

Energy Efficiency

The Mattabassett District – Cromwell, CT

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Joint Energy & Plant Operations Presentation & Tour

November 10, 2022



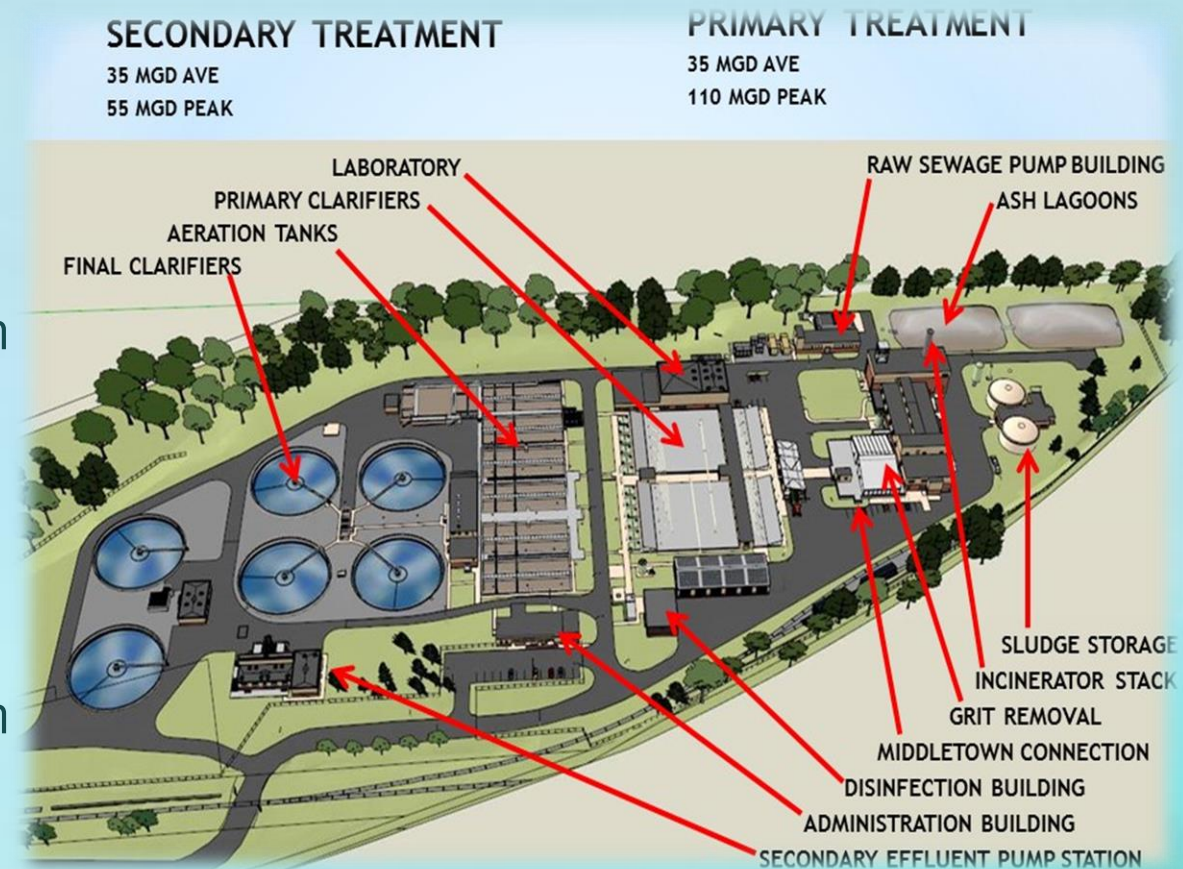
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Introduction to The Mattabassett District Wastewater Treatment Plant

- Located in Cromwell, Connecticut, along the Connecticut River
- Approximately 25 building structures located throughout the Plant
- The Plant operates 24/7 and processes an average wastewater flow of 21 million gallons per day (MGD)
- In 2015 the District completed a large expansion, increasing the flow process capacity to 35 MGD. The main improvements included;
 - ✓ Fluidizer bed incinerator with advanced emission controls
 - ✓ Three highly efficient dewatering centrifuges
 - ✓ Side stream reactor for nitrogen removal
 - ✓ Turbo air compressors for the aeration process
 - ✓ New odor control systems
 - ✓ Upgrade/expansion to the plants SCADA system



245
MAIN ST.

Welcome to

**THE MATTABASSETT
DISTRICT**



Introduction to ESCO

- The intent of the District was to enter into a contract for energy management services with an Energy Services Company (ESCO)
- Comprehensive improvements to the District facilities will be done by reducing energy consumption, cost and carbon footprint
- Upgrading facilities, optimizing utilities and operating budgets through comprehensive infrastructure, thus will ensure peak efficiency for the contract term, through proactive maintenance and service programs



What is Energy Management Services?

- Energy Management Services are defined as the design and installation of systems or maintenance programs, primarily intended to reduce the cost of energy and water in operating buildings and utility systems
- These services may be paid for by cost savings attributable to a reduction in energy and water consumption resulting from the services



Executive Summary – Project Specifics

Table E.3: ECM Matrix

Mattabasset District WWTP		Lighting System Improvements	Integrated Temperature Controls	Low Voltage Transformer	Reclaim Waste Heat from Fuel Cell	Pipe Insulation	RTU Replacement	AHU Replacement	Replace Raw Sewage Pumps	Replace Cone Valves
Energy Conservation Measures (ECMs)		1	2	3	4	5	8	9	13	14
Facility										
Administration Building	X	X				X				
Sludge Storage Building	X									
Dewatering Building	X	X		X			X	X		
Raw Sewage Pump/Rack Building	X								X	X
Primary Gallery	X	X								
Primary Pipe Tunnel	X									
Disinfection Building	X	X								
Maintenance Garage	X	X								
Laboratory/Maintenance Building	X	X								
Secondary Pipe Tunnel	X									
Blower Building	X	X								
Supplemental Carbon Building	X									
Return Sludge Pump Station	X	X								
Secondary Effluent Pump Station	X	X								
Plant Wide Savings			X							

