518
1,378.0	Fam1808	Office 20	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	587	69	518
1,379.0	Fam1808	Office 19	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,380.0	Fam1808	Office 21	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,381.0	Fam1808	Office 22	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,382.0	Fam1808	Office 23	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,383.0	Fam1808	Office 24	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,384.0	Fam1808	Office 25	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	587	69	518
1,385.0	Fam1808	Office 26	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,386.0	Fam1808	Office 27	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,387.0	Fam1808	Office 28	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,388.0	Fam1808	Office 29	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,389.0	Fam1808	Office 30	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,390.0	Fam1808	Office 31	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,391.0	Fam1808	Bath Men	1	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,261	0.1	0.0	0.0	196	43	153
1,392.0	Fam1808	Bath Women	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,261	0.2	0.0	0.2	730	86	644
1,393.0	Fam1808	Office 34	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	587	69	518
1,394.0	Fam1808	Office 32	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	587	69	518
1,395.0	Fam1808	Office 33	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	587	69	518
1,396.0	Fam1808	Conference 35	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,767	0.1	0.0	0.1	310	37	273
1,397.0	Fam1808	Conference 41-Group D	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,767	0.2	0.0	0.2	620	73	547
1,398.0	Fam1808	Office 42 Server	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,399.0	Fam1808	Office 43	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,400.0	Fam1808	Office 44	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,401.0	Fam1808	Office 45	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,402.0	Fam1808	Mechanical 47, Panels	1	4L4' T8 32w/EL	trof acr	1	1	2L4' LED 13w/ELEE HI/RLRB	rtrb 4' LED socket bar kit	780	0.1	0.0	0.1	87	34	54
1,403.0	Fam1808	Office 48	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,404.0	Fam1808	Office 46, Group E	1	4L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.3	0.0	0.3	881	104	777
1,405.0	Fam1808	Closet Across	1	4L4' T8 32w/EL	trof acr	2	2	2L4' LED 13w/ELEE HI/RLRB	rtrb 4' LED socket bar kit	1,092	0.2	0.0	0.2	245	39	206
1,406.0	Fam1808	Conference 37 Group C	1	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,767	0.4	0.1	0.4	1,240	146	1,094
1,407.0	Fam1808	Office 36	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	587	69	518
1,408.0	Fam1808	Office 39	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,409.0	Fam1808	Office 40	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,410.0	Fam1808	Storage 14 Record Room	1	4L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,264	0.3	0.1	0.2	425	68	357
1,411.0	Fam1808	Storage 14 Record Room Ba	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,264	0.1	0.0	0.1	142	23	119
1,412.0	Fam1808	Office 13	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,413.0	Fam1808	Office 15	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	587	69	518
1,414.0	Fam1808	Office 39	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	587	69	518
1,415.0	Fam1808	Office 12	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,416.0	Fam1808	Office 8	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,417.0	Fam1808	Office 11	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.1	0.0	0.1	294	35	259
1,418.0	Fam1808	Office 10	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	587	69	518
1,419.0	Fam1808	Conference Toni'S Room	1	4L4' T8 32w/EL 2 BALLASTS	trof acr	8	8	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,767	0.9	0.1	0.8	2,656	292	2,364
1,420.0	Fam1808	Conference Toni'S Room	1	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,767	0.4	0.1	0.4	1,240	146	1,094
1,421.0	Fam1808	Bath Men-Next To Toni'S Ro	1	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,261	0.1	0.0	0.1	365	43	322
1,422.0	Fam1808	Storage Slop	1	4L4' T8 32w/EL	trof acr	1	1	2L4' LED 13w/ELEE HI/RLRB	rtrb 4' LED socket bar kit	1,092	0.1	0.0	0.1	122	26	96
1,423.0	Fam1808	Bath Women	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,261	0.2	0.0	0.2	730	86	644
1,424.0	Fam1808	Bath Women	1	2x13W CF HARDWIRED	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,261	0.0	0.0	0.0	98	42	55
1,425.0	Fam1808	Kitchen	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,767	0.2	0.0	0.2	620	73	547
1,426.0	Fam1808	Hall Vestibule	1	2x13W CF HARDWIRED	can rec hor 6"	1	1	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,692	0.0	0.0	0.0	111	48	63
1,427.0	Fam1808	Office 3	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	587	69	518

Line	Building Name	Location	Fl	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
1,428.0	Fam1808	Office 2	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,621	0.2	0.0	0.2	587	69	518
1,429.0	Fam1808	Hall All Areas	1	2x13W CF HARDWIRED	can rec hor 6"	32	32	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,692	1.0	0.4	0.5	3,544	1,536	2,008
1,430.0	Fam1808	Hall All Areas	1	2x26W CF HARDWIRED/EL	can rec hor 6"	4	4	13 WATT LED/KIT	can kit LED Syl RT/5-6"	3,692	0.2	0.1	0.2	797	192	605
1,431.0	Fam1808	Hall All Areas	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,692	0.2	0.0	0.2	827	97	730
1,436.0	Fam1816	Classroom Computer Room	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,520	0.2	0.0	0.1	444	67	377
1,437.0	Fam1816	Office 101 Reception	1	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,902	0.1	0.0	0.1	255	38	217
1,438.0	Fam1816	Hall Entrance	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	3,692	0.1	0.0	0.0	222	37	185
1,439.0	Fam1816	Kitchen	1	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,767	0.1	0.0	0.1	243	37	207
1,440.0	Fam1816	Office 102	1	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,902	0.1	0.0	0.1	255	38	217
1,441.0	Fam1816	Closet	1	23W CF SCREWIN	sconce	2	2	10 WATT LED SI	screw in LED Alamp	520	0.1	0.0	0.0	26	10	16
1,442.0	Fam1816	Bath Men	1	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,261	0.1	0.0	0.1	287	43	244
1,443.0	Fam1816	Bath Women	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,261	0.2	0.0	0.1	574	86	488
1,444.0	Fam1816	Storage 103 File	1	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	936	0.1	0.0	0.1	82	17	66
1,445.0	Fam1816	Office 104	1	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,902	0.1	0.0	0.1	255	38	217
1,446.0	Fam1816	Hall Elevator	1	2L2' T12 20w STD/STD	strip	2	2	2L2' LED 7w/ELEE LO/RLRB	rtrb 2' LED	3,692	0.1	0.0	0.1	414	126	288
1,447.0	Fam1816	Office 106	1	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,902	0.1	0.0	0.1	255	38	217
1,448.0	Fam1816	Office 107	1	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,902	0.1	0.0	0.1	255	38	217
1,449.0	Fam1816	Closet	1	2L4' T8 32w U/EL	trof acr	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	520	0.1	0.0	0.0	31	10	21
1,450.0	Fam1816	Office 111	1	3L4' T8 32w/EL	trof parabolic	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,902	0.2	0.0	0.1	511	77	434
1,451.0	Fam1816	Office 110	1	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,902	0.1	0.0	0.1	255	38	217
1,452.0	Fam1816	Office 109	1	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,902	0.1	0.0	0.1	255	38	217
1,453.0	Fam1816	Office 108	1	3L4' T8 32w/EL	trof parabolic	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,902	0.1	0.0	0.1	255	38	217
1,454.0	Fam1816	Stair 1		2x13W CF HARDWIRED	drum	3	3	1L6" LED 5w 2PINBASE/MAG/RETUBE ONLY	retube LED 2pinGX23 horizontal	3,692	0.1	0.0	0.1	332	133	199
1,455.0	Fam1816	Stair 1		LED	drum	1		NO RETRO	no change already efficient	3,692						
1,456.0	Fam1816	Office 208	2	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls & switch	2,902	0.1	0.0	0.0	174	29	145
1,457.0	Fam1816	Office 210	2	2L4' T8 32w U/EL	trof acr	8	8	24 WATT LED/KIT	trof kit LED with controls & switch	2,902	0.4	0.1	0.3	1,393	230	1,163
1,458.0	Fam1816	Office 207 Group Room	2	2L4' T8 32w U/EL	trof acr	2	2	24 WATT LED/KIT	trof kit LED with controls & switch	2,902	0.1	0.0	0.1	348	57	291
1,459.0	Fam1816	Lounge 206	2	2L4' T8 32w U/EL	trof acr	2	2	24 WATT LED/KIT	trof kit LED with controls & switch	2,717	0.1	0.0	0.1	326	54	272
1,460.0	Fam1816	Office 203	2	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls & switch	2,902	0.1	0.0	0.0	174	29	145
1,461.0	Fam1816	Office 204	2	2L4' T8 32w U/EL	trof acr	5	5	24 WATT LED/KIT	trof kit LED with controls & switch	2,902	0.3	0.1	0.2	871	144	727
1,462.0	Fam1816	Office 204 Inside Office	2	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls & switch	2,902	0.1	0.0	0.0	174	29	145
1,463.0	Fam1816	Bath Unisex	2	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	3,261	0.1	0.0	0.0	196	32	163
1,464.0	Fam1816	Bath Unisex	2	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	3,261	0.1	0.0	0.0	196	32	163
1,465.0	Fam1816	Office 201	2	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls & switch	2,902	0.1	0.0	0.0	174	29	145
1,466.0	Fam1816	Office 202	2	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls & switch	2,902	0.1	0.0	0.0	174	29	145
1,467.0	Fam1816	Office 205	2	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls & switch	2,902	0.1	0.0	0.0	174	29	145
1,468.0	Fam1816	Closet 206	2	2L4' T8 32w U/EL	trof acr	1	1	20 WATT LED/KIT	rt 2L2' LED bar kit	520	0.1	0.0	0.0	31	10	21
1,469.0	Fam1816	Hall 2Nd Floor	2	2L4' T8 32w U/EL	trof acr	9	9	24 WATT LED/KIT	trof kit LED with controls	3,692	0.5	0.1	0.4	1,994	329	1,665
1,470.0	Fam1816	Closet Under Stair	2	60w INCANDESCENT	sconce	1	1	10 WATT LED SI	screw in LED Alamp	520	0.1	0.0	0.1	31	5	26
1,471.0	Fam1816	Conference 1St Floor Group	1	3L4' T8 32w/EL	trof parabolic	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	3,063	0.5	0.1	0.4	1,617	243	1,375
1,472.0	Fam1816	Conference 105 Community	1	3L4' T8 32w/EL	trof parabolic	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	3,063	0.3	0.1	0.3	1,078	162	916
1,473.0	Fam1816	Hall 1St Floor	1	3L4' T8 32w/EL	trof parabolic	10	10	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,692	0.9	0.2	0.7	3,249	487	2,762
1,474.0	Fam1816	Storage Attic	3	100w INCANDESCENT	keyless	5	5	10 WATT LED SI	screw in LED Alamp	520	0.5	0.1	0.5	260	26	234
1,475.0	Fam1816	Stair 2		2x13W CF HARDWIRED	drum	3	3	1L6" LED 5w 2PINBASE/MAG/RETUBE ONLY	retube LED 2pinGX23 horizontal	3,692	0.1	0.0	0.1	332	133	199
1,476.0	Fam1816	Storage Basement	b	2L4' T8 32w/EL	wrap	8	8	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	520	0.5	0.2	0.3	250	116	133
1,477.0	Fam1816	Storage Basement	b	100w INCANDESCENT	keyless	4	4	10 WATT LED SI	screw in LED Alamp	520	0.4	0.0	0.4	208	21	187
1,478.0	Fam1816	Mechanical Elevator Machine	b	2L4' T12 40w STD/STD	wrap	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	780	0.1	0.0	0.1	73	22	51
1,482.0	BOE	Office Open	1	4L4' T8 32w/EL	trof acr	18	18	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	1.9	0.3	1.6	4,980	587	4,393
1,483.0	BOE	Hall Reception	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,120	0.2	0.0	0.2	699	82	617
1,484.0	BOE	Bath Men	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,976	0.2	0.0	0.2	443	52	390
1,485.0	BOE	Bath Women	1	4L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,976	0.2	0.0	0.2	443	52	390
1,486.0	BOE	Kitchen	1	4L4' T8 32w/EL	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	0.6	0.1	0.5	1,660	196	1,464
1,487.0	BOE	Garage	1	2L4' T8 32w/EL	strip	28	28	2L4' LED 13w/ELEE/RLRB	rtrb 4' LED	936	1.5	0.8	0.7	1,572	839	734
1,488.0	BOE	Office In Garage	1	2L4' T8 32w/EL	wrap	4	4	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,106	0.2	0.1	0.1	505	236	270
1,489.0	BOE	Bath In Garage	1	2L4' T8 32w/EL	wrap	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,976	0.1	0.0	0.0	119	55	63
1,490.0	BOE	Storage Utility Room	1	13W CF HARDWIRED	drum	2		NO RETRO	no change	936	0.0	0.0		28	28	
1,491.0	BOE	Office Croft	1	4L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.3	0.0	0.3	708	83	624
1,492.0	BOE	Office Scannapieco	1	4L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.4	0.1	0.3	943	111	832
1,493.0	BOE	Classroom Training Room	1	4L4' T8 32w/EL	trof acr	13	13	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,668	1.4	0.2	1.2	3,885	458	3,427
1,494.0	BOE	Classroom Training Room	1	2L4' T8 32w U/EL	trof acr	4	4	24 WATT LED/KIT	trof kit LED with controls & switch	2,668	0.2	0.1	0.2	640	106	535

Line	Building Name	Location	Fl	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
1,503.0	Vets	Hall Left Side	1	75w INCANDESCENT	can rec vert 6"	2	2	10 WATT LED SI	screw in LED Alamp	5,824	0.2	0.0	0.1	874	116	757
1,504.0	Vets	Bedroom 4	1	75w INCANDESCENT	can rec vert 6"	4	4	10 WATT LED SI	screw in LED Alamp	2,548	0.3	0.0	0.3	764	102	662
1,505.0	Vets	Bedroom 3	1	75w INCANDESCENT	can rec vert 6"	4	4	10 WATT LED SI	screw in LED Alamp	2,548	0.3	0.0	0.3	764	102	662
1,506.0	Vets	Bedroom 2	1	75w INCANDESCENT	can rec vert 6"	4	4	10 WATT LED SI	screw in LED Alamp	2,548	0.3	0.0	0.3	764	102	662
1,507.0	Vets	Bedroom 1	1	75w INCANDESCENT	can rec vert 6"	4	4	10 WATT LED SI	screw in LED Alamp	2,548	0.3	0.0	0.3	764	102	662
1,508.0	Vets	Lounge Pool Table	1	75w INCANDESCENT	can rec vert 6"	6	6	10 WATT LED SI	screw in LED Alamp	5,533	0.4	0.1	0.4	2,490	332	2,158
1,509.0	Vets	Hall Main Entrance	1	75w INCANDESCENT	can rec vert 6"	2	2	10 WATT LED SI	screw in LED Alamp	5,824	0.2	0.0	0.1	874	116	757
1,510.0	Vets	Kitchen	1	4L4' T12 40w STD/STD	box acrylic	1	1	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,113	0.2	0.1	0.1	585	174	411
1,511.0	Vets	Kitchen	1	75w INCANDESCENT	can rec vert 6"	6	6	10 WATT LED SI	screw in LED Alamp	3,113	0.4	0.1	0.4	1,401	187	1,214
1,512.0	Vets	Dining Room	1	75w INCANDESCENT	can rec vert 6"	8	8	10 WATT LED SI	screw in LED Alamp	3,640	0.6	0.1	0.5	2,184	291	1,893
1,513.0	Vets	Laundry	1	75w INCANDESCENT	can rec vert 6"	3	3	10 WATT LED SI	screw in LED Alamp	1,404	0.2	0.0	0.2	316	42	274
1,514.0	Vets	Mechanical Boiler	1	9 WATT LED	sconce	5		NO RETRO	no change already efficient	936	0.0	0.0		42	42	
1,515.0	Vets	Bedroom 5	1	75w INCANDESCENT	can rec vert 6"	4	4	10 WATT LED SI	screw in LED Alamp	2,548	0.3	0.0	0.3	764	102	662
1,516.0	Vets	Bath Unisex	1	75w INCANDESCENT	can rec vert 6"	2	2	10 WATT LED SI	screw in LED Alamp	3,458	0.1	0.0	0.1	519	69	450
1,517.0	Vets	Bath	1	9 WATT LED	vanity	19		NO RETRO	no change already efficient	3,458	0.2	0.2		591	591	
1,518.0	Vets	Mechanical Elevator Panel R	1	60w INCANDESCENT	drum wall mt.	1	1	6 WATT LED SI	screw in LED Alamp	936	0.1	0.0	0.0	56	6	51
1,519.0	Vets	Stair To 2Nd Floor		75w INCANDESCENT	can rec vert 6"	2	2	10 WATT LED SI	screw in LED Alamp	5,824	0.2	0.0	0.1	874	116	757
1,520.0	Vets	Bedroom 6	2	75w INCANDESCENT	can rec vert 6"	4	4	10 WATT LED SI	screw in LED Alamp	2,548	0.3	0.0	0.3	764	102	662
1,521.0	Vets	Bedroom 7	2	75w INCANDESCENT	can rec vert 6"	4	4	10 WATT LED SI	screw in LED Alamp	2,548	0.3	0.0	0.3	764	102	662
1,522.0	Vets	Bedroom 8	2	75w INCANDESCENT	can rec vert 6"	4	4	10 WATT LED SI	screw in LED Alamp	2,548	0.3	0.0	0.3	764	102	662
1,523.0	Vets	Bedroom 9	2	75w INCANDESCENT	can rec vert 6"	4	4	10 WATT LED SI	screw in LED Alamp	2,548	0.3	0.0	0.3	764	102	662
1,524.0	Vets	Hall Living	2	75w INCANDESCENT	can rec vert 6"	10	10	10 WATT LED SI	screw in LED Alamp	5,824	0.8	0.1	0.7	4,368	582	3,786
1,525.0	Vets	Kitchen 2Nd Floor	2	4L4' T12 40w STD/STD	box acrylic	1	1	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	3,113	0.2	0.1	0.1	585	174	411
1,526.0	Vets	Kitchen 2Nd Floor	2	75w INCANDESCENT	can rec vert 6"	8	8	10 WATT LED SI	screw in LED Alamp	3,113	0.6	0.1	0.5	1,868	249	1,619
1,527.0	Vets	Dining Room	2	75w INCANDESCENT	can rec vert 6"	8	8	10 WATT LED SI	screw in LED Alamp	3,640	0.6	0.1	0.5	2,184	291	1,893
1,528.0	Vets	Bedroom 10	2	75w INCANDESCENT	can rec vert 6"	4	4	10 WATT LED SI	screw in LED Alamp	2,548	0.3	0.0	0.3	764	102	662
1,529.0	Vets	Bedroom 11	2	75w INCANDESCENT	can rec vert 6"	4	4	10 WATT LED SI	screw in LED Alamp	2,548	0.3	0.0	0.3	764	102	662
1,530.0	Vets	Bedroom 12	2	75w INCANDESCENT	can rec vert 6"	4	4	10 WATT LED SI	screw in LED Alamp	2,548	0.3	0.0	0.3	764	102	662
1,531.0	Vets	Bedroom 13	2	75w INCANDESCENT	can rec vert 6"	4	4	10 WATT LED SI	screw in LED Alamp	2,548	0.3	0.0	0.3	764	102	662
1,532.0	Vets	Laundry 2Nd Floor	2	75w INCANDESCENT	can rec vert 6"	3	3	10 WATT LED SI	screw in LED Alamp	1,404	0.2	0.0	0.2	316	42	274
1,533.0	Vets	Storage	2	60w INCANDESCENT	drum	1	1	10 WATT LED SI	screw in LED Alamp	780	0.1	0.0	0.1	47	8	39
1,534.0	Vets	Bath Unisex	2	75w INCANDESCENT	can rec vert 6"	2	2	10 WATT LED SI	screw in LED Alamp	3,458	0.1	0.0	0.1	519	69	450
1,535.0	Vets	Bath	2	9 WATT LED	vanity	19		NO RETRO	no change already efficient	3,458	0.2	0.2		591	591	
1,537.0	Vets	Storage Attic	2	60w INCANDESCENT	keyless	5	5	10 WATT LED SI	screw in LED Alamp	780	0.3	0.1	0.3	234	39	195
1,538.0	Vets	Stair 2Nd Floor To Attic		60w INCANDESCENT	keyless	1	1	10 WATT LED SI	screw in LED Alamp	5,824	0.1	0.0	0.1	349	58	291
1,539.0	Vets	Stair 2Nd Floor To Attic		LED	can rec vert 6"	1		NO RETRO	no change already efficient	5,824						
1,548.0	Main	Storage Records (Right)	1	2L4' T12 40w STD/STD	trof acr	50	50	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,170	4.2	1.0	3.2	5,499	1,048	4,451
1,549.0	Main	Bath Women	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	1,729	0.1	0.0	0.0	104	23	81
1,550.0	Main	Bath Women	1	60w INCANDESCENT	can rec vert 6"	1	1	10 WATT LED SI	screw in LED Alamp	1,729	0.1	0.0	0.0	104	17	86
1,551.0	Main	Hall Outside Women	1	4L8' T12 75w STD/STD	strip	1	1	4L4' LED 13w/ELEE/NEW white goods	new strip	2,860	0.3	0.1	0.3	990	183	807
1,552.0	Main	Hall Outside Women	1	2L8' T12 75w STD/STD	strip	1	1	4L4' LED 13w/ELEE/NEW white goods	new strip	2,860	0.2	0.1	0.1	495	183	312
1,553.0	Main	Bath Unisex	1	2L4' T8 32w/EL	wrap	1	1	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,729	0.1	0.0	0.0	104	48	55
1,554.0	Main	Bath Men	1	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	1,729	0.1	0.0	0.0	104	23	81
1,555.0	Main	Storage Records (Left)	1	2L8' T12 75w STD/STD	strip	25	25	4L4' LED 13w/ELEE/NEW white goods	new strip	1,170	3.9	1.4	2.5	5,060	1,872	3,188
1,556.0	Main	Storage Records (Left)	1	4L8' T12 75w STD/STD	strip	6	6	4L4' LED 13w/ELEE/NEW white goods	new strip	1,170	1.9	0.3	1.5	2,429	449	1,980
1,557.0	Main	Storage Records (Left)	1	20 WATT LED	trof acr	2		NO RETRO	no change already efficient	1,170	0.0	0.0		47	47	
1,558.0	Main	Office Open	1	4L4' T12 40w STD/STD	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	1.1	0.1	1.0	2,786	196	2,591
1,559.0	Main	Office Open	1	4L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	0.3	0.1	0.3	830	98	732
1,560.0	Main	Storage Archives	1	4L4' T8 32w/EL	trof acr	8	8	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,170	0.8	0.2	0.6	1,048	168	881
1,561.0	Main	Office Open County Historian	1	4L4' T8 32w/EL	trof acr	14	14	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	1.5	0.2	1.3	3,873	456	3,417
1,562.0	Main	Hall Display Space	1	2L8' T12 75w STD/STD	strip	3	3	4L4' LED 13w/ELEE/NEW white goods	new strip	2,860	0.5	0.2	0.3	1,484	549	935
1,563.0	Main	Hall Elevator Hall	1	2L4' T12 40w STD/STD	wrap	1	1	2L4' LED 13w/ELEE LO/NEW white goods	new wrap	2,860	0.1	0.0	0.1	269	80	189
1,564.0	Main	Mechanical Boiler Room	1	100w INCANDESCENT	keyless	2	2	10 WATT LED SI	screw in LED Alamp	780	0.2	0.0	0.2	156	16	140
1,565.0	Main	Stair	1	100w HI PRESSURE SODIUM	sconce	5	5	27 WATT LED SI	screw in LED KT-LED27HID-EX39-840-D/G2	2,860	0.7	0.1	0.5	1,859	386	1,473
1,566.0	Main	Stair	1	2L4' T12 40w STD/STD	strip	1	1	1L4' LED 13w/ELEE/NEW white goods	new LED strip	2,860	0.1	0.0	0.1	269	46	223
1,567.0	Main	Office Room A	2	2L4' T8 32w/EL	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.3	0.1	0.2	758	167	591
1,568.0	Main	Office Room B	2	2L4' T8 32w/EL	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.3	0.1	0.2	758	167	591
1,569.0	Main	Office Room C	2	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	253	56	197
1,570.0	Main	Office Room E	2	2L4' T8 32w/EL	trof acr	5	5	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.3	0.1	0.2	632	139	493
1,571.0	Main	Hall C To E	2	2L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.2	0.1	0.1	515	113	402

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
1,572.0	Main	Mechanical Dhw Room	2	100w INCANDESCENT	keyless pullchain	1	1	10 WATT LED SI	screw in LED Alamp	780	0.1	0.0	0.1	78	8	70
1,573.0	Main	Bath	2	2L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,729	0.2	0.1	0.1	311	93	218
1,574.0	Main	Shower	2	2L4' T8 32w/EL	trof acr	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,729	0.2	0.0	0.1	311	60	251
1,575.0	Main	Office Open Room J	2	2L4' T8 32w/EL	trof acr	10	10	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	0.6	0.2	0.4	1,482	326	1,156
1,576.0	Main	Office Open Room J	2	2L4' T8 32w/EL	trof acr	11	11	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	0.6	0.2	0.4	1,630	359	1,272
1,577.0	Main	Office Room I	2	2L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.1	379	83	296
1,578.0	Main	Office Room H	2	2L4' T8 32w/EL	trof acr	11	11	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.6	0.2	0.4	1,390	306	1,084
1,579.0	Main	Office 2Nd Floor	2	2L4' T8 32w/EL	trof acr	15	15	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.8	0.2	0.6	1,895	417	1,478
1,580.0	Main	Office Room F	2	2L4' T8 32w/EL	trof acr	9	9	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.5	0.1	0.3	1,137	250	887
1,581.0	Main	Office Next To Room F	2	2L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.0	0.1	379	83	296
1,582.0	Main	Conference 2Nd Floor	2	2L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,223	0.2	0.1	0.1	400	88	312
1,583.0	Main	Medical Exam Room	2	2L4' T8 32w/EL	trof acr	2	2	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,105	0.1	0.0	0.1	133	26	107
1,584.0	Main	Foyer Outside Exam Room	2	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.0	172	38	134
1,585.0	Main	Storage Under Stair	2	32W CF SCREWIN	keyless	1	1	10 WATT LED SI	screw in LED Alamp	520	0.0	0.0	0.0	18	5	12
1,586.0	Main	Stair	2	100w HI PRESSURE SODIUM	sconce	2	2	27 WATT LED SI	screw in LED KT-LED27HID-EX39-840-D/G2	2,860	0.3	0.1	0.2	744	154	589
1,587.0	Main	Stair	2	32W CF SCREWIN	sconce	1	1	10 WATT LED SI	screw in LED Alamp	2,860	0.0	0.0	0.0	97	29	69
1,588.0	Main	Hall Elevator	2	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.0	172	38	134
1,589.0	Main	Office 121 Main-Maria	3	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	239	53	186
1,590.0	Main	Office Therapy	3	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.0	119	26	93
1,591.0	Main	Foyer Next To Therapy	3	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.0	172	38	134
1,592.0	Main	Office Open Cps	3	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	0.2	0.1	0.2	593	130	462
1,593.0	Main	Office Open Outreach	3	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,210	0.2	0.1	0.1	530	117	414
1,594.0	Main	Office Corner Office	3	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.2	0.1	0.2	505	111	394
1,595.0	Main	Office Inside Corner Office	3	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,106	0.1	0.0	0.1	253	56	197
1,596.0	Main	Hall #1	3	2L4' T8 32w/EL	trof acr	11	11	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.7	0.2	0.5	1,888	415	1,472
1,597.0	Main	Hall #1	3	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls	2,860	0.1	0.0	0.0	172	28	143
1,598.0	Main	Hall Vestibule	3	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.0	172	38	134
1,599.0	Main	Conference Interview	3	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,223	0.1	0.0	0.1	267	59	208
1,600.0	Main	Bath Wic-Women	3	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,547	0.1	0.0	0.1	186	55	130
1,601.0	Main	Storage Slop	3	60w INCANDESCENT	keyless pullchain	1	1	10 WATT LED SI	screw in LED Alamp	520	0.1	0.0	0.1	31	5	26
1,602.0	Main	Bath Unisex	3	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,547	0.1	0.0	0.1	186	55	130
1,603.0	Main	Storage Food Pantry	3	4L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,105	0.1	0.0	0.1	124	20	104
1,604.0	Main	Storage Food Pantry	3	2L4' T8 32w/EL	trof acr	10	10	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,105	0.5	0.2	0.3	663	198	465
1,605.0	Main	Hall Behind Food Pantry	3	2L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.2	0.1	0.1	515	113	402
1,606.0	Main	Kitchen	3	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	0.1	0.0	0.1	296	65	231
1,607.0	Main	Office Across Kitchen	3	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.0	119	26	93
1,608.0	Main	Office Across Kitchen	3	2L4' T8 32w U/EL	trof acr	1	1	24 WATT LED/KIT	trof kit LED with controls & switch	1,989	0.1	0.0	0.0	119	20	100
1,609.0	Main	Office Behind Reception	3	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	239	53	186
1,610.0	Main	Office Reception	3	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.0	119	26	93
1,611.0	Main	Foyer Near Reception	3	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.0	172	38	134
1,612.0	Main	Lounge Waiting Area	3	2L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	2,223	0.2	0.1	0.1	400	88	312
1,613.0	Main	Storage Main Pantry	3	2L4' T8 32w/EL	trof acr	4	4	32 WATT LED/KIT	trof kit 2x4 LED with controls	1,170	0.2	0.1	0.1	281	84	197
1,614.0	Main	Hall Restroom To Pantry	3	2L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.2	0.1	0.1	515	113	402
1,615.0	Main	Office Open Cap Reception	3	2L4' T8 32w/EL	trof acr	8	8	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,470	0.5	0.1	0.3	1,186	261	925
1,616.0	Main	Hall Vestibule 121	3	2L4' T8 32w/EL	trof acr	1	1	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,860	0.1	0.0	0.0	172	38	134
1,617.0	Main	Office Judy	3	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	239	53	186
1,618.0	Main	Office Next To Judy (2)	3	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	239	53	186
1,619.0	Main	Lounge Small (2)	3	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	239	53	186
1,620.0	Main	Office Daisy (2)	3	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	239	53	186
1,621.0	Main	Office Across Daisy	3	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	239	53	186
1,622.0	Main	Office Christian	3	2L4' T8 32w/EL	trof acr	2	2	32 WATT LED/KIT	trof kit 2x4 LED with controls & switch	1,989	0.1	0.0	0.1	239	53	186
1,636.0	Golf	Lobby	3	10 WATT LED	can rec vert 6"	18		NO RETRO	no change already efficient	3,844	0.2	0.2		692	692	
1,637.0	Golf	Dining Room Patriot Hall (4)	3	25w INCANDESCENT	decorative candelabra	48	48	3 WATT LED SI	screw in LED flame candelabra	1,660	1.2	0.1	1.1	1,992	239	1,753
1,638.0	Golf	Dining Room Patriot Hall (4)	3	25w INCANDESCENT	decorative candelabra	20	20	3 WATT LED SI	screw in LED flame candelabra	1,660	0.5	0.1	0.4	830	100	730
1,639.0	Golf	Dining Room Patriot Hall	3	75w INCANDESCENT	can rec vert 8"	18	18	10 WATT LED SI	screw in LED Alamp	1,660	1.4	0.2	1.2	2,241	299	1,942
1,640.0	Golf	Dining Room Sybil'S Hall (4)	3	25w INCANDESCENT	decorative candelabra	88	88	3 WATT LED SI	screw in LED flame candelabra	1,660	2.2	0.3	1.9	3,652	438	3,214
1,641.0	Golf	Dining Room Sybil'S Hall (3)	3	25w INCANDESCENT	decorative candelabra	15	15	3 WATT LED SI	screw in LED flame candelabra	1,660	0.4	0.0	0.3	623	75	548
1,642.0	Golf	Dining Room Sybil'S Hall	3	60w INCANDESCENT	drum	3	3	10 WATT LED SI	screw in LED Alamp	1,660	0.2	0.0	0.2	299	50	249
1,643.0	Golf	Kitchen Serving Area, Sybil'S	3	22w CIRCLELINE HARDWIRE	drum wall mt.	1	1	14 WATT LED/NEW	new LED drum 12"	2,447	0.0	0.0	0.0	59	34	24
1,644.0	Golf	Kitchen Main	3	4L4' T8 28w/EL	vapor tight	13	13	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,447	1.2	0.7	0.5	3,117	1,781	1,336