- Ameresco conducted an Investment Grade Audit of the District’s facilities including core plant operations, administration buildings, and support facilities.
- After initial review of these facilities, a comprehensive assessment was provided to the District staff for review and consideration. This initial assessment included various energy and capital improvements as well as various renewable energy opportunities.
- Upon the District’s review, Ameresco was asked to focus on nine (9) core measurements that would provide the desired benefits.
- The IGA (Investment Grade Audit) describes in detail approximately \$2.8 Million worth of energy saving capital improvements, not all which could be included in the Performance Contract without a capital contribution from the District

Baseline

- As part of the IGA, Ameresco has developed a baseline model for each facility. The baseline developed for each building listed to the right is based on fiscal year 2017 (FY2017) utility data, normalized for the thirty-year typical meteorological year (TMY3) weather data for the Cromwell, CT area.
- In FY2017, the District processed 5,402 million gallons of wastewater, with an average daily rate of 14.8 million gallons per day.

Wastewater (MG)	Natural Gas Usage (CCF)	Electric Energy Usage (KWH)	Propane (Gal)	Water Usage (KGal)	Annual MMBTU
5,402	143,552	12,221,194	1,139	13,310	55,564

- Comparing the annual energy usage to the wastewater processed, the District’s performance calculated to 10.3BTU/Gallon per Day.
- The comparison of one’s plant energy intensity from another is not always an “apples to apples” comparison.
- Plants that have more influent biological oxygen demand (BOD) use more energy on average. Additionally, plants that are required to provide nutrient removal as part of their process will have higher energy intensity.
- When comparing the energy use intensity (EUI) with other plants, these factors need to be accounted for.

Table 1.1: Facilities Evaluated

STRUCTURE	AREA (SF)	HEATING SOURCE
Administration BLD	3,704	Own Boiler
Sludge Storage BLD	4,550	Central Boiler Plant
Sludge Storage Tanks	1,350	Non-heated
Dewatering BLD	46,821	Central Boiler Plant
Odor Control Systems	1,924	Non-heated
Raw Sewage Pump BLD	18,307	Central Boiler Plant
STRUCTURE	AREA (SF)	HEATING SOURCE
Detroiters	9,512	Non-heated
Girt & Grease BLD	560	Non-heated
Septage Receiving Area	3,050	Non-heated
Primary Gallery	4,936	Central Boiler Plant
Primary Pipe Tunnel	6,240	Central Boiler Plant
Primary Tanks	56,580	Non-heated
Disinfection BLD	2,202	Electric Heaters
Maintenance Garage	6,000	Gas Unit Heaters
Lab/Maintenance BLD	15,860	Central Boiler Plant
Secondary Pipe Tunnel	1,800	Central Boiler Plant
Blower BLD	8,810	Central Boiler Plant
Aeration Tanks	49,237	Non-heated
Side Stream Reactor	8,265	Non-heated
Supplemental Carbon BLD	472	Electric Heaters
Final Setting Tanks	37,087	Non-heated
Return Sludge Pump Station	4,071	Electric Heaters
Secondary Effluent Pump Station	8,070	Electric Heaters
Ash Lagoons	14,409	Non-heated
TOTAL	313,817	

Mattabassett District's Objectives

- Upgrade facilities, Optimize utilities, Optimize operating budget
- Leveraging energy savings to fund the cost of the program
- Replace inefficient equipment
- Create energy (gas, electric, oil) savings, maintenance savings and water savings
- Provide new capital equipment with no upfront cost
- Reduce Maintenance efforts
- Increased reliability
- Implement renewable and sustainable technologies

PRELIMINARY COMMISSIONING PLAN

- The commissioning of this project will utilize industry accepted standards to insure all ECM's are completed and operating as designed and intended.
- 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.
- The purpose of the commissioning plan is to provide direction to the commissioning process during construction. The plan will identify what equipment and systems will be commissioned, it will also identify parties involved, their roles, and required deliverables.

The Preliminary plan will detail the following steps;

1. A breakdown of each ECM and the level of pre-functional and functional testing, including areas of responsibility and deliverables.
2. Acceptance and turn over procedures including the integration of commissioning activates.
3. A brief description of commissioning documents
4. A training agenda and sample training goal for each ECM

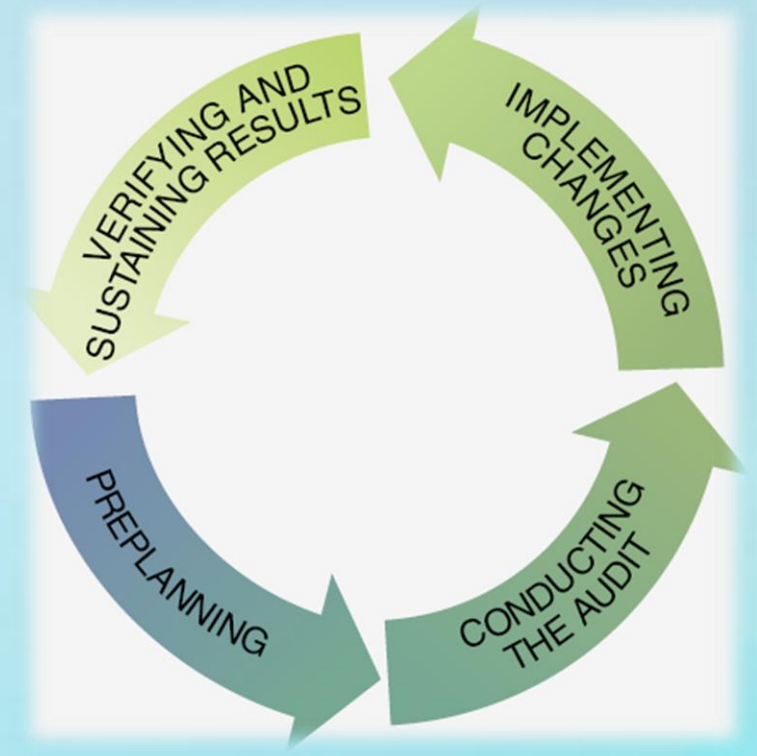
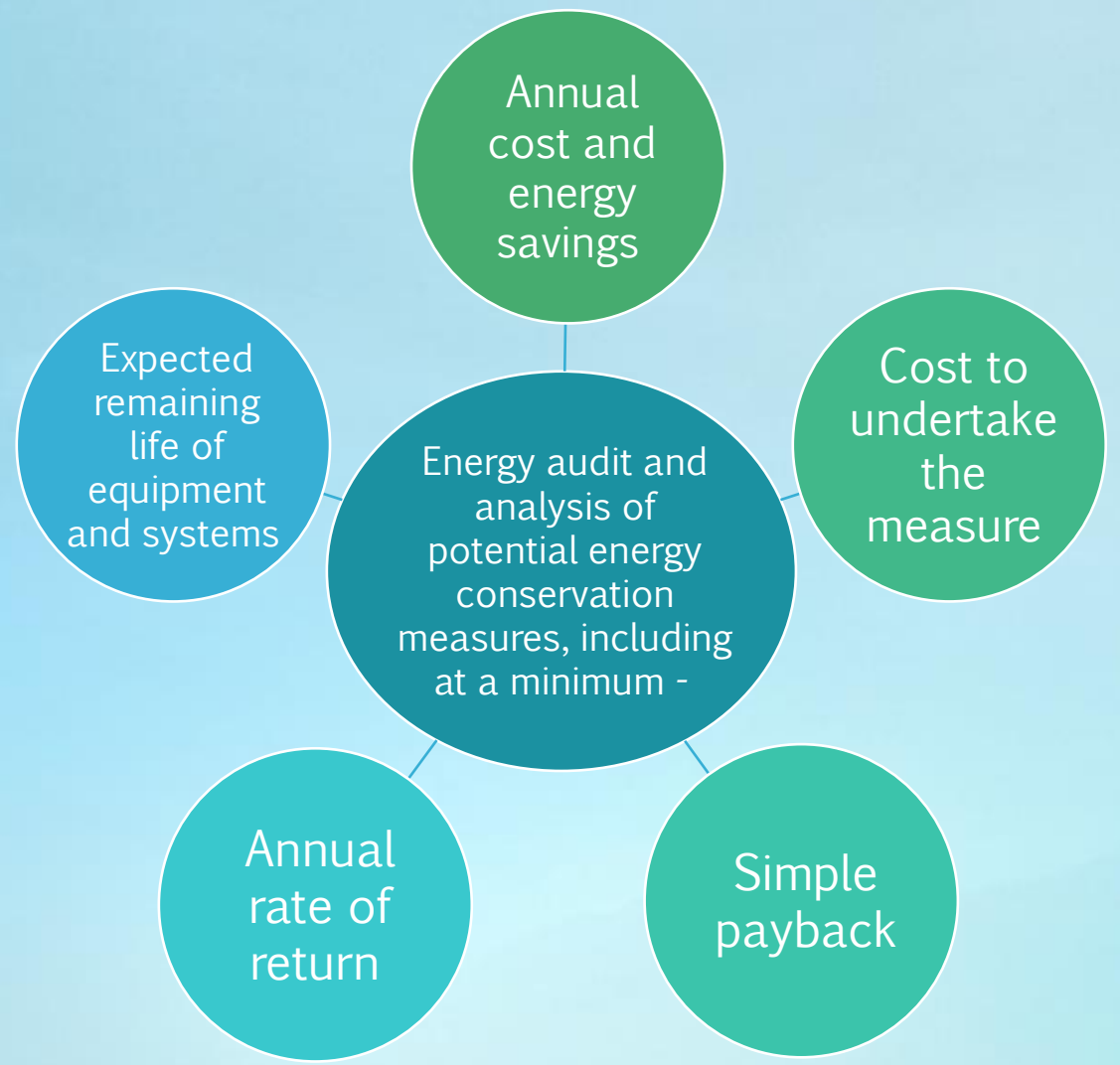
Mattabassett's Services Performed (continued)

- Design and installation or modification of equipment, systems and materials that will reduce energy and water consumption
 - ✓ Plant process equipment
 - ✓ Heating
 - ✓ Ventilation
 - ✓ Air conditioning systems
 - ✓ Lighting
 - ✓ Hot water systems
 - ✓ Any other energy and water using systems
 - ✓ Fuel Cells for electric generation
 - ✓ Renewable Solar Panels (offsite & onsite)



Mattabassett's Services Performed (continued)

ENERGY AUDIT



Energy Baseline & Savings Calculation Options

Method

Advantages

Disadvantages



Utility billing history

- ✓ Low cost
- ✓ Data already available
- ✓ Independent data
- ✓ Represent all effects of ESMs
- ✓ Account for interactive effects

- Effects of weather, occupancy, other changes may mask savings
- May be unreliable unless savings are significant compared to normal bill



System/Equipment sub-metering

- ✓ Isolate effects of ESMs
- ✓ Very accurate for lighting measures
- ✓ Results are more predictable (low risk)