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved	Pre kWH	Post kWH	kWH Saved
1,645.0	Golf	Storage Coat Check	3	2L4' T8 32w/EL	wrap	3	3	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	2,053	0.2	0.1	0.1	370	172	197
1,646.0	Golf	Bath Women	3	40w INCANDESCENT	decorative candelabra	2	2	3 WATT LED SI	screw in LED flame candelabra	3,582	0.1	0.0	0.1	287	21	265
1,647.0	Golf	Bath Women	3	25w INCANDESCENT	decorative candelabra	4	4	3 WATT LED SI	screw in LED flame candelabra	3,582	0.1	0.0	0.1	358	43	315
1,648.0	Golf	Bath Women	3	75w INCANDESCENT	can rec vert 5"	4	4	10 WATT LED SI	screw in LED Alamp	3,582	0.3	0.0	0.2	1,075	143	931
1,649.0	Golf	Bath Men	3	5 WATT LED	vanity	8		NO RETRO	no change already efficient	3,582	0.0	0.0		143	143	
1,650.0	Golf	Bath Men	3	10 WATT LED	drum	2		NO RETRO	no change already efficient	3,582	0.0	0.0		72	72	
1,651.0	Golf	Hall	3	2L4' T8 32w U/EL	trof parabolic	9	9	24 WATT LED/KIT	trof kit LED with controls	3,844	0.5	0.1	0.4	2,076	343	1,733
1,652.0	Golf	Office	3	2L4' T8 U 1.5"/EL	trof parabolic	3	3	24 WATT LED/KIT	trof kit LED with controls & switch	2,053	0.2	0.0	0.1	357	61	296
1,653.0	Golf	Office Inside - Left	3	2L4' T8 32w U/EL	trof parabolic	4	4	24 WATT LED/KIT	trof kit LED with controls & switch	2,053	0.2	0.0	0.2	493	81	411
1,654.0	Golf	Office Inside - Right	3	2L4' T8 32w U/EL	trof parabolic	4	4	24 WATT LED/KIT	trof kit LED with controls & switch	2,053	0.2	0.0	0.2	493	81	411
1,655.0	Golf	Office Manager	3	10 WATT LED	can rec vert 6"	8		NO RETRO	no change already efficient	2,053	0.1	0.1		164	164	
1,656.0	Golf	Office Manager	3	75w INCANDESCENT	can rec vert 7"	3	3	10 WATT LED SI	screw in LED Alamp	2,053	0.2	0.0	0.2	462	62	400
1,657.0	Golf	Closet	3	32W CF SCREWIN	keyless pullchain	1	1	10 WATT LED SI	screw in LED Alamp	1,311	0.0	0.0	0.0	45	13	31
1,658.0	Golf	Stair To 2Nd Floor	3	25w INCANDESCENT	decorative candelabra	2	2	3 WATT LED SI	screw in LED flame candelabra	3,844	0.1	0.0	0.0	192	23	169
1,659.0	Golf	Lounge (2)	3	25w INCANDESCENT	decorative candelabra	16	16	3 WATT LED SI	screw in LED flame candelabra	3,539	0.4	0.0	0.3	1,416	170	1,246
1,660.0	Golf	Stair To Basement	3	25w INCANDESCENT	decorative candelabra	1	1	3 WATT LED SI	screw in LED flame candelabra	3,844	0.0	0.0	0.0	96	12	85
1,661.0	Golf	Stair To Basement	3	23W CF SCREWIN	can rec vert 8"	2	2	10 WATT LED SI	screw in LED Alamp	3,844	0.1	0.0	0.0	192	77	115
1,662.0	Golf	Mechanical Boiler	3	4L4' T8 32w/EL-8'	strip	1	1	4L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,966	0.1	0.1	0.1	220	110	110
1,663.0	Golf	Mechanical Boiler	3	2L4' T8 32w/EL	strip	6	6	2L4' LED 13w/ELEE LO/RLRB	rtrb 4' LED	1,966	0.3	0.2	0.2	708	330	377
1,664.0	Golf	Hall Basement	3	15 WATT LED	can rec vert 6"	15		NO RETRO	no change already efficient	3,844	0.2	0.2		865	865	
1,665.0	Golf	Hall Basement	3	4L4' T8 32w/EL	trof acr	3	3	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,844	0.3	0.1	0.3	1,292	152	1,139
1,666.0	Golf	Bath Men	3	4L4' T12 34w EE/STD	trof acr	8	8	32 WATT LED/KIT	trof kit 2x4 LED with controls	3,582	1.2	0.1	1.1	4,585	378	4,207
1,667.0	Golf	Bath Men	3	40w INCANDESCENT	globe	8	8	6.5 WATT LED/NEW	screw in LED globe	3,582	0.3	0.0	0.3	1,146	186	960
1,668.0	Golf	Bath Foyer Men	3	2L4' T8 32w U/EL	trof acr	2	2	24 WATT LED/KIT	trof kit LED with controls	3,582	0.1	0.0	0.1	430	71	359
1,669.0	Golf	Lounge	3	15 WATT LED	can rec vert 6"	12		NO RETRO	no change already efficient	3,539	0.2	0.2		637	637	
1,670.0	Golf	Lounge	3	75w INCANDESCENT	can rec vert 6"	5	5	10 WATT LED SI	screw in LED Alamp	3,539	0.4	0.0	0.3	1,327	177	1,150
1,671.0	Golf	Kitchen	3	4L4' T12 34w EE/STD	trof acr	6	6	32 WATT LED/KIT	trof kit 2x4 LED with controls	2,447	0.9	0.1	0.8	2,349	194	2,155
1,672.0	Golf	Kitchen Hood	3	10 WATT LED	jar	2		NO RETRO	no change already efficient	2,447	0.0	0.0		49	49	
1,673.0	Golf	Bath Women	3	15 WATT LED	can rec vert 6"	20		NO RETRO	no change already efficient	3,582	0.3	0.3		1,075	1,075	
1,674.0	Golf	Lounge	3	75w INCANDESCENT	track head	6	6	10 WATT LED SI	screw in LED Alamp	3,539	0.4	0.1	0.4	1,593	212	1,380
1,675.0	Golf	Retail Pro Shop	3	75w INCANDESCENT	can rec vert 6"	1	1	10 WATT LED SI	screw in LED Alamp	3,189	0.1	0.0	0.1	239	32	207
1,676.0	Golf	Retail Pro Shop	3	9 WATT LED	track head	24		NO RETRO	no change already efficient	3,189	0.2	0.2		689	689	
1,677.0	Golf	Lounge Bar	3	75w INCANDESCENT	can rec vert 6"	22	22	10 WATT LED SI	screw in LED Alamp	3,539	1.6	0.2	1.4	5,839	779	5,061
1,678.0	Golf	Lounge Bar	3	9 WATT LED	track head	9		NO RETRO	no change already efficient	3,539	0.1	0.1		287	287	
1,679.0	Golf	Storage Bar	3	23W CF SCREWIN	can rec vert 6"	4	4	10 WATT LED SI	screw in LED Alamp	2,053	0.1	0.0	0.1	205	82	123
1,680.0	Golf	Lounge (Near Men)	3	2L4' T12 40w U STD/STD	trof parabolic	5	5	24 WATT LED/KIT	trof kit LED with controls & switch	3,539	0.4	0.1	0.4	1,663	175	1,488
1,681.0	Golf	Lounge (Near Men)	3	75w INCANDESCENT	can rec vert 6"	8	8	10 WATT LED SI	screw in LED Alamp	3,539	0.6	0.1	0.5	2,123	283	1,840
1,682.0	Golf	Lounge (Near Men)	3	23W CF SCREWIN	can rec vert 6"	6	6	10 WATT LED SI	screw in LED Alamp	3,539	0.1	0.1	0.1	531	212	319
1,683.0	Golf	Storage Garden Room	3	15 WATT LED	can rec vert 8"	13		NO RETRO	no change already efficient	1,311	0.2	0.2		256	256	
1,686.0	Golf	Shop Maintenance	3	4L8' T12 75w STD/STD	strip	5	5	4L4' LED 13w/ELEE/NEW white goods	new strip	2,840	1.6	0.3	1.3	4,913	909	4,004
1,687.0	Golf	Shop Maintenance	3	4L8' T12 75w STD/STD	wrap	1	1	4L4' LED 13w/ELEE/NEW white goods	new strip	2,840	0.3	0.1	0.3	983	182	801
1,688.0	Golf	Shop Maintenance	3	2L3' T12 30w STD/STD	strip plug-in	1	1	2L3' LED 8.5w/ELEE/RLRB	rtrb 3' LED	2,840	0.1	0.0	0.1	227	65	162
1,689.0	Golf	Shop Maintenance	3	2L8' T12 75w STD/STD	strip	1	1	4L4' LED 13w/ELEE/RLRB	rtrb 4' LED (8' strip kit)	2,840	0.2	0.1	0.1	491	182	310
1,690.0	Golf	Office Maintenance Shop	3	23W CF SCREWIN	can rec vert 6"	4	4	10 WATT LED SI	screw in LED Alamp	2,053	0.1	0.0	0.1	205	82	123
1,691.0	Golf	Garage Equipment	3	90w INCANDESCENT	keyless	4	4	10 WATT LED SI	screw in LED Alamp	2,840	0.3	0.0	0.3	1,022	114	909
						6,399	5,538				433.8	155.2	278.6	1,311,260	465,582	845,678

Energy Savings Calculations for

ECM 2: Lighting System Improvements - Exterior

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Putnam County, NY
Energy and Demand Savings Summary
Measure ID: 2
Measure Name: **Lighting System Improvements - Exterior**
Measure Location:
Engineers:

Site Name:		**Jail**	**Court**	**Bruen**	**Court1812**	**Main**	**Golf**	**EOC**	**Gov2**	**Gov3**	**Kern**	**KoehlerSr**	**PutnamSr**	**Fam1808**	**Hwy1**	**Hwy2**	**Hwy3**	**Hwy4**	**BOE**	**Vets**	**Fam1816**	**Law**	**Farm**	**Summary**
Item	Units	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	
Electricity																								
Energy On-Peak	kWh	128,091	23,512	32,482	57	8,160	1,358	37,924	4,117	9,189	11,042	14,607	19,449	6,894	867	7,836	2,216	10,438	7,888	2,171	5,672	1,384	6,742	342,097
Energy Off-Peak	kWh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy Total	kWh	128,091	23,512	32,482	57	8,160	1,358	37,924	4,117	9,189	11,042	14,607	19,449	6,894	867	7,836	2,216	10,438	7,888	2,171	5,672	1,384	6,742	342,097
Demand On-Peak, Monthly	kW	29.6	5.4	7.4	0.0	2.0	0.4	8.7	0.9	2.1	2.6	3.8	5.7	1.6	0.2	1.8	0.5	2.4	1.8	0.6	1.4	0.3	0.8	79.9
Demand On-Peak, Annual	kW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Demand Off-Peak, Monthly	kW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Demand Off-Peak, Annual	kW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fossil Fuel																								0
Natural Gas (NG)	CCF																							0
Liquid Propane Gas (LPG)	Gallons																							0
Steam	Mlbs																							0
Fuel Oil, #2	Gallons																							0
Fuel Oil, #4	Gallons																							0
Fuel Oil, #6	Gallons																							0
Solar Value Stack	$																							0
Water																								0
Water Savings	kGallons																							0
Sewer																								0
Sewer Savings	kGallons																							0

Line	Building Name	Location	Fl	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved Coin.	Pre kWH	Post kWH	kWH Saved
251.0	Jail	Bldg Mt Admin Roof	roof	250w METAL HALIDE	wallpack	1	1	51 WATT LED/NEW	new LED wallpack	4,380	0.3	0.1	0.2	1,292	223	1,069
275.0	Jail	Field North/South Canopy	ext	100w MERCURY VAPOR	drum	2	2	27 WATT LED SI	screw in LED KT-LED27HID-EX39-840-D/G2	2,190	0.2	0.1	0.2	526	118	407
276.0	Jail	Field Recreation-North/South	ext	250w METAL HALIDE	wallpack	1	1	51 WATT LED/NEW	new LED wallpack	4,380	0.3	0.1	0.2	1,292	223	1,069
277.0	Jail	Field Recreation-North/South	ext	175w METAL HALIDE	wallpack	2	2	51 WATT LED/NEW	new LED wallpack	4,380	0.4	0.1	0.3	1,796	447	1,349
278.0	Jail	Field East & West	ext	250w METAL HALIDE	wallpack	4	4	51 WATT LED/NEW	new LED wallpack	4,380	1.2	0.2	1.0	5,168	894	4,275
279.0	Jail	Field East & West	ext	250w HI PRESSURE SODIUM	wallpack	1	1	51 WATT LED/NEW	new LED wallpack	4,380	0.3	0.1	0.2	1,292	223	1,069
280.0	Jail	Bldg Mt Roof	ext	250w METAL HALIDE	wallpack	2	2	51 WATT LED/NEW	new LED wallpack	4,380	0.6	0.1	0.5	2,584	447	2,137
281.0	Jail	Bldg Mt Sheriff Entrance	ext	100w METAL HALIDE	old canopy	8	8	27 WATT LED/NEW	new LED canopy	4,380	1.0	0.2	0.7	4,205	946	3,259
282.0	Jail	Bldg Mt Jail Entrance (Spher	ext	100w METAL HALIDE	globe	2	2	27 WATT LED SI	screw in LED KT-LED27HID-EX39-840-D/G2	2,190	0.2	0.1	0.2	526	118	407
283.0	Jail	Bldg Mt Patrol Entrance	ext	100w METAL HALIDE	globe	2	2	27 WATT LED SI	screw in LED KT-LED27HID-EX39-840-D/G2	2,190	0.2	0.1	0.2	526	118	407
284.0	Jail	Bldg Mt Inside Vehicle Gate	ext	250w METAL HALIDE	wallpack	7	7	51 WATT LED/NEW	new LED wallpack	4,380	2.1	0.4	1.7	9,045	1,564	7,481
285.0	Jail	Parking Lot 30'Pole,Inside Ve	ext	400w METAL HALIDE	shoebox	2	2	102 WATT LED/NEW	new LED shoebox	4,380	0.9	0.2	0.7	3,986	894	3,092
286.0	Jail	Parking Lot 30'Pole,Inside Ve	ext	400w METAL HALIDE	shoebox	3	3	102 WATT LED/NEW	new LED shoebox	4,380	1.4	0.3	1.1	5,979	1,340	4,638
287.0	Jail	Bldg Mt North (Sheriff)30'	ext	250w METAL HALIDE	wallpack	4	4	51 WATT LED/NEW	new LED wallpack	4,380	1.2	0.2	1.0	5,168	894	4,275
288.0	Jail	Bldg Mt North (Sheriff)12'	ext	250w METAL HALIDE	wallpack	2	2	51 WATT LED/NEW	new LED wallpack	4,380	0.6	0.1	0.5	2,584	447	2,137
289.0	Jail	Parking Lot Pole East Patrol	ext	400w METAL HALIDE	shoebox	10	10	102 WATT LED/NEW	new LED shoebox	4,380	4.6	1.0	3.5	19,929	4,468	15,461
290.0	Jail	Bldg Mt East Patrol Park	ext	250w METAL HALIDE	wallpack	2	2	51 WATT LED/NEW	new LED wallpack	4,380	0.6	0.1	0.5	2,584	447	2,137
291.0	Jail	Bldg Mt Patrol Entry	ext	100w METAL HALIDE	decorative	1	1	27 WATT LED SI	screw in LED KT-LED27HID-EX39-840-D/G2	2,190	0.1	0.0	0.1	263	59	204
292.0	Jail	Bldg Mt Patrol Entry	ext	100w METAL HALIDE	step light	4	4	27 WATT LED SI	screw in LED KT-LED27HID-EX39-840-D/G2	4,380	0.5	0.1	0.4	2,102	473	1,629
293.0	Jail	Bldg Mt Patrol Entry Stair Lig	ext	100w METAL HALIDE	step light	7	7	27 WATT LED SI	screw in LED KT-LED27HID-EX39-840-D/G2	4,380	0.8	0.2	0.7	3,679	828	2,851
294.0	Jail	Bldg Mt East Inside Gate	ext	250w METAL HALIDE	wallpack	5	5	51 WATT LED/NEW	new LED wallpack	4,380	1.5	0.3	1.2	6,461	1,117	5,344
295.0	Jail	Bldg Mt Pump East Patrol	ext	250w METAL HALIDE	explosion	2		NO RETRO	no change	4,380	0.6	0.6		2,584	2,584	
296.0	Jail	Parking Lot East Pole	ext	400w METAL HALIDE	shoebox	3	3	102 WATT LED/NEW	new LED shoebox	4,380	1.4	0.3	1.1	5,979	1,340	4,638
297.0	Jail	Field Poles, South Inside Gat	ext	400w METAL HALIDE	shoebox	10	10	102 WATT LED/NEW	new LED shoebox	4,380	4.6	1.0	3.5	19,929	4,468	15,461
298.0	Jail	Bldg Mt South Inside Gate	ext	250w METAL HALIDE	wallpack	3	3	51 WATT LED/NEW	new LED wallpack	4,380	0.9	0.2	0.7	3,876	670	3,206
299.0	Jail	Bldg Mt West Inside Gate	ext	250w METAL HALIDE	wallpack	1	1	51 WATT LED/NEW	new LED wallpack	4,380	0.3	0.1	0.2	1,292	223	1,069
300.0	Jail	Bldg Mt North Above Garage	ext	250w METAL HALIDE	wallpack	1	1	51 WATT LED/NEW	new LED wallpack	4,380	0.3	0.1	0.2	1,292	223	1,069
301.0	Jail	Driveway Poles North (4)	ext	400w METAL HALIDE	shoebox	8	8	102 WATT LED/NEW	new LED shoebox	4,380	3.6	0.8	2.8	15,943	3,574	12,369
302.0	Jail	Parking Lot Main Front (2)	ext	400w METAL HALIDE	shoebox	8	8	156 WATT LED/NEW	new LED shoebox	4,380	3.6	0.6	3.0	15,943	2,733	13,210
303.0	Jail	Parking Lot Main Front (4)	ext	400w METAL HALIDE	shoebox	8	8	102 WATT LED/NEW	new LED shoebox	4,380	3.6	0.8	2.8	15,943	3,574	12,369
304.0	Jail	Bldg Mt Covered Parking	ext	50 WATT LED	drum	23		NO RETRO	no change already efficient	2,190	1.2	1.2		2,519	2,519	
319.0	Court	Bldg Mt Roof	ext	150w HI PRESSURE SODIUM	wallpack	4	4	28 WATT LED/NEW	new LED wallpack	4,380	0.8	0.1	0.6	3,329	491	2,838
524.0	Court	Parking Lot Court Parking & I	ext	175w METAL HALIDE	acorn	15	15	36 WATT LED SI	screw in LED KT-LED36HID-EX39-840-D/h2	4,380	3.1	0.5	2.5	13,469	2,365	11,103
525.0	Court	Bldg Mt Court Perimeter	ext	40 WATT LED	wallpack	9		NO RETRO	no change already efficient	4,380	0.4	0.4		1,577	1,577	
526.0	Court	Bldg Mt Court Main Entry	ext	1L2' T5HO 21w/EL	sconce	2		NO RETRO	no change	2,190	0.1	0.1		110	110	
527.0	Court	Field Court Wall Wash (Grnd	ext	250w METAL HALIDE	flood	2	2	54 WATT LED/NEW	new LED flood	4,380	0.6	0.1	0.5	2,584	473	2,111
528.0	Court	Parking Lot Court South Park	ext	250w METAL HALIDE	flood	1	1	54 WATT LED/NEW	new LED flood	4,380	0.3	0.1	0.2	1,292	237	1,056
529.0	Court	Bldg Mt Court South 25' High	ext	250w METAL HALIDE	flood	1	1	42 WATT LED/NEW	new LED flood	4,380	0.3	0.0	0.3	1,292	184	1,108
530.0	Court	Bldg Mt Court East 25' High	ext	250w METAL HALIDE	flood	3	3	54 WATT LED/NEW	new LED flood	4,380	0.9	0.2	0.7	3,876	710	3,167
531.0	Court	Bldg Mt North Court Equipme	ext	150w METAL HALIDE	wallpack	3	3	28 WATT LED/NEW	new LED wallpack	4,380	0.6	0.1	0.5	2,497	368	2,129
697.0	Bruen	Bldg Mt Bruen- Front	ext	400w HI PRESSURE SODIUM	wallpack	6	6	74 WATT LED/NEW	new LED wallpack	4,380	2.8	0.4	2.3	12,089	1,945	10,144
698.0	Bruen	Bldg Mt Bruen-Back 1St Floo	ext	250w HI PRESSURE SODIUM	flood	1	1	42 WATT LED/NEW	new LED flood	4,380	0.3	0.0	0.3	1,292	184	1,108
699.0	Bruen	Bldg Mt Bruen-Back Probatio	ext	100w METAL HALIDE	rectangular	1	1	20 WATT LED/NEW	new LED wallpack	4,380	0.1	0.0	0.1	526	88	438
700.0	Bruen	Bldg Mt Bruen-Back	ext	250w METAL HALIDE	flood	4	4	42 WATT LED/NEW	new LED flood	4,380	1.2	0.2	1.0	5,168	736	4,433
701.0	Bruen	Parking Lot Bruen-Front Pole	ext	175w METAL HALIDE	acorn	11	11	36 WATT LED SI	screw in LED KT-LED36HID-EX39-840-D/h2	4,380	2.3	0.4	1.9	9,877	1,734	8,142
702.0	Bruen	Parking Lot Bruen-Rooftop P	ext	250w METAL HALIDE	shoebox	4	4	138 WATT LED/NEW	new LED shoebox	4,380	1.2	0.3	0.9	5,168	1,209	3,960
703.0	Bruen	Parking Lot Bruen-Rooftop P	ext	250w METAL HALIDE	shoebox	4	4	52 WATT LED/NEW	new LED shoebox	4,380	1.2	0.2	1.0	5,168	911	4,257
717.0	Court1812	Canopy Main Entrance	ext	2x13W CF HARDWIRED	can rec hor 8"	2	2	17 WATT LED/KIT	can kit LED Syl RT/HO 6"	2,190	0.1	0.0	0.0	131	74	57

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved Coin.	Pre kWH	Post kWH	kWH Saved
772.0	Law	Bldg Mt Back	ext	200w INC HALOGEN	flood	2	2	42 WATT LED/NEW	new LED flood	4,380	0.4	0.1	0.3	1,752	368	1,384
829.0	Hwy1	Bldg Mt Hwy Bldg. 1,Front &	ext	100w METAL HALIDE	flood	2	2	21 WATT LED/NEW	new LED flood	4,380	0.2	0.0	0.2	1,051	184	867
830.0	Hwy2	Bldg Mt Hwy Bldg. 2, Front D	ext	100w METAL HALIDE	flood	1	1	21 WATT LED/NEW	new LED flood	4,380	0.1	0.0	0.1	526	92	434
831.0	Hwy2	Bldg Mt Hwy Bldg. 2, Back	ext	200w INC HALOGEN	flood	3	3	21 WATT LED/NEW	new LED flood	4,380	0.6	0.1	0.5	2,628	276	2,352
832.0	Hwy3	Field Hwy Gas Pump Lights	ext	175w METAL HALIDE	explosion	2		NO RETRO	no change	4,380	0.4	0.4		1,796	1,796	
833.0	Hwy3	Bldg Mt Hwy Bldg. 3 Front	ext	250w HI PRESSURE SODIUM	wallpack	2	2	42 WATT LED/NEW	new LED wallpack	4,380	0.6	0.1	0.5	2,584	368	2,216
834.0	Hwy4	Bldg Mt Hwy Bldg. 4 Back	ext	150w METAL HALIDE	flood	1	1	42 WATT LED/NEW	new LED flood	4,380	0.2	0.0	0.1	832	184	648
835.0	Hwy4	Bldg Mt Hwy Bldg. 4 Front	ext	250w HI PRESSURE SODIUM	wallpack	1	1	42 WATT LED/NEW	new LED wallpack	4,380	0.3	0.0	0.3	1,292	184	1,108
836.0	Hwy2	Bldg Mt Hwy Inside Salt Shed	ext	250w METAL HALIDE	lowbay	2	2	83 WATT LED/NEW	new LED hibay JHBL-1200LM-ACL-WD-MVOLT-GZ1	4,380	0.6	0.2	0.4	2,584	727	1,857
837.0	Hwy2	Bldg Mt Hwy Salt Shed Fron	ext	250w HI PRESSURE SODIUM	wallpack	2	2	42 WATT LED/NEW	new LED wallpack	4,380	0.6	0.1	0.5	2,584	368	2,216
838.0	Hwy2	Bldg Mt Hwy Salt Shed Fron	ext	250w HI PRESSURE SODIUM	flood	1	1	72 WATT LED/NEW	new LED flood	4,380	0.3	0.1	0.2	1,292	315	977
839.0	Hwy4	Parking Lot Hwy Wood Pole	ext	250w METAL HALIDE	flood	6	6	72 WATT LED/NEW	new LED flood	4,380	1.8	0.4	1.3	7,753	1,892	5,860
840.0	Hwy4	Parking Lot Hwy Pole Near B	ext	400w HI PRESSURE SODIUM	cobra head	2	2	138 WATT LED/NEW	new LED shoebox	4,380	0.9	0.3	0.6	4,030	1,209	2,821
889.0	KoehlerSR	Bldg Mt Koehler Front Canop	ext	100w INCANDESCENT	can rec vert 8"	4	4	10 WATT LED SI	screw in LED Alamp	2,190	0.4	0.0	0.4	876	88	788
890.0	KoehlerSR	Field Koehler, Front	ext	100w METAL HALIDE	bollard	5	5	27 WATT LED SI	screw in LED KT-LED27HID-EX39-840-D/G2	4,380	0.6	0.1	0.5	2,628	591	2,037
891.0	KoehlerSR	Bldg Mt Koehler, Sides & Bac	ext	13W CF HARDWIRED	wallpack	5	5	1L6" LED 5w 2PINBASE/MAG/RETUBE ONLY	retube LED 2pinGX23 horizontal	4,380	0.1	0.0	0.0	329	131	197
892.0	KoehlerSR	Bldg Mt Koehler, Back	ext	100w INCANDESCENT	coach light	6	6	10 WATT LED SI	screw in LED Alamp	2,190	0.6	0.1	0.5	1,314	131	1,183
893.0	KoehlerSR	Parking Lot Koehler, 12' Pole	ext	175w METAL HALIDE	shoebox	9	9	45 WATT LED/NEW	new LED shoebox	4,380	1.8	0.4	1.4	8,081	1,774	6,307
894.0	KoehlerSR	Driveway Koehler, 12' Poles	ext	175w METAL HALIDE	shoebox	3	3	45 WATT LED/NEW	new LED shoebox	4,380	0.6	0.1	0.5	2,694	591	2,102
895.0	KoehlerSR	Parking Lot Koehler, 12' Pole	ext	175w METAL HALIDE	shoebox	2	2	104 WATT LED/NEW	new LED shoebox	4,380	0.4	0.2	0.2	1,796	911	885
896.0	KoehlerSR	Parking Lot Koehler, 12' Pole	ext	250w METAL HALIDE	flood	1	1	42 WATT LED/NEW	new LED flood	4,380	0.3	0.0	0.3	1,292	184	1,108
937.0	PutnamSR	Bldg Mt P. Valley, Canopies	ext	100w METAL HALIDE	can rec vert 8"	17	17	24 WATT LED/KIT	can kit LED Syl RT/HO 8"	2,190	2.0	0.4	1.6	4,468	894	3,574
938.0	PutnamSR	Bldg Mt P. Valley, Front	ext	100w METAL HALIDE	bollard	4	4	27 WATT LED SI	screw in LED KT-LED27HID-EX39-840-D/G2	4,380	0.5	0.1	0.4	2,102	473	1,629
939.0	PutnamSR	Walkway P. Valley, Poles	ext	100w METAL HALIDE	decorative	3	3	27 WATT LED SI	screw in LED KT-LED27HID-EX39-840-D/G2	2,190	0.4	0.1	0.3	788	177	611
940.0	PutnamSR	Driveway P. Valley, 16' Poles	ext	250w METAL HALIDE	shoebox	7	7	70 WATT LED/NEW	new LED shoebox	4,380	2.1	0.5	1.6	9,045	2,146	6,899
941.0	PutnamSR	Parking Lot P. Valley, (2)	ext	250w METAL HALIDE	shoebox	4	4	138 WATT LED/NEW	new LED shoebox	4,380	1.2	0.3	0.9	5,168	1,209	3,960
942.0	PutnamSR	Bldg Mt P. Valley, Back Of Bl	ext	100w METAL HALIDE	wallpack	2	2	19 WATT LED/NEW	new LED wallpack	4,380	0.2	0.0	0.2	1,051	166	885
943.0	PutnamSR	Bldg Mt P. Valley, Back & Rig	ext	100w INCANDESCENT	globe	6	6	10 WATT LED SI	screw in LED Alamp	2,190	0.6	0.1	0.5	1,314	131	1,183
944.0	PutnamSR	Bldg Mt P. Valley, Basement	ext	150w METAL HALIDE	wallpack	1	1	28 WATT LED/NEW	new LED wallpack	4,380	0.2	0.0	0.2	832	123	710
1,017.0	gov2	Bldg Mt Campus 2, Entrance	ext	250w HI PRESSURE SODIUM	wallpack	2	2	42 WATT LED/NEW	new LED wallpack	4,380	0.6	0.1	0.5	2,584	368	2,216
1,018.0	gov2	Bldg Mt Campus 2, Back Cor	ext	200w INC HALOGEN	flood	1	1	42 WATT LED/NEW	new LED flood	4,380	0.2	0.0	0.2	876	184	692
1,019.0	gov2	Parking Lot Campus 2, Pole	ext	150w HI PRESSURE SODIUM	cobra head	2	2	52 WATT LED/NEW	new LED shoebox	4,380	0.4	0.1	0.3	1,664	456	1,209
1,120.0	gov3	Bldg Mt Campus 3, Back Wal	ext	250w METAL HALIDE	flood	5	5	54 WATT LED/NEW	new LED flood	4,380	1.5	0.3	1.2	6,461	1,183	5,278
1,121.0	gov3	Bldg Mt Campus 3, It Entranc	ext	100w METAL HALIDE	wallpack	1	1	20 WATT LED/NEW	new LED wallpack	4,380	0.1	0.0	0.1	526	88	438
1,122.0	gov3	Bldg Mt Campus 3,Front,By	ext	175w METAL HALIDE	wallpack	1	1	42 WATT LED/NEW	new LED wallpack	4,380	0.2	0.0	0.2	898	184	714
1,123.0	gov3	Bldg Mt Campus 3, Front & L	ext	175w METAL HALIDE	flood	2	2	42 WATT LED/NEW	new LED flood	4,380	0.4	0.1	0.3	1,796	368	1,428
1,124.0	gov3	Bldg Mt Campus 3 Front	ext	150w METAL HALIDE	flood	1	1	42 WATT LED/NEW	new LED flood	4,380	0.2	0.0	0.1	832	184	648
1,125.0	gov3	Bldg Mt Campus 3	ext	100w METAL HALIDE	flood	2	2	42 WATT LED/NEW	new LED flood	4,380	0.2	0.1	0.2	1,051	368	683
1,226.0	EOC	Bldg Mt Eoc Perimeter	ext	100w METAL HALIDE	goose	17	17	27 WATT LED SI	screw in LED KT-LED27HID-EX39-840-D/G2	4,380	2.0	0.5	1.6	8,935	2,010	6,925
1,227.0	EOC	Bldg Mt Eoc Canopies On Sid	ext	32W CF SCREWIN	can rec hor 6"	7	7	13 WATT LED/KIT	can kit LED Syl RT/5-6"	2,190	0.2	0.1	0.1	521	199	322
1,228.0	EOC	Walkway Eoc 12' Entrance P	ext	100w METAL HALIDE	goose	5	5	27 WATT LED SI	screw in LED KT-LED27HID-EX39-840-D/G2	4,380	0.6	0.1	0.5	2,628	591	2,037
1,229.0	EOC	Walkway Eoc Wall Wash (Gr	ext	150w METAL HALIDE	flood	3	3	42 WATT LED/NEW	new LED flood	4,380	0.6	0.1	0.4	2,497	552	1,945
1,230.0	EOC	Parking Lot Eoc & Campus 3	ext	250w METAL HALIDE	shoebox	20	20	138 WATT LED/NEW	new LED shoebox	4,380	5.9	1.4	4.5	25,842	6,044	19,798
1,231.0	EOC	Parking Lot Eoc & Campus 3	ext	250w METAL HALIDE	shoebox	6	6	70 WATT LED/NEW	new LED shoebox	4,380	1.8	0.4	1.4	7,753	1,840	5,913
1,232.0	EOC	Parking Lot Eoc, 22'Pole	ext	250w METAL HALIDE	shoebox	1	1	70 WATT LED/NEW	new LED shoebox	4,380	0.3	0.1	0.2	1,292	307	986
1,268.0	Farm	Bldg Mt Building 8	ext	20 WATT LED	sconce	23		NO RETRO	no change already efficient	8,103	0.5	0.5		3,727	3,727	
1,269.0	Farm	Bldg Mt Building 6	ext	100w METAL HALIDE	wallpack	2	2	28 WATT LED/NEW	new LED wallpack	8,103	0.2	0.1	0.2	1,945	454	1,491
1,270.0	Farm	Bldg Mt Building 6	ext	150w METAL HALIDE	wallpack	4	4	28 WATT LED/NEW	new LED wallpack	8,103	0.8	0.1	0.6	6,158	908	5,251