- Higher cost
- Misses interactive effects

ELECTRICITY DATA LOG 2014 - 2019

<u>Date</u>	<u>Account #1</u>	<u>Account #2</u>	<u>Usage kWh</u>
Jan 14	\$38,645.01	\$158,998.00	
Feb 14	\$39,386.00	\$66,414.85	
Mar 14	\$41,301.99	\$71,201.51	
Apr 14	\$47,880.40	\$86,159.81	
May 14	\$43,184.68	\$69,406.51	
Jun 14	\$40,726.86	\$68,808.18	
Jul 14	43230.38	5671190.3	
Aug 14	\$35,921.26	\$65,304.59	916,813
Sep 14	\$31,986.45	\$61,520.78	863,817
Oct 14	\$38,225.71	\$74,375.80	1,044,343
Nov 14	\$39,064.30	\$72,135.62	1,012,714
Dec 14	\$43,908.75	\$89,010.51	1,224,614
Jan 15	\$36,340.76	\$75,581.96	1,019,251
Feb 15	\$38,696.79	\$76,264.13	1,027,403
Mar 15	\$48,424.67	\$97,428.50	1,337,867
Apr 15	\$48,223.19	\$89,938.99	1,262,656
May 15	\$46,892.51	\$90,192.07	1,266,209
Jun 15	\$44,865.11	\$86,036.64	1,207,939
Jul 15	\$44,871.50	\$77,454.43	1,087,385
Aug 15	\$42,442.28	\$64,227.27	995,891
Sep 15	\$43,151.33	\$70,178.50	985,238
Oct 15	\$42,327.13	\$76,429.65	1,072,998
Nov 15	\$43,393.14	\$76,910.66	1,079,751
Dec 15	\$44,957.92	\$83,839.31	1,167,382
Jan-16	\$50,539.39	\$74,048.47	1,021,640
Feb-16	\$53,226.85	\$80,687.44	1,114,677
Mar-16	\$52,674.80	\$11,458.14	1,170,166
Apr-16	\$48,908.30	\$72,254.50	1,014,383
May-16	\$47,741.56	\$81,424.79	1,143,125
Jun-16	\$46,164.92	72.937.17	1,023,967
Jul-16	\$47,660.60	\$68,948.43	967,969
Aug-16	\$45,790.54	\$69,619.85	977,395
Sep-16	\$45,361.14	\$64,332.15	904,967
Oct-16	\$45,241.62	\$65,632.03	921,410
Nov-16	\$47,499.54	\$78,890.29	1,107,543
Dec-16	\$47,008.67	\$75,348.59	1,048,358

<u>Date</u>	<u>Account #1</u>	<u>Account #2</u>	<u>Usage kWh</u>
Jan-17	\$92,848.47	\$85,353.58	982,087
Feb-17	\$47,610.48	\$87,908.37	1,011,492
Mar-17	\$45,183.58	\$83,891.82	970,277
Apr-17	\$49,253.85	\$98,250.92	1,147,657
May-17	\$51,133.43	\$100,531.99	1,174,302
Jun-17	\$46,665.66	\$86,272.36	1,007,737
Jul-17	\$51,720.62	\$88,475.97	1,033,477
Aug-17	\$51,774.25	\$92,311.89	1,078,284
Sep-17	\$49,424.82	\$82,824.59	967,620
Oct-17	\$47,976.75	\$79,077.19	923,691
Nov-17	\$98,212.01	\$95,448.30	1,114,920
Dec-17	\$49,325.43	\$95,430.84	1,060,934
Jan-18	\$47,690.75	\$86,504.01	1,000,509
Feb-18	\$48,377.91	\$96,844.28	1,120,105
Mar-18	\$46,903.46	\$88,848.86	1,032,366
Apr-18	\$52,590.27	\$87,221.18	1,018,820
May-18	\$52,748.54	\$98,350.99	1,148,826
Jun-18	\$51,835.45	\$91,700.64	1,071,144
Jul-18	\$53,727.01	\$98,071.05	1,145,556
Aug-18	\$51,324.35	\$91,453.91	1,068,262
Sep-18	\$52,473.70	\$84,122.87	982,269
Oct-18	\$51,632.53	\$88,188.92	1,030,124
Nov-18	\$55,723.38	\$101,813.83	1,189,275
Dec-18	\$60,120.14	\$97,673.90	1,140,917
Jan-19	\$57,565.53	\$95,914.06	1,155,512
Feb-19	\$53,177.11	\$95,914.06	1,085,209
Mar-19	\$52,637.12	\$92,318.91	1,078,366
Apr-19	\$55,520.63	\$105,953.95	1,237,634
May-19	\$53,945.07	\$94,287.77	1,101,364
Jun-19	\$53,331.18	\$92,402.30	1,079,340
Jul-19	\$51,811.27	\$94,305.32	1,101,569
Aug-19	\$50,241.83	\$84,503.58	987,076
Sep-19	\$49,704.43	\$78,503.94	916,995
Oct-19	\$48,867.19	\$76,965.87	899,029
Nov-19	\$53,160.22	\$98,561.29	1,151,101
Dec-19	\$55,840.68	\$107,508.61	1,255,795

Utility Data Summary Fiscal Year 2017

Fiscal Year 2017

Date	Weather		Electric						Propane			Natural Gas			Total	Water & Sewer		Total	
	HDD	CDD	kW	Peak kWh	Off-Peak kWh	Total kWh	Total \$	\$/kWh Blended	Gallons	\$	\$/Gal	CCF	\$	\$/CCF	MMBtu	kGallons	Total \$	kGallons T	\$
Jul	0	425	1,731	235,577	732,392	967,969	\$116,609	\$0.1205	290	\$290	\$1.0000	2,560	\$3,828	\$1.4953	290	957	\$3,759	\$3.93	\$124,485
Aug	0	424	1,570	224,482	752,913	977,395	\$115,410	\$0.1181	218	\$218	\$1.0000	5,330	\$5,382	\$1.0098	569	965	\$3,788	\$3.93	\$124,799
Sep	37	182	1,625	219,537	685,430	904,967	\$109,693	\$0.1212	284	\$284	\$1.0000	5,720	\$6,791	\$1.1873	615	1,144	\$4,562	\$3.99	\$121,330
Oct	321	12	1,608	222,742	698,668	921,410	\$110,874	\$0.1203	338	\$338	\$1.0000	6,150	\$5,077	\$0.8255	664	1,107	\$4,417	\$3.99	\$120,706
Nov	635	0	1,565	256,042	851,501	1,107,543	\$126,390	\$0.1141	10	\$10	\$1.0000	10,110	\$6,524	\$0.6453	1,042	1,085	\$4,329	\$3.99	\$137,253
Dec	965	0	1,595	255,272	793,086	1,048,358	\$122,357	\$0.1167	0	\$0	\$0.0000	16,280	\$12,005	\$0.7374	1,677	750	\$3,026	\$4.04	\$137,388
Jan	971	0	1,628	225,889	756,198	982,087	\$178,202	\$0.1815	0	\$0	\$0.0000	18,520	\$15,153	\$0.8182	1,908	1,349	\$5,359	\$3.97	\$198,714
Feb	858	0	1,749	238,004	773,488	1,011,492	\$135,519	\$0.1340	0	\$0	\$0.0000	17,520	\$15,657	\$0.8937	1,805	1,201	\$4,780	\$3.98	\$155,956
Mar	939	0	1,578	227,172	743,105	970,277	\$129,075	\$0.1330	0	\$0	\$0.0000	20,570	\$16,168	\$0.7860	2,119	1,132	\$4,513	\$3.99	\$149,757
Apr	385	17	1,704	259,590	888,067	1,147,657	\$147,505	\$0.1285	0	\$0	\$0.0000	12,240	\$10,288	\$0.8405	1,261	1,108	\$4,421	\$3.99	\$162,214
May	239	37	1,862	274,288	900,014	1,174,302	\$151,665	\$0.1292	0	\$0	\$0.0000	10,400	\$8,396	\$0.8073	1,071	1,062	\$4,240	\$3.99	\$164,301
Jun	40	159	1,608	242,801	764,936	1,007,737	\$132,938	\$0.1319	0	\$0	\$0.0000	8,090	\$6,321	\$0.7813	833	1,451	\$5,754	\$3.97	\$145,013

Fiscal Year 2017 - Weather Adjusted w/ 30-year average HARTFORD BRADLEY INTL AP HDD

Date	Weather		Electric						Propane			Natural Gas			Total	Water & Sewer		Total	
	HDD	CDD	kW	Peak kWh	Off-Peak kWh	Total kWh	Total \$	\$/kWh Blended	Gallons	\$	\$/Gal	CCF	\$	\$/CCF	MMBtu	kGallons	Total \$	kGallons T	\$
Jul	0	281	1,731	235,577	732,392	967,969	\$116,609	\$0.1205	290	\$290	\$1.0000	2,561	\$2,109	\$0.8235	290	957	\$3,759	\$3.93	\$122,767
Aug	21	200	1,570	224,482	752,913	977,395	\$115,410	\$0.1181	218	\$218	\$1.0000	2,964	\$2,447	\$0.8257	325	965	\$3,788	\$3.93	\$121,863
Sep	119	63	1,625	219,537	685,430	904,967	\$109,693	\$0.1212	284	\$284	\$1.0000	4,869	\$4,046	\$0.8311	527	1,144	\$4,562	\$3.99	\$118,585
Oct	409	0	1,608	222,742	698,668	921,410	\$110,874	\$0.1203	338	\$338	\$1.0000	10,363	\$8,659	\$0.8356	1,098	1,107	\$4,417	\$3.99	\$124,288
Nov	644	0	1,565	256,042	851,501	1,107,543	\$126,390	\$0.1141	10	\$10	\$1.0000	14,834	\$12,415	\$0.8369	1,529	1,085	\$4,329	\$3.99	\$143,143
Dec	1,114	0	1,595	255,272	793,086	1,048,358	\$122,357	\$0.1167	0	\$0	\$0.0000	23,767	\$19,915	\$0.8379	2,448	750	\$3,026	\$4.04	\$145,299
Jan	1,145	0	1,628	225,889	756,198	982,087	\$178,202	\$0.1815	0	\$0	\$0.0000	24,351	\$20,406	\$0.8380	2,508	1,349	\$5,359	\$3.97	\$203,967
Feb	1,007	0	1,749	238,004	773,488	1,011,492	\$135,519	\$0.1340	0	\$0	\$0.0000	21,722	\$18,198	\$0.8378	2,237	1,201	\$4,780	\$3.98	\$158,497
Mar	778	0	1,578	227,172	743,105	970,277	\$129,075	\$0.1330	0	\$0	\$0.0000	17,371	\$14,544	\$0.8373	1,789	1,132	\$4,513	\$3.99	\$148,133
Apr	450	1	1,704	259,590	888,067	1,147,657	\$147,505	\$0.1285	0	\$0	\$0.0000	11,147	\$9,318	\$0.8359	1,148	1,108	\$4,421	\$3.99	\$161,244
May	167	27	1,862	274,288	900,014	1,174,302	\$151,665	\$0.1292	0	\$0	\$0.0000	5,777	\$4,809	\$0.8324	595	1,062	\$4,240	\$3.99	\$160,715
Jun	65	133	1,608	242,801	764,936	1,007,737	\$132,938	\$0.1319	0	\$0	\$0.0000	3,827	\$3,172	\$0.8287	394	1,451	\$5,754	\$3.97	\$141,864
Totals	5,920	706	19,822	2,881,396	9,339,798	12,221,194	\$1,576,238	\$0.1290	1,139	\$1,139	\$1.0000	143,552	\$120,039	\$0.8362	14,890	13,310	\$52,949	\$3.98	\$1,750,365

GUARANTEED ENERGY SAVINGS

A written Guarantee from the qualified provider that either;

- The amount of energy savings will be achieved

OR

- The qualified buyer shall reimburse the District for the shortfall
 - ✓ All savings in excess of the guaranteed savings contract shall be the sole property of the District

Project Pro-Forma

Initial Project Costs:	
Implementation costs	\$ 983,482
Total Initial Project Costs	\$ 983,482
Rebates	\$ -
Customer contributions / Unassigned Rebates	\$ 300,000
Net Project Costs after rebates	\$ 683,482