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved Coin.	Pre kWH	Post kWH	kWH Saved
1,359.0	Kern	Bldg Mt Kern, Near Wic Entra	ext	150w HI PRESSURE SODIUM	wallpack	1	1	42 WATT LED/NEW	new LED wallpack	4,380	0.2	0.0	0.1	832	184	648
1,360.0	Kern	Bldg Mt Kern, Front & Back	ext	100w HI PRESSURE SODIUM	wallpack	6	6	42 WATT LED/NEW	new LED wallpack	4,380	0.8	0.3	0.5	3,416	1,104	2,313
1,361.0	Kern	Bldg Mt Kern, Front & Back	ext	70w HI PRESSURE SODIUM	flood	1	1	21 WATT LED/NEW	new LED flood	4,380	0.1	0.0	0.1	394	92	302
1,362.0	Kern	Bldg Mt Kern, Canopy	ext	9 WATT LED	flood	4		NO RETRO	no change already efficient	4,380	0.0	0.0		158	158	
1,363.0	Kern	Bldg Mt Kern, Health Entranc	ext	75w INCANDESCENT	can rec vert 8"	1	1	14 WATT LED SI	screw in LED par38 hl	2,190	0.1	0.0	0.1	164	31	134
1,364.0	Kern	Parking Lot Kern, 30' 4 Fixtur	ext	250w HI PRESSURE SODIUM	shoebox	4	4	125 WATT LED/NEW	new LED shoebox	4,380	1.2	0.3	0.9	5,168	1,095	4,073
1,365.0	Kern	Parking Lot Kern, 30' Poles (2	ext	250w HI PRESSURE SODIUM	shoebox	2	2	70 WATT LED/NEW	new LED shoebox	4,380	0.6	0.1	0.5	2,584	613	1,971
1,366.0	Kern	Bldg Mt Kern, Dmv Entry	ext	23W CF SCREWIN	sconce	1	1	10 WATT LED SI	screw in LED Alamp	2,190	0.0	0.0	0.0	55	22	33
1,367.0	Kern	Bldg Mt Kern, Back	ext	20 WATT LED	flood	1		NO RETRO	no change already efficient	4,380	0.0	0.0		88	88	
1,368.0	Kern	Bldg Mt Kern, Back Door	ext	50 WATT LED	wallpack	1		NO RETRO	no change already efficient	4,380	0.1	0.1		219	219	
1,369.0	Kern	Bldg Mt Dmv Front	ext	400w HI PRESSURE SODIUM	shoebox	1	1	102 WATT LED/NEW	new LED shoebox	4,380	0.5	0.1	0.4	2,015	447	1,568
1,432.0	Fam1808	Parking Lot 1808, Poles Park	ext	400w HI PRESSURE SODIUM	cobra head	3	3	138 WATT LED/NEW	new LED shoebox	4,380	1.4	0.4	1.0	6,044	1,813	4,231
1,433.0	Fam1808	Bldg Mt 1808, Main Entry	ext	20 WATT LED	flood	1		NO RETRO	no change already efficient	4,380	0.0	0.0		88	88	
1,434.0	Fam1808	Parking Lot 1808, Poles Park	ext	250w HI PRESSURE SODIUM	cobra head	2	2	68 WATT LED/NEW	new LED shoebox	4,380	0.6	0.1	0.5	2,584	596	1,989
1,435.0	Fam1808	Bldg Mt 1808, Side & Exit Do	ext	175w METAL HALIDE	wallpack	1	1	51 WATT LED/NEW	new LED wallpack	4,380	0.2	0.1	0.2	898	223	675
1,479.0	Fam1816	Bldg Mt 1816, Perimeter	ext	250w METAL HALIDE	wallpack	5	5	51 WATT LED/NEW	new LED wallpack	4,380	1.5	0.3	1.2	6,461	1,117	5,344
1,480.0	Fam1816	Bldg Mt 1816, Main Entry	ext	60w INCANDESCENT	sconce	2	2	10 WATT LED SI	screw in LED Alamp	2,190	0.1	0.0	0.1	263	44	219
1,481.0	Fam1816	Bldg Mt 1816, Side Exit	ext	60w INCANDESCENT	drum	1	1	10 WATT LED SI	screw in LED Alamp	2,190	0.1	0.0	0.1	131	22	110
1,495.0	BOE	Bldg Mt Front Entry	ext	42W CF SCREWIN	wallpack	1	1	28 WATT LED/NEW	new LED wallpack	4,380	0.0	0.0	0.0	210	123	88
1,496.0	BOE	Bldg Mt Front Parking	ext	250w HI PRESSURE SODIUM	flood	1	1	54 WATT LED/NEW	new LED flood	4,380	0.3	0.1	0.2	1,292	237	1,056
1,497.0	BOE	Bldg Mt Above Door	ext	150w HI PRESSURE SODIUM	wallpack	1	1	36 WATT LED/NEW	new LED wallpack	4,380	0.2	0.0	0.2	832	158	675
1,498.0	BOE	Bldg Mt Garage Door	ext	250w HI PRESSURE SODIUM	flood	1	1	42 WATT LED/NEW	new LED flood	4,380	0.3	0.0	0.3	1,292	184	1,108
1,499.0	BOE	Bldg Mt Sides	ext	2x90w INCANDESCENTS	flood	2	2	14 WATT LED SI	screw in LED par38 hl	4,380	0.4	0.1	0.3	1,577	245	1,332
1,500.0	BOE	Bldg Mt Side/Front	ext	90w INCANDESCENT	flood	2	2	14 WATT LED SI	screw in LED par38 hl	4,380	0.2	0.0	0.2	788	123	666
1,501.0	BOE	Driveway	ext	250w METAL HALIDE	cobra head	2	2	52 WATT LED/NEW	new LED shoebox	4,380	0.6	0.1	0.5	2,584	456	2,129
1,502.0	BOE	Parking Lot	ext	250w HI PRESSURE SODIUM	cobra head	1	1	52 WATT LED/NEW	new LED shoebox	4,380	0.3	0.1	0.2	1,292	456	837
1,536.0	Vets	Bldg Mt Back Porch	ext	25w INCANDESCENT	sconce	1	1	6 WATT LED SI	screw in LED Alamp	2,190	0.0	0.0	0.0	55	13	42
1,540.0	Vets	Bldg Mt Front Entrance	ext	40w INCANDESCENT	sconce	3	3	6.5 WATT LED/NEW	screw in LED globe	2,190	0.1	0.0	0.1	263	43	220
1,541.0	Vets	Bldg Mt Front Entrance	ext	11W CF SCREWIN	pendant decorative	1	1	10 WATT LED SI	screw in LED Alamp	4,380	0.0	0.0	0.0	57	44	13
1,542.0	Vets	Bldg Mt Front	ext	100w METAL HALIDE	wallpack	2	2	19 WATT LED/NEW	new LED wallpack	4,380	0.2	0.0	0.2	1,051	166	885
1,543.0	Vets	Bldg Mt Side	ext	20 WATT LED	flood	1		NO RETRO	no change already efficient	4,380	0.0	0.0		88	88	
1,544.0	Vets	Bldg Mt Side	ext	150w METAL HALIDE	flood	1	1	42 WATT LED/NEW	new LED flood	4,380	0.2	0.0	0.1	832	184	648
1,545.0	Vets	Bldg Mt Side	ext	40w INCANDESCENT	sconce	1	1	6 WATT LED SI	screw in LED Alamp	2,190	0.0	0.0	0.0	88	13	74
1,546.0	Vets	Bldg Mt Back	ext	40w INCANDESCENT	sconce	3	3	6 WATT LED SI	screw in LED Alamp	2,190	0.1	0.0	0.1	263	39	223
1,547.0	Vets	Bldg Mt	ext	40w INCANDESCENT	sconce	1	1	10 WATT LED SI	screw in LED Alamp	2,190	0.0	0.0	0.0	88	22	66
1,623.0	Main	Bldg Mt 68 Marvin Aka 121 M	ext	400w HI PRESSURE SODIUM	cobra head	2	2	105 WATT LED/NEW	new LED shoebox	4,380	0.9	0.2	0.7	4,030	920	3,110
1,624.0	Main	Parking Lot Wood Pole 68 Ma	ext	250w HI PRESSURE SODIUM	cobra head	2	2	52 WATT LED/NEW	new LED shoebox	4,380	0.6	0.1	0.5	2,584	456	2,129
1,625.0	Main	Bldg Mt 68 Marvin Aka 121 M	ext	250w HI PRESSURE SODIUM	wallpack	1	1	42 WATT LED/NEW	new LED wallpack	4,380	0.3	0.0	0.3	1,292	184	1,108
1,626.0	Main	Bldg Mt 68 Marvin Aka 121 M	ext	150w HI PRESSURE SODIUM	wallpack	1	1	42 WATT LED/NEW	new LED wallpack	4,380	0.2	0.0	0.1	832	184	648
1,627.0	Main	Bldg Mt 121 Main, Entrances	ext	100w HI PRESSURE SODIUM	wallpack	2	2	42 WATT LED/NEW	new LED wallpack	4,380	0.3	0.1	0.2	1,139	368	771
1,628.0	Main	Bldg Mt 121 Main, Entrances	ext	100w INCANDESCENT	sconce	2	2	10 WATT LED SI	screw in LED Alamp	2,190	0.2	0.0	0.2	438	44	394
1,629.0	Golf	Parking Lot 30' Poles (6)	ext	112 WATT LED	flood	12		NO RETRO	no change already efficient	4,380	1.3	1.3		5,887	5,887	
1,630.0	Golf	Parking Lot 30' Poles	ext	112 WATT LED	flood	5		NO RETRO	no change already efficient	4,380	0.6	0.6		2,453	2,453	
1,631.0	Golf	Walkway 10' Poles	ext	100w INCANDESCENT	decorative	2	2	10 WATT LED SI	screw in LED Alamp	2,190	0.2	0.0	0.2	438	44	394
1,632.0	Golf	Bldg Mt Walkway Areas	ext	17 WATT LED	flood	5		NO RETRO	no change already efficient	4,380	0.1	0.1		372	372	
1,633.0	Golf	Bldg Mt Side	ext	2x13W CF HARDWIRED	drum wall mt.	4	4	1L6" LED 5w 2PINBASE/MAG/RETUBE ONLY	retube LED 2pinGX23 horizontal	4,380	0.1	0.0	0.1	526	210	315
1,634.0	Golf	Bldg Mt Entrance Canopy	ext	10 WATT LED	can rec vert 6"	18		NO RETRO	no change already efficient	2,190	0.2	0.2		394	394	
1,635.0	Golf	Bldg Mt Side-Right	ext	150w HI PRESSURE SODIUM	wallpack	1	1	42 WATT LED/NEW	new LED wallpack	4,380	0.2	0.0	0.1	832	184	648

Line	Building Name	Location	FI	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Qty In Scope	Post Fixture Description	Post Fixture Style	Annual Hours	Pre kW	Post kW	kW Saved Coin.	Pre kWH	Post kWH	kWH Saved
1,684.0	Golf	Bldg Mt Back Canopy	ext	10 WATT LED	drum	1		NO RETRO	no change already efficient	2,190	0.0	0.0		22	22	
1,685.0	Golf	Bldg Mt Back Canopy	ext	11 WATT LED	decorative	1		NO RETRO	no change already efficient	2,190	0.0	0.0		24	24	
1,692.0	Golf	Bldg Mt Maintenance Shop	ext	17 WATT LED	flood	2		NO RETRO	no change already efficient	4,380	0.0	0.0		149	149	
Total						**547**	**434**				**106.2**	**26.2**	**79.9**	**453,825**	**111,727**	**342,097**

Energy Savings Calculations for

ECM 3: Recommission Energy Management Systems

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Putnam County, NY	
Energy and Demand Savings Summary	
Measure ID:	**3**
Measure Name:	**Recommission Energy Management Systems**
Measure Location:	
Engineers:	

Site Name:		**Jail**	**Court**	**Court1812**	**EOC**	**Summary**
Item	Units	Savings	Savings	Savings	Savings	
Electricity						
Energy On-Peak	kWh					0
Energy Off-Peak	kWh	118,827	292,061	1,264	104,016	516,168
Energy Total	kWh	118,827	292,061	1,264	104,016	516,168
Demand On-Peak, Monthly	kW					0.0
Demand On-Peak, Annual	kW					0.0
Demand Off-Peak, Monthly	kW					0.0
Demand Off-Peak, Annual	kW					0.0
Fossil Fuel						0
Natural Gas (NG)	CCF	8,689	15,455	0	0	24,144
Liquid Propane Gas (LPG)	Gallons	0	0	0	0	0
Steam	Mlbs	0	0	0	0	0
Fuel Oil, #2	Gallons	0	0	371	2,494	2,865
Fuel Oil, #4	Gallons	0	0	0	0	0
Fuel Oil, #6	Gallons	0	0	0	0	0
Solar Value Stack	$	0	0	0	0	0
Water						0
Water Savings	kGallons					0
Sewer						0
Sewer Savings	kGallons					0

AMERESCO

Putnam County, NY
Sheriff's Department/Correctional Facility
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								**Existing Occupancy Schedule**				**Existing Heating/Cooling Schedule**				**Existing Motor Operating Schedule**				**Existing**				**Proposed**								**Savings**		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,153	2,153	0	0	0	0	0	0	2,153	1,646	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,937	1,937	0	0	0	0	0	0	1,937	1,481	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,722	1,722	0	0	0	0	0	0	1,722	1,317	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	19	0	0	0	19	0	0	0	19	0	0	0	1,507	1,507	8	0	15	4	0	0	1,507	1,152	7	1	0	221	
85 to 90	87.5	73.2	0.0	0	80	13	93	93	0	0	0	93	0	0	0	93	0	0	0	1,292	1,292	34	0	75	18	0	0	1,292	988	28	5	2	1,080	
80 to 85	82.5	69.5	0.0	8	167	50	225	225	0	0	0	225	0	0	0	225	0	0	0	1,076	1,076	69	0	182	43	0	0	1,076	823	56	10	3	2,614	
75 to 80	77.5	65.3	0.0	35	216	108	359	359	0	0	0	359	0	0	0	359	0	0	0	861	861	88	0	291	68	0	0	861	658	71	13	4	4,634	
70 to 75	72.5	62.4	0.0	83	267	174	524	524	0	0	0	524	0	0	0	524	0	0	0	646	646	96	0	424	100	0	0	646	494	78	14	4	6,764	
65 to 70	67.5	59.5	0.0	221	316	261	798	798	0	0	0	798	0	0	0	798	0	0	0	431	431	98	0	646	152	0	0	431	329	79	14	4	10,301	
60 to 65	62.5	54.9	0.0	279	289	344	912	912	0	0	0	912	0	0	0	912	0	0	0	215	215	56	0	738	174	0	0	215	165	45	8	3	11,773	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	830	0	0	0	830	0	0	0	830	0	0	0	(428)	(284)	96	0	672	158	0	0	(428)	0	78	0		12,062	18
50 to 55	52.5	44.8	0.0	280	288	311	879	879	0	0	0	879	0	0	0	879	0	0	0	(600)	(398)	316	0	712	167	0	0	(600)	(57)	256	0		12,774	60
45 to 50	47.5	41.5	0.0	291	168	242	701	701	0	0	0	701	0	0	0	701	0	0	0	(771)	(511)	424	0	567	134	0	0	(771)	(170)	343	0		9,169	81
40 to 45	42.5	38.0	0.0	255	212	237	704	704	0	0	0	704	0	0	0	704	0	0	0	(942)	(625)	597	0	570	134	0	0	(942)	(284)	484	0		9,208	114
35 to 40	37.5	33.3	0.0	330	192	244	766	766	0	0	0	766	0	0	0	766	0	0	0	(1,113)	(738)	837	0	620	146	0	0	(1,113)	(398)	688	0		10,019	149
30 to 35	32.5	29.6	0.0	236	163	248	647	647	0	0	0	647	0	0	0	647	0	0	0	(1,285)	(852)	865	0	524	123	0	0	(1,285)	(511)	729	0		7,403	136
25 to 30	27.5	24.1	0.0	206	95	132	433	433	0	0	0	433	0	0	0	433	0	0	0	(1,456)	(966)	685	0	351	82	0	0	(1,456)	(625)	587	0		4,954	98
20 to 25	22.5	21.6	0.0	159	68	79	306	306	0	0	0	306	0	0	0	306	0	0	0	(1,627)	(1,079)	559	0	248	58	0	0	(1,627)	(738)	485	0		3,501	74
15 to 20	17.5	16.9	0.0	67	51	73	191	191	0	0	0	191	0	0	0	191	0	0	0	(1,799)	(1,193)	395	0	155	36	0	0	(1,799)	(852)	346	0		2,185	49
10 to 15	12.5	10.5	0.0	45	57	48	150	150	0	0	0	150	0	0	0	150	0	0	0	(1,970)	(1,306)	347	0	121	29	0	0	(1,970)	(966)	306	0		1,716	41
5 to 10	7.5	6.4	0.0	53	20	37	110	110	0	0	0	110	0	0	0	110	0	0	0	(2,141)	(1,420)	281	0	89	21	0	0	(2,141)	(1,079)	250	0		1,259	32
0 to 5	2.5	1.9	0.0	58	6	21	85	85	0	0	0	85	0	0	0	85	0	0	0	(2,313)	(1,534)	238	0	69	16	0	0	(2,313)	(1,193)	212	0		973	26
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	25	0	0	0	25	0	0	0	25	0	0	0	(2,484)	(1,647)	76	0	20	5	0	0	(2,484)	(1,306)	68	0		286	8
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	3	0	0	0	3	0	0	0	3	0	0	0	(2,655)	(1,761)	10	0	2	1	0	0	(2,655)	(1,420)	9	0		34	1
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(2,827)	(1,874)	0	0	0	0	0	0	(2,827)	(1,534)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(2,998)	(1,988)	0	0	0	0	0	0	(2,998)	(1,647)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(3,169)	(2,101)	0	0	0	0	0	0	(3,169)	(1,761)	0	0		0	0
				2,920	2,920	2,920	8,760	8,760	0	0	0	8,760	0	0	0	8,760	0	0	0			6,176	0	7,091	1,669	0	0			5,204	65	20	112,932	886

Cell Ref.	**Comment**
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	**Value**	**Unit**	**CELL**	**Description**
			REF	
Occupied Area	87,895	SF	**AD43**	
Existing Heating Plant Efficiency	70.1%		**AD44**	
Existing Chiller Efficiency	3.5	COP	**AD45**	
Fan Power	66.7	kW	**AD46**	Run continuously
Heating Pump Power	9.6	kW	**AD47**	
Cooling Pump Power	1.0	kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC55**	70.0	**AE55**	
UnOccupied	72.0	**AC56**	70.0	**AE56**	

Average Proposed Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC60**	70.0	**AE60**	
UnOccupied	78.0	**AC61**	55.0	**AE61**	

Putnam County, NY
New Putnam County Courthouse
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								Existing Occupancy Schedule				Existing Heating/Cooling Schedule				Existing Motor Operating Schedule				Existing				Proposed								Savings		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,865	2,865	0	0	0	0	0	0	2,865	2,191	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,578	2,578	0	0	0	0	0	0	2,578	1,972	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,292	2,292	0	0	0	0	0	0	2,292	1,753	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	19	0	0	0	19	0	0	0	2,005	2,005	11	0	8	11	0	0	2,005	1,534	5	5	1	524	
85 to 90	87.5	73.2	0.0	0	80	13	93	25	68	0	0	93	0	0	0	93	0	0	0	1,719	1,719	45	0	42	51	0	0	1,719	1,315	20	19	6	2,564	
80 to 85	82.5	69.5	0.0	8	167	50	225	60	165	0	0	225	0	0	0	225	0	0	0	1,432	1,432	92	0	100	125	0	0	1,432	1,095	41	39	12	6,202	
75 to 80	77.5	65.3	0.0	35	216	108	359	96	263	0	0	359	0	0	0	359	0	0	0	1,146	1,146	117	0	160	199	0	0	1,146	876	52	50	15	10,996	
70 to 75	72.5	62.4	0.0	83	267	174	524	140	384	0	0	524	0	0	0	524	0	0	0	859	859	128	0	234	290	0	0	859	657	57	54	17	16,049	
65 to 70	67.5	59.5	0.0	221	316	261	798	214	584	0	0	798	0	0	0	798	0	0	0	573	573	130	0	356	442	0	0	573	438	58	55	17	24,442	
60 to 65	62.5	54.9	0.0	279	289	344	912	244	668	0	0	912	0	0	0	912	0	0	0	286	286	74	0	407	505	0	0	286	219	33	31	10	27,933	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	222	608	0	0	830	0	0	0	830	0	0	0	(249)	(178)	0	183	371	459	0	0	(249)	0	0	45		29,215	138
50 to 55	52.5	44.8	0.0	280	288	311	879	235	644	0	0	879	0	0	0	879	0	0	0	(325)	(232)	0	263	392	487	0	0	(325)	(27)	0	64		30,940	199
45 to 50	47.5	41.5	0.0	291	168	242	701	188	513	0	0	701	0	0	0	701	0	0	0	(400)	(285)	4	265	313	388	0	0	(400)	(81)	4	88		22,207	177
40 to 45	42.5	38.0	0.0	255	212	237	704	189	515	0	0	704	0	0	0	704	0	0	0	(476)	(339)	24	322	314	390	0	0	(476)	(135)	24	132		22,302	190
35 to 40	37.5	33.3	0.0	330	192	244	766	205	561	0	0	766	0	0	0	766	0	0	0	(551)	(393)	49	411	342	424	0	0	(551)	(189)	49	191		24,266	220
30 to 35	32.5	29.6	0.0	236	163	248	647	173	474	0	0	647	0	0	0	647	0	0	0	(627)	(447)	60	398	289	358	0	0	(627)	(242)	60	201		17,127	197
25 to 30	27.5	24.1	0.0	206	95	132	433	116	317	0	0	433	0	0	0	433	0	0	0	(702)	(501)	53	301	193	240	0	0	(702)	(296)	53	162		11,462	139
20 to 25	22.5	21.6	0.0	159	68	79	306	82	224	0	0	306	0	0	0	306	0	0	0	(778)	(555)	46	237	137	169	0	0	(778)	(350)	46	133		8,100	104
15 to 20	17.5	16.9	0.0	67	51	73	191	51	140	0	0	191	0	0	0	191	0	0	0	(853)	(609)	34	163	85	106	0	0	(853)	(404)	34	95		5,056	68
10 to 15	12.5	10.5	0.0	45	57	48	150	40	110	0	0	150	0	0	0	150	0	0	0	(929)	(662)	31	140	67	83	0	0	(929)	(458)	31	84		3,971	56
5 to 10	7.5	6.4	0.0	53	20	37	110	29	81	0	0	110	0	0	0	110	0	0	0	(1,004)	(716)	26	111	49	61	0	0	(1,004)	(512)	26	68		2,912	43
0 to 5	2.5	1.9	0.0	58	6	21	85	23	62	0	0	85	0	0	0	85	0	0	0	(1,080)	(770)	23	93	38	47	0	0	(1,080)	(566)	23	58		2,250	35
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	7	18	0	0	25	0	0	0	25	0	0	0	(1,155)	(824)	7	29	11	14	0	0	(1,155)	(619)	7	19		662	11
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	3	0	0	0	3	0	0	0	(1,231)	(878)	1	4	1	2	0	0	(1,231)	(673)	1	2		79	1
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(1,306)	(932)	0	0	0	0	0	0	(1,306)	(727)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(1,382)	(986)	0	0	0	0	0	0	(1,382)	(781)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(1,458)	(1,039)	0	0	0	0	0	0	(1,458)	(835)	0	0		0	0
				2,920	2,920	2,920	8,760	2,346	6,414	0	0	8,760	0	0	0	8,760	0	0	0			955	2,918	3,911	4,849	0	0			624	1,595	78	269,260	1,576

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	Value	Unit	CELL REF	Description
Occupied Area	50,137	SF	**AD43**	
Existing Heating Plant Efficiency	70.0%		**AD44**	
Existing Chiller Efficiency	3.5	COP	**AD45**	
Fan Power	53.1	kW	**AD46**	Run continuously
Heating Pump Power	10.5	kW	**AD47**	
Cooling Pump Power	2.2	kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures

	Cooling		Heating		Description
Occupied	72.0	**AC55**	74.0	**AE55**	
UnOccupied	72.0	**AC56**	74.0	**AE56**	

Average Proposed Space Temperatures

	Cooling		Heating		Description
Occupied	72.0	**AC60**	74.0	**AE60**	
UnOccupied	78.0	**AC61**	55.0	**AE61**	

Putnam County, NY
1812 Courthouse
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								Existing Occupancy Schedule				Existing Heating/Cooling Schedule				Existing Motor Operating Schedule				Existing				Proposed								Savings		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	155	155	0	0	0	0	0	0	155	119	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	140	140	0	0	0	0	0	0	140	107	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	124	124	0	0	0	0	0	0	124	95	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	12	7	0	0	12	7	0	0	109	109	0	0	12	7	0	0	109	83	0	0	0	0	
85 to 90	87.5	73.2	0.0	0	80	13	93	22	71	0	0	61	32	0	0	61	32	0	0	93	93	2	1	61	32	0	0	93	71	2	1	0	0	
80 to 85	82.5	69.5	0.0	8	167	50	225	54	171	0	0	147	78	0	0	147	78	0	0	78	78	4	2	147	78	0	0	78	59	4	2	0	0	
75 to 80	77.5	65.3	0.0	35	216	108	359	85	274	0	0	235	124	0	0	235	124	0	0	62	62	5	3	235	124	0	0	62	48	5	2	1	137	
70 to 75	72.5	62.4	0.0	83	267	174	524	125	399	0	0	343	181	0	0	343	181	0	0	47	47	5	3	343	181	0	0	47	36	5	2	1	201	
65 to 70	67.5	59.5	0.0	221	316	261	798	190	608	0	0	523	276	0	0	523	276	0	0	31	31	6	3	523	276	0	0	31	24	6	2	1	0	
60 to 65	62.5	54.9	0.0	279	289	344	912	217	695	0	0	597	315	0	0	597	315	0	0	16	16	3	2	597	315	0	0	16	12	3	1	0	0	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	198	632	0	0	543	287	0	0	543	287	0	0	(34)	(34)	0	24	543	287	0	0	(34)	(15)	0	16		0	7
50 to 55	52.5	44.8	0.0	280	288	311	879	209	670	0	0	576	303	0	0	576	303	0	0	(48)	(48)	0	37	576	303	0	0	(48)	(29)	0	29		0	8
45 to 50	47.5	41.5	0.0	291	168	242	701	167	534	0	0	459	242	0	0	459	242	0	0	(62)	(62)	0	39	459	242	0	0	(62)	(43)	0	33		0	6
40 to 45	42.5	38.0	0.0	255	212	237	704	168	536	0	0	461	243	0	0	461	243	0	0	(75)	(75)	3	49	461	243	0	0	(75)	(56)	3	43		0	6
35 to 40	37.5	33.3	0.0	330	192	244	766	182	584	0	0	502	264	0	0	502	264	0	0	(89)	(89)	6	64	502	264	0	0	(89)	(70)	6	58		0	7
30 to 35	32.5	29.6	0.0	236	163	248	647	154	493	0	0	424	223	0	0	424	223	0	0	(103)	(103)	8	63	424	223	0	0	(103)	(84)	8	58		0	6
25 to 30	27.5	24.1	0.0	206	95	132	433	103	330	0	0	284	149	0	0	284	149	0	0	(117)	(117)	7	48	284	149	0	0	(117)	(97)	7	45		0	4
20 to 25	22.5	21.6	0.0	159	68	79	306	73	233	0	0	200	106	0	0	200	106	0	0	(130)	(130)	6	39	200	106	0	0	(130)	(111)	6	36		0	3
15 to 20	17.5	16.9	0.0	67	51	73	191	45	146	0	0	125	66	0	0	125	66	0	0	(144)	(144)	5	27	125	66	0	0	(144)	(125)	5	25		0	2
10 to 15	12.5	10.5	0.0	45	57	48	150	36	114	0	0	98	52	0	0	98	52	0	0	(158)	(158)	4	23	98	52	0	0	(158)	(139)	4	22		0	1
5 to 10	7.5	6.4	0.0	53	20	37	110	26	84	0	0	72	38	0	0	72	38	0	0	(171)	(171)	4	18	72	38	0	0	(171)	(152)	4	17		0	1
0 to 5	2.5	1.9	0.0	58	6	21	85	20	65	0	0	56	29	0	0	56	29	0	0	(185)	(185)	3	15	56	29	0	0	(185)	(166)	3	15		0	1
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	6	19	0	0	16	9	0	0	16	9	0	0	(199)	(199)	1	5	16	9	0	0	(199)	(180)	1	5		0	0
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	2	1	0	0	2	1	0	0	(213)	(213)	0	1	2	1	0	0	(213)	(193)	0	1		0	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(226)	(226)	0	0	0	0	0	0	(226)	(207)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(240)	(240)	0	0	0	0	0	0	(240)	(221)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(254)	(254)	0	0	0	0	0	0	(254)	(235)	0	0		0	0
				2,920	2,920	2,920	8,760	2,086	6,674	0	0	5,736	3,024	0	0	5,736	3,024	0	0			73	467	5,736	3,024	0	0			73	412	3	338	52

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	Value	Unit	CELL	Description
			REF	
Occupied Area	13,605	SF	**AD43**	
Existing Heating Plant Efficiency	75.0%		**AD44**	
Existing Chiller Efficiency	2.9	COP	**AD45**	
Fan Power	5.4	kW	**AD46**	Run continuously
Heating Pump Power	1.2	kW	**AD47**	
Cooling Pump Power	5.7	kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC55**	70.0	**AE55**	
UnOccupied	72.0	**AC56**	70.0	**AE56**	

Average Proposed Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC60**	70.0	**AE60**	
UnOccupied	78.0	**AC61**	63.0	**AE61**	

Putnam County, NY
Emergency Operations Center/TOPS
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								**Existing Occupancy Schedule**				**Existing Heating/Cooling Schedule**				**Existing Motor Operating Schedule**				**Existing**				**Proposed**								**Savings**		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,136	2,136	0	0	0	0	0	0	2,136	1,634	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,923	1,923	0	0	0	0	0	0	1,923	1,470	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,709	1,709	0	0	0	0	0	0	1,709	1,307	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	19	0	0	0	19	0	0	0	1,495	1,495	8	0	8	11	0	0	1,495	1,143	4	3	1	211	
85 to 90	87.5	73.2	0.0	0	80	13	93	22	71	0	0	93	0	0	0	93	0	0	0	1,282	1,282	34	0	42	51	0	0	1,282	980	15	14	4	1,033	
80 to 85	82.5	69.5	0.0	8	167	50	225	54	171	0	0	225	0	0	0	225	0	0	0	1,068	1,068	68	0	100	125	0	0	1,068	817	31	29	9	2,498	
75 to 80	77.5	65.3	0.0	35	216	108	359	85	274	0	0	359	0	0	0	359	0	0	0	854	854	87	0	160	199	0	0	854	653	39	37	11	4,429	
70 to 75	72.5	62.4	0.0	83	267	174	524	125	399	0	0	524	0	0	0	524	0	0	0	641	641	96	0	234	290	0	0	641	490	43	40	12	6,465	
65 to 70	67.5	59.5	0.0	221	316	261	798	190	608	0	0	798	0	0	0	798	0	0	0	427	427	97	0	356	442	0	0	427	327	43	41	13	9,845	
60 to 65	62.5	54.9	0.0	279	289	344	912	217	695	0	0	912	0	0	0	912	0	0	0	214	214	55	0	407	505	0	0	214	163	25	23	7	11,252	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	198	632	0	0	830	0	0	0	830	0	0	0	(123)	(94)	0	61	371	459	0	0	(123)	(71)	0	31		8,342	31
50 to 55	52.5	44.8	0.0	280	288	311	879	209	670	0	0	879	0	0	0	879	0	0	0	(161)	(122)	0	97	392	487	0	0	(161)	(99)	0	59		8,834	38
45 to 50	47.5	41.5	0.0	291	168	242	701	167	534	0	0	701	0	0	0	701	0	0	0	(198)	(150)	0	103	313	388	0	0	(198)	(128)	0	68		6,341	35
40 to 45	42.5	38.0	0.0	255	212	237	704	168	536	0	0	704	0	0	0	704	0	0	0	(235)	(179)	0	129	314	390	0	0	(235)	(156)	0	89		6,368	39
35 to 40	37.5	33.3	0.0	330	192	244	766	182	584	0	0	766	0	0	0	766	0	0	0	(273)	(207)	0	168	342	424	0	0	(273)	(185)	0	120		6,929	48
30 to 35	32.5	29.6	0.0	236	163	248	647	154	493	0	0	647	0	0	0	647	0	0	0	(310)	(236)	0	165	289	358	0	0	(310)	(213)	0	121		4,801	44
25 to 30	27.5	24.1	0.0	206	95	132	433	103	330	0	0	433	0	0	0	433	0	0	0	(347)	(264)	0	126	193	240	0	0	(347)	(241)	0	94		3,213	32
20 to 25	22.5	21.6	0.0	159	68	79	306	73	233	0	0	306	0	0	0	306	0	0	0	(385)	(292)	0	100	137	169	0	0	(385)	(270)	0	75		2,270	25
15 to 20	17.5	16.9	0.0	67	51	73	191	45	146	0	0	191	0	0	0	191	0	0	0	(422)	(321)	0	70	85	106	0	0	(422)	(298)	0	53		1,417	17
10 to 15	12.5	10.5	0.0	45	57	48	150	36	114	0	0	150	0	0	0	150	0	0	0	(460)	(349)	0	60	67	83	0	0	(460)	(326)	0	46		1,113	14
5 to 10	7.5	6.4	0.0	53	20	37	110	26	84	0	0	110	0	0	0	110	0	0	0	(497)	(378)	1	48	49	61	0	0	(497)	(355)	1	37		816	11
0 to 5	2.5	1.9	0.0	58	6	21	85	20	65	0	0	85	0	0	0	85	0	0	0	(534)	(406)	2	40	38	47	0	0	(534)	(383)	2	31		631	9
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	6	19	0	0	25	0	0	0	25	0	0	0	(572)	(434)	1	13	11	14	0	0	(572)	(412)	1	10		185	3
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	3	0	0	0	3	0	0	0	(609)	(463)	0	2	1	2	0	0	(609)	(440)	0	1		22	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(646)	(491)	0	0	0	0	0	0	(646)	(468)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(684)	(520)	0	0	0	0	0	0	(684)	(497)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(721)	(548)	0	0	0	0	0	0	(721)	(525)	0	0		0	0
				2,920	2,920	2,920	8,760	2,086	6,674	0	0	8,760	0	0	0	8,760	0	0	0			449	1,181	3,911	4,849	0	0			202	1,024	58	87,016	346

Cell Ref.	**Comment**
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	**Value**	**Unit**	**CELL REF**	**Description**
Occupied Area	24,922	SF	**AD43**	
Existing Heating Plant Efficiency	78.5%		**AD44**	
Existing Chiller Efficiency	3.5	COP	**AD45**	
Fan Power	14.9	kW	**AD46**	Run continuously
Heating Pump Power	3.3	kW	**AD47**	
Cooling Pump Power	7.4	kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC55**	74.0	**AE55**	
UnOccupied	72.0	**AC56**	74.0	**AE56**	

Average Proposed Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC60**	74.0	**AE60**	
UnOccupied	78.0	**AC61**	70.0	**AE61**	

Energy Savings Calculations for

ECM 4: Web-enabled Programmable Thermostats

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Putnam County, NY	
Energy and Demand Savings Summary	
Measure ID:	**4**
Measure Name:	**Web-enabled Programmable Thermostats**
Measure Location:	
Engineers:	

Site Name:		**Main**	**Golf**	**Gov2**	**Gov3**	**Kern**	**KoehlerSr**	**PutnamSr**	**Fam1808**	**Hwy1**	**Hwy2**	**Hwy3**	**Hwy4**	**BOE**	**Fam1816**	**Law**	**Farm**	**Summary**
Item	Units	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	
Electricity																		
Energy On-Peak	kWh																	0
Energy Off-Peak	kWh	16,052	24,340	0	0	5,165	28,691	14,041	3,669	397	0	0	0	4,247	1,643	3,491	12,449	114,186
Energy Total	kWh	16,052	24,340	0	0	5,165	28,691	14,041	3,669	397	0	0	0	4,247	1,643	3,491	12,449	114,186
Demand On-Peak, Monthly	kW																	0.0
Demand On-Peak, Annual	kW																	0.0
Demand Off-Peak, Monthly	kW																	0.0
Demand Off-Peak, Annual	kW																	0.0
Fossil Fuel																		0
Natural Gas (NG)	CCF	0	0	1,360	0	978	7,122	0	412	0	0	0	0	1,702	611	773	0	12,957
Liquid Propane Gas (LPG)	Gallons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,119	4,119
Steam	Mlbs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Oil, #2	Gallons	0	1,603	0	986	0	0	336	0	453	116	1,127	776	0	0	0	0	5,397
Fuel Oil, #4	Gallons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Oil, #6	Gallons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solar Value Stack	$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water																		0
Water Savings	kGallons																	0
Sewer																		0
Sewer Savings	kGallons																	0

Putnam County, NY
121 Main Street
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								Existing Occupancy Schedule				Existing Heating/Cooling Schedule				Existing Motor Operating Schedule				Existing				Proposed								Savings		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	69	0	0	0	0	0	0	69	69	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	62	62	0	0	0	0	0	0	62	62	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55	55	0	0	0	0	0	0	55	55	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	19	0	0	0	5	14	0	0	48	48	0	0	5	14	0	0	48	48	0	0	0	0	
85 to 90	87.5	73.2	0.0	0	80	13	93	25	68	0	0	93	0	0	0	25	68	0	0	41	41	1	0	25	68	0	0	41	41	0	1	0	0	
80 to 85	82.5	69.5	0.0	8	167	50	225	60	165	0	0	225	0	0	0	60	165	0	0	35	35	3	0	60	165	0	0	35	35	1	2	0	0	
75 to 80	77.5	65.3	0.0	35	216	108	359	96	263	0	0	359	0	0	0	96	263	0	0	28	28	3	0	96	263	0	0	28	28	1	2	0	0	
70 to 75	72.5	62.4	0.0	83	267	174	524	140	384	0	0	524	0	0	0	140	384	0	0	21	21	4	0	140	384	0	0	21	21	1	3	0	0	
65 to 70	67.5	59.5	0.0	221	316	261	798	214	584	0	0	798	0	0	0	214	584	0	0	14	14	4	0	214	584	0	0	14	14	1	3	0	0	
60 to 65	62.5	54.9	0.0	279	289	344	912	244	668	0	0	912	0	0	0	244	668	0	0	7	7	2	0	244	668	0	0	7	7	1	2	0	0	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	222	608	0	0	830	0	0	0	222	608	0	0	(15)	(15)	0	8	222	608	0	0	(15)	0	0	0		0	8
50 to 55	52.5	44.8	0.0	280	288	311	879	235	644	0	0	879	0	0	0	235	644	0	0	(26)	(26)	2	16	235	644	0	0	(26)	(7)	2	4		0	11
45 to 50	47.5	41.5	0.0	291	168	242	701	188	513	0	0	701	0	0	0	188	513	0	0	(37)	(37)	3	18	188	513	0	0	(37)	(18)	4	9		0	8
40 to 45	42.5	38.0	0.0	255	212	237	704	189	515	0	0	704	0	0	0	189	515	0	0	(47)	(47)	5	23	189	515	0	0	(47)	(29)	6	15		0	8
35 to 40	37.5	33.3	0.0	330	192	244	766	205	561	0	0	766	0	0	0	205	561	0	0	(58)	(58)	8	32	205	561	0	0	(58)	(39)	9	23		0	7
30 to 35	32.5	29.6	0.0	236	163	248	647	173	474	0	0	647	0	0	0	173	474	0	0	(69)	(69)	9	32	173	474	0	0	(69)	(50)	9	25		0	5
25 to 30	27.5	24.1	0.0	206	95	132	433	116	317	0	0	433	0	0	0	116	317	0	0	(80)	(80)	7	25	116	317	0	0	(80)	(61)	8	21		0	3
20 to 25	22.5	21.6	0.0	159	68	79	306	82	224	0	0	306	0	0	0	82	224	0	0	(90)	(90)	6	20	82	224	0	0	(90)	(72)	6	17		0	2
15 to 20	17.5	16.9	0.0	67	51	73	191	51	140	0	0	191	0	0	0	51	140	0	0	(101)	(101)	4	14	51	140	0	0	(101)	(82)	5	12		0	1
10 to 15	12.5	10.5	0.0	45	57	48	150	40	110	0	0	150	0	0	0	40	110	0	0	(112)	(112)	4	12	40	110	0	0	(112)	(93)	4	11		0	1
5 to 10	7.5	6.4	0.0	53	20	37	110	29	81	0	0	110	0	0	0	29	81	0	0	(122)	(122)	3	10	29	81	0	0	(122)	(104)	3	9		0	0
0 to 5	2.5	1.9	0.0	58	6	21	85	23	62	0	0	85	0	0	0	23	62	0	0	(133)	(133)	3	8	23	62	0	0	(133)	(114)	3	8		0	0
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	7	18	0	0	25	0	0	0	7	18	0	0	(144)	(144)	1	3	7	18	0	0	(144)	(125)	1	2		0	(0)
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	3	0	0	0	1	2	0	0	(154)	(154)	0	0	1	2	0	0	(154)	(136)	0	0		0	(0)
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(165)	(165)	0	0	0	0	0	0	(165)	(146)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(176)	(176)	0	0	0	0	0	0	(176)	(157)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(186)	(186)	0	0	0	0	0	0	(186)	(168)	0	0		0	0
				2,920	2,920	2,920	8,760	2,346	6,414	0	0	8,760	0	0	0	2,346	6,414	0	0			71	219	2,346	6,414	0	0			64	171	0	0	55

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	Value	Unit	CELL REF	Description
Occupied Area	32,200	SF	**AD43**	
Existing Heating Plant Efficiency	90.0%		**AD44**	
Existing Chiller Efficiency	2.9	COP	**AD45**	
Fan Power		kW	**AD46**	
Heating Pump Power		kW	**AD47**	
Cooling Pump Power		kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures					
	Cooling		Heating		Description
Occupied	72.0	**AC55**	64.8	**AE55**	
UnOccupied	72.0	**AC56**	64.8	**AE56**	

Average Proposed Space Temperatures					
	Cooling		Heating		Description
Occupied	72.0	**AC60**	64.8	**AE60**	
UnOccupied	72.0	**AC61**	56.0	**AE61**	

Heat from Electric	26%		**AD63**	Upper Levels, Electric BB

Putnam County, NY
Putnam National Golf Club - Clubhouse
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								**Existing Occupancy Schedule**				**Existing Heating/Cooling Schedule**				**Existing Motor Operating Schedule**				**Existing**				**Proposed**								**Savings**		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,788	1,788	0	0	0	0	0	0	1,788	1,367	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,609	1,609	0	0	0	0	0	0	1,609	1,230	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,430	1,430	0	0	0	0	0	0	1,430	1,094	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	10	10	0	0	19	0	0	0	19	0	0	0	1,251	1,251	8	0	10	10	0	0	1,251	957	4	3	1	29	
85 to 90	87.5	73.2	0.0	0	80	13	93	47	47	0	0	93	0	0	0	93	0	0	0	1,073	1,073	34	0	47	47	0	0	1,073	820	17	13	4	141	
80 to 85	82.5	69.5	0.0	8	167	50	225	113	113	0	0	225	0	0	0	225	0	0	0	894	894	69	0	113	113	0	0	894	684	34	26	8	307	
75 to 80	77.5	65.3	0.0	35	216	108	359	180	180	0	0	359	0	0	0	359	0	0	0	715	715	88	0	180	180	0	0	715	547	44	33	10	484	
70 to 75	72.5	62.4	0.0	83	267	174	524	262	262	0	0	524	0	0	0	524	0	0	0	536	536	96	0	262	262	0	0	536	410	48	37	11	529	
65 to 70	67.5	59.5	0.0	221	316	261	798	399	399	0	0	798	0	0	0	798	0	0	0	358	358	97	0	399	399	0	0	358	273	49	37	11	537	
60 to 65	62.5	54.9	0.0	279	289	344	912	456	456	0	0	912	0	0	0	912	0	0	0	179	179	56	0	456	456	0	0	179	137	28	21	7	307	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	415	415	0	0	830	0	0	0	830	0	0	0	(67)	(67)	0	34	415	415	0	0	(67)	(13)	0	2		327	32
50 to 55	52.5	44.8	0.0	280	288	311	879	440	440	0	0	879	0	0	0	879	0	0	0	(93)	(93)	0	52	440	440	0	0	(93)	(40)	0	19		693	34
45 to 50	47.5	41.5	0.0	291	168	242	701	351	351	0	0	701	0	0	0	701	0	0	0	(120)	(120)	10	55	351	351	0	0	(120)	(67)	10	28		746	27
40 to 45	42.5	38.0	0.0	255	212	237	704	352	352	0	0	704	0	0	0	704	0	0	0	(147)	(147)	24	69	352	352	0	0	(147)	(93)	24	42		875	27
35 to 40	37.5	33.3	0.0	330	192	244	766	383	383	0	0	766	0	0	0	766	0	0	0	(174)	(174)	40	89	383	383	0	0	(174)	(120)	40	60		1,088	29
30 to 35	32.5	29.6	0.0	236	163	248	647	324	324	0	0	647	0	0	0	647	0	0	0	(200)	(200)	46	88	324	324	0	0	(200)	(147)	46	63		882	25
25 to 30	27.5	24.1	0.0	206	95	132	433	217	217	0	0	433	0	0	0	433	0	0	0	(227)	(227)	39	67	217	217	0	0	(227)	(174)	39	51		656	17
20 to 25	22.5	21.6	0.0	159	68	79	306	153	153	0	0	306	0	0	0	306	0	0	0	(254)	(254)	34	53	153	153	0	0	(254)	(200)	34	42		464	12
15 to 20	17.5	16.9	0.0	67	51	73	191	96	96	0	0	191	0	0	0	191	0	0	0	(280)	(280)	25	37	96	96	0	0	(280)	(227)	25	30		289	7
10 to 15	12.5	10.5	0.0	45	57	48	150	75	75	0	0	150	0	0	0	150	0	0	0	(307)	(307)	22	32	75	75	0	0	(307)	(254)	22	26		227	6
5 to 10	7.5	6.4	0.0	53	20	37	110	55	55	0	0	110	0	0	0	110	0	0	0	(334)	(334)	18	25	55	55	0	0	(334)	(280)	18	21		167	4
0 to 5	2.5	1.9	0.0	58	6	21	85	43	43	0	0	85	0	0	0	85	0	0	0	(360)	(360)	16	21	43	43	0	0	(360)	(307)	16	18		129	3
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	13	13	0	0	25	0	0	0	25	0	0	0	(387)	(387)	5	7	13	13	0	0	(387)	(334)	5	6		38	1
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	2	2	0	0	3	0	0	0	3	0	0	0	(414)	(414)	1	1	2	2	0	0	(414)	(360)	1	1		5	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(440)	(440)	0	0	0	0	0	0	(440)	(387)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(467)	(467)	0	0	0	0	0	0	(467)	(414)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(494)	(494)	0	0	0	0	0	0	(494)	(440)	0	0		0	0
				2,920	2,920	2,920	8,760	4,380	4,380	0	0	8,760	0	0	0	8,760	0	0	0			727	631	4,380	4,380	0	0			504	579	53	8,920	222

Cell Ref.	**Comment**
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	**Value**	**Unit**	**CELL**	**Description**
			REF	
Occupied Area	26,070	SF	**AD43**	
Existing Heating Plant Efficiency	70.0%		**AD44**	
Existing Chiller Efficiency	2.9	COP	**AD45**	
Fan Power	6.7	kW	**AD46**	
Heating Pump Power	1.2	kW	**AD47**	
Cooling Pump Power	0.0	kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC55**	70.0	**AE55**	
UnOccupied	72.0	**AC56**	70.0	**AE56**	

Average Proposed Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC60**	70.0	**AE60**	
UnOccupied	78.0	**AC61**	60.0	**AE61**	

Putnam County, NY
Donald B. Smith Government Campus - Building 2
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								Existing Occupancy Schedule				Existing Heating/Cooling Schedule				Existing Motor Operating Schedule				Existing				Proposed								Savings		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,363	831	0	0	0	0	0	0	1,363	831	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,227	748	0	0	0	0	0	0	1,227	748	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,090	665	0	0	0	0	0	0	1,090	665	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	5	14	0	0	5	14	0	0	954	582	1	3	5	14	0	0	954	582	1	3	0	0	
85 to 90	87.5	73.2	0.0	0	80	13	93	22	71	0	0	22	71	0	0	22	71	0	0	818	499	6	12	22	71	0	0	818	499	6	12	0	0	
80 to 85	82.5	69.5	0.0	8	167	50	225	54	171	0	0	54	171	0	0	54	171	0	0	681	416	12	24	54	171	0	0	681	416	12	24	0	0	
75 to 80	77.5	65.3	0.0	35	216	108	359	85	274	0	0	85	274	0	0	85	274	0	0	545	332	16	31	85	274	0	0	545	332	16	31	0	0	
70 to 75	72.5	62.4	0.0	83	267	174	524	125	399	0	0	125	399	0	0	125	399	0	0	409	249	17	34	125	399	0	0	409	249	17	34	0	0	
65 to 70	67.5	59.5	0.0	221	316	261	798	190	608	0	0	190	608	0	0	190	608	0	0	273	166	18	34	190	608	0	0	273	166	18	34	0	0	
60 to 65	62.5	54.9	0.0	279	289	344	912	217	695	0	0	217	695	0	0	217	695	0	0	136	83	10	20	217	695	0	0	136	83	10	20	0	0	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	198	632	0	0	198	632	0	0	198	632	0	0	(85)	(33)	0	13	198	632	0	0	(85)	(3)	0	0		0	13
50 to 55	52.5	44.8	0.0	280	288	311	879	209	670	0	0	209	670	0	0	209	670	0	0	(120)	(62)	0	36	209	670	0	0	(120)	(33)	0	14		0	22
45 to 50	47.5	41.5	0.0	291	168	242	701	167	534	0	0	167	534	0	0	167	534	0	0	(154)	(92)	4	46	167	534	0	0	(154)	(62)	4	29		0	18
40 to 45	42.5	38.0	0.0	255	212	237	704	168	536	0	0	168	536	0	0	168	536	0	0	(188)	(121)	10	64	168	536	0	0	(188)	(92)	10	47		0	18
35 to 40	37.5	33.3	0.0	330	192	244	766	182	584	0	0	182	584	0	0	182	584	0	0	(222)	(151)	18	89	182	584	0	0	(222)	(121)	18	70		0	19
30 to 35	32.5	29.6	0.0	236	163	248	647	154	493	0	0	154	493	0	0	154	493	0	0	(256)	(180)	21	92	154	493	0	0	(256)	(151)	21	75		0	16
25 to 30	27.5	24.1	0.0	206	95	132	433	103	330	0	0	103	330	0	0	103	330	0	0	(290)	(210)	18	72	103	330	0	0	(290)	(180)	18	61		0	11
20 to 25	22.5	21.6	0.0	159	68	79	306	73	233	0	0	73	233	0	0	73	233	0	0	(325)	(240)	15	59	73	233	0	0	(325)	(210)	15	51		0	8
15 to 20	17.5	16.9	0.0	67	51	73	191	45	146	0	0	45	146	0	0	45	146	0	0	(359)	(269)	11	41	45	146	0	0	(359)	(240)	11	37		0	5
10 to 15	12.5	10.5	0.0	45	57	48	150	36	114	0	0	36	114	0	0	36	114	0	0	(393)	(299)	10	36	36	114	0	0	(393)	(269)	10	32		0	4
5 to 10	7.5	6.4	0.0	53	20	37	110	26	84	0	0	26	84	0	0	26	84	0	0	(427)	(328)	9	29	26	84	0	0	(427)	(299)	9	27		0	3
0 to 5	2.5	1.9	0.0	58	6	21	85	20	65	0	0	20	65	0	0	20	65	0	0	(461)	(358)	7	25	20	65	0	0	(461)	(328)	7	23		0	2
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	6	19	0	0	6	19	0	0	6	19	0	0	(495)	(388)	2	8	6	19	0	0	(495)	(358)	2	7		0	1
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	1	2	0	0	1	2	0	0	(530)	(417)	0	1	1	2	0	0	(530)	(388)	0	1		0	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(564)	(447)	0	0	0	0	0	0	(564)	(417)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(598)	(476)	0	0	0	0	0	0	(598)	(447)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(632)	(506)	0	0	0	0	0	0	(632)	(476)	0	0		0	0
				2,920	2,920	2,920	8,760	2,086	6,674	0	0	2,086	6,674	0	0	2,086	6,674	0	0			207	771	2,086	6,674	0	0			207	632	0	0	139

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	Value	Unit	CELL	Description
			REF	
Occupied Area	15,900	SF	**AD43**	
Existing Heating Plant Efficiency	90.0%		**AD44**	
Existing Chiller Efficiency	2.9	COP	**AD45**	Controlling RTUs
Fan Power	5.6	kW	**AD46**	
Heating Pump Power		kW	**AD47**	
Cooling Pump Power		kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures					
	Cooling		Heating		Description
Occupied	72.0	**AC55**	70.0	**AE55**	
UnOccupied	80.0	**AC56**	63.0	**AE56**	

Average Proposed Space Temperatures					
	Cooling		Heating		Description
Occupied	72.0	**AC60**	70.0	**AE60**	
UnOccupied	80.0	**AC61**	58.0	**AE61**	

Putnam County, NY
Donald B. Smith Government Campus - Building 3
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								Existing Occupancy Schedule				Existing Heating/Cooling Schedule				Existing Motor Operating Schedule				Existing				Proposed								Savings		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,726	1,053	0	0	0	0	0	0	1,726	1,053	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,554	947	0	0	0	0	0	0	1,554	947	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,381	842	0	0	0	0	0	0	1,381	842	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	5	14	0	0	5	14	0	0	1,208	737	2	4	5	14	0	0	1,208	737	2	4	0	0	
85 to 90	87.5	73.2	0.0	0	80	13	93	22	71	0	0	22	71	0	0	22	71	0	0	1,036	632	8	15	22	71	0	0	1,036	632	8	15	0	0	
80 to 85	82.5	69.5	0.0	8	167	50	225	54	171	0	0	54	171	0	0	54	171	0	0	863	526	16	31	54	171	0	0	863	526	16	31	0	0	
75 to 80	77.5	65.3	0.0	35	216	108	359	85	274	0	0	85	274	0	0	85	274	0	0	691	421	20	39	85	274	0	0	691	421	20	39	0	0	
70 to 75	72.5	62.4	0.0	83	267	174	524	125	399	0	0	125	399	0	0	125	399	0	0	518	316	22	43	125	399	0	0	518	316	22	43	0	0	
65 to 70	67.5	59.5	0.0	221	316	261	798	190	608	0	0	190	608	0	0	190	608	0	0	345	211	22	44	190	608	0	0	345	211	22	44	0	0	
60 to 65	62.5	54.9	0.0	279	289	344	912	217	695	0	0	217	695	0	0	217	695	0	0	173	105	13	25	217	695	0	0	173	105	13	25	0	0	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	198	632	0	0	198	632	0	0	198	632	0	0	(140)	(5)	0	0	198	632	0	0	(140)	0	0	0		0	0
50 to 55	52.5	44.8	0.0	280	288	311	879	209	670	0	0	209	670	0	0	209	670	0	0	(192)	(51)	8	30	209	670	0	0	(192)	(23)	8	6		0	24
45 to 50	47.5	41.5	0.0	291	168	242	701	167	534	0	0	167	534	0	0	167	534	0	0	(244)	(97)	17	56	167	534	0	0	(244)	(69)	17	37		0	19
40 to 45	42.5	38.0	0.0	255	212	237	704	168	536	0	0	168	536	0	0	168	536	0	0	(296)	(143)	29	88	168	536	0	0	(296)	(115)	29	69		0	19
35 to 40	37.5	33.3	0.0	330	192	244	766	182	584	0	0	182	584	0	0	182	584	0	0	(348)	(189)	43	131	182	584	0	0	(348)	(162)	43	110		0	21
30 to 35	32.5	29.6	0.0	236	163	248	647	154	493	0	0	154	493	0	0	154	493	0	0	(400)	(236)	47	140	154	493	0	0	(400)	(208)	47	122		0	18
25 to 30	27.5	24.1	0.0	206	95	132	433	103	330	0	0	103	330	0	0	103	330	0	0	(452)	(282)	38	113	103	330	0	0	(452)	(254)	38	102		0	12
20 to 25	22.5	21.6	0.0	159	68	79	306	73	233	0	0	73	233	0	0	73	233	0	0	(504)	(328)	32	94	73	233	0	0	(504)	(300)	32	86		0	8
15 to 20	17.5	16.9	0.0	67	51	73	191	45	146	0	0	45	146	0	0	45	146	0	0	(556)	(374)	23	67	45	146	0	0	(556)	(346)	23	62		0	5
10 to 15	12.5	10.5	0.0	45	57	48	150	36	114	0	0	36	114	0	0	36	114	0	0	(608)	(420)	21	60	36	114	0	0	(608)	(393)	21	56		0	4
5 to 10	7.5	6.4	0.0	53	20	37	110	26	84	0	0	26	84	0	0	26	84	0	0	(660)	(467)	17	49	26	84	0	0	(660)	(439)	17	46		0	3
0 to 5	2.5	1.9	0.0	58	6	21	85	20	65	0	0	20	65	0	0	20	65	0	0	(712)	(513)	14	42	20	65	0	0	(712)	(485)	14	39		0	2
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	6	19	0	0	6	19	0	0	6	19	0	0	(764)	(559)	5	13	6	19	0	0	(764)	(531)	5	13		0	1
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	1	2	0	0	1	2	0	0	(816)	(605)	1	2	1	2	0	0	(816)	(577)	1	2		0	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(868)	(651)	0	0	0	0	0	0	(868)	(624)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(920)	(698)	0	0	0	0	0	0	(920)	(670)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(972)	(744)	0	0	0	0	0	0	(972)	(716)	0	0		0	0
				2,920	2,920	2,920	8,760	2,086	6,674	0	0	2,086	6,674	0	0	2,086	6,674	0	0			398	1,085	2,086	6,674	0	0			398	948	0	0	137

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	Value	Unit	CELL REF	Description
Occupied Area	20,140	SF	**AD43**	
Existing Heating Plant Efficiency	77.2%		**AD44**	
Existing Chiller Efficiency	2.9	COP	**AD45**	
Fan Power	8.3	kW	**AD46**	
Heating Pump Power		kW	**AD47**	
Cooling Pump Power		kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC55**	71.0	**AE55**	
UnOccupied	80.0	**AC56**	58.0	**AE56**	

Average Proposed Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC60**	71.0	**AE60**	
UnOccupied	80.0	**AC61**	55.0	**AE61**	

Putnam County, NY
Kern Building - Health Dept/DMV/WIC
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								Existing Occupancy Schedule				Existing Heating/Cooling Schedule				Existing Motor Operating Schedule				Existing				Proposed								Savings		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,660	1,174	0	0	0	0	0	0	1,660	1,174	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,494	1,057	0	0	0	0	0	0	1,494	1,057	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,328	939	0	0	0	0	0	0	1,328	939	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	8	11	0	0	8	11	0	0	1,162	822	3	3	6	13	0	0	1,162	822	2	4	0	6	
85 to 90	87.5	73.2	0.0	0	80	13	93	22	71	0	0	39	54	0	0	39	54	0	0	996	704	13	13	30	63	0	0	996	704	10	15	1	31	
80 to 85	82.5	69.5	0.0	8	167	50	225	54	171	0	0	94	131	0	0	94	131	0	0	830	587	27	26	74	151	0	0	830	587	21	30	2	65	
75 to 80	77.5	65.3	0.0	35	216	108	359	85	274	0	0	150	209	0	0	150	209	0	0	664	470	34	34	118	241	0	0	664	470	27	39	2	97	
70 to 75	72.5	62.4	0.0	83	267	174	524	125	399	0	0	218	306	0	0	218	306	0	0	498	352	37	37	172	352	0	0	498	352	29	42	2	116	
65 to 70	67.5	59.5	0.0	221	316	261	798	190	608	0	0	333	466	0	0	333	466	0	0	332	235	38	37	261	537	0	0	332	235	30	43	2	138	
60 to 65	62.5	54.9	0.0	279	289	344	912	217	695	0	0	380	532	0	0	380	532	0	0	166	117	22	21	299	613	0	0	166	117	17	25	1	112	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	198	632	0	0	346	484	0	0	346	484	0	0	(114)	0	0	19	272	558	0	0	(114)	0	0	9		102	9
50 to 55	52.5	44.8	0.0	280	288	311	879	209	670	0	0	366	513	0	0	366	513	0	0	(151)	(16)	0	27	288	591	0	0	(151)	(16)	0	14		151	14
45 to 50	47.5	41.5	0.0	291	168	242	701	167	534	0	0	292	409	0	0	292	409	0	0	(188)	(47)	0	43	229	472	0	0	(188)	(47)	0	31		140	12
40 to 45	42.5	38.0	0.0	255	212	237	704	168	536	0	0	293	411	0	0	293	411	0	0	(225)	(78)	7	66	230	474	0	0	(225)	(78)	7	54		172	12
35 to 40	37.5	33.3	0.0	330	192	244	766	182	584	0	0	319	447	0	0	319	447	0	0	(262)	(109)	16	97	251	515	0	0	(262)	(109)	16	84		221	14
30 to 35	32.5	29.6	0.0	236	163	248	647	154	493	0	0	270	377	0	0	270	377	0	0	(298)	(141)	21	104	212	435	0	0	(298)	(141)	21	92		201	12
25 to 30	27.5	24.1	0.0	206	95	132	433	103	330	0	0	180	253	0	0	180	253	0	0	(335)	(172)	19	84	142	291	0	0	(335)	(172)	19	75		144	8
20 to 25	22.5	21.6	0.0	159	68	79	306	73	233	0	0	128	179	0	0	128	179	0	0	(372)	(203)	17	69	100	206	0	0	(372)	(203)	17	63		102	6
15 to 20	17.5	16.9	0.0	67	51	73	191	45	146	0	0	80	111	0	0	80	111	0	0	(409)	(235)	13	50	63	128	0	0	(409)	(235)	13	46		63	4
10 to 15	12.5	10.5	0.0	45	57	48	150	36	114	0	0	63	88	0	0	63	88	0	0	(446)	(266)	12	44	49	101	0	0	(446)	(266)	12	41		50	3
5 to 10	7.5	6.4	0.0	53	20	37	110	26	84	0	0	46	64	0	0	46	64	0	0	(483)	(297)	10	36	36	74	0	0	(483)	(297)	10	33		37	2
0 to 5	2.5	1.9	0.0	58	6	21	85	20	65	0	0	35	50	0	0	35	50	0	0	(520)	(328)	9	30	28	57	0	0	(520)	(328)	9	29		28	2
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	6	19	0	0	10	15	0	0	10	15	0	0	(556)	(360)	3	10	8	17	0	0	(556)	(360)	3	9		8	1
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	1	2	0	0	1	2	0	0	(593)	(391)	0	1	1	2	0	0	(593)	(391)	0	1		1	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(630)	(422)	0	0	0	0	0	0	(630)	(422)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(667)	(453)	0	0	0	0	0	0	(667)	(453)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(704)	(485)	0	0	0	0	0	0	(704)	(485)	0	0		0	0
				2,920	2,920	2,920	8,760	2,086	6,674	0	0	3,650	5,110	0	0	3,650	5,110	0	0			300	852	2,868	5,892	0	0			263	778	11	1,985	100

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	Value	Unit	CELL	Description
			REF	
Occupied Area	19,365	SF	**AD43**	
Existing Heating Plant Efficiency	75.2%		**AD44**	
Existing Chiller Efficiency	2.9	COP	**AD45**	
Fan Power	5.5	kW	**AD46**	
Heating Pump Power		kW	**AD47**	
Cooling Pump Power		kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC55**	73.0	**AE55**	
UnOccupied	78.0	**AC56**	55.0	**AE56**	

Average Proposed Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC60**	73.0	**AE60**	
UnOccupied	78.0	**AC61**	55.0	**AE61**	

Putnam County, NY
William Koehler Senior Center
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								Existing Occupancy Schedule				Existing Heating/Cooling Schedule				Existing Motor Operating Schedule				Existing				Proposed								Savings		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,541	1,541	0	0	0	0	0	0	1,541	1,178	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,387	1,387	0	0	0	0	0	0	1,387	1,060	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,233	1,233	0	0	0	0	0	0	1,233	943	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	3	16	0	0	19	0	0	0	19	0	0	0	1,079	1,079	6	0	8	11	0	0	1,079	825	3	2	1	52	
85 to 90	87.5	73.2	0.0	0	80	13	93	17	76	0	0	93	0	0	0	93	0	0	0	924	924	24	0	42	51	0	0	924	707	11	10	3	256	
80 to 85	82.5	69.5	0.0	8	167	50	225	40	185	0	0	225	0	0	0	225	0	0	0	770	770	49	0	100	125	0	0	770	589	22	21	6	537	
75 to 80	77.5	65.3	0.0	35	216	108	359	64	295	0	0	359	0	0	0	359	0	0	0	616	616	63	0	160	199	0	0	616	471	28	27	8	805	
70 to 75	72.5	62.4	0.0	83	267	174	524	94	430	0	0	524	0	0	0	524	0	0	0	462	462	69	0	234	290	0	0	462	353	31	29	9	961	
65 to 70	67.5	59.5	0.0	221	316	261	798	143	656	0	0	798	0	0	0	798	0	0	0	308	308	70	0	356	442	0	0	308	236	31	30	9	1,138	
60 to 65	62.5	54.9	0.0	279	289	344	912	163	749	0	0	912	0	0	0	912	0	0	0	154	154	40	0	407	505	0	0	154	118	18	17	5	929	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	148	682	0	0	830	0	0	0	830	0	0	0	(125)	(64)	0	78	371	459	0	0	(125)	(9)	0	25		846	52
50 to 55	52.5	44.8	0.0	280	288	311	879	157	722	0	0	879	0	0	0	879	0	0	0	(160)	(82)	0	116	392	487	0	0	(160)	(27)	0	38		1,254	78
45 to 50	47.5	41.5	0.0	291	168	242	701	125	576	0	0	701	0	0	0	701	0	0	0	(196)	(101)	1	120	313	388	0	0	(196)	(46)	1	43		1,157	77
40 to 45	42.5	38.0	0.0	255	212	237	704	126	578	0	0	704	0	0	0	704	0	0	0	(231)	(119)	7	147	314	390	0	0	(231)	(64)	7	61		1,420	86
35 to 40	37.5	33.3	0.0	330	192	244	766	137	629	0	0	766	0	0	0	766	0	0	0	(267)	(137)	14	190	342	424	0	0	(267)	(82)	14	87		1,827	103
30 to 35	32.5	29.6	0.0	236	163	248	647	116	531	0	0	647	0	0	0	647	0	0	0	(303)	(156)	17	185	289	358	0	0	(303)	(101)	17	90		1,661	95
25 to 30	27.5	24.1	0.0	206	95	132	433	77	356	0	0	433	0	0	0	433	0	0	0	(338)	(174)	15	141	193	240	0	0	(338)	(119)	15	71		1,191	69
20 to 25	22.5	21.6	0.0	159	68	79	306	55	251	0	0	306	0	0	0	306	0	0	0	(374)	(192)	13	111	137	169	0	0	(374)	(137)	13	58		842	53
15 to 20	17.5	16.9	0.0	67	51	73	191	34	157	0	0	191	0	0	0	191	0	0	0	(410)	(211)	10	77	85	106	0	0	(410)	(156)	10	41		526	35
10 to 15	12.5	10.5	0.0	45	57	48	150	27	123	0	0	150	0	0	0	150	0	0	0	(445)	(229)	9	66	67	83	0	0	(445)	(174)	9	36		413	30
5 to 10	7.5	6.4	0.0	53	20	37	110	20	90	0	0	110	0	0	0	110	0	0	0	(481)	(247)	8	53	49	61	0	0	(481)	(192)	8	30		303	23
0 to 5	2.5	1.9	0.0	58	6	21	85	15	70	0	0	85	0	0	0	85	0	0	0	(516)	(266)	7	44	38	47	0	0	(516)	(211)	7	25		234	19
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	4	21	0	0	25	0	0	0	25	0	0	0	(552)	(284)	2	14	11	14	0	0	(552)	(229)	2	8		69	6
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	3	0	0	0	3	0	0	0	(588)	(302)	0	2	1	2	0	0	(588)	(247)	0	1		8	1
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(623)	(321)	0	0	0	0	0	0	(623)	(266)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(659)	(339)	0	0	0	0	0	0	(659)	(284)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(694)	(357)	0	0	0	0	0	0	(694)	(302)	0	0		0	0
				2,920	2,920	2,920	8,760	1,564	7,196	0	0	8,760	0	0	0	8,760	0	0	0			424	1,342	3,911	4,849	0	0			246	752	42	16,429	726