Financial Assumptions	
Term of Project (yrs)	12.0 yrs
Term of Financing (yrs)	12.0 yrs
Estimated Financing Rate	3.50%
Payments per year (frequency)	12
Discount Rate	3.50%
Net Present Value of cash flow	\$ 258,846
Project Simple Payback	13.05

Pro-forma										
	1a	1b	2	3	4	5	6	7	8	9
Year	Efficiency Savings	Fuel Cell Revenue	Solar PV RECs	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	\$ 73,691	\$ -	\$ -	\$ 73,691	\$ 1,687	\$ 75,378	\$ 56,947	\$ 12,875	\$ 5,556	\$ 5,556
2	\$ 75,901	\$ -	\$ -	\$ 75,901	\$ 1,738	\$ 77,639	\$ 58,822	\$ 13,261	\$ 5,556	\$ 11,112
3	\$ 78,178	\$ -	\$ -	\$ 78,178	\$ 1,790	\$ 79,969	\$ 60,754	\$ 13,659	\$ 5,556	\$ 16,667
4	\$ 80,524	\$ -	\$ -	\$ 80,524	\$ 1,844	\$ 82,368	\$ 62,743	\$ 14,069	\$ 5,556	\$ 22,223
5	\$ 82,940	\$ -	\$ -	\$ 82,940	\$ 1,899	\$ 84,839	\$ 64,792	\$ 14,491	\$ 5,556	\$ 27,779
6	\$ 85,428	\$ -	\$ -	\$ 85,428	\$ 1,956	\$ 87,384	\$ 66,902	\$ 14,926	\$ 5,556	\$ 33,335
7	\$ 87,991	\$ -	\$ -	\$ 87,991	\$ 2,015	\$ 90,005	\$ 69,076	\$ 15,373	\$ 5,556	\$ 38,891
8	\$ 90,630	\$ -	\$ -	\$ 90,630	\$ 2,075	\$ 92,705	\$ 71,315	\$ 15,835	\$ 5,556	\$ 44,446
9	\$ 93,349	\$ -	\$ -	\$ 93,349	\$ 2,137	\$ 95,487	\$ 73,632	\$ -	\$ 5,556	\$ 50,002
10	\$ 96,150	\$ -	\$ -	\$ 96,150	\$ 2,202	\$ 98,352	\$ 76,029	\$ -	\$ 5,556	\$ 55,558
11	\$ 99,034	\$ -	\$ -	\$ 99,034	\$ 2,268	\$ 101,302	\$ 78,487	\$ -	\$ 5,556	\$ 61,114
12	\$ 102,005	\$ -	\$ -	\$ 102,005	\$ 2,336	\$ 104,341	\$ 81,034	\$ -	\$ 5,556	\$ 66,670
13	\$ 105,065	\$ -	\$ -	\$ 105,065	\$ 2,406	\$ 107,471	\$ -	\$ -	\$ 107,471	\$ 174,141
14	\$ 108,217	\$ -	\$ -	\$ 108,217	\$ 2,478	\$ 110,695	\$ -	\$ -	\$ 110,695	\$ 284,836
15	\$ 111,464	\$ -	\$ -	\$ 111,464	\$ 2,552	\$ 114,016	\$ -	\$ -	\$ 114,016	\$ 398,852
16	\$ 114,808	\$ -	\$ -	\$ 114,808	\$ 2,629	\$ 117,437	\$ -	\$ -	\$ 117,437	\$ 516,288
17	\$ 118,252	\$ -	\$ -	\$ 118,252	\$ 2,708	\$ 120,960	\$ -	\$ -	\$ 120,960	\$ 637,248
18	\$ 121,800	\$ -	\$ -	\$ 121,800	\$ 2,789	\$ 124,588	\$ -	\$ -	\$ 124,588	\$ 761,836
19	\$ 125,453	\$ -	\$ -	\$ 125,453	\$ 2,873	\$ 128,326	\$ -	\$ -	\$ 128,326	\$ 890,162
20	\$ 129,217	\$ -	\$ -	\$ 129,217	\$ 2,959	\$ 132,176	\$ -	\$ -	\$ 132,176	\$ 1,022,338
Totals	\$ 1,980,097	\$ -	\$ -	\$ 1,980,097	\$ 45,339	\$ 2,025,436	\$ 888,609	\$ 114,489	\$ 1,022,338	\$ 1,022,338

Notes:

- 1 This Proforma Cash Flow reflects an estimated tax exempt lease rate of 3.5%. 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.

Project Selection Sheet

Project Term (years)	12
Assumed rebates	\$ -
Upfront Capital Contribution	\$ 300,000
	\$ -
Upfront Capital Contribution and Rebates	\$ 300,000

(enter an integer between 10 and 20)

(If customer elects to contribute capital instead of construction financing)

Annual Contribution	\$ -
---------------------	------

Run Scenario	<input type="button" value="Run Scenario"/>
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(push button after selecting deal)

Output	
Synchronized?	OK
Selected deal work?	Yes
Year 1 Net Cash Flow	\$5,556
Total Financed Amount (including CPI, net of contribs/rebates)	\$708,272
Construction Period Interest	\$0
Total Project Size	\$983,482
Total Savings Over Term	\$2,025,436
Total Costs Over Term	\$1,003,097
Assumed Finance Rate	3.50%
Assumed Construction Period Financing	3.50%
Electric Escalation	3.00%
Gas Escalation	3.00%
Other Escalation	3.00%
Finance Term	12
Measurement & Verification Term	8

0 enter 1 for level payments or 0 for level annual benefits

Measure Number	Building Group	Building	ECM Description	Measure Cost	O&M Savin	Energy Savings	Total Savings	Simple Payback (years)	Rebates	Simple Payback (years)	Include? (1=yes)
1	WWTP	PlantWide	Lighting System Improvements - Interior	\$ 321,352	\$ 1,638	\$ 45,451	\$ 47,089	6.8	\$ -	6.8	1
2	WWTP	PlantWide	Integrated Temperature Controls	\$ 273,816	\$ -	\$ 19,100	\$ 19,100	14.3	\$ -	14.3	1
3	WWTP	PlantWide	Low Voltage Transformer Replacements	\$ 124,186	\$ -	\$ 6,638	\$ 6,638	18.7	\$ -	18.7	1
5	WWTP	AdminBLD	Pipe Insulation	\$ 2,797	\$ -	\$ 108	\$ 108	25.8	\$ -	25.8	1
8	WWTP	DewaterBLD	RTU Replacement	\$ 119,166	\$ -	\$ 247	\$ 247	482.5	\$ -	482.5	1
9	WWTP	DewaterBLD	AHU Replacement	\$ 92,165	\$ -	\$ -	\$ -		\$ -		1
X	WWTP	X	Contingency	\$ 50,000							1
Total Selected				\$ 983,482	\$ 1,638	\$ 71,544	\$ 73,183	13.4	\$ -	13.4	7

Mattabassett's Services Performed (continued)

COST & SAVINGS SUMMARY

6.3: OPERATIONS AND MAINTENANCE SAVINGS

$$AnnualSavings = \$MAINT/year \times (1 + Esc)^{(CurrentYear-2018)}$$

The maintenance savings breakdown per measure is as follows:

ECM	\$MAINT/YEAR
ECM 1: Lighting System Improvements	\$1,638
Totals	\$1,638

ECM 1 O&M savings are based on reduced material replacements costs due to replacing old lamps and ballasts with new.

The variable "Esc" equals 3.0% for the term of the project and is described in the Unit Prices section.

6.4: MAXIMUM DAILY QUANTITY GAS COSTS

$$AnnualSavings = \$MDQ/year \times (1 + Esc)^{(CurrentYear-2018)}$$

The maintenance savings breakdown per measure is as follows:

ECM	\$MDQ/YEAR
ECM 4: Reclaim Waste Heat from Fuel Cell	\$5,600
Totals	\$5,600

ECM 4 MDQ savings are based on additional gas rate savings associated with reducing gas usage at the affected buildings.

The variable "Esc" equals 3.0% for the term of the project and is described in the Unit Prices section.

6.5: UNIT PRICES SECTION

The following base unit prices are based on the Utility Rate Tables on the following page. These unit prices were utilized in calculating the financial savings associated with modified energy use.

ELECTRICITY COSTS:

$$\$/kW = Base_{kW} \times (1 + Esc)^{CurrentYear-2018}$$

$$\$/kWh_{peak} = Base_{kWh_{peak}} \times (1 + Esc)^{CurrentYear-2018}$$

$$\$/kWh_{offpeak} = Base_{kWh_{offpeak}} \times (1 + Esc)^{CurrentYear-2018}$$

The base for each location is listed in the following table.

FOSSIL FUEL COSTS:

$$\$/mmbtu_{gas} = \frac{Base_{gas}}{103 mbtu/CCF} \times (1 + Esc)^{CurrentYear-2018}$$

The base for each location is listed in the following table.

UTILITY ESCALATION:

$$Esc = 3.0\%/yr$$

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.

UTILITY RATE TABLES:

The following table presents the floor utility rates to be used for calculating the energy cost savings, per building, associated with this project, unless modified by the tables following below. These utility rate tables are considered the floor rates. The rates used for calculating the annual energy cost savings will be the greater of the floor rates or the current rates in effect during the period covered by the Annual Reconciliation Report.

FACILITY	\$/KW	\$/KWH _{PEAK}	\$/KWH _{OFFPEAK}	\$/CCF NATURAL GAS	\$/MDQ NATURAL GAS
Administration Building	\$15.80	\$0.1145	\$0.0994	\$0.8825	\$1.935
All Other Facilities	\$15.80	\$0.1145	\$0.0994	\$0.5186	\$2.746

Mattabassett's Services Performed (continued)