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	Value	Unit	CELL REF	Description
Occupied Area	17,976	SF	**AD43**	
Existing Heating Plant Efficiency	76.0%		**AD44**	
Existing Chiller Efficiency	3.5	COP	**AD45**	
Fan Power	7.4	kW	**AD46**	
Heating Pump Power		kW	**AD47**	
Cooling Pump Power		kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures

	Cooling		Heating		Description
Occupied	72.0	**AC55**	75.0	**AE55**	
UnOccupied	72.0	**AC56**	75.0	**AE56**	

Average Proposed Space Temperatures

	Cooling		Heating		Description
Occupied	72.0	**AC60**	75.0	**AE60**	
UnOccupied	78.0	**AC61**	60.0	**AE61**	

Putnam County, NY
Putnam Valley Senior Center
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								Existing Occupancy Schedule				Existing Heating/Cooling Schedule				Existing Motor Operating Schedule				Existing				Proposed								Savings		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	306	306	0	0	0	0	0	0	306	234	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	276	276	0	0	0	0	0	0	276	211	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	245	245	0	0	0	0	0	0	245	187	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	19	0	0	0	19	0	0	0	214	214	1	0	6	13	0	0	214	164	0	1	0	35	
85 to 90	87.5	73.2	0.0	0	80	13	93	22	71	0	0	93	0	0	0	93	0	0	0	184	184	5	0	30	63	0	0	184	141	2	2	1	173	
80 to 85	82.5	69.5	0.0	8	167	50	225	54	171	0	0	225	0	0	0	225	0	0	0	153	153	10	0	74	151	0	0	153	117	3	5	2	362	
75 to 80	77.5	65.3	0.0	35	216	108	359	85	274	0	0	359	0	0	0	359	0	0	0	123	123	13	0	118	241	0	0	123	94	4	6	2	543	
70 to 75	72.5	62.4	0.0	83	267	174	524	125	399	0	0	524	0	0	0	524	0	0	0	92	92	14	0	172	352	0	0	92	70	4	7	2	648	
65 to 70	67.5	59.5	0.0	221	316	261	798	190	608	0	0	798	0	0	0	798	0	0	0	61	61	14	0	261	537	0	0	61	47	5	7	2	768	
60 to 65	62.5	54.9	0.0	279	289	344	912	217	695	0	0	912	0	0	0	912	0	0	0	31	31	8	0	299	613	0	0	31	23	3	4	1	627	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	198	632	0	0	830	0	0	0	830	0	0	0	(31)	(31)	0	19	272	558	0	0	(31)	(22)	0	12		570	7
50 to 55	52.5	44.8	0.0	280	288	311	879	209	670	0	0	879	0	0	0	879	0	0	0	(46)	(46)	0	33	288	591	0	0	(46)	(37)	0	26		846	7
45 to 50	47.5	41.5	0.0	291	168	242	701	167	534	0	0	701	0	0	0	701	0	0	0	(61)	(61)	0	37	229	472	0	0	(61)	(52)	0	31		780	6
40 to 45	42.5	38.0	0.0	255	212	237	704	168	536	0	0	704	0	0	0	704	0	0	0	(76)	(76)	0	48	230	474	0	0	(76)	(67)	0	42		958	6
35 to 40	37.5	33.3	0.0	330	192	244	766	182	584	0	0	766	0	0	0	766	0	0	0	(91)	(91)	0	64	251	515	0	0	(91)	(82)	0	58		1,232	6
30 to 35	32.5	29.6	0.0	236	163	248	647	154	493	0	0	647	0	0	0	647	0	0	0	(106)	(106)	3	64	212	435	0	0	(106)	(97)	3	58		1,120	5
25 to 30	27.5	24.1	0.0	206	95	132	433	103	330	0	0	433	0	0	0	433	0	0	0	(120)	(120)	4	49	142	291	0	0	(120)	(111)	4	46		803	3
20 to 25	22.5	21.6	0.0	159	68	79	306	73	233	0	0	306	0	0	0	306	0	0	0	(135)	(135)	5	39	100	206	0	0	(135)	(126)	5	37		568	2
15 to 20	17.5	16.9	0.0	67	51	73	191	45	146	0	0	191	0	0	0	191	0	0	0	(150)	(150)	4	27	63	128	0	0	(150)	(141)	4	26		354	2
10 to 15	12.5	10.5	0.0	45	57	48	150	36	114	0	0	150	0	0	0	150	0	0	0	(165)	(165)	4	24	49	101	0	0	(165)	(156)	4	23		278	1
5 to 10	7.5	6.4	0.0	53	20	37	110	26	84	0	0	110	0	0	0	110	0	0	0	(180)	(180)	3	19	36	74	0	0	(180)	(171)	3	18		204	1
0 to 5	2.5	1.9	0.0	58	6	21	85	20	65	0	0	85	0	0	0	85	0	0	0	(195)	(195)	3	16	28	57	0	0	(195)	(186)	3	15		158	1
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	6	19	0	0	25	0	0	0	25	0	0	0	(210)	(210)	1	5	8	17	0	0	(210)	(201)	1	5		46	0
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	3	0	0	0	3	0	0	0	(224)	(224)	0	1	1	2	0	0	(224)	(216)	0	1		6	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(239)	(239)	0	0	0	0	0	0	(239)	(230)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(254)	(254)	0	0	0	0	0	0	(254)	(245)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(269)	(269)	0	0	0	0	0	0	(269)	(260)	0	0		0	0
				2,920	2,920	2,920	8,760	2,086	6,674	0	0	8,760	0	0	0	8,760	0	0	0			91	445	2,868	5,892	0	0			48	431	10	11,079	47

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	Value	Unit	CELL	Description
			REF	
Occupied Area	14,292	SF	**AD43**	
Existing Heating Plant Efficiency	75.0%		**AD44**	
Existing Chiller Efficiency	3.5	COP	**AD45**	
Fan Power	4.1	kW	**AD46**	
Heating Pump Power		kW	**AD47**	
Cooling Pump Power		kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC55**	68.0	**AE55**	
UnOccupied	72.0	**AC56**	68.0	**AE56**	

Average Proposed Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC60**	68.0	**AE60**	
UnOccupied	78.0	**AC61**	65.0	**AE61**	

Putnam County, NY
Putnam Family & Community Services - 1808
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								Existing Occupancy Schedule				Existing Heating/Cooling Schedule				Existing Motor Operating Schedule				Existing				Proposed								Savings		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	971	687	0	0	0	0	0	0	971	687	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	874	618	0	0	0	0	0	0	874	618	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	777	550	0	0	0	0	0	0	777	550	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	7	12	0	0	11	8	0	0	11	8	0	0	680	481	3	1	9	10	0	0	680	481	2	2	0	3	
85 to 90	87.5	73.2	0.0	0	80	13	93	35	58	0	0	56	37	0	0	56	37	0	0	583	412	11	5	46	47	0	0	583	412	9	7	1	15	
80 to 85	82.5	69.5	0.0	8	167	50	225	84	141	0	0	135	90	0	0	135	90	0	0	486	344	22	11	111	114	0	0	486	344	18	13	1	36	
75 to 80	77.5	65.3	0.0	35	216	108	359	135	224	0	0	215	144	0	0	215	144	0	0	389	275	28	14	177	182	0	0	389	275	24	17	1	65	
70 to 75	72.5	62.4	0.0	83	267	174	524	197	328	0	0	313	211	0	0	313	211	0	0	291	206	31	15	259	265	0	0	291	206	26	19	2	94	
65 to 70	67.5	59.5	0.0	221	316	261	798	299	499	0	0	477	321	0	0	477	321	0	0	194	137	32	15	394	404	0	0	194	137	26	19	2	144	
60 to 65	62.5	54.9	0.0	279	289	344	912	342	570	0	0	546	366	0	0	546	366	0	0	97	69	18	9	451	461	0	0	97	69	15	11	1	164	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	311	519	0	0	497	333	0	0	497	333	0	0	(46)	0	0	9	410	420	0	0	(46)	0	0	5		149	4
50 to 55	52.5	44.8	0.0	280	288	311	879	330	549	0	0	526	353	0	0	526	353	0	0	(63)	(8)	0	15	434	445	0	0	(63)	(8)	0	8		158	7
45 to 50	47.5	41.5	0.0	291	168	242	701	263	438	0	0	419	282	0	0	419	282	0	0	(80)	(25)	2	22	346	355	0	0	(80)	(25)	2	17		114	5
40 to 45	42.5	38.0	0.0	255	212	237	704	264	440	0	0	421	283	0	0	421	283	0	0	(97)	(42)	8	32	348	356	0	0	(97)	(42)	8	27		114	5
35 to 40	37.5	33.3	0.0	330	192	244	766	287	479	0	0	458	308	0	0	458	308	0	0	(114)	(59)	16	45	378	388	0	0	(114)	(59)	16	40		124	6
30 to 35	32.5	29.6	0.0	236	163	248	647	243	404	0	0	387	260	0	0	387	260	0	0	(131)	(76)	19	48	320	327	0	0	(131)	(76)	19	43		105	5
25 to 30	27.5	24.1	0.0	206	95	132	433	162	271	0	0	259	174	0	0	259	174	0	0	(148)	(93)	16	38	214	219	0	0	(148)	(93)	16	35		70	3
20 to 25	22.5	21.6	0.0	159	68	79	306	115	191	0	0	183	123	0	0	183	123	0	0	(165)	(110)	14	31	151	155	0	0	(165)	(110)	14	29		50	2
15 to 20	17.5	16.9	0.0	67	51	73	191	72	119	0	0	114	77	0	0	114	77	0	0	(182)	(127)	10	22	94	97	0	0	(182)	(127)	10	21		31	1
10 to 15	12.5	10.5	0.0	45	57	48	150	56	94	0	0	90	60	0	0	90	60	0	0	(199)	(144)	9	19	74	76	0	0	(199)	(144)	9	18		24	1
5 to 10	7.5	6.4	0.0	53	20	37	110	41	69	0	0	66	44	0	0	66	44	0	0	(216)	(161)	8	16	54	56	0	0	(216)	(161)	8	15		18	1
0 to 5	2.5	1.9	0.0	58	6	21	85	32	53	0	0	51	34	0	0	51	34	0	0	(233)	(178)	7	13	42	43	0	0	(233)	(178)	7	13		14	1
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	9	16	0	0	15	10	0	0	15	10	0	0	(250)	(195)	2	4	12	13	0	0	(250)	(195)	2	4		4	0
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	2	1	0	0	2	1	0	0	(267)	(212)	0	1	1	2	0	0	(267)	(212)	0	1		0	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(284)	(229)	0	0	0	0	0	0	(284)	(229)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(300)	(246)	0	0	0	0	0	0	(300)	(246)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(317)	(263)	0	0	0	0	0	0	(317)	(263)	0	0		0	0
				2,920	2,920	2,920	8,760	3,285	5,475	0	0	5,240	3,520	0	0	5,240	3,520	0	0			257	385	4,328	4,432	0	0			232	361	7	1,498	42

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	Value	Unit	CELL REF	Description
Occupied Area	11,333	SF	**AD43**	
Existing Heating Plant Efficiency	75.3%		**AD44**	
Existing Chiller Efficiency	2.9	COP	**AD45**	
Fan Power	1.7	kW	**AD46**	
Heating Pump Power		kW	**AD47**	
Cooling Pump Power		kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures					
	Cooling		Heating		Description
Occupied	72.0	**AC55**	71.0	**AE55**	
UnOccupied	78.0	**AC56**	55.0	**AE56**	

Average Proposed Space Temperatures					
	Cooling		Heating		Description
Occupied	72.0	**AC60**	71.0	**AE60**	
UnOccupied	78.0	**AC61**	55.0	**AE61**	

Heat from Electric	0%		**AD63**	Entire Building, Electric BB

Putnam County, NY
Highway Department - Building 1 Admin
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								Existing Occupancy Schedule				Existing Heating/Cooling Schedule				Existing Motor Operating Schedule				Existing				Proposed								Savings		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	370	370	0	0	0	0	0	0	370	370	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	333	333	0	0	0	0	0	0	333	333	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	296	296	0	0	0	0	0	0	296	296	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	19	0	0	0	19	0	0	0	259	259	2	0	7	12	0	0	259	259	1	1	0	0	
85 to 90	87.5	73.2	0.0	0	80	13	93	22	71	0	0	93	0	0	0	93	0	0	0	222	222	7	0	36	57	0	0	222	222	3	4	0	0	
80 to 85	82.5	69.5	0.0	8	167	50	225	54	171	0	0	225	0	0	0	225	0	0	0	185	185	14	0	87	138	0	0	185	185	6	9	0	0	
75 to 80	77.5	65.3	0.0	35	216	108	359	85	274	0	0	359	0	0	0	359	0	0	0	148	148	18	0	139	220	0	0	148	148	7	11	0	0	
70 to 75	72.5	62.4	0.0	83	267	174	524	125	399	0	0	524	0	0	0	524	0	0	0	111	111	20	0	203	321	0	0	111	111	8	12	0	0	
65 to 70	67.5	59.5	0.0	221	316	261	798	190	608	0	0	798	0	0	0	798	0	0	0	74	74	20	0	309	489	0	0	74	74	8	12	0	0	
60 to 65	62.5	54.9	0.0	279	289	344	912	217	695	0	0	912	0	0	0	912	0	0	0	37	37	12	0	353	559	0	0	37	37	4	7	0	0	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	198	632	0	0	830	0	0	0	830	0	0	0	(20)	(18)	1	17	321	509	0	0	(20)	(8)	1	8		52	9
50 to 55	52.5	44.8	0.0	280	288	311	879	209	670	0	0	879	0	0	0	879	0	0	0	(25)	(23)	3	22	340	539	0	0	(25)	(13)	3	13		77	9
45 to 50	47.5	41.5	0.0	291	168	242	701	167	534	0	0	701	0	0	0	701	0	0	0	(31)	(29)	3	22	271	430	0	0	(31)	(18)	3	14		71	8
40 to 45	42.5	38.0	0.0	255	212	237	704	168	536	0	0	704	0	0	0	704	0	0	0	(36)	(34)	5	26	272	432	0	0	(36)	(23)	5	18		87	8
35 to 40	37.5	33.3	0.0	330	192	244	766	182	584	0	0	766	0	0	0	766	0	0	0	(41)	(39)	6	32	296	470	0	0	(41)	(29)	6	24		112	8
30 to 35	32.5	29.6	0.0	236	163	248	647	154	493	0	0	647	0	0	0	647	0	0	0	(46)	(44)	6	31	250	397	0	0	(46)	(34)	6	24		0	7
25 to 30	27.5	24.1	0.0	206	95	132	433	103	330	0	0	433	0	0	0	433	0	0	0	(51)	(49)	5	23	168	265	0	0	(51)	(39)	5	18		0	5
20 to 25	22.5	21.6	0.0	159	68	79	306	73	233	0	0	306	0	0	0	306	0	0	0	(57)	(55)	4	18	118	188	0	0	(57)	(44)	4	15		0	3
15 to 20	17.5	16.9	0.0	67	51	73	191	45	146	0	0	191	0	0	0	191	0	0	0	(62)	(60)	3	12	74	117	0	0	(62)	(49)	3	10		(0)	2
10 to 15	12.5	10.5	0.0	45	57	48	150	36	114	0	0	150	0	0	0	150	0	0	0	(67)	(65)	3	11	58	92	0	0	(67)	(55)	3	9		0	2
5 to 10	7.5	6.4	0.0	53	20	37	110	26	84	0	0	110	0	0	0	110	0	0	0	(72)	(70)	2	8	43	67	0	0	(72)	(60)	2	7		0	1
0 to 5	2.5	1.9	0.0	58	6	21	85	20	65	0	0	85	0	0	0	85	0	0	0	(77)	(75)	2	7	33	52	0	0	(77)	(65)	2	6		(0)	1
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	6	19	0	0	25	0	0	0	25	0	0	0	(83)	(81)	1	2	10	15	0	0	(83)	(70)	1	2		0	0
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	3	0	0	0	3	0	0	0	(88)	(86)	0	0	1	2	0	0	(88)	(75)	0	0		0	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(93)	(91)	0	0	0	0	0	0	(93)	(81)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(98)	(96)	0	0	0	0	0	0	(98)	(86)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(103)	(101)	0	0	0	0	0	0	(103)	(91)	0	0		0	0
				2,920	2,920	2,920	8,760	2,086	6,674	0	0	8,760	0	0	0	8,760	0	0	0			136	232	3,389	5,371	0	0			80	226	0	397	63

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	Value	Unit	CELL	Description
			REF	
Occupied Area	5,400	SF	**AD43**	
Existing Heating Plant Efficiency	71.0%		**AD44**	
Existing Chiller Efficiency	2.9	COP	**AD45**	
Fan Power		kW	**AD46**	
Heating Pump Power	0.4	kW	**AD47**	
Cooling Pump Power		kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC55**	77.0	**AE55**	
UnOccupied	72.0	**AC56**	75.0	**AE56**	

Average Proposed Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC60**	77.0	**AE60**	
UnOccupied	72.0	**AC61**	65.0	**AE61**	

Heat from Electric	55%		**AD63**	Fujitsu MiniSplits

Putnam County, NY
Highway Department - Building 2 Sign Shop
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								Existing Occupancy Schedule				Existing Heating/Cooling Schedule				Existing Motor Operating Schedule				Existing				Proposed								Savings		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	69	0	0	0	0	0	0	69	69	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	62	62	0	0	0	0	0	0	62	62	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	56	56	0	0	0	0	0	0	56	56	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	19	0	0	0	19	0	0	0	49	49	0	0	7	12	0	0	49	49	0	0	0	0	
85 to 90	87.5	73.2	0.0	0	80	13	93	22	71	0	0	93	0	0	0	93	0	0	0	42	42	1	0	36	57	0	0	42	42	1	1	0	0	
80 to 85	82.5	69.5	0.0	8	167	50	225	54	171	0	0	225	0	0	0	225	0	0	0	35	35	3	0	87	138	0	0	35	35	1	2	0	0	
75 to 80	77.5	65.3	0.0	35	216	108	359	85	274	0	0	359	0	0	0	359	0	0	0	28	28	3	0	139	220	0	0	28	28	1	2	0	0	
70 to 75	72.5	62.4	0.0	83	267	174	524	125	399	0	0	524	0	0	0	524	0	0	0	21	21	4	0	203	321	0	0	21	21	1	2	0	0	
65 to 70	67.5	59.5	0.0	221	316	261	798	190	608	0	0	798	0	0	0	798	0	0	0	14	14	4	0	309	489	0	0	14	14	1	2	0	0	
60 to 65	62.5	54.9	0.0	279	289	344	912	217	695	0	0	912	0	0	0	912	0	0	0	7	7	2	0	353	559	0	0	7	7	1	1	0	0	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	198	632	0	0	830	0	0	0	830	0	0	0	(7)	(7)	0	5	321	509	0	0	(7)	(4)	0	3		0	2
50 to 55	52.5	44.8	0.0	280	288	311	879	209	670	0	0	879	0	0	0	879	0	0	0	(11)	(11)	1	9	340	539	0	0	(11)	(8)	1	7		0	2
45 to 50	47.5	41.5	0.0	291	168	242	701	167	534	0	0	701	0	0	0	701	0	0	0	(16)	(16)	1	10	271	430	0	0	(16)	(12)	1	9		0	2
40 to 45	42.5	38.0	0.0	255	212	237	704	168	536	0	0	704	0	0	0	704	0	0	0	(20)	(20)	2	14	272	432	0	0	(20)	(16)	2	12		0	2
35 to 40	37.5	33.3	0.0	330	192	244	766	182	584	0	0	766	0	0	0	766	0	0	0	(24)	(24)	4	18	296	470	0	0	(24)	(21)	4	16		0	2
30 to 35	32.5	29.6	0.0	236	163	248	647	154	493	0	0	647	0	0	0	647	0	0	0	(28)	(28)	4	18	250	397	0	0	(28)	(25)	4	16		0	2
25 to 30	27.5	24.1	0.0	206	95	132	433	103	330	0	0	433	0	0	0	433	0	0	0	(33)	(33)	3	14	168	265	0	0	(33)	(29)	3	13		0	1
20 to 25	22.5	21.6	0.0	159	68	79	306	73	233	0	0	306	0	0	0	306	0	0	0	(37)	(37)	3	11	118	188	0	0	(37)	(33)	3	10		0	1
15 to 20	17.5	16.9	0.0	67	51	73	191	45	146	0	0	191	0	0	0	191	0	0	0	(41)	(41)	2	8	74	117	0	0	(41)	(38)	2	7		0	1
10 to 15	12.5	10.5	0.0	45	57	48	150	36	114	0	0	150	0	0	0	150	0	0	0	(45)	(45)	2	7	58	92	0	0	(45)	(42)	2	6		0	0
5 to 10	7.5	6.4	0.0	53	20	37	110	26	84	0	0	110	0	0	0	110	0	0	0	(49)	(49)	1	5	43	67	0	0	(49)	(46)	1	5		0	0
0 to 5	2.5	1.9	0.0	58	6	21	85	20	65	0	0	85	0	0	0	85	0	0	0	(54)	(54)	1	5	33	52	0	0	(54)	(50)	1	4		0	0
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	6	19	0	0	25	0	0	0	25	0	0	0	(58)	(58)	0	1	10	15	0	0	(58)	(55)	0	1		0	0
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	3	0	0	0	3	0	0	0	(62)	(62)	0	0	1	2	0	0	(62)	(59)	0	0		0	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(66)	(66)	0	0	0	0	0	0	(66)	(63)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(71)	(71)	0	0	0	0	0	0	(71)	(67)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(75)	(75)	0	0	0	0	0	0	(75)	(71)	0	0		0	0
				2,920	2,920	2,920	8,760	2,086	6,674	0	0	8,760	0	0	0	8,760	0	0	0			42	126	3,389	5,371	0	0			32	121	0	0	16

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	Value	Unit	CELL REF	Description
Occupied Area	3,240	SF	**AD43**	
Existing Heating Plant Efficiency	75.0%		**AD44**	
Existing Chiller Efficiency	2.9	COP	**AD45**	
Fan Power	0.0	kW	**AD46**	
Heating Pump Power	0.0	kW	**AD47**	
Cooling Pump Power	0.0	kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC55**	66.0	**AE55**	
UnOccupied	72.0	**AC56**	66.0	**AE56**	

Average Proposed Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC60**	66.0	**AE60**	
UnOccupied	72.0	**AC61**	62.0	**AE61**	

Putnam County, NY
Highway Department - Building 3 Dispatch/Garage
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								Existing Occupancy Schedule				Existing Heating/Cooling Schedule				Existing Motor Operating Schedule				Existing				Proposed								Savings		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	549	549	0	0	0	0	0	0	549	549	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	494	494	0	0	0	0	0	0	494	494	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	439	439	0	0	0	0	0	0	439	439	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	19	0	0	0	19	0	0	0	384	384	2	0	7	12	0	0	384	384	1	2	0	0	
85 to 90	87.5	73.2	0.0	0	80	13	93	22	71	0	0	93	0	0	0	93	0	0	0	329	329	10	0	36	57	0	0	329	329	4	6	0	0	
80 to 85	82.5	69.5	0.0	8	167	50	225	54	171	0	0	225	0	0	0	225	0	0	0	274	274	21	0	87	138	0	0	274	274	8	13	0	0	
75 to 80	77.5	65.3	0.0	35	216	108	359	85	274	0	0	359	0	0	0	359	0	0	0	219	219	27	0	139	220	0	0	219	219	10	16	0	0	
70 to 75	72.5	62.4	0.0	83	267	174	524	125	399	0	0	524	0	0	0	524	0	0	0	165	165	29	0	203	321	0	0	165	165	11	18	0	0	
65 to 70	67.5	59.5	0.0	221	316	261	798	190	608	0	0	798	0	0	0	798	0	0	0	110	110	30	0	309	489	0	0	110	110	12	18	0	0	
60 to 65	62.5	54.9	0.0	279	289	344	912	217	695	0	0	912	0	0	0	912	0	0	0	55	55	17	0	353	559	0	0	55	55	7	10	0	0	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	198	632	0	0	830	0	0	0	830	0	0	0	(43)	(43)	3	32	321	509	0	0	(43)	(9)	3	10		0	22
50 to 55	52.5	44.8	0.0	280	288	311	879	209	670	0	0	879	0	0	0	879	0	0	0	(60)	(60)	8	49	340	539	0	0	(60)	(26)	8	25		0	24
45 to 50	47.5	41.5	0.0	291	168	242	701	167	534	0	0	701	0	0	0	701	0	0	0	(78)	(78)	10	50	271	430	0	0	(78)	(43)	10	32		0	19
40 to 45	42.5	38.0	0.0	255	212	237	704	168	536	0	0	704	0	0	0	704	0	0	0	(95)	(95)	13	62	272	432	0	0	(95)	(60)	13	43		0	19
35 to 40	37.5	33.3	0.0	330	192	244	766	182	584	0	0	766	0	0	0	766	0	0	0	(112)	(112)	19	81	296	470	0	0	(112)	(78)	19	60		0	21
30 to 35	32.5	29.6	0.0	236	163	248	647	154	493	0	0	647	0	0	0	647	0	0	0	(130)	(130)	19	79	250	397	0	0	(130)	(95)	19	62		0	17
25 to 30	27.5	24.1	0.0	206	95	132	433	103	330	0	0	433	0	0	0	433	0	0	0	(147)	(147)	15	60	168	265	0	0	(147)	(112)	15	48		0	12
20 to 25	22.5	21.6	0.0	159	68	79	306	73	233	0	0	306	0	0	0	306	0	0	0	(164)	(164)	12	47	118	188	0	0	(164)	(130)	12	39		0	8
15 to 20	17.5	16.9	0.0	67	51	73	191	45	146	0	0	191	0	0	0	191	0	0	0	(181)	(181)	9	33	74	117	0	0	(181)	(147)	9	28		0	5
10 to 15	12.5	10.5	0.0	45	57	48	150	36	114	0	0	150	0	0	0	150	0	0	0	(199)	(199)	8	28	58	92	0	0	(199)	(164)	8	24		0	4
5 to 10	7.5	6.4	0.0	53	20	37	110	26	84	0	0	110	0	0	0	110	0	0	0	(216)	(216)	6	23	43	67	0	0	(216)	(181)	6	20		0	3
0 to 5	2.5	1.9	0.0	58	6	21	85	20	65	0	0	85	0	0	0	85	0	0	0	(233)	(233)	5	19	33	52	0	0	(233)	(199)	5	17		0	2
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	6	19	0	0	25	0	0	0	25	0	0	0	(250)	(250)	2	6	10	15	0	0	(250)	(216)	2	5		0	1
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	3	0	0	0	3	0	0	0	(268)	(268)	0	1	1	2	0	0	(268)	(233)	0	1		0	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(285)	(285)	0	0	0	0	0	0	(285)	(250)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(302)	(302)	0	0	0	0	0	0	(302)	(268)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(319)	(319)	0	0	0	0	0	0	(319)	(285)	0	0		0	0
				2,920	2,920	2,920	8,760	2,086	6,674	0	0	8,760	0	0	0	8,760	0	0	0			265	570	3,389	5,371	0	0			181	497	0	0	156

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	Value	Unit	CELL	Description
			REF	
Occupied Area	9,600	SF	**AD43**	
Existing Heating Plant Efficiency	79.0%		**AD44**	
Existing Chiller Efficiency	2.9	COP	**AD45**	
Fan Power	2.8	kW	**AD46**	
Heating Pump Power		kW	**AD47**	
Cooling Pump Power	0.0	kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures

	Cooling		Heating		Description
Occupied	72.0	**AC55**	70.0	**AE55**	
UnOccupied	72.0	**AC56**	70.0	**AE56**	

Average Proposed Space Temperatures

	Cooling		Heating		Description
Occupied	72.0	**AC60**	70.0	**AE60**	
UnOccupied	72.0	**AC61**	60.0	**AE61**	

Putnam County, NY
Highway Department - Building 4 Garage
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								**Existing Occupancy Schedule**				**Existing Heating/Cooling Schedule**				**Existing Motor Operating Schedule**				**Existing**				**Proposed**								**Savings**		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	107	107	0	0	0	0	0	0	107	107	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96	96	0	0	0	0	0	0	96	96	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86	86	0	0	0	0	0	0	86	86	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	19	0	0	0	19	0	0	0	75	75	0	0	7	12	0	0	75	75	0	0	0	0	
85 to 90	87.5	73.2	0.0	0	80	13	93	22	71	0	0	93	0	0	0	93	0	0	0	64	64	2	0	36	57	0	0	64	64	1	1	0	0	
80 to 85	82.5	69.5	0.0	8	167	50	225	54	171	0	0	225	0	0	0	225	0	0	0	54	54	4	0	87	138	0	0	54	54	2	3	0	0	
75 to 80	77.5	65.3	0.0	35	216	108	359	85	274	0	0	359	0	0	0	359	0	0	0	43	43	5	0	139	220	0	0	43	43	2	3	0	0	
70 to 75	72.5	62.4	0.0	83	267	174	524	125	399	0	0	524	0	0	0	524	0	0	0	32	32	6	0	203	321	0	0	32	32	2	4	0	0	
65 to 70	67.5	59.5	0.0	221	316	261	798	190	608	0	0	798	0	0	0	798	0	0	0	21	21	6	0	309	489	0	0	21	21	2	4	0	0	
60 to 65	62.5	54.9	0.0	279	289	344	912	217	695	0	0	912	0	0	0	912	0	0	0	11	11	3	0	353	559	0	0	11	11	1	2	0	0	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	198	632	0	0	830	0	0	0	830	0	0	0	(31)	(27)	4	22	321	509	0	0	(31)	(5)	4	7		0	15
50 to 55	52.5	44.8	0.0	280	288	311	879	209	670	0	0	879	0	0	0	879	0	0	0	(42)	(37)	7	32	340	539	0	0	(42)	(16)	7	15		0	16
45 to 50	47.5	41.5	0.0	291	168	242	701	167	534	0	0	701	0	0	0	701	0	0	0	(52)	(48)	8	32	271	430	0	0	(52)	(27)	8	19		0	13
40 to 45	42.5	38.0	0.0	255	212	237	704	168	536	0	0	704	0	0	0	704	0	0	0	(63)	(59)	10	39	272	432	0	0	(63)	(37)	10	26		0	13
35 to 40	37.5	33.3	0.0	330	192	244	766	182	584	0	0	766	0	0	0	766	0	0	0	(74)	(69)	13	50	296	470	0	0	(74)	(48)	13	35		0	14
30 to 35	32.5	29.6	0.0	236	163	248	647	154	493	0	0	647	0	0	0	647	0	0	0	(84)	(80)	13	48	250	397	0	0	(84)	(59)	13	36		0	12
25 to 30	27.5	24.1	0.0	206	95	132	433	103	330	0	0	433	0	0	0	433	0	0	0	(95)	(91)	10	36	168	265	0	0	(95)	(69)	10	28		0	8
20 to 25	22.5	21.6	0.0	159	68	79	306	73	233	0	0	306	0	0	0	306	0	0	0	(106)	(101)	8	29	118	188	0	0	(106)	(80)	8	23		0	6
15 to 20	17.5	16.9	0.0	67	51	73	191	45	146	0	0	191	0	0	0	191	0	0	0	(116)	(112)	5	20	74	117	0	0	(116)	(91)	5	16		0	4
10 to 15	12.5	10.5	0.0	45	57	48	150	36	114	0	0	150	0	0	0	150	0	0	0	(127)	(123)	5	17	58	92	0	0	(127)	(101)	5	14		0	3
5 to 10	7.5	6.4	0.0	53	20	37	110	26	84	0	0	110	0	0	0	110	0	0	0	(138)	(134)	4	13	43	67	0	0	(138)	(112)	4	11		0	2
0 to 5	2.5	1.9	0.0	58	6	21	85	20	65	0	0	85	0	0	0	85	0	0	0	(149)	(144)	3	11	33	52	0	0	(149)	(123)	3	10		0	2
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	6	19	0	0	25	0	0	0	25	0	0	0	(159)	(155)	1	4	10	15	0	0	(159)	(134)	1	3		0	0
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	3	0	0	0	3	0	0	0	(170)	(166)	0	0	1	2	0	0	(170)	(144)	0	0		0	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(181)	(176)	0	0	0	0	0	0	(181)	(155)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(191)	(187)	0	0	0	0	0	0	(191)	(166)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(202)	(198)	0	0	0	0	0	0	(202)	(176)	0	0		0	0
				2,920	2,920	2,920	8,760	2,086	6,674	0	0	8,760	0	0	0	8,760	0	0	0			117	352	3,389	5,371	0	0			100	261	0	0	108