COST & SAVINGS SUMMARY

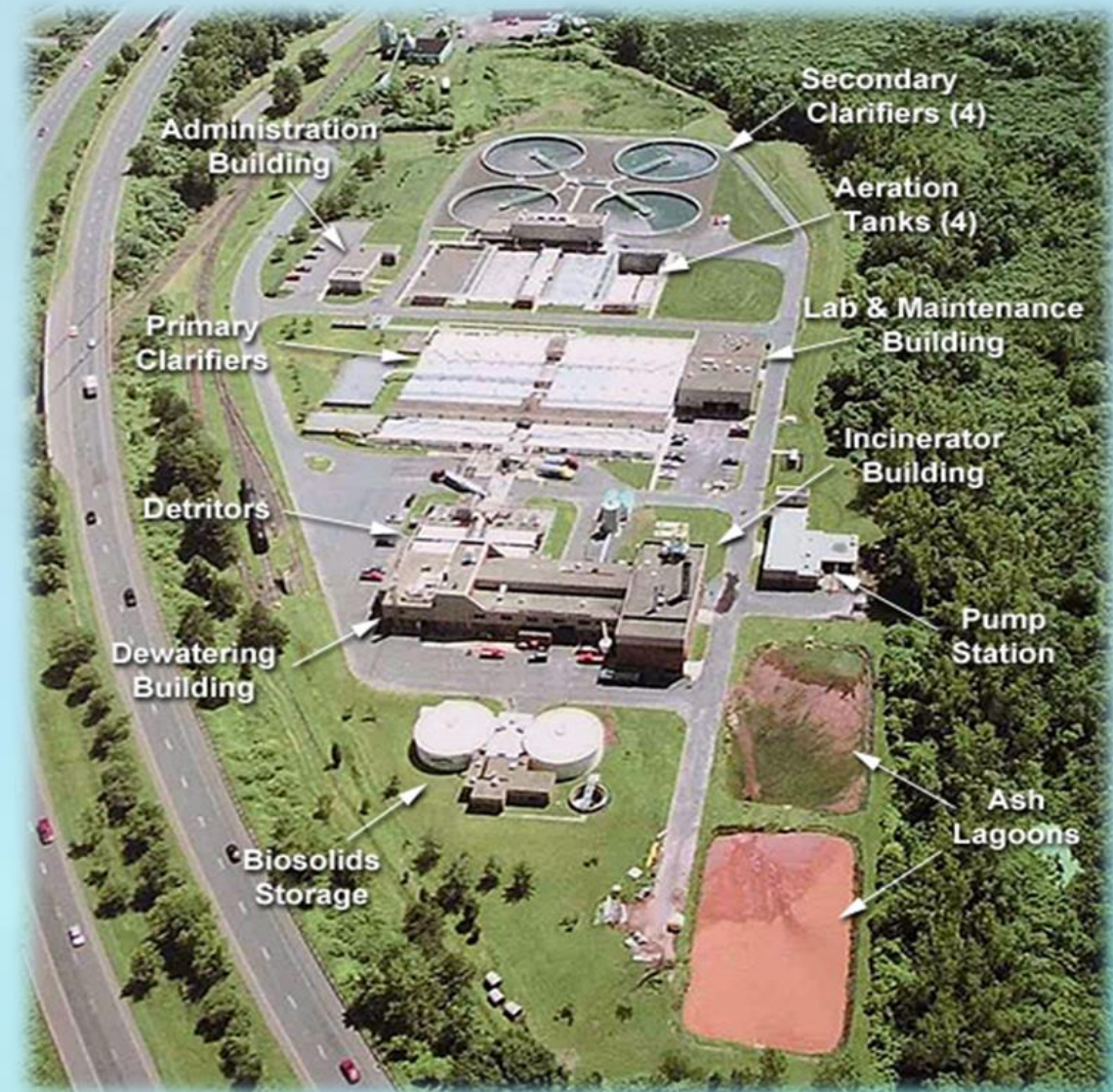
Table E.2: ECM Cost and Savings Summary

ECM #	ECM Name	Annual kW	Total kWh	Natural Gas (CCF)	Natural Gas Maximum Daily Rate (CCF)	Energy Savings	O&M Savings	Total Project Savings	Total Project Costs	SPB
1	Lighting System Improvements	561	372,352	(2,996)	-	\$ 45,451	\$ 1,638	\$ 47,089	\$ 307,286	6.53
2	Integrated Temperature Controls	-	153,882	6,900	-	\$ 19,100	\$ -	\$ 19,100	\$ 261,831	13.71
3	Low Voltage Transformer Replacements	73	53,283	-	-	\$ 6,638	\$ -	\$ 6,638	\$ 118,750	17.89
4	Reclaim Waste Heat from Fuel Cell	-	-	70,910	2,039	\$ 42,371	\$ -	\$ 42,371	\$ 360,492	8.51
5	Pipe Insulation	-	-	123	-	\$ 108	\$ -	\$ 108	\$ 2,674	24.68
8	RTU Replacement	-	2,392	-	-	\$ 247	\$ -	\$ 247	\$ 113,950	461.36
9	AHU Replacement	-	-	-	-	\$ -	\$ -	\$ -	\$ 88,131	-
13	Replace Raw Sewage Pumps	-	-	-	-	\$ -	\$ -	\$ -	\$ 992,609	-
14	Replace Cone Valves	-	-	-	-	\$ -	\$ -	\$ -	\$ 632,818	-
		634	581,909	74,937	2,039	\$ 113,916	\$ 1,638	\$ 115,554	\$ 2,878,542	24.91

ENVIRONMENTAL IMPACTS

- Determination of the impacts of each project on the reduction of greenhouse gas emissions, including;
 - ✓ Carbon dioxide
 - ✓ Methane
 - ✓ Nitrous oxide
 - ✓ Certain hydrofluorocarbons
 - ✓ Overall carbon footprint of the District

Ensuring Energy Efficiency



PREVENTATIVE MAINTENANCE

- Training of “in-house” operating and maintenance staff on the new equipment and systems to ensure peak performance is achieved through the project life
- Preventative maintenance and repair services for the equipment installed
- Monitoring and verification of project savings
- Energy Benchmarking and Action Plan to address Clean Energy Pledge through (CEFIA)



- **Lighting System**
 - Yearly site inspection of the lighting systems to ensure lamp and ballast technologies are in operation and future replacement lamps are at least as efficient as the Ameresco installed technologies
- **Integrated Temperature Controls**
 - Quarterly and annually inspections to review the available data trends and a visual inspection of major control areas
- **Low Voltage Transformer Replacements**
 - Yearly site inspection of installed transformers
- **Reclaim Waste Heat from Fuel Cell**
 - Yearly site inspection of the new heat exchanger and pumps to verify they are operational, also inspect the maintenance logs to verify proper maintenance is occurring
- **Pipe Insulation, RTU Replacement, AHU Replacement, Raw Sewage Pump Replacement, Cone valve Replacement**
 - Yearly site inspection to verify all is operational

Modifying/Reviewing the Baseline

- ❖ In order to modify the Baseline, the standards of the changes must be established. These changes may alter an energy consumption trend in the facility, examples;
 - Energy equipment, other than ESCO equipment that malfunctions, or is repaired, or replaced in a manner that increases or decreases energy consumption
 - Discovery of an error in the original baseline



What's next?/Conclusion

- Project was paid for out of reserves instead of energy savings to avoid interest and loan closing costs
- Preventative maintenance and repair services for the equipment installed
- Monitoring and verification of project savings over the next eight (8) years
- Energy Benchmarking and Action Plan to address Clean Energy Pledge through (CEFIA)
- Benefited from Eversource equipment rebates for lighting and transformers, save approximately \$50,000