Cell Ref.	**Comment**
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	**Value**	**Unit**	**CELL**	**Description**
			REF	
Occupied Area	5,000	SF	**AD43**	
Existing Heating Plant Efficiency	85.1%		**AD44**	
Existing Chiller Efficiency	2.9	COP	**AD45**	
Fan Power		kW	**AD46**	
Heating Pump Power		kW	**AD47**	
Cooling Pump Power		kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC55**	72.0	**AE55**	
UnOccupied	72.0	**AC56**	70.0	**AE56**	

Average Proposed Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC60**	72.0	**AE60**	
UnOccupied	72.0	**AC61**	60.0	**AE61**	

Putnam County, NY
Board of Elections
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								**Existing Occupancy Schedule**				**Existing Heating/Cooling Schedule**				**Existing Motor Operating Schedule**				**Existing**				**Proposed**								**Savings**		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	249	249	0	0	0	0	0	0	249	190	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	224	224	0	0	0	0	0	0	224	171	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	199	199	0	0	0	0	0	0	199	152	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	6	13	0	0	19	0	0	0	19	0	0	0	174	174	1	0	7	12	0	0	174	133	0	1	0	5	
85 to 90	87.5	73.2	0.0	0	80	13	93	27	66	0	0	93	0	0	0	93	0	0	0	149	149	5	0	35	58	0	0	149	114	2	2	1	25	
80 to 85	82.5	69.5	0.0	8	167	50	225	66	159	0	0	225	0	0	0	225	0	0	0	124	124	10	0	86	139	0	0	124	95	4	5	1	52	
75 to 80	77.5	65.3	0.0	35	216	108	359	105	254	0	0	359	0	0	0	359	0	0	0	100	100	12	0	137	222	0	0	100	76	5	6	2	78	
70 to 75	72.5	62.4	0.0	83	267	174	524	153	371	0	0	524	0	0	0	524	0	0	0	75	75	13	0	200	324	0	0	75	57	5	6	2	93	
65 to 70	67.5	59.5	0.0	221	316	261	798	233	565	0	0	798	0	0	0	798	0	0	0	50	50	14	0	304	494	0	0	50	38	5	6	2	110	
60 to 65	62.5	54.9	0.0	279	289	344	912	266	646	0	0	912	0	0	0	912	0	0	0	25	25	8	0	347	565	0	0	25	19	3	4	1	90	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	242	588	0	0	830	0	0	0	830	0	0	0	(45)	(26)	4	28	316	514	0	0	(45)	(16)	4	11		82	17
50 to 55	52.5	44.8	0.0	280	288	311	879	256	623	0	0	879	0	0	0	879	0	0	0	(58)	(37)	8	39	335	544	0	0	(58)	(26)	8	19		121	20
45 to 50	47.5	41.5	0.0	291	168	242	701	204	497	0	0	701	0	0	0	701	0	0	0	(70)	(47)	9	38	267	434	0	0	(70)	(37)	9	21		112	17
40 to 45	42.5	38.0	0.0	255	212	237	704	205	499	0	0	704	0	0	0	704	0	0	0	(83)	(57)	12	46	268	436	0	0	(83)	(47)	12	28		137	18
35 to 40	37.5	33.3	0.0	330	192	244	766	223	543	0	0	766	0	0	0	766	0	0	0	(96)	(68)	17	58	292	474	0	0	(96)	(57)	17	37		177	21
30 to 35	32.5	29.6	0.0	236	163	248	647	189	458	0	0	647	0	0	0	647	0	0	0	(109)	(78)	17	56	246	401	0	0	(109)	(68)	17	37		161	19
25 to 30	27.5	24.1	0.0	206	95	132	433	126	307	0	0	433	0	0	0	433	0	0	0	(122)	(89)	13	42	165	268	0	0	(122)	(78)	13	28		115	13
20 to 25	22.5	21.6	0.0	159	68	79	306	89	217	0	0	306	0	0	0	306	0	0	0	(134)	(99)	11	33	117	189	0	0	(134)	(89)	11	23		81	10
15 to 20	17.5	16.9	0.0	67	51	73	191	56	135	0	0	191	0	0	0	191	0	0	0	(147)	(110)	7	22	73	118	0	0	(147)	(99)	7	16		51	7
10 to 15	12.5	10.5	0.0	45	57	48	150	44	106	0	0	150	0	0	0	150	0	0	0	(160)	(120)	6	19	57	93	0	0	(160)	(110)	6	14		40	5
5 to 10	7.5	6.4	0.0	53	20	37	110	32	78	0	0	110	0	0	0	110	0	0	0	(173)	(131)	5	15	42	68	0	0	(173)	(120)	5	11		29	4
0 to 5	2.5	1.9	0.0	58	6	21	85	25	60	0	0	85	0	0	0	85	0	0	0	(186)	(141)	4	13	32	53	0	0	(186)	(131)	4	9		23	3
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	7	18	0	0	25	0	0	0	25	0	0	0	(198)	(151)	1	4	10	15	0	0	(198)	(141)	1	3		7	1
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	3	0	0	0	3	0	0	0	(211)	(162)	0	1	1	2	0	0	(211)	(151)	0	0		1	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(224)	(172)	0	0	0	0	0	0	(224)	(162)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(237)	(183)	0	0	0	0	0	0	(237)	(172)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(249)	(193)	0	0	0	0	0	0	(249)	(183)	0	0		0	0
				2,920	2,920	2,920	8,760	2,555	6,205	0	0	8,760	0	0	0	8,760	0	0	0			177	413	3,337	5,423	0	0			138	287	9	1,589	155

Cell Ref.	**Comment**
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	**Value**	**Unit**	**CELL**	**Description**
			REF	
Occupied Area	7,260	SF	**AD43**	
Existing Heating Plant Efficiency	87.0%		**AD44**	
Existing Chiller Efficiency	2.9	COP	**AD45**	
Fan Power	0.6	kW	**AD46**	
Heating Pump Power		kW	**AD47**	
Cooling Pump Power		kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC55**	75.0	**AE55**	
UnOccupied	72.0	**AC56**	70.0	**AE56**	

Average Proposed Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC60**	75.0	**AE60**	
UnOccupied	78.0	**AC61**	65.0	**AE61**	

Putnam County, NY
Putnam Family & Community Services - 1816
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								Existing Occupancy Schedule				Existing Heating/Cooling Schedule				Existing Motor Operating Schedule				Existing				Proposed								Savings		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	229	229	0	0	0	0	0	0	229	175	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	206	206	0	0	0	0	0	0	206	157	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	183	183	0	0	0	0	0	0	183	140	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	7	12	0	0	19	0	0	0	19	0	0	0	160	160	1	0	11	8	0	0	160	122	1	0	0	0	
85 to 90	87.5	73.2	0.0	0	80	13	93	35	58	0	0	93	0	0	0	93	0	0	0	137	137	4	0	54	39	0	0	137	105	3	1	0	0	
80 to 85	82.5	69.5	0.0	8	167	50	225	84	141	0	0	225	0	0	0	225	0	0	0	114	114	9	0	131	94	0	0	114	87	5	3	1	0	
75 to 80	77.5	65.3	0.0	35	216	108	359	135	224	0	0	359	0	0	0	359	0	0	0	91	91	11	0	209	150	0	0	91	70	7	4	1	0	
70 to 75	72.5	62.4	0.0	83	267	174	524	197	328	0	0	524	0	0	0	524	0	0	0	69	69	12	0	306	218	0	0	69	52	7	4	1	0	
65 to 70	67.5	59.5	0.0	221	316	261	798	299	499	0	0	798	0	0	0	798	0	0	0	46	46	12	0	466	333	0	0	46	35	7	4	1	0	
60 to 65	62.5	54.9	0.0	279	289	344	912	342	570	0	0	912	0	0	0	912	0	0	0	23	23	7	0	532	380	0	0	23	17	4	2	1	0	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	311	519	0	0	830	0	0	0	830	0	0	0	(19)	(16)	0	9	484	346	0	0	(19)	(3)	0	3		0	6
50 to 55	52.5	44.8	0.0	280	288	311	879	330	549	0	0	879	0	0	0	879	0	0	0	(27)	(22)	0	14	513	366	0	0	(27)	(9)	0	7		0	7
45 to 50	47.5	41.5	0.0	291	168	242	701	263	438	0	0	701	0	0	0	701	0	0	0	(35)	(28)	1	15	409	292	0	0	(35)	(16)	1	9		0	6
40 to 45	42.5	38.0	0.0	255	212	237	704	264	440	0	0	704	0	0	0	704	0	0	0	(43)	(34)	3	18	411	293	0	0	(43)	(22)	3	12		0	6
35 to 40	37.5	33.3	0.0	330	192	244	766	287	479	0	0	766	0	0	0	766	0	0	0	(51)	(41)	6	24	447	319	0	0	(51)	(28)	6	16		0	8
30 to 35	32.5	29.6	0.0	236	163	248	647	243	404	0	0	647	0	0	0	647	0	0	0	(58)	(47)	7	24	377	270	0	0	(58)	(34)	7	17		0	7
25 to 30	27.5	24.1	0.0	206	95	132	433	162	271	0	0	433	0	0	0	433	0	0	0	(66)	(53)	6	18	253	180	0	0	(66)	(41)	6	13		0	5
20 to 25	22.5	21.6	0.0	159	68	79	306	115	191	0	0	306	0	0	0	306	0	0	0	(74)	(59)	5	14	179	128	0	0	(74)	(47)	5	11		0	4
15 to 20	17.5	16.9	0.0	67	51	73	191	72	119	0	0	191	0	0	0	191	0	0	0	(82)	(66)	4	10	111	80	0	0	(82)	(53)	4	7		0	2
10 to 15	12.5	10.5	0.0	45	57	48	150	56	94	0	0	150	0	0	0	150	0	0	0	(90)	(72)	3	9	88	63	0	0	(90)	(59)	3	7		0	2
5 to 10	7.5	6.4	0.0	53	20	37	110	41	69	0	0	110	0	0	0	110	0	0	0	(97)	(78)	3	7	64	46	0	0	(97)	(66)	3	5		0	2
0 to 5	2.5	1.9	0.0	58	6	21	85	32	53	0	0	85	0	0	0	85	0	0	0	(105)	(84)	2	6	50	35	0	0	(105)	(72)	2	4		0	1
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	9	16	0	0	25	0	0	0	25	0	0	0	(113)	(91)	1	2	15	10	0	0	(113)	(78)	1	1		0	0
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	3	0	0	0	3	0	0	0	(121)	(97)	0	0	2	1	0	0	(121)	(84)	0	0		0	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(129)	(103)	0	0	0	0	0	0	(129)	(91)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(136)	(109)	0	0	0	0	0	0	(136)	(97)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(144)	(116)	0	0	0	0	0	0	(144)	(103)	0	0		0	0
				2,920	2,920	2,920	8,760	3,285	5,475	0	0	8,760	0	0	0	8,760	0	0	0			99	169	5,110	3,650	0	0			75	131	6	0	56

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	Value	Unit	CELL	Description
			REF	
Occupied Area	5,333	SF	**AD43**	
Existing Heating Plant Efficiency	95.0%		**AD44**	
Existing Chiller Efficiency	2.9	COP	**AD45**	
Fan Power		kW	**AD46**	
Heating Pump Power		kW	**AD47**	
Cooling Pump Power		kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC55**	70.0	**AE55**	
UnOccupied	72.0	**AC56**	70.0	**AE56**	

Average Proposed Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC60**	70.0	**AE60**	
UnOccupied	78.0	**AC61**	60.0	**AE61**	

Putnam County, NY
Burchetta Building (Law Dept) - 48 Gleneida
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								Existing Occupancy Schedule				Existing Heating/Cooling Schedule				Existing Motor Operating Schedule				Existing				Proposed								Savings		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59	59	0	0	0	0	0	0	59	45	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53	53	0	0	0	0	0	0	53	41	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	47	0	0	0	0	0	0	47	36	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	19	0	0	0	19	0	0	0	41	41	0	0	8	11	0	0	41	32	0	0	0	9	
85 to 90	87.5	73.2	0.0	0	80	13	93	22	71	0	0	93	0	0	0	93	0	0	0	35	35	1	0	42	51	0	0	35	27	1	0	0	42	
80 to 85	82.5	69.5	0.0	8	167	50	225	54	171	0	0	225	0	0	0	225	0	0	0	30	30	2	0	100	125	0	0	30	23	1	1	0	88	
75 to 80	77.5	65.3	0.0	35	216	108	359	85	274	0	0	359	0	0	0	359	0	0	0	24	24	3	0	160	199	0	0	24	18	1	1	0	133	
70 to 75	72.5	62.4	0.0	83	267	174	524	125	399	0	0	524	0	0	0	524	0	0	0	18	18	3	0	234	290	0	0	18	14	1	1	0	159	
65 to 70	67.5	59.5	0.0	221	316	261	798	190	608	0	0	798	0	0	0	798	0	0	0	12	12	3	0	356	442	0	0	12	9	1	1	0	188	
60 to 65	62.5	54.9	0.0	279	289	344	912	217	695	0	0	912	0	0	0	912	0	0	0	6	6	2	0	407	505	0	0	6	5	1	1	0	153	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	198	632	0	0	830	0	0	0	830	0	0	0	(19)	(19)	0	12	371	459	0	0	(19)	(1)	0	3		168	9
50 to 55	52.5	44.8	0.0	280	288	311	879	209	670	0	0	879	0	0	0	879	0	0	0	(27)	(27)	0	19	392	487	0	0	(27)	(8)	0	8		249	11
45 to 50	47.5	41.5	0.0	291	168	242	701	167	534	0	0	701	0	0	0	701	0	0	0	(34)	(34)	0	20	313	388	0	0	(34)	(16)	0	11		230	9
40 to 45	42.5	38.0	0.0	255	212	237	704	168	536	0	0	704	0	0	0	704	0	0	0	(42)	(42)	1	25	314	390	0	0	(42)	(24)	1	16		282	9
35 to 40	37.5	33.3	0.0	330	192	244	766	182	584	0	0	766	0	0	0	766	0	0	0	(50)	(50)	3	33	342	424	0	0	(50)	(31)	3	23		362	10
30 to 35	32.5	29.6	0.0	236	163	248	647	154	493	0	0	647	0	0	0	647	0	0	0	(57)	(57)	4	32	289	358	0	0	(57)	(39)	4	24		274	8
25 to 30	27.5	24.1	0.0	206	95	132	433	103	330	0	0	433	0	0	0	433	0	0	0	(65)	(65)	3	25	193	240	0	0	(65)	(47)	3	19		196	5
20 to 25	22.5	21.6	0.0	159	68	79	306	73	233	0	0	306	0	0	0	306	0	0	0	(73)	(73)	3	20	137	169	0	0	(73)	(54)	3	16		139	4
15 to 20	17.5	16.9	0.0	67	51	73	191	45	146	0	0	191	0	0	0	191	0	0	0	(80)	(80)	2	14	85	106	0	0	(80)	(62)	2	11		87	2
10 to 15	12.5	10.5	0.0	45	57	48	150	36	114	0	0	150	0	0	0	150	0	0	0	(88)	(88)	2	12	67	83	0	0	(88)	(70)	2	10		68	2
5 to 10	7.5	6.4	0.0	53	20	37	110	26	84	0	0	110	0	0	0	110	0	0	0	(96)	(96)	2	9	49	61	0	0	(96)	(77)	2	8		50	1
0 to 5	2.5	1.9	0.0	58	6	21	85	20	65	0	0	85	0	0	0	85	0	0	0	(103)	(103)	2	8	38	47	0	0	(103)	(85)	2	7		39	1
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	6	19	0	0	25	0	0	0	25	0	0	0	(111)	(111)	1	2	11	14	0	0	(111)	(93)	1	2		11	0
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	3	0	0	0	3	0	0	0	(119)	(119)	0	0	1	2	0	0	(119)	(100)	0	0		1	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(126)	(126)	0	0	0	0	0	0	(126)	(108)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(134)	(134)	0	0	0	0	0	0	(134)	(116)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(142)	(142)	0	0	0	0	0	0	(142)	(123)	0	0		0	0
				2,920	2,920	2,920	8,760	2,086	6,674	0	0	8,760	0	0	0	8,760	0	0	0			36	230	3,911	4,849	0	0			28	166	2	2,927	71

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	Value	Unit	CELL	Description
			REF	
Occupied Area	4,130	SF	**AD43**	
Existing Heating Plant Efficiency	82.1%		**AD44**	
Existing Chiller Efficiency	2.9	COP	**AD45**	
Fan Power	1.2	kW	**AD46**	
Heating Pump Power	0.2	kW	**AD47**	
Cooling Pump Power		kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC55**	70.0	**AE55**	
UnOccupied	72.0	**AC56**	70.0	**AE56**	

Average Proposed Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC60**	70.0	**AE60**	
UnOccupied	78.0	**AC61**	58.0	**AE61**	

Putnam County, NY
Tilly Foster Farm Building #8
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								Existing Occupancy Schedule				Existing Heating/Cooling Schedule				Existing Motor Operating Schedule				Existing				Proposed								Savings		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,029	1,029	0	0	0	0	0	0	1,029	787	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	926	926	0	0	0	0	0	0	926	708	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	823	823	0	0	0	0	0	0	823	629	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	3	16	0	0	19	0	0	0	19	0	0	0	720	720	4	0	8	11	0	0	720	551	2	2	1	11	
85 to 90	87.5	73.2	0.0	0	80	13	93	13	80	0	0	93	0	0	0	93	0	0	0	617	617	18	0	41	52	0	0	617	472	8	8	2	53	
80 to 85	82.5	69.5	0.0	8	167	50	225	32	193	0	0	225	0	0	0	225	0	0	0	514	514	36	0	99	126	0	0	514	393	16	15	5	112	
75 to 80	77.5	65.3	0.0	35	216	108	359	51	308	0	0	359	0	0	0	359	0	0	0	411	411	46	0	158	201	0	0	411	315	20	20	6	168	
70 to 75	72.5	62.4	0.0	83	267	174	524	75	449	0	0	524	0	0	0	524	0	0	0	309	309	50	0	231	293	0	0	309	236	22	21	7	200	
65 to 70	67.5	59.5	0.0	221	316	261	798	114	684	0	0	798	0	0	0	798	0	0	0	206	206	51	0	352	447	0	0	206	157	22	22	7	237	
60 to 65	62.5	54.9	0.0	279	289	344	912	130	782	0	0	912	0	0	0	912	0	0	0	103	103	29	0	402	510	0	0	103	79	13	12	4	194	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	119	711	0	0	830	0	0	0	830	0	0	0	(87)	(35)	4	60	366	464	0	0	(87)	(21)	4	26		176	34
50 to 55	52.5	44.8	0.0	280	288	311	879	126	753	0	0	879	0	0	0	879	0	0	0	(111)	(49)	8	84	387	492	0	0	(111)	(35)	8	42		261	42
45 to 50	47.5	41.5	0.0	291	168	242	701	100	601	0	0	701	0	0	0	701	0	0	0	(136)	(63)	9	83	309	392	0	0	(136)	(49)	9	45		241	38
40 to 45	42.5	38.0	0.0	255	212	237	704	101	603	0	0	704	0	0	0	704	0	0	0	(161)	(77)	12	100	310	394	0	0	(161)	(63)	12	57		296	43
35 to 40	37.5	33.3	0.0	330	192	244	766	109	657	0	0	766	0	0	0	766	0	0	0	(186)	(91)	16	127	337	429	0	0	(186)	(77)	16	75		381	52
30 to 35	32.5	29.6	0.0	236	163	248	647	92	555	0	0	647	0	0	0	647	0	0	0	(210)	(105)	16	122	285	362	0	0	(210)	(91)	16	74		346	48
25 to 30	27.5	24.1	0.0	206	95	132	433	62	371	0	0	433	0	0	0	433	0	0	0	(235)	(119)	12	92	191	242	0	0	(235)	(105)	12	57		248	35
20 to 25	22.5	21.6	0.0	159	68	79	306	44	262	0	0	306	0	0	0	306	0	0	0	(260)	(133)	10	72	135	171	0	0	(260)	(119)	10	46		175	27
15 to 20	17.5	16.9	0.0	67	51	73	191	27	164	0	0	191	0	0	0	191	0	0	0	(285)	(147)	7	50	84	107	0	0	(285)	(133)	7	32		110	18
10 to 15	12.5	10.5	0.0	45	57	48	150	21	129	0	0	150	0	0	0	150	0	0	0	(310)	(161)	6	43	66	84	0	0	(310)	(147)	6	27		86	15
5 to 10	7.5	6.4	0.0	53	20	37	110	16	94	0	0	110	0	0	0	110	0	0	0	(334)	(175)	5	34	48	62	0	0	(334)	(161)	5	22		63	12
0 to 5	2.5	1.9	0.0	58	6	21	85	12	73	0	0	85	0	0	0	85	0	0	0	(359)	(188)	4	28	37	48	0	0	(359)	(175)	4	18		49	10
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	4	21	0	0	25	0	0	0	25	0	0	0	(384)	(202)	1	9	11	14	0	0	(384)	(188)	1	6		14	3
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	0	3	0	0	3	0	0	0	3	0	0	0	(409)	(216)	0	1	1	2	0	0	(409)	(202)	0	1		2	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(433)	(230)	0	0	0	0	0	0	(433)	(216)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(458)	(244)	0	0	0	0	0	0	(458)	(230)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(483)	(258)	0	0	0	0	0	0	(483)	(244)	0	0		0	0
				2,920	2,920	2,920	8,760	1,251	7,509	0	0	8,760	0	0	0	8,760	0	0	0			343	904	3,859	4,901	0	0			212	628	31	3,423	376

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	Value	Unit	CELL	Description
			REF	
Occupied Area	12,600	SF	AD43	
Existing Heating Plant Efficiency	90.2%		AD44	
Existing Chiller Efficiency	3.2	COP	AD45	
Fan Power	1.5	kW	AD46	
Heating Pump Power		kW	AD47	
Cooling Pump Power		kW	AD48	
UnOcc. Fan & Pump Cycling	10.0%		AD49	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		AD50	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		AD51	% CFM Saved

Average Existing Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC55**	75.0	**AE55**	
UnOccupied	72.0	**AC56**	70.0	**AE56**	

Average Proposed Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC60**	75.0	**AE60**	
UnOccupied	78.0	**AC61**	65.0	**AE61**	

Energy Savings Calculations for

ECM 5: Heat Timer & Thermostatic Radiator Valves

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Putnam County, NY

Energy and Demand Savings Summary

Measure ID: **5**

Measure Name: **Heat Timer & Thermostatic Radiator Valves**

Measure Location:

Engineers:

Site Name:		**Bruen**	**Summary**
Item	Units	Savings	
Electricity			
Energy On-Peak	kWh		0
Energy Off-Peak	kWh	0	0
Energy Total	kWh	0	0
Demand On-Peak, Monthly	kW		0.0
Demand On-Peak, Annual	kW		0.0
Demand Off-Peak, Monthly	kW		0.0
Demand Off-Peak, Annual	kW		0.0
Fossil Fuel			0
Natural Gas (NG)	CCF	0	0
Liquid Propane Gas (LPG)	Gallons	0	0
Steam	Mlbs	0	0
Fuel Oil, #2	Gallons	2,927	2,927
Fuel Oil, #4	Gallons	0	0
Fuel Oil, #6	Gallons	0	0
Solar Value Stack	$	0	0
Water			0
Water Savings	kGallons		0
Sewer			0
Sewer Savings	kGallons		0

AMERESCO

Putnam County, NY
David D. Bruen County Office Building
Recommission Energy Management Systems

TMY-3 Weather Data for Danbury, CT								Existing Occupancy Schedule				Existing Heating/Cooling Schedule				Existing Motor Operating Schedule				Existing				Proposed								Savings		
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Cooling Energy Savings (MMBTU)	HVAC Electrical Savings (kWh)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**AA**	**AB**	**AC**	**AD**	**AE**	**AF**	**AG**	**AH**	**AI**
Cooling																																		
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	754	754	0	0	0	0	0	0	754	754	0	0	0	0	
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	679	679	0	0	0	0	0	0	679	679	0	0	0	0	
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	603	603	0	0	0	0	0	0	603	603	0	0	0	0	
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	12	7	0	0	12	7	0	0	528	528	2	1	6	13	0	0	528	528	1	2	0	0	
85 to 90	87.5	73.2	0.0	0	80	13	93	22	71	0	0	61	32	0	0	61	32	0	0	452	452	8	4	30	63	0	0	452	452	4	8	0	0	
80 to 85	82.5	69.5	0.0	8	167	50	225	54	171	0	0	147	78	0	0	147	78	0	0	377	377	16	8	74	151	0	0	377	377	8	16	0	0	
75 to 80	77.5	65.3	0.0	35	216	108	359	85	274	0	0	235	124	0	0	235	124	0	0	302	302	20	11	118	241	0	0	302	302	10	21	0	0	
70 to 75	72.5	62.4	0.0	83	267	174	524	125	399	0	0	343	181	0	0	343	181	0	0	226	226	22	12	172	352	0	0	226	226	11	23	0	0	
65 to 70	67.5	59.5	0.0	221	316	261	798	190	608	0	0	523	276	0	0	523	276	0	0	151	151	22	12	261	537	0	0	151	151	11	23	0	0	
60 to 65	62.5	54.9	0.0	279	289	344	912	217	695	0	0	597	315	0	0	597	315	0	0	75	75	13	7	299	613	0	0	75	75	6	13	0	0	
Heating																																		
55 to 60	57.5	48.4	0.0	287	248	295	830	198	632	0	0	543	287	0	0	543	287	0	0	(83)	(60)	0	48	272	558	0	0	(83)	0	0	7		0	42
50 to 55	52.5	44.8	0.0	280	288	311	879	209	670	0	0	576	303	0	0	576	303	0	0	(112)	(89)	0	75	288	591	0	0	(112)	(14)	0	11		0	64
45 to 50	47.5	41.5	0.0	291	168	242	701	167	534	0	0	459	242	0	0	459	242	0	0	(140)	(117)	3	79	229	472	0	0	(140)	(43)	3	28		0	51
40 to 45	42.5	38.0	0.0	255	212	237	704	168	536	0	0	461	243	0	0	461	243	0	0	(169)	(146)	10	99	230	474	0	0	(169)	(72)	10	48		0	51
35 to 40	37.5	33.3	0.0	330	192	244	766	182	584	0	0	502	264	0	0	502	264	0	0	(198)	(175)	17	129	251	515	0	0	(198)	(100)	17	73		0	56
30 to 35	32.5	29.6	0.0	236	163	248	647	154	493	0	0	424	223	0	0	424	223	0	0	(226)	(203)	20	127	212	435	0	0	(226)	(129)	20	80		0	47
25 to 30	27.5	24.1	0.0	206	95	132	433	103	330	0	0	284	149	0	0	284	149	0	0	(255)	(232)	17	97	142	291	0	0	(255)	(157)	17	65		0	32
20 to 25	22.5	21.6	0.0	159	68	79	306	73	233	0	0	200	106	0	0	200	106	0	0	(283)	(261)	15	77	100	206	0	0	(283)	(186)	15	55		0	22
15 to 20	17.5	16.9	0.0	67	51	73	191	45	146	0	0	125	66	0	0	125	66	0	0	(312)	(289)	11	53	63	128	0	0	(312)	(215)	11	39		0	14
10 to 15	12.5	10.5	0.0	45	57	48	150	36	114	0	0	98	52	0	0	98	52	0	0	(341)	(318)	10	46	49	101	0	0	(341)	(243)	10	35		0	11
5 to 10	7.5	6.4	0.0	53	20	37	110	26	84	0	0	72	38	0	0	72	38	0	0	(369)	(346)	8	37	36	74	0	0	(369)	(272)	8	29		0	8
0 to 5	2.5	1.9	0.0	58	6	21	85	20	65	0	0	56	29	0	0	56	29	0	0	(398)	(375)	7	31	28	57	0	0	(398)	(301)	7	25		0	6
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	6	19	0	0	16	9	0	0	16	9	0	0	(427)	(404)	2	10	8	17	0	0	(427)	(329)	2	8		0	2
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	2	1	0	0	2	1	0	0	(455)	(432)	0	1	1	2	0	0	(455)	(358)	0	1		0	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(484)	(461)	0	0	0	0	0	0	(484)	(387)	0	0		0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(513)	(490)	0	0	0	0	0	0	(513)	(415)	0	0		0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(541)	(518)	0	0	0	0	0	0	(541)	(444)	0	0		0	0
				2,920	2,920	2,920	8,760	2,086	6,674	0	0	5,736	3,024	0	0	5,736	3,024	0	0			223	964	2,868	5,892	0	0			172	610	0	0	406

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Existing Occupancy hours
M - P	Existing Heating/Cooling hours
Q - T	Existing Motor Operating Hours
U	Occupied Cooling and Heating loads (MBH)
V	Unoccupied Cooling and Heating loads (MBH)
W	Cooling = [col U] x ([col M] + [col O]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col M] + [col O]) x MIN([col U] + internal gains , 0) + IF([col I] + [col K] > [col M]+[col O] , (([col I] + [col K]) - ([col M] + [col O])) x MIN([col V] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
X	Cooling = [col R] x ([col J] + [col L]) ÷ 1,000 ÷ AD45
	Heating = -([col N] + [col P]) x MIN([col V] + internal gains , 0) + IF([col I] + [col K] < [col M] + [col O] , (([col M] + [col O]) - ([col I] + [col K])) x MIN([col U] + internal gains , 0)) ÷ 1,000 ÷ AD44
Y - AB	Proposed Operating hours
AC	Proposed Occupied Cooling and Heating Loads:
	Cooling = ([col B] - AC60) ÷ ([col B] - AC55) x [col U]
	Heating = ([col B] - AE60) ÷ ([col B] - AE55) x [col U]
AD	Proposed Unoccupied Cooling and Heating Loads:
	Cooling = ([col B] - AC61) ÷ ([col B] - AC56) x [col V]
	Heating = ([col B] - AE61) ÷ ([col B] - AE56) x [col V] ([col V] is modified to account for reduced kitchen and building ventilation due to EMS)
AE	Cooling = [col AC] x ([col Y] + [col AA]) ÷ 1,000 ÷ AD45
	Heating = -MIN([col I] + [col K] , [col Y] + [col AA]) x MIN([col AC] + internal gains , 0) + IF([col I] + [col K] > [col Y]+[col AA] , (([col I] + [col K]) - ([col Y] + [col AA])) x MIN([col AD] + internal gains , 0) , 0) ÷ 1,000 ÷ AD44
AF	Cooling = [col AD] x ([col Z] + [col AB]) ÷ 1,000 ÷ AD45
	Heating = -([col Z] + [col AB]) x MIN([col AD] + internal gains , 0) + IF([col I] + [col K] < [col Y] + [col AA] , (([col Y] + [col AA]) - ([col I] + [col K])) x MIN([col AC] + internal gains , 0)) ÷ 1,000 ÷ AD44
AG	= ([col W] + [col X]) - ([col AE] + [col AF])
	HVAC Fan and Pump Savings
AH	Cooling =([col Q] + [col S] + ([col R] + [col T]) x AD49) x (AD46 + AD48) - ([col Y] + [col AA] + ([col Z] + [col AB]) x AD49) x (AD46 + AD48)
	Heating =([col Q] + [col S]) x AD46 + IF(B20<35,([col R] + [col T]) x AD49 x AD46, IF(B20>50,0,([col R] + [col T]) x AD49 x AD46)) - (([col Y] + [col AA]) x AD46 + IF(B20<35,([col Z] + [col AB]) x AD49 x AD46, IF(B20>50,0,([col Z] + [col AB]) x AD49 x AD46)))
AI	= ([col W] + [col X]) - ([col AE] + [col AF])

Assumptions:	Value	Unit	CELL	Description
			REF	
Occupied Area	40,320	SF	**AD43**	
Existing Heating Plant Efficiency	79.0%		**AD44**	
Existing Chiller Efficiency	3.5	COP	**AD45**	
Fan Power		kW	**AD46**	
Heating Pump Power		kW	**AD47**	
Cooling Pump Power		kW	**AD48**	
UnOcc. Fan & Pump Cycling	10.0%		**AD49**	% Operating Hours During UnOcc.
UnOcc. Kitchen Vent. Reduction	0.0%		**AD50**	% CFM Saved
UnOcc. Ventilation Reduction	0.0%		**AD51**	% CFM Saved

Average Existing Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC55**	72.0	**AE55**	
UnOccupied	72.0	**AC56**	68.0	**AE56**	

Average Proposed Space Temperatures					
	Cooling		Heating		**Description**
Occupied	72.0	**AC60**	72.0	**AE60**	
UnOccupied	72.0	**AC61**	55.0	**AE61**	

Heat from Electric	36%		**AD63**	Fujitsu MiniSplits

Energy Savings Calculations for

ECM 6: Fuel Oil to Natural Gas Conversion

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Putnam County, NY	
Energy and Demand Savings Summary	
Measure ID:	**6**
Measure Name:	**Fuel Oil to Natural Gas Conversion**
Measure Location:	
Engineers:	

Site Name:		**Bruen**	**Court1812**	**Gov3**	**Hwy1**	**Summary**
Item	Units	Savings	Savings	Savings	Savings	
Electricity						
Energy On-Peak	kWh					0
Energy Off-Peak	kWh					0
Energy Total	kWh	0	0	0	0	0
Demand On-Peak, Monthly	kW					0.0
Demand On-Peak, Annual	kW					0.0
Demand Off-Peak, Monthly	kW					0.0
Demand Off-Peak, Annual	kW					0.0
Fossil Fuel						0
Natural Gas (NG)	CCF	-2,481	-2,776	-6,930		-12,187
Liquid Propane Gas (LPG)	Gallons				-1,218	-1,218
Steam	Mlbs					0
Fuel Oil, #2	Gallons	1,848	2,177	5,279	1,073	10,378
Fuel Oil, #4	Gallons					0
Fuel Oil, #6	Gallons					0
Solar Value Stack	$					0
Water						0
Water Savings	kGallons					0
Sewer						0
Sewer Savings	kGallons					0

Putnam County, NY
David D. Bruen County Office Building
Fuel Oil to Natural Gas Conversion

TMY-3 Weather Data for Danbury, CT								**Existing Occupancy Schedule**				**Proposed EMS Operating Hours**								**Proposed**		**Savings**
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Interacted Occ. Heat Load (MBH)	Interacted UnOcc. Heat Load (MBH)	Occ. Heat Usage (MMBTU)	UnOcc. Heat Usage (MMBTU)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**
Cooling																						
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0							
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0							
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0							
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	6	13	0	0							
85 to 90	87.5	73.2	0.0	0	80	13	93	22	71	0	0	30	63	0	0							
80 to 85	82.5	69.5	0.0	8	167	50	225	54	171	0	0	74	151	0	0							
75 to 80	77.5	65.3	0.0	35	216	108	359	85	274	0	0	118	241	0	0							
70 to 75	72.5	62.4	0.0	83	267	174	524	125	399	0	0	172	352	0	0							
65 to 70	67.5	59.5	0.0	221	316	261	798	190	608	0	0	261	537	0	0							
60 to 65	62.5	54.9	0.0	279	289	344	912	217	695	0	0	299	613	0	0							
Heating																						
55 to 60	57.5	48.4	0.0	287	248	295	830	198	632	0	0	272	558	0	0	(69)	4	0	5	0	5	0
50 to 55	52.5	44.8	0.0	280	288	311	879	209	670	0	0	288	591	0	0	(97)	(8)	0	8	0	8	0
45 to 50	47.5	41.5	0.0	291	168	242	701	167	534	0	0	229	472	0	0	(125)	(23)	0	11	0	11	0
40 to 45	42.5	38.0	0.0	255	212	237	704	168	536	0	0	230	474	0	0	(153)	(36)	0	21	0	21	0
35 to 40	37.5	33.3	0.0	330	192	244	766	182	584	0	0	251	515	0	0	(180)	(49)	0	34	0	33	0
30 to 35	32.5	29.6	0.0	236	163	248	647	154	493	0	0	212	435	0	0	(198)	(62)	1	37	1	36	0
25 to 30	27.5	24.1	0.0	206	95	132	433	103	330	0	0	142	291	0	0	(216)	(75)	3	30	3	30	0
20 to 25	22.5	21.6	0.0	159	68	79	306	73	233	0	0	100	206	0	0	(235)	(88)	4	25	4	25	0
15 to 20	17.5	16.9	0.0	67	51	73	191	45	146	0	0	63	128	0	0	(253)	(101)	3	18	3	18	0
10 to 15	12.5	10.5	0.0	45	57	48	150	36	114	0	0	49	101	0	0	(271)	(114)	4	16	4	16	0
5 to 10	7.5	6.4	0.0	53	20	37	110	26	84	0	0	36	74	0	0	(290)	(127)	3	13	3	13	0
0 to 5	2.5	1.9	0.0	58	6	21	85	20	65	0	0	28	57	0	0	(308)	(139)	3	11	3	11	0
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	6	19	0	0	8	17	0	0	(327)	(152)	1	4	1	4	0
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	1	2	0	0	(345)	(165)	0	0	0	0	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	(462)	(378)	0	0	0	0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	(491)	(406)	0	0	0	0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	(519)	(434)	0	0	0	0	0
				2,920	2,920	2,920	8,760	2,086	6,674	0	0	2,868	5,892	0	0			23	234	22	231	3

Cell Ref.	**Comment**
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Occupied hours as per the RFP data
M - P	Equipment operating hours after EMS is installed
Q	Interacted Occupied Heating loads (MBH)
R	Interacted Unoccupied Heating loads (MBH)
S	Heating = -(MIN([col I] + [col K],[col M] + [col O]) x MIN([col Q] + internal gains,0) + IF([col I] + [col K] > [col M] + [col O],(([col I] + [col K]) - ([col M] + [col O])) x MIN([col R] + internal gains,0),0)) ÷ 1,000 ÷ R43
T	Heating = -((([col N] + [col P]) x MIN([col R] + internal gains,0) + IF([col I] + [col K] < [col M] + [col O],(([col M] + [col O]) - ([col I] + [col K])) x MIN([col Q] + internal gains,0),0)) ÷ 1,000 ÷ R43
U	Heating = -(MIN([col I] + [col K],[col M] + [col O]) x MIN([col Q] + internal gains,0) + IF([col I] + [col K] > [col M] + [col O],(([col I] + [col K]) - ([col M] + [col O])) x MIN([col R] + internal gains,0),0)) ÷ 1,000 ÷ R44
V	Heating = -((([col N] + [col P]) x MIN([col R] + internal gains,0) + IF([col I] + [col K] < [col M] + [col O],(([col M] + [col O]) - ([col I] + [col K])) x MIN([col Q] + internal gains,0),0)) ÷ 1,000 ÷ R44
W	= [col S] + [col T] - [col U] - [col V]

Assumptions:	**Value**	**Unit**	**CELL REF**	**Description**
Existing Heating Plant Efficiency	79.0%		**R43**	Baseline Boiler Efficiency
Proposed Heating Plant Efficiency	80.0%		**R44**	Proposed Boiler Efficiency

Putnam County, NY
1812 Courthouse
Fuel Oil to Natural Gas Conversion

TMY-3 Weather Data for Danbury, CT								Existing Occupancy Schedule				Proposed EMS Operating Hours								Proposed		Savings
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Interacted Occ. Heat Load (MBH)	Interacted UnOcc. Heat Load (MBH)	Occ. Heat Usage (MMBTU)	UnOcc. Heat Usage (MMBTU)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**
Cooling																						
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0							
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0							
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0							
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	12	7	0	0							
85 to 90	87.5	73.2	0.0	0	80	13	93	22	71	0	0	61	32	0	0							
80 to 85	82.5	69.5	0.0	8	167	50	225	54	171	0	0	147	78	0	0							
75 to 80	77.5	65.3	0.0	35	216	108	359	85	274	0	0	235	124	0	0							
70 to 75	72.5	62.4	0.0	83	267	174	524	125	399	0	0	343	181	0	0							
65 to 70	67.5	59.5	0.0	221	316	261	798	190	608	0	0	523	276	0	0							
60 to 65	62.5	54.9	0.0	279	289	344	912	217	695	0	0	597	315	0	0							
Heating																						
55 to 60	57.5	48.4	0.0	287	248	295	830	198	632	0	0	543	287	0	0	(25)	(8)	0	9	0	9	1
50 to 55	52.5	44.8	0.0	280	288	311	879	209	670	0	0	576	303	0	0	(38)	(16)	0	19	0	18	1
45 to 50	47.5	41.5	0.0	291	168	242	701	167	534	0	0	459	242	0	0	(51)	(22)	0	22	0	21	1
40 to 45	42.5	38.0	0.0	255	212	237	704	168	536	0	0	461	243	0	0	(63)	(29)	0	29	0	28	2
35 to 40	37.5	33.3	0.0	330	192	244	766	182	584	0	0	502	264	0	0	(75)	(36)	3	40	2	37	3
30 to 35	32.5	29.6	0.0	236	163	248	647	154	493	0	0	424	223	0	0	(87)	(42)	5	40	4	37	3
25 to 30	27.5	24.1	0.0	206	95	132	433	103	330	0	0	284	149	0	0	(99)	(48)	5	31	4	29	2
20 to 25	22.5	21.6	0.0	159	68	79	306	73	233	0	0	200	106	0	0	(111)	(54)	5	24	4	23	2
15 to 20	17.5	16.9	0.0	67	51	73	191	45	146	0	0	125	66	0	0	(122)	(61)	4	17	3	16	1
10 to 15	12.5	10.5	0.0	45	57	48	150	36	114	0	0	98	52	0	0	(134)	(67)	3	15	3	14	1
5 to 10	7.5	6.4	0.0	53	20	37	110	26	84	0	0	72	38	0	0	(146)	(74)	3	12	3	11	1
0 to 5	2.5	1.9	0.0	58	6	21	85	20	65	0	0	56	29	0	0	(158)	(80)	3	10	2	9	1
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	6	19	0	0	16	9	0	0	(170)	(87)	1	3	1	3	0
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	2	1	0	0	(182)	(93)	0	0	0	0	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	(205)	(193)	0	0	0	0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	(218)	(206)	0	0	0	0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	(231)	(219)	0	0	0	0	0
				2,920	2,920	2,920	8,760	2,086	6,674	0	0	5,736	3,024	0	0			30	272	28	255	19

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Occupied hours as per the RFP data
M - P	Equipment operating hours after EMS is installed
Q	Interacted Occupied Heating loads (MBH)
R	Interacted Unoccupied Heating loads (MBH)
S	Heating = -(MIN([col I] + [col K],[col M] + [col O]) x MIN([col Q] + internal gains,0) + IF([col I] + [col K] > [col M] + [col O],(((col I] + [col K]) - ([col M] + [col O])) x MIN([col R] + internal gains,0),0)) ÷ 1,000 ÷ R43
T	Heating = -(((col N] + [col P]) x MIN([col R] + internal gains,0) + IF([col I] + [col K] < [col M] + [col O],(((col M] + [col O]) - ([col I] + [col K])) x MIN([col Q] + internal gains,0),0)) ÷ 1,000 ÷ R43
U	Heating = -(MIN([col I] + [col K],[col M] + [col O]) x MIN([col Q] + internal gains,0) + IF([col I] + [col K] > [col M] + [col O],(((col I] + [col K]) - ([col M] + [col O])) x MIN([col R] + internal gains,0),0)) ÷ 1,000 ÷ R44
V	Heating = -(((col N] + [col P]) x MIN([col R] + internal gains,0) + IF([col I] + [col K] < [col M] + [col O],(((col M] + [col O]) - ([col I] + [col K])) x MIN([col Q] + internal gains,0),0)) ÷ 1,000 ÷ R44
W	= [col S] + [col T] - [col U] - [col V]

Assumptions:	Value	Unit	CELL REF	Description
Existing Heating Plant Efficiency	75.0%		**R43**	Baseline Boiler Efficiency
Proposed Heating Plant Efficiency	80.0%		**R44**	Proposed Boiler Efficiency

Putnam County, NY
Donald B. Smith Government Campus - Building 3
Fuel Oil to Natural Gas Conversion

TMY-3 Weather Data for Danbury, CT								Existing Occupancy Schedule				Proposed EMS Operating Hours								Proposed		Savings
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Interacted Occ. Heat Load (MBH)	Interacted UnOcc. Heat Load (MBH)	Occ. Heat Usage (MMBTU)	UnOcc. Heat Usage (MMBTU)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**
Cooling																						
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0							
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0							
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0							
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	5	14	0	0							
85 to 90	87.5	73.2	0.0	0	80	13	93	22	71	0	0	22	71	0	0							
80 to 85	82.5	69.5	0.0	8	167	50	225	54	171	0	0	54	171	0	0							
75 to 80	77.5	65.3	0.0	35	216	108	359	85	274	0	0	85	274	0	0							
70 to 75	72.5	62.4	0.0	83	267	174	524	125	399	0	0	125	399	0	0							
65 to 70	67.5	59.5	0.0	221	316	261	798	190	608	0	0	190	608	0	0							
60 to 65	62.5	54.9	0.0	279	289	344	912	217	695	0	0	217	695	0	0							
Heating																						
55 to 60	57.5	48.4	0.0	287	248	295	830	198	632	0	0	198	632	0	0	(158)	0	0	0	0	0	0
50 to 55	52.5	44.8	0.0	280	288	311	879	209	670	0	0	209	670	0	0	(202)	(20)	10	4	10	3	0
45 to 50	47.5	41.5	0.0	291	168	242	701	167	534	0	0	167	534	0	0	(238)	(51)	16	24	15	23	1
40 to 45	42.5	38.0	0.0	255	212	237	704	168	536	0	0	168	536	0	0	(275)	(82)	24	46	23	44	2
35 to 40	37.5	33.3	0.0	330	192	244	766	182	584	0	0	182	584	0	0	(312)	(113)	35	73	34	70	4
30 to 35	32.5	29.6	0.0	236	163	248	647	154	493	0	0	154	493	0	0	(348)	(144)	37	81	35	79	4
25 to 30	27.5	24.1	0.0	206	95	132	433	103	330	0	0	103	330	0	0	(385)	(175)	29	68	28	65	3
20 to 25	22.5	21.6	0.0	159	68	79	306	73	233	0	0	73	233	0	0	(421)	(206)	24	57	23	55	3
15 to 20	17.5	16.9	0.0	67	51	73	191	45	146	0	0	45	146	0	0	(458)	(236)	17	41	17	40	2
10 to 15	12.5	10.5	0.0	45	57	48	150	36	114	0	0	36	114	0	0	(495)	(267)	15	37	15	36	2
5 to 10	7.5	6.4	0.0	53	20	37	110	26	84	0	0	26	84	0	0	(531)	(298)	12	31	12	30	1
0 to 5	2.5	1.9	0.0	58	6	21	85	20	65	0	0	20	65	0	0	(568)	(329)	11	26	10	25	1
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	6	19	0	0	6	19	0	0	(605)	(360)	3	8	3	8	0
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	1	2	0	0	(641)	(391)	0	1	0	1	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	(880)	(618)	0	0	0	0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	(932)	(664)	0	0	0	0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	(983)	(709)	0	0	0	0	0
				2,920	2,920	2,920	8,760	2,086	6,674	0	0	2,086	6,674	0	0			235	498	227	480	25

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Occupied hours as per the RFP data
M - P	Equipment operating hours after EMS is installed
Q	Interacted Occupied Heating loads (MBH)
R	Interacted Unoccupied Heating loads (MBH)
S	Heating = -(MIN([col I] + [col K],[col M] + [col O]) x MIN([col Q] + internal gains,0) + IF([col I] + [col K] > [col M] + [col O],(((col I] + [col K]) - ([col M] + [col O])) x MIN([col R] + internal gains,0),0)) ÷ 1,000 ÷ R43
T	Heating = -(((col N] + [col P]) x MIN([col R] + internal gains,0) + IF([col I] + [col K] < [col M] + [col O],(((col M] + [col O]) - ([col I] + [col K])) x MIN([col Q] + internal gains,0),0)) ÷ 1,000 ÷ R43
U	Heating = -(MIN([col I] + [col K],[col M] + [col O]) x MIN([col Q] + internal gains,0) + IF([col I] + [col K] > [col M] + [col O],(((col I] + [col K]) - ([col M] + [col O])) x MIN([col R] + internal gains,0),0)) ÷ 1,000 ÷ R44
V	Heating = -(((col N] + [col P]) x MIN([col R] + internal gains,0) + IF([col I] + [col K] < [col M] + [col O],(((col M] + [col O]) - ([col I] + [col K])) x MIN([col Q] + internal gains,0),0)) ÷ 1,000 ÷ R44
W	= [col S] + [col T] - [col U] - [col V]

Assumptions:	Value	Unit	CELL REF	Description
Existing Heating Plant Efficiency	77.2%		**R43**	Baseline Boiler Efficiency
Proposed Heating Plant Efficiency	80.0%		**R44**	Proposed Boiler Efficiency

Putnam County, NY
Highway Department - Building 1 Admin
Fuel Oil to Natural Gas Conversion

TMY-3 Weather Data for Danbury, CT								**Existing Occupancy Schedule**				**Proposed EMS Operating Hours**								**Proposed**		**Savings**
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Interacted Occ. Heat Load (MBH)	Interacted UnOcc. Heat Load (MBH)	Occ. Heat Usage (MMBTU)	UnOcc. Heat Usage (MMBTU)	Occ Cooling/Heating Energy Consump. (MMBTU)	UnOcc Cooling/Heating Energy Consump. (MMBTU)	Heating Energy Savings (MMBTU)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**
Cooling																						
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0							
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0							
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0							
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	7	12	0	0							
85 to 90	87.5	73.2	0.0	0	80	13	93	22	71	0	0	36	57	0	0							
80 to 85	82.5	69.5	0.0	8	167	50	225	54	171	0	0	87	138	0	0							
75 to 80	77.5	65.3	0.0	35	216	108	359	85	274	0	0	139	220	0	0							
70 to 75	72.5	62.4	0.0	83	267	174	524	125	399	0	0	203	321	0	0							
65 to 70	67.5	59.5	0.0	221	316	261	798	190	608	0	0	309	489	0	0							
60 to 65	62.5	54.9	0.0	279	289	344	912	217	695	0	0	353	559	0	0							
Heating																						
55 to 60	57.5	48.4	0.0	287	248	295	830	198	632	0	0	321	509	0	0	(20)	(6)	0	5	0	3	1
50 to 55	52.5	44.8	0.0	280	288	311	879	209	670	0	0	340	539	0	0	(24)	(11)	0	9	0	7	2
45 to 50	47.5	41.5	0.0	291	168	242	701	167	534	0	0	271	430	0	0	(29)	(16)	0	11	0	8	3
40 to 45	42.5	38.0	0.0	255	212	237	704	168	536	0	0	272	432	0	0	(34)	(20)	0	15	0	11	4
35 to 40	37.5	33.3	0.0	330	192	244	766	182	584	0	0	296	470	0	0	(39)	(25)	1	20	0	15	5
30 to 35	32.5	29.6	0.0	236	163	248	647	154	493	0	0	250	397	0	0	(43)	(30)	2	20	1	15	5
25 to 30	27.5	24.1	0.0	206	95	132	433	103	330	0	0	168	265	0	0	(48)	(35)	2	16	1	12	4
20 to 25	22.5	21.6	0.0	159	68	79	306	73	233	0	0	118	188	0	0	(53)	(39)	2	13	1	9	4
15 to 20	17.5	16.9	0.0	67	51	73	191	45	146	0	0	74	117	0	0	(58)	(44)	1	9	1	7	3
10 to 15	12.5	10.5	0.0	45	57	48	150	36	114	0	0	58	92	0	0	(62)	(49)	1	8	1	6	2
5 to 10	7.5	6.4	0.0	53	20	37	110	26	84	0	0	43	67	0	0	(67)	(54)	1	6	1	5	2
0 to 5	2.5	1.9	0.0	58	6	21	85	20	65	0	0	33	52	0	0	(72)	(58)	1	5	1	4	2
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	6	19	0	0	10	15	0	0	(77)	(63)	0	2	0	1	1
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	1	2	0	0	(81)	(68)	0	0	0	0	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	(86)	(73)	0	0	0	0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	(91)	(77)	0	0	0	0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	(96)	(82)	0	0	0	0	0
				2,920	2,920	2,920	8,760	2,086	6,674	0	0	3,389	5,371	0	0			11	138	8	103	38

Cell Ref.	**Comment**
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Occupied hours as per the RFP data
M - P	Equipment operating hours after EMS is installed
Q	Interacted Occupied Heating loads (MBH)
R	Interacted Unoccupied Heating loads (MBH)
S	Heating = -(MIN([col I] + [col K],[col M] + [col O]) x MIN([col Q] + internal gains,0) + IF([col I] + [col K] > [col M] + [col O],(([col I] + [col K]) - ([col M] + [col O])) x MIN([col R] + internal gains,0),0)) ÷ 1,000 ÷ R43
T	Heating = -(([col N] + [col P]) x MIN([col R] + internal gains,0) + IF([col I] + [col K] < [col M] + [col O],(([col M] + [col O]) - ([col I] + [col K])) x MIN([col Q] + internal gains,0),0)) ÷ 1,000 ÷ R43
U	Heating = -(MIN([col I] + [col K],[col M] + [col O]) x MIN([col Q] + internal gains,0) + IF([col I] + [col K] > [col M] + [col O],(([col I] + [col K]) - ([col M] + [col O])) x MIN([col R] + internal gains,0),0)) ÷ 1,000 ÷ R44
V	Heating = -(([col N] + [col P]) x MIN([col R] + internal gains,0) + IF([col I] + [col K] < [col M] + [col O],(([col M] + [col O]) - ([col I] + [col K])) x MIN([col Q] + internal gains,0),0)) ÷ 1,000 ÷ R44
W	= [col S] + [col T] - [col U] - [col V]

Assumptions:	**Value**	**Unit**	**CELL REF**	**Description**
Existing Heating Plant Efficiency	71.0%		**R43**	Baseline Boiler Efficiency
Proposed Heating Plant Efficiency	95.0%		**R44**	Proposed Boiler Efficiency

Energy Savings Calculations for

ECM 8: Variable Frequency Drives for HW Pumps

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Putnam County, NY	
Energy and Demand Savings Summary	
Measure ID:	**8**
Measure Name:	**Variable Frequency Drives For HW Pumps**
Measure Location:	
Engineers:	

Site Name:		**Jail**	**EOC**	**Summary**
Item	Units	Savings	Savings	
Electricity				
Energy On-Peak	kWh	48,633	11,652	60,285
Energy Off-Peak	kWh	0	0	0
Energy Total	kWh	48,633	11,652	60,285
Demand On-Peak, Monthly	kW			0.0
Demand On-Peak, Annual	kW			0.0
Demand Off-Peak, Monthly	kW			0.0
Demand Off-Peak, Annual	kW			0.0
Fossil Fuel				
Natural Gas (NG)	CCF			0
Liquid Propane Gas (LPG)	Gallons			0
Steam	Mlbs			0
Fuel Oil, #2	Gallons			0
Fuel Oil, #4	Gallons			0
Fuel Oil, #6	Gallons			0
Solar Value Stack	$			0

Putnam County, NY
Sheriff's Department/Correctional Facility
Variable Frequency Drives For HW Pumps

TMY-3 Weather Data for Danbury, CT								Proposed EMS Schedule and Loads						Existing Pump Usage		Proposed Pump Usage				Savings	
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Peak Cool/Heat Pump Usage (kWh)	Off-Peak Cool/Heat Pump Usage (kWh)	Proposed Occ VFD Load Percentage (%)	Proposed UnOcc VFD Load Percentage (%)	Peak Cool/Heat Pump Usage (kWh)	Off-Peak Cool/Heat Pump Usage (kWh)	HVAC Pump Savings (Peak kWh)	HVAC Pump Savings (Off Peak kWh)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**
Cooling																					
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	2,153	1,646	0	0	100%	100%	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	1,937	1,481	0	0	100%	100%	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	1,722	1,317	0	0	100%	100%	0	0	0	0
90 to 95	92.5	76.2	0.0	0	17	2	19	15	4	0	0	1,507	1,152	134	0	100%	100%	137	0	(3)	0
85 to 90	87.5	73.2	0.0	0	80	13	93	75	18	0	0	1,292	988	657	0	86%	86%	422	0	235	0
80 to 85	82.5	69.5	0.0	8	167	50	225	182	43	0	0	1,076	823	1,589	0	71%	71%	591	0	998	0
75 to 80	77.5	65.3	0.0	35	216	108	359	291	68	0	0	861	658	2,536	0	60%	60%	559	0	1,977	0
70 to 75	72.5	62.4	0.0	83	267	174	524	424	100	0	0	646	494	3,702	0	60%	60%	816	0	2,886	0
65 to 70	67.5	59.5	0.0	221	316	261	798	646	152	0	0	431	329	5,637	0	60%	60%	1,242	0	4,395	0
60 to 65	62.5	54.9	0.0	279	289	344	912	738	174	0	0	215	165	6,443	0	60%	60%	1,420	0	5,023	0
Heating																					
55 to 60	57.5	48.4	0.0	287	248	295	830	672	158	0	0	(428)	0	5,728	0	60%	60%	1,263	0	4,466	0
50 to 55	52.5	44.8	0.0	280	288	311	879	712	167	0	0	(600)	(57)	6,067	0	60%	60%	1,337	0	4,730	0
45 to 50	47.5	41.5	0.0	291	168	242	701	567	134	0	0	(771)	(170)	4,952	0	60%	60%	1,091	0	3,861	0
40 to 45	42.5	38.0	0.0	255	212	237	704	570	134	0	0	(942)	(284)	4,973	0	60%	60%	1,096	0	3,877	0
35 to 40	37.5	33.3	0.0	330	192	244	766	620	146	0	0	(1,113)	(398)	5,411	0	60%	60%	1,193	0	4,218	0
30 to 35	32.5	29.6	0.0	236	163	248	647	524	123	0	0	(1,285)	(511)	5,516	0	60%	60%	1,216	0	4,300	0
25 to 30	27.5	24.1	0.0	206	95	132	433	351	82	0	0	(1,456)	(625)	3,692	0	60%	60%	814	0	2,878	0
20 to 25	22.5	21.6	0.0	159	68	79	306	248	58	0	0	(1,627)	(738)	2,609	0	61%	60%	606	0	2,003	0
15 to 20	17.5	16.9	0.0	67	51	73	191	155	36	0	0	(1,799)	(852)	1,628	0	68%	60%	487	0	1,142	0
10 to 15	12.5	10.5	0.0	45	57	48	150	121	29	0	0	(1,970)	(966)	1,279	0	74%	68%	485	0	794	0
5 to 10	7.5	6.4	0.0	53	20	37	110	89	21	0	0	(2,141)	(1,079)	938	0	81%	76%	446	0	492	0
0 to 5	2.5	1.9	0.0	58	6	21	85	69	16	0	0	(2,313)	(1,193)	725	0	87%	84%	426	0	299	0
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	20	5	0	0	(2,484)	(1,306)	213	0	94%	92%	153	0	60	0
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	2	1	0	0	(2,655)	(1,420)	26	0	100%	100%	22	0	3	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	(2,827)	(1,534)	0	0	100%	100%	0	0	0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	(2,998)	(1,647)	0	0	100%	100%	0	0	0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	(3,169)	(1,761)	0	0	100%	100%	0	0	0	0
				2,920	2,920	2,920	8,760	7,091	1,669	0	0			64,455	0			15,821	0	48,633	0

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Proposed Operating hours
M	Proposed Occupied Cooling and Heating Loads from EMS
N	Proposed Unoccupied Cooling and Heating Loads from EMS
O	= ([col I] + [col J] x P46) x P44
P	= ([col K] + [col L] x P46) x P44
Q	Estimated VFD Loading based on 100% at design day load and 60% at minimum
R	Estimated VFD Loading based on 100% at design day load and 60% at minimum
S	= ([col I] x P44 x [col Q] ^3 / 0.98 + ([col J] x P44 x P46 x [col R] ^3 / 0.98
T	= ([col K] x P44 x [col Q] ^3 / 0.98 + ([col L] x P44 x P46 x [col R] ^3 / 0.98
U	= ([col O] - [col S])
V	= ([col P] - [col T])

Assumptions:	Value	Unit	CELL	Description
			REF	
Occupied Area	87,895	SF	**P43**	
Pump Power	8.5	kW	**P44**	total kW of Secondary HHW pumps
Minimum Allowable VFD Speed	60.0%		**P45**	estimate
UnOcc. Pump Cycling	10.0%		**P46**	% Operating Hours During UnOcc.

Putnam County, NY
Emergency Operations Center/TOPS
Variable Frequency Drives For HW Pumps

TMY-3 Weather Data for Danbury, CT								**Proposed EMS Schedule and Loads**						**Existing Pump Usage**		**Proposed Pump Usage**				**Savings**	
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Occ. Cool/ Heat Load (MBH)	UnOcc. Cool/ Heat Load (MBH)	Peak Cool/Heat Pump Usage (kWh)	Off-Peak Cool/Heat Pump Usage (kWh)	Proposed Occ VFD Load Percentage (%)	Proposed UnOcc VFD Load Percentage (%)	Peak Cool/Heat Pump Usage (kWh)	Off-Peak Cool/Heat Pump Usage (kWh)	HVAC Pump Savings (Peak kWh)	HVAC Pump Savings (Off Peak kWh)
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**
Cooling																					
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	2,136	1,634	0	0	100%	100%	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	1,923	1,470	0	0	100%	100%	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	1,709	1,307	0	0	100%	100%	0	0	0	0
90 to 95	92.5	76.2	0.0	0	17	2	19	8	11	0	0	1,495	1,143	28	0	100%	100%	28	0	(1)	0
85 to 90	87.5	73.2	0.0	0	80	13	93	42	51	0	0	1,282	980	136	0	86%	86%	87	0	49	0
80 to 85	82.5	69.5	0.0	8	167	50	225	100	125	0	0	1,068	817	329	0	71%	71%	122	0	207	0
75 to 80	77.5	65.3	0.0	35	216	108	359	160	199	0	0	854	653	526	0	60%	60%	116	0	410	0
70 to 75	72.5	62.4	0.0	83	267	174	524	234	290	0	0	641	490	767	0	60%	60%	169	0	598	0
65 to 70	67.5	59.5	0.0	221	316	261	798	356	442	0	0	427	327	1,168	0	60%	60%	257	0	911	0
60 to 65	62.5	54.9	0.0	279	289	344	912	407	505	0	0	214	163	1,335	0	60%	60%	294	0	1,041	0
Heating																					
55 to 60	57.5	48.4	0.0	287	248	295	830	371	459	0	0	(123)	(71)	1,081	0	60%	60%	238	0	843	0
50 to 55	52.5	44.8	0.0	280	288	311	879	392	487	0	0	(161)	(99)	1,145	0	60%	60%	252	0	892	0
45 to 50	47.5	41.5	0.0	291	168	242	701	313	388	0	0	(198)	(128)	1,026	0	60%	60%	226	0	800	0
40 to 45	42.5	38.0	0.0	255	212	237	704	314	390	0	0	(235)	(156)	1,031	0	60%	60%	227	0	803	0
35 to 40	37.5	33.3	0.0	330	192	244	766	342	424	0	0	(273)	(185)	1,121	0	60%	60%	247	0	874	0
30 to 35	32.5	29.6	0.0	236	163	248	647	289	358	0	0	(310)	(213)	1,888	0	60%	60%	416	0	1,471	0
25 to 30	27.5	24.1	0.0	206	95	132	433	193	240	0	0	(347)	(241)	1,263	0	60%	60%	278	0	985	0
20 to 25	22.5	21.6	0.0	159	68	79	306	137	169	0	0	(385)	(270)	893	0	63%	61%	212	0	681	0
15 to 20	17.5	16.9	0.0	67	51	73	191	85	106	0	0	(422)	(298)	557	0	69%	68%	153	0	405	0
10 to 15	12.5	10.5	0.0	45	57	48	150	67	83	0	0	(460)	(326)	438	0	75%	74%	139	0	299	0
5 to 10	7.5	6.4	0.0	53	20	37	110	49	61	0	0	(497)	(355)	321	0	82%	81%	119	0	202	0
0 to 5	2.5	1.9	0.0	58	6	21	85	38	47	0	0	(534)	(383)	248	0	88%	87%	107	0	141	0
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	11	14	0	0	(572)	(412)	73	0	94%	94%	36	0	37	0
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	(609)	(440)	9	0	100%	100%	5	0	4	0
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	(646)	(468)	0	0	100%	100%	0	0	0	0
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	(684)	(497)	0	0	100%	100%	0	0	0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	(721)	(525)	0	0	100%	100%	0	0	0	0
				2,920	2,920	2,920	8,760	3,911	4,849	0	0			15,382	0			3,730	0	11,652	0

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I - L	Proposed Operating hours
M	Proposed Occupied Cooling and Heating Loads from EMS
N	Proposed Unoccupied Cooling and Heating Loads from EMS
O	= ([col I] + [col J] x P46) x P44
P	= ([col K] + [col L] x P46) x P44
Q	Estimated VFD Loading based on 100% at design day load and 60% at minimum
R	Estimated VFD Loading based on 100% at design day load and 60% at minimum
S	= ([col I] x P44 x [col Q] ^3 / 0.98 + ([col J] x P44 x P46 x [col R] ^3 / 0.98
T	= ([col K] x P44 x [col Q] ^3 / 0.98 + ([col L] x P44 x P46 x [col R] ^3 / 0.98
U	= ([col O] - [col S])
V	= ([col P] - [col T])

Assumptions:	Value	Unit	CELL	Description
			REF	
Occupied Area	24,922	SF	P43	
Pump Power	2.9	kW	P44	total kW of Secondary HHW pumps
Minimum Allowable VFD Speed	60.0%		P45	estimate
UnOcc. Pump Cycling	10.0%		P46	% Operating Hours During UnOcc.

Energy Savings Calculations for

ECM 10: Premium Efficiency Transformers

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Putnam County, NY	
Energy and Demand Savings Summary	
Measure ID:	**10**
Measure Name:	**Premium Efficiency Transformers**
Measure Location:	
Engineers:	

Site Name:		**Jail**	**Court**	**EOC**	**KoehlerSr**	**Summary**
Item	Units	Savings	Savings	Savings	Savings	
Electricity						
Energy On-Peak	kWh	18,590	51,816	8,413	13,399	92,218
Energy Off-Peak	kWh	0	0	0	0	0
Energy Total	kWh	18,590	51,816	8,413	13,399	92,218
Demand On-Peak, Monthly	kW	2.1	5.9	1.0	1.5	10.5
Demand On-Peak, Annual	kW	25.4	70.8	11.5	18.3	126.0
Demand Off-Peak, Monthly	kW					0.0
Demand Off-Peak, Annual	kW					0.0
Fossil Fuel						0
Natural Gas (NG)	CCF					0
Liquid Propane Gas (LPG)	Gallons					0
Steam	Mlbs					0
Fuel Oil, #2	Gallons					0
Fuel Oil, #4	Gallons					0
Fuel Oil, #6	Gallons					0
Solar Value Stack	$					0
Water						0
Water Savings	kGallons					0
Sewer						0
Sewer Savings	kGallons					0

Putnam County, NY
Sheriff's Department/Correctional Facilit
Premium Efficiency Transformer

	Existing Transformer Details													Proposed Transformer Details						Savings		
Location	Unit Size (kVA)	Occ. Hours % Load	UnOcc. Hours % Load	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Load Power Factor	Existing Occ. Efficiency	Existing UnOcc. Efficiency	Existing Occ. kW Losses	Existing UnOcc. kW Losses	Existing Annual Peak Losses (kWh)	Existing Annual Off-Peak Losses (kWh)	Proposed Occ. Efficiency	Proposed UnOcc. Efficiency	Proposed Occ. kW Losses	Proposed UnOcc. kW Losses	Proposed Annual Peak Losses (kWh)	Proposed Annual Off-Peak Losses (kWh)	Monthly Demand Savings (kW)	Annual Peak Electric Energy Savings (kWh)	Annual Off-Peak Electric Energy Savings (kWh)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Mech Room near Boiler Room	30.0	15.0%	10.0%	7,091	1,669	0	0	95.0%	90.1%	86.0%	0.47	0.46	4,118	0	97.5%	96.7%	0.11	0.10	954	0	0.36	3,164	0
Mech Room near Boiler Room	45.0	15.0%	10.0%	7,091	1,669	0	0	95.0%	89.7%	85.5%	0.74	0.72	6,423	0	97.9%	97.2%	0.14	0.12	1,206	0	0.59	5,217	0
Mech Room near Boiler Room	112.5	15.0%	10.0%	7,091	1,669	0	0	95.0%	91.9%	88.4%	1.42	1.40	12,404	0	98.4%	97.9%	0.26	0.23	2,196	0	1.16	10,208	0
Totals	**187.5**	**15.0%**	**10.0%**								**2.63**	**2.58**	**22,945**	**0**			**0.51**	**0.45**	**4,355**	**0**	**2.12**	**18,590**	**0**

Cell Ref.	Comment
A	Location of Transformer
B	Transformer Nameplate Rating - kVA
C - D	Estimated existing transformer loading as a percent of nameplate rating
E - H	Facility operating hours from EMS calculation
I	Estimated load powerfactor seen at the transformer - output
J	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (standard no load losses) + [col D]^2 x (standard full load losses minus standard no load losses))
K	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (standard no load losses) + [col E]^2 x (standard full load losses minus standard no load losses))
L	= ([col B] x [col D] x [col J] ÷ [col K] - [col B] x [col D] x [col J])
M	= ([col B] x [col E] x [col J] ÷ [col L] - [col B] x [col E] x [col J])
N	= [col M] x [col F] + [col N] x [col G]
O	= [col M] x [col H] + [col N] x [col I]
P	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (esaver no load losses) + [col D]^2 x (esaver full load losses minus esaver no load losses))
Q	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (esaver no load losses) + [col E]^2 x (esaver full load losses minus esaver no load losses))
R	= ([col B] x [col D] x [col J] ÷ [col Q] - [col B] x [col D] x [col J])
S	= ([col B] x [col E] x [col J] ÷ [col R] - [col B] x [col E] x [col J])
T	= [col S] x [col F] + [col T] x [col G]
U	= [col S] x [col H] + [col T] x [col I]
V	= [col M] - [col S]
W	= [col N] - [col T]
X	= [col O] -[col U]

ESAVER-C3L loss table

kVA	No Load (W)	Full load (W)
15	55	851
30	90	1313
45	116	1552
75	157	2204
112.5	217	2546
150	298	3388
225	423	4881
300	526	6066
500	795	8527
750	1132	11423

Standard AL 115C loss table

kVA	No Load (W)	Full load (W)
15	325	985
30	480	1218
45	750	1835
75	956	2789
112.5	1448	3559
150	1727	4620
225	1950	6740
300	2760	7160
500	3830	9830
750	3980	16800

Putnam County, NY
New Putnam County Courthouse
Premium Efficiency Transformers

	Existing Transformer Details														Proposed Transformer Details						Savings		
Location	Unit Size (kVA)	Occ. Hours % Load	UnOcc. Hours % Load	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Load Power Factor	Existing Occ. Efficiency	Existing UnOcc. Efficiency	Existing Occ. kW Losses	Existing UnOcc. kW Losses	Existing Annual Peak Losses (kWh)	Existing Annual Off Peak Losses (kWh)	Proposed Occ. Efficiency	Proposed UnOcc. Efficiency	Proposed Occ. kW Losses	Proposed UnOcc. kW Losses	Proposed Annual Peak Losses (kWh)	Proposed Annual Off Peak Losses (kWh)	Monthly Demand Savings (kW)	Annual Peak Electric Energy Savings (kWh)	Annual Off-Peak Electric Energy Savings (kWh)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Penthouse	45.0	15.0%	10.0%	3,911	4,849	0	0	95.0%	89.7%	85.5%	0.74	0.72	6,382	0	97.9%	97.2%	0.14	0.12	1,152	0	0.59	5,231	0
Boiler Room	112.5	15.0%	10.0%	3,911	4,849	0	0	95.0%	91.9%	88.4%	1.42	1.40	12,324	0	98.4%	97.9%	0.26	0.23	2,108	0	1.16	10,216	0
Boiler Room	112.5	15.0%	10.0%	3,911	4,849	0	0	95.0%	91.9%	88.4%	1.42	1.40	12,324	0	98.4%	97.9%	0.26	0.23	2,108	0	1.16	10,216	0
Electrical Closet Floor 1	45.0	15.0%	10.0%	3,911	4,849	0	0	95.0%	89.7%	85.5%	0.74	0.72	6,382	0	97.9%	97.2%	0.14	0.12	1,152	0	0.59	5,231	0
Electrical Closet Floor 2	45.0	15.0%	10.0%	3,911	4,849	0	0	95.0%	89.7%	85.5%	0.74	0.72	6,382	0	97.9%	97.2%	0.14	0.12	1,152	0	0.59	5,231	0
Electrical Closet Floor 3	45.0	15.0%	10.0%	3,911	4,849	0	0	95.0%	89.7%	85.5%	0.74	0.72	6,382	0	97.9%	97.2%	0.14	0.12	1,152	0	0.59	5,231	0
Electrical Closet Floor 4	45.0	15.0%	10.0%	3,911	4,849	0	0	95.0%	89.7%	85.5%	0.74	0.72	6,382	0	97.9%	97.2%	0.14	0.12	1,152	0	0.59	5,231	0
Electrical Room Lower Level	45.0	15.0%	10.0%	3,911	4,849	0	0	95.0%	89.7%	85.5%	0.74	0.72	6,382	0	97.9%	97.2%	0.14	0.12	1,152	0	0.59	5,231	0
Totals	**495.0**	**15.0%**	**10.0%**								**7.26**	**7.13**	**62,941**	**0**			**1.36**	**1.20**	**11,125**	**0**	**5.90**	**51,816**	**0**

Cell Ref.	Comment
A	Location of Transformer
B	Transformer Nameplate Rating - kVA
C - D	Estimated existing transformer loading as a percent of nameplate rating
E - H	Facility operating hours from EMS calculation
I	Estimated load powerfactor seen at the transformer - output
J	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (standard no load losses) + [col D]^2 x (standard full load losses minus standard no load losses))
K	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (standard no load losses) + [col E]^2 x (standard full load losses minus standard no load losses))
L	= ([col B] x [col D] x [col J] ÷ [col K] - [col B] x [col D] x [col J])
M	= ([col B] x [col E] x [col J] ÷ [col L] - [col B] x [col E] x [col J])
N	= [col M] x [col F] + [col N] x [col G]
O	= [col M] x [col H] + [col N] x [col I]
P	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (esaver no load losses) + [col D]^2 x (esaver full load losses minus esaver no load losses))
Q	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (esaver no load losses) + [col E]^2 x (esaver full load losses minus esaver no load losses))
R	= ([col B] x [col D] x [col J] ÷ [col Q] - [col B] x [col D] x [col J])
S	= ([col B] x [col E] x [col J] ÷ [col R] - [col B] x [col E] x [col J])
T	= [col S] x [col F] + [col T] x [col G]
U	= [col S] x [col H] + [col T] x [col I]
V	= [col M] - [col S]
W	= [col N] - [col T]
X	= [col O] -[col U]

ESAVER-C3L loss table

kVA	No Load (W)	Full load (W)
15	55	851
30	90	1313
45	116	1552
75	157	2204
112.5	217	2546
150	298	3388
225	423	4881
300	526	6066
500	795	8527
750	1132	11423

Standard AL 115C loss table

kVA	No Load (W)	Full load (W)
15	325	985
30	480	1218
45	750	1835
75	956	2789
112.5	1448	3559
150	1727	4620
225	1950	6740
300	2760	7160
500	3830	9830
750	3980	16800

Putnam County, NY
Emergency Operations Center/TOPS
Premium Efficiency Transformers

	Existing Transformer Details														Proposed Transformer Details						Savings		
Location	Unit Size (kVA)	Occ. Hours % Load	UnOcc. Hours % Load	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Load Power Factor	Existing Occ. Efficiency	Existing UnOcc. Efficiency	Existing Occ. kW Losses	Existing UnOcc. kW Losses	Existing Annual Peak Losses (kWh)	Existing Annual Off Peak Losses (kWh)	Proposed Occ. Efficiency	Proposed UnOcc. Efficiency	Proposed Occ. kW Losses	Proposed UnOcc. kW Losses	Proposed Annual Peak Losses (kWh)	Proposed Annual Off Peak Losses (kWh)	Monthly Demand Savings (kW)	Annual Peak Electric Energy Savings (kWh)	Annual Off Peak Electric Energy Savings (kWh)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Electrical Room #1 (Powersmiths)	112.5	15.0%	10.0%	3,911	4,849	0	0	95.0%	91.9%	88.4%	0.00	0.00	0	0	98.4%	97.9%	0.00	0.00	0	0	0.00	0	0
Electrical Room #1 (Regular)	30.0	15.0%	10.0%	3,911	4,849	0	0	95.0%	90.1%	86.0%	0.47	0.46	4,090	0	97.5%	96.7%	0.11	0.10	908	0	0.36	3,183	0
Electrical Room #2 (Powersmiths)	112.5	15.0%	10.0%	3,911	4,849	0	0	95.0%	91.9%	88.4%	0.00	0.00	0	0	98.4%	97.9%	0.00	0.00	0	0	0.00	0	0
Electrical Room #2 (Regular)	45.0	15.0%	10.0%	3,911	4,849	0	0	95.0%	89.7%	85.5%	0.74	0.72	6,382	0	97.9%	97.2%	0.14	0.12	1,152	0	0.59	5,231	0
Totals	**75.0**	**15.0%**	**10.0%**								**1.21**	**1.19**	**10,472**	**0**			**0.25**	**0.22**	**2,059**	**0**	**0.95**	**8,413**	**0**

Cell Ref.	Comment
A	Location of Transformer
B	Transformer Nameplate Rating - kVA
C - D	Estimated existing transformer loading as a percent of nameplate rating
E - H	Facility operating hours from EMS calculation
I	Estimated load powerfactor seen at the transformer - output
J	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (standard no load losses) + [col D]^2 x (standard full load losses minus standard no load losses))
K	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (standard no load losses) + [col E]^2 x (standard full load losses minus standard no load losses))
L	= ([col B] x [col D] x [col J] ÷ [col K] - [col B] x [col D] x [col J])
M	= ([col B] x [col E] x [col J] ÷ [col L] - [col B] x [col E] x [col J])
N	= [col M] x [col F] + [col N] x [col G]
O	= [col M] x [col H] + [col N] x [col I]
P	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (esaver no load losses) + [col D]^2 x (esaver full load losses minus esaver no load losses))
Q	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (esaver no load losses) + [col E]^2 x (esaver full load losses minus esaver no load losses))
R	= ([col B] x [col D] x [col J] ÷ [col Q] - [col B] x [col D] x [col J])
S	= ([col B] x [col E] x [col J] ÷ [col R] - [col B] x [col E] x [col J])
T	= [col S] x [col F] + [col T] x [col G]
U	= [col S] x [col H] + [col T] x [col I]
V	= [col M] - [col S]
W	= [col N] - [col T]
X	= [col O] -[col U]

ESAVER-C3L loss table		
kVA	No Load (W)	Full load (W)
15	55	851
30	90	1313
45	116	1552
75	157	2204
112.5	217	2546
150	298	3388
225	423	4881
300	526	6066
500	795	8527
750	1132	11423

Standard AL 115C loss table		
kVA	No Load (W)	Full load (W)
15	325	985
30	480	1218
45	750	1835
75	956	2789
112.5	1448	3559
150	1727	4620
225	1950	6740
300	2760	7160
500	3830	9830
750	3980	16800

Putnam County, NY
William Koehler Senior Center
Premium Efficiency Transformers

	Existing Transformer Details														Proposed Transformer Details						Savings		
Location	Unit Size (kVA)	Occ. Hours % Load	UnOcc. Hours % Load	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Load Power Factor	Existing Occ. Efficiency	Existing UnOcc. Efficiency	Existing Occ. kW Losses	Existing UnOcc. kW Losses	Existing Annual Peak Losses (kWh)	Existing Annual Off Peak Losses (kWh)	Proposed Occ. Efficiency	Proposed UnOcc. Efficiency	Proposed Occ. kW Losses	Proposed UnOcc. kW Losses	Proposed Annual Peak Losses (kWh)	Proposed Annual Off Peak Losses (kWh)	Monthly Demand Savings (kW)	Annual Peak Electric Energy Savings (kWh)	Annual Off-Peak Electric Energy Savings (kWh)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Electrical Room Bsmt	112.5	15.0%	10.0%	3,911	4,849	0	0	95.0%	91.9%	88.4%	1.42	1.40	12,324	0	98.4%	97.9%	0.26	0.23	2,108	0	1.16	10,216	0
Electrical Room Bsmt	30.0	15.0%	10.0%	3,911	4,849	0	0	95.0%	90.1%	86.0%	0.47	0.46	4,090	0	97.5%	96.7%	0.11	0.10	908	0	0.36	3,183	0
Totals	**142.5**	**15.0%**	**10.0%**								**1.89**	**1.86**	**16,414**	**0**			**0.37**	**0.33**	**3,015**	**0**	**1.52**	**13,399**	**0**

Cell Ref.	Comment
A	Location of Transformer
B	Transformer Nameplate Rating - kVA
C - D	Estimated existing transformer loading as a percent of nameplate rating
E - H	Facility operating hours from EMS calculation
I	Estimated load powerfactor seen at the transformer - output
J	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (standard no load losses) + [col D]^2 x (standard full load losses minus standard no load losses))
K	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (standard no load losses) + [col E]^2 x (standard full load losses minus standard no load losses))
L	= ([col B] x [col D] x [col J] ÷ [col K] - [col B] x [col D] x [col J])
M	= ([col B] x [col E] x [col J] ÷ [col L] - [col B] x [col E] x [col J])
N	= [col M] x [col F] + [col N] x [col G]
O	= [col M] x [col H] + [col N] x [col I]
P	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (esaver no load losses) + [col D]^2 x (esaver full load losses minus esaver no load losses))
Q	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (esaver no load losses) + [col E]^2 x (esaver full load losses minus esaver no load losses))
R	= ([col B] x [col D] x [col J] ÷ [col Q] - [col B] x [col D] x [col J])
S	= ([col B] x [col E] x [col J] ÷ [col R] - [col B] x [col E] x [col J])
T	= [col S] x [col F] + [col T] x [col G]
U	= [col S] x [col H] + [col T] x [col I]
V	= [col M] - [col S]
W	= [col N] - [col T]
X	= [col O] -[col U]

ESAVER-C3L loss table

kVA	No Load (W)	Full load (W)
15	55	851
30	90	1313
45	116	1552
75	157	2204
112.5	217	2546
150	298	3388
225	423	4881
300	526	6066
500	795	8527
750	1132	11423

Standard AL 115C loss table

kVA	No Load (W)	Full load (W)
15	325	985
30	480	1218
45	750	1835
75	956	2789
112.5	1448	3559
150	1727	4620
225	1950	6740
300	2760	7160
500	3830	9830
750	3980	16800

Energy Savings Calculations for

ECM 11: Vending Misers

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Putnam County, NY	
Energy and Demand Savings Summary	
Measure ID:	**11**
Measure Name:	**Vending Misers**
Measure Location:	
Engineers:	

Site Name:		**Jail**	**Summary**
Item	Units	Savings	
Electricity			
Energy On-Peak	kWh	2,087	2,087
Energy Off-Peak	kWh		0
Energy Total	kWh	2,087	2,087
Demand On-Peak, Monthly	kW		0.0
Demand On-Peak, Annual	kW		0.0
Demand Off-Peak, Monthly	kW		0.0
Demand Off-Peak, Annual	kW		0.0
Fossil Fuel			0
Natural Gas (NG)	CCF	-61	-61
Liquid Propane Gas (LPG)	Gallons	0	0
Steam	Mlbs	0	0
Fuel Oil, #2	Gallons	0	0
Fuel Oil, #4	Gallons	0	0
Fuel Oil, #6	Gallons	0	0
Solar Value Stack	$	0	0

Building	Quantity of Snack Machines	Quantity of Refrigerated Drink Machines	Total Connected Demand	Existing Hours of Operation	Existing Electric Consumption	Proposed Hours of Operation	Proposed Electric Consumption	Operating Months per Year	Annual Electric Savings
[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]
Sheriff's Department/Correctional Facility	1	1	0.51	8,760	4,441	5,000	2,535	12	1,906
	1	1	0.51		4,441		2,535		1,906

Item	Value	Units	cell ref	Remarks
Existing Annual Hours of Operation per Machine	8,760	Hrs.	**[C62]**	Vending Machines are constantly plugged in.
Time Between Auto Repower	2.00	Hrs.	**[C63]**	based on Bayview Tech data
Duration of Auto Repower	0.40	Hrs.	**[C64]**	based on Bayview Tech data
Non-perishable Snack Machine Average Power Draw	80	watts	**[C65]**	Average power draw
Refrigerated Drink Machine Average Power Draw	427	watts	**[C66]**	Average power draw

Cell Ref.	Comment
A	Facility
B	Number of Snack Machines
C	Number of Drink Machines
D	Total connected electric demand per building
E	= [C62]
F	= [col D] x [col E]
G	Building Occ. hours + ([C62] - Building Occ. hours) ÷ ([C63] + [C64]) x [C64]
H	= [col D] x [col G]
I	Months per year the machine is powered on
J	= [col F] x [col H]

Putnam County, NY

Vending Misers

Interactive Savings Calculation

	Savings		Heating Penalty				Cooling Benefit			
A	B	C	D	E	F	G	H	I	J	K
Facility	Annual kW	Annual kWh	Heat Gain to Space	Heating Months	Heating System Efficiency	Heating Penalty MMBtu	Total Space Cooled	Cooling Months	Cooling System COP	Cooling Benefit MMBtu
Sheriff's Department/Correctional Facility	0.0	1,906	100.0%	8.0	70.1%	(6.2)	100.0%	4.0	3.52	0.6
New Putnam County Courthouse	0.0	0	100.0%	8.0	70.0%	0.0	100.0%	4.0	3.52	0.0
David D. Bruen County Office Building	0.0	0	100.0%	8.0	79.0%	0.0	60.0%	4.0	3.52	0.0
1812 Courthouse	0.0	0	100.0%	8.0	75.0%	0.0	40.0%	4.0	2.93	0.0
121 Main Street	0.0	0	100.0%	8.0	90.0%	0.0	5.0%	4.0	2.93	0.0
Putnam National Golf Club - Clubhouse	0.0	0	100.0%	8.0	70.0%	0.0	100.0%	4.0	2.93	0.0
Emergency Operations Center/TOPS	0.0	0	100.0%	8.0	78.5%	0.0	100.0%	4.0	3.52	0.0
Donald B. Smith Government Campus - Building 1	0.0	0	100.0%	8.0	90.0%	0.0	100.0%	4.0	2.93	0.0
Donald B. Smith Government Campus - Building 2	0.0	0	100.0%	8.0	90.0%	0.0	100.0%	4.0	2.93	0.0
Donald B. Smith Government Campus - Building 3	0.0	0	100.0%	8.0	77.2%	0.0	100.0%	4.0	2.93	0.0
Kern Building - Health Dept/DMV/WIC	0.0	0	100.0%	8.0	75.2%	0.0	100.0%	4.0	2.93	0.0
William Koehler Senior Center	0.0	0	100.0%	8.0	76.0%	0.0	100.0%	4.0	3.52	0.0
Putnam Valley Senior Center	0.0	0	100.0%	8.0	75.0%	0.0	75.0%	4.0	3.52	0.0
_14	0.0	0	100.0%	8.0	71.6%	0.0	0.0%	4.0	2.93	0.0
Putnam Family & Community Services - 1808	0.0	0	100.0%	8.0	75.3%	0.0	100.0%	4.0	2.93	0.0
Highway Department - Building 1 Admin	0.0	0	100.0%	8.0	71.0%	0.0	100.0%	4.0	2.93	0.0
Highway Department - Building 2 Sign Shop	0.0	0	100.0%	8.0	75.0%	0.0	50.0%	4.0	2.93	0.0
Highway Department - Building 3 Dispatch/Garage	0.0	0	100.0%	8.0	79.0%	0.0	100.0%	4.0	2.93	0.0
Highway Department - Building 4 Garage	0.0	0	100.0%	8.0	85.1%	0.0	50.0%	4.0	2.93	0.0
Transit Facility/Planning Department	0.0	0	100.0%	8.0	76.0%	0.0	0.0%	4.0	2.93	0.0
Board of Elections	0.0	0	100.0%	8.0	87.0%	0.0	100.0%	4.0	2.93	0.0
Totals	**0.0**	**1,906**				**(6.2)**				**0.6**

Notes:	
A	Applicable building included in comprehensive energy audit
B	Measure demand savings {kW} associated with Measure retrofit measures
C	Measure energy savings {kWh} associated with Measure retrofit measures
D	Estimated percentage of Measure energy transmitted to conditioned space
E	Estimated length of heating season
F	Estimated heating system efficiency, interacted with other measures
G	Resulting heating penalty due to Measure upgrades = [col C] x [col D] x 3,413 x ([col E] / 12) / [col F] / 1,000,000
H	Estimated percentage of space cooled
I	Estimated Length of cooling season
J	Estimated cooling system efficiency, interacted with other measures
K	Resulting cooling benefit due to Measure upgrades = [col C] x [col D] x 3,413 x ([col I] / 12) / [col J] / 1,000,000

Energy Savings Calculations for

ECM 12: Walk-in Refrigeration Controls

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Putnam County, NY

Energy and Demand Savings Summary

Measure ID: **12**

Measure Name: **Walk-in Refrigeration Controls**

Measure Location:

Engineers:

Site Name:		**Jail**	**KoehlerSr**	**Summary**
Item	Units	Savings	Savings	
Electricity				
Energy On-Peak	kWh	8,753	22,600	31,353
Energy Off-Peak	kWh			0
Energy Total	kWh	8,753	22,600	31,353
Demand On-Peak, Monthly	kW			0.0
Demand On-Peak, Annual	kW			0.0
Demand Off-Peak, Monthly	kW			0.0
Demand Off-Peak, Annual	kW			0.0
Fossil Fuel				0
Natural Gas (NG)	CCF			0
Liquid Propane Gas (LPG)	Gallons			0
Steam	Mlbs			0
Fuel Oil, #2	Gallons			0
Fuel Oil, #4	Gallons			0
Fuel Oil, #6	Gallons			0
Solar Value Stack	$			0

Putnam County, NY
Walk-in Refrigeration Controls

			Part I: Refrigeration Compressors and Condensor Fans															Part II: Cycling Evaporator Fan Sets														Part III: ECM Motors				Part IV: Glass Door Heaters on Coolers & Freezers										Summary							
Building	Cooler Location	Cooler Description	Comp Voltage	Comp FLA	Comp Phase	Comp PF	Fan Voltage	Fan FLA	Fan Phase	Fan PF	kW Load	Compressor Duty Cycle (Winter)	Compressor Duty Cycle (Non-Winter)	Winter Hours	Non-Winter Hours	Compressor Runtime per Year [Hours]	Compressor Energy Use per Year [kWh/yr]	Evap Fans	Evap Voltage	Evap FLA	Evap Phase	Evap PF	kW Load	Evap Fan Off-Hours (w/delay)	Savings due to Cycling Evap Fans [kWh/yr]	Savings due to reduced cooling load [kWh/yr]	Savings from Direct Digital Temp Controls	Comp Savings [kWh/yr]	Evap Run Hours	Resulting Evap Savings	Savings Summary [kWh/yr]	kW Load of Evaporator Fans	Motor Savings [kWh/yr]	Savings due to reduced cooling load [kWh/yr]	Savings Summary [kWh/yr]	Number of Doors	Heater Voltage	Heater FLA	Heater Phase	Evap PF	kW Load	Existing Door Heater Use [kWh/yr]	Reduction in Heater Hours	Proposed Door Run Hours	Energy Savings for Door Heaters [kWh/yr]	Savings due to Cycling Evap Fans [kWh/yr]	Savings due to reduced cooling load [kWh/yr]	Comp Savings [kWh/yr]	Resulting Evap Savings	ECM Motor Savings [kWh/yr]	Savings due to reduced cooling load [kWh/yr]	Energy Savings for Door Heaters [kWh/yr]	Total Savings [kWh/yr]
A	B	C																																																				
Jail	Kitchen	Refrigerator	208	12	3	0.85	230	3.2	1	0.85	4.30	30%	52%	2,190	6,570	4,073	17,517	2	115	2.1	1	0.55	0.27	4,035	1,072	488	5%	876	4,725	63	2,498	65%	816	371	1,187	1					0.00	0		8,760	0	1,072	488	876	63	816	371	0	3,685
Jail	Kitchen	Freezer	208	12	3	0.85	230	3.2	1	0.85	4.30	30%	52%	2,190	6,570	4,073	17,517	2	208	1.0	3	0.55	0.40	4,035	1,599	728	5%	876	4,725	94	3,296	65%	1,217	554	1,771	1					0.00	0		8,760	0	1,599	728	876	94	1,217	554	0	5,067
											0.00	30%	52%	2,190	6,570	4,073	0					0.55	0.00	4,035	0	0	5%	0	4,725	0	-	65%	0	0	0						0.00	0		8,760	0	0	0	0	0	0	0	0	0
KoehlerSr	Basement	Refrigerator	208	12	3	0.85	230	3.2	1	0.85	4.30	30%	52%	2,190	6,570	4,073	17,517	2	115	1.7	1	0.55	0.22	4,035	868	395	5%	876	4,725	51	2,189	65%	660	301	961	1					0.00	0		8,760	0	868	395	876	51	660	301	0	3,150
KoehlerSr	Basement	Freezer	208	12	3	0.85	230	3.2	1	0.85	4.30	30%	52%	2,190	6,570	4,073	17,517	2	208	1.0	3	0.55	0.40	4,035	1,599	728	5%	876	4,725	94	3,296	65%	1,217	554	1,771	1	120	1.02	1	0.84	0.10	901		8,760	901	1,599	728	876	94	1,217	554	901	5,968
KoehlerSr	Kitchen	Freezer	208	12	3	0.85	230	3.2	1	0.85	4.30	30%	52%	2,190	6,570	4,073	17,517	2	208	1.0	3	0.55	0.40	4,035	1,599	728	5%	876	4,725	94	3,296	65%	1,217	554	1,771	1	120	1.35	1	0.84	0.14	1,192		8,760	1,192	1,599	728	876	94	1,217	554	1,192	6,259
KoehlerSr	Kitchen	Refrigerator	208	12	3	0.85	230	3.2	1	0.85	4.30	30%	52%	2,190	6,570	4,073	17,517	2	115	2.1	1	0.55	0.27	4,035	1,072	488	5%	876	4,725	63	2,498	65%	816	371	1,187	1					0.00	0		8,760	0	1,072	488	876	63	816	371	0	3,685
KoehlerSr	Kitchen	Freezer	208	12	3	0.85	230	3.2	1	0.85	4.30	30%	52%	2,190	6,570	4,073	17,517	2	208	1.1	1	0.55	0.25	4,035	1,015	462	5%	876	4,725	59	2,413	65%	773	352	1,125	1					0.00	0		8,760	0	1,015	462	876	59	773	352	0	3,538
																	122,618								8,824	4,015		6,131		517	19,487		6,717	3,057	9,773						0.24	2,093			2,093	8,824	4,015	6,131	517	6,717	3,057	2,093	31,353

Cell Ref.	Comment
A-M	Data from Site Investigation
N	= [D] x [E] x [G]x [H]x [I]xSQRT([J])
O	= [N] x [M]/1000
P	= [N] x [L] x ([M]/8760) x 3.413
Q	= IF([K]=3,1.36,1.55)
R	= [P]/9500 x [Q] x 1000
S	= [R] x [M]/1000
T	=(1-IF([F]="S",0.243,0.25))x [L]
U	= (1-IF([F]="s",0.4967,0.5324)) x [N]
V	= [U] x [M]/1000
W	= [U] x [T] x ([M]/8760) x 3.413
X	= [Q]
Y	= [W]/9500 x [X] x 1000
Z	= [Y] x [M]/1000
AA	= [N] - [U]
AB	= [O] - [V]
AC	= [S] - [Z]
AD	= [AB] + [AC]

Energy Savings Calculations for

ECM 13: Steam Trap Replacements

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Putnam County, NY	
Energy and Demand Savings Summary	
Measure ID:	**13**
Measure Name:	**Steam Trap Replacements**
Measure Location:	
Engineers:	

Site Name:		**Bruen**	**Summary**
Item	Units	Savings	
Electricity			
Energy On-Peak	kWh		0
Energy Off-Peak	kWh		0
Energy Total	kWh	0	0
Demand On-Peak, Monthly	kW		0.0
Demand On-Peak, Annual	kW		0.0
Demand Off-Peak, Monthly	kW		0.0
Demand Off-Peak, Annual	kW		0.0
Fossil Fuel			0
Natural Gas (NG)	CCF		0
Liquid Propane Gas (LPG)	Gallons		0
Steam	Mlbs		0
Fuel Oil, #2	Gallons	1,308	1,308
Fuel Oil, #4	Gallons		0
Fuel Oil, #6	Gallons		0
Solar Value Stack	$		0
Water			0
Water Savings	kGallons		0
Sewer			0
Sewer Savings	kGallons		0

Putnam County, NY

David D. Bruen County Office Building

Steam Trap Replacements

Function	Trap Type	Quantity	Trap Orifice Diameter (Inches)	Steam Pressure (Psig)	Quantity of Traps Failed Open	Quantity of Traps Leaking Open	Failed Trap Steam Loss (lbs/hr)	Leaking Trap Steam Loss (lbs/hr)	Heating System Operating Hours	Blow-by Steam (Mlb/yr)	Blow-by Steam (MMBTU)
[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]
Drip	Bucket	0	5/32	5	0.0	0.0	0.0	0.0	3,366	0	0
Drip	FT	5	17/78	5	0.5	0.5	9.5	2.4	3,366	10	13
Process	Bucket	0	3/16	5	0.0	0.0	0.0	0.0	3,366	0	0
Hvac	1" FT	0	17/78	5	0.0	0.0	0.0	0.0	3,366	0	0
Hvac	1-1/4" FT	0	5/16	5	0.0	0.0	0.0	0.0	3,366	0	0
Hvac	1-1/2" FT	0	16/41	5	0.0	0.0	0.0	0.0	3,366	0	0
Hvac	2" FT	0	1/2	5	0.0	0.0	0.0	0.0	3,366	0	0
Rad	Thermo.	51	1/4	5	5.1	5.1	126.8	31.7	3,366	133	169
Venturi	Venturi	0	1/4	5	0.0	0.0	0.0	0.0	3,366	0	0
Totals		**56**			**5.6**	**5.6**	**136.3**	**34.1**		**143**	**181**

Item	Value	Units	Cell Ref	Remarks
Failed Trap Discharge Coefficient	0.50		**[D22]**	A function of hole size and geometry
Leaking Trap Discharge Coefficient	0.25		**[D23]**	A function of hole size and geometry
% of Failed Steam Traps	10%		**[D24]**	Estimated
% of Leaking Steam Traps	10%		**[D25]**	Estimated
% of Time Blow-by	25%		**[D26]**	Estimated
Heating System Efficiency	79%		**[D27]**	From Baseline
Enthalpy of Steam	1,000.0	Btu/lb	**[D28]**	Based on operating steam pressure

Cell Ref.	Comment
A	Equipment steam trap serves
B	Type of trap
C	Quantity of traps
D	Diameter of trap orifice
E	Operating steam pressure at steam trap
F	Quantity of traps failed
G	Quantity of traps leaking
H	= 3600 ÷ 70 x PI() ÷ 4 x [D22] x [D] ^2 x ([E) + 14.7) x [F]
I	= 3600 ÷ 70 x PI() ÷ 4 x [D22] x [D23] x [D] ^2 x ([E) + 14.7) x [F]
J	Hours the heating system is on.
K	= ([H] + [I]) x [J] x [D26] ÷ 1,000
L	= [K] x 1,000 x [D28] ÷ 1,000,000 ÷ [D27]